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Most Notes from Private Sector are also available on-line. There is full text in HTML format for on-screen viewing or a downloadable file in Adobe’s PDF format (http://www.worldbank.org/html/fpd/notes/notelist.html).
The Restructuring and Privatization of the U.K. Electricity Supply—Was It Worth It?  
David M. Newbery and Michael G. Pollitt report on a study that assesses the costs and benefits of the restructuring and privatization of the electricity supply sector in England and Wales. Since privatization, real unit costs have fallen by about 50 percent and real pool prices by 20 percent, and a switch from coal to gas has contributed to a drop in polluting emissions. But some of the positive changes can be attributed to external factors, such as the development of high-efficiency combined cycle turbines and the fall in coal prices. So the authors estimate the net benefits of privatization over the period 1995–2010 by comparing the historical and projected path of the privatized industry with what might have happened had the assets stayed under public ownership. They estimate the overall net benefits from privatization at £11.9 billion. Costs fall, but much of the benefit goes to the generators—because prices in the wholesale market fall much less. The authors suggest that more competition may help to reduce these prices.

A Retrospective on the Mexican Toll Road Program (1989–94)  
In 1989, Mexico initiated a private toll road program of fifty-three concessions involving an investment of about US$1.3 billion in limited recourse financing over the period 1989–94. The program more than doubled the size of the national toll road network, but miscalculations of investment costs and overoptimistic forecasts of operating income undermined the viability of the toll roads. An already bad situation was made worse by the Mexican currency crisis of December 1994, and the private toll road initiative came to a virtual standstill. Local commercial banks were saddled with nonperforming loans estimated at US$4.5 billion to US$5.5 billion. Concessionaires and their affiliates have been faced with writing off large portions of their investments. And users were left with some of the highest tolls in the world. Jeff Ruster diagnoses the flaws in the design of the program and shows how the failure was manifested in the implementation of different phases of the projects.

The Private Sector in Water and Sanitation—How to Get Started  
The more risk and responsibility a government hands over to the private sector in water and sanitation, the more powerful the incentives for better performance—but also the more demands on the government in commitment and preparation. So a government about to enter into a long partnership for a water concession or build-operate-transfer arrangement—typically for twenty-five to thirty years—needs to be sure that it does not overlook details that will later land it in messy renegotiations. A lease is less demanding, but offers smaller gains and will not fix such problems as chronic underinvestment. It will, however, give the government time to prepare a longer-term option. In this Note, based on toolkits recently published by the World Bank, Penelope J. Brook Cowen sets out the range of options for involving the private sector in water and sanitation and reviews the lessons on what can make or break a private participation process.

Privatization and Restructuring in Central and Eastern Europe  
One of the most important policy questions in the transition economies is what governments can do to speed the restructuring of firms and thus hasten the transition to a mature market economy. Robert E. Anderson, Simeon Djankov, Gerhard Pohl, and Stijn Claessens report on a study that provides some answers. Privatization encourages restructuring if it is rapid and comprehensive and leads to concentrated ownership. Privatization also promotes restructuring because privatized firms are more likely than state-owned enterprises to exercise wage restraint—and wage restraint is vital to free up the necessary internal finance. But policies that increase bank lending to firms, such as debt forgiveness and recapitalization, may do more harm than good. The safest course is to recapitalize banks only as part of privatization and to encourage negotiations for financial restructuring only after the banks are privatized.
The Drivers of the Information Revolution—Cost, Computing Power, and Convergence 27

James Bond explains the drivers of the information revolution—the decline in the cost of transmitting information, the increase in the power of computing, and the shift from analog to digital information technologies that has joined the telecommunications and computing industries and merged segments of the information industry. Over the past twenty years, the cost of voice transmission circuits and the computing power per dollar invested have both fallen by a factor of 10,000. Prices have not fallen nearly as fast—they have been set by a cartel-like system of international agreements between incumbent monopolies. But as convergence restructures the telecommunications industry, new operators are arbitraging the difference between costs and the old tariff structures, putting pressure on incumbent telecommunications operators.

Telecommunications Is Dead, Long Live Networking 31

James Bond looks at how the drivers of the information revolution are transforming the structure of the telecommunications industry. The end of natural monopoly, the breakdown of the old pricing mechanisms, the increasing competition from new operators and new products, and the globalization of the industry are forcing radical change. This spells trouble for incumbent telecommunications operators—most of whose assets are holes in the ground. Many incumbents are responding by forming global alliances. But this trend may have more to do with their desire to recreate in international markets the oligarchies they are used to at home than with the underlying market forces. Where is the industry heading? One view of the future sees transmission capacity and bandwidth becoming tradable commodities, with the industry fragmenting into wholesalers investing in capacity, brokers intermediating supply and demand for capacity, and retailers dealing with the consumer.

Telecommunications Reform—How to Succeed 35

Telecommunications reform—privatization and opening markets to competition—can be a positive-sum game in which all stakeholders gain: customers, existing and new operators, employees, domestic and foreign investors, and government. But the extent and timing of benefits vary from one case to another. Björn Wellenius sets out some rules for reform that will enhance those benefits: Get support at the highest level of political authority. Sort out conflicting objectives early—especially the conflict between maximizing revenue and delivering more, better, and cheaper services. Use market mechanisms rather than individual negotiations to select partners and determine the right sale price. Establish and follow clearly defined processes for sale and regulation that are open to participation and review by all interested parties. And respect and trust the general public and keep it informed. Although major transactions such as a privatization or the issuance of new licenses drive the reform agenda, change continues well beyond them. Following the rules and honoring commitments help consolidate an environment for sustainable development of telecommunications.

Liberalizing Telecommunications and the Role of the World Trade Organization 39

In February 1997, sixty-nine governments of high-income and developing countries agreed to liberalize their basic telecommunications services under an agreement negotiated through the World Trade Organization. Most participants in the agreement have subscribed to procompetitive regulatory principles, including independent regulators, competitive safeguards, measures to ensure interconnection, universal service obligations, and transparent and nondiscriminatory practices in licensing. The markets affected by the arrangement represent more than 90 percent of the world market for telecommunications. Carlos A. Primo Braga reviews the evolution of the agreement and argues that the critical issues now are ensuring the quality of implementation and setting up a procompetitive regulatory environment.
What the Transformation of Telecom Markets Means for Regulation

Peter Smith looks at the impact of the changes in the telecommunications industry on regulation. As demand changes, services converge, and new players emerge, the key issue for regulators is promoting competition. The work of regulators is becoming increasingly complex at the same time that convergence and the common principles established in regional and international trade agreements are reducing their discretion. One way for regulators to deal with the complexity is to privatize aspects of regulation—for example, by creating property rights to the spectrum and by outsourcing some regulatory tasks. But the specialized telecommunications regulatory agency is probably a transitory entity that may eventually find itself merged into a multisectoral antitrust agency.

The Private Sector and the Internet

Carlos A. Primo Braga and Carsten Fink look at the rise of the Internet as the main application behind the emerging global information infrastructure. Many now believe that the Internet provides a window into a future in which access to information will be independent of geographic location and interactivity in a multimedia environment will be ubiquitous. The authors review the need for a regulatory framework for the Internet in three critical areas: provision of backbone access, Internet service providers, and information services. They also explore the problem of the appropriability of content, discussing intellectual property rights in the digital era and other remedies to the cost recovery problem. For developing countries, however, the critical bottleneck is still their weak information infrastructure.
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The Restructuring and Privatization of the U.K. Electricity Supply—Was It Worth It?

David M. Newbery and Michael G. Pollitt

The electricity supply industry in England and Wales was under public ownership from 1948 to 1990. For most of this period, a single company, the Central Electricity Generating Board (CEGB), operated all generation and transmission as a vertically integrated statutory monopoly, while twelve area boards acted as regional distribution monopolies. The CEGB during this time was a classic example of a cost-of-service regulated public utility—with excessive capital costs, overdependence on high-cost indigenous coal and nuclear power, low productivity growth, and low return on assets.

In 1990, the CEGB was restructured and privatized. What were the costs and benefits? The question is important not only because the CEGB accounted for such a significant share of economic activity—with value added equal to about 1 percent of GDP—but also because its restructuring was a key part of the “British electricity experiment,” which has provided a model for power sector reform around the world. This Note reports the results of a social cost-benefit analysis of the restructuring and privatization of the CEGB.

The reform

The restructuring of the CEGB involved dividing it into four successor companies on March 31, 1990—three of which were soon sold to the general public—creating a power pool, and liberalizing entry into the generation market. The three privatized companies are National Power and PowerGen, which took the thermal generating plant, and National Grid, which was allocated the high-voltage transmission network. Nuclear Electric took the nuclear power stations.

Significant changes followed. In the first six years after restructuring, labor productivity in the successor companies more than doubled. There was a marked shift away from coal and toward natural gas. At privatization, generation based on fossil fuel used 92 percent coal, 7 percent oil, and only 1 percent gas. In the next five years, purchases of British coal fell from 74 million metric tons to 30 million, and by August 1996, gas accounted for 23 percent of generation. In the meantime, the price of coal delivered to power stations fell by 20 percent in real terms. The switch from coal and the “dash for gas” contributed to a substantial drop in emissions of sulfur dioxide and nitrogen oxides, both sources of acid rain, and of carbon dioxide, the cause of global warming.

The power generation sector added 9.5 megawatts of capacity in combined cycle gas turbines (nearly 20 percent of peak demand) in 1990–96, while demand rose less than 6.5 percent; of the new capacity, half was installed by new entrants. Fossil fuel costs per kilowatt-hour (kWh) of electricity generated fell by 45 percent in real terms as a result of fuel switching and efficiency increases, while nuclear fuel costs per kWh fell by 60 percent. Overall, real unit costs fell by about 50 percent, while real pool prices fell by a more modest 20 percent, with the difference between the two figures reflecting the lack of competition among generating companies.

Some of these positive changes could be attributed to external factors. The timely development of high-efficiency combined cycle gas turbines, the lifting of the European Union (EU) ban on burning gas to generate electricity, and tighter EU limits on sulfur emissions all encouraged the switch to gas, and the decline in...
international coal and oil prices and in the
domestic price of gas contributed to the re-
duction in unit costs.

The restructuring and privatization were not
without costs. The “dash for gas” greatly accel-
erated the decline of the coal industry. Em-
ployment fell from nearly 250,000 miners at
the time of the 1984–85 coal miners strike to
only 7,000 by 1994. The collapse of the British
coal market was the subject of a Parliamentary
inquiry. Partly in response to that inquiry, policy
toward the still publicly owned nuclear gen-
eration industry was reviewed, plans to build
more nuclear power stations were abandoned
in early 1996, and the nuclear industry was re-
structured. The more modern nuclear power
stations were sold as British Energy in June
1996, leaving only the rump of aging first-
generation Magnox stations and the fuel re-
processing facilities in the public sector. The
coal industry was privatized at the end of 1994.

A social cost-benefit analysis

Studies have used several methods to assess the
economic effects of privatization on formerly
state-owned companies, including financial perfor-
manence analysis, labor and total factor
productivity analysis, frontier efficiency measure-
ment, and social cost-benefit analysis. Although
all these methods are of interest, only a full so-
cial cost-benefit analysis identifies who gained,
who lost, and by how much—by comparing the
historical and predicted future course of an in-
dustry after privatization with a counterfactual
in which the industry remains unprivatized.
Jones, Tandon, and Vogelsang (1990) set out
this method, and Galal and others (1994) apply
it to twelve privatizations, two of which involved
Chilean electricity companies.

In simple terms, the analysis reduces to a project
appraisal, in which restructuring and privatiza-
tion are an investment project that has associ-
ated costs (redundancy payments, brokers fees)
and creates a stream of net benefits arising from
the evaluated differences between the privatized
industry and a counterfactual publicly owned
industry. The costs and benefits continue into
the future, so the method involves projecting
into the future both the actual outcomes and the
counterfactual.

The social cost-benefit analysis of the CEGB’s
restructuring and privatization proceeds in two
stages: first the net benefits of the restructur-
ing and privatization are calculated, then these
benefits are apportioned among shareholders,
the government, and the power purchasers in
the pool or wholesale market (the distribution
companies and the supply businesses of the
generating companies) to see how the gains
are distributed. The first stage of the analysis
values four areas of net benefits and costs sepa-
rate ly: the efficiency savings, the investment
and fuel use effects, the costs of reorganiza-
tion, and the environmental benefits. In each
area, it establishes a set of counterfactuals with
which data or projections for the actual indus-
try are compared. The start date from which
the effects of restructuring and privatization are
evaluated is a weighted average of the years
1985–88. Actual data are available until March
1996, and projections are made to 2010.

To allow some sensitivity analysis for the more
debatable issues, two counterfactuals are used.
One is labeled pro-privatization because the un-
derlying assumptions about the industry under
continued public ownership are more pessi-
mistic than under the other counterfactual and
so it suggests greater net benefits from privati-
zation. The other counterfactual is labeled pro-
CEGB because its more optimistic assumptions
about the industry under continued public
ownership point to smaller net benefits from
privatization. The counterfactuals incorporate
three key items: Productivity growth is lower
in both counterfactuals compared with the act-
ual, but slightly higher under pro-CEGB than
under propriovatization. Gas and coal prices are
the same as actual under pro-CEGB but higher
under propriovatization. And under both
counterfactuals, the CEGB invests in uneco-
nomic nuclear capacity and retrofitting of some
coal plant with flue-gas desulfurization units,
but under propriovatization it builds more
nuclear and coal plant and does more retrofit-
ting. The counterfactuals are based on reports
of the CEGB before privatization and an analysis of the CEGB's performance in the decade before restructuring. The proprivatization counterfactual is probably closer to what would have happened in the absence of privatization.

