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Network Externality
Premiums and International
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Exchange

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Working Party on Communication Infrastructures and Services Policy

**NETWORK EXTERNALITY PREMIUMS AND INTERNATIONAL TELECOMMUNICATION
TRAFFIC EXCHANGE**

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FOREWORD

In December 2008 this report was presented to the Working Party on Communication Infrastructures and Services (CISP). It was recommended to be made public by the Committee for Information, Computer and Communications Policy (ICCP) in March 2009.

The report was prepared by Mr Sam Paltridge of the OECD's Directorate for Science, Technology and Industry. It is published on the responsibility of the Secretary General of the OECD.

MAIN POINTS

The aim of this paper is to examine the economic impact of proposals to add a non-cost “premium” to international telecommunication charges. This work follows up on earlier OECD work which examined international traffic exchange.¹ The paper concludes that attempts to use non-market methods, and distort prices, is likely to have negative implications for the provision of international telecommunication services and that competition is acting to more efficiently meet policy goals.

At recent meetings of Study Group 3, responsible for international telecommunication tariff and accounting principles at the International Telecommunication Union (ITU), some delegations proposed a ‘network externality premium’ be added to compensation arrangements surrounding international traffic exchange. This culminated in an ITU-T Recommendation being passed at the World Telecommunication Standardisation Assembly (WTSA) in October 2008 which provides, subject to commercial agreement, for the possibility of such a premium to be payable in respect of traffic passing from network operators in developed to developing countries.² The stated aim is to fund further network expansion including awareness campaigns.

This paper examines the concept of a network externality premium as a contribution to ongoing discussions on international traffic exchange. It finds that markets are already acting to internalise network externalities and, that the policy objectives proponents have for premiums, are being met more efficiently by regulatory reform. It points out that much of the literature on network externalities ignores the dynamic nature and use of ICTs and the role innovation can play in addressing side effects. What some may see as imperfections others view as opportunities which can be creatively addressed by markets.

This paper argues that externality premiums, which would not be cost-based and would be discriminatory, stand to further cloud a settlement system that has historically been characterised by a severe lack of transparency and distorted prices. At the same time, the benefits of the commercial system for interconnection, which has emerged over the past decade, are highlighted. The paper notes, for example, that in contrast to many forecasts for elasticity of demand, liberalisation has benefited network operators in developing countries by generating greater flows of traffic than expected and frequently, as a consequence, greater revenue from termination payments. The breakdown of the historical settlements system has also benefited users through lower prices. The paper concludes that externality premiums are not only highly impractical but that they have the potential to distort competition which has recently expanded access much faster than at any time in the history of communication services.

Many will view the proposed network externality premium as an attempt to return to the past, when the ITU was widely argued to be a cartel responsible for maintaining high prices for international telecommunication services.³ If implemented, the ITU-T Recommendation would do a disservice to an organisation which has been positive toward market liberalisation since the 1990s.

In considering the foregoing it is timely to take stock of the role ICTs play in facilitating economic and social goals. One of the key messages from the 2008 Seoul Ministerial on the “Future of the Internet Economy” was to the importance of communication networks in underpinning broader economic and social development. Sometimes this larger picture can be overlooked in relatively narrow debates surrounding international traffic exchange. This is not to draw attention away from the need for infrastructure development or the progress which has been made in recent years. Liberalised markets are adding around one billion additional telecommunication subscriptions every two years. Yet, there is a need to remember that the primary value lies in what such networks enable. ICT networks, for example, were used to convey USD 251 billion in financial remittances to developing countries in 2007. Moreover mobile

phones are rapidly emerging as a way for people around the world, without bank accounts, to send and receive money at a lower cost and with greater efficiency. The ability of markets to use networks to deliver services beyond telephony, to otherwise marginal users, may prove to be one the greatest boons of ICTs for development.

The work undertaken in support of the Seoul Ministerial included analysis on international interconnection in recognition of its role underpinning the global Internet Economy.⁴ There is, however, a need to build on this work to support policy makers as they consider the further development of access to communication networks and the relationship to international connectivity. In particular, proposals for network externality premiums, based as they are on economic theory, need to be critically examined and their potential costs and benefits better understood by all stakeholders.

While the goal of network expansion is laudable the proposal for a network externality premium raises many questions. Does, for example, couching the discussion in terms of externalities, rather than the simpler concept of the network effect, distract policy makers from a more productive assessment of the barriers to growth in developed countries? Are the proposed actions practical or will they engender greater problems than the problems they portend to solve? While imperfections may exist it would be self-defeating to introduce measures which undermined the market's overall effectiveness. Nor would an efficient allocation of resources be best served by acting in a contrary fashion to best practice principles such as cost orientation, non-discrimination and transparency, which have guided the reform in international traffic exchange.

Given the outstanding success of liberalisation, in expanding access to communication services, policy makers should endeavour to introduce competition in markets which still have monopolies and increase competition where it is only just beginning to take hold. To facilitate this process it is possible to share experience garnered by all stakeholders over more than a decade, from developed and developing countries, with its growing body of best practices in respect to regulatory reform. The tremendous gains made by market oriented reform should be at the foreground of these considerations. What needs to be underscored is support for the financial arrangements that have emerged in a commercial marketplace and which are underpinning continuing growth in the sector. The introduction of a network externality premium would be a step backward and could only be practical with monopolies in each country.

NETWORK EXTERNALITY PREMIUMS AND INTERNATIONAL TELECOMMUNICATION TRAFFIC EXCHANGE

Introduction

Improving access to communication networks in developing countries is a driver for their overall economic and social development. Over the past decade a greater reliance on the market, in many low-income countries, has made owning and using a telephone increasingly affordable and accessible. This has assisted in the creation of new sources of income and employment as well as encouraging innovation aimed at meeting local requirements. More broadly new services, and the falling prices for international communication, have improved the ability of developing countries to interact with the global economy as well as underpin financial and social relationships across borders.

A number of delegations to Study Group 3, responsible for international telecommunication tariff and accounting principles at the International Telecommunication Union (ITU), have proposed a 'network externality premium' be added to compensation arrangements surrounding international traffic exchange.⁵ The stated aim, in recognition of the benefits network growth entails, is to expand access and use in developing countries.

As agreement on the issue could not be reached at Study Group level, the matter was referred to the World Telecommunication Standardisation Assembly (WTSA) which met in October 2008. The WTSA adopted a new Recommendation (ITU-T D.156⁶) which Recommends:

1. *that the developing countries examine whether it would be appropriate for a premium, referred to as a network externality premium, to be a non-cost, additional element, on the accounting rate for incoming international traffic from the operators of developed networks to the operators of developing-country networks;*
2. *that this premium be negotiated on a commercial bilateral basis by the concerned operators on the basis of the elements referred to in acknowledging 2 and 3 above, taking into account all relevant factors including, but not limited to: traffic level, potential business, immigrants to the developed countries, and languages spoken in the two countries;*
3. *that this premium be paid on the tariff for incoming international traffic from developed countries to developing countries, in other words, that it be a non-cost, additional element on the termination rate/accounting rate;*
4. *that the funds made available by the network externality premium be used exclusively for extending networks in developing countries and for awareness campaigns, including, but not limited to, media and advertising costs, taking into account acknowledging 3 above; such costs for awareness campaigns should have a positive effect on the number of customers;*

5. *that the use of the funds made available by the network externality premium be monitored by the concerned parties, as mutually agreed, with appropriate oversight by an independent accounting firm, providing that this firm is not the regular auditor for either of the two parties; moreover, this fund may be established in a third country for the purposes of neutrality;*
6. *that further studies be carried out regarding formulas, models and guidelines for determining the actual value of any premium, how it should be collected, shared, distributed, and used, and its impact on the concerned operators.*

However, 28 ITU Member States, including the majority of OECD countries, have entered reservations against the Recommendation and stated that they would not apply it.⁷

The primary weakness, with the foregoing proposal, is that it is wholly out of step with a shift to a commercial market which has occurred over the past decade. It fails to recognise that markets are already acting to meet the critical policy objective of expanded access to communications in a more efficient manner than the imposition of such a scheme. It can also be viewed as a step back to an era in which a group of monopolies administered an ITU-based system which demonstrably benefited telecommunication operators far more than users. If it were to be implemented it would invite charges that the ITU was acting as a cartel to raise the prices paid by users and promote anti-competitive effects. In reality, of course, this does a disservice to an organisation whose members have been increasingly favourable toward the role competition has played over the past decade.

The introduction of reforms in the 1990s, at the level of ITU-T Recommendations (*e.g.* cost-orientation, non-discrimination), have had a positive effect even as the accounting rate system decreased in relevance. On the other hand, the growth of commercial arrangements for traffic exchange, based on the “Internet model”, have transformed and largely supplanted traditional compensation arrangements.⁸ This has been to the benefit of users. Whereas the historical settlements model (*i.e.* the accounting rate system and half-circuit pricing for leased lines) led to high costs for traffic exchange, the Internet model’s use of peering and transit provides an incentive for all operators to minimise costs. These costs reductions have, in competitive markets, been passed on to users and lower prices have encouraged greater use of services.

There is also a hazard in linking network externalities to subsidies for network expansion and use. A premium imposed on compensation arrangements would only be justified where the benefits attributable to the network externality, for those paying the cost, were equal to or greater than the costs incurred in its collection and application. Such a determination at the domestic level, let alone internationally, would be challenging. In the United Kingdom the assessment that a positive network externality exists which it is appropriate for the customer of another network to pay for, the calculation of the amount of the externality to be paid and its application proved extremely complex and controversial. As the only OECD country to initially decide a payment based on a network externality was justified, though limited to mobile networks, the United Kingdom’s experience is very valuable. In that respect it is highly noteworthy that after a careful and detailed study of the application of a network externality surcharge (NES) on mobile call termination (MCT) rates, the United Kingdom’s Competition Commission concluded:

“... the NES is not a proportionate regulatory mechanism for achieving its ends, that there is no longer a sound case for the NES, and that its inclusion within the MCT price control was an error.”⁹ A further element, worth noting from the United Kingdom’s experience, is that the proposed network externality payment was extremely low. In 2007 OFCOM proposed a fee that amounted to around USD 0.004 per minute. Thus, even at the domestic level, where the positive externality of new users joining the network can be expected to be stronger than at the international level, the payment previously thought to be justified was set at a very low level. This is highly pertinent to the consideration of a proposed externality

payment at the internal level, because existing compensation rates for international traffic are frequently argued to be well above cost. In that sense, therefore, they can be said to already include a network externality premium.

In reviewing the implications of a network externality premium at the international level, this paper is organised as follows. It begins by briefly recounting what the greater use of competition in communication markets has achieved, in terms of network expansion, compared with the monopoly era. This is followed by a discussion of what network externalities are and how they are treated in the existing literature. The paper then addresses how markets are acting to take account of network externalities in two key areas. The first deals with international 'internalisation' and the second with how innovation is interacting with externalities. The paper then briefly reviews the historical accounting rate system and the current model based on termination rates. Finally, the paper addresses considerations of a practical nature that would accompany any move to introduce a network externality premium.

Regulatory reform and network growth

Until the close of 1997 the majority of OECD countries, and most developing countries, had monopolies over the provision of telecommunication services. In contrast the following decade was typified by rapid liberalisation. Performance in both eras can be usefully compared by considering the following global developments:

- The first billion telephone subscriptions, reached by the end of 1997, took more than a century to accomplish. It took just four years to add the second billion, three years for the third billion and two years for the fourth billion.¹⁰
- In 1997 the tele-density for low income countries was just 1.5 fixed and mobile telephone subscriptions per 100 inhabitants. By 2007 this had increased to 23.9 per 100 inhabitants (Figure 1).
- Telecommunication revenue in low income countries grew from USD 10 billion in 1996 to USD 60 billion in 2006. Over the same period the total foreign direct investment in telecommunication, in developing and transition economies, was USD 100 billion.
- Between 1996 and 2006 annual investment in telecommunication infrastructure more than doubled in low income countries, from USD 4.4 billion to USD 9.6 billion per annum. This was in an environment of falling equipment costs and a shift to less expensive wireless based systems.

After a century of low growth in access in developing economies, progress in recent years has been little short of breathtaking, something to which those countries can be justifiably proud. It can, of course, be readily acknowledged that there is not a one-to-one relationship between the number of subscriptions and individual access.¹¹ In fact, this is the case in both eras (monopoly and liberal) and, in developed and developing countries alike. Some historical and contemporary factors to take into consideration, in thinking about overall access, include the number of second lines on fixed networks, the level of ownership of dual SIM cards, resale and shared access. Their effects, however, may be to offset each other in terms of assessing whether policy objectives are being met. The ownership of dual SIM cards means that individual access can be overstated by simply looking at subscriptions. On the other hand, particularly in developing economies, there is significant resale of prepaid subscriptions by micro-entrepreneurs as well as shared use by families, friends and neighbours. This means access can be understated by only considering subscriptions. Notwithstanding the foregoing caveats, it is clear that competitive markets have far outperformed monopolies in terms of expansion. Almost half of the access growth for low income countries, leading to the close of 2007, had occurred in the previous two years.

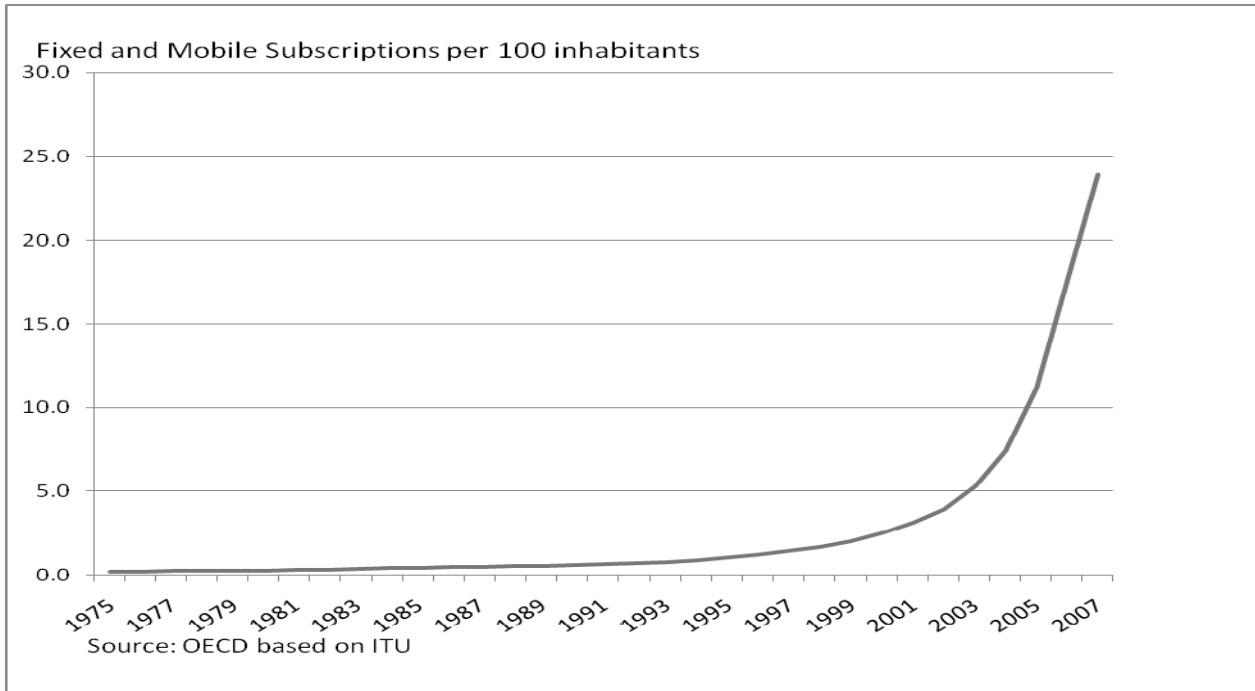
Policy and regulatory reform surrounding ICTs have been chiefly responsible for the gains over recent years. Liberalisation of communication markets was the critical step along with separation of policy and operational responsibilities, the creation of independent regulators and privatisation.¹² All of these initiatives have been aimed at providing the right incentives for operators to expand service, introduce new technologies and attract investment from capital markets. Just as critical has been the introduction of reforms to the principles underpinning international traffic exchange. These include recommended best practices, such as cost orientation and non-discrimination as well as efforts toward greater transparency.

