

Telecommunications Challenges in Developing Countries

Asymmetric Interconnection Charges for Rural Areas

Andrew Dymond



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THE WORLD BANK
Washington, D.C.

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Manufactured in the United States of America

First printing: February 2004



printed on recycled paper

1 2 3 4 06 05 04

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ISBN: 0-8213-5784-0

eISBN: 0-8213-5785-9

ISSN: 1726-5878

Andrew Dymond is the Managing Director of Intelcon Research & Consultancy Ltd., Vancouver, Canada.

Library of Congress Cataloging-in-Publication Data has been requested.

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ACKNOWLEDGMENTS

The author acknowledges the considerable inputs and criticisms received at every stage by colleagues at Intelecon, Sonja Oestmann, Geoff Wilkins, and Jeremy Boyd. The latter also undertook a very thorough final editorial review. Very useful advice and input were received at the draft report stage from Edgardo Sepulveda of McCarthy Tétrault, Toronto. At the World Bank, thanks are due especially to Peter Smith, Mustafa Terrab, Howard Williams, and Gareth Locksley all of whom took the time to review the draft and to provide very useful and insightful criticism and inputs, to help improve the thoroughness of the analysis.

ACRONYMS AND ABBREVIATIONS

CDR	Call detail recording
CPP	Calling party pays
CRT	Comunicacion y Telfonia Rural
EU	European Union
FCC	Federal Communications Commission
GSM	Global system for mobile communications
IN	Intelligent network
ISDN	Integrated services digital network
MPP	Mobile party pays
NECA	National Exchange Carrier's Association
NLD	National long-distance
OECD	Organization for Economic Cooperation and Development
UCC	Ugandan Communications Commission
UN	United Nations
UTL	Uganda Telecom
VSAT	Very small aperture terminal

EXECUTIVE SUMMARY

This report addresses the important issue of interconnection, the application and enforcement of which is widely recognized to be key to effective liberalization strategy, or often a key reason for failure. Nowhere is this more critical than in the area of rural telecommunications, where network costs are known to be high and where the traditional consensus has been that services cannot be rolled out without subsidies. In a liberalizing environment, the issue becomes even more critical. Rural areas must be better connected, but subsidies—even best-practice explicit subsidies applied in a so-called “smart” way—cannot cover all of the areas that will remain without service unless better means of incentivizing investment are explored.

This report investigates an approach to rural telecommunications investment that would seek to bridge most of the so-called rural “access gap” by revising the network interconnection regime, such that operators serving high cost areas would receive higher call termination fees. The new regime would be built on geographically de-averaged termination charges, to be more indicative of network cost differences between urban and rural networks. The new system could change the business model for rural networks, harnessing the potential for incoming call revenues to shoulder much more of the investment feasibility than currently allowed. It is argued that the rural access gap could be *bridged largely* by more efficient pricing, thus reducing the need for subsidies, leaving only the most remote and challenging areas in need of financial support.

The approach is not without precedent in the market today, though the broad implementation of asymmetric regimes would meet some challenges that need to be addressed. This report investigates the historic and current examples of asymmetric interconnection. It also looks at the relevance of asymmetric termination rates and user tariffs in the mobile and mobile-to-fixed interconnection regimes today. It addresses a wide range of related issues and questions, such as: customer affordability; customer education and awareness; numbering plan and billing; should asymmetric interconnection apply equally to fixed and mobile networks; whether detailed cost models are required; and could asymmetric termination, while eliminating current market distortions, create other distortions. Alternative strategies for implementation are considered.

The report does not claim to offer exhaustive analysis on network costing, though it argues that urban and rural networks (both fixed and mobile) can be shown to have sufficiently differing capital and operating costs to warrant termination rates that would create greater pricing efficiency and social benefit. Many areas in developing countries are largely starved of investment because the available resources cannot overcome the investment hurdle created by price averaging. The issues addressed are thus mostly practical ones, addressing how the implementation hurdles can be overcome and consensus reached on the rates to charge. The report hopefully develops a clearer view than previously available as to whether asymmetric interconnection is a practical alternative for developing country markets. The general conclusion is that it is a practical possibility and that the potential benefits of implementation make compelling reasons for at least piloting the concept in a few more countries as soon as possible.

INTRODUCTION

General

Intelecon Research & Consultancy Ltd. was retained by the World Bank to identify and assess issues, precedents, and potential problems with the introduction of a geographically de-averaged, asymmetric interconnection regime that is based on the principle of geographically disaggregated costs for operators serving rural areas in developing countries.

Between fixed network operators, the payment of a higher fee to terminate a domestic telephone call in one direction (into a higher cost area) than in the reverse direction is an uncommon practice, although historically it is well established as a means to ensure the viability of small rural operators in Canada and the United States. The importance of considering cost-based interconnection fees in the developing world relates to the challenge of how to provide access to rural communities traditionally understood to be chronically unviable, even while a large, pent-up demand, and need for access and urban-to-rural communication is seen to exist.

Interconnection charges between fixed and mobile networks are already at different levels in most countries, with mobile operators usually receiving higher termination rates. While there is some pressure for regulatory review of the *degree* of asymmetry required to justify termination costs, precedent already exists for asymmetry itself. However, an interconnection regime that allows geographical de-averaging of rates would require a fundamental movement away from nationally averaged rates. Despite the facts that de-averaged rates would better reflect the cost differences between urban and rural networks and that huge benefits for rural telecommunication development could result, it could place another burden on young regulators. Furthermore, the technical issues relating to numbering plan, call accounting, and interoperator billing might be significant in some countries where older, less feature-rich software and hardware platforms are used.

Even without this, it is well-known that unfair interconnection practices and weak regulation have plagued and hindered the emergence of true multioperator and competitive markets, many of which could have benefited rural areas greatly. This has occurred in markets as widely dispersed as Bangladesh, Czech Republic, Ghana, India, and Poland.

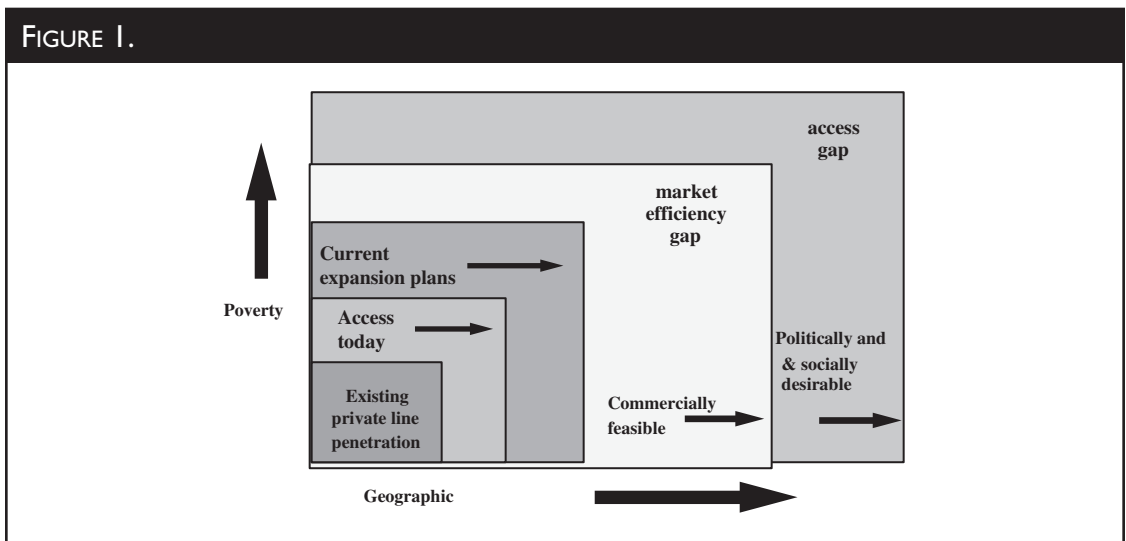
The objective of this report is to address the potential problem areas, point out the main lessons from the limited experience available to date, set out potential approaches to the solutions, and present a way forward.

The Starting Hypothesis

Enforcement of interconnection is a regulatory pillar for market liberalization. Appropriately priced termination, particularly for rural market, can limit the size of subsidies required and enabling the subsidies that are used to become more targeted and effective.

The theoretical justification for asymmetric interconnection, which is developed in more detail in Chapter 2, is that: (a) rural networks cost much more to build and operate than urban networks,¹ (b) moving charges toward cost would create greater economic efficiency, and (c) users are willing to pay higher tariffs to cover additional costs which are understandable to them.

Governments often maintain geographic averaging for social equality (universal service) reasons, but in developing countries this usually perpetuates low incentives for rural network investment. On the other hand, if users are willing to pay higher charges to support rural networks, asymmetric interconnection would provide a better commercial foundation for groups considering an investment in rural telecommunications or responding to tender calls for rural licenses through universal access or rural development funds. By creating higher interconnection revenues than offered at present, asymmetric interconnection could harness the well-known fact that there is more pent-up demand for calls from urban centers into low-income rural destinations than the reverse.



Asymmetric interconnection is one important mechanism that could help to close the “market efficiency gap,” by enabling the market to work more effectively, reaching further into rural heartlands (Navas-Sabater et al. 2000). Asymmetric termination charges can thus be thought of as a network interconnection equivalent of tariff rebalancing that has been in process in recent years, in which historically low prices for monthly rental and local calls have been increasing, better to reflect the cost of building and operating local access networks compared to long distance networks. With asymmetric costs thus better reflected within the interconnection pricing mechanism, subsidies from universal access funds can then concentrate on the “access gap” for those rural telecommunications situations that still exist beyond the limits of the market place.

1. We are referring to rural networks where the costs, calculated on a call-minute-basis, are demonstrably higher.

As such, and with the help of the natural explosion of mobile networks extending access to lower-income people and out into rural areas, asymmetric interconnection could be a keystone of universal access strategies.

Although higher termination charges would apply to all incoming calls into areas with high costs (with no differentiation based on whether the applications are public or private), one downstream mechanism that could create new universal access opportunities is the increased potential for rural operators to share their incoming call revenues with public pay phone retailers, to incentivize them to develop a larger incoming call market, or to develop the market in other ways. For example, higher termination charges could create greater incentive for call termination services such as voice messaging and “virtual telephone service” (where individuals have personal accounts and voice message boxes they can access from any phone through a personal identification number based scheme). Such services can contribute to improving network access for a much wider segment of the population.

The Challenges

Despite the apparent benefits, there are challenges when attempting to change the status quo. How can policy makers depart safely from the accepted norm, which although “unfair” to rural operators and service providers, requires less regulatory innovation, experimentation, and arm-twisting? Attempts to implement asymmetric interconnection without careful planning could create a range of practical issues that would dampen enthusiasm.

In this study we have considered standard interconnection principles and practices. We have looked at historical precedents, parallel cases of asymmetric interconnection (for example, in the mobile-to-fixed network arena), recent trends, and existing precedents for asymmetric interconnection in support of rural service.