The results

What does the analysis show about the net benefits? The fuel and investment effects of the privatization range from gains of £3.6 billion to losses of £0.7 billion (at the U.K. public sector's preferred 6 percent discount rate), depending on assumptions about how a utility under continued public ownership would have invested in new capacity (table 1). The net gains from privatization are higher relative to the proprivatization counterfactual; the gains come from the ending of the expensive nuclear expansion program that might have seen two new nuclear power stations built and the sharp switch from expensive British coal to cheaper natural gas for electricity generation.

Regardless of the counterfactual used, some of the benefits of privatization are dissipated in higher payments to Electricité de France (EdF), the French utility, for its cheap electricity imports. This happens because before privatization EdF had received a price equal to the average of the marginal costs of the two systems (a price lower than the system marginal cost in England and Wales), while since privatization it has received the pool price (which is at or above system marginal cost) plus a share of the fossil fuel levy paid to non-fossil fuel generators (introduced at the time of privatization to finance decommissioning at Nuclear Electric). If privatization had not occurred in the United Kingdom, the payment terms would not have changed to the benefit of EdF.

Against both counterfactuals, privatization yields substantial environmental benefits as cleaner gas generation replaces older coal-fired plant and thermal efficiencies rise at the remaining fossil fuel plant, leading to sharply reduced emissions. The figures in table 1 are conservative estimates of the environmental benefits, which include unmeasured improvements in nitrogen oxide emissions and benefits from reduced coal burning.

The restructuring and privatization have high direct costs, £2.8 billion. This figure includes all the restructuring costs of the successor companies, including substantial redundancy and early retirement payments. But the restructuring and privatization deliver unambiguous benefits in lower operating costs (£8.8 billion relative to proprivatization, £7.6 billion relative to pro-CEGB). The difference reflects the lower labor and materials and services costs that the restructuring and privatization deliver—gains difficult to imagine under a counterfactual publicly owned CEGB.

<table>
<thead>
<tr>
<th></th>
<th>Relative to proprivatization counterfactual</th>
<th>Relative to pro-CEGB counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel and investment effects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End of nuclear expansion program</td>
<td>3.3</td>
<td>2.8</td>
</tr>
<tr>
<td>Effect on price of French imports</td>
<td>-2.6</td>
<td>-1.5</td>
</tr>
<tr>
<td>Net fossil fuel costs</td>
<td>2.9</td>
<td>-2.1</td>
</tr>
<tr>
<td>Total</td>
<td>3.6</td>
<td>-0.7</td>
</tr>
<tr>
<td><strong>Externality benefits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reductions in sulfur dioxide emissions (£125 per metric ton)</td>
<td>1.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Reductions in carbon dioxide emissions (£12 per metric ton of carbon)</td>
<td>1.4</td>
<td>1.2</td>
</tr>
<tr>
<td>Total</td>
<td>2.3</td>
<td>1.9</td>
</tr>
<tr>
<td><strong>Restructuring</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costs</td>
<td>-2.8</td>
<td>-2.8</td>
</tr>
<tr>
<td>Cost savings</td>
<td>8.8</td>
<td>7.6</td>
</tr>
<tr>
<td>Total</td>
<td>6.0</td>
<td>4.8</td>
</tr>
<tr>
<td>Total net benefits</td>
<td>11.9</td>
<td>6.0</td>
</tr>
<tr>
<td>Total net benefits (pence per kWh)</td>
<td>0.21</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Source: Authors' estimates.
The overall net benefit of the privatization is substantially positive relative to both counterfactuals: £11.9 billion and £6.0 billion. These figures may be converted to permanent savings in the unit cost of electricity of 0.21 and 0.09 pence per kWh at a time that electricity prices were about 2.8 pence per kWh. Thus, privatization delivers a permanent cost reduction equivalent to about 3.2 to 7.5 percent of prices, or an extra 40 percent return on assets.

How has this net benefit been distributed among shareholders, purchasers in the wholesale market, and the government? Examination of price trends shows that wholesale prices have not fallen nearly as fast as costs and that profits have risen sharply in the successor companies: combined profits (before taxes and exceptionals) rose from £2.0 billion in 1991–92 to £3.5 billion in 1995–96. The share prices of National Power and PowerGen have approximately tripled since flotation, outperforming the stock market by more than 100 percent. Thus, the companies seem to have unambiguously gained from the privatization. Power purchasers seem to be paying higher prices than they would have under continued public ownership (higher company profit margins offset lower costs). And the government has gained from sales revenue, higher taxes on profits, and dividend income, though it has lost the revenue associated with the public sector dividend target for the CEGB.

Table 2 shows one possible calculation of the distribution of the net benefits of privatizing the CEGB. In it prices in the privatized industry and the counterfactual publicly owned firm converge in 2000. The study assumes that regulation would ensure long-run convergence of predicted and counterfactual prices. The results of the calculation show the perverse nature of the distributional effects of the privatization. The government’s substantial sales revenue (£9.7 billion) up to March 1996 is at least partially offset by loss of flow revenue, because tax revenue from the successor companies falls below the public sector dividend target. As a result, the government is £1.2 billion better off relative to proprivatization if prices converge in 2000. Relative to both counterfactuals, the shareholders benefit by more than the total net benefit, even after the sales proceeds paid to acquire the assets are subtracted.

Conclusion

Was it worth it? Yes, but the analysis suggests two major areas for improvement in the process of the restructuring and privatization. First, about a quarter of the net gains were transferred out of the country because of the change in payment arrangements for French electricity. If more attention had been paid to this possibility at the time of restructuring, some arrangement could probably have been found to prevent it. Second, introducing more competition in generation (by creating more successor companies) would have reduced excess entry and lowered prices, improving the distribution of the net benefits and increasing social welfare.

References


David M. Newbery and Michael G. Pollitt, Department of Applied Economics and Faculty of Economics, University of Cambridge, Cambridge, U.K.
A Retrospective on the Mexican Toll Road Program (1989–94)

Jeff Ruster

Mexico's private toll road program more than doubled the national toll road network—from 4,500 kilometers in 1989 to 9,900 kilometers in 1994. Fifty-three concessions were awarded for the approximately 5,500 kilometers of roads, and by the first quarter of 1995 forty-four were in full or partial operation, representing 5,120 kilometers. The investment of approximately US$13 billion in the program over the period 1989–94 was sourced from local commercial bank debt, concessionaire equity, and federal and state government grants and equity contributions (figure 1).

However, gross miscalculation of investment costs and operating income led to an unsustainable set of operating conditions for these limited recourse financings. The financial equilibrium of the sector was further undermined by the Mexican currency crisis of December 1994. The combination of macroeconomic and project-level factors brought new project development to a virtual standstill, despite government estimates that another 6,500 kilometers of roads are needed by 2000. Restructuring of both project debt and equity investments has been the main focus of recent efforts.

The financial and economic repercussions have been widespread. Local commercial banks were saddled with nonperforming toll road loans estimated at US$4.5 billion to US$5.5 billion. Concessionaires and their affiliates were faced with writing off significant portions of their investments. Moreover, the government has been unable to unplug the road construction program and has been under severe pressure to inject scarce financial resources to rescue investors. Users, in the meantime, were left with some of the most expensive road tolls in the world.

In retrospect, some industry observers have characterized the toll road program as a rushed and poorly designed effort to develop the infrastructure the country needed to compete effectively in an era of free trade. Others have simply labeled it a mechanism to lift the construction industry out of the economic depression of the 1980s. Whatever the diagnosis for the poor performance of the sector, from a private investment perspective the impact was to shut off capital flows to the sector and to add to the Mexican banking system's nonperforming loan portfolio.

This Note presents a diagnostic of key policy, regulatory, and institutional gaps that undermined the financial equilibrium of the sector. A checklist of recurrent problems illustrates how the failure to address these issues manifested itself in the course of implementation.

**Figure 1** Sources of Funding for the Toll Road Concessions

- **Concessionaire equity**: 29% (US$3.8 billion)
- **Domestic commercial banks**: 52% (US$6.7 billion)
- **Federal and state government grants and equity**: 19% (US$2.5 billion)

*Source: Author's compilation.*
BOX 1 THE TOLL ROAD CONCESSIONS

Legal framework. Under the program, the Secretary of Communications and Transport granted concessions to special-purpose entities, which in almost all cases were either directly owned by or were affiliates of one or more local construction companies. The concession agreements were issued under the federal law of General Means of Communication, which governs, among other things, roads that connect two or more Mexican states and bridges along any such road. Under this legal framework, concessions could not exceed fifteen years, though this was later extended to thirty years, and a free, parallel alternative to each highway was required.3

Concession party responsibilities. The concessionaire was responsible for financing, building, operating, and maintaining the toll road subject to government regulation for a specified period of time in exchange for the right to receive toll revenues generated by the project. The role of the Secretary of Communications and Transport centered on project definition, including highway path, location of interchanges and toll booths, and number of lanes; establishment of design and construction standards; design and implementation of tendering procedures; and supervision of the concessionaire.

Concession design. The concession specified the duration of the agreement, the work to be undertaken, operational and maintenance standards, government supervision, required maintenance reserve funds, concessionaire reporting requirements, certain fees payable to the government, and the tolls to be charged. On termination of the concession, the right to operate the highway and to collect toll revenues reverted to the government. The government was to remain the owner of the project throughout the term of the concession.

Tariff and adjustment mechanism. Each concession set forth a schedule of tolls by category of vehicle. Tolls were allowed to increase semiannually in accordance with the consumer price index (CPI) or whenever the CPI increased by 5 percent or more since the previous adjustment. All other toll adjustments beyond the levels set forth in the concession required the government's written approval.

Guarantees. Each concession also contained guarantees of traffic volumes by category of vehicle. Most concessions provided that if the actual traffic volumes on the highway fell short of those specified in the concession, the concessionaire would be entitled to request an extension of the term of the concession to permit recovery of its investment.

Major issues and sector performance

Although the program attracted significant private investment, well-publicized problems negatively affected sector performance. These revolved around the following issues:

- **Inadequate tendering process and concession design.** The prequalification standard was not rigorous enough (for example, bidders were not required to submit a detailed financing plan). Also, the project award criteria limited the pool of potential candidates (and thus potential competition for the market) to a handful of local construction companies that were more interested in the construction work than in the long-term financial viability of the projects. (See box 1 for an outline of the concessions.)

- **Inadequate financial discipline in government-owned commercial banks.** This led to large amounts of non-recourse financing with little or no due diligence undertaking. It was not uncommon for lenders to waive important conditions precedent to initial and subsequent funding (insurance and bonding requirements, securing permits and rights of way, satisfactory review of traffic studies, geotechnical and environmental studies, and the like). As the story goes, such behavior was guided by an implicit understanding that even if the projects proved commercially nonviable, ultimate recourse was indeed to the government.

- **Underdeveloped local financial markets.** Legal and regulatory limitations combined with poor macroeconomic fundamentals inhibited the capacity of local markets to provide long-term fixed rate financing. Peso-denominated debt featured very short maturities rarely extending beyond five years, with interest rates often 1,000 to 1,500 basis points above those paid by the government. This situation was exacerbated by the currency crisis of December 1994, when all-in interest rates rose to more than 100 percent a year for most projects, which were already strapped to meet their debt service obligations.

- **Underdeveloped institutional capability.** The above three issues were aggravated by the fact that the program's scope simply ex-
ceeded the technical and administrative capacity of the local construction industry, the liquidity of domestic financial markets, the project finance experience of most financial intermediaries involved, and the institutional capabilities of regulatory officials. Consequently, the control mechanisms needed to develop the roads within such a short time were never adequately addressed.

A summary follows of how these four problems manifested themselves in project implementation—in the regulatory and institutional framework for the concessions, the operative period, and the financial and legal arrangements of the projects.

**The regulatory and institutional framework**

Problems relating to the regulatory and institutional framework for the concessions included vague project selection criteria stemming in large part from the lack of an intermodal strategy and inadequate planning criteria at the federal and state level, inadequate prequalification and award criteria, uncertain tariff adjustment procedures, and lack of an independent regulatory authority to supervise the contractual arrangements. The major recurring issues included the following:

- This greenfield program sought to establish five main road corridors, three of which were to run between the main industrial centers in Mexico and the principal border crossings into the United States. Nonetheless, some high-priority segments were never concessioned, while others that were constructed lacked contiguous sections that would integrate them into the network. This piecemeal pattern of contracting reduced the near-term attractiveness of the toll roads to long-distance traffic, particularly to truckers, who pay the highest tolls.
- Somewhat related is the lack of an intermodal development strategy. Thus, project development in the various transport sectors often occurred without due coordination. Consequently, investors were unable to determine whether a project fit well into the long-term development plans of a region, especially given concurrent plans to privatize the rail, port, and airport sectors.
- Understaffing and limited institutional capabilities within the Secretariat of Communications and Transport often led to problems in obtaining permits or approvals for change orders on a timely basis and to inadequate enforcement of the concession requirements regarding construction and maintenance quality control standards.
- In addition to the problems relating to bid selection criteria, there was no efficient pre-selection process to screen out potential bidders that lacked the capacity to assume the essential risks of construction design and management, completion of large projects, and commercial management of toll road operations. While operating a toll road is fairly simple (mostly consisting of collecting tolls from passing vehicles), managing a toll road program is much more complex. It includes estimating demand in the face of competition from toll-free roads or other forms of transport, adjusting tolls to optimize revenues, planning maintenance to minimize long-term costs, and managing short- and long-term financial commitments. Ideally, the bidding consortia should be able to demonstrate that these skills are available to them. The lack of a good screening process led, for example, to the selection of medium-size concessionaires that financed their equity contributions through commercial loans. When projects began to suffer financial difficulties, these concessionaires were often unable to meet their equity infusion requirements. Others did not have the necessary technical capabilities, including specialized machinery, skilled labor, and adequate quality control procedures. Even some of the larger companies were stretched too thin, given the speed at which different concessions were awarded to the same firm.
- Formal mechanisms were never established for soliciting or channeling inquiries or requests from private sector participants before, during, or after the bidding process. Thus, the relationship that developed between the public and private sectors often lacked transparency and was at times adversarial.
Project cost structure

Cost overruns and delays frequently arose because of information deficiencies, problems with securing rights of way, lack of effective turnkey construction arrangements, unanticipated design changes, local community resistance, and permitting issues. As a result, the average cost per kilometer of new highway rose to about US$2.6 million to US$2.8 million, compared with the original estimated cost of US$1.7 million. This figure does not reveal the full extent of the overruns associated with the “hard costs” of construction, that is, the costs associated with required equipment, material, and labor, and as opposed to “soft costs” (interest payments during construction, cost escalation due to inflation, advisory services, and the like). The dramatic drop during 1990–94 in both inflation and interest rates offset in part the real increases in hard costs.

