



# Supra-national regulation for supra-national telecommunications carriers?

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The article reviews the extraordinary number of international ventures by major telecommunications organizations and explores problems for traditional national regulation that these global networks create. A theoretical model is defined that illustrates the adjustment process of different national policies to each other. The choice of various supra-national regulatory arrangements is shown to be affecting substantive policy. The article then discusses options for coordination and concludes that the concrete problems created by supra-national carriers do not justify the hidden cost of elaborate mechanisms of supra-national policy. Since such coordination has traditionally been used to prop up monopoly arrangements, a better approach for the foreseeable future is to encourage more national policy experimentation and focus less on international policy coordination. Copyright © 1996 Published by Elsevier Science Ltd

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## The emergence of transnational carriers and alliances<sup>1</sup>

As the liberalization of telecommunications spreads to many countries it also transforms the international system of telecommunications. It leads to the emergence of global telecommunications networks and alliances, to new types of service providers, and to an end of the traditional notion of telecommunications as a national and territorial sector. This creates pressure on the traditional national forms of regulation and control of telecommunication networks, and it requires us to think about the appropriate regulatory structure for the new type of supra-national telecommunications firm.

Traditional regulatory tools were predicated on a certain industry structure, nearly always territorial monopolies. But that structure is in the process of changing to multi-network competition and transnational carriers. There are many reasons for these changes. On the supply side, liberalization has resulted in new market participants; privatization enabled foreign ownership of the traditional carriers; and international alliances served as a prudent course for both expansion and defense alike. On the demand side, pent-up consumer needs led developing countries to seek foreign carriers' investment and expertise, while large users sought global communications services to match the scope of their business operations. The size of the market for such 'seamless' services is estimated to grow to US\$25 billion by the year 2000.<sup>2</sup> Carriers internationalized their services through operating agreements, consortia, joint ventures, direct equity investments, or mergers. The participants in these ventures, not surprisingly, are predominantly first-world

firms.<sup>3</sup> Their extra-territorial investments are heavily in Eastern Europe (32%) and South America (26%). There is little venture activity in Africa (2%).

Several types of supranational telecommunications providers emerged over time:

- (a) Traditional international carriers: such as Cable & Wireless, the former British colonial carrier which operates in over 50 countries, and expanded upon that foundation.
- (b) Traditional collaborative carriers: such as Intelsat and Inmarsat and their regional equivalents, Eutelsat and Arabsat. There are also many other consortia of established national operators for international submarine cables.

These traditional arrangements are now joined by numerous networked international ventures. The following list is partial, for more detail see Appendices A and B.

- (c) Global alliances. Concert: (BT (UK), MCI (US)); Flag (includes NYNEX (US), Dallah Al-Barkara (Saudi Arabia), Marubeni (Japan)); GlobalOne (Deutsche Telekom, France Telecom, Sprint (US)); Infonet (Belgacom, KDD (Japan), KPN (Netherlands), Swiss Telecom PTT, Telefonica (Spain), Telia (Sweden), Telstra (Australia)); Uniworld (AT&T (US), KPN, Swiss Telecom PTT, Telefonica, Telia); WorldPartners (a loose grouping of the Uniworld partners and the Pacific region companies KDD, Singapore Telecom, Telstra, Korea Telecom, Telecom New Zealand, Hong Kong Telecom, Unitel (Canada) and Philippines LDT).
- (d) Regional and national ventures:

- (i) Western Europe: such as Atlas (Deutsche Telekom, France Telecom); Belgacom (Ameritech (US), Tele Danmark, Singapore Telecom); Bouyges Telecom (C&W (UK), US West, Veba (Germany)); Cablecomms (NYNEX); Infostrada (Bell Atlantic (US), Olivetti); Mannesman Mobilfunk (AirTouch (US), Mannesman AG (Germany)); Mercury (C&W, Bell Canada Enterprises); Telewest (TCI (US), US West); Tele2 (C&W, Kinnevik (Sweden)); Unisource (KPN, Swiss Telecom PTT, Telefonica, Telia); Verbacom (C&W, Veba); Viag Interkom (BT, Viag (Germany)).

- (ii) Eastern Europe and Former Soviet Union: such as Matav (Ameritech, Deutsche Telekom); Pannon GSM (KPN, Hungarian carriers, Nortelinvest (Norway), Telecom Finland, Tele Danmark, Telia); Polkomtel (Airtouch, Plock (Poland), Polska Miedz (Poland), Tele Danmark); Ukrainian Mobile Communications (Deutsche Telekom, KPN, Telecom Denmark, Ukrainian PTOs); UTEL (AT&T, Deutsche Telekom, KPN).

- (iii) Asia-Pacific: Asean Telecom Holdings (Communications Authority of Thailand, Philippines LDT, PT Indosat (Indonesia), Singapore Telecom, Telecom Malaysia); Birla Communications (AT&T, Birla Group (India)); Clear Communications (BT, MCI, Television New Zealand, TODD (New Zealand)); Hong Kong Telecommunications

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<sup>2</sup>Federal Communications Commission, International Bureau, 'Global Communication Alliances: Forms and Characteristics of Emerging Organizations', prepared by Douglas Galbi and Chris Keating, 8 February 1996.

<sup>3</sup>29% from Western Europe, 17% from North America, and 13% from Asia/Pacific. *Ibid.*, pp 11-13

- (C&W, CITIC (China), Hutchinson Whampoa (Hong Kong); NYNEX-Reliance (India); Optus (BellSouth (US), C&W, Australian investors)); PHS International (C&W, DoCoMo (Japan), Hong Kong Telecom, Itochu (Japan)); TelecomAsia (NYNEX, Thai PTO); Telecom New Zealand (Ameritech, Bell Atlantic); TT&T (NTT (Japan), Thai PTO); Tu-Ka Chugoku (GTE (US), Airtouch, Nissan Motors, Japan Telecom, DDI (Japan)); Wipro BT (BT, Wipro (India)).
- (iv) The Americans: Alestra (AT&T, Grupo Alfa (Mexico), GTE, Telefonica); Avantel (Grupo Financiero Banamex Accival (Mexico), MCI; C&W: operations in Barbados, Jamaica and Grenada); CANTV (Banco Mercantil (Venezuela) Electricidad de Caracas (Venezuela), GTE, Lucent (US), Telefonica); GTE owns British Columbia Telephone, Quebec Telephone and Codetel (Dominican Republic); MCI-Stentor (Canada); Telecom Argentina (France Telecom, J P Morgan (US), Perez (Argentina), STET (Italy)); Telefonica de Argentina (Citicorp (US), Techint (Argentina), Telefonica); Telefonica Larga Distancia de Puerto Rico (Telefonica); Telefonica del Peru (Telefonica, Peruvian government); Telmex (France Telecom, Grupo Carso (Mexico), Southwestern Bell (US)); Unitel (AT&T, Bank of Nova Scotia, Royal Bank of Canada, Toronto Dominion Bank).

Entirely new types of carriers are also emerging:

- (e) Low-earth orbiting satellite carriers (LEOs): such as GlobalStar (AirTouch, Alcatel Espace (France), Alenia Spazio (Italy), Dacom (Korea), Deutsche Aerospace, France Telecom, Hyundai Electric (Korea), Loral (US), Qualcomm (US), Vodafone (UK)); ICO Global Communications (Inmarsat); Iridium (Motorola (US), Sprint, Bell Canada, Raytheon (US), Pacific and Electric Cable (Taiwan), Hawarid Group (Saudi Arabia), Krunichev (Russia), Nippon Iridium (18 large Japanese companies, including Sony and Mitsubishi), China Great Wall, Muidiri (Venezuela), Lockheed Martin (US), STET, Telefonica, United Communications (Thailand), Vebacom (Germany)); Odyssey (TRW (US), Teleglobe (Canada)); Orion (British Aerospace, Corn Dev (Canada), Kingston Communications (UK), Lockheed Martin, Matra-Hachette (France), Nissho Iwai (Japan), Orion Network Systems (US), STET); Teledesic (William Gates, Craig McCaw, McCaw development, Kinship Partners).
- (f) Light carriers and systems integrators: non-facilities service providers and resellers of telecommunications services that purchase bulk services from telecommunications carriers, including call back operators and arbitrageurs. Examples are PTI, Unidial, Frontier, 10297, International Discount Telecommunications (IDT), and USA Global Link.
- (g) Internet-based telecommunications service providers: firms utilizing software to permit voice calls on the Internet, either directly or via public network segments. Companies include IDT, Four11, FreeTel, FrontNet and Net Talk.