Finally, the technical and regulatory issues related to numbering and billing systems, which, in some countries, could represent significant hurdles to seamless implementation of asymmetric interconnection, receive attention as to solutions evident from the case examples studied.

BASIC CONCEPTS

In this chapter, we provide introductions to the operator-operator relationship, the main options as to who pays for asymmetric interconnection, the types of interoperator payment, the theoretical justification for asymmetric interconnection, and a look at operator investment incentives.

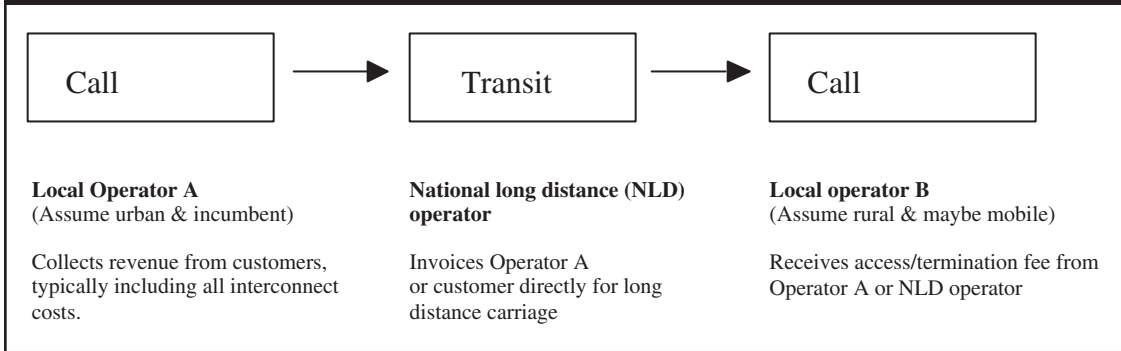
Interconnection: Operator-to-Operator Payments

In order to clarify terms for this study, we differentiate between originating, long-distance (transit) and terminating operators (omitting international for the moment). The relationship between local and transit operators, illustrated in the following diagram, can be visualized in either a regional monopoly or competitive market environment. Indeed, some of the historic examples discussed subsequently are more associated with regulated regional monopolies than with competing operators. However, cost-based asymmetric interconnection has its most beneficial application in creating an efficient market for *high cost* rural telecommunications—that is, in closing the “market efficiency gap” in areas where operators experience higher costs—in a liberalized environment. The diagram applies to either case.

For the sake of simplicity, we designate operator A as the larger, incumbent and/or urban-based operator, and B as a rural operator (whether fixed or mobile)² which has a higher cost structure, calculated on a call-per-minute basis. We are considering primarily the mechanism for implementing a different interoperator payment structure in the A-to-B direction (that shown) than in the B-to-A direction. This is based on the hypothesis that the cost structure for Operator B to serve rural areas will be significantly different (higher) than for Operator A.

2. It is recognized that the incumbent operator may also have an extensive rural network, though the point of the paper is that it is often underinvested, and thus asymmetric termination charges are under consideration to increase incentives whether the rural segment is actually a new operator or the incumbent. Thus the analysis can be applied between any pair of operators for calls originating in an urban area and terminating in a *high cost* rural area.

FIGURE 2.



In the majority of developing countries, the NLD operator is also the incumbent local operator (A). However, this is changing, and increasingly Operator B may also have a long-distance network, especially if it is an already-established mobile operator with a national cellular infrastructure. Hence the point of interconnection could include the use of long distance in either or both operator’s national network(s).

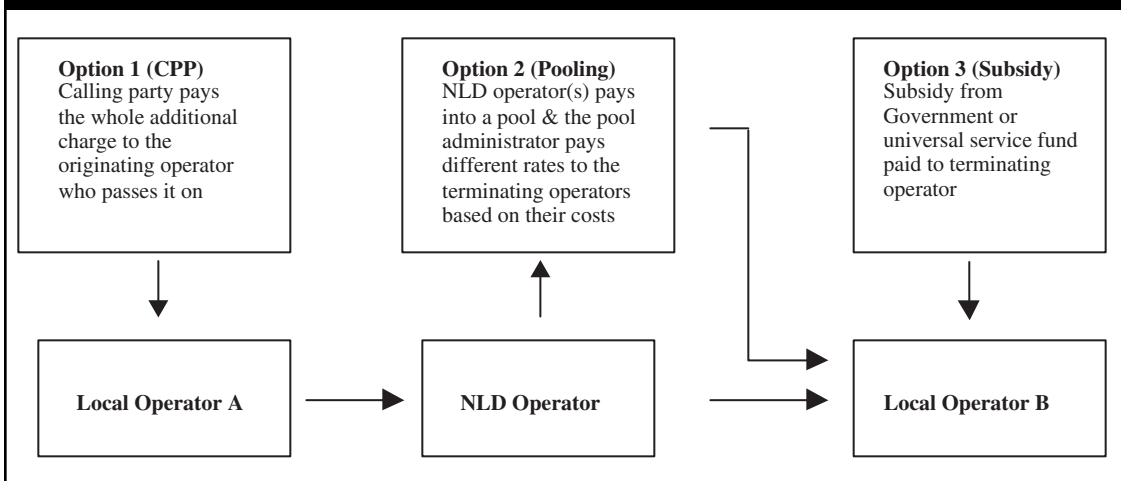
If we assume, as international trends indicate, that the bulk of costs are due to the local network, with long distance accounting for only a small percentage of the total, then we could eliminate the NLD portion of the figure. For greater simplicity therefore, we could talk mostly about the relations between Operator A and Operator B, assuming that the different costs we refer to include local and long distance.

Who Pays the Additional Charges for Asymmetric Interconnection?

Subsequent chapters describe various options for who actually pays the additional cost associated with asymmetric interconnection. In international practice, this may be paid by the users, absorbed by operators, or covered by subsidy. Some countries use a combination.

Option 1 is used by Chile in fixed service, and is being adopted by Colombia and Peru; it is also used widely in fixed-to-mobile interconnection practice outside of North America.

FIGURE 3.



Options 2 and 3 are used in North America. In the United States, Options 2 and 3 are used in combination. These very different approaches are discussed and compared in detail later in the report and conclusions drawn as to which option is the most appropriate in the developing country setting.

Types of Interoperator Financial Interconnection Arrangements

Historical interoperator agreements can be classed as:

- *Sender keeps all.* Considering Operators A and B and assuming they have approximately equal cost traffic in each direction between one another (and discounting or treating separately the long-distance network), no payments are made by either operator for terminating calls;
- *Revenue sharing.* Associated with the regulated monopoly world, and based on an agreed and managed division of call revenues between originating, long-distance and terminating operators; and
- *Cost-based charges.* Fixed rates, which are paid by the originating operator to the transit and terminating operator(s). The originating operator has to charge users sufficiently to cover all his interconnection charges, plus his own costs and profit.

The *sender keeps all* option cannot really be used for asymmetric interconnection because it often (though not necessarily always) assumes equal terms for originating and terminating operators. *Revenue sharing*, as we shall see, has been used for managing a form of asymmetric payment, especially in North America. *Cost-based charges* are generally recognized to be preferable in today's liberalized environment because: (a) they are more flexible in the face of competitive rate changes, (b) once established, they are less prone to intercarrier argument, and (c) they are the best basis for pricing the use of one operator's network elements by its competitors. For example, in a revenue sharing system, local exchange carriers would see their revenues decline as long-distance operators reduce their rates and would therefore tend to oppose rate reductions, whereas in a cost-based environment, they can maintain their cost coverage and mark-up in an arithmetically more straightforward fashion.

Theoretical Justification for Asymmetric Interconnection

The primary reasoning why asymmetric interconnection rates are justified is two-fold:

- (a) *The cost of rural networks is much higher than urban networks.* This is due to lower user density (less than one telephone per square kilometer, rather than hundreds or thousands per square kilometer in urban areas); the length of the "local loops," often necessitating wireless technology to reduce costs; and the often higher costs of support structure relative to capacity (need for a dedicated, stand-alone power supply). Operational costs such as maintenance and transportation are also higher in rural networks. While much has been written—mostly by promoters of wireless technology—to prove that costs are reducing, the cost reductions are throughout the network. The *differential* between rural and urban networks remains such that fixed rural networks are still at least 6 to 10 times more costly per subscriber or unit of capacity to establish and operate than urban ones, and therefore should have higher termination rates.³ Even for mobile networks, the author's recent work on universal access strategies in Nigeria and Uganda has concluded that new base stations in marginal non-

3. Historic cost differentials quoted by the ITU are that rural lines are seven times costlier than urban. Many examples and graphs can be used to support a similar differential today. Cribbett notes that "average lines costs in low-density areas of Australia were found to be between 6 to 10 times the average cost per line in the rest of Australia" (Sepulveda 2002). Per-line costs in one of the Chilean rural networks, at \$5,000, are clearly at least 6 to 10 times typical urban costs and this is reflected in the cost modelling exercise undertaken to establish interconnection rates in that country—see Chapter 3. Many similar cases in developing countries can be cited.

urban areas typically serve less than 10 percent the number of resident customers than the national (mainly urban) average. Whereas total network considerations, including the strategic value of service extension and urban to rural roaming, must obviously be taken into account, it is clear that the all-important airtime costs-per-minute are many times higher in rural areas than in urban areas.

- (b) *A pricing structure that better reflected comparative costs, inasmuch as a rationale and workable structure could be devised, would contribute to economic efficiency.* It is recognized that modern pricing systems tend to assume that geographical averaging is socially just and is therefore desirable. However, it is argued later that, in the capital-constrained environment of developing countries, this is, in fact, a luxury that cannot be afforded and is counter-productive, because it results in the higher cost rural areas being starved of investment. The evidence is that neither can we assume that universal service/access obligations, or universal access funds, should carry the whole burden. Thus it is argued that first creating greater market efficiency by moving termination charges toward cost (even if the whole cost differential is not met) would improve public benefit, particularly in liberalizing or competitive markets.
- (c) *Users will pay extra tariffs for rural telecommunication services that do not exist today.* This complements the above argument. There is strong evidence that users in developing countries are generally willing to pay higher charges to cover the cost of higher interconnection. This comes from studies indicating that low-income people will pay at least the world average of 2 to 3 percent of income on telecommunications, and from Intelecon's own experience in user surveys where users have stated that they would pay extra to be able to call their relatives, friends or business associates in rural communities that have no phone today.⁴ Also, the current worldwide experience of mobile networks using calling party pays (CPP) billing—discussed later in the report—is that customers generally are used to paying for additional interconnection charges by paying higher retail tariffs for internetwork calling.

As we explain later in the report, this foundation appears to be more relevant to developing country situations, striving for universal access, where there is still a critical need to develop rural networks under conditions of resource constraints. Whereas some advanced countries recognize the cost justification requirement for asymmetric interconnection, they do not have the same shortage of existing services in rural areas and choose to maintain geographically averaged tariffs under their universal service objectives and thus to cover differential costs with subsidies rather than calling party charges. This is the specific luxury that advanced and resource-rich countries enjoy, which the majority of developing countries clearly do not have. Hence user willingness to pay is a critical justification for considering asymmetrical interconnection.