Reasons for the cost overruns included the following:

- Projects often broke ground with only very preliminary engineering and design work. In the case of the 267 kilometer Cuernavaca-Acapulco toll road, for example, this led to cost overruns of 200 percent and time delays of thirty months.
- Construction often began without first securing the right of way. This failure was often exacerbated by mounting resistance from local farmers and community groups, environmentalists, and historical conservationists, and resulted in delays and even rerouting of some projects. As problems occurred, machinery and material sat idle while mobilization and interest costs mounted.
- One of the most frequently recurring problems related to supervision and unilaterally mandated change orders by the Secretary of Communications and Transport. In a project in which four pedestrian bridges were expected, the final number reached almost sixty as a result of government-mandated change orders, often required to appease local interest groups.
- Many projects were financed under very loose cost-plus construction arrangements or none at all. This, combined with the fact that lenders only rarely hired an independent engineer to assist them with their due diligence investigation before financial closing or with supervision of the contractors’ efforts, created a void in terms of monitoring quality control programs, permitting issues, and the progress of construction budgets, critical path activities, and the like.
- In some projects, construction came to a virtual standstill because of poorly defined procedures and bureaucratic delays regarding the issuance of permits for purchase and use of chemicals or dangerous substances. In one project, time delays resulting from problems in securing permits for dynamite directly resulted in cost increases of nearly 30 percent.

Project revenue structure

Cash flow generated by the sector has been far below base-case expectations as a result of traffic shortfalls and higher-than-expected operations and maintenance expenditures. The December 1994 currency crisis led to a sharp decline in disposable income and thus road usage, along with a drop in economic activity that resulted in a marked decrease in commercial activity and freight transportation. As a result, of the thirty-two projects for which operating data were available in March 1995, less than five could meet their base-case revenue projections. On average, actual project revenues were 30 percent below original projections.

Important factors leading to this situation included the following:

- Shortcomings in the traffic studies reflected a general lack of expertise by the concessionaires, the lenders, and their consultants in developing adequate methodologies (box 2). On only five of the thirty-two toll roads for which traffic data are available has the average daily traffic been above base-case expectations (table 1).
- In some projects, trucks were expected to account for 20 to 45 percent of users. In reality, trucks were less than 5 percent of the traffic on many roads, leading to a weighted aver-
Traffic study methodologies often suffered from the following:

- Lack of analysis of specific traffic characteristics, including time and seasonal variations by type of vehicle, trip origins and destinations, and purpose and frequency of trips.
- Failure in projections to identify key economic parameters that would affect road usage, such as population, employment, per capita auto ownership, per capita and disposable income, and performance of key industrial indicators.
- Unrealistic growth rate assumptions for extended periods that, if realized, would have exceeded the capacity of the road.
- Failure to include an end-user learning curve or differences in tariff elasticity between end users.
- Overreliance on increased demand due to the opening of interconnecting roads, the construction of which was often delayed or never undertaken.
- Underestimation of the congestion relief that the opening of the new toll road would bring for the toll-free option, and thus overestimation of the actual time savings of the new road.
- Insufficient attention to general conditions of alternative and feeder routes and the identification of factors influencing the traffic-carrying capacity of key sections.
- Inadequate and at times not readily accessible data from the Secretary of Communications and Transport for traffic studies.
- Though investors sometimes employed their own independent consultants, actual fieldwork was limited to one to two weeks of traffic surveys. This was often the result of insufficient time allotted to bidders and financiers between the date of release of the bid documents and the deadline for delivery of bids.

- Inadequate toll collection operations and systems, poorly designed fiduciary structures, and the inexperience of the trustees and commercial banks responsible for supervising the flow of project funds led to less than strict controls over collection and proper application of road revenues.

**Project financial structure**

Lack of liquidity in the local financial markets, use of short-term, high-cost, floating rate debt, currency risk (both devaluation and convertibility) faced by international investors, and the
high cost and limited availability of surety and insurance coverage severely hampered sector performance.

- Concessionaires’ financial contributions were in the form of “sweat equity” provided through the retention of work from construction affiliates. These contributions originally amounted to 25 to 30 percent of investment costs, but as lenders demanded higher equity cushions and debt service coverage ratios, the contributions increased to about 50 percent of project costs. This led to inflated construction budgets (and hence toll levels), with some projects effectively financed with 100 percent or more leverage. Estimates of the average gross margins in the road building program range from 35 percent to 50 percent of total costs. Like the distortions arising from the bid selection criteria, these excessive margins in no small part were the result of a lack of competition among the limited number of project bidders.

- The concession agreements contained an adjustment clause to shorten the concession term if traffic exceeded guaranteed levels. Because of the lack of any upside potential, this clause led to significant disincentives to apply true risk capital.

- The only source of local debt financing was the commercial banking sector. But the tenors for such debt often extended only through the construction period, with the expectation that once the project was in operation, cash flows would be securitized through local or international debt offerings. However, as roads incurred cost overruns and the debt servicing ability of the projects proved far less than had been expected, these construction lenders soon were forced to restructure and extend the terms of their bridge financing. In addition, the loans were characterized by high floating interest rates, often 1,000 basis points higher than the local market reference rate. This combination of high interest rates and short maturities resulted in prohibitively high tariffs.

- As many projects became increasingly unable to meet their debt service obligations, lenders’ appetite for new toll road investments declined. Consequently, many banks that had underwritten huge amounts for projects were later unable to syndicate or refinance the loans, and liquidity quickly dried up in the market. Once word spread about the actual financial situation of many projects, other, untapped sources of funding (such as international institutional investors) quickly turned their attention to other investment opportunities, both within and outside the country. Likewise, in the few international offerings, market liquidity and resulting pricing were adversely affected by the presence of currency risk, in the form of both exchange rate depreciation and convertibility or transferability concerns.

- Local commercial banks were lacking in credit analysis, loan documentation, internal controls, and risk and liquidity management. Thus, the skills needed for limited recourse financing—to analyze project credit, security arrangements, and operative agreements—simply were not adequate for the complexity of the projects and the huge demand for credit.

- Performance, advance payment, and hidden defects bonds, as well as insurance for property damage, third-party liability, force ma-

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**TABLE 1**  
**DAILY TRAFFIC HAS NOT MET EXPECTATIONS**

<table>
<thead>
<tr>
<th>Average daily traffic as a percentage of guaranteed traffic</th>
<th>Number of roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 100</td>
<td>5</td>
</tr>
<tr>
<td>75–100</td>
<td>2</td>
</tr>
<tr>
<td>50–74</td>
<td>8</td>
</tr>
<tr>
<td>25–49</td>
<td>8</td>
</tr>
<tr>
<td>6–24</td>
<td>9</td>
</tr>
</tbody>
</table>

*Note: As of December 1994.  
Source: Author’s compilation.*
jeure, and delayed opening, were high cost and very scarce. Where coverage was secured, significant problems arose in collection. These problems resulted as much from lenders’ inexperience in negotiating the terms of such policies as from cumbersome and vague collection procedures.

Legal considerations

Legal aspects of the projects that weakened financial discipline included issues associated with lender security and enforcement rights, dispute resolution mechanisms, tax treatment, and procedures for securing government capital contributions. Key problems included the following:

- Legal disputes in Mexico arising between a private party and the government were to be resolved within the constraints of the Mexican court system and were not subject to international arbitration. Being subject to the local court system represented a significant risk to international investors because of their lack of familiarity with the legal system.
- State governments were expected to provide grants or cash equity or to dedicate toll revenues from existing roads for certain projects as part of the construction financing, as contingent obligations to cover cost overruns, or to cover costs related to securing the right of way. But there were often delays or actual defaults in the fulfillment of these financial obligations, in part because the contributions were to be sourced from annual budget appropriations, a process subject to tremendous uncertainty and discretion. As a result, state governments were often left without any means for meeting their obligations. Other problems arose because of the lack of a clear registration process for public debt, which left lenders with no clear understanding of where they stood relative to other state creditors.
- Lenders were not allowed a collateral assignment of the concession agreement. Consequently, they could neither secure revenue generated by the project nor exercise borrower substitution rights in the event of a default. This greatly diminished their bargaining power at the negotiating table with both the borrower and the government.
- Some concessionaires were not single-purpose entities. In these cases, it was impossible for lenders to isolate specific cash flows by project, and borrowers with multiple concessions were able to apply the cash flow from some projects to support the financial needs of related but separately financed ventures.
- Under many trust agreements, local banks allowed the concessionaire the final word in technical decisions on such matters as change orders, change of material subcontractors, and toll collection procedures. This led to major problems relating to construction and operating costs as well as quality control.
- Certain tax aspects affected the financial viability of the projects. Changes to the tax code were required regarding the 2 percent tax on assets, application and calculation of depreciation and tax credits, and payment of value added taxes. But these modifications were made only after nearly twenty-five projects had been concessioned, and in many cases they required annual approval and thus subjected financiers to nonrenewal risk.

Policy conclusions

Policies to address such issues will vary depending on sector objectives, the current status of the legal and regulatory framework, and the technical and financial capability of the public and private sector participants. Of the many lessons to be learned from the Mexican program, however, perhaps the most important for governments developing a sector program based on private investment is the necessity of devising systems of regulation and support that provide the encouragement and room for maneuver that the private sector needs, while minimizing the government’s exposure to the host of commercial and financial risks surrounding projects. The sector strategy must include sound and explicit incentives to select worthwhile projects. Prices should be set to ensure the viability of privatized enterprises without protecting private parties from bankruptcy. Prices should also be allowed to
reflect actual demand—in this respect, the need to develop congestion pricing is of fundamental importance. The regulatory framework should check the abuse of market power and ensure adequate services. Besides protecting investors, an appropriate regulatory and market structure protects the government and eventually taxpayers from bearing ultimate responsibility for the financial performance of privatized enterprises.

1 Federal funding also included contributions by Petroleos Mexicanos (Pemex) and by Caminos y Puente Federales de Ingreso y Servicio Conexo (Capufe), the federal highways and bridge operator, for more than 1,100 kilometers (km) of public toll roads.

2 Recent government estimates show that 26 billion new pesos (US$3 billion) will be required to restructure existing concessions. The World Bank’s Operations Evaluation Department reports that by early 1997 nearly forty projects, accounting for US$1.5 billion of debt and equity investments, have submitted requests to the government for financial restructuring.

3 The governments of several Mexican states also granted concessions under local law to build and operate highways; these have generally been modeled on those granted by the Secretary of Communications and Transport under federal law.

4 The five major links are: Nogales-Cuahac–Tepic–Guadalajara–Toluca–Mexico City (521 km); Nuevo Laredo–Reynosa–Monterrey–San Luis Potosi–Querétaro–Mexico City (480 km); Ciudad Juárez–Mexico City–Puebla–Oaxaca (540 km); Mexico City–Veracruz–Sayula–Ocozocuautla–Arriaga–Puerto Madero (428 km); and Tláhuac–Pachuca–Mexico City (222 km).

5 Three projects already in operation were nevertheless able to refinance the international capital markets prior to the December 1994 currency crisis. These three projects are as follows:

- The ten-year, US$207 million placement for the Toluca toll road in June 1992. The deal initially was not well received despite expiring of about 700 basis points over U.S. Treasuries. Investor concerns centered on tight debt-service coverage ratios of 1.25 to 1, combined with the existence of currency risk, a particularly sensitive issue at the time because the peso was estimated to be about 20 percent overvalued.

- The US$110 million placement for the Fieretep–Pitelmida and Montanillo–Anemita toll roads, which were jointly securitized. The proposed financing and security structure was perceived as much simpler than that in the Toluca placement, and it provided for a dual amortization process. The target amortization is based on a twelve-year final maturity. The alternative schedule requires payment (with a 1 percent added premium for investors) in eighteen years if project revenues are impaired, whether because of insufficient traffic flows, currency fluctuations, or similar risks. The deal was priced at about 500 basis points over U.S. Treasuries at the time of closing.

- The Mexico City–Ciernataca toll road, owned and operated by Capufe. The placement of exchange rate-linked bonds in August 1994 was originally planned as a US$625 million, twenty-year maturity transaction. But because of investor concerns about currency risk and long-term interest rate volatility, the issue was cut back to a seven-year, US$205 million 144A placement (though also featuring a dual amortization schedule with an expected payout in five and a half years and a targeted average life of three and a third years). The deal received a local currency-based “A” rating from Standard & Poor’s. The deal was initially placed at about 350 basis points over U.S. Treasuries. A fourth financing of about US$100 million for the Tepic–Guadalajara toll road was canceled at the last minute because of the onset of the December 1994 currency crisis.