### **The impact of new global telecommunications carriers on traditional regulation**

The impact of the new global telecommunications arrangements on traditional regulation ranges in probability from the concrete to the hypothetical.

- New forms of consumer fraud from distant locations become possible, such as deceptive telemarketing or bogus 'free-phone' enticements to call. These schemes, by generating international calls, may be profitable to another country's PTO, thereby reducing its eagerness to cooperate in their eradication.
- International activity coupled with asymmetric liberalization enables an extension of national market power internationally. If country A does not permit real competition against its incumbent PTO, it affects global competition when that PTO is expanding into other countries while holding gatekeeper powers over reciprocal entry into its home market.
- National price and profit regulation can be undermined by carriers shifting revenues and costs among jurisdictions, either in real or accounting terms. For example, a carrier will move its billings to countries that do not control the allowable rate of return or do so generously, and shift expenses in the opposite direction. Similarly, since price cap formulas tend to include productivity and inflation factors that differ, carriers have an incentive to shift the billings to those countries where the productivity factor is low and the inflation adjustment rapid, ie, where regulated real prices decline more slowly.
- Countries lose control over prices of telecommunication services through the new types of arbitrage, especially for international calls. This affects the traditional price support mechanisms and requires the creation of new arrangements.
- National content policy is hard to maintain in an international setting. A worldwide harmonization of content policy is unlikely and undesirable due to divergent national views. Yet when each country enforces its own rules, the most restrictive content regulations may dominate by subjecting distant content providers to liability.
- The national protection of security, privacy and quality of communications traveling across the globe is difficult. There are greater opportunities for security breaches. Encryption policies are difficult to maintain in an international setting because of sovereignty concerns. When it comes to service quality, network crashes in one country may spill over across borders. Quality standards are harder to maintain in an international chain of transmission, and uniform or minimum standards may lead to needlessly high standards for poor countries. In privacy protection, it is possible to welcome data protection laws by the shifting of data abroad.
- National labor relations in telecommunications are affected because some employment can be shifted to low-wage, low-union countries.

While it is important to be alert to these problems and to others that will undoubtedly emerge, the good news is that most of the issues outlined here do not suggest imminent crisis, except for the maintenance of monopoly pricing in international services and for national content rules. This gives us time to evaluate the options—ranging from doing nothing to creating supra-national regulatory agencies with full powers

over the other agencies. To evaluate these options requires first some theoretical tools.

### A theory of multi-jurisdictional regimes<sup>4</sup>

The choice of regulatory arrangements and institutions is not merely procedural but also policy determinative. It is partly a question of historical and legal traditions, administrative efficiency and economic externalities, but also a matter of variations in interest group power at different levels of government. Interest groups pragmatically desire the jurisdictional arrangement and level whose outcome they like best, despite their official ideology, and the relation between group strengths and benefits on the different governmental level affects the preferred inter-governmental arrangement of regulation. In consequence, there is no such thing as an 'objective' best regulatory multi-jurisdictional arrangement that is independent of preferred regulatory policy.

For a simple framework to analyze a regulation in its international dimensions, we define regulation as the setting, by a regulatory body, of a price vector  $R$  on firms conducting an economic activity. A total prohibition is an infinite price; a total *laissez-faire* approach means a vector of market prices; most regulation is somewhere in between and can be viewed as a way of making an economic activity costlier (as in the case of limiting telemarketing) or cheaper to some (as in the case averaging residential telephone prices). Various interest groups are affected by the setting of these prices, and they seek regulatory  $R$ 's by exercising pressure through the political process.

Regulation is set by the agency according to some optimization criterion. This criterion is, of course, the subject of some debate. For those who hold the view of that regulation is based on the public interest, the agency's objective is to maximize the benefits to society;<sup>5</sup> for others, it is to serve the agency's self-interest.<sup>6</sup> These two criteria are not necessarily inconsistent if maximizing benefits to various interest groups also maximizes support for the agency. It then becomes possible to determine the nationally optimizing  $R$  as the maximum of net aggregate benefits accrued to interest groups.<sup>7</sup>

The regulation in one country may affect the interest groups in the other countries as well. For example, country A's businesses are benefited by country B's regulation of telephone fraud, but its consumers may become the target for such operations as they are displaced from B. The regulatory strictness in A is, thus, among others, a function of country B's regulation:

$$R^*_A = mR^n_B$$

where  $m$  is a short notation for the remaining parameters. The analogous relations hold for  $R_B$ . We thus have a 'reaction model' in which each country adjusts its regulation in response to the other. This is shown in Figure 1.

Given an initial regulation in Country B of  $R_{B1}$ ,  $R_{A1}$  is determined by Country A's reaction, which in turn generates  $R_{B2}$ , leading to  $R_{A2}$ , and so on. This process leads either to an equilibrium at the point of intersection  $P$  or to corner solutions; the latter occurring where countries drive each other into total deregulation or into total prohibition. A 'race to the top'

<sup>4</sup>Less theoretically inclined readers may skip this section and proceed to the next section.

<sup>5</sup>Shepherd, W *The Treatment of Market Power: Antitrust Regulation and Public Enterprise* Columbia University Press, New York (1975).

<sup>6</sup>Niskanen, W *Bureaucracy and Representative Government*. Aldine, Atherton, Chicago, (1971).

<sup>7</sup>For the detailed model, see Noam, E M 'Choice of governmental level in regulation' *Kyklos, International Review for Social Sciences* 1981 35 2278-2291

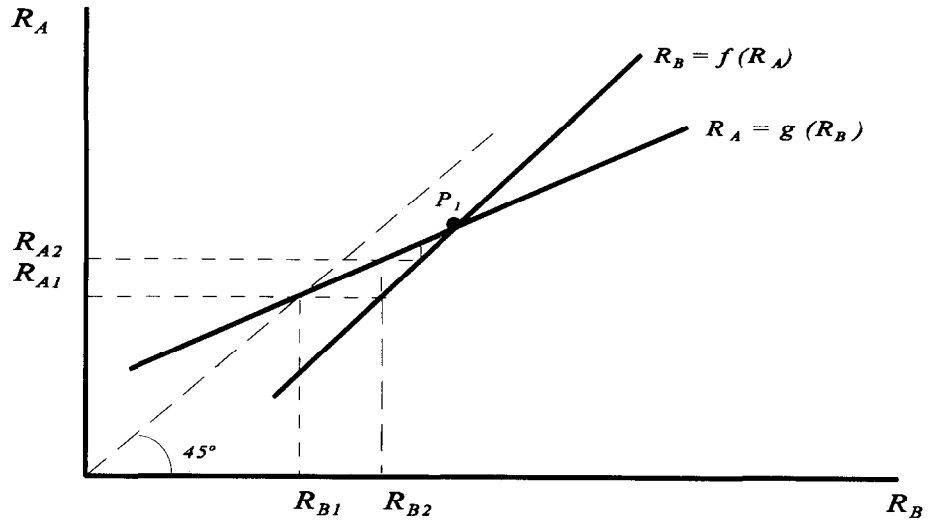


Figure 1. Reaction functions of national regulations.

would occur where each jurisdiction attempts to shift undesirable activities to its neighbors, or tries to avoid becoming the recipient of its neighbor's undesirable exports. An example for the former might be stricter data privacy to prevent undesirable activities from spilling in. A 'race to the bottom' occurs where each jurisdiction tries to lower regulation to become more attractive than its neighbor, for example by lowering business telephone rates. The point of intersection of the two reaction functions is at:

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$$R_A = (mn^\alpha)^{\frac{1}{1-\alpha^2}}$$

A stable equilibrium exists when  $R_B = f(R_A)$  is steeper than the inverse of  $R_A = g(R_B)$  at the point of intersection, ie, when it cuts  $R_A$  from below. This holds when the difference in the elasticities of benefits with respect to a country's own regulation exceeds the difference in the cross-elasticities with respect to the other country's regulation.

The conclusion is that there may be no need for a formal coordination between countries A and B; an equilibrium can be reached by unilateral actions and reactions aiming at unilateral optimization.

In some cases, however, the reactions of both countries are such that no equilibrium is reached, but rather an upward or downward spiral takes place to the detriment of both countries. In the former case, the high strictness of national regulation that may emerge in the absence of coordination will not please advocates of deregulation. In some cases, they may have to swallow their frequently parallel dislike of inter-jurisdictional coordination because deregulation might not be stable if it is eroded by others.