Operator Investment Incentive

The following table provides an insight, at the outset, as to whether operators are likely to be incentivized to invest more in rural networks as a result of asymmetric termination charges. This depends to an extent on whether new payment is injected, whether through Option 1 (user retail charges) or by one of the other options discussed. Table 1 below provides a summary of the situation faced by operators in the case calls are: originated and terminated by the same operator, or interconnected between Operation A and B, as described earlier.

It is important to separate the case where both call origination and termination would be by the same operator (for example, the incumbent, second national operator or mobile operator) from the case where interoperator payments are made.

Table 1 indicates that an incumbent or national (fixed or mobile) operator with an extensive national network is only incentivized to invest more in rural networks if tariff increases are allowed

4. A report by Intelecon (2000) contained an extensive user baseline survey that documented, among other things, a high demand for urban-to-rural calling and willingness to pay higher on urban-to-rural calls.

TABLE I. IS RURAL NETWORK INVESTMENT INCENTIVE CREATED?

Tariff and payment scenarios	(i) Call kept within same area	(ii) Call made between different operators	
	Operator A = B	Operator A (urban)	Operator B (rural)
Additional user tariff charged for terminating in rural destination (irrespective of whether call goes via interconnection)	Yes	Incremental originating revenue from additional calls	Yes
Option 1: Additional user tariff allowed only to cover calls with asymmetrical interconnection (i.e. no additional tariff for intra-network calls)	No	Incremental originating revenue from additional calls	Yes
Option 2: Revenue pool based interconnection offered on a cost basis to terminating operators	Unlikely	Incremental originating revenue from additional calls	Yes
Option 3: Subsidy based interconnection offered on cost basis to terminating operators	Unlikely	Incremental originating revenue from additional calls	Yes
Asymmetrical interconnection implemented without additional user tariff or external payment	No (Reallocation only)	Lower margin on calls	Yes

for all rural terminated calls, whether or not they involve interconnection. If user tariff increases are only allowed to cover additional terminating charges, then the main incentive is provided only to new rural operators (serving only rural areas) to receive and terminate calls.

In both cases however, the originating operator, if different from the terminating operator, will generate additional urban-rural traffic from new rural investment by the rural operator and therefore will also see additional profit. *Hence there is a win-win situation for both originating and terminating operators if additional payments are generated, even if incumbents are not themselves incentivized to make new investments in rural areas.*

If, however, an asymmetric interconnection regime is implemented with no additional payments (such that user tariffs must stay the same), then the only possible incentive to invest in rural areas is enjoyed by new rural entrants, because rural operators receive higher termination charges but urban operators cannot increase their tariffs to compensate for the higher termination costs. Incumbent national operators would be generating traffic that provides a lower margin, because they would retain less. Even though they would still be able to retain a profit margin because their costs to generate incremental rural destined calls are not high, their motivation to even support asymmetric terminating charges may not be high. In this case, they are likely to see complications for themselves with the new regime (for example, they might have to exclude rural destined calls from time-of-day discounts) and are therefore likely to oppose change.

COUNTRY EXPERIENCE AND PRECEDENTS

In this chapter, we look at the global precedents for asymmetry in network terminations charges, looking first at fixed networks and then at mobile and fixed-to-mobile calls. While historical cases do have relevance, we concentrate mostly on present day precedents where operators and consumers are used to paying asymmetric tariffs and termination charges, or where regulators have had to address the issues in the current technical and regulatory environment.

In summary, both historic and present day fixed network practices in North America, as well as in Chile, Colombia, and Peru, provide solid precedent for today's asymmetric termination charges. In addition, the vast majority of fixed-to-mobile interconnection arrangements are asymmetric, with much higher termination rates enjoyed by mobile than fixed operators.⁵ However, the methods of finance, whether directly by users through the tariff regime (as in Chile and in most of the mobile world) or by means of subsidies that help to maintain geographically averaged tariffs (as in Canada and the United States), represent opposite approaches to be considered by the report.

Fixed Network Precedents

Historic Asymmetric Agreements in North America

Historically, Canada and United States regulators instituted interconnection agreements that favored small rural operators, with a form of asymmetric agreement that ensured the commercial health and survival of small operators. These cases are important because: (a) they represent a system of geographically de-averaged rates, and (b) they helped to create extensive rural networks that the countries enjoy today.

Canada. The agreements between Bell Canada and small operators in Ontario and Quebec had a “sliding scale” revenue-sharing formula that guaranteed small operators a base of revenue

5. These are under regulatory pressure to reduce rapidly over the next few years. As the report describes, despite the fact that the differentials are destined to reduce, GSM mobile networks have enjoyed very rapid growth under conditions with large asymmetrical interconnection (access) charges and significant tariff differentials for calling into mobile networks as a result.

from interconnection traffic. Their share of the revenues exchanged with Bell Canada declined, as a per-minute rate, once their base minimum revenue was reached. This scheme recognized their higher costs and minimum revenue needs. However, the Canadian model was not necessarily based on actual costs (and especially not long-run incremental costs), as much as on an assessment of what revenues were required to maintain operators in business.⁶

Current termination rates in Canada are geographically averaged, but they are also asymmetrical in the sense that various operators across the country can calculate and offer different rates, based on their total average costs, in accordance with a formula stipulated by the regulator, the CRTC. Thus, a regional operator in a relatively high-cost area (for example, Northwestel) can be paid more per minute of terminating access than larger and more geographically spread operators such as Bell Canada or Telus. However, departures from geographically averaged costs within each operator's territory are not covered through de-averaged termination rates. They are mainly financed through allocations from the country's universal service fund, which is designed to subsidize "high-cost areas."

United States. The National Exchange Carriers' Association (NECA) has for many years managed a revenue pool collected from long-distance operators, from which it distributes access/call termination charges to the 1,100 local exchange carriers it represents, in accordance with their costs relative to the amount of traffic they terminate. Whereas the terminology and method of calculation has evolved over the years, the effective result is that higher cost small town and rural operators receive significantly higher access charges than the large urban-based carriers. The rates are calculated by NECA based on a set of cost data submitted by the operators, and are in accordance with FCC calculation rules.

NECA also manages a separate, additional government sponsored subsidy fund, which is available to small rural operators because the amount distributed from the revenue pool is often insufficient to cover their cost. NECA is only able to cover part of the rural access charge from the revenue pool because the FCC has stipulated that long-distance rates should be geographically averaged, hence the urban-rural differences cannot be fully reflected in NECA's charges to the long-distance operators. The highest cost operators must be compensated from both the revenue pool *and* the subsidy fund. The average access charge received by rural operators is approximately US 6 cents per minute, comprising US 2.2 cents from the revenue pool and US 3.8 cents from the government-sponsored subsidy fund. This compares to US 0.5 cents per minute received by the larger local exchange carriers. Some of the smaller and more remote operators receive much higher rates, with the excess covered by additional subsidy.

In an interview, NECA indicated that the calculated access rates allow rural operators to make an industry average 11.25 percent rate of return from their operations. Also, it was stated that judging from the fact that most small operators are able to introduce advanced services at the same rate as the larger operators, most are in a healthy state.

Finland

Finland is a useful case to look at, because it is also well documented, and developments trace the interconnection issues that have arisen over the last decade or so. Historically, local telephone service was provided by a large number of local monopolies (most cooperatives), whereas national long-distance service was provided by a separate entity, which is now Sonera (recently merged with Telia of Sweden). The most relevant developments to this report occurred after 1994. Until this point, local and long-distance charges were separate and explicit to the user, but no termination charge was paid to fixed network operators. A *sender keeps all* arrangement was in force, assuming

6. Other forms of asymmetrical revenue sharing, which were not dealing small operator or rural telecommunication issue as this report—e.g. the abandoned Telecom Canada Revenue Settlement Plan between the provincial operator members of Telecom Canada, and the abandoned Commonwealth Telecommunications Settlement Plan were also not cost based.

that the traffic terminated in opposite directions was approximately equal. Even if this appeared fair enough in terms of traffic volume, it did not address the issue of differing local network costs, as the North American model does.

Traffic imbalances were recognized to be increasing with the growth of mobile communications and with premium/peak rate pricing in fixed networks. In 1994, a *revenue division* regime, based on an estimation of average network costs and maintained by a price cap, was introduced. Call termination access charges were included in the division. The originating operator charged its customers for call origination, call termination and long distance separately, but on the same bill. The termination charge was uniform for the whole country—that is, no allowance was made for differing operator costs—and comprised a flat call setup charge plus a per-minute charge (a common practice, which is also standard in the European Union), with off-peak discounts.

In 1999, cost-based changes were introduced to meet European Union (EU) requirements. The result is that terminating operators are now paid different per-minute call termination rates, which are de-averaged between the capital region and rest of country (only two different cost zones). The difference in per-minute rate is just 17 percent; after inclusion of the call set-up cost, the difference amounts to only 6 percent on a three-minute call (\$0.014 per minute in the capital region and \$0.015 per minute in the rest of the country).

This example, although importantly it also represents a case of limited geographical de-averaging, is less immediately relevant to developing countries because it is based on sophisticated modeling (to achieve a relatively small difference in charges) that could not easily or rapidly be undertaken in most emerging markets. In fact, neither could the North American models be easily transferred to developing countries because of their complexity. However, they do recognize the financial impact of large differences in cost between urban and rural networks and the necessity to devise a system to address the issue.

Most Relevant Fixed Network Example for Rural Applications - Chile

In Chile, there seems to be little question that the interconnection regime has contributed to the viability of the rural operators and possibly even to the minimization of required subsidies. Interconnection is cited by Wellenius as “the single most important regulatory factor for the commercial viability of rural services in Chile” (Wellenius 2001).

Chile’s access charge (interconnect) regime is clearly asymmetric, both in respect of company type/size and geography, as shown in Table 2. The access charges were determined in terms of the capital and operating costs of a hypothetical efficient rural operating company meeting expected demand over a five-year planning period, and was consistent with the method used in Chile for determining regulated telecommunications prices generally.

It will be noted that access charges to rural destinations in the incumbent CNT network are three to four times higher than urban destined calls. However, *rural operators* receive between eight and 30 times the CTC national or CNT urban access rate respectively, depending on time of day.

Paying for the Difference

The higher termination charges for urban-to-rural calls are passed on to the calling party. For example an urban-based customer of CTC or CNT pays half the normal local urban rate for call origination (because he is

TABLE 2. CHILE, ACCESS RATES

Company	Localities	Access charge (US cents/minute)	
		Peak	Off-peak
CTC-national	All	1.0	0.2
CNT-regional	Cities	1.5-2.4	0.3-0.4
	Towns	3.1	0.4
	Rural areas	7.2	1.2
Rural only	All	18.7	9.3
Mobile operators	All	21.1	14.8

Note: Pesos converted to dollars at the rate of \$1=Ch\$600.

Source: Wellenius 2001. Tariff decree of 1999 and CTR data for July 2001.

only originating and not terminating locally), *plus* the terminating operator's access charge, plus long distance if applicable.