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The Private Sector in Water and Sanitation—How to Get Started

Penelope J. Brook Cowen

The benefits from private participation in water and sanitation depend on the level of risk and responsibility the government hands over to the private sector. But strong government commitment and careful preparation are required if the private sector is to take on significant risks and responsibilities. A government about to enter into a concession contract for twenty-five or thirty years, for example, needs to be sure that it does not, in haste, gloss over details that will later land it in messy renegotiations, with loss of face to all concerned and reduced benefits to consumers. But governments often worry that detailed preparations take too much time. This Note, based on a set of World Bank toolkits compiled from experiences in involving the private sector in water and sanitation, reviews the essential factors in choosing a privatization option and argues that preparation pays dividends.

What makes the business special?

The activities of urban water and sanitation utilities range from impounding and treating raw water, to distributing water and collecting sewage, to treating sewage. In many ways, decisions about how to involve the private sector in these operations resemble decisions about privatization in any other utility sector. All such privatizations, for example, require decisions on how to set up an independent regulator and how to set and enforce service standards. But water and sanitation have special features that governments must take into account in choosing and designing a contract and in designing a supporting policy framework:

- Water and sanitation systems are characterized by a high degree of natural monopoly. Although competition is feasible in such limited areas as building capacity and providing plumbing services, it is difficult to achieve in distribution and collection, core activities in water and sanitation (table 1). So governments wanting to involve the private sector have been able to rely little on competition to assure good outcomes for consumers and have instead had to devise regulatory systems for this purpose.

BOX 1 TOOLKITS FOR PRIVATE SECTOR PARTICIPATION IN WATER AND SANITATION

The World Bank has recently published a set of toolkits to guide governments in designing and implementing private sector arrangements for water and sanitation. The toolkits focus on three sets of issues:

- How to choose a private sector participation option. What are the options? What might you have to do to make your preferred option practicable? What are the risks?
- How to design the process for refining and implementing the chosen option. What might a critical path look like? How do you set up a government unit to run the privatization process? What can you expect from legal, financial, economic, and engineering advisers—and how do you go about hiring them? How do you design a bidding process? What can you do to keep the contract on track once you’ve chosen a private partner?
- How to ensure that contracts cover all the issues. What should a management, build-operate-transfer (BOT), or concession contract cover? In writing or reviewing contractual documents for a concession, a BOT arrangement, or a management contract, how do you know if you’ve covered everything? What are your options for allocating and managing the many risks that go with the contract?

Information on how to obtain copies of the toolkits can be found at the World Bank’s Website (http://www.worldbank.org).
**TABLE 1  COMPETITION AND MONOPOLY IN WATER AND SANITATION**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Characteristics of competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocation of water resources and regulation of use</td>
<td>Natural monopoly in each hydrogeographical unit (such as a river basin)</td>
</tr>
<tr>
<td>Capacity construction</td>
<td>Competitive (but may depend on access to water resources)</td>
</tr>
<tr>
<td>Bulk supply generation</td>
<td>Small number of possible suppliers (often only one)</td>
</tr>
<tr>
<td>Water treatment*</td>
<td>Local monopoly</td>
</tr>
<tr>
<td>Local distribution*</td>
<td>Local monopoly</td>
</tr>
<tr>
<td>Local sewerage network*</td>
<td>Local monopoly</td>
</tr>
<tr>
<td>Sewage treatment*</td>
<td>Local monopoly</td>
</tr>
<tr>
<td>Equipment and appliance sales, plumbing services</td>
<td>Competitive</td>
</tr>
</tbody>
</table>

* Core activities of traditional water and sanitation utilities.

- Water is essential to life, and access to it must be ensured for all. Guaranteeing access for the poor will sometimes require designing subsidies or schemes for reducing the cost of delivering services to the very poor. A complicating factor for reformers is that existing systems for allocating scarce raw water resources among alternative uses—urban consumption, irrigation, industry—are often incompatible with efficient use. In India, for example, many cities go short of water while farmers continue to receive subsidized water for irrigation.
- Water and sanitation are well suited to local management, and in many countries, responsibility for service provision is decentralized to the provincial or municipal level. As a result, complex interjurisdictional issues often need to be resolved before the private sector can be brought in.
- Many of the assets of water and sanitation systems are buried, so obtaining accurate information about them is costly—increasing the cost of preparing for private sector participation, and the chance of surprises after the contract is signed.
- Broad access to water and sanitation yields important public health and environmental benefits. Government interventions to promote these benefits are likely to remain after privatization.

None of these issues is a barrier to private sector participation—all arise under both public and private provision. But governments often systematically confront their implications only when they begin to contemplate private sector involvement. Failure to adequately address these issues increases the risk that a government will be unable to find a partner for its pre-

**TABLE 2  THE MAIN OPTIONS FOR PRIVATE SECTOR PARTICIPATION AND THEIR ALLOCATION OF RESPONSIBILITIES**

<table>
<thead>
<tr>
<th>Option</th>
<th>Asset ownership</th>
<th>Operations and maintenance</th>
<th>Capital investment</th>
<th>Commercial risk</th>
<th>Duration</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service contract</td>
<td>Public</td>
<td>Public and private</td>
<td>Public</td>
<td>Public</td>
<td>1–2 years</td>
<td>Chile (Santiago)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>India (Madras)</td>
</tr>
<tr>
<td>Management contract</td>
<td>Public</td>
<td>Private</td>
<td>Public</td>
<td>Public</td>
<td>3–5 years</td>
<td>Gaza</td>
</tr>
<tr>
<td>Lease</td>
<td>Public</td>
<td>Private</td>
<td>Public</td>
<td>Shared</td>
<td>8–15 years</td>
<td>Guinea (17 cities)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Poland (Gdansk)</td>
</tr>
<tr>
<td>Build-operate-transfer</td>
<td>Private (bulk services)</td>
<td>Private</td>
<td>Private</td>
<td>Private</td>
<td>20–30 years</td>
<td>Malaysia (Johor)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Australia (Sydney)</td>
</tr>
<tr>
<td>Concession</td>
<td>Public</td>
<td>Private</td>
<td>Private</td>
<td>Private</td>
<td>25–30 years</td>
<td>Argentina (Buenos Aires)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Côte d'Ivoire</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Philippines (Manila)</td>
</tr>
<tr>
<td>Divestiture</td>
<td>Private</td>
<td>Private</td>
<td>Private</td>
<td>Private</td>
<td>Indefinite</td>
<td>England and Wales</td>
</tr>
</tbody>
</table>
ferred form of private sector participation or that a private sector arrangement will fall short of its broad policy objectives.

The main private sector options—and who’s doing what

Different countries have adopted different options for private sector participation. Trinidad and Tobago is using a management contract for water and sewerage services and plans to replace it with a concession. Guinea has a lease arrangement for water treatment and supply in seventeen cities. Buenos Aires and several other Argentine provinces have concessions for water and sewerage. And England and Wales have divested their water and sanitation utilities.

The main options can be clearly distinguished by how they allocate responsibility for such functions as asset ownership and capital investment between the public and private sectors (table 2). The more risk and responsibility are passed to the private sector, the more powerful are its incentives to improve services. Service contracts, which confer little risk and responsibility on the private sector, offer commensurately small gains—and are simply not designed to address managerial inefficiency or chronic underinvestment. Concessions and divestitures are well suited to tackling these problems—but demand more from government in commitment and preparation.

In practice, private sector arrangements are often hybrids of these models. For example, leases may pass some responsibility for small-scale investment to the private sector, and management contracts may, like leases, have revenue-sharing provisions that pass on some commercial risk. Options can also be used in combination—for example, a build-operate-transfer contract for bulk water supply might be combined with a management or lease contract for operating the distribution system.

Key factors in choosing an option

Governments seeking to involve the private sector in water and sanitation may have a range of objectives—introducing greater technical and managerial expertise and new technology, improving efficiency, constructing large-scale projects, cutting the cost of public subsidies or redirecting them to the poor, and making the sector more responsive to customers. All forms of private sector participation can be designed to improve technical and managerial capacity. But whether the other objectives can be met depends on which option is chosen and whether the government can do a good job on the enabling and regulatory environment. A poor job can lead to dissatisfied customers and difficult renegotiations with the private partner. Under the Guinea lease, for example, consumers have lost out because disputes over the division of responsibilities between the government and the operator have hampered new connections and service improvements. The Buenos Aires concession has led to better service, but there have been costly disputes over the definition of the regulator’s role (for example, in determining investment requirements) and the handling of adjustments in tariff levels and structure.

To determine which private sector options are feasible—or what must be done to make a preferred option possible—a government needs to undertake a range of analyses:

- An analysis of the state of the utility—looking at the current level and standard of service, the condition and serviceability of assets, the human resources, and the financial performance. Is information about the utility’s assets good enough to serve as a base for long-term contracts? If not, can better information be produced rapidly? Where information about the quality of underground pipes, for example, is partial or inaccurate, revelations about the true state of the system that come after a concession contract has been signed may lead to costly renegotiations.
- An analysis of the existing regulatory framework—both general laws that might affect private participation in the sector and sector-specific laws and institutions focusing on pricing and quality standards. Does the existing regulatory framework provide sufficient support for the private sector so that it will take on commercial risk? If not, can the necessary changes be made fairly easily? And if not, can parts of the regulatory function be simplified or contracted out in the short term?
### Table 3: Prerequisites for Successful Implementation of Different Private Sector Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Stakeholder support and political commitment</th>
<th>Cost-recovering tariffs</th>
<th>Good information about the system</th>
<th>Developed regulatory framework</th>
<th>Good country credit rating</th>
<th>Potential benefits of the option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service contract</td>
<td>Unimportant</td>
<td>Not necessary in the short term</td>
<td>Possible to proceed with only limited information</td>
<td>Minimal monitoring capacity needed</td>
<td>Not necessary</td>
<td>Low</td>
</tr>
<tr>
<td>Management contract</td>
<td>Low to moderate levels needed</td>
<td>Preferred but not necessary in the short term</td>
<td>Sufficient information required to set incentives</td>
<td>Moderate monitoring capacity needed</td>
<td>Not necessary</td>
<td></td>
</tr>
<tr>
<td>Lease</td>
<td>Moderate to high levels needed</td>
<td>Necessary</td>
<td>Good information required</td>
<td>Strong capacity for regulation and coordination needed</td>
<td>Not necessary</td>
<td></td>
</tr>
<tr>
<td>Build-operate-transfer</td>
<td>Moderate to high levels needed</td>
<td>Preferred</td>
<td>Good information required</td>
<td>Strong capacity for regulation and coordination needed</td>
<td>Higher rating will reduce costs</td>
<td></td>
</tr>
<tr>
<td>Concession</td>
<td>High levels needed</td>
<td>Necessary</td>
<td>Good information required</td>
<td>Strong regulatory capacity needed</td>
<td>Higher rating will reduce costs</td>
<td></td>
</tr>
<tr>
<td>Divestiture</td>
<td>High levels needed</td>
<td>Necessary</td>
<td>Good information required</td>
<td>Strong regulatory capacity needed</td>
<td>Higher rating will reduce costs</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The shading signals the degree of importance: □ not significant □ low □ moderate □ high

regulatory capacity is weak, for example, collection of information on the utility’s technical and financial performance could be contracted out to a private auditing company.

- An analysis of which stakeholders (employees, consumers, environmentalists, government agencies) support private participation and which oppose it. Can processes and policies be put in place to meet stakeholder concerns? Can the risk of political interference be minimized? Often, a key factor in the success of a private sector project is identifying the concerns of employees early on and finding constructive ways of addressing them—rather than allowing those concerns to derail the reform process later.

- An analysis of the financial viability of alternative options. Do current tariffs cover costs? Can the private sector reasonably be expected to boost efficiency enough to meet the proposed service objectives without increasing tariffs? If not, will consumers be willing to pay higher tariffs? And if not, can grant finance (or subsidies to needy households) support service improvements? This kind of financial analysis can sometimes lead to redefinition of a private sector project—for example, rebalancing planned investment expenditures between new production capacity and the rehabilitation of existing distribution systems.

As table 3 shows, in a very simplified way, the results of these analyses can point the government to an appropriate choice of private sector option. If regulatory capacity is weak and political commitment is low, for example, a concession will be difficult to implement. Even with strong political commitment to a concession or divestiture, however, countries that lack a good business climate or a strong track record of successful private investment may not immediately be able to attract large-scale private financing for infrastructure projects. These countries may need to start out with a management contract and work up to options that demand more of the private sector.

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Privatization and Restructuring in Central and Eastern Europe

Robert E. Anderson, Simeon Djankov, Gerhard Pohl, and Stijn Claessens

This Note reports on the first comprehensive analysis of the industrial restructuring that has taken place since 1992 in Central and Eastern Europe. The study, covering more than 6,000 industrial firms in seven countries, looks at which government policies have been most effective in speeding enterprise restructuring. The results show that privatization is the single most important factor in restructuring. The method of privatization has been less important: management buyouts and massive giveaways of firms through voucher privatization have led to results similar to those of case-by-case sales to foreign or domestic investors. The study also shows that privatizing industrial and commercial firms is the most effective way to improve the solvency of the banking sector—more effective than bank recapitalization or debt forgiveness.

The approach

The study compares the extent of restructuring by firms in seven Central and Eastern European countries: Bulgaria, the Czech Republic, Hungary, Poland, Romania, the Slovak Republic, and Slovenia. The number of firms in the sample for each country ranges from 700 to 1,000, and the firms account for 40 to 90 percent of employment in manufacturing (table 1). The governments in the seven countries have used different policies to encourage restructuring, and comparing enterprise performance among the countries should shed light on which have been most effective. The study tests the restructuring data for the effect of such policies as rapid privatization, concentrated outside ownership (for better governance), wage growth restraint (to improve cash flow and fund restructuring), financial discipline (firms may be more likely to restructure if neither the government nor banks finance their losses), and maintaining debt obligations (firms may have a greater incentive to restructure if banks do not forgive or reduce debts). The data are subjected to econometric analysis to separate the impact of government policies from the effects of such other factors as size, sector, and initial productivity levels.