The model can be used to predict the regulatory strictness of various coordination arrangements such as harmonization, pre-emption, supra-national agencies, etc. Different institutional systems result in different strictness.<sup>8</sup> Thus, the choice of the coordination arrangement, seemingly a procedural issue, is, in fact, a substantive policy determination of the nature of the regulation itself. Therefore, the incentive for a particular

<sup>8</sup> *Ibid.*

arrangement is not its administrative superiority but rather that its policy outcome is preferred by a dominant constellation of affected interest groups.

### **Institutional options for regulation**

Following the identification in the second section of the regulatory issues raised by supra-national carriers, and the more theoretical discussion of the third section, we can now address the institutional options for regulation, applying the model selectively. The menu of possible approaches is quite long.

A *supra-national regulatory agency* with full powers. Because this would reduce national sovereignty it requires the existence of serious problems that cannot be dealt with otherwise.

In terms of the model, the supra-national option would be to set regulation centrally at a common *international* strictness, determined by maximizing the support function to the supra-national regulator by the aggregated national interest groups. This can be higher or lower than uncoordinated outcomes. Supra-regulation is not invariably stricter than national regulation, for the reasons discussed above. In telecommunications, for example, regulations by the European Commission in Brussels are less strict than those of most of the Member States of the European Union. But the reverse can also be the case, as, for example, in the regulation of cable television in the United States, where the federal rules are stricter than those of most states or localities.

One question is why interest groups (or a whole country) would consent to supra-regulation. A dominant group will normally consent to a shift to supra-regulation only where its favored policy would be enhanced, eg, if the balance of power of interest groups in the other country is even more favorable to its concerns. However, for symmetrical reasons, the dominant group in the other country would then oppose supra-regulation lest it dilute its own influence. 'Log-rolling' aside, this then leaves as the primary reasons for mutual joining of supra-regulation three cases: (1) when the balance of power is essentially similar in the two countries, so that supra-regulation does not make much difference. This is why policy coordination is easier among western European countries than, for example, east Asian ones. (2) When supra-regulation establishes a policy cartel to avoid separate regulation to affect each other and to lead to results that are considered suboptimal by the dominant groups. This is more likely to be important where the cross-elasticity of regulation is high, eg, when countries interact strongly with each other. (3) When supra-national regulation is part of a larger collaborative effort such as building European institutions from which dominant groups benefit more than what they lose in one particular sector.

*Two-level regulation with preemption* is a variant of supra-regulation, with national and supra-national agencies coexisting. Examples are concurrent telecom regulations in the US among the federal government and the states, and the European Union and its Member States. The top level has some powers to pre-empt regulations inconsistent with its own. But the ability of the lower level to opt out of certain regulations, and the tendency of the higher level to expand its authority create struggles over jurisdiction.

*Harmonization* is the process by which inconsistencies among countries are supplanted, with uniformity, by mutual agreement. Here, the issue is not the strictness *per se* but the importance of being identical. There are situations where efficiencies exist in uniformity or connectivity. The width of railroad gauges is an example. Technologists tend to favor standardization. Economists have more mixed views because uniformity has its costs. To have cars with identical pollution controls in both Australia and Japan may not necessarily be optimal for either or for both jointly. In terms of Figure 1, uniformity is given by the 45° line, which would be identical to the equilibrium point  $P_1$  only by coincidence.

There are reasons for a country to be non-uniform. Examples include large countries for whom international interaction may be small relative to its costs, such as the United States, which, eg, can still afford a non-metric system of measurements. At the other extreme, small countries or states also provide examples of non-conformity in regulation: Lichtenstein in banking; Delaware in corporation law; Hong Kong in tariff duties; Monaco in taxes. These examples suggest that small countries, in particular, have incentives to be nonconforming since the domestic loss due to laxity can be more than offset by an inflow of economic activity from the larger countries. To prevent such non-uniformity, the other countries may have to impose substantial pressure on the maverick jurisdictions or compensate them in a variety of direct or indirect ways.

*Regulatory treaties* are bilateral or multilateral agreements among countries. These treaties work best when there is a great deal of commonality of interest. Stability of the treaties decreases as the number of parties to the agreement and their heterogeneity grows.

For an agreement, each side must be better off than before. Agreement will stop at the point where marginal benefits of a regulation begin to be negative for at least one country. This would be at a level of strictness where the first country experiences a regulatory optimum. This would be the lowest common denominator. In effect, a dominant interest group in any one country would determine the regulatory structures for all countries. It holds a veto. This could be released a bit where compensation to some participants is possible, which is one of the ways the European Union operates the agricultural field.

*Regulatory coordination by national agencies* is a lower level of agreement than a treaty. Where it requires unanimity on the proper course of action, it, too, may result in a joint policy of the lowest common denominator.

*Ad-hoc collaboration* is an informal process that addresses problems as they arise. The mechanisms vary: task forces; committees; phone calls; etc. The informality and the expert focus of this arrangement tends to produce results; on the other hand, it may also revolve around personal relationships and understandings that may change.

*Dispute resolution* requires arbitration of regulatory conflicts among countries. A dispute resolution must be based on agreed rules and policy goals. It does not work well when it comes to detailed substantive issues. The enforceability of decisions of dispute resolution bodies is also a question.

*Coordination by specialized international telecommunications bodies* tend to be formally non-binding and lacking enforcement power. Broad membership, such as that of the ITU, leads to tensions in goals between



rich and poor countries. Geographic and developmental stratification, on the other hand, leaves out many interested parties.

*General international bodies* coordinate telecommunications policy in the context of broader issues such as trade policy and economic reform. But negotiations in forums such as the GATT or WTO may allot inadequate attention to specific telecommunications issues and may lead to log-rolling ('You give us potatoes, we give you telecommunications'). On the other hand, it brings parties to the bargaining table beyond the immediately affected interest groups and can thus help break log-jams.

*Reciprocity* is the establishment of a common regulatory position among countries. Country A will extend certain treatment to the telecommunications companies of country B, provided that country B does the same for country A's companies. But a requirement for exact ('mirror image') reciprocity may create regulatory grid-lock, because under it no country can move first. A reciprocity based on a rough equivalence standard provides greater flexibility.

*Deference* means following the rules set by a 'lead country' that initiates a regulatory proceeding, or to agree on which country should take the leading role. In other cases, deference is imposed. It is then possible that regulation is not uniform but discriminatory, where discrimination is defined as different measures of strictness in different jurisdictions. This can occur, for example, where the regulatory agency of country A can impose regulations not only on its own country, but it can also dictate B's regulation, with the main goal of benefiting A. Colonialism is an example for such an arrangement, eg, Britain's regulation of cotton spinning in India. Analytically,  $R_A$  and  $R_B$  of the model are set to maximize A's welfare.

*Information exchange.* Countries may agree to exchange information, eg, on company finances, technical performance or consumer fraud problems.

*Law enforcement collaboration.* Countries may agree to help each other to achieve telecommunications objectives as part of broader criminal justice collaboration. Examples are dealing with telecommunications fraud, or developing a multinational encryption key system.

*International financial lending institutions* may exert some regulatory power, especially with respect to developing countries. In order to receive economic assistance from these institutions, the developing country is often required to undertake reforms, such as cuts in spending, establishment of free market principles, privatization of government-owned companies and monetary reform. Using this approach, the World Bank has institutionalized telecommunications policies such as privatization and market access. The problem with this option is that financial lending institutions become involved in overseeing the internal development of the telecommunications infrastructure. This leads to tensions between lender and borrower, and at times between liberalization and financial returns.

*Coordinated advocacy* by business and consumer-interest groups. To accomplish such coordination, several umbrella organizations for large users exist. There are no coordinating organizations of equal weight on the consumer side.

*Coordination by carriers* is the traditional form of collaboration. It is simpler for operating companies than coordination through

governments. For similar reasons, such coordination can become an instrument of cartel collaboration without the public accountability of governments.

*User coordination:* an example is the self-governance of the Internet. The problems with this model are that compliance is largely voluntary, and that difficulties arise in attempting to coordinate thousands of users worldwide once the spirit of voluntarism gives way to commercial interests.

*Coordination by systems integrators:* delegation of coordination by users to service packagers, who meet the different requirements of each country. The advantages are flexibility and an absence of the need for governments to reach agreement. The disadvantages are that the in-house harmonization of multiple differing standards and rules may be costly, and that harmonization might simply mean adhering to the strictest rule.

*Foreign intervention in national proceedings:* countries participate in the regulatory proceedings of other countries. For such a system to be successful, the process must be genuinely open and foreign submissions must neither be resented nor receive privileged attention. By entering another country's regulatory process, a country implicitly grants reciprocal opportunities.