For network operators the introduction of competition has provided an incentive to expand service. It is an axiom of economic theory that entities with monopoly power can maximise their returns by creating scarcity.¹³ If those monopolies stem from regulation, as they did in the case of telecommunication, other providers have no opportunity to create abundance. In some countries, during this period, action in lieu of competition, such as rate of return regulation, subsidies or government fiat, attempted to redress the problem of monopoly power. These initiatives had variable success across different countries and, even among OECD countries, produced a wide range of performance in terms of tele-density.

In many developing countries the resources, which could be devoted in an attempt to substitute for competitive effects, were severely limited and competing with other areas of public expenditure. This contributed to long waiting lists for a telephone service, sometimes stretching over many years. This meant that demand frequently went unsatisfied even for those ready and willing to pay for service. In countries typified by a high degree of corruption, potential subscribers frequently had to pay bribes to receive service. Thankfully, such waiting lists have been largely eliminated through markets promoting greater efficiency in the delivery of service and greater access to private capital focused on network expansion.

While there is an increasing appreciation of the benefits of using competition, to expand access, recognition remains insufficient in many countries. This is evident in proposals that seek to impose premiums on the rates, used to compensate operators for the termination of communication traffic between their respective networks. Such proposals fail to appreciate that imposing a mechanism, which for all practical purposes is incompatible with a market based system, will act as a constraint on network expansion. It also lacks an historical appreciation of how such mechanisms underperformed in the monopoly era (Box 1) and how markets are acting, not only to deliver unprecedented expansions in access, but also to address network externalities. In short, network expansion has occurred through competition and in the face of declining international call termination charges which have been moving toward cost, and not through subsidies from high, non-cost based, international call termination charges.

Figure 1. Low Income Countries (Tele-density)



Source: OECD based on ITU

Box 1. Why the accounting rate system did not translate into higher telephone penetration rates and use

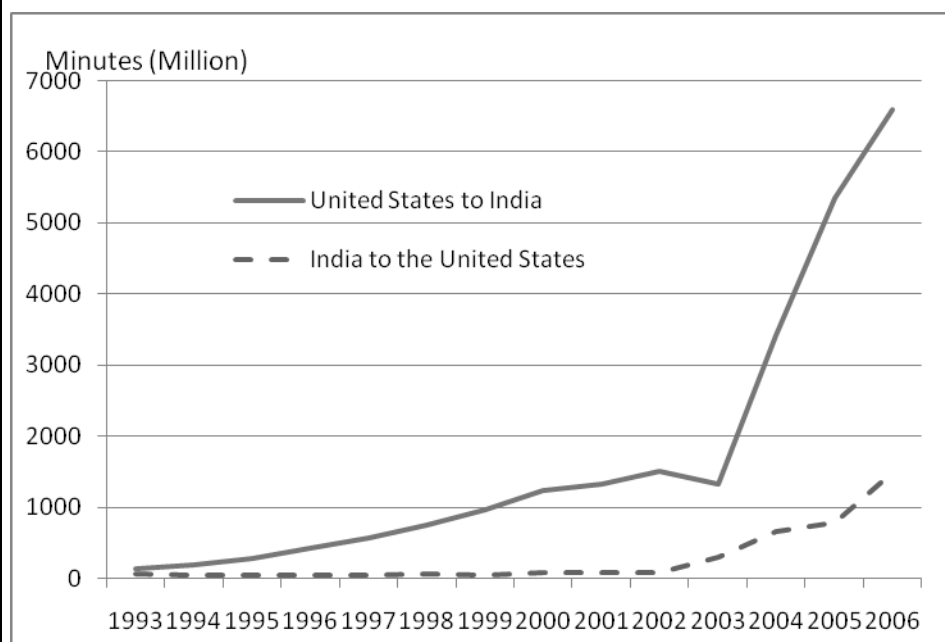
Some of the most disappointing effects of monopolies occurred through the international accounting rate system. Accounting rates were a bilateral system for determining the payments to be made between operators for traffic between their respective networks. In practice this system poorly contributed to network expansion. To understand this effect it needs to be recalled that incumbent operators had monopolies over termination of all traffic in their country. While an increase in calling opportunities, engendered by network expansion, would have increased the amount of traffic and revenue to be gained by international settlements, in practice, other factors counted for more.

In the case of private monopolies the revenue from settlements was often added to the bottom line rather than being directed back into network expansion. In the case of state-owned carriers revenue from international settlements was frequently diverted, to purposes other than telecommunication, compounding incentives for management not to reinvest in network expansion. In both instances the supply-led nature of the sector, as opposed to being demand-driven, made for a poor basis to see the opportunities reinvestment could have delivered. There are, for example, several well documented cases of incumbents, with continuing monopolies over international service, not passing revenue from international settlements to new entrants in domestic markets.¹⁴ These included instances where new entrants were providing service in rural areas that incumbents had been unwilling to serve, but which nonetheless had generated significant incoming settlement revenue. Such practices represented an inefficient allocation of resources and held back network expansion in developing countries.

Another effect of the system was to constrain the use of international telecommunication services. One example is provided by the route between the United States and India. The United States liberalised the provision of international services in the 1980s. The result was an increase of traffic (e.g. telephone calls) from the United States to India but, as prices remained relatively high due to the accounting rate system, demand was still weak. Indeed, some of the growth in traffic, from the United States to India, between the mid 1990s until 2002 was attributable the emergence of “call-back” services and refile.¹⁵ Both these phenomena, which reverse the direction of traffic, were a response to the high prices faced by Indian consumers.

Demand in both India and the United States increased substantially following liberalisation, at the Indian end of the route, in 2002.¹⁶ As prices were drastically reduced Indian users no longer had an incentive to use call-back or operators to refile traffic. This is the most likely explanation for the drop in traffic recorded as being from the United States to India between 2002 and 2003 and an increase in the reverse direction. From that time on there has been a tremendous increase in traffic flowing between the two countries which has benefited consumers and helped underpin India’s expanding role in the global economy. In turn, this economic growth has supported overall economic and social development. The expansion of India’s network has also built its own momentum in terms of attracting investment. Between 1997 and 2007 India’s tele-density grew from less than 2% to more than 23%. While the settlements do represent an important source of foreign currency, for operators in developing countries, it is worth observing that they have a lower relative importance than during the accounting rate period. One factor here is the potential for increased foreign direct investment, as markets are opened, but also that general economic growth enhances the ability to sustain network expansion. This can be illustrated by the case of India. In 1996 the net settlement (USD 298 million) from the United States to India was responsible for 2.3% of India’s foreign currency reserves of USD 17 Billion.¹⁷ By 2006 the net settlement from the United States to India, of USD 239 million, represented just over 0.1% of foreign reserves of more than USD 176 Billion.¹⁸

Number of telecommunication Minutes exchanged between the United States and India



Source: OECD based on FCC International Traffic Data Reports.

For further discussion on international settlements refer to the section of this report dealing with Accounting Rates.

What are network externalities and network effects?

At the individual level the benefits of expanded access, to communication networks, can be readily grasped. By joining a network a user can communicate with all other users on that network and, beyond, on interconnected networks. There can also be an effect in which the network itself becomes more valuable to participants as the number of users, or opportunities for communication, increases (i.e. the network effect). The network effect is sometimes termed as a 'network externality' though the two terms, strictly speaking, are not interchangeable.¹⁹

Externalities are side effects of economic activities in which those affected, positively or negatively, have not participated directly in the decisions which led to those outcomes.²⁰ They are sometimes categorised as market outcomes that affect parties other than the direct producers and consumers of a good or service. Text book examples include a factory which pollutes the surrounding environment (a negative externality for those affected) or a householder, who by painting their residence, or tending their garden, improves the value of surrounding properties (a positive externality for neighbours). Side effects such as these, when not taken into account in the pricing of economic transactions, are a form of market imperfection. As the costs and benefits, for third parties, have not formed part of the calculations of those deciding to undertake these activities, too much or too little of this activity may be produced.²¹

For economists the solution to the problem of externalities is to seek some way of bringing them into the financial considerations of decision makers. The aim is for the costs or benefits of actions to be accounted for in economic transactions (i.e. internalisation). A polluter, for example, may cease to do so if they face financial penalties or if consumers shun their products. A householder may be more inclined to paint their house if neighbours contribute to the cost of materials or maintain their own properties in a

desirable manner. Economists also note that markets may evolve in ways that address imperfections and that internalising an externality is only optimal if the benefits outweigh the costs. An important consideration for policy makers is, therefore, whether markets are already acting to internalise externalities as producers or consumers will endeavour to minimise their costs or maximise their benefits

The potential for network expansion can be viewed as a positive externality. Those making this case argue that when a user joins a network they take into account their own benefit but do not consider the benefit for others. The corollary being, that if this additional benefit is not captured in the pricing of a service, a less than optimal network expansion will occur (*i.e.* too little production of a positive externality). Their suggested solutions may range from premiums paid by existing users or subsidies from other sources (*e.g.* public revenue) to align the interests of the prospective subscriber with the benefit to others already on the network.

There are several pitfalls in thinking about network externalities instead of, more simply, using the concept of network effects. All can agree that the expansion of networks (the network effect) is desirable and policies can be crafted and assessed with that aim in mind. By way of contrast, a policy presupposing an externality starts from the premise that an imperfection needs to be addressed. It does not necessarily take into account whether the market is already acting to meet policy goals. In other words, even if an imperfection exists and could be measured (many externalities are widely considered to be unmeasurable), it is far from clear that any action will expand the network faster than pursuing market based growth. This is why economists urge caution in using the concept of externalities because "...to some it may imply the need for a public policy intervention when none is called for."²²

Producers and consumers often do take externalities into account, even if not always as the aggregate level, and market solutions frequently evolve. By addressing network externalities, rather than network effects, actions may be contrary to policy objectives or impose greater costs than benefits. It leaves open the possibility, for example, that an externality will be paid for twice – once voluntarily and directly by the actors directly affected and a second time by a top-down subsidy scheme to which they may be forced to contribute. At the same time, analysis of network externalities has not kept pace with technological and service developments. None of the proposals, reviewed for this paper, take into account the way markets are already interacting with externalities. A further weakness is that the underlying academic literature is almost entirely predicated on domestic rather than international communication.

In the case of telecommunications the beneficiaries of externalities (*i.e.* the ones expected to pay a premium) are the existing customers who are able to make calls to the additional subscribers who join a network as a result. An existing customer would generally benefit more when a new national subscriber joins the network than when a non-national customer joins the network. Local externalities tend to be stronger than remote or international externalities.²³ If the network effect was used as the basis for the policy this would not be at issue because, by definition, all users benefit from network growth (*i.e.* they have a greater number of calling opportunities even if they are not exercised). By way of contrast, network externalities can be relatively weak or strong according to any individual user's calling patterns. As presently structured the existing subscribers in developing countries might be expected to benefit the most through internalisation of the externality but the burden falls on existing users in developed countries. A more logical course, based on externalities as opposed to some other criteria, would be to align the allocation of resources with the strength of the externality. An existing subscriber in a developed economy would be expected to benefit more when a marginal user from their own country joins the network rather than one in another country.

It could be argued that a network externality premium is being applied equitably in that only those people making calls will bear the cost. Here it is useful, once again, to consider the relative strength of externalities. Those users primarily affected might be expected to be business and the Diaspora. Most

international business calls will be business-to-business and the externality for the marginal users targeted by any such scheme would likely be weak. The result would be to raise the cost of doing business, with that country, and the creation of an incentive to either bypass the system or locate those activities most affected in other countries. In terms of the Diaspora, such a policy raises the cost for those people that frequently have the most limited economic means in developed countries. While people with existing subscriptions in developing countries benefit, including for example business users in those countries, the burden will fall disproportionately on migrant groups that tend to be less well-off in developed countries.

Markets can better assist in addressing externalities for business and the Diaspora and the existing economic literature does assist in understanding how this works. In any network industry the additional subscriber is not always compensated for the benefit they bring by subscribing, however firms can use price discrimination to benefit users to maximise their network effect on the market (*e.g.* a large user can be given a lower price to compensate for positive network effects on market).²⁴ This argument would imply that increasing prices, through some form of premium, would penalise those users who bring the largest positive effects to the market. At the same time, innovative solutions have been emerging for the Diaspora, discussed later in this paper, that are much more efficiently and equitably internalising international externalities.

Policy makers also need to take into account the existing arrangements for international traffic exchange, in any consideration of network externalities. This should include international agreements aimed at promoting best practices. Proposals for network externality premiums, for example, run counter to existing principles (*e.g.* cost orientation, non-discrimination, and transparency) aimed at increasing the efficient allocation of resources. They have the potential to distort competitive markets, particularly if incumbent operators use the additional funding to expand their market power or to discourage market entry by new operators. This could stall necessary reform in those countries which still have monopolies over international service provision. They are, moreover, completely impractical and would not attend to their stated goal of addressing a supposed, but widely considered un-measurable, market imperfection.

Internalisation of externalities

The decision of each user to join a network is, for the most part, independent of any other user's choice, though, by both doing so, they share a common benefit. On the other hand, the existence of a 'network externality' hinges on perceptions of value by individual users in relation to others. This includes the value users perceive from being part of a network and their willingness to compensate others to join a network. The United Kingdom's Competition Commission has defined a 'network externality' as being the benefit users derive, from calling and being called by new users, that people *often* do not take into account in deciding whether to subscribe to a service.²⁵ They point out that social welfare is maximised if the price of joining a network takes into account externalities (*i.e.* internalises them) in such a way that optimises the network effect.