The measures of restructuring used in the study include profitability, proportion of firms with a positive operating cash flow, average operating cash flow as a percentage of revenue, growth

<table>
<thead>
<tr>
<th>Country</th>
<th>Firms</th>
<th>Employees 1992</th>
<th>Employees as a percentage of total manufacturing employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>828</td>
<td>314,042</td>
<td>48</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>706</td>
<td>829,312</td>
<td>64</td>
</tr>
<tr>
<td>Hungary</td>
<td>1,044</td>
<td>428,645</td>
<td>41</td>
</tr>
<tr>
<td>Poland</td>
<td>1,066</td>
<td>1,338,645</td>
<td>45</td>
</tr>
<tr>
<td>Romania</td>
<td>1,092</td>
<td>2,121,102</td>
<td>91</td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>905</td>
<td>578,737</td>
<td>93</td>
</tr>
<tr>
<td>Slovenia</td>
<td>727</td>
<td>219,959</td>
<td>90</td>
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</tbody>
</table>
TABLE 2 PROGRESS IN PRIVATIZATION, 1995
(percentage privatized)

<table>
<thead>
<tr>
<th>Country</th>
<th>Manufacturing firms</th>
<th>Manufacturing firms weighted by output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>89</td>
<td>93</td>
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<tr>
<td>Hungary</td>
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<td>Poland</td>
<td>61</td>
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<td>Romania</td>
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<tr>
<td>Slovak Republic</td>
<td>79</td>
<td>83</td>
</tr>
<tr>
<td>Slovenia</td>
<td>41</td>
<td>41</td>
</tr>
</tbody>
</table>

Source: Authors' estimates.

TABLE 3 ANNUAL LABOR PRODUCTIVITY GROWTH, 1992–95
(percent)

<table>
<thead>
<tr>
<th>Country</th>
<th>Privatized firms</th>
<th>State-owned firms</th>
<th>All firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>12.4</td>
<td>-1.4</td>
<td>-1.4</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>8.6</td>
<td>-2.6</td>
<td>6.8</td>
</tr>
<tr>
<td>Hungary</td>
<td>6.0</td>
<td>3.2</td>
<td>4.8</td>
</tr>
<tr>
<td>Poland</td>
<td>7.5</td>
<td>1.4</td>
<td>5.4</td>
</tr>
<tr>
<td>Romania</td>
<td>1.0</td>
<td>-0.5</td>
<td>0.1</td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>7.8</td>
<td>-4.1</td>
<td>5.1</td>
</tr>
<tr>
<td>Slovenia</td>
<td>7.2</td>
<td>1.8</td>
<td>3.6</td>
</tr>
<tr>
<td>Average</td>
<td>7.3</td>
<td>-0.2</td>
<td>3.6</td>
</tr>
</tbody>
</table>

a. Firms privatized by 1995.
Source: Authors' estimates.

FIGURE 1 TOTAL FACTOR PRODUCTIVITY GROWTH
(percent, cumulative)

The data show that labor productivity growth in labor productivity, growth in total factor productivity, and growth in exports. The data show that for each firm these measures tend to be highly correlated. The econometric analysis focuses on the two most reliable indicators of restructuring: growth in labor productivity and growth in total factor productivity. The study defines a “privatized” firm as one for which more than a third of shares have been transferred to private investors. It measures the extent of privatization in a country by using both a simple count of the firms classified as privatized and a count weighted by output to reflect differences in size. On both measures, the Czech Republic, Hungary, and the Slovak Republic come out ahead, while Bulgaria lags behind, having made little progress in privatization (table 2).

Impact of privatization

The data show that labor productivity growth across the seven countries averaged 7.3 percent a year for privatized firms during 1992–95, but –0.2 percent for state-owned firms (table 3). The econometric analysis indicates that privatization accounts for almost all this productivity growth. The only exception to this pattern is Hungary, where state-owned firms achieved half the productivity gains of privatized firms. In Bulgaria and Romania, where privatization has been insignificant, productivity in state-owned firms is declining, pulling down labor productivity for the manufacturing sector as a whole.

Results are similar for the productivity of all factors of production. The cumulative gains in total factor productivity for privatized firms far exceed those for state-owned firms in the sample (figure 1). The analysis shows that privatization has increased total factor productivity growth by about 4 percentage points a year.

The data also show that even a credible threat of privatization promotes restructuring. For example, in Poland, where the government’s commitment to privatization was perceived as credible, the firms included in the mass privatization program began to show rapid improvement in profitability in 1994 and 1995—long before they were formally privatized in November 1995.
One possible explanation for this is that managers, improved their performance because they expected to be held accountable by the future new owners. Government plans for large-scale privatization programs appear to boost productivity in state-owned firms, probably because of similar anticipation and signaling effects.

### Method of privatization

Many foreign advisers to the governments of transition economies initially believed that mass privatization and insider buyouts would lead to weak pressures to restructure and that the preferred strategy should be sale to strategic investors. But the study finds no significant differences in the effectiveness of privatization methods. Productivity growth for privatized firms in the Czech and Slovak Republics, which chose mass privatization, is similar to that in Hungary and Poland, which have relied more on case-by-case privatization (table 3). Also in the Czech Republic, where data on the results of different privatization methods are available for a sufficiently long period, the study finds only minor differences among the methods. But it finds strong effects of ownership concentration on the speed of restructuring.  

### The role of wage restraint

Restructuring is likely to be encouraged if the workforce does not initially absorb all the productivity gains through higher wages. Firms must finance much of their investment with retained earnings from current cash flow, especially when the financial system is weak. But this demands new habits. While firms in industrial countries have relied mostly on internal cash flow to finance working capital or new investment, firms in the formerly socialist economies have relied heavily on loans from state-owned banks.

The study finds that privatized firms have retained most of their large productivity gains to finance productivity-enhancing investments. In all the countries, labor productivity has grown faster than real wages in privatized firms (as shown by their position above the diagonal in figure 2). That does not mean that real wages in these firms did not also grow rapidly. But since the firms maintained a large margin between
labor productivity and wages, they were able to sustain high levels of investment per worker (table 4). By contrast, real wage growth in state-owned enterprises has exceeded labor productivity gains, eroding internal financing.

The analysis shows that privatization has had a greater effect on wage restraint than have government wage policies. Most of the seven countries had a policy of limiting wage increases (though by 1995, all countries had market-determined wages). For example, the Czech Republic, Hungary, and Poland each introduced an excess wage tax during 1991–94. But even though government-led wage restraint applied primarily (or exclusively) to state-owned firms, wages grew faster in the state sector than in the private sector in both Hungary and Poland. And in Bulgaria and the Slovak Republic, which pursued more vigorous wage restraint in the state sector, real wages still outstripped productivity in state-owned firms—but not in the private sector.

Financial restructuring and the role of banks

What actions, if any, should governments in the region take to encourage the financial restructuring of overindebted firms? In industrial countries, most financial restructuring takes place through private negotiations between private lenders (mostly banks) and private firms. But in transition economies, most banks and many firms are still under state ownership, so the incentives to negotiate are different. Many banks in the region inherited large portfolios of nonperforming loans when state enterprises, suddenly exposed to competition, started running big losses. Audits done in accordance with international accounting standards showed that up to 60 percent of the banks’ loans were considered irrecoverable. The usual advice at this point was for the government to take over the bad loans and recapitalize the banks (usually through an asset swap).

The study’s analysis shows that this course was premature. In countries that pursued large and rapid privatization programs, privatized firms have improved their profitability much more than expected, making government intervention in the banks unnecessary. By contrast, in countries that have done little or no privatization, firms’ financial conditions did not improve and the banks’ bad-loan problems are worse than the pessimists expected (figure 3). The speed of privatization of the industrial and commercial sectors has proved to be the most important policy issue for the financial sector.

Conclusion

One of the most important policy questions in the transition economies is what governments can do to speed the restructuring of firms and thus hasten the transition to a mature market economy. The study provides some answers. Rapid and comprehensive privatization leading to concentrated ownership encourages restructuring. Privatization also promotes restructuring because privatized firms are more likely than state-owned enterprises to exercise wage restraint—and wage restraint is vital to free up internal finance. Policies that increase bank lending to firms, such as debt forgiveness and recapitalization, may do more harm than good. The safest course is to recapitalize banks only as part of privatization and to encourage negotiations for financial restructuring only after the banks are privatized.

1 To ensure comparability, the study adjusted the data to reflect differences in accounting standards both over time and among countries and excluded utility, banking, and agricultural firms and new private companies. The distribution of firms among subsectors—mostly food, textiles, chemicals, metals, machinery, and transport equipment—is similar across the countries.

2 Labor productivity (value added per man-hour) does not take into account depreciation, debt service, and taxes, which are more likely to differ from country to country because of differences in historical circumstances, tax laws, or accounting standards.


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The Drivers of the Information Revolution—Cost, Computing Power, and Convergence

James Bond

In the past few years, there has been a technological phase-shift as computers have become ubiquitous, communications technologies have multiplied, and the Internet has become a widely used means of doing business. The three most powerful trends driving these developments are the decline in the cost of transmitting information, the increase in the power of computing, and the shift from analog to digital information technologies that has joined the telecommunications and computing industries and merged market segments of the information industry. This Note explains these three trends.

Cost of communicating

The cost of communicating has declined dramatically in the past twenty years. The cost of a voice transmission circuit, for example, has fallen by a factor of 10,000 as a result of the development of fiber optics, cheap electronics, and smart wireless (figure 1).

Fiber optics. First produced commercially by Corning Glass in 1970, fiber-optic cable has become the increasingly dominant means of signal transmission in telephony since the mid-1980s, replacing copper cables, microwave transmission, and satellite. Optical fiber has extremely high capacity (bandwidth) because of the light it transports. The high frequency of light allows higher information density than conventional cable: a fiber thinner than a single hair can carry a laser signal combining many thousands of telephone conversations, so that the cost per voice circuit becomes almost infinitesimal. Because fiber optics reduces the cost of signal transmission so much, and because this cost is increasingly fixed (with maintenance costs much lower than for conventional cable, the cost is mostly in installation), the generalization of fiber optics is profoundly changing the industry's cost structure, moving it away from existing tariff setting mechanisms.

Cheap electronics. A key part of the telephone infrastructure is network exchanges, made up of switching equipment. Automatic switches were originally electromechanical, but the switches installed today are electronic—essentially specialized computers. The advent of cheap, powerful, microprocessor-based computing has altered the economics of switching, reducing costs and increasing reliability while also delivering new value added services for the user (such as call waiting and caller ID). Cheap electronics are also at the heart of cellular telephony and personal communications services, which use electromagnetic spectrum more efficiently than conventional wireless. And computing power now makes it possible to run existing telecommunications infrastructure as an "intelligent network," improving capacity utilization, lowering the cost of maintaining switches, and creating new services, such as virtual private networks.

Smart wireless. Wireless technology is evolving toward higher frequencies (inherently more information dense), with a range of clever
The Drivers of the Information Revolution—Cost, Computing Power, and Convergence

**FIGURE 1  COST TRENDS IN OPTICAL FIBER TRANSMISSION**

Index of transmission cost per bits per second per kilometer (log scale)

Transmission costs have fallen by a factor of 10,000 in 20 years

Note: Mbps is megabits per second; Gbps is gigabits per second.
Source: AT&T data.

**FIGURE 2  PRICE TRENDS IN INFORMATION PROCESSING**

Index of investment cost per instruction per second (log scale)

Computing power per dollar invested has risen by a factor of 10,000 in 20 years

Source: World Bank compilation based on industry data.

**FIGURE 3  TRENDS IN TRANSISTORS PER MICROPROCESSOR**

The number of transistors on a microchip doubles every 2 years

Source: World Bank compilation based on industry data.

These three developments have necessarily been accompanied by a move away from analog to digital technology, in which signals are transmitted as binary code. Digital telephone networks ensure better quality and allow the use of packing protocols for data transmission, such as frame relay, Asynchronous Transfer Mode (ATM), and the Internet protocol TCP/IP.

**Power of computing**

The second important driver of the information revolution has been the relentless increase in the power of computing. Computing power per dollar invested has risen by a factor of 10,000 in twenty years (figure 2). Power has increased and costs have fallen because of the development of integrated circuits and microchips, because of increasing transistor density on microchips, and because of economies of scale in production.

**Integrated circuits, miniaturization, and microchips.** The modern electronics era began with the invention of the integrated circuit in a Texas Instruments laboratory in Dallas in 1958. The integrated circuit, which groups transistors and
other electronic circuits on a tiny piece of semiconductor, is a breakthrough in product design because of its enormous potential for miniaturization and for reducing unit costs. The microchip, essentially an entire computer on a chip, was developed by Intel (as the four-bit 4004 processor) in 1971. Its 2,300 transistors provide all the essential functions of a computer.

Increasing transistor density. The density of transistors has been rising exponentially—a phenomenon sometimes characterized as Moore's law. In the 1960s, Gordon Moore, an electrical engineer and a cofounder of Intel, observed that the number of transistors on a microchip doubles every one to two years. Because computing power is roughly proportional to the number of transistors, or “gates,” on the microprocessor, this would translate into a doubling of computing power per microchip every eighteen months or so. And because the cost of a microchip rises only slowly from one generation to the next and represents only about 5 to 15 percent of the cost of the computer, Moore's law would translate into a near doubling of computing power for a given investment every eighteen months. In fact, the growth in power over twenty-four years—from the Intel 4004 (2,300 transistors) of 1971 to the Pentium II (7.5 million) of 1997—averaged nearly 40 percent a year, corresponding to a doubling every twenty-five and a half months—close enough to Moore's estimate (figure 3).