*Non-coordination under regulation*—countries do not coordinate policy. But, as has been discussed in the third section, they may adjust policies to each other. If the regulations in country B affect country A, country A will modify its policies. In this reactive fashion, countries may reach stable equilibrium, even in the absence of formal coordination. In other cases, they may drive each other to 'corner solutions', and reach a policy of substantial strictness or laxity.

*Non-coordination under competition*—countries liberalize, do not coordinate and do not even adjust regulation, but rather allow global market forces to operate. For example, if a carrier shifts costs and revenues from one jurisdiction to another, one way to deal with the problem would be for regulatory agencies to agree on how to treat these cost allocations, how to monitor them, etc. But it might be simpler to let competition in both jurisdictions prevent such manipulation in the first place, by making manipulative pricing non-sustainable. A competitive coordination means creating multi-country open telecommunications markets. This strategy does not solve all problems. For example, consumer fraud by third parties is not a market issue but a law enforcement problem. Similarly, asymmetric liberalization creates distortions; it becomes harder to maintain subsidizing policies, and negative externalities may exist.

Thus, the spectrum of options ranges, on the one extreme, from highly centralized arrangements such as supra-national agencies with full autonomous powers, to full reliance on market forces without any inter-governmental action, on the other. The regulatory outcomes of these different regulatory institutional arrangements depend on the size and direction of cross-elasticities, benefits to affected interest groups, and their political weight, as discussed in the model of the previous section.

## Conclusion

It would be easy to jump from an identification of problems to seek an elaborate option for regulatory coordination. But this is not our conclusion.

- The multitude of policy issues associated with supra-national carriers are too varied to suggest a single approach of supra-national policy and regulation. Because jurisdictional arrangements are outcome determinative, the choice of a single arrangement reduces flexibility in policy. Nor would a single approach provide enough flexibility to accommodate the various affected interest groups.
- Of the issues identified, the more immediate are those of reforming the international accounting rate system and the financing system for universal connectivity. More difficult conceptually are the problems of asymmetric liberalization with its potential for discriminatory extension of market power. An emerging issue is the threat to global free flow of information by the need to conform to the content policies of restrictive countries. Similarly, the potential for new types of consumer fraud is disturbing. Most other issues are hypothetical or long term.
- On the other hand, the history of international telecommunications agreements and collaborations from their earliest days has been one of creating international cartels to prop up national monopoly arrangements. It would be surprising if any new supra-national regulatory arrangement would not similarly be captured by the established telecommunications carriers, or be driven by broader motivations not primarily of telecommunications.
- In many cases, coordination could be accomplished through market forces and arbitrage rather than through inter-governmental collaboration. This would suggest a liberalization and a reduction in deregulatory asymmetry rather than the creation of regulatory symmetry.
- However, market forces by themselves do not deal with all policy problems, such as redistributive goals, negative spill-overs, law enforcement issues and the transition to a competitive system which may require interconnection arrangements. These are, however, primarily national issues calling for national responses, with some international coordination only in the case of pronounced spillovers.
- The absence of formal coordination among countries does not mean that countries do not adjust their policies. They react to each other, and such reactions will lead to stable equilibria in many cases.
- In other cases, however, no equilibria are likely. For example, the stricter one country's consumer protection laws, the greater the advantage to another country to use lax standards to encourage foreign investments.

Thus, problems brought about by supra-national carriers can be addressed by a flexible and diverse set of approaches:

- Countries should support each other's consumer protection and other law enforcement actions against fraud, as part of general law enforcement cooperation.
- Countries should not support each other's efforts to limit competitive entry and create asymmetries.
- For specific problems, countries could establish *ad hoc* collaboration of regulatory agencies.

- Traditional policy goals, such as assuring universal connectivity, can be pursued and financed by each country.<sup>9</sup>
- Countries should actively participate in other countries' regulatory proceedings which affect them. This would simplify the adjustment process.

Thus the main conclusion is not to create elaborate mechanisms of policy coordination. The history of these mechanisms is one of emphasizing consensus, stability and harmonization. Those are values appropriate to government utilities, not to a high-technology sector undergoing revolutionary changes. Ironically, for a world full of conflict telecommunications are probably the one sector that historically has been cursed with an excess of policy collaboration and with a compulsion to protect. But today's priorities are not the international solving of every problem, but the creation of opportunities for the new information age. Where problems emerge, they can be dealt with at the time.

This does not mean that only market values should govern. For example, if a country wants to subsidize the connectivity of its poor and rural populations, it can do so. But there is no need to protect subsidies through a protection of the entrenched monopoly market structure, and through a defense of that system internationally against competitive international rates.

It might be different tomorrow. But today, the world of telecommunications needs more policy experimentation and less harmonization.

<sup>9</sup>Noam, E M, 'Beyond liberalization III: reforming universal service' *Telecommunications Policy* 1994 18 (9) 687-704

## Appendix A

### Investments of major carriers<sup>1</sup>

- |   |  |                        |   |
|---|--|------------------------|---|
| ● <i>AirTouch (formerly part of Pacific Telesis, US)</i>  | Electric (Korea), Loral (US), Qualcomm (US), Vodaphone (UK)                              | e. 25%                 | Centertel (Poland)                            |
| a. 51% NordicTel (Sweden)   | j. 4.5% Tu-Ka Chugoku (Japan)  | f. 12.3%               | Belgacom Mobile (Belgium).                    |
| b. 34.8% Mannesman Mobilfunk (Germany)  | k. Cellular operations in India, Italy, Poland, Portugal, Spain, South Korea and Sweden. | ● <i>AT&amp;T (US)</i> |   |
| c. 25% Belgacom Mobile (Belgium)  | l. Paging systems in France, Portugal, Spain and Thailand.                               | a. 100%                | AT&T Puerto Rico                              |
| d. 23% Telecel (Portugal)   | ● <i>Ameritech (US)</i>  | b. 62.2%               | AT&T Jens (Japan)                             |
| e. 19.25% Polkomtel (Poland)  | a. 67%   | c. 55%                 | Rosnet International (Russia)                 |
| f. 15.8% AirTel/ASR (Spain)   | b. 50%   | d. 50%                 | A/O Telmos (Russia)                           |
| g. 15.8% OmniTel (Italy)  | c. 49.9%   | e. 49%                 | Birla Communications (India)                  |
| h. 9% Interest in trans-Pacific cable between Japan and US  | d. 40%   | f. 40%                 | Uniworld                                      |
| i. 6.4% GlobalStar with Alcatel Espace (France), Dacom (Korea), Deutsche Aerospace, France Telecom, Hyundai | a. 67%   | g. 35%                 | Celumovil (Colombia)                          |
|   | b. 50%   | h. 35%                 | Jamaica Digiport Int'l                        |
|   | c. 49.9%   | i. 33%                 | Unitel (Canada)                               |
|   | d. 40%   | j. 30%                 | Smartone (Hong Kong)                          |
|   |  | k. 22%                 | Movitel del Noroeste (Mexico)                 |
|   |  | l. 20%                 | PT Bukaka Singapore Telecom Int'l (Indonesia) |
|   |  | m. 20%                 | Alestra (Mexico)                              |
|   |  | n. 17%                 | UTEL (Ukraine)                                |

<sup>1</sup>Part of the information on AT&T, BT, C&W, Deutsche Telekom, France Telecom and Sprint is from the FCC, *op cit*, Appendix pp 1-7.