One of the challenges in dealing with externalities is the difficulty in identifying those affected. In contrast to the network effect (where it can be argued all users benefit equally from an expansion in calling opportunities), the strength of network externalities will be relative to each user. In defining the network externality, Crandall and Waverman observed:

"The network externality in telephone networks may be characterised fairly simply. What I am willing to pay to join a network is a function of how many others I can call (and can call me). The standard economic analysis of this externality concludes that the *n*th person to join a network should pay a price below her costs to induce her to subscribe. She does not, in evaluating the costs and benefits of a telephone, consider the benefits she provides to others. As a result the

externalities ... [relate to] ... the impossibility of identifying the beneficiaries, who otherwise might be induced to compensate her directly.”²⁶

If producers or consumers make decisions, which incorporate the costs or benefits of side effects on others, they are not properly speaking externalities. As Liebowitz and Margolis point out:

“Although the individual consumers of a product are not likely to internalise the effect of their joining a network on other members of a network, the owner of a network may very well internalise such effects. When the owner of a network (or technology) is able to internalise such network effects, they are no longer externalities.”²⁷

In other words, “The difference between a network effect and a network externality lies in whether the impact of an additional user on other users is somehow internalised.”²⁸ In seeking to address one phenomenon (*i.e.* the network effect) operators may alter related factors (*i.e.* network externalities). Network operators, for example, co-operate in the creation and use of standards to permit communication across different networks in recognition of the network effect. They do so because the benefits (interconnectivity) outweigh the cost (making standards). Their actions reflect demand from their customers, who would be quick to complain if their communication options were limited and, who ultimately bear the cost of the standardisation. An important point, that needs to be recognised in all discussions on network externalities, is that network operators have incentives to internalise the phenomenon as they strive to enhance the network effect.

Internalisation of network externalities by network owners

The introduction of Short Message Service (SMS) provides a good example of operator internalising externalities and taking into account the network effect. Initially, SMS was not planned as a commercial service. The original purpose was for operators to share information with customers as well as staff.²⁹ The unplanned side effects were to enable users to text message to each other and for operators not to be able to bill users for this service. This meant the economic value of a positive externality, for consumers, was not being captured by producers. As an unplanned side effect, rather than a commercial service, SMS also had limitations. These included users, on one network, not being able to text users on another network.³⁰ Struck by the growing popularity of the phenomenon, operators internalised the externality by introducing pricing and billing systems for SMS and added value, by enabling transmission across networks to enhance the network effect.

The solution to the positive externality generated by SMS would not have surprised Ronald Coase. Professor Coase was the economist who pointed out, in the 1960s, that property rights provided incentives, for their owners, to tackle inefficient outcomes resulting from externalities.³¹ The problem for universal application of this principle, as recognised by Coase, was in those situations where high transaction costs acted as a barrier to efficient resource allocation.³² Among these costs is the identification of those affected, by any externality, and placing a solution into effect (*e.g.* negotiations, contracts etc). Network operators, it can be argued, played that role in the case of SMS. This raises the question of whether they perform the same role with other externalities and whether markets are already acting to internalise network externalities.

The classic problem with network externalities is the challenge of identifying beneficiaries that might otherwise directly contribute to the cost of adding new telephony subscribers. In the monopoly era network externalities tended to be dealt with obliquely. Universal service policies were largely justified based on social externalities associated with having a telephone service (*e.g.* ensuring widespread availability of the ability to call emergency services) or, more broadly, the economic and social benefits of the network effect. In fostering cross subsidies, from one broad group to another, to meet these goals, network

externalities were addressed to an extent but, arguably, in a haphazard fashion. In other words very broad groups (business/consumer, urban/rural, long distance/local) met the costs or reaped the benefits. If such policies had been applied, only in respect to network externalities, there would have been more limited intervention. As Crandall and Waverman point out, it would have only been necessary to intervene for those individuals whose private benefits did not exceed the cost of serving them, but who generated sufficient external benefits to make up the difference.³³

Enter prepaid cards

There is, however, a different way of looking at the problem of network externalities in a market-based environment. Consider the situation in which a mechanism was introduced with the effect that the private benefits, to the user, almost always exceeded the price they are willing to pay. Consider further that, while someone joining the network does not internalise the benefit to others, this benefit is well recognised by network operators. The solution, therefore, was a system that enabled a network operator to charge users whatever they are willing to pay. In fact, this is what a market based approach has delivered through pre-paid cards.

The introduction of prepaid cards has also gone a long way toward internalising or, in some countries, eliminating network externalities. Few writing about network externalities, in the previous century, envisaged tele-densities would exceed 100%, let alone 200%.³⁴ Fewer still would have expected the developing countries to be surpassing 100%.³⁵ This does not, of course, mean that everyone in these economies has a telephone. It does show, however, that competitive markets, in contrast to monopolies, are rapidly expanding access and, in the course of doing so, are internalising network externalities.

During the monopoly era operators typically charged a connection fee, a fixed monthly line rental and usage charges. There was little flexibility in these arrangements. In this context, the network externalities, as described by Crandall and Waverman for a traditional telephone service, represented a larger consideration or barrier, than they do today, for users considering joining a network. In contrast markets are better able to determine price sensitivities. Network operators, like any business, will endeavour to charge consumers the maximum amount they can for any good or service.³⁶ Consumers have, of course, different propensities to pay. Pre-paid cards not only eliminated the credit barriers to joining a network but enabled operators to introduce a means for consumers to signal how price sensitive they were to paying the fixed fees which typified traditional telephone service. Moreover, the new strategy had the advantage of internalising network externalities (*i.e.* people who would not otherwise have joined a network became subscribers).

For price sensitive consumers, the innovation of pre-paid cards, resulting from competition, turned the traditional pricing model on its head. Not only were connection fees commonly waived but joining a network could be considered in terms of what can be called the minimum cost of subscription (MCS). The MCS is the lowest possible charge a user can pay and still remain connected to a network. In some developing countries this can now be less than USD 2 per month for wireless service.³⁷ This is why in developed countries it is increasingly common to see nominal mobile penetration rates greater than 100%, indicating that at least some consumers, attracted by the MCS, have more than one mobile service.³⁸ The advantage for the low usage or low income user, whose private benefit may not have justified subscription under a traditional pricing model, is that they can rationalise having service for the first time. Their private benefit, in other words, will always exceed the cost of joining the network (*i.e.* what they are willing to pay).

At the same time, many mobile users continue to be billed on a post-pay basis. They generally pay fixed monthly fees, have higher network usage and receive a reduced unit price (*i.e.* a lower per minute rate or unlimited service). In this way post-pay users, who are less price sensitive, make a greater

individual contribution to meeting a network's joint and common costs. The issue here, however, is not one of cross subsidisation. Both pre-paid and post-paid users pay their way but the market has found a better way for them to signal how price sensitive they are. Users may give little or no thought to the network externalities being addressed but the effect is the same. Both post-paid and pre-paid users benefit from the internalisation of the network externalities and the resulting growth of the network effect.

The prepaid model is also being applied to fixed networks services in some countries. In India, Bharat Sanchar Nigam Ltd (BSNL) has introduced a scheme whereby subscribers can have a fixed line telephone connection on a pre-paid basis.³⁹ The service differs from telephone cards in that no PIN code is needed making it simpler to use. The scheme is aimed at making fixed lines more attractive relative to mobile services. The MCS for this service is less than USD 0.50 per month.⁴⁰ Further discounts are available in rural areas for exchanges serving less than 1000 users, effectively setting the price of the MCS at zero.

India's highly competitive access market has also delivered the innovation of lifetime prepaid cards for wireless service. Aimed at low income people the prepaid cards have no fixed validity period. In other words the cards enable users to continue to receive calls even in those months when they cannot afford to top up their cards with credits for making calls. Competition, therefore, not only acts to expand access for low income users but also to retain them as customers when they might otherwise leave the network.

Network Investment and Externalities

It is not just in pricing that operators may take network externalities, or the network effect, into consideration. Operators invest in networks, for the most part, with an anticipation of future growth. A significant factor is the economics of building and maintaining networks in relation to that growth. The cost of putting into place capacity for future requirements may be marginal compared with adding that capacity, or replacing a system, at a later stage. Nevertheless, that investment must be paid for by shareholders, in anticipation of future growth and returns, or increasingly, as the network grows, by subscribers. In this manner, network operators are already acting to internalise network externalities by addressing network effects. By getting today's subscribers to contribute to a network's joint and common costs they lay the foundation for new subscribers. Operators have, arguably, identified the beneficiaries of future growth, at least in part, as being those people already on a network. As such, existing subscribers are compensating new subscribers even if they may not directly benefit, from any particular subscriber joining a network, or take the benefit for others into account in their own decision to subscribe.

Internalisation of network externalities by consumers

Consumers also internalise, what may otherwise remain externalities, when they perceive direct benefit for those they call and who call them. In some countries fixed lines may be retained by people with mobile phones due to lower termination charges and consequently, lower call charges for other users calling them. On mobile networks different individuals, sharing a relationship, may select the same network to benefit from reduced 'on-net calls'. Some may purchase SIM cards on more than one network for the same purpose. Consumers also buy telephones or telephone service for each other. Family members routinely buy service for each other in recognition of the benefits of calling and being called by each other. While this is well recognised at the national level there is a growing international element to this phenomenon which acts to internalise network externalities. Needless to say the strongest positive network externalities are geographically local, with family and friends, or with local business intermediaries, accounting for many tariff plans which take this into account.

Migrants and offshore workers provide an international dimension to the issue of network externalities, particularly for developing countries. Diasporas are making increasing use of services which enable them to purchase telephone service for others in countries where they do not themselves reside

(Table 1). By inputting a user's telephone number, such services enable customers to send credit to that mobile phone.

People located anywhere in the world, for example, can use "mamamikes" to purchase telephones and airtime for friends and relatives in Kenya and Uganda.⁴¹ A spin-off from the same company, Kikwe, offers a top-up service in Kenya, Ghana and Sierra Leone and offers users the chance to send a complimentary SMS to the recipient when they remit the airtime.⁴² Another service provider, 'aryty' enables people in Canada and the United States to purchase airtime for users in the Philippines through the Internet or their mobile phones.⁴³ The aryty service, started in 2007, is currently being expanded to India and the Gulf Region.⁴⁴ Global Topup already operates in that region enabling users around the world to purchase prepaid airtime for people in India. In 2007, Telecom Malaysia also began a service enabling migrant workers in that country to top up the airtime of people in Indonesia and Bangladesh.

In Latin America, Unpaid Systems launched a service (RechargeBrazil) in July 2008 which enables people in the United States to top up the phone cards of their friends and family in Brazil.⁴⁵ Working with PayPal, RechargeBrazil facilitates users making direct payments, for others, on any of the Brazil's mobile service providers. While the majority of schemes are recent and focus on wireless services, Telmex has offered "Mexico En Linea", aimed at fixed services, since 1998.⁴⁶ People residing in Canada and the United States can pay for the installation of a Telmex line, in Mexico, as well as pay a portion of or the full amount of the recipient's monthly telephone bill.⁴⁷ There is no monthly subscription fee for the service. Between 1998 and 2002, TelmexUSA received about one million applications for connections, under the scheme, of which around 70% were approved. Mexico's largest wireless operator offers "Telcel Amigo", a service which allows people in the United States to directly top up airtime for its subscribers located in Mexico.⁴⁸

In September 2008 Digicel, in partnership with Western Union, launched a service enabling United States residents to buy airtime and send it to mobile phone accounts belonging to its users in Jamaica, Haiti, El Salvador and Guyana.⁴⁹ In the future, the companies plan to add the service for Anguilla, Antigua, Dominica, Grenada, St. Kitts, St. Lucia, St. Vincent, Barbados, and Trinidad and Tobago. Western Union has also partnered with Orascom Telecom which operates six mobile networks in Algeria, Pakistan, Egypt, Tunisia, Bangladesh and Zimbabwe to offer remittance services.⁵⁰

An example of an alternative or complementary service, which internalises international network externalities, is provided by TracFone Mobile. Tracfone, a network reseller owned by America Movil, offers low cost post-pay and prepaid wireless service to users in the United States. TracFone's "International Neighbors" service allows users to obtain, at no cost, three Mexican or Canadian phone numbers.⁵¹ A user's family and friends, in those countries, can then call a TracFone user in the United States, by dialing a local number in their own country, without paying for an international long distance call. The TracFone user in the United States pays for the incoming call at their standard airtime rate with no additional charge.⁵² The Canadian or Mexican user only pays the cost of a local call.

The advantage of the foregoing schemes is that they enable beneficiaries to directly compensate other users. In turn, this provides demand side encouragement for network expansion and use. As noted earlier, one of the challenges with externalities is identification of the parties affected and the application of an efficient way of internalisation. Services, such as the foregoing, enable both these challenges to be addressed by the market. They are more efficient than possible alternatives in that there is far less risk that funds will be mislaid, misdirected or appropriated by an intermediary. In addition, the problem of corruption is vastly reduced or eliminated. For much the same reasons mobile networks are now emerging as a platform for financial remittances of all types (Box 2). Policy makers and operators should encourage greater diffusion of such schemes because they directly and efficiently act to internalise positive

externalities. Policy makers can also look to innovation in other areas to see if the market is addressing internalisation of network externalities.

Table 1. Selected Services offering Direct International Payments for Telephone Service

Name of Service	Description	URL
mamamikes	A service for anyone around the world to top up airtime for users in Kenya or Uganada. The recipient can choose to collect their airtime from a Nairobi or Kampala office or it can be automatically loaded onto their phone. Airtime PIN numbers can also be sent via SMS to the mobile phone.	www.mamamikes.com www.kikwe.com
RechargeBrazil	Introduced in July 2008 and aimed at people the United States paying for airtime for users in Brazil. Realtime top-up via website using PayPal in co-operation with mobile providers.	www.recargabrasil.com
Mexico En Linea	Introduced in 1998 and aimed at people in Canada and the United States paying for fixed lines for users in Mexico.	www.telmexusa.com/us/re_t_mexlinea.html
aryty	Introduced in 2007 the service is and aimed at people in Canada and the United States paying for airtime for users in the Philippines. Realtime top-ups can be made via a website or SMS from a previously credited card.	www.aryty.com
Paybox, Transfer To and Telecom Malaysia	Paybox and "Transfer To" provide tools for international remittances mobile banking. Working with Telecom Malaysian they created a service which enables Indonesian or Bangladeshi workers, living in Malaysia, to send airtime to their relatives abroad by SMS. A similar service MoneyBox Africa has been announced for Nigeria.	www.paybox.net www.transfer-to.com www.fixedandmobile.com
Primissimo	A service for the Cameroonian Diaspora to buy airtime for people in Cameroon.	www.primissimo.net
Global Topup	Enables users around the world to purchase prepaid airtime for users in India. Plans to expand to other markets.	www.globaltopup.com

Source: OECD

Box 2. International Financial Remittances

The effect of a network externality premium would be to raise the price of financial remittances over mobile phones. In other words it would penalise those users already contributing revenue to the terminating carrier and add costs to making more numerous small remittance transactions. By way of contrast, a policy that aimed to reduce the price of telecommunication services, through competition, would enhance the opportunity for people without bank accounts, in both developed and developing countries, to increase the use of communication networks for financial remittances. The benefits for broader economic and social development stand to be far greater than the financial flows from the foreign purchase of airtime. Yet, both will contribute to network development through direct and indirect stimulation of demand.