Economies of scale. Computing has also become far cheaper and more powerful because of economies of scale in production, not only of microchips but of such essential ancillary equipment as mass storage (disk drives), removable storage, and computer network equipment. The emergence of a set of de facto industry standards—based on the first IBM personal computer (PC) of 1981, the Intel microprocessor instruction set, and the Microsoft operating systems (DOS and Windows)—has also enabled producers to standardize equipment and software and encouraged price competition.

One result of the increase in the power of computing and the decline in the cost of communicating is the rise of networks. When PCs began penetrating the business environment around 1981, they were used mainly as standalone workstations. Independent mainframe computers, accessed by “dumb” terminals, continued to handle much of the heavy processing. Today’s business computers are connected to one another in local area networks (LANs), and increasingly, these private networks are interconnected through the Internet, the international “network of networks,” which is doubling in size every year. Because of the growing interconnection, PCs’ primary function has shifted from document and spreadsheet management to communication and information processing. The growth of the Internet illustrates Metcalfe's law (Metcalfe was the co-founder of modern computer networking), which states that the value of a network equals the square of the number of interconnected nodes. As new users join the Internet, its value for all users increases geometrically. Metcalfe's law illustrates how networking PCs radically increases their value as a knowledge tool.

Convergence

As costs have fallen and digitalization has replaced analog technologies in telecommunications, the telecommunications, information technology, and media industries are merging into a “bit industry” that manipulates voice, image, video, and computer data in binary form. This convergence has profound implications for the industries involved.

• Communications and information services are being delinked from their underlying delivery infrastructure: telephone services can be delivered through coaxial cable, data services and Internet access through telephone lines, and cable TV through direct broadcast satellite.
• Accompanying the delinking is increasing overlap between the two primary components of the communications industry, which have traditionally been segregated: common carrier conduit systems and networks designed to transmit signals anonymously (telephony) and content-based information sources and technologies (broadcasting).

Thus, it is now possible to receive radio broadcasts over the Internet (using telephone
networks), and telephone services can be provided by companies in cable TV (a broadcast medium). Broadcasting (from one to many) now shades from narrow-casting (custom-tailored information) to one-to-one communication like telephony (figure 4).

Convergence has important implications for policymakers. First, it has made existing models for the telecommunications industry obsolete. Those models have assumed that telecommunications is a public service, delivered through a network that is a natural monopoly. But these models are negated by the competition now possible between segments of the delivery infrastructure (intermodal competition) and, increasingly, within segments (intramodal competition). Convergence thus means that governments must lower barriers to entry and overhaul telecommunications regulatory systems to promote competition, moving away from utility-type regulation.¹

Second, convergence raises serious issues relating to content regulation. In broadcasting, countries have applied standards of decency, privacy, and protection of intellectual property rights using different mechanisms, but usually relying on a combination of self-regulation and legal sanctions (through the courts). Telecommunications content has been largely unregulated, because it is not technically possible to do so using existing content regulation mechanisms. But, convergence opens new realms of communications where traditional content regulation cannot be applied. In this context, what do policymakers do about decency, privacy, and intellectual property rights?

Convergence also opens up huge opportunities for developing countries to accelerate the rollout of connectivity to their populations using innovative technologies and private sector-led investment in a competitive mode. Cheaper communications are offering new possibilities for countries to be internationally competitive and to "plug in" to the global economy—and providing much more cost-effective ways to deliver essential public services to the poor.

¹ See Peter Smith, "What the Transformation of Telecoms Markets Means for Regulation" (page 4 in this issue).

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Telecommunications Is Dead, Long Live Networking

The effect of the information revolution on the telecom industry

James Bond

Economic history teaches us that no industry is immune to change. Canals gave way to railroads, which in turn bowed to road transport when the cost of motor vehicles fell enough to make it more cost-effective. Banks are scrambling to adjust to a world in which debt can be raised on bond markets and consumers can obtain many traditional banking services online. And the telecommunications giants, which have reigned supreme for the past fifty years, are being besieged in their turn as the information revolution overturns the certainties on which their strength is based.

The threat to the giants arises from the huge decline in the cost of communicating, the increase in the power of computing, and the shift to digital technology. These forces have led to industrial convergence as communications and information services (such as basic telephone service and cable TV) have been delinked from their delivery infrastructures (the telecommunications and cable networks). With the delinking has come increasing overlap between the two main components of the communications industry: common carrier conduit systems (delivering telephony) and content-based information sources and technologies (broadcasting). As a result of these changes, new competitors are emerging from unexpected directions, and the market domination on which telecommunications companies base their strength is melting away.

The economics of telecommunications

New technology has profoundly altered the industry's cost structure, and as a result, the structure of the industry and its pricing methods have become incoherent. The end of natural monopoly, the trend toward new pricing structures, and the increasing competition and globalization in the industry are forcing radical change.

The end of scale and natural monopoly

In a conventional wired network, most of the investment goes to establish the local loop, particularly the civil works needed to extend the network to the end user. About two-thirds of the assets on the balance sheet of telecommunications operators are "holes in the ground"—the trenches needed to lay the cables. Thus, in a traditional network, 70 to 85 percent of the cost of a call, even an international one, consists of the cost of the low-technology link covering only the last couple of miles.

BOX 1 WHAT IS THE TELECOMMUNICATIONS INDUSTRY?

- **Telecommunications Infrastructure** has three main components: terminal equipment, such as telephones and fax machines in users' homes and businesses; the local loop, generally a pair of copper wires connecting the terminal equipment to switching equipment in the local exchange; and long-distance or international transmission networks, made up of fiber-optic cables, microwave links, and satellites.
- **Telecommunications Services** have focused on calling services: local calls (within the local exchange network) and long-distance or international calls. Increasingly, however, these basic services have been augmented by the transmission of data in binary form and by value added services (such as call waiting and Internet access), which increase functionality for the end user and generate supplementary income for the telecommunications operator.
Because in the conventional local loop based on copper wires the marginal cost of each new subscriber declines no matter how many existing subscribers there are, the telecommunications sector—or at least its local loop portion—has been considered a natural monopoly. Economic theory suggests that the best way to manage a natural monopoly is to create a regulated utility, granting it a franchise to deliver the service in exchange for certain obligations (such as nondiscriminatory treatment of consumers) and regulating the prices it can charge for the end product. This explains the nearly universal model for the telecommunications sector: a local monopoly company, often a public enterprise, with regulated prices.

But wireless, cable TV, and other technologies are now challenging the conventional local loop based on wireline technology and buried copper (figure 1). In many cases, wireless is already cheaper per new subscriber than wireline. And the much flatter cost curves of wireless show that size no longer brings any real cost advantage. It is possible to have several competing providers of local service without raising the network’s overall costs much. The implications are considerable: the best way to deliver service to customers is no longer through a utility but through competing providers of local telecommunications services. The prevailing model for the telecommunications sector in most of the world is simply wrong. Furthermore, the telecommunications reforms sweeping the world should focus more on the structure of the sector—providing as much potential for competition as possible—than on the transfer of the monopoly telecommunications company from the public to the private sector. In many cases, however, the reverse is happening.

**The move to bandwidth-based pricing**

Almost universally, how much you pay for a telephone call depends on how long you talk and how far away your correspondent is. If you are in Paris, it is much more expensive to call New York than Toulouse, and the price you pay (beyond the monthly rental fee for the line) is proportional to the time you talk. But that is not
how costs are built up for telecommunications operators. For example, tariffs for international calls, based on the outdated accounting rate system, nearly always far exceed the cost of providing the service (box 2).

A second problem relates to new services. The new communications services that customers increasingly demand send varying amounts of information per second down the transmission line. Paging, for example, requires narrow bandwidth (a small amount of information per second), while new multimedia services (such as teleconferencing) require a huge amount of bandwidth because transmitting video sends much more information down the line than does transmitting sound alone. But most telecommunications operators do not offer choice in bandwidth: customers get a standard telephone line, accommodating 64 kilobits per second (kbps) in Europe and 56 kbps in the United States.

To an increasing degree, the costs borne by telecommunications operators are made up of three elements: a fixed monthly amount, which corresponds to the capital costs of the local loop; a one-time cost for each connection, corresponding to the cost of switching that call; and a transmission cost, which is proportional to the bandwidth. But actual customer charges are quite different. And because it is increasingly possible to compete for customers, new, agile operators are emerging that take advantage of the possibilities for arbitrage between tariffs and actual costs. Much of the new activity is in international service. But new players are also emerging in other areas, such as Internet service providers, which enable customers to place long-distance calls for the price of the local loop connection (figure 2).

It is safe to predict that competition and market forces will drive tariffs closer to long-run incremental costs, both in level and in structure. And within a couple of years, consumers will probably be able to buy the bandwidth capacity they need for a given connection, which, because of declining transmission costs, will cost no more than a few cents per hour even for international calls (in addition to the monthly rental for local access).

**BOX 2 THE IMPENDING COLLAPSE OF THE INTERNATIONAL ACCOUNTING RATE SYSTEM**

International tariffs for telecommunications services are based on the accounting rate system, which was developed as part of a regulatory tradition holding that international services are supplied through a bilateral correspondent relationship between national monopoly carriers. An accounting rate is the price the two national carriers (or their governments) negotiate for handling one minute of international telephone service. Revenues are shared between the two carriers. The accounting rate system was originally intended to allow each carrier to recover its costs for handling an international call.

The main problem with the accounting rate system is that for nearly every country the cost of transmitting a call has fallen dramatically over the past twenty years, but the fall in price has lagged this decline. As a result, the rate greatly exceeds the cost of providing the service, so accounting rates, which still assume that the sector is a monopoly, generate huge economic rents for telephone companies handling international calls. In some cases, international calls account for the entire profit of the sector and even generate foreign exchange for the government.

This system is showing signs of imminent collapse. New possibilities for competition in international services make the sector a fertile area for arbitrage—and so we are seeing significant activity in call-back services, calling cards, Internet telephony, and the like. These new sources of competition undercut the hugely inflated accounting rates and eat into the income of telecommunications operators—especially those offering the lowest prices. As a result, the U.S. regulator, the Federal Communications Commission, is seeking to replace international accounting rates with a new benchmark system based more closely on actual costs.

**Intermodal competition, globalization, and the WTO negotiations**

Policymakers increasingly accept that competition in the local loop is both possible and desirable. But competition is also bringing changes that policymakers are much less knowledgeable about—in the explosion of new technologies, products, and services competing with one another to deliver connectivity to the end user (figure 3). New technologies increase arbitrage...
The trend toward global alliances may stem more from the desire of former monopoly players to re-create at the international level the oligarchies to which they are accustomed in their domestic markets than from the underlying market forces in the industry.

The old monopoly telecommunications sector is fast disappearing. National telecommunications markets are fragmenting into a multiplicity of niche markets at the same time that trade barriers are falling. Many new operators are emerging, each targeting the segment that best corresponds to its comparative advantage. In this new networked bit industry, offering a huge range of competing technologies and services, the future for the incumbent telecommunications companies looks increasingly bleak. Over the next decade, as the market shifts from under their feet and as new, more nimble actors emerge, we can expect the dominance of the telecommunications operators over their traditional markets to erode spectacularly. Some countries are likely to see their major telecommunications operators fail as new players appear that quickly become household names around the world.

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Today, more than sixty emerging economies—some twenty-five in Sub-Saharan Africa alone—are at some stage of transformation from a state telecommunications monopoly to private-led, competitive markets. When well done, such reforms can be positive-sum games in which all stakeholders gain—customers, existing and new operators, employees, domestic and foreign investors, and the government. Faster market growth, new and better services, lower costs, and, eventually, lower prices follow. This Note outlines the key factors in successful telecommunications reform.

**Get support at the top**

Reform is most likely to succeed if it is led at the highest level of political authority. That is usually the head of government, who then allocates responsibility for the reform to a single person with direct access to senior government officials, freedom to cut red tape, and resources to assemble a small support team and hire the necessary experts. Such was the case in the privatization of Mexico’s telecommunications company, Telmex. The president announced the reform in August 1989, appointed the minister of finance chairman of the board and gave him overall responsibility for the privatization, and handed over the chief executive’s job to an experienced public administrator with a clear reform mandate. Privatization was completed in December 1990. By contrast, Brazil’s attempts at reform beginning in the early 1980s did not muster the necessary political muscle. Not until 1997 has real progress been made.

**Sort out conflicting objectives early**

The primary purpose of reform is to get consumers more, better, new, and less costly services. Pressures from interest groups—incumbents wanting continued protection, new entrants seeking special deals, treasury officials expecting to use sale revenues to reduce budget deficits, financial advisers earning success fees tied to transaction prices—can steer reform off this track. In particular, sale strategies that drive up the prices for existing companies or new licenses can repress growth, reduce the funding available to invest in the companies, or result in high tariffs. The Mexican government, for example, concluded that the six-year long-distance monopoly granted to Telmex in 1990 had led to higher consumer prices and slower growth than would have resulted under competition. So, in 1996, it chose to forgo the high fees it could have obtained by tendering one or two new licenses and instead opted for unrestricted entry. In India, the exorbitant prices bid for second fixed operator licenses in 1996, combined with modest revenue projections (based on the low per capita income), are making it difficult to raise debt financing for investment. By contrast, the government of Bolivia privatized Entel in 1996 by issuing new shares for which the winning bidder paid US$600 million—funds immediately available for investment in the company. In Brazil, the consortium that won the cellular license in São Paulo in 1997 with a US$2.5 billion bid—four times the government’s asking price and 60 percent more than the second-highest bid—is likely to pass on the cost to customers through much higher tariffs than those proposed by rival bidders.

Sale strategies that place less emphasis on cash up front can, moreover, yield substantially more cash to the government later. For example, awarding a cellular license to the bidder that offers the largest build-out plan—rather than the one offering the highest license fee—can
increase tax revenue for years to come by creating more business. And initially selling only the minimum number of government shares needed to effectively transfer control of the state company to the new owners (usually 20 to 30 percent) allows the government to float the balance later and obtain much higher prices, once the company appreciates under private management. In the Telmex privatization, for example, the government initially sold 20 percent of the shares to a strategic investor in 1990 for US$1.8 billion, then sold 31 percent more through public offerings in 1991 and 1992 for US$4.5 billion—70 percent more per share.