- o. 10% Compania de Telefonos de Interior (Argentina) linking UK, Japan and intermediate points. Chile, Denmark, France, Mexico, New Zealand, Uruguay, Venezuela.
- p. 10% Celumovil de la Costa (Colombia) Partners include Dallah Al-Barkara (Saudi Arabia) and Marubeni (Japan)
- q. Otecel (Ecuador)
- r. Yunnan & Xhia (China)
- s. NTT FAN (Japan)
- t. WorldPartners (a loose association of carriers including KDD, KPN, Singapore Telecom, Swiss Telecom PTT, Telefonica, and Telia as equity owners. Hong Kong Telecom, Korea Telecom, Philippines Long Distance Telephone, Telecom New Zealand, Telstra, and Unitel (Canada) are non-equity partners
- u. Africa ONE—37 000 km submarine cable surrounding the continent. Partners with ITU, RASCOM (Africa), PATU (Africa), and Alcatel.
- *Bell Atlantic (US, to be merged with NYNEX)*
  - a. 49.9% Telecom New Zealand jointly with Ameritech
  - b. 49% Iusacel (Mexico)
  - c. 49% Pacific Star Communications (New Zealand)
  - d. 33% Infostrada (Italy)
  - e. 24.5% Eurotel Cellular Service (Czech and Slovak Republics)
  - f. 11.6% OmniTel (Italy)
  - g. Wireless operations in Argentina, Denmark, France, Germany, New Zealand, Uruguay, Venezuela
  - h. Provision of consulting, network and software development services to telecommunications operators in Finland, Italy, South Korea, Sweden.
- *NYNEX (to be merged with Bell Atlantic)*
  - a. Managing partner of FLAG—fiber cable
- b. 75% Cablecomms (UK) (cable TV and telecommunications)
- c. 50% Gibraltar–Nynex Communications
- d. 50% Nynex–Reliance Cellular (India)
- e. TelecomAsia (Thailand)
- f. Cellular ventures in Greece and Japan.
- *Bell Canada Enterprises (BCE)*
  - a. 87.2% Bell CableMedia (UK)
  - b. 23% Videotron (UK)
  - c. 20% Mercury (UK)
  - d. Worldlink Telecom (Canada)
  - e. Iridium partners with Motorola (US), Sprint (US), Raytheon (US), Pacific and Electric Cable (Taiwan), Mawarid Group (Saudi Arabia), Krunichev (Russia), Nippon Iridium (18 large companies including Sony and Mitsubishi), China Great Wall, Muidiri (Venezuela), Lockheed Martin (US), STET, Telefonica, United Communications (Thailand) and Vebacom (Germany).
- *BellSouth (US)*
  - a. 24.5% Optus (Australia)
  - b. 21.4% E-Plus PCN (Germany)
  - c. Mobile data network in UK
  - d. Paging and answering services in Australia and UK
  - e. Cellular and/or mobile operations in Argentina,
- *BT (UK)*
  - a. 75% Concert
  - b. 60% Cellnet (UK)
  - c. 50.5% Albacom (Italy)
  - d. 50% Gibtel (Gibraltar)
  - e. 50% Megared (Spain)
  - f. 50% Wipro (India)
  - g. 50% Viag Interkom (Germany)
  - h. 49% India Cellular
  - i. 40% Mahindra (India)
  - j. 40% Max BT (India)
  - k. 40% St Petersburg Int'l (Russia)
  - l. 33% Telenordia (Sweden)
  - m. 25% Clear Communications (New Zealand)
  - n. 25% Newtone (Israel)
  - o. 20% Personal Communications (Hong Kong)
  - p. 20% MCI (US)
  - q. 6.3% Airtel/ASR (Spain)
  - r. 5% Tu-Ka Cellular (Japan)
  - s. Network Information Services (Japan).
- *Cable & Wireless (UK)*
  - a. 100% C&W Inc (US)
  - b. 100% Telecom Vanuatu (Asia Pacific)
  - c. 97% Eastecnica (Portugal)
  - d. 85% Barbados External Telecommunications
  - e. 80.7% Paktel (Pakistan)
  - f. 80% Mercury (UK)
  - g. 79% Telecommunications of Jamaica
  - h. 70% Grenada Telecommunications
  - i. 63% Tilts Communications (Latvia)
  - j. 58% Hong Kong Telecommunications
  - k. 51% Companhia de Telecommunicacoes de Macau
  - l. 51% Tele-Yemen
  - m. 51% Yemen International Telecommunications Company
  - n. 50% Belcel (Belarus)
  - o. 50% C&W Europe

- p. 50% Mercury One 2 One (UK)
- q. 49% Fiji International Telecommunications
- r. 49% Mobikom (Belarus)
- s. 45% Dhivehi Raajjeyge Gulhun Private (Maldives)
- t. 45% Vebacom (Germany)
- u. 40% ETPI (Philippines)
- v. 39.9% Tele 2 (Sweden)
- w. 25% MTN (South Africa)
- x. 24.5% Optus (Australia)
- y. 22.3% Ocel (Colombia)
- z. 21% Lattelekom (Latvia)
- aa. 20% Batelco (Bahrain)
- bb. 20% Bouyges Telecom (France)
- cc. 17.6% International Digital Communications (Japan)
- dd. 12.8% Bell CableMedia (UK)
- ee. 10% Bezeq (Israel)
- ff. 0.03% Videotron (UK)
- gg. Metropolitan Communications (Russia)
- hh. PHS International (Japan)
- ii. Asiasat
- jj. MobileOne (Singapore).
- *Deutsche Telekom*
- a. GlobalOne (100% Germany, 33% Europe, 25% World, 16.5% North America)
- b. 67% Matav (Hungary) with Ameritech
- c. 50% Atlas (with France Telecom)
- d. 50% MagyarCom (Hungary)
- e. 27% Mobile TeleSystems (Russia)
- f. 25% PT Satelindo (Indonesia)
- g. 21% TRI (Malaysia)
- h. 20% Teletes (Turkey)
- i. 17% UTEL (Ukraine)
- j. 16% Ukrainian Mobile Communications (UMC)
- k. 10% Sprint (US).
- *France Telecom*
- a. GlobalOne (100% France, 33% Europe, 25% World, 16.5% North America)
- b. 100% FTNS Nordic (Sweden)
- c. 90% Mobistar (Belgium)
- d. 70% Societe Ivorian de Mobiles (Ivory Coast)
- e. 50% Atlas (with Deutsche Telekom)
- f. 49% Operator Hungaria
- g. 49% OPT-New Caledonia
- h. 49% Telecoms Ext. de la Polynesie Francaise
- i. 40% Socatel (Central African Republic)
- j. 40% DGCT (Equatorial Guinea)
- k. 35.5% BPL Systems (India)
- l. 35% Panafon (Greece)
- m. 34% Sonatel (Senegal)
- n. 33% Vanitel (Vanuatu)
- o. 33% Vanitel Cellular (Vanuatu)
- p. 25% Centertel (Poland)
- q. 20% St Pierre & Miquelon (France)
- r. 19.5% Telecom Argentina
- s. 11% Mobile Telesystems (Russia)
- t. 10% Movistar (Argentina)
- u. 10% Sprint (US)
- v. 5% Telmex (Mexico)
- w. 3.2% GlobalStar
- x. Radiomovil (Mexico)
- y. Teco Tasa (Uruguay)
- z. Telcel (Mexico)
- aa. PT Pramindo Ikat Nusantara (Indonesia).
- *GTE (US)*
- a. 100% British Columbia Telephone
- b. 100% Quebec Telephone
- c. 100% Codotel (Dominican Republic)
- d. 51% Of consortium including Lucent and Telefonica which owns 40% of CANTV (Venezuela)
- e. 14.5% Alectra (Mexico)
- f. 4.5% Tu-Ka Chugoku (Japan)
- g. Partner in cellular consortia in Germany and Argentina
- h. Provides international telecommunications services to Moscow hotels
- i. Joint venture in China to provide paging services.
- *KPN (Netherlands)*
- a. 50% JaszTel (Hungary)
- b. 25% Unisource
- c. 20% Pannon GSM (Hungary)
- d. 17% UTEL (Ukraine)
- e. 16% Ukrainian Mobile Communications (UMC)
- f. 15% Uniworld
- g. 13% SPT Telecom (Czech Republic)
- h. 14.5% Infonet
- i. WorldPartners.
- *MCI (US)*
- a. 100% MCI de Venezuela
- b. 49% Avantel (Mexico)
- c. 25% Clear Communications (New Zealand)
- d. 25% Concert
- e. 23.5% Belize Telecom
- f. 15% Newtone (Israel)
- g. MCI-Stentor (North America)
- h. AskyB (US).
- *NTT (Japan)*
- a. 44% NTT, the world's largest telecommunications company, faces limitations on its international service role.
- b. 18.5% NTT FAN (Future Agent network—for global multimedia services)
- c. 15% Thai Telephone & Telecommunication (TT&T)
- d. 2% Smart Communications (Philippines)
- e. 2% Nextwave Communications (US) PCS
- f. 0.9% Nextel Communications (US)
- g. PHS International (Japan)
- Mobile venture in China.

● **SBC (formerly Southwestern Bell, US)**

- a. 40% VTR Inversiones (Chile)
- b. 15.5% MTN (South Africa)
- c. 11.75% Telewest (UK) (largest cable television/telecommunications operation)
- d. 10% SFR (France)
- e. 8.3% Shinsegi Mobile Communications (South Korea)
- f. 5% Telmex (Mexico)
- g. Alliances in Australia and Israel.