The World Bank estimates that international financial remittances toward developing countries totalled USD 251 billion in 2007.⁵³ The phenomenon is challenging to measure for a variety of reasons including the harmonisation of definitions and data collection as well as financial remittances that take place outside the banking system.⁵⁴ It represents, however, a larger financial flow than foreign direct investment and a much higher total than for official development aid.⁵⁵ As a ratio of GDP it can typically range from 4% to 8% in African countries. In relation to export earnings it can range from 15% to 40%.⁵⁶ That being said, the flows of financial remittances to Africa are lower than toward other developing regions.⁵⁷ While undoubtedly reflecting a number of factors, the lack of an efficient means to remit funds and its high cost have acted as a barrier for Africa. ICTs can be used to address this barrier if the right policy and regulatory frameworks are in place.

Mobile phone networks are an emerging platform for international financial remittances. There are a number of advantages including much less expensive transactions than traditional banking or remittance services, and being an enabling technology for people without bank accounts. Additionally, because transaction costs are lower, particularly for small sums, it enables users to send smaller amounts of money more regularly and ensure payment is made directly to the beneficiary. It also has the effect of drawing money that would otherwise have gone via informal remittances into systems that are observable and measurable. The service also generates revenue for operators. Each remittance is responsible for at least two SMS, between a remittance company and the sender and the receiver, to ensure the transaction.

The IMF has defined the remittance process using mobile phones as per below:

Information Flow

A sender visits a remittance company and fills out an information sheet. The remittance company in the sender's country submits to its partner bank in the recipient's country all relevant information provided by the sender. At the same time, the remittance company assigns an account number to the beneficiary's mobile phone and credits the number of the beneficiary. The service sends a text message to both the sender and the recipient, notifying them that the money has been transferred. The beneficiary can now get cash from the partnering institutions or through an ATM at a participating bank.

Funds Flow

The remittance company in the sender's country maintains a pre-funded account at a local bank in the receiving country. When a sender remits, the funds are transferred to the beneficiary's money card. Meanwhile, the beneficiary receives a notification through a text message that the funds are credited to his money card. The beneficiary then claims his cash at accredited encashment centers by showing the text message in his mobile phone.⁵⁸

Innovation and network externality internalisation

The literature dealing with externalities in communication markets, for the most part, has a twentieth century perspective. It views telephones and networks solely as a means for making and receiving telephone calls. It largely does not take into account different ways of paying for telephone service (e.g. prepaid cards).⁵⁹ For the most part it locates the pricing of telephones in a single country (Box 3). As a

consequence, for an industry characterised by rapid technological and service innovation, the text book examples are not always in accord with how telephones are used in practice. This is particularly true in thinking about network externalities in developing countries and the calculation of the private benefits of owning a telephone.

The theory of network externalities presupposes that users do not take into consideration the benefits they provide to others, when they join a network, and therefore are not compensated. In fact, in developing countries, telephones are commonly shared by multiple individuals, with compensation for use being paid to the telephone's owner. This can range from micro-entrepreneurs reselling airtime, from street stalls or bicycles, through to friends and neighbours sharing the cost of a telephone.⁶⁰ In India, Pakistan, the Philippines and Thailand, for example, more than 50% of all mobile subscribers in rural areas share mobile phones, with friends, relatives and acquaintances, outside their households.⁶¹

Resale of telephone service also occurs in OECD countries. Pre-paid cards selling below face value are routinely bought and sold on eBay. One reason this is possible may be the ability of micro-entrepreneurs to buy cards, in bulk, at wholesale rates. In addition there are various promotional offers from wireless operators which offer lower introductory prices for prepaid service. From the operator's perspective such promotions lower the barriers to joining a network, particularly for low income users. Once a user has purchased a card they may become an ongoing customer and purchase additional airtime. On the other hand, some users may prefer to use such offers as a form of disposable service. They use the minutes for as long as the card is valid and then bid on or buy a new card. The benefit to low income users may be relatively inexpensive rates compared to normal prepaid service (*e.g.* USD 0.03 or USD 0.04 compared with USD 0.10). Purchasing pre-paid airtime through auctions provides a further avenue for some price sensitive users to lower the minimum cost of telephone access. The downside of "disposable service", in terms of network externalities, is that each new card comes with a new telephone number. Though, even here, markets may act to externalise externalities as mobile phones interface with Internet-based call forwarding services.⁶²

Nor is it a simple matter to attribute what proportion of the overall benefit a user derives, in being part of a network, from telephony. Making and receiving telephone calls is, of course, only one application to be found on today's multi-functional devices. Examples of other applications include communicating text (SMS, email) receiving broadcast services (radio and television), playing games or personal entertainment (music, video) accessing information services (news, weather, commodity prices), taking and transmitting photographs or videos, social networking (*e.g.* Twitter) as well as interaction with other devices (*e.g.* from slingboxes to personal computers). Mobile phone users also interact with the Internet in a myriad of new ways. Examples include uploading photographs to websites such as 'Flickr' or video to 'Youtube' or text to blogs. Mobile phones can be used to indicate presence (*e.g.* Loopt, Wrrl, Zintin) or determine location, using the cellular networks themselves, Wifi or GPS, and provide associated maps or information.⁶³

The uses to which mobile phones are being put show extraordinary creativity. One illustration of the variety of uses such devices can be put to is illustrated by Apple's iPhone. In early October 2008, there were more than 2600 applications for the iPhone available for downloading on Apple's website.⁶⁴ Examples included applications which informed motorists of local fuel prices in their location; price checks for products through ISBN and UPC codes against online vendor alternatives; social networking; entertainment; as well as all manner of news and information services.

When users make use of the iPhone, or similar devices, they are joining a network which provides a gateway to a network of networks. If consumers have an unlimited data plan, their assessment of private benefit is increasingly an outcome of the richness of applications. This is reflected in the fact that existing users are willing to pay more for certain types of handsets with additional features and calling plans which include data access.

Innovation, surrounding networks in developing countries, is also readily evident from the work of a growing number of “ICT anthropologists”. Companies such as Nokia and Intel are devoting greater resources to looking at how people are using ICTs with the aim of improving their design and applicability.⁶⁵ Observing that people shared mobile phones in developing countries, for example, led Nokia to introduce the option of multiple address books on devices to enhance privacy. Noting users are highly price sensitive and that others share and resell service prompted the introduction of pre-paid and cost tracking applications.⁶⁶ Increasingly, however, the uses to which phones are put have been unanticipated by manufacturers and service providers. The ICT anthropologists document the customisation (‘hacks’) of phones for numerous purposes and local conditions and then feed that information back to design teams.⁶⁷ Some uses may have little to do with telephony. Examples in developing countries include:

- In mid-2008, a Kenyan teenager received a great deal of publicity after being reported to develop a car immobiliser operated by a mobile phone.⁶⁸ The system can be used as an anti-theft or tracking device. If the ignition is started when the car is supposed to be locked, the device communicates via SMS with the owner’s mobile phone requesting a PIN code to enable the vehicle to start. Similar services have emerged in other countries such as India.⁶⁹
- Mobile phones are being used as ‘broadcast technologies’ for text services and document exchange. NGOs and other groups, for example, have used the ‘Frontline SMS’ software to broadcast text messages to users for purposes ranging from monitoring to elections, corruption and human rights through to providing information on healthcare.⁷⁰ By using the Episurvey, for example, health authorities can collate information on the spread of disease, by sending questionnaires across mobile networks, so data can be gathered from people on their phones.⁷¹ Perhaps the best example is the ‘mPedigree’ service which enables users, after purchasing a drug and scratching a panel, to text the number to see if the product is genuine and prior to its date of expiry.⁷² Authorities have also used text services to broadcast information about natural disasters.⁷³
- Mobile phones are being used as a substitute for the services and tools provided by financial intermediaries or institutions. This can range from acting as store of value, payment mechanism or a tool for financial remittances. Safaricom’s M-PESA service, for example, enables users to transfer money using a mobile phone in Kenya.⁷⁴ In the first 18 months of service it transferred funds valued at over USD 500 million.⁷⁵ In that time the service registered 3.8 million customers, a figure that the Kenyan banking system took a century to reach.⁷⁶ These unanticipated services, pioneered in developing countries, are now being made available by mobile providers to ‘unbanked’ people in developing and developed countries.⁷⁷ At the same time application developers are taking successful models from developed countries and adapting them to local requirements. One example is developing services similar to PayPal for mobile phones.⁷⁸
- Mobile phones are being used for the delivery of government services. One example, in India, is the delivery of pensions through a combination of RFID enabled cards and Near Field Communication (NFC) enabled mobile phones.⁷⁹ Under this scheme pensioners have a chip enabled card which includes their personal information together with a fingerprint. On presentation of the card the information is scanned by the mobile phone and authorisation given for the agent to dispense the pension entitlement. The scheme is reported to have significantly reduced transaction costs, eliminated opportunities for corruption and fraud as well as providing a more efficient service to users. Accordingly, the Indian government aims to expand the use of mobile phones to provide services to people without bank accounts.

- Mobile phone networks have become a platform for commerce. Take the example of ‘CellBazaar’ in Bangladesh. The service has been described as a ‘Craigslislist’ for mobile telephones. People advertise a wide variety of things from agricultural produce and real-estate to jobs and services. The GSM Association has noted, “While common telephony establishes one-to-one communication, CellBazaar links many-to-many using the same basic mobile infrastructures.”⁸⁰ In Africa, mobile phones can be used to access TradeNet, an agricultural market information and trading service for farmers and their suppliers.⁸¹ The service pioneered in Ghana but now available across Africa, mostly uses SMS to enable trades and information dissemination. Co-operatives and partners have the option of subsidising SMS messages for their constituents or customers. Senegal’s Manobi offers a similar platform for farmers and fishermen.⁸²

The foregoing raises the question of how innovation, surrounding the use of networks, can inform debates about externalities. One obvious aspect is that the revenue opportunities for operators are no longer limited to telephony. Operators can share revenue with third party service providers (e.g. as occurs with NTT’s i-mode) or act as intermediaries themselves to sell products and services (terminal devices, ringtones, music, information, applications, financial remittances/mobile banking and so forth). They can also sell access to their subscriber base to advertisers. Some mobile service providers, for example, provide SMS and MMS advertising to their subscribers in return for lower telephony prices.⁸³ In the Philippines, U-mobile is a service owned by two network operators.⁸⁴ It is aimed at 15 to 35 year olds, by invitation only, willing to accept advertising in return for free calls and texts.

In India, “mGinger” offers advertising on SMS received by users. In return for signing up for the service and providing personal information users receive a payment for each text they receive and payment for texts read by the people they have referred to the service.⁸⁵ Cheques are sent to those users when the amounts they accumulate exceed USD 6.11 and they are free to nominate the number of messages they are willing to receive and the time of day. Dubbed “permission based advertising”, mGinger has spawned a number of competitors offering advertising supported SMS.⁸⁶ Opportunities for revenue growth, such as these, may be taken into account when operators consider or address network externalities. The value of the customer to the operator is, in other words, no longer limited to their use of telephony.

In South Africa, Vodacom offers an SMS-based service that is generating about 20 million messages per day.⁸⁷ “Please Call Me” is Vodacom’s free call-back service aimed at prepaid users. Users can send an advertiser funded SMS for free, requesting a call back from another user. Vodacom also offers a service called “AdMe”, wherein users give their permission to receive advertising, with promotional offers, from which the operator derives revenues.⁸⁸ The genesis of the service is related to externalities. In developing countries highly price sensitive users will signal others to call them back such as through information on missed calls. This represents a positive externality for the user and generates a cost for the operator. Vodacom’s solution internalises this externality by adding value to the caller (*i.e.* through improved information) as well as creating an opportunity for revenue (*e.g.* generating a new call, call termination or advertising).

Advertising on mobile phones still represents a relatively small share of the overall advertising market. On the other hand it is a rapidly growing market segment with a potential reach that will exceed four billion users by 2009. One of the largest firms serving advertisements to mobile devices is AdMob.⁸⁹ The company reported request for advertisements increased from 1.5 billion in September 2007 to five billion in September 2008 (Table 2). AdMob data cover only the mobile sites, applications and publishers that are part of its global network. It is, therefore, not representative of the entire market. Notwithstanding this, as one of the largest players in this market, the data reveal a number of interesting characteristics. One is that the OECD country share of advertising requests, for the top 20 countries, made up 51% of the total - down from 63% in 2007. Moreover a number of developing countries had many more advertisements

served over mobile phones than OECD countries. These data suggest advertising on mobile networks is developing rapidly outside the OECD area.

In competitive markets operators will seek to internalise externalities for particular groups of people. At the same time, the multi-dimensional nature of today's telephones is making adoption by these communities more rewarding. Africa's TradeNet provides one example. Another example comes from India where Bharti Airtel has a noteworthy agreement with the Indian Farmers Fertiliser Cooperative Limited (IFFCO).⁹⁰ Bharti Airtel is a network operator in India with over 64 million subscribers. IFFCO is a co-operative just under 40 000 societies aimed at providing fertilisers and agricultural services to India's farming communities. The agreement, announced in May 2008, makes available to IFFCO members low priced handsets bundled with Airtel mobile connection and discounts on calls to other IFFCO members.⁹¹ The farmers also get access to five free voice messages on market prices, farming techniques, weather forecasts, animal husbandry, rural health initiatives, fertiliser availability, and so forth, on a daily basis. In addition, the farmer is able to call a dedicated helpline, staffed by people with expertise in various fields, to get answers to their specific queries. The stated aim is to promote community building in the rural areas. There are, of course, other advantages for both parties. Bharti Airtel gets to set up towers at sites provided by IFFCO societies and has an advantage over competitors in marketing services to rural consumers. At the same time, IFFCO is able to strike a better deal for its members than may be otherwise available together with information and services targeted toward their needs that include, but also go beyond, telephony.

Today, the calculation of benefits for owning a telephone, which was always complex for telephony, takes on an air of impossibility. Some proportion of the private benefit and external benefit from having a telephone will, self evidently, be telephony. But, how users interact with other people or machines through communication networks is increasingly multi-faceted. This includes using mobile phones to interact with communication networks in ways not originally intended by the suppliers of services. This changing perception of value, in owning or using a mobile phone, will be reflected in many things that relate to network expansion from word of mouth recommendations by consumers to the strategies of operators. In short network externalities are no longer a simple function of being able to call or be called but the result of the range of applications which can be used.

Why is this significant? Simply put, in a competitive market operators have an incentive to add value which internalises externalities whether that be in device functionality or in services. For their part consumers add value to services ranging from contributing user-generated content through to social networking. That content may range from the Los Angeles Fire Department's use of Twitter, to provide information on emergencies, through to a Bangladeshi farmer using 'CellBazaar' to find the price of commodities.⁹² The user that once went unaware and unrewarded for the external benefit, they generated for others, in joining a network may today be compensated financially (*e.g.* a lower price through acceptance of advertising or resale of their airtime) or in kind (*e.g.* information or content provided by other users which provides a financial or social benefit).