**Set clear policies, rules, and procedures**

The business offered to investors must be clearly defined in the laws, regulations, and main transaction documents (licenses, contracts of sale). The most critical policy issues relate to pricing, competition, and interconnection. In pricing, governments must bite the bullet early and rebalance tariffs. The price an operator is allowed to charge its customers is the most important determinant of profitability and ability to finance growth. Existing tariffs are often way out of line with costs—for too high for international calls, too low for local calls and fixed charges, and somewhere in between for domestic long-distance calls and initial connection (sometimes tariffs are also too low overall). Including rebalancing plans in licenses or contracts often delays further reforms; new owners tend to defer raising some prices to avoid the public fallout, yet later expect the licensing of competitors to be delayed because tariffs remain unbalanced. In setting new tariff structures, calculating the actual costs of each operator is seldom a viable method. Rather, tariffs observed in competitive markets probably offer the best guidance on efficient prices. Some cost elements (land, labor, taxes) vary considerably among countries, but the main costs (equipment, capital) are determined in global markets and international benchmarks are thus relevant. As the market becomes more competitive, pricing can increasingly be left to the operators.

The interconnection obligation of the dominant operators, the principles under which terms of interconnection will be negotiated, and the process and timetable for a regulatory decision if the parties fail to reach agreement must be clearly spelled out. A new operator's ability to reach (and be reached by) customers of the existing operator and to use parts of existing networks on reasonable technical and price terms (rather than building complete new facilities) plays a big part in determining not only its own viability but also the economic efficiency of the sector. In Poland, failure to sort out interconnection with the incumbent meant that of some 200 licenses issued to independent operators since 1990, only about twelve were in use in 1996. Licensees cited the main impediments as unfavorable terms for sharing revenues with the dominant state operator, limited access to its network, slow negotiation of interconnection agreements, and a prohibition on setting up their own transmission facilities.

Reforms should follow clearly defined processes that are open to participation and review by all interested parties. The public should be kept informed. Market mechanisms, not individual negotiations, should be used to select partners and determine the right sale prices. And the award of licenses and contracts should strictly adhere to the evaluation criteria announced at the outset. Once a window of political opportunity for reform opens, time is of the essence—but that should not be used as an excuse to cut corners or strike deals behind closed doors.

Clear rules and processes must also be applied to the regulatory function. The locus and functions of regulatory authority and the basic procedures that will govern its relationships with operators and customers must be defined, preferably by law. That does not mean that a full regulatory capability must be in place before major reform steps can be undertaken. Initial regulatory decisions can be written into licenses and contracts of sale. A core decisionmaking capability in the form of a commission, say, and a secretariat with processing capability, supported by outsourcing of expertise, can handle essential tasks in the first two or three
years, such as issuing licenses, managing conflicting demands on the radio spectrum, and resolving interconnection disagreements. Other areas of competence can be gradually developed as needed. Chances are that successive problems will arise, peak, and then decline to a low simmer, so that a permanent, comprehensive in-house capability may never be needed. Moreover, in most emerging economies, anything beyond a minimalist regulatory institution is not feasible.

Open all markets to competition

Without competition, the benefits from increased private participation will not be fully realized. In Latin America, for example, countries that granted monopoly privileges of six to ten years to privatized state enterprises saw connections grow at 1.5 times the rate under state monopolies—but at only half the rate in Chile, where the government retained the right to issue competing licenses at any time (table 1). Rural areas, too, can become an attractive business under liberal entry and pricing policies. In Chile, government subsidies equivalent to less than 0.5 percent of total telecommunications revenue, allocated through competitive bidding in 1995, mobilized twenty times as much private investment to extend basic telephone access to rural areas. The program brought service to about a third of the rural population lacking it.

Contrary to views often expressed by financial advisers, investors are not opposed to competition—as long as they are not also burdened with regulatory uncertainty, unrealistic service obligations, and rigid tariffs and employment rules. This is true even in small, low-income markets. Ghana Telecom was successfully privatized in late 1996 at the same time that a license was awarded for a second full-service national operator and three other cellular companies were already in place—and the price per line was similar to that paid for the monopoly in neighboring Côte d’Ivoire. But lack of clarity regarding competition policy drives investors away. Partial privatization in 1996 of Svyazinvest, the Russian holding company of eighty-five regional telecommunications companies, failed shortly before closing when the winning bidder realized that the government did not intend to grant Svyazinvest a license to build its own long-distance network.

Enhance credibility and stability

Even if a government gets all the policies, rules and procedures right, operators and investors will come and remain only if they believe that the government will stay the course. Governments can do several things to enhance credibility and stability. To safeguard reforms against political changes, governments should develop the reforms with the support of major stakeholders—various branches of government, public and private sector users, chambers of commerce, consumer groups, large enterprises (including state-owned firms) that could become alternative network providers, local banks and investors, and the staff and management of existing operating companies.

In emerging economies, most with strong growth potential, the concerns of labor can be readily accommodated. Most workers stand to gain from higher salaries, improved career prospects, and new opportunities as employees or entrepreneurs in a rapidly expanding market. Growth allows major gains in labor productivity with little reduction in personnel. As Ghana Telecom prepared to privatize in 1996, some 500 workers (14 percent of the telecommunications and postal workforce) agreed to leave with severance packages that cost the government less than 3 percent of the initial proceeds from pri-

### TABLE 1 FASTER GROWTH IN OPEN, PRIVATIZED MARKETS

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Brazil, Colombia, Ecuador, Peru, Uruguay</td>
<td>7.0</td>
<td>7.8</td>
</tr>
<tr>
<td>Argentina, Mexico, Venezuela</td>
<td>6.7</td>
<td>11.3</td>
</tr>
<tr>
<td>Chile</td>
<td>6.6</td>
<td>20.5</td>
</tr>
</tbody>
</table>

*Source: Pyramid Research data; World Bank data.*
Telecommunications Reform—How to Succeed

Telecommunications reform. After privatization, potential labor problems largely disappeared as a result of management’s promises of no forced redundancies, the introduction of training programs, and expectations of growth. By contrast, labor unions whose concerns—and political clout—had been ignored brought Sri Lanka’s reform program to a halt in the mid-1980s. In the restructuring of state telecommunications enterprises in Latin America, an additional enticement has been offered—employee stock option plans that transfer about 5 percent of shares to employees on favorable terms.

Essential for reducing investor risk is limiting the opportunity for discretionary government or regulatory intervention in business, especially in the early years. In Uganda, initial decisions on tariffs, service obligations, and default interconnection terms are being written into licenses and contracts (as was also done in Ghana). Numbers that will remain firm for, say, five years—subject if necessary to automatic adjustment, based on simple formulas, for inflation, foreign exchange, or other factors—are more effective at reducing risk than are rules for calculating these numbers.

Telecommunications reforms gain credibility when coupled with broader programs in which the government has a large stake. The privatization of ENTel in Argentina was the flagship of President Menem’s multisectoral public enterprise reform program in the early 1990s, and everyone knew that a failure by the government to stick to the rules it had set for telecommunications would have undermined the whole program. More generally, telecommunications reforms benefit from a healthy overall business climate—political stability, sound macroeconomic management, and policies favoring a private-led, competitive, open economy.

Anchoring key elements of reform in international frameworks also adds credibility. Every World Trade Organization (WTO) member country that subscribes to the telecommunications agreement of 1997 enters a binding international commitment to implement aspects of the country’s own reform targets, abide by a common set of regulatory principles, and recognize the WTO as an instance of intergovernmental appeal (see page 39). All this is likely to provide comfort to investors worried about regulatory risk. Similarly, loans, credits, and guarantees from multilateral agencies such as the World Bank Group involve government obligations that can be tailored to help offset such risks as failure of the government to abide by the terms of licenses (on pricing, for example) or ensure access to foreign exchange for debt service or dividend payments. A 1993 investment of US$90 million by the International Finance Corporation and the European Bank for Reconstruction and Development in the Hungarian state telecommunications company mobilized US$1.2 billion in foreign funds at the time of privatization.

Investors, operators, and customers will be reassured by a telecommunications law that establishes broad principles and rules governing the sector. But a law with a narrower objective, such as establishing a regulatory authority, may suffice. The timing of amending or replacing a dated law must weigh the potential delays and political cost. Telmex was privatized in 1990 in the framework of a 1938 transport and communications law—but passage of a new law in 1995 was essential to open the market for competition in 1996.

Conclusion

Major transactions such as a privatization or the issuance of new licenses tend to drive the reform agenda, but change continues well beyond these transactions. Following the rules and honoring commitments help consolidate an environment for sustainable growth. Also critical are to build a regulatory capability to suit changing needs, take every opportunity to enhance competition, and address any persistent gaps between development and commercial objectives.

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February 15, 1997, will be remembered as a landmark date in the history of the multilateral trade system. On that day, sixty-nine governments formalized commitments to liberalize their basic telecommunications services under the General Agreement on Trade in Services (GATS). The resulting Decision on Commitments in Basic Telecommunications has both symbolic and practical meaning. The final act of the Uruguay Round in Marrakech in 1994—giving birth to the World Trade Organization (WTO)—was described by many as the beginning of a new era in international trade rules. The agreement on basic telecommunications can be characterized as the first major accomplishment of this new era. Moreover, it will foster the liberalization of telecommunications, bringing significant benefits for industrial and developing countries alike.

This Note reviews the evolution of the services and telecommunications negotiations, the scope of the new set of multilateral disciplines, and the implications of the agreement for WTO members, particularly developing countries. The basic message is that the agreement is a major accomplishment, but implementing the commitments it contains will pose a significant challenge for many of the developing country WTO members. But the potential benefits of following through with these commitments are not trivial, and policymakers should maintain the focus on the liberalization agenda, building on the commitments already made.

A clash of worlds

In the early 1980s, when the trade community, under the leadership of the United States, began to discuss the inclusion of services in the multilateral trade regime, there was no consensus on the best way to proceed. Developing countries, for example, opposed the negotiations either because they believed that they did not enjoy comparative advantage in the relevant industries or because they feared that these negotiations would intrude into other areas, such as foreign direct investment policies and national regulatory regimes. Needless to say, other topics—for example, agriculture and textiles—were much more prominent on the negotiating agenda of developing countries.

For telecommunications, resistance to trade negotiations also came from major players in the industry. After all, state-owned enterprises were the suppliers of telecommunications services in all but a handful of countries, and international telephony was conducted like a cartel, with transactions closely regulated under rules negotiated under the International Telecommunication Union (ITU). Using trade negotiations to promote the liberalization of telecommunications was an alien concept to most of this community. It was also perceived as a threat to national regulators, and in some countries, it was even portrayed as a threat to national sovereignty.

Despite the opposition, the services negotiations progressed more smoothly than most analysts had predicted at the beginning of the Uruguay Round. The internationalization of services is at the very core of the process of economic globalization. Service industries (for example, telecommunications, transport, financial services) provide critical links among geographically dispersed markets. Efficient, high-quality links are fundamental for transnational corporations—the most dynamic actors in globalization—and this critical need explains
their strong interest in the establishment of multilateral disciplines in services trade. Pushed by these powerful interests and the growing recognition of the potential benefits of liberalizing services, the negotiating agenda evolved gradually, and by 1993, the basic architecture of the GATS had been agreed on.

**The GATS in a nutshell**

The GATS comprises the framework agreement (with its twenty-nine articles and eight annexes) as well as the schedules of specific commitments and the lists of exemptions to most-favored-nation (MFN) treatment submitted by member countries. It covers four modes of international delivery of services: cross-border supply (for example, international telephony), consumption abroad (tourism), commercial presence (provision of services abroad through a branch, agency, or subsidiary), and the presence of natural persons (entry and temporary stay of foreign individuals in order to supply a service).

It broadly follows the tradition of its counterpart for trade in goods—the General Agreement on Tariffs and Trade (GATT)—emphasizing nondiscrimination and imposing limits on the use of quantitative restrictions on trade. But it introduces innovations, covering transactions associated with commercial presence and introducing a concept of market access that goes beyond border restrictions (for example, in principle, it proscribes restrictions on the type of organization under which foreign providers can establish commercial presence).

Unconditional MFN treatment is a basic obligation of signatories that applies to all services, an obligation that bars a WTO member from treating other members less favorably than any other country. But the GATS allows MFN exemptions as long as the member country identifies them explicitly. The list of exemptions is supposed to be time-bound and, in principle, should not last more than ten years. Another basic obligation of members is a commitment to transparency, which requires governments to publish and make available to the public the laws and regulations that affect trade in services.

Market access and national treatment are specific obligations under the GATS. They apply only to the service industries and activities listed by a country in its schedule of commitments. These obligations are specified at the level of each of the four modes of supply and subject to the limits made explicit in the offer. The GATS adopts a “positive list” approach with respect to sectoral coverage of service industries—that is, only the industries and activities scheduled in the commitments are subject to the GATS’s specific obligations.

**The treatment of telecommunications in the GATS**

The definition of telecommunications services for GATS purposes is comprehensive, encompassing both basic services—those that involve simply end-to-end transmission of voice or data—and value added services—those that modify the form or content of the messages relayed through the networks. By the end of the Uruguay Round, forty-eight schedules (representing 59 of the 125 governments participating in the negotiations) contained commitments in telecommunications. But almost all of these commitments covered only value added services, reflecting the resistance still facing this novel approach to telecommunications negotiations. In short, most of the relevant markets for communications continued to operate outside multilateral disciplines.