● **Singapore Telecom**

- a. 100% Information Network Services (Indonesia)
- b. 76% Lanka Cellular Services (Sri Lanka)
- c. 55% Infolink Network Services (Australia)
- d. 52% Lanka Communications Services (Sri Lanka)
- e. 50% Globe Telekom (Philippines)
- f. 40% PT Bukaka Singapore Telecom International (Indonesia)
- g. 27% ADSB Telecommunications, consortium which owns 49.9% of Belgacom. Belgacom owns 14.5% of Infonet.
- h. 24.5% AAP Telecommunications (Australia)
- i. 20% Asean Holdings (Asia-Pacific region)
- j. 12.3% Belgacom Mobile (Belgium)
- k. WorldPartners.

● **Sprint (US)**

- a. GlobalOne (100% US, 66% North America, 50% world, 33% Europe)
- b. 100% Sprint Communications Canada
- c. 60% Sprint Business Telecom (Bulgaria)
- d. 51% Sprint Movil (Argentina)
- e. 50% Rosprint (Russia)

- f. 50% Sprint Networks (Russia)
- g. 49% Alcatel Data Networks (France)
- h. 26% Sprint RPTelekom (Poland)
- i. Iridium.

● **STET (Italy)**

- a. 50% Entel (Bolivia)
- b. 20% Entel (Chile)
- c. 12.5% Etecsa (Cuba)
- d. 19.5% Telecom Argentina
- e. 12% TMobil (Czech Republic)
- f. Iridium.

● **Swiss Telecom PTT**

- a. 50% JaszTel (Hungary)
- b. 30% Natel D (India)
- c. 30% Muitara Telecommunications (Malaysia)
- d. 25% Unisource
- e. 15% Uniworld
- f. 14.5% Infonet
- g. 13% SPT Telecom (Czech Republic)
- h. WorldPartners.

● **Telefonica (Spain)**

- a. 80% Telefonica Larga Distancia de Puerto Rico
- b. 60% Telefonica Telemobil (Romania)
- d. 44% CTC Cellular (Chile)
- e. 43.6% Compania de Telecomunicaciones de Chile (CTC)
- f. 40% Of Chilean cable-telecommunications joint venture with TCI (US) and two Chilean cable companies
- g. 35% Telefonica del Peru
- h. 31% Codelco (Colombia)
- i. 25% Unisource
- j. 22% Cocolo (Colombia)
- k. 22% Of consortium which owns Telefonica de Argentina
- l. 16% Of consortium which owns CANTV (Venezuela)
- m. 15% Contactel (Portugal)
- n. 15% Uniworld
- o. 14.5% Alestra (Mexico)
- p. 14.5% Infonet

- q. 10% Teco Tasa (Uruguay)
- r. 10% Movistar (Argentina)
- s. Iridium
- t. WorldPartners.

● **Telia (Sweden)**

- a. 60% Starman Elektroonika (Estonia)
- b. 26% Nambia GSM
- c. 25% Lat Mobilais Telfons (Latvia)
- d. 25% Unisource
- e. 25% NW GSM (Russia)
- f. 24.5% Eesti Mobiltelfon (Estonia)
- g. 15% Uniworld
- h. 14.5% Infonet
- i. 13% Pannon GSM (Hungary)
- j. 6.8% OmniTel (Italy)
- k. WorldPartners.

● **US West**

- a. 50% Mercury One 2 One (UK)
- a. 45% Delta Telecom (Russia)
- b. 41.9% Westel Radiotelefon (Hungary)
- c. 26.75% Telewest (UK) (largest cable television/telecommunications operator)
- d. 24.5% Eurotel Cellular (Czech and Slovak Republics)
- e. 22% Moscow Cellular Communications (Russia)
- f. 5% Bouyges Telecom (France)
- g. Tu-ka Cellular
- h. Titus Communications (Japan)
- i. Personal communications network operations in UK
- j. International telecommunications gateways in Russia and Lithuania
- k. Other cable operations in Belgium, France, Germany, Hungary, Japan, Spain and Sweden
- l. Other cellular operations in France, India, Japan and UK.

## Appendix B

### Alliances and investments

#### Global alliances

*Concert.* BT (UK, 75%) and MCI (US, 25%). BT acquired a 20% interest in MCI in 1994.

*FLAG.* NYNEX (US) is the managing partner of the 17 000-mile 'Fiber-optic Link Around the Globe', whose partners include Dallah Al-Barkara (Saudi Arabia) and Marubeni (Japan).

*GlobalOne.* Sprint (US, 100%, 66% North America, 50% world, 33% Europe); France Telecom (France, 100%, 33% Europe, 25% world, 16.5% North America); and Deutsche Telekom (Germany, 100%, 33% Europe, 25% world, 16.5% North America). FT and DT also purchased 10% each of Sprint in 1996.

*GlobalStar.* AirTouch (US, 6.4%), Alcatel Espace (France, 4.7%), Dacom (Korea, 1.3%), Deutsche Aerospace (Germany, 3.7%), France Telecom (France, 3.2%), Hyundai Electric (Korea, 5.1%), Loral (US, 35.8%), Qualcomm (US, 7.9%), Vodafone, (UK, 7.5%).

*Infonet.* Telefonica (Spain, 14.5%), Swiss Telecom PTT (14.5%), Belgacom (Belgium, 14.5%), KPN (Netherlands, 14.5%), Telia (Sweden, 14.5%), Telstra (Australia, 14.2%), KDD (Japan, 13.3%).

*Iridium.* Motorola (US), Sprint, Bell Canada, Raytheon (US), Pacific and Electric Cable (Taiwan), Mawarid Group (Saudi Arabia), Krunichev (Russia), Nippon Iridium (18 large Japanese companies, including Sony and Mitsubishi), China Great Wall, Muidiri (Venezuela), Lockheed Martin (US), STET (Italy), Telefonica, United Communications (Thailand), Vebacom (Germany).

*Odyssey.* TRW (US, 50%), Teleglobe (Canada, 50%).

*Orion.* British Aerospace (25%), Com Dev (Canada, 4.2%), Kingston Communications (UK, 4.2%), Lockheed Martin (8.3%), Matra-Hachette (France, 8.3%), Nissho Iwai (Japan, 8.3%), Orion Network Systems (US, 16.6%).

*Teledesic.* (William Gates, Craig McCaw, McCaw Development, Kinship Partners).

*Uniworld.* AT&T (US, 40%), and *Unisource* (60%), which in turn is owned by KPN (25%), Swiss Telecom PTT (25%), Telefonica (25%), Telia (25%).

*WorldPartners.* A loose association of carriers with AT&T, KDD, KPN, Singapore Telecom, Swiss Telecom PTT, Telefonica, and Telia as equity owners, and Hong Kong Telecom, Korea Telecom, Philippines Long Distance Telephone, Telecom New Zealand, Telstra and Unitel (Canada) as non-equity partners.

#### Western Europe

*Belgium.* Belgacom Mobile (AirTouch, 25%), Ameritech (US, 12.3%), Belgian Government (37.6%), Singapore Telecom (12.3%), TeleDanmark (12.3%); Belgacom (49.9% equity interests by ADSB Telecommunications (consortium comprising Ameritech (40%), Singapore Telecom (27%), Tele Danmark (33%)); Mobistar (France Telecom, 90%), Telinfo (Belgium, 10%).

*France.* Bouyges Telecom (C&W (UK, 20%), US West (5%), Veba (Germany, 15%)); SFR (SBC (US, 10%), Vodafone, Cie Generale des Eaux (France)); Alcatel Data Networks (Sprint (49%), Alcatel Alsthom (51%)); St Pierre & Miquelon (France Telecom (20%)).

*Germany.* E-Plus PCN (BellSouth (US, 21.4%), Thyssen Telecom (28.4%), Vebacom (28.4%), Vodafone (16.4%); Vebacom (C&W (45%), Veba

(Germany, 55%); Viag Interkom (BT (50%), Viag (Germany, 50%)); Mannesman Mobilfunk (AirTouch (34.8%), Mannesman AG (Germany)).

*Gibraltar.* GibTel (BT (50%), Gibraltar Government (50%)); Gibraltar-NYNEX Communications Company (Gibraltar Government (50%) and NYNEX (50%)).

*Greece.* Panafon (France Telecom (35%)).

*Ireland.* Esat Digifon (Comunicorp (Ireland, 40%), ITU Nominees (Ireland, 20%), Telenor (Norway, 20%)).

*Italy.* Albacom (BT (50.5%), Banco Nazionale del Lavoro (Italy, 49.5%)); Infostrada (Bell Atlantic (US, 33%), Olivetti (Italy, 67%)); OmniTel (Bell Atlantic (11.6%), Olivetti (41.5%), Telia (6.8%), AirTouch (15.8%), Mannesman AG (6%)).