Box 3. International Roaming and the Network Effect

The development of cellular mobile networks enabled telecommunication users to roam across borders for the first time. International roaming is the term applied to a service that enables a user to continue to be connected to a wireless network even when they are in a foreign country. The first generation of cellular systems were, however, limited in the international connectivity they could provide in that users could only roam across networks which had a common equipment supplier.⁹³ In recognition of customer demand network operators and equipment vendors created standards and developed technologies and service agreements to enable users to roam across networks. In other words they enhanced the network effect through innovation.

Unlike SMS, roaming was not an unplanned side-effect (i.e. an externality) which needed to be internalised. Operators intentionally developed the service, to enhance the network effect, by enabling existing users to remain connected to a network even when they were outside the territory covered by the network on which they were registered. The incentive for network owners, to do this, was that a premium could be charged for the additional value created for the roamer when they made and received calls. A question which can be considered is whether externalities come into play. In the case of call externalities, as both the calling party and receiving party generally pay part of the cost of the call, the pricing of roaming internalises the externality. The classic theory of network externalities, on the other hand, is about compensating marginal users to join a network, in recognition of the value they bring, rather than charging existing users an additional sum, for themselves to remain part of a network.

Certainly, by paying relatively high prices roamers contribute to general revenue and, therefore, play a part in providing an incentive for network operators to price joining a network, for marginal users, in ways that maximise the roamer's calling opportunities. The incentives to do this, however, already exist without considering roaming. On the other hand, if operators priced roaming in a way that encouraged marginal users to join networks a case might be made that this contributes to internalising the network externality. Historically, it would be hard to make that case. Critics of roaming prices have argued that they are far above costs and priced in ways that maximise producer surplus rather than consumer surplus.⁹⁴ In other words, they claim, operators are able to charge users much higher prices than would be the case if there was greater competition in that market segment.

With the foregoing in mind it is worth considering recent developments in Africa. Since 2006 a number of network operators do not charge users additional fees for roaming to and from a growing number of sub-Saharan African countries. This innovation, pioneered in developing countries enables "on-net" users to be treated as local customers in whichever country they are visiting. The largest such plan is offered by Zain, a Kuwait based company, operating across 22 countries in the Middle East and Africa.⁹⁵ By September 2008, Zain's "One Network" service enabled users to roam across 16 of these countries without incurring additional charges for on-net calls.⁹⁶ This meant that a Nigerian user visiting, for example, Gabon or Jordan could receive a call without being charged for the incoming call. The rate for making a local call was the same as that charged to Zain's customers in that country. The One Network service is automatically activated upon a user crossing the geographic border with no prior registration required or sign-up fee. The service was equally available to pre-paid and post paid customers. A number of Zain's competitors offer borderless roaming though in fewer African countries.⁹⁷

Borderless pricing for roaming is interesting in several respects that bear on externalities. First, is that this innovation has emerged first in developing economies rather than developed economies. Marginal users in developing countries, at least on the surface, appear to be getting much more attractive roaming deals than those in developed economies. Consider, for example, that a low income user making a pilgrimage from Nigeria to Saudi Arabia might elect to switch off their mobile phone rather than pay high roaming charges for incoming calls. By way of contrast, with borderless roaming service, they would not be charged for the incoming call providing them with an incentive to remain part of the network at all times. Such schemes further complicate the proposed network externality premium. As proposed, a user in a developed country might be paying a premium to call a user in a developing country, such as Sudan, even though the latter could be living in Saudi Arabia.

Table 2: AdMob Mobile Advertising

Country	Sep-2008		Sep-2007		Request Increase September 2007-September 2008
	Requests	% of Requests	Requests	% of Requests	
United States	1,992,732,034	39.3	734,272,875	46.1	2.7x
Indonesia	1,135,977,186	22.4	84,390,452	5.3	13.5x
India	391,278,541	7.7	166,297,747	10.4	2.4x
United Kingdom	197,404,623	3.9	89,726,007	5.6	2.2x
Philippines	144,663,278	2.9	11,110,124	0.7	13.0x
South Africa	107,451,198	2.1	116,342,069	7.3	0.9x
Nigeria	89,848,935	1.8	2,884,122	0.2	31.2x
Romania	62,286,761	1.2	30,044,024	1.9	2.1x
China	54,403,922	1.1	7,471,365	1.1	7.3x
Malaysia	47,201,472	0.9	5,859,766	0.4	8.1x
Brunei	39,272,572	0.8	15,657,179	1.0	2.5x
Saudi Arabia	35,622,323	0.7	3,723,609	0.2	9.6x
Israel	33,906,466	0.7	21,748,162	1.4	1.6x
Australia	32,267,923	0.6	11,390,551	0.7	2.8x
Canada	30,846,195	0.6	26,110,308	1.6	1.2x
Kenya	30,547,361	0.6	10,343,288	0.6	3.0x
Italy	29,488,307	0.6	7,605,276	0.5	3.9x
Pakistan	28,849,805	0.6	8,127,478	0.5	3.5x
Bangladesh	26,267,624	0.5	24,051,999	1.5	1.1x
France	22,797,962	0.5	13,454,907	0.8	1.7x
Other Countries	538,586,636	10.6	203,041,854	12.7	2.7x
Total	5,071,701,124	100	1,593,653,162	100	3.2x

Source: AdMob

Money flows from international traffic exchange

Most of the academic literature dealing with network externalities only considers domestic situations. Using this as the basis for a network externality premium at the international level, however, raises many issues that have not received adequate attention. First and foremost among these considerations are the existing arrangements for the exchange of international communication traffic.

As proposals for a network externality premium have been limited to two systems the discussion here will focus on these arrangements. One is the traditional accounting rate system and the second are termination payments. In brief the two mechanisms work as follows:

- Accounting Rates: A bilateral system for determining the payments to be made by operators for traffic being carried between their respective networks.⁹⁸ Under the system operators (Networks A and B) agreed on an accounting rate which was typically divided 50/50 to determine the settlement rate. If traffic was equally balanced no payment was made. If traffic was greater in one direction, than the other, a settlement payment was made by the operator sending the greater volume of traffic.
- Termination Rates: Traffic from a customer of one network (Network A) to a customer of another (Network B) is carried to a point of interconnection. Network A pays Network B to

terminate the traffic by completing the communication over Network B's access network. Under this system Network A may also pay Network C to carry traffic to Network B. Commercial termination agreements may have several variations including an agreement to swap a certain volume of traffic. Service providers can also buy and sell minutes of termination anonymously or openly at wholesale minute exchanges.

Commercial arrangements for completing traffic, such as an international telephone call, on a fixed or wireless access network, increasingly use termination rates. The main factor behind the change, from accounting rates to termination rates, has been the liberalisation of communication markets. The accounting rate system was originally designed for an environment in which there was a monopoly operator in each country. As monopolies precluded any operator carrying traffic across international borders a financial mechanism was needed to facilitate end to end connectivity, hence the development of the accounting rate system.

Once liberalisation occurred, carriers could not only carry traffic on an end to end basis, for their own customers in different countries, they could also carry traffic for other operators. In this environment the termination of international traffic, for the most part, came to be treated similarly to domestic traffic. In other words, the payment for completing a telephone call may be the same whether that call had a domestic or international origination. In effect the financial arrangements for how traffic is terminated were separated from its carriage across borders. Today, the carriage of international traffic may be done in a myriad of ways (*e.g.* private leased lines, self network provision on an end-to-end basis, through the networks of commercial partners, by using Internet transit and peering arrangements and so forth). It is only when an operator needs to terminate that traffic, on someone else's network, that a termination rate may be applicable.

The rise of the Internet has also had an impact on the proportion of international traffic exchanged under the accounting rate system. First, the dramatic increase in the carriage of data of all types, through packet switched networks, has meant that the share of telephony traffic has declined in proportion to total traffic. Second, the convergence of services toward Internet Protocol (IP) networks has meant that telephony on IP networks is treated no differently from other data traffic. The packets for a voice over IP (VoIP) call from one Internet user to another will be carried in exactly the same way as any other Internet traffic. As such, the commercial arrangements facilitating the carriage of this traffic (*i.e.* peering and transit) will be the same as for any other Internet traffic.⁹⁹ In addition, when such traffic does terminate in other networks, such as the public switched telecommunication network (PSTN), it is the local termination rate which is applicable not an accounting rate.

Proponents of a network externality premium favour it being an additional element on top of existing accounting rates or termination rates. As there is no agreement on: a methodology to measure network externalities; if the phenomenon is measurable; and if any such system could be made to work in practice in a commercial market place; no assessment has yet been made of its likely magnitude. If it was ever to be implemented, some have suggested an externality premium may increase termination rates by as much as 50%. In the absence of an agreed methodology, this figure may be viewed as an effort to win support, from those network operators perceiving themselves as likely beneficiaries, rather than having a well considered foundation. It is worth, however, considering in general terms how an externality premium would interact with existing termination systems and how these systems work in practice.

Accounting rates

Although accounting rate system is used by operators in fewer countries to settle traffic than was historically the case, there are valuable lessons to be drawn from experience with that system.

The accounting rate system did provide a flow of revenue from developed to developing countries and some of this money may have been reinvested in network expansion. It is also understandable that some incumbents regret the passing of a system which generated monopoly rents. An examination of the evidence, however, provides a different perspective on the efficiency of the system. First, there is little or no evidence that international settlement revenue was reinvested in network expansion or underpinned universal service.¹⁰⁰ The reasons for this are numerous but can mostly be attributed to the low level of incentives incumbents had for reinvestment or, in some cases, their freedom to do so. Even if it was hypothetically assumed that 100% of settlement revenue was reinvested, the system still performed very poorly in terms of network expansion.

The accounting rate period, stretching roughly from 1930s to the late 1990s, was typified by very poor tele-densities and low growth rates.¹⁰¹ Perhaps, the easiest way to understand this point is to look at the rapid expansion of access, which has accompanied liberalisation and the breakdown of the accounting rate system. In 1994 the continent of Africa had a tele-density of less than two telephone subscriptions per 100 inhabitants. By the close of 2007 this had grown to more than 30 telephone subscriptions per 100 inhabitants. In other words, the period when the accounting rate system either broke down or rates were significantly reduced, has produced the largest increase in network expansion.

The second way that reality does not accord with the mythology is the claim that the breakdown of the accounting rate system has constrained investment. In fact the reverse is the case. Liberalisation has accompanied a vast increase in foreign direct investment in developing countries targeted at access expansion. Moreover the sums involved are much greater than the previous revenue streams from international settlements.¹⁰² By growing their base of subscribers operators have become more attractive to investors and this has, in turn, increased the amount of funds available for network expansion. It can be readily acknowledged that technological change, particularly the development of less expensive wireless infrastructure, has contributed to the ability of operators to expand access. That being said advances in this area being transferred to the market place are directly attributable to competition. Using wireless to expand service was always possible, but in practice little used, in the monopoly era.

The third way reality does not accord with the mythology, of the accounting rate era, is that many operators generate greater termination revenues now than they did in the past. Net outpayments from operators, based in the United States, to African counterparts, for example, are frequently greater today than they were under the accounting rate system. In any given year the net outpayments to any operator may, of course, fluctuate. In total, however, operators in African countries received payments of around USD 100 million greater in 2006, than they did in 1996, and more than USD 200 million greater than 1994. In fact, the total net outpayments from the United States to Africa were the highest ever recorded in 2006, the latest year for which data are available (Figure 2).

One reason for this increase, in aggregate revenue at the national level, is that although interconnection between networks has become more cost-oriented, the volume of international traffic has increased enormously over recent years. Between 2000 and 2006 outgoing traffic from the United States to Africa increased by 344% (Figure 3). Traffic in the opposite direction increased 80%. The primary reason for this increase is that accounting rates kept the prices for international telephony artificially high to the point of being prohibitive for many users to make calls. It is also the case that network expansion, as a result of liberalisation, has created many more calling opportunities. As such the increase in traffic volume is the result of lower prices for international calls and network expansion.

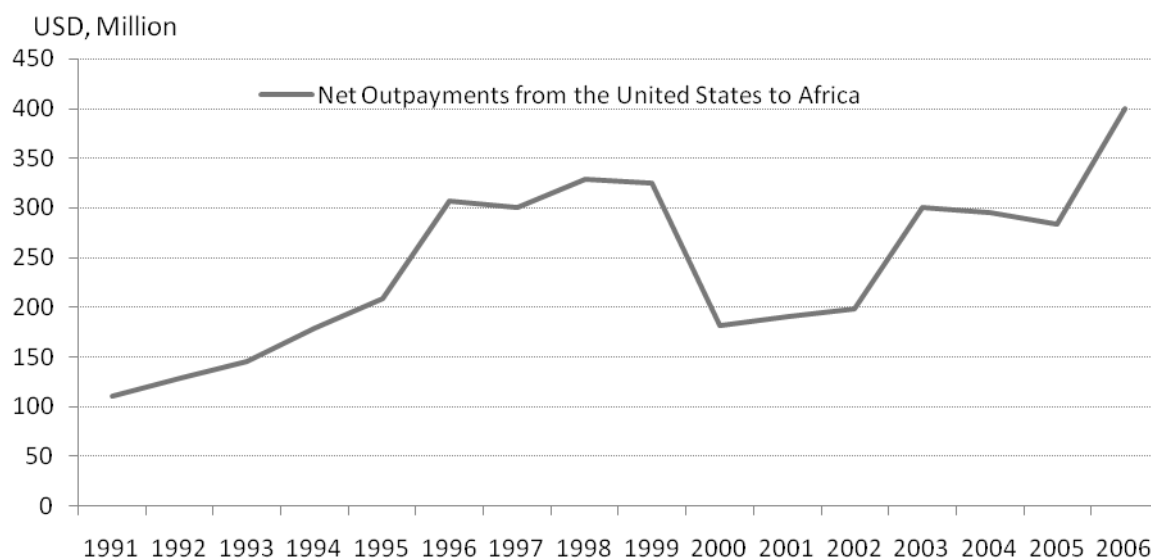
Given relative income levels it is not surprising that traffic is greater from developed to developing countries. The increases between the United States and Africa, however, have been far greater than predicted by most studies of the potential effect of the introduction of the FCC's benchmark settlement rates or liberalisation. These studies assigned a lower elasticity of demand to users in the United States, for

their calls to Africa, than proved to be the case.¹⁰³ As a result the total revenue from United States net outpayments has increased across Africa. The imposition of a network externality premium would push prices in the opposite direction potentially dampening this newly generated demand.