Impact of the Regime

The largest independent operator, CTR, has reported that 60 percent of its revenues come from the favorable cash flow created by the imbalance in its termination charge account with urban operators, due to incoming calls. In our view also, CTR has done little to exploit the full potential of this revenue source because its public pay phones are largely unmanned.⁷ If it developed more call termination services and used some of its access revenue to develop public call office (shop based) retailers and incentivize messaging and incoming call growth through a per-minute distribution to the local retailers, we are sure that they could have an even healthier incoming call revenue stream. The increase would likely more than pay for any investment and revenue share paid to develop the services.

In summary, Chile's asymmetric interconnection regime appears to be more than fair to the rural operators, whose per-line capital costs are probably in the range of 8 to 10 times the average per-line costs in urban centers, and also take operating cost differences into account.⁸

Colombia and Peru

The other current example of asymmetric interconnection is Colombia, which has only recently implemented a scheme to better reflect the costs of rural operators. Colombia's regulator, Comisión de Regulación de Telecomunicaciones, passed a resolution in December 2001 to institute asymmetric interconnection for rural areas.⁹ Peru studied the Chile approach and is also known to be planning an asymmetric regime, though the details have not been announced.

Because of its historical multioperator environment, Colombia's change is a natural development as the country moves into a more liberalized market. Actual rates are not available at the present time and, of course, the impact of these changes on the viability of the more rural operators, and especially GVT and Gilat Satellite Networks, which won the 1999 rural fund subsidy bidding process, cannot yet be assessed. However, Colombia is clearly the second Latin American example of asymmetrical interconnection, with Peru close behind.

The implication is that the regulators of Chile, Colombia, and Peru—who have the most experience of universal access fund subsidy auctions—have all concluded that asymmetric interconnection is an important ingredient to minimize subsidies, attracting serious bidders, and the subsequent long-term health of rural operators.

Adopted but Still to be Developed—Uganda

During the development of the rural communications policy for the Ugandan Communications Commission (UCC), Intelecon advised adoption of an asymmetric interconnection regime similar to Chile's for rural areas. Intelecon also recommended that UCC provide explicit guidance (voluntary not mandated) for the sharing of incoming call revenues "down the value chain" with public access telephone retailers. The revenue sharing with public service retailers is envisaged as a means

7. Intelecon has reviewed the CTR experience and we believe that CTR's marketing efforts in this regard have been flawed. Thus the company has not made full use of the very enlightened and cost-based Chilean interconnection regime and has "paid the price" in terms of lower-than-potential revenues.

8. CTR's per-line capital costs are \$5,000 per line, compared to urban costs likely in the \$500-600 range.

9. Resolution 463, December 2001, modifies the original interconnection regulations to provide for additional charges on rural-bound calls by operators serving the rural area, to reflect cost. Further, Resolution 469, 2002—"Por medio de la cual se modifica la Resolución Comisión de Regulación de Telecomunicaciones 087 de 1997 y se expide un Régimen Unificado de Interconexión (RUDI)." institutes cost-based charges as the universal interconnection principal.

of incentivizing the growth of messaging, incoming call termination and “virtual telephone service” for rural people. Under such a regime, it is expected that:

- the ratio of incoming to outgoing calls should increase,
- viability for the rural operator should increase and thus attract more investment,
- viability of the public telephone retailers should increase and, with this, their number should increase and the market should accelerate,
- downward pressure should be brought to bear on outgoing call rates, which are recommended to be left flexible, with UCC stipulating only a maximum allowable per-minute tariff (for example, twice the rate of urban pay phones).

UCC and the Government of Uganda have adopted the principle within the approved rural communications policy and UCC has expressed interest in proceeding with a pilot to develop the modalities for implementation. The major operators—Uganda Telecom and MTN Uganda—have also expressed public support for the concept. In addition, MTN Uganda has implemented a limited form of asymmetry by agreeing to pay its own manned pay phone retailers for incoming calls terminated, irrespective of the existence of an asymmetric interconnection payment.

The detailed modalities of how an asymmetric interconnection regime would be implemented and priced, and to what extent the value chain opportunities for public pay phone service would be managed or guided, are yet to be developed. In 2000, MTN and Intelcon agreed on joint sponsorship, with UCC, of a manned pay phone pilot in Butologo, a relatively remote village of Mubende District in Western Uganda, where the operator would receive payment for terminating incoming calls. While not successful for practical management reasons, mainly because neither UCC nor MTN were able to provide sufficient attention and support to the operator at the time, MTN has continued to express its support for another, more official pilot to develop the operating structure for a similar scheme. Uganda Telecom and Celtel, the third cellular operator, have also expressed initial interest in the pilot. It is expected that implementation will come in 2003, along with implementation of the universal access strategy.

Under Consideration—Nepal

McCarthy Tétrault, consultant to Nepal Telecommunications Authority (NTA) on the execution of its subsidy auction for a rural telecommunications license, reports that NTA has expressed interest in implementing an asymmetric interconnection regime.

The Precedent of Fixed-Mobile Asymmetrical Interconnection

Almost all fixed-mobile network interconnection agreements are asymmetric in nature, though rarely geographically disaggregated within the same country. The cost structure of mobile networks is very different from that of fixed networks. In particular, a mobile operator has lower fixed costs, while its access network (the radio interface) is almost totally traffic sensitive and is therefore a variable cost within a ceiling determined by traffic capacity per cell.

Especially in countries with CPP regimes, where the cost of terminating incoming calls on the mobile network is covered by the interconnection charge rather than by the mobile subscriber, the concept of asymmetric interconnection between fixed and mobile network operators is the norm. Generally speaking these countries have seen much faster growth in their mobile networks than countries—such as Canada and the United States—where the mobile party pays (MPP) for all air-time covering calls in both directions. *The implication therefore is that higher access charges and higher internetwork tariffs have been accepted as a normal practice where CPP is adopted.*

A survey of comparative prices in 2001 showed that fixed-to-mobile call termination charges in EU countries are several times as high as mobile-to-fixed rates. This is mainly because fixed networks’

interconnection rates have been under heavy pressure to decrease toward cost (long-run incremental cost) to support competition, whereas, ironically, mobile rates have not been under the same scrutiny until recently, largely because the mobile sector was considered to be already competitive.¹⁰ There is now strong pressure from regulators for mobile access charges to reduce rapidly.

A sample of “emerging market” CPP countries¹¹ indicated that fixed-to-mobile interconnection rates are 64 percent more than mobile-to-fixed rates,¹² largely due to the fact that fixed network interconnection rates do not yet reflect long run incremental costs. Part of the reason for this may be the use of historical costs as the basis for interconnection rates (or in some cases no convincing cost basis at all).

Retail tariffs reflect the differences in interconnection charges, with users paying more on fixed-to-mobile than mobile-to-fixed and mobile-to-mobile calls, though not necessarily in the same proportions, because the differences are due to the *incremental* costs caused by access charges. The figures available reveal that, on average, fixed network customers were usually paying more to connect to a mobile customer than for the longest distance domestic call on the fixed network.

It should be noted that whereas mobile access charges that are higher than fixed network charges are the norm, the extent of the difference in charges, and even whether different charges are even justified on a cost basis, is now under serious scrutiny by EU regulators. OFTEL in the United Kingdom has issued instructions for rates to fall rapidly, whereas the EU is taking an even more aggressive position in questioning the validity of differential rates (especially roaming surcharges). In summary, although it is not expected that regulators would eliminate this pillar of the mobile business model rapidly in today’s financial climate, it is clear that the extent of the differentials is set to reduce significantly.

10. In 2001, fixed-to-mobile interconnection rates in the EU average approximately \$0.14 per minute, whereas mobile-to-fixed rates range from \$0.01 per minute for local and \$0.02 including double transit.

11. Botswana, Cambodia, Costa Rica, Dominican Republic, Guatemala, Malaysia, México, and Phillipines.

12. \$0.09 per minute for fixed-to-mobile and \$0.056 per minute for mobile-to-fixed interconnect.

MAIN ISSUES RELATED TO NETWORKS AND COSTS

What Networks Could be Considered for Asymmetric Interconnection?

Should it apply only to licensed rural operators that qualify for or are established under competitions from universal access funds (i.e. as an explicit “market efficiency” measure to reduce the need for subsidies), or also to existing commercial regional or nationwide operators who already serve rural areas? If asymmetric rates should apply to all, how should rural areas justifying higher terminations charges be defined?

There are “purist” and practical sides to this question. In principle, if considered at all, cost-based termination rates should apply to all high cost areas, existing or new, whether or not the operator is applying for or competing for universal access funds. This is for two reasons:

- (a) In a liberalized market, assuming tariffs have also been rebalanced, no parts of the network should need to be cross-subsidized,¹³ otherwise they will surely suffer in the long run and service quality will decline, even if total costs are recovered through geographically averaged tariffs. Hence special rates to recover the costs of terminating calls on all rural network segments with high costs would be a good target. This is the model used by Chile.
- (b) If not offered to existing as well as new operators, it could be argued that an uneven playing field is being implemented, with the incumbent operator(s) being asked to continue to accept geographically averaged tariffs for calls to high-cost areas, *as well as* contribute to a universal access fund.¹⁴

13. Except those most remote communities which, even after all reasonable cost-based price adjustments and investment incentives have been applied, are still uneconomic but for social policy reasons are still considered necessary targets that will be supported by a universal access fund.

14. The argument against this is that the incumbent could have the opportunity to compete for the universal access license, and that asymmetric interconnection will reduce the requirement for subsidies and thus benefit the whole market.

However, if applied to all fixed-network lines in rural areas, including existing operators, the following problems or challenges arise:

- (a) The differentiation between urban and rural, or more correctly low-cost and high-cost, could be quite complex, necessarily require a degree of subjectivity, and consequently be quite controversial. No doubt, the definition should include one or a combination of indicators and, unless already well-defined, would need a study exercise, at least to identify and classify the exchange lines for the whole national network according to indicators such as:
 - population of the community
 - size of the local exchange
 - length and/or cost of the local loop
 - transmission distance or infrastructure cost between the closest regional exchange and the community in question.

Many existing rural lines would probably be served bolder or limited capacity exchanges that could present a call routing or accounting/billing challenge.

In the light of these issues, although *less than ideal* it would clearly be more *straightforward* to restrict asymmetric interconnection arrangements to customer lines or network segments where three of the following four conditions apply:

- (a) The segment has no service today and will be served or licensed under a universal access or rural telecommunication development fund mechanism; or
- (b) The segment is demonstrably “high cost” because it is using a technology (e.g. very small aperture terminal [VSAT], or multiaccess radio) for which the per-user costs are well-known and can be well-demonstrated, based on an agreed formula, as higher cost than urban or national average;
- (c) The segment’s switching, call-accounting and billing facilities are capable of implementing asymmetric interconnection (or could be made capable at low cost); and
- (d) The physical point of interconnection with the main public switched telephone network is located where the billing data and/or exchange of interconnection data and billing will not pose a problem.