*Spain.* AirTel/ASR (AirTouch (15.8%), BT (6.3%), Banco Santander and Banco Central Hispano (27.4%), group of regional Spanish banks and utilities (16.8%)); Megared (BT (50%), Banco Santander (Spain, 50%)).

*Sweden.* FTNS Nordic (France Telecom (100%)); Telenordia (BT (33%), Tele Danmark, Telenor); Tele2 (C&W (39.9%), Kinnevik (Sweden, 60.1%)); NordicTel (AirTouch (51%), Vodafone (19.5%), consortium of Swedish banks (29.5%)).

*Portugal.* Contactel (Telefonica (15%), Eastecnica (C&W (97%)); Telecel (AirTouch (23%), Espirito Santo (Portugal, 38.5%), Amorim (Portugal, 38.5%)).

*UK.* Telewest (Cox (US, 11.75%), SBC (11.75%), TCI (US, 26.75%), US West (26.75%); Videotron (Bell Canada (23%), C&W (0.03%)); Bell Cable-Media (Bell Canada International (42%), Jones Intercable (12.3%), C&W (12.8%)); Cablecomms (NYNEX



(75%); Cellnet (BT (60%), Securicor (UK, 40%)); Mercury (C&W (80%), Bell Canada Enterprises (20%)); Mercury One 2 One (C&W (50%), US West (50%)).

*Europe general.* Atlas (Deutsche Telekom (50%) and France Telecom (50%)); C&W Europe (C&W (50%) and Veba (50%)); Unisource (KPN (25%), Swiss Telecom PTT (25%), Telefonica (25%), Telia (25%)).

### Eastern Europe

*Armenia.* Armentel (two Armenian PTOs and Trans-World Telecom (US)).

*Belarus.* Belcel (C&W (50%), Belarus Government (50%)); Mobilkom (C&W (49%), Bulgarian Telecommunications (51%)).

*Bulgaria.* Sprint Business Telecom (Sprint (60%), Bulgarian Telecommunications (40%)).

*Czech and Slovak Republics.* Eurotel Cellular Service (US West (24.5%), Bell Atlantic (24.5%), Czech PTO (25%), Slovak PTO (25%)); SPT Telecom (Swiss Telecom PTT (13%), KPN (13%)); TMobil (DeTeMobil) (Germany, 84.5%), STET (12%), three Czech companies).

*Estonia.* Eesti Mobiltel (Estonian PTO, Telecom Finland, Telia (24.5%)); Starman Elektroonika (Telia (60%)).

*Hungary.* Matav (67% Ameritech and Deutsche Telekom through their joint venture, MagyarCom); MagyarCom (Ameritech (50%), Deutsche Telekom (50%)); Pannon GSM (KPN (20%), local Hungarian carriers, Nortelinvest (Norway), Telecom Finland, Tele Danmark, Telia (13%)); Operator Hungaria (France Telecom (49%), Antenna Hungaria (51%)); Westel Radiotelefon (US West (41.9%), Matav (Hungary, 43.6%), KFT (Hungary, 9.5%), World Bank/IFC (5%)); JaszTel (Swiss Telecom PTT (50%), KPN (50%)).

*Latvia.* Lat Mobilais Telfons (Telecom Finland, Telia (25%), three Latvian companies); Tilts Communications (C&W (63%), Lattelekom (Latvian PTO), Telecom Finland, World Bank/IFC); Lattelekom (C&W (21%)).

*Poland.* Centertel (Ameritech (25%), France Telecom (25%), local Polish PTO); Polkomtel (AirTouch (19.25%), Plock (Polish oil refinery, 19.25%), Polska Miedz (Polish state-owned copper producer, 19.25%), Tele Danmark (19.25%), Polskie Sieci (Poland, 11.5%), Weglokoke Stalexport (Poland, 5.5%), Tele-Energ (Poland, 1.0%), Telbank (Poland, 0.5%), BIG (Poland, 0.5%); Sprint RPTelekom (Sprint (26%), RP Telekom (Poland, 74%)).

*Romania.* Telefonica Telemobil (Telefonica (60%)).

*Russia.* A/O Telmos (AT&T (50%), Moscow City Telephone Company (50%)); Metropolitan Communications (C&W, Intertelecom (Russian PTO)); Mobil TeleSystems (Deutsche Telekom (27%), France Telecom (11%)); Rosnet International (AT&T (55%), Rosnet (Russia, 42%), Intercon (US consulting group, 3%)); St Petersburg Int'l (BT (40%), Russian Government (60%)); Moscow Cellular Communications (US West (22%)); Rosprint (Sprint (50%), Central Telegraph (Russia, 50%)); Sprint Networks (Sprint (50%), Central Telegraph (Russia, 50%)); NW GSM (Telia (25%)); Delta Telecom (US West (45%)).

*Ukraine.* Ukraine Mobile Communications (Ukrainian PTOs (52%), Deutsche Telekom (16%), KPN (16%), Tele Danmark (16%)); UTEL (Deutsche Telekom (17%), AT&T (17%), KPN (17%), Ukrainian Ministry of Communications (51%)).

### Africa and the Middle East

*Bahrain.* Batelco (C&W (20%), Bahrain Government (80%)).

*Central African Republic.* Socatel (France Telecom (40%), French Government (60%)).

*Israel.* Newtone (BT (25%), MCI (15%), Darcom (Israel, 20%), Globe-Tel (Israel, 20%), Idan Software (Israel, 20%); Bezeq (C&W (10%), Israeli Government (65%), public (25%)); Pelephone (Bezeq (50%), Motorola (50%)).

*Ivory Coast.* Societe Ivorian de Mobiles (ComAfrique (Ivory Coast, 30%), France Telecom (70%)).

*Namibia.* Namibia GSM (Telia (26%)).

*Senegal.* Sonatel (France Telecom (34%), Senegal Government (66%)).

*South Africa.* MTN (C&W (25%), SBC (15.5%), group of South African companies (59.5%)).

*Turkey.* Teletes (Deutsche Telekom (20%)); Turkcell (Ericsson (Sweden, 15%), Telecom Finland (35%), Turk Telekom (50%)); Comsat Telecommunications Services (Comsat (US, 51%), Koc-Unisys (Turkey, 24.5%), Sumitomo (Japan, 24.5%)); Telsim Mobil Telekomunikasyon Hizmetleri (Alcatel (France), Detecom (Turkey), Siemens, Teletes (Turkey), Simko (Turkey), Rumeli (Turkey)).

*Yemen.* YITC (C&W (51%), Yemen Government (49%)); Tele-Yemen (GPTC (Yemen), C&W (51%)).

*Africa general.* Africa ONE—37 000 km submarine cable surrounding Africa ITU, RASCOM (Africa), PATU (Africa), AT&T, Alcatel.

### Asia-Pacific

*Australia.* AAP Telecommunications (Singapore Telecom (24.5%), AAP (Australia, 51%), Todd New Zealand (24.5%)); Infolink Network Services (Singapore Telecom (55%)); Optus (BellSouth (24.5%), C&W (24.5%), Australian investors); Telstra V-Comm (Telstra), Videsh Saniha Nigam (India)).

*Cambodia.* Cambodia GSM Limited (Cambodian Ministry of Posts and

Telecomms, Royal Groups of Companies, Millicom International Cellular (UK)).

*China.* Yunnan & Xhia (AT&T).

*Fiji Islands.* Fiji International Telecommunications (C&W (49%), Fiji Government (51%)).

*Hong Kong.* Personal Communications (BT (20%)); Hong Kong Telecommunications (C&W (58%), CITIC (China, 10%), Hutchinson Whampoa (Hong Kong, 32%)); Honeycomb International (China Unicom, Hysan (Hong Kong), Tele Danmark, Telenor); Smartone (AT&T (30%), ABC Communications (Hong Kong, 15%), Sun Hung Kai (Hong Kong, 40%), Town Khan (China, 15%)).

*French Polynesia.* Telecoms Ext. de la Polynesie Francaise (France Telecom (49%)).

*India.* BPL Systems (BPL Group (India, 51%), France Telecom (35.5%), LCC (US, 13.5%)); Wipro BT (BT (50%), Wipro (India, 50%)); Birla Communications (AT&T (49%), Birla Group (India, 51%)); Mahindra (BT (40%), Mahindra & Mahindra (India, 60%)); Max BT (BT (40%), Max India (60%)); NYNEX-Reliance Cellular Company (NYNEX (50%), Reliance (India, 50%)); India Cellular (BT (49%)); Escotel (Escorts India, First Pacific Company (Hong Kong)); Hexacom (Shyam Cellular Infrastructure Projects (India), Telecommunications Consultants (India), Telesystem International Wireless (Canada), Kuwait Mabite Teleco Corp)); Fascal (Himaschal Futuristic Communications Ltd, Shinawatra (Thailand), Bezeq, Kotak Mahindra (India)); Natel D (Swiss Telecom PTT (30%)).