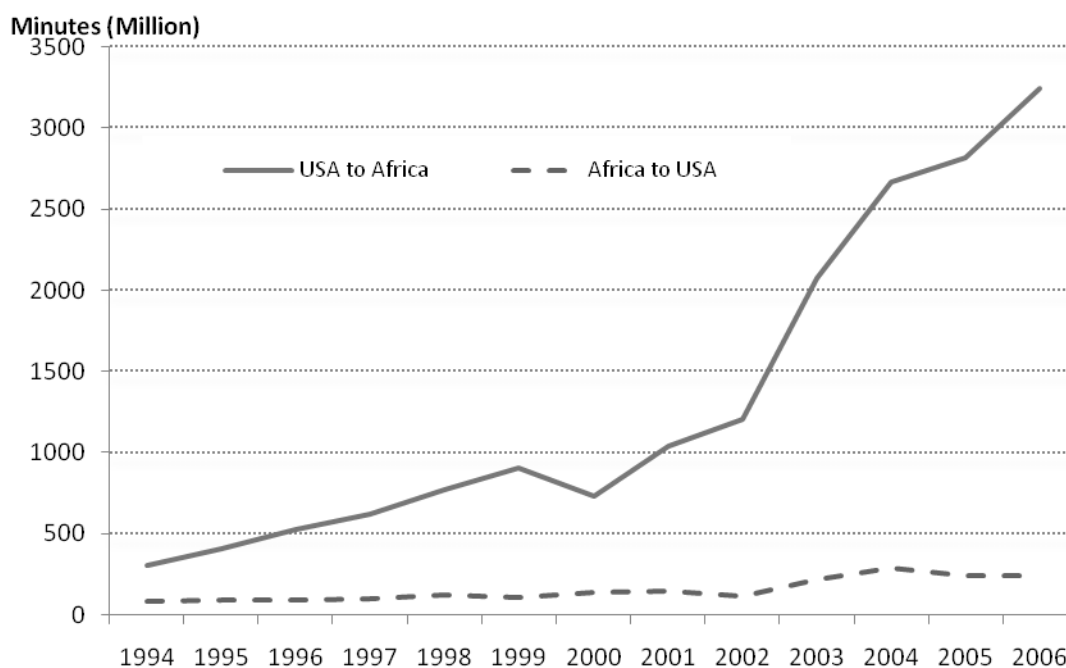
It is necessary to remember that while changes to how international traffic is exchanged have benefited many operators in Africa, maximising revenue from outpayments was not the objective. Reform to policy and regulatory settings had the objective of increasing the efficiency of communication markets with a view to increasing overall economic and social development. The increasing size of the international market is, of course, welcome but it is against the overall welfare enhancement that policies should be measured.

Policies which seek to increase revenue for a specific category of firms, from other firms, for a specific market segment, will almost invariably generate opportunities for rent seeking behaviour. A network externality premium would be a prime candidate. The lesson to be drawn from the accounting rate system is that it did not provide the correct incentives to increase welfare. The objective for many monopolists, in the absence of some offsetting incentive, such as rate or return regulation, was to maximise settlement revenue rather than expand network access. In a liberalised environment the incentive is to enlarge your customer base, in part, because this creates greater opportunities for termination revenue but also because it generates far greater revenue from domestic service. Any operator not acting to expand their network would cede these revenue opportunities to their competitors. The next section examines how termination rates may themselves affect the level of payments between operators.

Figure 2. Net outpayments from the United States to Africa



Source: OECD based on FCC International Traffic Data Reports.

Figure 3. Telephone traffic between the United States and Africa

Source: OECD based on FCC International Traffic Data Reports.

Termination rates

At the close of 2007 there were around 4.5 billion fixed and wireless telephone subscriptions in the world.¹⁰⁴ Just over 70% of these subscriptions used cellular wireless networks with the remainder being fixed lines. In most countries the rates to terminate on fixed and wireless networks significantly diverge. Terminating traffic on wireless networks is generally, but not always, much more expensive than on fixed networks. Wireless operators say the higher rates are justified by higher costs and that they operate in a competitive market. Critics point out that each mobile operator has a monopoly over termination of traffic, to their own customers, and leverage that factor into higher termination charges.

In some countries, however, the termination rates are little different between fixed and mobile networks. This occurs, for example, in countries that have mobile party pays (sometimes called receiving party pays). In countries with mobile party pays system (MPP) both the calling and called parties bear part of the cost of a call. By way of contrast in countries with calling party pays (CPP), the originator of the call pays the entire cost.

By 2007 around 75% of all mobile subscriptions in the world were in countries with CPP and 25% in countries with MPP (Canada, China, Hong Kong China, Singapore, Sri Lanka and the United States). This balance is expected to shift further toward CPP, as in 2007, China's mobile operators began to shift from MPP to CPP. On the other hand, there has been discussion regarding the potential to introduce MPP in Europe, though the enthusiasm for such a change is far from universal.¹⁰⁵

The merits of CPP and MPP have been considered elsewhere.¹⁰⁶ In this document the focus is on externalities and how a network externality premium may interact with existing termination arrangements. Before considering the latter interaction a new type of externality can be introduced as it does bear on MPP and CPP. Some economists hold that there are not only network externalities but also call externalities.¹⁰⁷

When one user calls another they generate an externality for the called party and, this call, may generate further calls.¹⁰⁸ In CPP markets the called parties have not contributed directly to the cost of the call. For Crandall and Waverman, "...this externality provides no reason to subsidise access by taxing calling. In fact, it suggests that the recipient should be billed for part of the cost of the call, not that her monthly line rental should be subsidised".¹⁰⁹ While Crandall and Waverman had fixed networks in mind this is, in fact, how MPP works in practice for wireless networks. In other words, users in countries with MPP are already contributing an externality payment for domestic and international calls.

The affect of MPP and CPP on the price of an international call can be illustrated relatively easily in the prices for using Skype to call fixed or mobile users (Table 3). The price to call a number in Canada or the United States, using Skype, is the same irrespective of whether the call is to a fixed or mobile user (USD 0.021 per minute) or where the caller is located in the world. If the call is to a mobile user with an MPP subscription, the Canadian or United States user, will generally pay for that incoming call at the same rate they pay for an outgoing call. By way of example, a United States wireless user paying USD 100 per annum for 1000 minutes of airtime would nominally pay USD 0.10 per minute to receive that call. The total cost of a Skype call to both parties is, therefore, USD 0.121 per minute of which the United States user pays USD 0.10 and the foreign user pays USD 0.021.

If a Canadian or United States user makes a Skype call to a fixed or mobile user in Sweden they will pay significantly different rates (USD 0.021 for a fixed line and USD 0.29 for a mobile service). Similarly, a call to a South African would cost USD 0.068 to a fixed line and USD 0.233 to a mobile user. In both these cases the recipients of the calls, in South Africa or Sweden, do not contribute directly to the cost of receiving the call. The cost of termination is met by the Canadian or United States user.

Table 3. SkypeOut Rates for Selected Countries (USD, Per Minute)

	To call a fixed line	To call a Mobile
Australia	0.021	0.203
Austria	0.021	0.270
Canada	0.021	0.021
France	0.021	0.203
Finland	0.031	0.203
Germany	0.021	0.246
Hong Kong, China	0.021	0.021
Japan	0.023	0.154
Korea	0.021	0.073
Singapore	0.021	0.021
South Africa	0.068	0.268
Sweden	0.021	0.292
Switzerland	0.021	0.367
United States	0.021	0.021

Shaded countries use MPP

Source: Skype (September 2008)

Taking into consideration differences between MPP and CPP markets the likely effect of a network externality premium can be considered. Fortunately data are available, for the United States, which enable analysis of the impact MPP is having on payments from operators in that country to the rest of the world. While it is not possible to break these data out by payments for fixed and mobile termination it would be

expected that users in the United States pay more to terminate calls in countries with CPP than users in those countries pay in the reverse direction. In practice this proves to be the case.

The United States user, on average, pays twice the amount per minute to terminate a call than Africans pay in the reverse direction (Table 4). The difference between termination payments per minute to the Caribbean or the Middle East is around five times greater. This is not because the operators in the United States do not charge a termination fee, to operators in other countries, but rather because that the fee is very low as a result of the contribution to the cost of terminating the call by the United States consumer. The same situation probably applies for Canadians, Singaporeans and other countries with MPP.

To capitalise on this effect, operators in CPP countries simply need to take advantage of the dynamics of a commercial market place. There is no barrier in liberalised markets to them paying the same termination rates as the carriers Skype uses to terminate traffic. For example, China Telecom sells termination in Ghana at the following rates – USD 0.074 per minute to fixed lines in Accra and USD 0.133 per minute to mobiles. China Telecom's rate to the United States is a uniform USD 0.017 per minute for fixed and mobile services. Both these rates are openly available, along with those of other providers at the VPF Minutes Market.¹¹⁰

To examine the effect of MPP further it is possible to look at payments made and received by United States operators to African countries. What emerges is that African countries almost always paid more per minute, on average, to terminate traffic under the accounting rate system than the operators from the United States did in the opposite direction (Table 5).¹¹¹ As the accounting rate system increasingly broke down, and the number of mobile subscribers grew in both Africa and the United States, this situation was reversed. This indicates that at least some African operators appear are taking advantage of lower termination rates in the United States. At the same time, they are charging higher fixed and mobile termination rates to operators from the United States.

Returning to the issue of a proposed network externality premium the conclusion is clear. Users in the United States, and probably other countries with MPP, are already paying an externality premium. These users pay the bulk of the termination cost on mobile networks in their own country as well as for foreign calls. The introduction of a network externality premium on top of existing arrangements would, therefore, mean that users paid twice. A Canadian mobile user, for example, already pays the bulk of the termination fee to receive a call from an African country. For a call in the opposite direction the Canadian user pays the entire cost of termination. The effect of a network externality premium would mean the Canadian paid an additional fee on the existing termination cost in addition to the contribution they already make to the cost of receiving the call.

Table 4. Payout to Foreign Carriers and Receipts from Foreign Carriers in Selected Regions (USD, Per Minute)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
USA to Africa	0.73	0.62	0.54	0.44	0.36	0.23	0.18	0.14	0.12	0.11	0.13
Africa to USA	0.70	0.66	0.55	0.53	0.36	0.27	0.13	0.04	0.07	0.07	0.06
USA to Asia	0.65	0.56	0.43	0.35	0.28	0.21	0.16	0.11	0.09	0.08	0.06
Asia to USA	0.60	0.55	0.40	0.28	0.20	0.16	0.11	0.07	0.07	0.05	0.03
USA to Caribbean	0.51	0.47	0.43	0.34	0.25	0.15	0.12	0.11	0.10	0.08	0.11
Caribbean to USA	0.47	0.41	0.36	0.35	0.24	0.16	0.07	0.06	0.05	0.03	0.02
USA to Middle East	0.87	0.73	0.59	0.42	0.32	0.20	0.16	0.10	0.10	0.09	0.11
Middle East to USA	0.85	0.71	0.54	0.32	0.18	0.10	0.03	0.03	0.04	0.03	0.02
USA to Western Europe	0.21	0.16	0.12	0.09	0.08	0.07	0.08	0.07	0.07	0.05	0.05
Western Europe to USA	0.22	0.17	0.13	0.10	0.07	0.05	0.03	0.03	0.03	0.03	0.02
USA to World	0.43	0.35	0.29	0.22	0.18	0.14	0.11	0.09	0.07	0.06	0.06
World to USA	0.30	0.27	0.21	0.15	0.11	0.08	0.05	0.04	0.04	0.03	0.02

Source: OECD based on FCC International Traffic Data Reports.

Table 5. Payout to Foreign Carriers and Receipts from Foreign Carriers in Selected African Countries (USD, Per Minute)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
USA to Botswana	0.60	0.49	0.34	0.25	0.25	0.21	0.08	0.08	0.08	0.10	0.13
Botswana to USA	0.66	0.53	0.36	0.29	0.20	0.25	0.12	0.03	0.09	0.08	0.06
USA to Cameroon	0.88	0.82	0.71	0.47	0.29	0.30	0.19	0.15	0.16	0.12	0.14
Cameroon to USA	0.69	0.94	0.77	0.93	0.48	0.19	0.34	0.20	0.16	0.13	0.11
USA to Cote d'Ivoire	1.11	0.84	0.89	0.69	0.56	0.23	0.16	0.14	0.13	0.12	0.12
Cote d'Ivoire to USA	1.12	1.15	0.98	1.34	0.49	0.33	0.33	0.11	0.14	0.11	0.09
USA to Gabon	0.78	0.83	0.47	0.47	0.32	0.15	0.14	0.11	0.10	0.05	0.05
Gabon to USA	0.87	0.86	0.59	0.47	0.33	0.16	0.17	0.05	0.09	0.06	0.04
USA to Ghana	0.49	0.39	0.42	0.29	0.31	0.18	0.10	0.07	0.09	0.07	0.11
Ghana to USA	0.51	0.50	0.49	0.57	0.34	0.40	0.10	0.06	0.05	0.05	0.07
USA to Kenya	0.68	0.64	0.57	0.50	0.39	0.28	0.21	0.20	0.20	0.16	0.15
Kenya to USA	0.70	0.67	0.60	0.56	0.61	0.37	0.29	0.15	0.15	0.10	0.06
USA to Nigeria	0.73	0.74	0.71	0.58	0.37	0.26	0.23	0.15	0.10	0.10	0.10
Nigeria to USA	0.78	0.75	0.67	0.61	0.43	0.30	0.25	0.20	0.11	0.07	0.05
USA to Senegal	1.26	0.83	0.73	0.51	0.29	0.28	0.18	0.14	0.14	0.13	0.15
Senegal to USA	1.30	0.96	0.77	1.07	0.40	0.27	0.11	0.03	0.08	0.07	0.04
USA to South Africa	0.54	0.49	0.40	0.32	0.29	0.16	0.13	0.10	0.07	0.07	0.08
South Africa to USA	0.56	0.53	0.42	0.34	0.31	0.19	0.06	0.01	0.02	0.03	0.03
USA to Uganda	0.59	0.51	0.29	0.20	0.20	0.16	0.10	0.10	0.07	0.07	0.08
Uganda to USA	0.64	0.50	0.36	0.40	0.24	0.18	0.12	0.01	0.07	0.07	0.07

Source: OECD based on FCC International Traffic Data Reports.

Practical considerations on network externality premiums

Proposals for network externality premiums are the subject of study and discussion by delegations at the ITU. The text and various elements of these proposals will continue to evolve with many issues unresolved or yet to be considered. It is not difficult, however, to envisage many practical and procedural challenges to the implementation of a network externality premium. The most fundamental obstacle is that the environment for the provision of international telecommunications has changed considerably from the era in which governments and operators could collectively agree and insist on such arrangements.

Proposals for network externality premiums are premised on a 'supply side' framework that does not take into account the reality of today's market for international communication services as well as being anti-competitive in nature. Following increasing liberalisation, around the world, the provision of communication services is 'demand driven' and takes place in a commercial market. This has led to several considerations which make the introduction of non-cost based elements across international markets impractical. Foremost among these considerations should be the views of users (business and consumers) who would ultimately have to meet the cost of network externality premiums. The necessary acquiescence by users is either presumed or seemingly not considered to be significant.