In some countries the barriers to “retrofitting” asymmetrical interconnection in the whole country may not be large. Chile implemented a national scheme with application to the whole country as shown in Table 2. Discussions with one of the consultants involved with Chile’s implementation indicated that the process was relatively smooth, however conditions within the sector were relatively ideal. The issues are discussed in more detail in Chapter 5.

Should Asymmetric Interconnection Apply to Fixed and Mobile Operators?

General Arguments in Favor of Including Mobile Operators

There are several reasons why asymmetric interconnection (higher termination rates than the current ones for rural areas) should be considered for mobile as well as fixed operators, though there are also practical issues to be addressed. These may, in combination, amount to a case for *not* applying additional asymmetry to mobile networks. At the least, precautions and special conditions would be needed and are discussed in the subsequent chapters.

Dealing first with the reasons mobile operators should be included:

- *Role of mobile operators in rural areas.* Increasingly mobile operators are reaching out into rural areas, offering affordable customer packages and modes of access, and (we expect) bidding on rural access funds. The latter will be especially the case as rural funds become

more prevalent, because mobile operators recognize the value of expansion nationally along transportation routes. In Africa for example, mobile operators are dominant, even in some quite challenging and remote areas without fixed line service. Thus withholding rural access rates from the most likely candidates for subsidy could penalize them as compared to other, perhaps less appropriate technologies.

The Grameen Phone experience in Bangladesh, similar cases in India (for example, Spice Telecom), and many observed applications in Uganda, to name only a few, illustrate how important the mobile networks are becoming. The mobile network is the first to reach many areas, for example in Africa, and the dominance of mobile may be quite permanent because of the convenience of wireless and mobility services. Also, fixed-mobile pay phones have been implemented in several countries, and in some cases under official universal access obligations. Table 3 lists some of the official mobile-based public access projects. However, many private lines can also operate unofficially as public access, and these have been observed by Intelcon in many countries.

- *Relevance and acceptance of asymmetric termination rates.* Because most mobile operators already enjoy asymmetrical interconnection rates (because the cost structure for a wireless network is different from that of a fixed network), they are used to the concept and better understand the commercial benefits of incoming call revenue. Because the application of a cellular mobile network in rural areas will typically have lower subscriber and traffic density per cell than in urban areas, a higher “second tier” termination rate for rural deployments could be justified, as described, with Uganda and Nigeria as the case examples, in Chapter 2.

Would “Mobile User Pay” and “Calling Party Pay” Cases be Treated Differently?

Mobile interconnection rates are already more asymmetric (fixed-to-mobile termination rates are higher) in the CPP environment than in the MPP environment. We have also seen that the degree of asymmetry is not sustainable and will surely decline as regulators bring pressure on mobile operators to move toward long run incremental costing. However, rates will no doubt remain asymmetric for some time to come.

CPP dominates the global system for mobile communication (GSM) world, hence in almost all developing country cases, CPP practices will be the more relevant. Furthermore, CPP carries the advantageous feature that when rural users (assumed to be low income) are receiving calls, they do not have to pay incoming air-time charges. Calls in the A to B (urban-to-rural) direction are paid for by the urban caller. Because rural networks often have higher incoming than outgoing traffic, it

TABLE 3. MOBILE-BASED PUBLIC ACCESS PROJECTS

Country and Mobile Operator	Type of Pay Phone
Bangladesh: Grameen Phone	Women, recruited by Grameen bank and given a microfinance loan to buy handsets, operate mobile phones as public phones in rural areas.
Colombia	Mobile technology is used for the Compartel program/rural telecommunication fund including pay phones.
Ecuador: BellSouth	At least 618 pay phones—367 of which are in the two largest cities, Quito and Guayaquil. They offer public pay phones also to be housed to restaurant and shop owners, gas stations and similar establishments.
India: Spice Telecom	Mobile operator recruit small entrepreneurs to operate mobile phones as pay phones.
South Africa: MTN and Vodacom	Both mobile operators are obligated to provide fixed-wireless public pay phones in container.
Uganda: MTN	Mobile operator created subdivision MTN Publicom to provide fixed-wireless pay phones using a franchise-type arrangement.

is clear that urban users (often the richer relatives of the rural users) will pay most of the calling costs. *This is a “pro-poor” practice that should be encouraged in the universal access context.*¹⁵

In non-CPP environments, asymmetric interconnection would still be beneficial, because it is more socially desirable for the higher costs of rural cell deployment to be borne through interconnection payments (and ultimately by urban-to-rural callers who can afford to pay a higher tariff) than by the rural network users. However, non-CPP cases are few and are declining in number.¹⁶

Should There be a Distinction Between Individual Users and “Fixed-Mobile” Public Access Phones?

There are two issues that would need to be addressed, namely:

- (a) Should the higher mobile termination rates apply only to calls into “public access lines” or to any mobile customers in designated rural cells?
- (b) This becomes an issue because most universal access targets at least have traditionally been focused on fixed public pay phones. However, this is changing and, once mobile networks become a prime means of access, the difference between private and public access also blurs. Hence, an asymmetric interconnection regime should probably treat all terminations equally. This also would emphasize the fact that geographical de-averaged termination charges have no real linkage to the public access (universal access) market except to improve the investment incentives for operators to extend their reach further into rural areas.
- (c) Should higher termination rates apply only on calls to rural users or terminals designated as fixed or “home zoned” (i.e. having only limited mobility) in the designated rural cells, or to all calls terminating in the designated rural cells, whether the users are resident or happen to be roaming in a rural cell?
- (d) There could be significant potential for abuse if asymmetrical termination rates were applied only to certain “fixed” (or as “public access” phones). Unscrupulous operators could designate certain users as “rural” or “public access phones,” receiving higher termination rates, while allowing them to actually operate in urban, lower cost localities as private users.

There is little precedent for addressing these specific problems, because in the mobile world there are no known interconnection agreements which are geographically de-averaged to the extent necessary to designate certain cells as rural.

However, mobile network management software is available to designate individual customers either as full network or “home zone” users (restricted to operating in their home cell or area). One example of a special home zone service is that offered by the Lithuanian GSM operator, Bite (www.bite.lt). Home zone is described as a territory within the network—e.g. one cell or a few cells—where users receive lower cost service, similar to fixed telephone service. A user can sign up for the service and register his/her home zone territory simply by calling a special service number. It is understood that Telstra’s mobile service in Australia, Germany’s D2 and Orange also all offer home zone service.

Applying this capability to access/termination charges, users in certain designated cells could be registered as restricted to their home zone and thus marked for higher access charges (or for that matter, they could be marked for both special low tariffs as well as higher termination charges). Thus some numbers on mobile networks could be nominated both as restricted to operate in their home zone

15. Alternatively, we might expect some urban relatives to occasionally remit funds to their rural relatives to increase call affordability in the reverse (lower cost) direction, with asymmetric charges being offset by higher outgoing rural revenues. Either way, the existence of a rural network that people use in a market-responsive way is infinitely better than not having a network at all because of low business justification or limited subsidy funds.

16. In India, most GSM operators currently charge for incoming call minutes.

and requiring a higher interconnect/ termination charge. The regulator could monitor this to ensure compliance, as well as to minimize abuse.

The alternative, of course, is to nominate all calls into specific rural cells as “high termination charge” calls. However, this means that even calls to urban-registered mobiles merely roaming into rural areas would also attract high charges and would need to be labeled as higher tariff calls. This could create even more confusion amongst callers than if they are only being asked to pay higher tariffs for mobile customers or terminals they know to be located rural areas (see Chapter 5 for a discussion of tariffs and customer relations).

Arguments Against Special Rural Interconnection for Mobile

There are two main arguments against inclusion of *most* mobile operators in a rural termination charge regime, although they are probably not as strong as the reasons for inclusion.

The first argument, and perhaps the key one against including mobile in special interconnection is that most CPP mobile network operators already enjoy higher interconnection access charges than fixed network operators. In fact, most fixed rural operators would be very happy with the rates enjoyed by mobile operators. Table 2 indicates that Chile’s mobile operators already enjoy a higher rate than the fixed rural operators. Nigeria is also a case where the mobile operators enjoy a significant termination rate advantage over competitive fixed wireless operators, such that the latter would probably be significantly incentivized if they received less than a 100 percent increase over their current rate, yet still remain well behind the rate enjoyed by mobile operators.¹⁷

This would imply that there is little justification or need to introduce a second level of asymmetry into mobile operator interconnection until such point, as discussed in Chapter 3, that the differential between mobile and fixed access charges is lowered significantly. In fact, some would argue that if mobile operators were offered higher termination rates for rural rates, perhaps their urban rates should be reduced in compensation. This would greatly reduce their interest in geographic de-averaging, and could create a need for a detailed cost study, which might be a challenge to organize.

On the other hand, in some developing countries—notably South Africa and Uganda—the point of near equivalence between fixed and mobile network termination rates has already been reached, and thus the argument against is greatly reduced in these cases.

The second argument is that urban-rural differences may be too difficult to calculate with any degree of accuracy, especially in the developing country regulatory environment. A problem with geographically de-averaged access charges for mobile operators could be how accurate or stable differential cost estimates are likely to be. Due to the dynamic nature of mobile telephony’s growth, identifying differing call-per-minute costs for cells in some parts of the country (the rural ones) may be a much greater challenge than for fixed networks. Per-minute costs are very much demand driven, and mobile operators derive revenues from both “resident” users and “roamers” from elsewhere who travel into regional and rural areas for trade or other reasons. Also, the volume and revenue impact of incoming calls, as a result of public pay phones and private phones being available in certain areas, are hard to predict. Hence, some cells might change in nature relatively quickly and move from relatively high cost to lower cost and hence low viability to high viability. This would need to be counted in the termination charge calculation methodology.

Conclusion

On balance, we believe that the above arguments indicate that mobile operators, because of their potential to reach rural areas rapidly, should be included in a geographical de-averaging regime in cases where they do not already enjoy a significant advantage over fixed networks.

17. Mobile operators receive 18 Naira (\$0.13) per minute whereas fixed wireless operators receive 7 Naira (\$0.05) per minute. The impact of the substantial license fees paid by mobile operators (which fixed operators do not usually have to pay) also has, of course, to be considered in this particular case.

In any case, even if not included, this should not preclude mobile operators' advance into rural areas and their bidding for universal access subsidies, because capital subsidies may still be justified and be an efficient means to leverage and accelerate new cell deployment in unreached areas of the country. In order to qualify for subsidies however, depending on the bidding rules they still might need to designate certain phones as having fixed or limited mobility status, which is feasible.

Could Asymmetric Interconnection Distort Investment Patterns?

It has been suggested that asymmetric termination rates could encourage some operators to tilt their investment decisions significantly in favor of rural deployments for wrong reasons, and to do so in sufficient volume to distort the market. In reality, whereas the regulator's objective would be to encourage additional rural investment by operators, the impact in developing countries is likely to be very marginal on urban network investment. In fact, it could be argued that the market is already quite distorted because of geographically averaged interconnection, and that any movement toward more rural investment as a result of differential termination rates that better reflect relative costs between urban and rural networks would actually reduce distortions.