*Indonesia.* PT Satelindo (Deutsche Telekom (25%), PT Birngaraha (Indonesia, 45%), PT Telekom (Indonesia, 22.5%), Indosat (7.5%)); Information Network Services (Singapore Telecom (100%)); PT Bukaka Singapore Telecom International (Singapore Telecom (40%), FIT Bukaka Telekomindo International (Indonesia, 60%), AT&T

(20%), KDD (20%), DTAG (Malaysia, 20%)); PT Pramindo Ikat Nusantara (PT Astratel Nusantara (Indonesia), France Telecom, two local Indonesian companies).

*Japan.* Network Information Services (BT); International Digital Communications (C&W (17.6%); NTT FAN NTT (Japan, 44%), AT&T, Sony)); AT&T Jens (AT&T (62.2%), consortium of 22 major Japanese companies including Fujitsu, Hitachi, Industrial Bank of Japan, and KDD (37.8%)); Tu-ka Cellular (BT (5%), GTE (US), US West, Nissan (Japan), Motorola)); Globe Telekom (Ayala (Philippines, 50%), Singapore Telecom (50%)); PHS International (NTT, C&W, Hong Kong Telecom, Itochu (Japan)); Tu-Ka Chugoku (GTE (4.5%), Air-Touch (4.5%), Nissan (23.75%), Japan Telecom (23.75%), Hoitachi (Japan, 5.5%), West Japan Railways (5.5%), Nippon Steel (Japan, 5.0%), Toyota (Japan, 5.0%)); Titus Communications (US West, Toshiba, Itochu, Time Warner Japan).

*Macau.* Companhia de Telecomunicacoes de Macau (C&W (51%), Macau Government (49%)).

*Malaysia.* Muitara Telecommunications (Swiss Telecom PTT (30%), Tan Sri Tan (Malaysia, 70%)); TRI of Malaysia (Deutsche Telekom (21%)).

*Maldives.* Dhivehi Raajjeye Gulhum Private (C&W (45%), Maldives Government (55%)).

*New Caledonia.* OPT New Caledonia (France Telecom (49%)).

*New Guinea.* DGCT (France Telecom (40%)).

*New Zealand.* Clear Communications (BT (25%), MCI (25%), Television New Zealand (25%), TODD (New Zealand, 25%)); Pacific Star Communications (Bell Atlantic (49%), Telecom Corp of New Zealand (51%)); Telecom New Zealand (49.9% joint equity ownership by Bell Atlantic and Ameritech).

*Pakistan.* Paktel (C&W (80.7%), Pakistani Government (19.3%)).

*Philippines.* Globe Telekom (Singapore Telecom (50%)); Smart Communications (NTT (15%), First Pacific (Hong Kong, 14%), Metro Pacific (Philippines, 14%), Ve-a-Fernando Group (Philippines, 57%); ETPI (C&W (40%)).

*Singapore.* MobileOne (Keppel Group, Singapore Press Holdings, C&W, Hong Kong Telecom).

*South Korea.* Shinsegi Mobile Communications (SBC (8.3%), Pohang Iron & Steel (South Korea, 15%), Kolon (South Korea, 15%), Qualcomm (2%), consortium of Korean investors (59.7%)).

*Sri Lanka.* Lanka Cellular Services (Singapore Telecom (76%)); Lanka Communications Services (Singapore Telecom (52%)).

*Thailand.* TelecomAsia (NYNEX and local Thai PTO); TT&T (NTT (18.5%), local Thai PTO (81.5%)).

*Vanuatu.* Vanitel (France Telecom (33%), Vanuatu Government (67%)); Vanitel Cellular (France Telecom (33%)); Telecom Vanuatu (C&W (100%)).

*Asia-Pacific Region.* Asean Telecom Holding (Communications Authority of Thailand (20%), Philippines Long Distance Telephone Company (20%), PT Indosat (Indonesia, 20%), Singapore Telecom (20%), Telecom Malaysia (20%)); Asiasat (C&W, Hutchinson Whampoa (Hong Kong), Chinese investment company); Jupiter Telecommunications (Sumitomo (37.5%), TCI (US, 32.5%), Japanese TV Networks (30%)).

### *The Americas*

*Argentina.* Telecom Argentina (France Telecom (19.5%), J P Morgan (US), Perez Company (Argentina), STET (19.5%)); Telefonica de Argentina (Telefonica (22%), Citicorp (US), Techint (Argentina)); Movistar (France Telecom (10%), Telefonica (10%)); Sprint Movil (Sprint (51%));

**Compania de Telefonos de Interior** (AT&T (10%).

**Barbados.** Barbados External Telecommunications (C&W (85%), Barbados Government (15%).

**Belize.** Belize Telecom (MCI (23.5%).

**Bolivia.** Entel (Bolivian Government (50%), STET (50%).

**Canada.** British Columbia Telephone (GTE (100%)); Quebec Telephone (GTE (100%)); Sprint Communications Canada (Sprint (100%)); Unitel (AT&T (33%), Bank of Nova Scotia (Canada, 28%), Royal Bank of Canada (16%), Toronto Dominion Bank (Canada, 23%)); WorldLink Telecom (Infonet consortium, Bell Canada).

**Chile.** CTC (Telefonica (43.6%)); VTR Inversiones (Grupo Luksic (Chile, 51%), SBC (40%), Siemens (9%)); Entel (Chilquinta (Chile, 18%), Private Pension Funds (Chile, 46%), Samsung (Korea, 16%), STET (20%)); CTC Cellular (Telefonica (44%).

**Colombia.** Cocolo (Telefonica (22%)); Cellumovil (AT&T (35%), Grupo Santo Domingo (Colombia), LCC, Nothingham Holdings (US)); Cellumovil de la Costa (AT&T (10%)); Ocel (C&W (22.3%)); Codelco (Telefonica (31%).

**Cuba.** Etecsa (Cuban Government (51%), Grupo Doms (Mexico, 37%), STET (12.5%).

**Dominican Republic.** Codetel (GTE (100%).

**Ecuador.** Otecel (AT&T).

**Grenada.** Grenada Telecommunications (C&W (70%), Grenada Government (30%).

**Jamaica.** Jamaica Digiport (AT&T (35%), Jamaican Government (65%)); Telecommunications of Jamaica (C&W (79%), Jamaican Government (21%).

**Mexico.** Telmex (equity investments by France Telecom (5%), Grupo Carso (Mexico, 10.4%), SBC (5%)); Alestra (AT&T (20%), Grupo Alfa (Mexico, 25.6%), Grupo Bancomer (Mexico, 24.4%), GTE (14.5%), Telefonica (14.5%)); Avantel (MCI (49%), Grupo Financiero Banamex Accival (Mexico, 51%)); Iusacel (Bell Atlantic (49%), Grupo Iusacel (Mexico, 51%)); Telcel (France Telecom, Telmex (Mexico)); Movitel de Noroeste (AT&T (22%)); Radiomovil (France Telecom).

**Peru.** Telefonica del Peru (Peruvian Government (7.7%), Telefonica (35%).

**Puerto Rico.** Telefonica Larga Distancia de Puerto Rico (Telefonica (80%)); AT&T Puerto Rico (AT&T (100%).

**United States.** MCI (BT (20%)); Nextel Communications (NTT (0.9%), Bank of Tokyo, Matsushita (Japan)); Nextwave (NTT (2%), Philadelphia Power (US), Qualcomm, Sony)); Sprint (Deutsche Telekom (10%), France Telecom (10%)); C&W Inc (C&W (100%)); AskyB (MCI, Newscorp (UK)).

**Uruguay.** Teco Tasa (France Telecom, Telecom Argentina, Telefonica (10%).

**Venezuela.** CANTV (40% equity investment by a consortium comprising Banco Mercantil Group Caracas (Venezuela, 12%), Electricidad de Caracas (Venezuela, 16%), GTE (51%), Lucent (US, 5%), Telefonica (16%); MCI de Venezuela (MCI (100%).

**America general.** Optel Communications (Teleglobe (20%), US private investors (80%)); Canus 1—linking US and Canada and linked to Europe by transatlantic cable (Optel Communications (US, 50%), Teleglobe (50%); MCI-Stentor (MCI (Canada)).