In all the contributions, reviewed for this paper, the proposed negotiations on network externality premiums are only taking place between suppliers (network operators). There is an apparent presumption that if bilateral suppliers agree on a non-cost based element being added to termination charges, in one or more directions, this can be readily implemented. There is no discussion of the view users may take toward such a scheme which would, of course, impact on the prices they pay. In a liberalised market network operators need to win acceptance by customers for their service offerings and the prices of those services. This raises many practical questions for such a scheme to be implemented. These could include whether users would be given the right to opt-in or opt-out of paying a network externality premium or whether the externality premium would be made transparent on their bills with an explanation of its purpose.

A further consideration is whether such a system could be made to work, even presuming a set of voluntary agreements between bilateral operators. Today, the termination of traffic is a global market, and in some respects, is much like any other commodity. It is possible to buy and sell termination, for most countries of the world, at one of the various online markets or terminate traffic by negotiating transit with an operator with global reach. In this way many operators and service providers are not in the position to directly negotiate an externality premium. If an operator agreed to a network externality premium, generating a higher price for users, without the acquiescence of users, they would be at a disadvantage in respect to competitors who would rapidly gain market share from disaffected customers. The same would apply to a transit carrier that would place itself in a disadvantage in selling service to other operators. Thus, while such schemes purport to be voluntary they could only be made to work in the cases where monopoly power existed or where pressure was brought to bear on all corresponding operators. In fact, the danger exists that some countries may decide to reconstitute a central actor to deal with this process. This would then run the risk that funds may not reach market participants or not in an equitable manner. It may also advantage one operator over others thereby distorting competition.

During the breakdown in the accounting rate system, experience showed that operators and consumers would look for least cost routing for international traffic. This led to all manner of practices which are far less evident today because of the move toward commercially negotiated cost oriented termination (e.g. refile, tromboning, call-back and so forth). In the event charges for termination rates varied, due to externality premiums only being applied on traffic from developed to developing countries, there would be an incentive to route traffic through third parties. In fact, there would be little means even for operators to assess compliance by other operators. This would be the case not only on corresponding traffic but also for

the application of funds. The experience many countries had with rate of return regulation bears testament to it being a costly and complex process open to rent seeking behaviour. Transposing this to an international level would merely add to these challenges.

Consideration should also be given to the implications for taxation. A consumer making an international call is generally taxed in the country of origin with the value added tax paid being based on the price of the call. This means public revenue authorities in the country of origin, unless a special exemption was made, would be taxing the network externality premium. A Danish user, for example, would pay a 25% value added tax (VAT) on the network externality premium which would go to general revenue of the Danish Government and not toward network expansion in a developing country.

In sub-Saharan Africa some 25 governments levy a luxury tax on mobile phone handsets.¹¹² Five of these governments also charge luxury tax on airtime. This means they charge an additional fee over and above VAT on calls. The effective tax rate in Uganda is 30% (18% VAT, 12% Excise Duty) and in Rwanda 28% (VAT 18%, 10% Excise Duty). If the premium was applied to reducing service or equipment charges, could a country see a reduction in government revenue (i.e. the retail price would be lower engendering a lower tax return)? In practice, this may be unlikely as it would be expected that market growth would offset for the effects of lower prices. In any case the operator in the country receiving the premium would have to pay tax if, as is likely, the network externality premium was treated as general revenue. The net result is that the network externality premium is taxed multiple times across developed and developing countries.

The foregoing discussion has highlighted several areas that need further discussion and such a list is far from exhaustive. To avoid having to consider all issues it is possible to group the remaining discussion under three main headings that relate to key principles underlying reform to the accounting rate system. These are the principles of cost-orientation, non-discrimination and transparency.

Cost-orientation

Proposals for network externality premiums would essentially introduce a non-cost based element into the calculation of end user prices. This runs counter to a principle – cost orientation - that has guided reform in the exchange of international communication traffic over more than a decade. Moreover, proposals for network externality premiums start with the premise that other elements, used to calculate prices, are cost oriented. This may not be the case and settlement or termination rates that are not cost-oriented, in effect, already include an externality premium. While beyond the scope of this paper, for example, there is an ongoing debate as to whether charges for termination on mobile networks are cost oriented. Critics of the level of termination rates on mobile networks, in countries with calling party pays, argue that this segment of the market has insufficient competitive pressure on prices. As a result they say termination prices are well above costs. Adding a non-cost based element, based on formula that took into account the existing termination rate, could provide an incentive for operators not to move these rates toward cost particularly in markets where there is insufficient competition.

Proposals for network externality premiums also fail to recognise the difficulties inherent in calculating costs. It might be thought that this was of little importance if a premium is a non-cost based element added to a termination fee. Yet, even with voluntary contributions to network expansion or use, corresponding operators would undoubtedly like to ensure that funding, is applied for the purpose it is intended and, reasonably reflects the cost of provision. This would give rise to problems that traditionally were in the domain of regulators. Recipient operators, for example, may have incentives to gold plate networks or unreasonably pad costs. Funds that might otherwise have been spent on expansion might instead be diverted to an operator's bottom line or used for a different purpose. How would such oversight

be exercised such that ensured the public interest both in the country of origin and the country of termination? Who would meet the costs of such oversight?

The issues surrounding consumers may be even more complex. Here it needs to be remembered that some proponents of network externality premiums hold out the possibility of subsidising service and equipment. How might this interact with the realities in today's market place and be cost oriented for corresponding operators and their users? What would eventuate, for example, if pre-paid cards were subsidised. On the surface this is perhaps the most logical way to reach low income users in terms of network externalities. On the other hand many users have more than one SIM card in developing countries. They do so because they calculate their private benefit, in joining more than one network, is greater than with a single card based on domestic externalities (*e.g.* cheaper on-net calls). By definition the externality premium is an effort to get others to compensate those joining a network (*i.e.* the benefit they receive by being able to call the new user which they do not take into account) but they might quickly be in the situation of subsidising users to join multiple networks. In other words the incentives for the recipients would not be aligned with the costs and benefits of the originator.

If service (*i.e.* call charges) was subsidised there could be many anticipated and unanticipated side effects. The most obvious effect, which can be anticipated, is that there will be no relation between the price paid by a user and the subsidy. In competitive markets operators price services according to what the market will bear not their underlying costs. The only sure way to reduce prices toward costs is through competition. In the absence of a perfectly competitive market the fruits of a network externality premium are more likely to be added to an operator's bottom line than applied to price reductions. Unanticipated effects may relate to users. Consider, for example, that in many countries credits for airtime is quickly becoming an alternative currency. Airtime credits can be used to make telephone calls or, in a growing number of countries, pay for other goods and services ranging from groceries to books and insurance. Not only is there no logical relationship between subsidising calls and network externalities (as opposed to call externalities or social externalities), there will increasingly be no fixed relationship between the use of airtime credit and its application.

One of the primary reasons why so few countries have attempted to use network externalities as a policy or a regulatory tool is that it is virtually impossible to implement. For example, Recommendation D156, approved at the 2008 World Telecommunications Standardization Assembly (WTSA 08), does not explain who will collect and distribute the network externality premium, the operator providing international service, or the local operator providing the last mile connection, or the national regulator? Who is responsible for investing the collected premium so that it is spent only towards expanding the network? The difficulties in implementing a network externalities program are summed up in a recent Kenyan interconnection decision which notes that the use of a network externalities surcharge was rejected as a factor in interconnection charges because "... of the lack of an accepted method for evaluating it [network externalities] with any certainty, and mainly because of the lack of a practical mechanism to ensure that any such surcharge would be used to support the acquisition and retention of marginal subscribers."¹¹³

In addition, the Recommendation is vague about the possible receipt of subsidies by individuals other than the marginal subscribers. Any receipt of subsidies by subscribers other than marginal subscribers in developing countries concomitant with higher charges for outgoing calls from developed countries will result in a significant loss of consumer welfare. This sentiment is reflected in the Tanzanian regulator's observation that states that "[T]he efficiency gains theoretically obtained by including a mark-up for network externalities created by subsidizing the marginal customers do not justify the large disadvantages associated with the approach in the form of the large cross-subsidies and demand distortions associated with subsidizing all customers."¹¹⁴

It is critical to bear in mind that very few empirical studies have attempted to estimate network externalities. Results from the few studies that have been conducted, including the results of a recent study on price structure and network externalities in Sub-Saharan Africa, show little evidence of the presence of significant network externalities, and, therefore, little reason to impose network externality premium to subsidise marginal subscribers. The experience from the United Kingdom, where the same conclusions were drawn, has been addressed earlier in this paper.

Non-discrimination

Proponents of network externality premiums generally advocate they should only apply to traffic passing from operators in developed countries to operators in developing countries. It should not apply, in their view, to traffic in the reverse direction or between other combinations of operators (*e.g.* to and from operators in developed countries or to and from operators in developing countries). Others believe that if any such proposal was ever to be introduced it should apply equally to all operators and all routes. Both positions have deficiencies.

The proposal for a network externality premium would cut across the principle of non-discrimination for the exchange of international traffic, established by ITU-Recommendation D.140 and more broadly is counter to a number of WTO rules which are binding on the 153 Members (practically all of whom are also members of the ITU), and subject to WTO dispute settlement procedures. The WTO's General Agreement on Trade in Services (GATS) states: "With respect to any measure covered by this Agreement, each Member shall accord immediately and unconditionally to services and service suppliers of any other Member treatment no less favourable than that it accords to like services and service suppliers of any other country (Article II: Most-Favoured-Nation Treatment)."¹¹⁵

Assuming that the ITU proposal was implemented in a manner falling within the scope of what the WTO defines as a governmental measure, and the Member had not scheduled a reservation to this most-favoured nation (MFN) rule with respect to international telecommunications services (only a handful of Members have done so), this provision would likely prohibit the Member from imposing or requiring differential charges on the services or service suppliers of other WTO members simply on the basis of being identified as belonging to the class of a developed or developing economy. Even if not implemented via a governmental measure, (*i.e.* as a commercial policy), a network externality premium imposed by an operator in a WTO Member state that has undertaken specific commitments with respect to basic telecommunications services (70-plus WTO Members have undertaken such commitments) would also likely be contrary to the GATS Annex on Telecommunications which states: "Each Member shall ensure that any service supplier of any other Member is accorded access to and use of public telecommunications transport networks and services on reasonable and non-discriminatory terms and conditions, for the supply of a service included in its Schedule."¹¹⁶ Finally, a network externality premium imposed by a major supplier in any of the 60-plus WTO Members that have undertaken specific commitments with respect to regulatory principles (The so called "Reference Paper") would likely be inconsistent with those commitments, which oblige Members to ensure that its major suppliers offer interconnection to any other basis telecommunications service supplier (including suppliers from other Members) on a non-discriminatory basis.

In sum, the proposal for a network externality premium to be imposed on incoming international traffic from the operators of developed country networks to the operators of developing country networks runs counter to WTO rules, and the WTO members implementing such a proposal would be subject to challenge for breach of those rules under WTO dispute settlement procedures.

The applicability of network externality premiums to all routes and operators can also be questioned. The existence of a network externality is presumed when less than all possible subscribers, with potential

for benefit to themselves and others, are members. In practice this would be less than the total population, as for some individuals, there may be little utility in being part of a network for themselves or others (*e.g.* the very young or elderly). It can be noted, however, that many countries have a greater number of mobile subscriptions than their official population. In the classic sense, by the very nature of the definition, network externalities do not exist with a telephone subscription penetration above 100%.

Operators in developing countries, where mobile penetration may soon exceed 100%, may point to fixed line penetrations as being sub optimal or that, logically, not everyone has service. Proponents of network externality premiums may then be placed in the position of having to discriminate between different types of technologies (*e.g.* fixed or wireless networks). This may lead to an inefficient use of resources by financing higher cost networks or technologies.

Operators in developed countries might also argue that not all low income people in areas they serve have a telephone service. This raises the question of whether there should be discrimination in favour of low income users in one country over another. From an economic perspective, if a policy is premised on network externalities, the externality effect would likely be greatest for users in the same country. This would argue, in the case of a limited resource, that any discrimination toward low income users by operators in developed countries, based on network externalities, should favour such users in the same country.

It is also the case that some countries with lower average incomes than others, nevertheless have higher mobile penetration rates. At the close of 2007, the ITU reports Gabon and South Africa had respective mobile subscription penetration rates of 87 and 88 per 100 inhabitants.¹¹⁷ This was a higher rate than recorded by Canada, Japan, Mexico and the United States and on a par with France. The OECD countries mentioned have significantly higher GDP per capita than the two African countries. Few would suggest, however, that people in Gabon should pay a network externality premium to users in an OECD country.

Discussion of the non-discrimination principle also raises the issue of identification of beneficiaries which is inherent to any externality. Proposals for externality premiums tend to be structured in terms of countries, or networks being operated in particular countries, but today's communications markets are borderless. Liberalisation has encouraged operators to build end-to-end networks and, in the case of incumbents, to invest beyond their traditional market. If a network externality premium was applied to traffic from developed to developing countries it could well be the case that operators with headquarters in developed countries are the beneficiaries. It is also the case that operators headquartered in developing countries are rapidly spreading into other developing countries and, on occasion, into OECD countries. In all these cases operators have standard incentives to expand service and in the majority of cases are very well resourced to undertake that task. If non-cost based premiums are added to payments between these operators a number of risks could emerge.

Any externality premium may represent a subsidy from one operator to another possibly operating in the same market or markets. Even presuming 100% compliance, in respect to reinvestment in network expansion or usage, the potential exists for significant market distortions. Take the example of New Zealand Communications (formerly Econet Wireless) which is planning to be the third mobile network operator in New Zealand. The company is headquartered in South Africa and its principal operations are in a number of African countries.¹¹⁸ If Telecom New Zealand, hypothetically, paid a network externality premium to Econet's operator in Botswana or Zimbabwe it could free up resources for its competitor to invest in New Zealand.

At the same time, Telecom New Zealand competes with Vodafone New Zealand, a company headquartered in an OECD country but with extensive operations in many developing countries including

Africa. If Telecom New Zealand pays a premium to Vodafone, which is reinvested in developing countries, it potentially frees up resources for Vodafone to invest in New Zealand. In addition, it would make Vodafone more attractive to capital markets in which it competes with Telecom New Zealand. To make the situation even more complex Econet and Vodafone compete in some of the same African countries.

The incentives operators, with common ownership may have to use a network externality premiums, in ways that are not intended, needs to be considered. What would be the effect on competition, for example, if operators under common ownership in developed countries negotiated higher network externality premiums with sister companies than with competitors? A subsidiary may, for example, be able to engage in predatory pricing against rivals under the banner of network externalities. This may disadvantage operators in developing countries without access to the same resources, and in the longer run, disadvantage users if there was a diminution of competition.

The foregoing is more than a theoretical supposition. Some mobile operators, such as “Hutchison 3”, allege that other operators are less than enthusiastic about negotiating lower termination rates when they share ownership with a company competing in a market in which Hutchison operates.¹¹⁹ The implication is that subsidiaries of the same company do not believe it is in their interest to offer a competitor, in another market, lower termination rates. If this type of discrimination occurs in a market segment where rates, at least in theory, are oriented toward cost the problem may be magnified for a non-cost based externality premium.