In any case, geographical de-averaging will not change the fundamental economics of urban networks for the vast majority of calls. It is not expected that geographical de-averaging of interconnection will lead to lower urban termination rates, except perhaps in a minority of cases where existing termination rates are shown to be obviously too high. In such cases, changes to the interconnection regime would lead to greater market efficiency, as well as benefiting the rural areas that were previously underinvested because of the previous distortions.

Does Implementation First Require a Detailed Cost Study?

Should geographically de-averaged termination rates be instituted only after a detailed cost study or can they be implemented or piloted on the basis of a mutually agreeable rate estimate based on generic costs? If so, how would future adjustments or corrections be made?

General Response

Ideally, any new interconnection policy should be based on a cost study. However, the Chilean cost modeling referenced in Chapter 3, based on a hypothetical efficient rural operator, illustrates how proxy modeling can be an acceptable, and probably sufficiently accurate, method of cost estimation at least for the start-up period. Furthermore, if a relatively rapid pilot implementation is considered, say in one or two countries initially, the rates could be based on proxy numbers and/or consensus between the participating parties. The estimates could use, for example, the predicted ratio of forward-looking per-customer capital and operating costs, and/or per-minute call costs (applied appropriately to the network case under consideration) based on best estimates of demand over three to five, to project incremental costs in relation to country average or urban costs.

Future adjustments resulting either from cost trends, more detailed cost studies or radical changes in the traffic volume (which could change unit costs) would need to be provided for. This can be done as described in later chapters herein.

The Practical Approach

Because the posting of interconnection rates could have a large bearing on the motivation of private investors to provide rural services, as well as on the amount of subsidy they might demand in a subsidy auction from universal access funds, it will be very important to provide a relatively stable interconnection regime. Thus the following is recommended:

- Establish an initial proposed rate for rural operator interconnect, similar to Chile and shown in Table 2, using estimated costs, but taking note of the different approach which might need to be instituted if differential urban/rural rates for mobile operators are contemplated.

- Following a brief consultation process with key stakeholders (for example, main operators) confirm or modify the proposed rates based on *consensual agreement*, to be accepted for an initial period of at least three years. This could possibly be less than the full estimated rates.
- If the rates will be subject to a more detailed cost study within that period, stipulate that any changes toward actual cost would be limited to a maximum movement of, say, plus or minus 10 percent per year for five years, after which a final adjustment may be made.¹⁸

In summary, it should be remembered that even if consensus-based rates appear to come up with smaller adjustments than suspected as justifiable if a full cost study were undertaken, *any movement toward relative costs between low cost and high cost networks will create greater market efficiency*. It is therefore recommended that implementation strive toward interim termination rates that are significantly different, though conservative, compared to existing averaged rates (for example, a 100 to 200 percent increase in fixed termination rates, rather than 500 percent, might be acceptable, and possibly much lower relative increases in the case of mobile termination rates.)

Should Asymmetric Interconnection Reflect or Follow Peak/Discount Rates?

Because network traffic-carrying costs are related to capacity, interconnection rates should have peak and discount periods, just as retail calling rates are priced with peak/discount periods to encourage users to spread their calling away from busy-hours. However the rural operators themselves should decide whether their costs are busy-hour sensitive like in urban networks.

The Chilean case and many fixed-mobile interconnection rates have peak and discount rates. Thus the answer to this question is reasonably straightforward. There are strong reasons why interconnection charges should be priced this way if operators believe that this reflects cost.

Also, modern interconnection billing systems are able to handle rate changes within their call tracking and “rating engine” software, with the caveats already noted about some incumbent billing systems (see Chapter 6).

18. The key point here is not the actual figures (which could be adjusted), but to maintain relative stability/predictability for investors even if a subsequent cost study shows that the initial proxy/consensus based estimates were not fully correct.

TARIFF REGULATION RELATED TO ASYMMETRIC INTERCONNECTION

The first requirement for the effective operation of liberalized markets, of course, is tariff rebalancing. Thus geographically de-averaged interconnection rates should probably not be considered if tariffs are obviously still seriously imbalanced, unless the degree of imbalance is known or can be estimated, and implementation of asymmetric interconnection for rural areas is properly paced with a program of tariff rebalancing. Whether or not tariffs should be revised to cover the additional cost of asymmetric termination rates needs to be addressed from both the investment incentive and regulatory/economic perspectives. We deal first with the investment incentive angle, and then consider price regulation.

Referring back to Table 1 in Chapter 2, the most appropriate way to incentivize all potential operators—incumbent and new entrant—to invest in rural networks is to allow tariffs for calls into high cost rural areas to rise, to cover the additional costs of investment or to cover higher termination rates. It was noted that other payments schemes, such as a revenue pool or subsidies could incentivize new entrants. However, they would be challenging to organize for the typical developing country and, as discussed in Chapter 7, are not really appropriate for countries where universal access, as opposed to universal service, is the objective.

In Favor of Revision to “Calling Party Pays”

In principle, there should be no barrier to higher call rates to higher cost destinations. The reasons are:

- (a) Calls should be priced on a cost basis, namely:

$$\begin{aligned} & \textit{Origination cost and administration} + \textit{transport} + \textit{termination costs} \\ & \quad + \textit{profit margin} = \textit{retail price} \end{aligned}$$

Thus a pure approach to call pricing would imply that calls carrying a higher terminating charge should be priced higher, as always has been the case with international long-distance

rates in any case. The termination cost could involve payment to another operator, or could be reflected purely by the higher cost of rural termination within the same operator.¹⁹

An interview with one incumbent operator (Uganda) raised the issue that if tariffs do not reflect the higher costs, then the originating operator's ability to offer nonpeak discounts could be severely constrained on rural-bound calls. This will be especially so if the rural-bound call terminates on another operator's network and involves paying a termination charge.

Thus on the basis that costs increase and that improvements in rural service would be anticipated, we believe that call rates to rural areas could legitimately increase.

- (b) The Chilean and Finnish practice and general examination of call cost development in liberalized markets around the world suggest that tariffs should track and reflect all cost elements, though clearly, for the sake of simplicity, there should probably be only one additional "charge band" for rural, not many. In other words, one new charge band is recommended for designated rural/high cost areas.
- (c) There are precedents for higher customer tariffs for higher cost destinations in almost all fixed-mobile interconnection relations, due directly to the higher fixed-to-mobile interconnect/termination charges. In CPP countries, subscribers usually pay higher per-minute rates for inter-network calling in both directions.²⁰
- (d) As discussed in Chapter 2, customers appear willing to pay.

Counterarguments

Even though costs increase and service improvements would be anticipated, some regulators might argue to keep rates uniform. *We have noted in Chapter 3 that the Canadian and United States' approach is to maintain geographically averaged retail tariffs, with the use of subsidies, as a basic principle of universal service.* However, we believe this is not the best approach for developing countries, below a certain level of income and teledensity, because:

- Limited financial resources and the poor record of cross-subsidized rural service provision constrain how much subsidization is available or appropriate;
- It is better to have a good service to rural areas, charged closer to cost, than a poor level of service (and we have evidence that urban users wanting to call their rural contacts think this way);
- By increasing the urban-to-rural prices, those who are able and willing to pay—and will benefit from the service—will contribute to the rollout of commercial service in rural areas;
- Indirectly, a price increase for calling into rural areas could contribute to keeping rural outgoing call rural rates from public pay phone retailers low. Private pay phone retailers typically charge users a premium above the official tariff. In Nigeria, Uganda, and elsewhere, the markups are higher when effective retail competition does not exist. If, on the other hand, pay phone retailers might derive a per-minute revenue, as a downstream share of incoming termination rates, their viability will increase, their number in rural areas will increase, thus competition will increase and the tendency to over-charge for outgoing calls will diminish.

A further counterargument could be taken from traditional network economics that fixed costs should be paid for by user connection fees and line rentals, not from higher call tariffs, because traditional fixed local loop costs are not traffic sensitive. A portion of the rural network will still be covered in this way, by those users demanding fixed private line service. However, a slavish adherence to this principle would merely prolong the financial "unfeasibility" of rural networks, or increase the amount

19. In this case the operator would use a "transfer price" to impute the high cost in its rural network.

20. Whereas fixed-to-mobile calls usually cost more than mobile-to-fixed, it is also true that mobile-to-fixed calls are often higher priced than mobile-to-mobile, due to the existence of the termination fee paid to the fixed operator.

of cross-subsidies required. An interconnection regime based on projected demand for traffic usage and cost-recovery over a reasonable period is more likely to result in sustainable investment, subsidy minimization and effective rural operations. In the case of developing country rural networks, where an alternative successful model is yet to be demonstrated, it could be argued that the model of support suggested—which emulates the mobile model that is increasingly effective in developing countries—is at least worthy of experimentation. It would, in fact, become a means of internalizing to the network some of the externalities which urban callers to rural areas would otherwise derive.

Additional Issues to Consider

The following issues and trends with differential tariffing and trends should be noted.

- Calls to mobile subscribers usually require use of an operator-specific, unique area code. Thus, users know that they are calling a mobile subscriber, which is a basic principle of customer service quality. It is also fairly common that calling a mobile subscriber (from a fixed line) is more expensive than calling a fixed-line number, therefore the use of a unique area code serves to signal that a higher price is likely. For the avoidance of doubt, callers could, however, also be notified by means of a message.
- Cost-reduction practices such as “beeping” (where the caller leaves his signature but hangs up before the called party answers), short message service, and users switching from their mobiles to public pay phones to make long-distance calls are common amongst low-income users in the CPP mobile world. This does not argue against tariff differentiation, but merely indicates that users learn to deal with tariff differentials creatively. They are effectively using the mobile network for communications access at the lowest possible personal cost.
- All mobile interconnection rates appear to be national and therefore not geographically disaggregated in any way, thus implementing differential rates might be considered by some as an added and unwelcome burden. As already suggested, high fixed-to-mobile termination rates in some markets may make differential charges for rural areas unjustifiable at the present time, though in some countries they will be.
- Mobile interconnection rates and call tariffs are now under scrutiny and subject to significant rate reductions in some jurisdictions—regulators are justifiably looking for fair practices. This does not rule out differential tariffs but rather emphasizes that charging rates need to be carefully crafted and followed.
- Mobile rates are increasingly competing directly with fixed network rates. Some feel that the increasingly common practice for mobile operators to use a single charge band which renders mobile calls lower priced than long-distance calls on the fixed network is unfair cross-subsidization. However, they are typically using their own backbone for the transit portion and this is part of the intense fixed versus mobile competition now existing in many countries. In the long run, the market will be priced as close to marginal cost as possible, with the result that the price of calls to rural areas should probably justifiably rise and in some countries may represent the only justifiable charge increase.

Would Asymmetric Termination Charges Create Undesirable Arbitrage?

The term “arbitrage” has been used to describe opportunities that exist—often temporarily—in the telecommunications business for users to exploit mismatches between the pricing of calls in opposite directions over the same network route. For example, calls from some OECD countries (for example, the United States and United Kingdom) into many developing countries used to enjoy much lower rates than in the reverse direction. This gave rise to huge traffic imbalances (more calls into the developing countries) and to “call-back” services, whereby users in the developing countries could call to virtual operators that exploited the different rates by cutting and reconnecting the developing country’s outgoing calls, thus rerouting them back to appear as incoming calls.

It has been argued, that geographically asymmetric termination rates would create similar situations within the countries employing them, such that, for example, urban people could forward money to their rural relatives to enable them to avail themselves of the lower rural-to-urban rates, rather than making higher cost urban-to-rural calls.

However, there are two very significant differences between the two situations described. First, whereas international call arbitrage is based on *price mismatches that are actual distortions* created by the fact that one direction is charged on a cost-related basis and the other is not, asymmetric interconnection would be quite the reverse. Because the different termination rates would be indicative of relative costs between urban and rural networks, any traffic imbalance would be due to users reacting to relatively efficient market pricing. Second, the revenue for the total traffic between the urban and rural destinations would still accrue to the operators *in-country*, and, if the interconnection regime is carefully crafted, the operator providing the rural network segment would still receive significantly higher revenues than if the interconnection regime remained geographically averaged.

The higher revenues would be either from originating a higher number of outgoing urban-bound calls or from terminating inbound calls at the higher termination charge rate. In summary, the essence of the asymmetric interconnection regime is to create an improved business case for rural networks based on more efficient pricing, such that rural networks can afford to exist by generating decent revenues from calls in both directions.

Rate Postalization

An additional trend is national rate “postalization”,²¹ whereby even fixed-network, long-distance charges are effectively disappearing, in favor of a single call rate—that is, no discrimination between local and long distance. At least three countries (Iceland, Norway, and Sweden) have abandoned long-distance rates in favor of a postalized rate. As noted above, some mobile networks similarly use postalized rates,²² hence there is pressure toward simple, uncomplicated calling rates with no differentiation. To reintroduce differentiation based on the relatively high cost of rural cellular networks may be a backwards step in some minds and may also attract the attention of regulators, whose tendency is usually to want to eliminate geographical differences under their universal service policy.

However, in some ways postalization would perhaps assist the concept of asymmetric termination charges, and an adjusted tariff for rural calls could be, in the end, the only differential that is justified on a significant differential cost basis. Though in a fully competitive market, even rural calling rates may be “postalized” for strategic reasons.

Conclusion on Tariffs

On balance, we recommend that asymmetrical interconnection should be paid via adjusting tariffs for rural-bound calls to cover costs. The only question that arises is whether all rural-destined call charges should be raised, including those which stay within a single network, or only those which need to cover a higher termination charge.

In an environment where all rural networks including those of the incumbent (for example, in Chile) would be assigned cost-based termination rates, all retail tariffs would be based on a new scale. Under a more limited approach, to apply new access rates only to rural operators, only calls destined to rural operators would have revised retail tariffs.

On balance, in order to increase incentive for rural network investment generally, it is recommended that an ideal implementation would aim toward a universal implementation of revised termination rates and therefore all rural-bound tariffs would be revised.

As discussed below, the customer awareness aspect of the numbering plan issue should be considered carefully and, if possible, solved to ensure fairness. However, in the event special access

21. “Postalized” is taken from the normal postal sector practice of having one letter rate for whole countries.

22. Nigeria, Thailand, and Uganda are but three examples.

codes are not required, a recorded message notifying customers that their called number carries a higher tariff would also be a sufficient indication.

Downstream Beneficiaries—Should They be Regulated or Licensed?

As already noted, the potential downstream beneficiaries within the value-chain of asymmetric termination charge payments could include public pay phone retailers (local entrepreneurs and business people manning pay phones). They could receive a share of incoming call-minute revenues as an incentive to terminate incoming calls.²³

Studies and anecdotal evidence from around the world have highlighted the fact that although there is a huge potential demand for incoming calls to pay phones in rural areas (up to several times the outgoing call volume), the pay phone retailers often have little incentive to allow inward call termination. This is because often pay phones are unmanned and, even if manned, they derive virtually no revenue from incoming calls, except typically for a small message fee. If they received a share of the interconnection termination charge, they would be incentivized to:

- allow users to make “call-back” calls (where users can make a short call to their contact and wait for them to return the call),
- pass messages and set up messaging schemes to maximize incoming revenues,
- advertise means of receiving incoming calls, etc.

This would maximize the operator’s revenue also and generally contribute to rural telecommunication profitability and development.

To what degree should this practice be regulated or licensed? In principal, this matter should be left to the market place. In the freer markets, it is evident that entrepreneurial pay phone activity is thriving and users are enjoying the benefit of having multiple options to make a phone call. With asymmetric termination charges, operators would have the *option* to develop the market further by sharing some of their incremental revenue obtainable from incremental rural expansion, but this should not be mandatory. It is a business decision.

On the other hand, most of the entrepreneurial activity takes place in towns and along highways, rather than in more remotely located villages. Regulators may wish to exercise some control over user prices—for example, per-minute retail prices for outgoing calls could be capped by setting a reasonable maximum rate (such as twice that of national or urban-based pay phone tariffs). However, this will be difficult to enforce and perhaps should not even be attempted. It is envisaged that asymmetric termination rates, accompanied by revenue sharing with pay phone operators, would tend to increase the number of viable service retailers in rural locations and this, in turn could exert downward pressure on outgoing call retail prices through competition between retailers.

Although it is recommended that regulators resist the temptation to regulate, it is strongly recommended that they establish leadership by promoting revenue sharing in their publicity about asymmetric termination rates. The regulator or universal access fund manager could also promote the pay phone franchising, or even establish a microloan program, using fund resources, for the purchase of special rural packages for pay phone operators.²⁴

23. It should be noted that geographically de-averaged termination rates should apply to incoming private user calls as well as calls into public access lines served by the same rural network. Hence the “downstream benefits” are purely a revenue share financed by higher urban-to-rural tariffs and paid by the urban operator to the rural operator, which the rural operator may choose to offer to public phone service retailers in order to incentivize incoming call market development.

24. In Uganda, UCC’s rural communications development fund (RCDF) can set up or outsource a microgrant or microloan program to enable rural entrepreneurs to purchase special rural packages. The object of these is to enhance the operating potential of public pay phones in areas where the existing wireless signal is weak and/or a reliable power source is unavailable. A rural package would comprise one or more of a fixed-mobile handset; pole, cable and antenna; and personal sized solar panel and charger. Total maximum cost is \$500.

In summary, regulators should leave all registration or control to the operators to decide what mode of control they wish to exercise, and to merely monitor the process. At the most, the regulator may request that the operators publish the terms of revenue sharing agreement offered to rural pay phone retailers, and to provide a list of localities where they have telephone service retailers in operation, as well as localities where they would like to have them. The regulator should, then, limit mandatory control to the localities where operators have accepted universal access obligations and subsidies, and to the collection of information and monitoring, in order to encourage the most rapid market development.

NUMBERING AND BILLING ISSUES

There are a few operational prerequisites to the successful implementation of asymmetric, geographically de-averaged termination rates. Most are hindrances associated with legacy networks that must be addressed, rather than being total “deal breakers.”

What Prerequisite Changes in the Numbering Plan are Required

Consideration must be given to the numbering plan for two reasons:

- *Technical* issues related to call accounting and billing, call routing and points of interconnection which could render implementation difficult;
- *Customer service and awareness* ensuring that users are duly notified as to which calls will be charged with a higher rate.

When considered together with the call accounting and billing issue, the numbering plan could be one of the major obstacles to rapid and problem-free implementation of asymmetrical interconnection in some countries. However, the problems are solvable and regulators need to insist, with all means at their disposal, that satisfactory implementations be made.

The Technical Issues

As noted in the previous chapter, call accounting and billing should not, in principle, present a problem for modern digital exchanges. The vast majority of *new* rural deployments will use modern switches. As well, even if originating from a nondigital switch, the majority of calls to/from rural areas may be made or routed through a digital exchange in the capital city or another nearby city. However, incumbent call accounting and billing systems are not always compatible with the requirements. The following cases could present a problem:

- Special rural operators who use a single switch (for example, a single VSAT hub) could appear to the incumbent fixed operator’s subscribers as a local call. This may need to be

solved by introducing changes to the numbering scheme (for example, a special area code or digit, or assigning all rural calls to a specific “NXX” exchange code)²⁵ to indicate to both users and the billing software that special charges apply.²⁶

- The numbers designated by operators for rural terminating charges—especially if below the NXX level—may not be recognized as special by the incumbent’s accounting and billing software. (However, the software in advanced digital switches can typically recognize number blocks and treat them differently.).
- Calls originating from outdated regional centers in the fixed network may not have digital switches and/or latest software. This will apply to many of the business calls to/from the village, which often originate in the nearest regional town. Most likely, only area codes and additional digits can solve this, and recognition for this would need to be retrofitted nationally. Some operators may take a long time to do this—for example, India’s BSNL recently held up the implementation of long-distance competitive operator preselection, because it required the insertion of a digit which BSNL claimed would take a year to implement.

The Customer Issue

As already noted, the practice of customers having to pay more to terminate a fixed-to-mobile call is commonplace. The concept of paying more on certain types of call (due to asymmetric termination rates) is thus known and accepted in principle, but typically is applied on a geographically-averaged basis. The area code usually provides an indication to the caller that he is calling a mobile subscriber. To take an example (Uganda), customers calling from Uganda Telecom’s (UTL’s) fixed network to the largest mobile network—that of MTN—call to the 077 area code. The peak-time charge (\$0.16/min) is more than twice the standard local call price within the fixed network (\$0.07/min) and 60 percent higher than a standard national long distance call (\$0.10/min).²⁷

From/ to	UTL local	UTL Long dist.	MTN national	MTN rural
UTL →	.07	.10	.16	.20

Now, if some of MTN’s customers become designated as rural lines, this could lead to an even higher charge (say \$0.20 or \$0.24 per minute). How would they know which calls will carry the higher price unless the rural customers have a different area code or require a special access digit?

Whereas, we have noted elsewhere that a special recorded message could notify users of a higher tariff rate, a numbering scheme that is well publicized would perhaps be more elegant. On balance, we believe that the use of a separate area code or prefix would probably be necessary in many incumbent networks and should also be seriously considered for customer awareness.

It is recommended that during a pilot program, at least two cases should be tested—one where awareness is provided through the numbering scheme and one where it is not.

What Modifications to Intercarrier Billing Would be Required?

We have noted the potential obstacles represented by the limitations of call accounting and billing systems, especially in some incumbents’ networks. Effective interconnection billing requires the following elements: call accounting, call rating, and charging/billing.

25. Standard numbering plan assignments are thus: NPA-NXX-XXXX, where the NPA (numbering plan area) is the ‘area code’ and the NXX either designates a local exchange or a numbering block within a local exchange.