Transparency

An important principle in the provision of communication services is to ensure transparency in the information made available to consumers. In the monopoly era most operators refused to publish their accounting rates. The few exceptions were in New Zealand, the United Kingdom and the United States.¹²⁰ Arguably this became less important as the accounting rate system itself broke down and termination became a commodity (*e.g.* openly exchanged with published prices in online markets). In today’s environment the introduction of a non-cost based element, into the calculation of end user prices, without providing adequate information to consumers, would clearly not meet best practices in respect to transparency.

The OECD’s policy guidance for empowering and protecting consumers in communication services, developed for the Seoul Ministerial, states¹²¹:

- *Consumers of communication services should be provided by service providers with clear and accurate information about the terms, conditions and costs associated with those services; the information should be easily accessible and sufficient to enable them to make informed decisions.*
- *The implications for consumers of “opt-in” and “opt-out” default provisions at the time of contract renewal should be further examined by stakeholders.*
- *Consumers should receive adequate notice of any intention to modify contractual conditions and about their right of withdrawal in such cases.*

Any additional fee, levied on international communications and paid by one operator to another, would need to be passed on to consumers. To meet best practice standards the additional non-cost based charge should be made explicit to the consumer together with an explanation of its purpose. For existing subscribers the imposition of a fee would also represent a change in the conditions of service. As such operators would also be obliged to advise consumers accordingly.

Some consumers may, of course, be willing to ‘opt-in’ to a transparent scheme aimed at enhancing the network effect in developing countries if they were confident the proceeds would be directed to network expansion and use. Explaining a premium based on network externalities, however, would likely prove to be challenging. It is not difficult to find examples of consumers voluntarily paying premiums, aimed at developing country producers, such as those that operate under the banner of ‘Fair Trade’.¹²² But, as noted earlier, more transparent and efficient schemes targeting network externalities, on an international basis, are already emerging in the market.

Direct externality payments, such as those made through *mamamikes* or *RechargeBrazil*, are better placed to correct imperfections than supply-side schemes. They do not need top down imposition by governments or network operators though both can play a role in promoting awareness or in facilitation of such mechanisms. They also overcome one of the weaknesses of alternatives under which intermediaries capitalise on a consumer’s lack of knowledge about elements of cost. They are also an outcome of a competitive market.

It is demonstrable that some ‘Fair Trade’ schemes, such as paying a premium on a cup of coffee, disproportionately reward intermediaries compared to producers.¹²³ By way of contrast, demand-side externality schemes, such as *RechargeBrazil*, ensure that the amounts paid directly benefit users and that pricing is transparent. A person purchasing airtime for someone abroad can be expected to be informed by the recipient if that airtime was unreasonably more expensive than they could purchase directly (with due consideration for transaction costs). They also enable negotiation between the parties with most to gain from internalising network externalities (*i.e.* users) rather than negotiation between suppliers. In addition, the user paying for the service is not paying VAT in the country in which they are resident, as would be the case with a network externality premium. In short, the market has found a fairer, more transparent and efficient way to internalise the network externality.

NOTES

- ¹ For a summary of earlier work see: “Internet Traffic Exchange: Market Developments and the Measurement of Growth”, DSTI/ICCP/TISP(2005)11/FINAL OECD, 5 April 2006. <http://www.oecd.org/dataoecd/25/54/36462170.pdf> and “Internet Traffic Exchange and the Development of End to End International Telecommunication Competition”, DSTI/ICCP/TISP(2001)5/FINAL, 13 March 2002. <http://www.oecd.org/dataoecd/47/20/2074136.pdf> and “International Telecommunication Tariffs: Charging Practices and Procedures”, ICCP 34, OECD Paris 1994.
- ² The draft recommendation cited in this paper is in TD 19 Rev.2 (WP 3/3) – E. As a work in progress the text may evolve.
- ³ For a summary of the arguments as to why the ITU could be viewed as a cartel see: Mark Zacher and Brent Sutton, “Governing Global Networks: International Regimes for Transportation and Communications”, Cambridge University Press, 1996. An opposing view was that it was not a cartel in that it did not set retail prices. See also: Jonathan David Aronson, Peter F. Cowhey, “When Countries Talk: International Trade in Telecommunications Services”, Ballinger Pub. Co., 1988.
- ⁴ OECD, “Global Opportunities for Internet Access Development”, COM/DSTI/DCD(2007)3/FINAL, 2008 [http://www.oecd.org/olis/2007doc.nsf/LinkTo/NT00005BFA/\\$FILE/JT03239667.PDF](http://www.oecd.org/olis/2007doc.nsf/LinkTo/NT00005BFA/$FILE/JT03239667.PDF).
- ⁵ The April 2008 Draft recommendation were proposed by Cameroon and Cote D’Ivoire. For a brief history of the proposal see: Vince Affleck, “Network externalities: work in ITU-T SG 3”, Ofcom, Accra, 26 May 2008.
- ⁶ <http://www.itu.int/rec/T-REC-D.156/en>
- ⁷ Argentina, Australia, Austria, Canada, Czech Republic, Finland, France, Germany, Greece, Italy, Japan, Liechtenstein, Lithuania, Mexico, Netherlands, Norway, Paraguay, Poland, Portugal, Russian Federation, Serbia, Spain, Switzerland, Thailand, Turkey, United Kingdom, Uruguay, United States.
- ⁸ Anecdotally the amount of traffic settled under the traditional system fell dramatically in the late 1990s and at that time one carrier reported to the OECD that less than 5% of its telephony traffic was settled using accounting rates. The only country where data are publicly available on the amount of traffic settled under tradition and non-traditional arrangements is the United States. For 2006, operators in that country reported 22.1 billion minutes of U.S. billed traditional settlement traffic and 50.4 billion billed non-traditional minutes of traffic. While 30% of the total, settled under traditional arrangements, could be argued to be a significant amount of the total traffic, in the FCC’s assessment “...this may understate the total amount of traffic settled under non-traditional arrangements because it appears that carriers continued to report substantial amounts of non-traditional settlement traffic as traditional settlement traffic.” The FCC highlight, for example, that operators reported 4.5 billion and 1.0 billion minutes of traditional settlement traffic, respectively, for Canada and the United Kingdom. As the FCC has permitted non-traditional settlement arrangements for U.S.-Canada and U.S.-U.K. traffic since 1992 and 1994 the agency believes it unlikely that carriers are in fact settling substantial amounts of traffic on these two United States international routes under traditional settlement arrangements. Refer to page 5 in FCC, “2006 International Telecommunications Data”, released 4th August 2008. <http://www.fcc.gov/ib/sand/mniab/traffic/files06/CREPOR06.PDF> A further factor to take into

consideration is that traffic carried over private leased lines or end to end facilities owned by the operators themselves, including Internet traffic, are not reported in these data.

⁹ UK Competition Commission, “Mobile phone wholesale voice termination charges: Determination”, 16 January 2009. para 4.160 http://www.competition-commission.org.uk/appeals/communications_act/mobile_phones_determination.pdf.

¹⁰ The statistics in these billets are all drawn from the ITU’s Telecommunication database with the exception of the FDI figure which comes from UNCTAD. World Investment Report 2008” http://www.unctad.org/en/docs/wir2008_en.pdf.

¹¹ In respect to dual ownership of SIM cards in selected African countries see: Alison Gillwald, “First Glance E-access and household survey 2008”, 2008 <http://www.researchictafrica.net/images/upload/Gillwald%20ITU%20Geneva%20May%202008.pdf>.

¹² A wide variety of sources are available on reform to communication markets including best practice principles developed by the 2003 ITU-D’s Global Symposium for Regulators (GSR) to be found at: http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR03/Documents/bestpractices_31.pdf.

¹³ Simon Cox (Editor), “Economics: making sense of the Modern Economy”, The Economist, 2nd Edition, 2006. P 239.

¹⁴ This situation, for example, existed for many years in Bangladesh. Refer: Dr. Don Richardson, Ricardo Ramirez, Moinul Haq, TeleCommons Development Group(TDG), “Grameen Telecom’s Village Phone Programme in Rural Bangladesh: a Multi-Media Case Study”, 17 March 2000 P27 <http://www.telecommons.com/villagephone/finalreport.pdf>.

¹⁵ Tim Kelly, “The pricing of international telecom services”, Seminar on tariff strategies for competitive environments, AL TTC, Ghaziabad, 20-22 July 1999. Call-back and refile were estimated to make up around 30% of traffic to India, from the United States, by 1997.

¹⁶ India’s international market was opened to unrestricted entry in 2002/2003.

¹⁷ Kelly, Op.cit.

¹⁸ <http://rdocdocs.rbi.org.in/rdocs/Wss/PDFs/75042.pdf>.

¹⁹ S.J. Liebowitz and Stephen E. Margolis, “Network Externalities (Effects)”, <http://www.utdallas.edu/~liebowit/palgrave/network.html> The authors note: “First a definitional concern: Network effects should not properly be called network externalities unless the participants in the market fail to internalise these effects. After all, it would not be useful to have the term ‘externality’ mean something different in this literature than it does in the rest of economics. Unfortunately, the term externality has been used somewhat carelessly in this literature.”

²⁰ See Chapter 2: Relevance and Theory of Externalities” in William J Baumol and Wallace E Oates, “The Theory of Environmental Policy”, Second Edition, Cambridge University Press, 1998.

²¹ Farrell and Klemperer note that when a network effect is not internalised (*i.e.* it remains an externality) then it can be argued that there would be under-adoption of a good (service). Under these conditions it has been argued that the network will be too small; and, adoption will tend to be too slow so that optimality requires subsidizing the marginal adopter to the extent of his external contribution to others. Co-ordination and “Lock-In: Competition with Switching Costs and Network Effects”, 2001 <http://www.nuff.ox.ac.uk/users/klemperer/lockinwebversion.pdf>.

- 22 Robert W. Crandall and Leonard Waverman, “Who Pays for Universal Service?: When Telephone Subsidies Become Transparent”, Brookings Institution Press, 2000. p 156.
- 23 The strength of local externalities is underlined in Arun Sundararajan, “Local network effects and complex network structure”, This Draft: September 2007, http://oz.stern.nyu.edu/papers/sundararajan_lne.pdf.
- 24 See: “Public Policy in Network Industries”, by Nicholas Economides in Paolo Buccirossi (ed.), Handbook of Antitrust Economics, Cambridge, The MIT Press, 2006.
- 25 United Kingdom Competition Commission, “Vodafone, 02, Orange and T-Mobile: Reports on references under section 13 of the telecommunications Act 1984 on the charges made by Vodafone, 02, Orange and T-Mobile for terminating calls from fixed and mobile networks.” 2003. p. 225-226.
- 26 Robert W. Crandall and Leonard Waverman, “Who Pays for Universal Service?: When Telephone Subsidies Become Transparent”, Brookings Institution Press, 2000.
- 27 S.J. Liebowitz and Stephen E. Margolis, Op.cit.
- 28 *Ibid.*
- 29 Richard Wray, “First with the message, Interview: Cor Stutterheim, executive chairman, CMG”, The Guardian, 16 March 2002 <http://www.guardian.co.uk/business/2002/mar/16/5>.
- 30 BBC Online, “Happy bthdy txt!” 3 December, 2002 http://news.bbc.co.uk/2/hi/uk_news/2538083.stm.
- 31 Ronald H Coase, The Problem of Social Cost, Journal of Law and Economics, 3: pp. 1–44, 1960 <http://www.sfu.ca/~allen/CoaseJLE1960.pdf> Crandall and Waverman, Op.cit p 24
- 32 Coase, Op.cit, p7 “In order to carry out a market transaction it is necessary to discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on. These operations are often extremely costly, sufficiently costly at any rate to prevent many transactions that would be carried out in a world in which the pricing system worked without cost.”
- 33 Crandall and Waverman, Op.cit. p 25.
- 34 At the close of 2007 Hong Kong, China recorded a teledensity of 200% as reported by the ITU.
- 35 Gabon may have been the first sub-Saharan African country to surpass 100% mobile penetration. Gabon’s regulatory authority reports quarterly updates at: www.artel.ga Based on 2007 population data the country would have exceeded 100% during 2008. These data includes users with dual SIM cards and operators may not always remove inactive subscribers from their databases.
- 36 Tim Harford, “The UnderCover Economist”, Abacus, London, 2008 p 35.
- 37 OECD, “Global Opportunities for Internet Access Development”, Op.cit. p 24.
- 38 Ewan Sutherland, “Counting mobile phones, SIM cards & customers”, 19 April, 2008 <http://www.itu.int/ITU-D/ict/statistics/material/sutherland-mobile-numbers.pdf>.
- 39 Thomas K. Thomas, “BSNL offers pre-paid scheme on fixed line”, 6 September 2006. <http://www.thehindubusinessline.com/2006/09/07/stories/2006090704740100.htm> A further example comes from Brasil Telecom which offers a pre-paid service that integrates cellular, fixed line and public

telephony. Users buy credit which can be used on mobile phones and make calls from fixed lines, including public telephones. Brazil Telecom, "Brasil Telecom GSM announces launch of operations", 2004 <http://www.secinfo.com/d17EG1.197.htm>.

40 Users have two options. Under Option 1 they pay an upfront fee of USD 5.44 covering 24 months. Under Option 2 they pay USD 0.43 per month for 24 months. Option 2 includes USD 0.43 of included calls. Calls under both options are charged at USD 0.02 per unit. The length of units varies according to several distance bands with local calls including 180 seconds.

41 <http://www.mamamikes.com>.

42 <https://www.kikwe.com/>.

43 <https://www.aryty.com/>.

44 "Aryty brings overseas prepaid phone credit service to India", The Economic Times, 6 Jul, 2008 http://economictimes.indiatimes.com/News/News_By_Industry/Telecom/Aryty_brings_overseas_prepaid_phone_credit_service_to_India/articleshow/3202745.cms.

45 <http://www.recargabrasil.com/recarga.do?method=load>.

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56 Gupta, *et al*, Op.cit., The totals are higher relative to GDP and export earnings for Lesotho and Cape Verde.

57 Gupta *et al.*, point out that Africa received just 4 percent of total remittances which was by far the smallest share to developing countries in the year 2005.

58 *Ibid.*

59 One exception is in the United Kingdom where pre-paid cards have figured in discussions of network externalities.

60 See for example an interview with Michael Joseph, chief executive officer of Kenya's Safaricom, where he says: "If you want to go and buy airtime now, for instance, you won't go to a big shop. You'll likely go to some shop on the side of the road. That person probably didn't get the airtime from one of our dealers. He bought it from another person, who bought it from another person, who bought it from another person. It's this creative distribution channel selling our products and services that's created a tremendous amount of work apart from all of the other things we do, like building our base stations, maintaining them, and things like that." Katy Gabel, "Kenya: Low-Cost Phones Revolutionize Africa", 18 September 2008. <http://allafrica.com/stories/200809180964.html>.

61 LirneAsia has document significant sharing of mobile phones outside the household, by poor people, in selected developing countries: <http://lirneasia.net/wp-content/uploads/2008/07/shared-use-of-mobiles-in-sri-lanka-3.png>.

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