26. This problem and solution occurred in Chile. Further details of the problems and solutions will be obtained.

27. In the reverse direction, most MTN subscribers calling to Uganda Telecom’s fixed network pay just 20 percent higher than calling to another MTN subscriber. The lower difference probably reflects the asymmetric nature of the interconnection agreement between the fixed and mobile network.

Central to each operator's billing system is the rating engine, which receives call accounting data and generates customer interoperator bills as well as the customer bills.

There are various charging and billing mechanisms, which include metering (pulse counting); signaling system (for example, SS#7) generated "charge band" messages with separate meters for local, national and international calls; call detail recording (CDR) in the local exchanges; real-time billing data; etc. Some of these system elements overlap with one another and/or coexist within the same network. As already discussed, this causes potential region-to-region problems within large networks.

The most common practice on modern networks is to use CDRs generated in the originating exchange and forwarded to all corresponding switches. CDRs include:

- calling and called numbers
- call duration
- transit carriers
- time of day
- service type
- supplementary information such as intelligent network (IN) and integrated services digital network (ISDN) services, etc.

Interconnection billing aggregates data from all CDRs (that is, from all calls made in a period), looks up data from the "rating engine" (a database of prices), and processes the bills. As already noted, if not equipped with the data processing software, operators have to resort to special digits, area codes and traffic measuring exercises to keep track of and bill certain call destinations correctly.

New operators, the most modern switches, and cellular mobile companies are typically Intelligent Network-capable and, in principle, would have little problem with handling differential interconnection charge rates, whether or not they are indicated by separate area codes. However, in some cases, new software modules may be required.

As noted previously, the most challenging problems could occur in the regional networks of incumbent operators, from where many calls to rural businesses would originate. These areas may have only outmoded call metering systems. In this case, a special access code could be used by the incumbent to route calls first to the appropriate accounting system for the call, or to activate special traffic measurement.

Because the issues arising can only be addressed on a case by case basis, it is recommended (as elsewhere) that piloting of asymmetrical interconnection should be attempted in environments both where the most advanced accounting is available and where numbering, call accounting and billing system adjustments have to be made.

RELATING DE-AVERAGED INTERCONNECTION TO UNIVERSAL ACCESS POLICY

As noted in Chapter 1, asymmetric termination rates should be seen as a prior and complementary part of a country's universal access strategy. It supports extension of a liberalized market's geographical reach and efficiency. *In the developing country context*, it is not in conflict with the implementation of other mechanisms such as universal access/rural telecommunication development funds, which address the extension of access to areas that are unreachable by the market. Asymmetric, geographically de-averaged termination rates even potentially reduce the amount of subsidy required from these funds, by extending the market's reach and reducing the financial requirements of serving the final "access gap."

Comparison of North American and Chilean Financial Models

On reflection, it is clear from the prime case examples that Canada and the United States, which have high-cost rural lines and small private operators, have decided that the interests of universal service (United States), *in the high income OECD context*, are not served by a full cost-based asymmetrical interconnection regime. Imposing this on the market would mitigate against their objective of geographically-averaged pricing. The practice would probably also be resisted in the EU for the same reason and in favor of eventual rate postalization. However the European cost variation between urban and rural is also probably much less and usually involves far fewer small rural operators.

North America thus moderates (though does not eliminate altogether) asymmetric, geographic de-averaging in its fixed-line market through the application of subsidies from reasonably well-endowed universal service funds. However, both Canada and especially the United States clearly have the objective of safeguarding the financial health of small rural operators, through the termination rates regime, and ensuring that they can provide rural customers with service quality close to that available in urban centers.

Chile represents the other end of the tactical spectrum, though their strategy is still to support the financial survival and health of rural operators. However, urban operators and eventually users are expected to pay the full cost of calling into rural areas in all but the most extremely high-cost cases which rely on a capital subsidy from the rural development fund. Most of these areas have to

date only been reached by fixed-line networks in view of their remoteness. At least in part because of the asymmetric interconnection regime, subsidies are kept to an absolute minimum and in the majority of cases have been used in the “smart” way to leverage much larger private investments and promote market development.

Conclusion

On balance we believe that:

- For developing countries, where “access,” not universal service, is the target for years to come, and where subsidy capital is in short supply, the Chilean model is closer to the best-case approach for extending fixed networks into otherwise unreachable rural areas;
- Cross-subsidization and obligation-led rural telecommunication development does not have a good record in developing countries, because of resource constraints and also because of the traditional belief, which has been hard to shake, that rural service provision has no return. Cost-based, geographically de-averaged asymmetric termination rates and differential urban-to-rural tariffs provide an opportunity to finally reverse this inheritance and to serve rural areas profitably;
- A standard model, more or less following the Chilean example—including a model interconnection agreement, costing methodology, and means of integration with universal access licensing—should be developed and applied both to cases where operators could benefit from designated rural termination rate areas, as well as (ideally) to all fixed networks, including those of the incumbent, to ensure full market efficiency, investment motivation and a level playing field.
- Wherever appropriate, as defined by the report, the model should be applied to both fixed and mobile network cases and mobile operators should also be included in geographically de-averaged termination charge regime.

SUMMARY AND NEXT STEPS

Study Outcome

The investigations have developed a clearer view than previously available as to whether asymmetric interconnection is a practical alternative for developing country markets and what hurdles exist.

Precedent and Justification

The study has concluded that, despite the newness of the concept for fixed-network relations in developing countries, there is sufficient precedent from North America and Latin America to point to the justification for asymmetric interconnection involving rural operators. The Latin American model, essentially from Chile but also being at least partially adopted by Colombia and Peru, points to the value of considering asymmetric access charges as an essential part of an integrated universal access strategy, including universal access subsidy auctions.

The Chilean model has been considered in comparison with the North American model for appropriateness to developing countries. It has been concluded that the Chilean model provides the essential direction for:

- cost-related asymmetrical interconnection,
- user pay tariffs covering the full costs of rural network termination, and
- optimal integration with a country's universal access policy.

The prime consideration is that the Chilean model is better suited for the resource-constrained environment of developing countries. It is therefore the most likely to meet with successful implementation and to lead to accelerated rural telecommunications development.

Application of the Asymmetric Model

It has been concluded that the ideal application of cost-based access charges would be nationwide as in the Chilean model. However, it is recognized that least-resistance implementation would be limited to special access charges for new fixed-network rural operators.

Numbering and Billing Issues

It has been concluded that the areas of greatest challenge—related especially to customer education, numbering scheme, and billing system implementation—can be resolved satisfactorily if the regulator is interested in taking advantage of the opportunity for a more effective and financially efficient universal access strategy. The Chilean example encountered some teething troubles, but these were resolvable without extended difficulty due to the commitment of all concerned. Hence, it would be important to provide opportunity for a consultation in which the stages of implementation of asymmetric interconnection are reviewed carefully with a representative from Subtel, Chile, and perhaps one of the major operators or consultants involved in the implementation.

Mobile Networks and Asymmetrical Interconnection

The fixed-to-GSM mobile interconnection regime and CPP experience shows a strong asymmetric precedent as well as evidence of user willingness to pay for asymmetrical interconnection generally. In addition, mobile networks are already playing a major role in rural service expansion and universal access. Despite these factors, it is concluded that in many situations mobile access rates may not easily be de-averaged to include special rural access charges at this time. Many mobile access rates are high enough without imposing an additional layer. Also, there would be significant practical management issues and the calculation of actual urban-rural cost differences could be very difficult, because multiple factors are involved in new cell development and market changes take place rapidly.

Thus, it is expected that many mobile operators may not necessarily be prime candidates unless (as in the case of Uganda and possibly elsewhere) they have already implemented symmetric or near-symmetric interconnection with fixed operators. In cases where mobile operators are bidding in subsidy auctions, which in Africa can be expected soon, they could be suitable for rural access charges, though each case would need to be considered individually. Further consideration is warranted. For the moment, for practical reasons, participation by mobile operators in special rural termination rates might be appropriate in a minority rather than a majority of cases.

Next Step

The matter of how regulators will actually implement a regime of asymmetric termination charges, including the necessary regulatory instruments, costing modeling methodology, numbering and billing plan, integration with licensing concessions and consumer tariffs, must be fleshed out. Whereas Chile can be used as the starting model, each country will be different. In particular, most African countries will be considerably different and yield several unique models. Therefore a post-study consultation workshop is required in order to bring together experienced experts, to receive a presentation and discuss the outcome of the study and then develop a specific case study focus on potential target(s) for implementation.

It is recommended that two countries be carefully selected as targets for pilot implementation of a full (nationwide) and limited (covering areas of special universal access licensing) rollout. These implementations therefore would be one focus of discussions during the consultation.

Participants at the workshop would receive and review an outline of this study, review and critique sample regulatory instruments, discuss the issues identified in this report, and map out a potential structure for the two model regulatory regimes and plans of action for the pilot countries.

Neither Chile nor any other jurisdiction appears to have fully explored the incoming call termination and downstream value-chain opportunities as a means to develop the public access telephone market to its full potential as a result of asymmetric interconnection. Options for manned pay phones to develop a greater use of incoming call termination, messaging, and virtual telephone service on the back of higher call termination rates should be explored. This is recommended to be included in the consultation and pilot program, in order to explore the potential for inclusion in at least one of the pilots.

REFERENCES

- Intelecon. 2001. "Policies and Strategies for Rural Communications in Uganda." March report submitted to Ugandan Communications Commission.
- Navas-Sabater, Juan, Andrew Dymond, and Niina Juntunen. 2000. *Telecommunications and Information Services for the Poor: Towards a Strategy for Universal Access*. World Bank Discussion Paper No. 432, Washington, DC.
- Sepulveda, Edgardo. 2002. "Model Universal Services Fund Policies and Procedures, Part II." Report prepared for Commonwealth Telecommunications Organisation and International Telecommunications Union.
- Wellenius, Björn. 2001. "Closing the Rural Communication Access Gap: Chile 1995–2002."

Telecommunications Challenges in Developing Countries: Asymmetric Interconnection Charges for Rural Areas is part of the World Bank Working Paper series. These papers are published to communicate the results of the Bank's ongoing research and to stimulate public discussion.

This report addresses an important aspect of interconnection—the settings of call termination charges. In rural telecommunications, network costs are known to be high. The traditional consensus has been that many rural areas cannot be connected without subsidies. This paper investigates the possibilities for implementing a geographically de-averaged charge regime indicative of the relative cost differences between urban and rural networks. This could change the business model for rural networks, significantly increasing revenues from incoming calls.

The study investigates historic and current examples of asymmetric charges and user tariffs in fixed-to-mobile interconnection regimes today. It addresses a wide range of related issues and questions: customer affordability; customer education and awareness; numbering plan and billing; whether detailed cost models would be required; and whether asymmetric termination charges, while eliminating current market distortions, would create other distortions. Alternative implementation strategies are also considered, with an eye to practicality for developing countries. It concludes that the concept is feasible, and the study further provides ideas for piloting the concept in a limited number of countries.

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ISBN 0-8213-5784-0