The Uruguay Round accomplished some important results for the sector; however. First, it raised awareness about the potential role of trade negotiations in fostering the liberalization of telecommunications. Second, it helped to diminish the gap in understanding between the trade and telecommunications communities by promoting a dialogue on their distinct approaches to regulation. Third, it established that access to telecommunications services was critical for trade in services and that users were entitled to fair
terms of access (as outlined in the Annex on Telecommunications of the GATS).

But the limited progress in effective liberalization of basic telecommunications led WTO members to agree to continue the negotiations beyond the date of the Round's completion (April 15, 1994). Basic telecommunications joined maritime transport, financial services, and the movement of natural persons as topics for sectoral negotiations. The Negotiating Group on Basic Telecommunications (NGBT) was created in May 1994, with a deadline of April 30, 1996, for completing the talks.

**From the NGBT to the GBT**

Participation in the NGBT was voluntary. Initially, fifty-three WTO members decided to participate in the negotiations, with twenty-four other governments attending the meetings as observers. The attitude of most participating countries about the usefulness of engaging in these negotiations had shifted significantly by then. In part, this simply reflected a better understanding of the potential benefits of liberalizing telecommunications. More fundamentally, however, it reflected the growing recognition that the industry faces a paradigm shift. Technological progress is rapidly eroding the sustainability of old practices based on monopolistic behavior, state control, and protected markets for local providers. Callback systems, virtual private networks, the Internet, and the growing promise of modern satellite communications are multiplying the opportunities for bypassing telecommunications monopolies. At the same time, the increasing information intensiveness of transnational corporations and the dramatic reductions in the cost of communications create additional incentives for customers to actively explore bypassing alternatives.

In the NGBT, the focus of the debate rapidly moved on from “why to liberalize” to “how to liberalize.” Important conceptual progress was made as participants recognized that for telecommunications, the value of the market access commitments would be greatly reduced unless a procompetitive regulatory framework was also put in place. A draft reference paper describing regulatory disciplines supportive of market entry was negotiated, and most countries became signatories to this text (partially or in its entirety) in the context of additional commitments made in their offers (expanding on their market access and national treatment commitments). This can be characterized as the first multilateral effort to deal explicitly with substantive aspects of competition policy. Even though limited to telecommunications, it was a major achievement, and it paves the way for future multilateral disciplines and international harmonization.

By April 1996, thirty-four offers (encompassing forty-eight governments, with the European Union's submission counting as one) were on the table. Still, some countries—particularly the United States—were dissatisfied with the quality and coverage of the offers. Moreover, in the final phase of the talks, the issue of satellite services—that is, to what extent explicit provision for these services needed to be made in the offers—added “noise” to the negotiations. As a result, no deal was attained by the deadline of April 30, 1996. Given the progress already achieved, however, there was broad
support for continuing the negotiations. Seizing this opportunity, Renato Ruggiero, Director-General of the WTO, suggested that countries should be given a chance to improve on their offers, and February 15, 1997, was established as the new deadline for the negotiations. A new body—the Group on Basic Telecommunications (GBT)—was created to carry on with the negotiations, replacing the NGBT, and the rules of participation were changed to make all WTO members full participants.

The negotiations restarted in July 1996, and by the WTO Ministerial Conference in Singapore in December 1996, several countries had already tabled improved offers, signaling support for a successful conclusion of the negotiations. Still, some thorny issues remained. Lively discussions continued on international services (for example, countries with more liberal regimes were concerned that an MFN commitment to liberalize international services could give rise to anticompetitive practices by foreign monopolistic carriers), on satellite services, and on what constituted an adequate “critical mass” for a deal. Other controversial issues included how to avoid discriminatory practices in the allocation of spectrum and how to draw the line between telecommunications and audiovisual services given the growing technological convergence in these areas.

Gradually, however, technical and political solutions began to emerge. With respect to international services, the United States unilaterally announced a new policy toward international settlement rates in December 1996, creating a mechanism for addressing the concerns of its own carriers about the distortions of the accounting rates system outside the WTO framework. This helped deflate opposition to the agreement based on concerns that it could foster anticompetitive practices (for example, through one-way accounting rate bypass). Also

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**FIGURE 1 COUNTRIES MAKING BASIC TELECOMMUNICATIONS COMMITMENTS**

<table>
<thead>
<tr>
<th>Service</th>
<th>Developing countries</th>
<th>High-income countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voice telephony</td>
<td>31</td>
<td>24</td>
</tr>
<tr>
<td>Domestic long distance</td>
<td>29</td>
<td>22</td>
</tr>
<tr>
<td>International</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>Resale</td>
<td>19</td>
<td>23</td>
</tr>
<tr>
<td>Data transmission</td>
<td>37</td>
<td>26</td>
</tr>
<tr>
<td>Private leased circuit services</td>
<td>29</td>
<td>26</td>
</tr>
<tr>
<td>Terrestre mobile</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>Other terrestre mobile services</td>
<td>34</td>
<td>26</td>
</tr>
<tr>
<td>Mobile satellite services</td>
<td>29</td>
<td>24</td>
</tr>
<tr>
<td>Fixed satellite services</td>
<td>28</td>
<td>23</td>
</tr>
<tr>
<td>Trunked radio</td>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>Reference paper (additional commitments)</td>
<td>30</td>
<td>27</td>
</tr>
</tbody>
</table>

Source: World Trade Organization data.
helping to pave the way to the final agreement were the adoption of a technologically neutral approach to scheduling (that is, unless otherwise noted, the commitments would cover all transmission possibilities including satellite services) and the acceptance of the concepts that frequency and spectrum management should not be used to undermine market access commitments and that MFN exemptions could temporarily be used to address the differences in treatment of audiovisual services.

In a parallel effort, governments, the WTO, and several other multilateral organizations worked to raise awareness of the importance of the negotiations for developing countries and to help these countries prepare their own offers. The World Bank, for example, through its Information for Development (infoDev) program and in close cooperation with the WTO, sponsored a project to provide technical assistance to more than twenty developing countries in the final stages of the negotiations. By early 1997, it became clear that a "critical mass" of offers would be achieved. On February 15, 1997, the telecommunications talks were successfully concluded.

The scope of the agreement

Sixty-nine WTO members tabled commitments by February 15, 1997. These schedules will become formally binding by January 1, 1998. Not only were several new offers added to those available in April 1996, but thirty-two of the thirty-four original offers were revised, typically leading to more substantive commitments. Commitments were made in all basic telecommunications services by both high-income and developing countries (figure 1). Moreover, most participants made commitments either to all or to parts of the reference paper, subscribing to procompetitive regulatory principles (for example, the establishment of independent regu-
FIGURE 3  COUNTRIES WITH LOWEST TELEDENSITY LESS ACTIVE IN WORLD TRADE ORGANIZATION NEGOTIATIONS

Teledensity in 1995
Main telephone lines per 100 inhabitants
- >25
- 10-25
- 1-10
- <1

WTO offers
(February 1997)
- Countries making offers

The boundaries, colors, denominations, and any other information shown on this map do not imply, on the part of the World Bank Group, any judgment on the legal status of any territory or any endorsement or acceptance of such boundaries.

Source: International Telecommunication Union and World Trade Organization data.

The exact implications of the agreement for a particular country can only be assessed by a careful analysis of its schedule of commitments, including phasing considerations, list of qualifications by activity and mode of delivery, and

lators, the adoption of competitive safeguards, measures to ensure interconnection, transparent and nondiscriminatory practices with respect to licensing, and universal service obligations).
eventual recourse to MFN exemptions (nine governments claimed such exemptions for certain activities). It is fair to say, however, that in contrast with the GATS's results in 1994, when most schedules were characterized by status quo commitments (that is, governments basically bound themselves not to adopt more restrictive policies), the outcome of the basic telecommunications negotiations will foster significant additional liberalization. In this sense, the agreement proved wrong those analysts who were skeptical of the role of sectoral negotiations in fostering liberalization at the multilateral level.

The markets affected by the agreement represent more than 90 percent of the world market for telecommunications (figure 2). Developing countries account for less than 20 percent of the global revenues from telecommunications services, but they are the fastest-growing markets for these services. Their participation in the WTO process is thus important not only for developmental reasons, but also because these markets are bound to increase in relative importance. The countries with the weakest telecommunications infrastructure (such as in Sub-Saharan Africa) are also those that participated less actively in the WTO negotiations (figure 3). Assistance to help bring these countries into the system should be a priority for the donor community.

The road ahead

Analyses of the importance of the basic telecommunications agreement tend to cluster around two extreme positions. Most analysts have been extremely enthusiastic and present the agreement as delivering swift liberalization of participating markets. Others are more sceptical, pointing out that the multilateral regime and the regulatory authorities are being overtaken by the velocity of technological change in the industry. According to these skeptics, the agreement plays at best a secondary role in this process of change.

Reality is somewhere in between. It is true that fast technological change has been the main driver of the paradigm shift in telecommunications, and it explains to a large extent the changing attitude in the industry on the desirability (and inevitability) of competition. But credible rules relating to market access, constraints on discrimination, and a procompetitive regulatory environment play an important part in shaping the outcome of this “revolution,” particularly in influencing the distribution of its benefits.

Private capital is expected to take the lead in funding investments in telecommunications in the developing world. In the early 1990s, 65 percent of the financing for basic wireline telecommunications in the developing world came from internal sources (profits), with commercial funds (20 percent) and official sources (15 percent) playing a more limited role. By the end of this decade, it is estimated that private capital flows will finance a much greater share of the investments in the sector (55 percent), with internal (40 percent) and official sources (5 percent) reducing their relative participation.

But private investors will be willing to invest in modernizing the telecommunications infrastructure of developing countries only if they can count on fair and stable rules of the game. Accordingly, developing countries able to signal their commitment to liberalization and to adopt a procompetitive regulatory environment will be in a better position to attract the capital flows required for these investments. WTO commitments can play an important part in this.

Benefits for developing countries are not limited to attracting foreign direct investment. Liberalization will also improve local firms' access to efficient telecommunications service provid-
ers. This will increase their competitiveness—and thus their ability to explore the dynamism of international trade in information-intensive products and services. Last but not least, competition will improve the price-quality mix of the telecommunications services available to consumers. The critical remaining issue is the quality of the implementation of the commitments. Many developing countries are entering uncharted territory, particularly with respect to procompetitive regulatory disciplines. Those able to meet these challenges will be much better positioned to benefit from the “information age.”

1 This section relies on Primo Braga (1996). For further details on the rationale for liberalizing services and on the architecture of the GATS, see UNCTAD and World Bank (1994) and Hoekman (1996).

2 Basic services cover voice telephony, telex, telegraph, facsimile, data transmission, private leased circuit services, fixed and mobile satellite systems and services, cellular telephony, mobile data services, paging, and personal communication services. Value-added services include email, voice mail, on-line data processing, on-line database storage and retrieval, and electronic data interchange.

For further details on this project, which was executed by the International Institute of Communications, visit the infoDev Website at http://www.worldbank.org/html/infodev/infodev.html.

Antigua and Barbuda, Argentina, Australia, Bangladesh, Belize, Bolivia, Brazil, Brunei Darussalam, Bulgaria, Canada, Chile, Colombia, Côte d'Ivoire, Czech Republic, Dominica, Dominican Republic, Ecuador, El Salvador, European Communities and its Member States, Ghana, Grenada, Guatemala, Hong Kong, Hungary, Iceland, India, Indonesia, Israel, Jamaica, Japan, the Republic of Korea, Malaysia, Mauritius, Mexico, Morocco, New Zealand, Norway, Pakistan, Papua New Guinea, Peru, Philippines, Poland, Romania, Senegal, Singapore, Sri Lanka, Switzerland, Slovak Republic, South Africa, Thailand, Trinidad and Tobago, Tunisia, Turkey, United States, and Venezuela.

For a discussion of the results of the GATS in promoting services liberalization, see Hoekman and Primo Braga (1996).

References


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What the Transformation of Telecom Markets Means for Regulation

Peter Smith

In most countries, telecommunications regulators no longer regulate a static, monopolistic industry that provides essentially a single product, telephone service, but a dynamic, multiproduct, multioperator industry. In this respect, the telecommunications regulator is way ahead of its peers in other utility sectors in moving from a monopolistic to a competitive market. This environment is a fast-changing and increasingly complex one in which regulators face reduced scope for discretionary decisions. This Note explores the implications for the regulatory agenda.

The transformation of telecommunications markets is occurring in several dimensions—in the changing structure of demand, in the convergence of services, and in the changing structure of the industry. The transformation is driven mainly by technological developments. But competitive pressures resulting from the globalization of the world economy and the ideology and results of reform policies in the sector are also important forces.

- **Changing demand structure.** Only ten years ago, conventional "fixed" voice telephony dominated the revenues of all telephone companies. Today, unprecedented growth in demand for new services—facsimile, mobile telephony, and Internet—is fundamentally changing the overall structure of demand in the sector. For example, in Thailand recently, 24 percent of all telephones were mobile. The exponential growth in the number of Internet servers and users, and consequently in the demand for bandwidth to carry graphics-rich data files, is intensifying the demand for national and international transmission links.

- **Convergence of services.** Convergence is occurring not only between telecommunications, broadcasting, cable television, and the Internet, but also within segments of the telecommunications market. For example, cellular mobile telephony is now a substitute for conventional local telephone service for many customers; the distinction between local and long-distance calling or, with the pending introduction of global personal mobile satellite service, between domestic and international service is becoming less and less relevant.

The distinction between local and long-distance calling or, with the pending introduction of global personal mobile satellite service, between domestic and international service is becoming less and less relevant; and paging and cellular telephony are now sometimes bundled as a single service delivered through the same handset.

- **Changing industry structure.** There has been a fundamental shift in the industry structure in many countries toward a multioperator environment. Several factors are driving this shift. New operators are entering the market...
from other utility sectors (in the United Kingdom, for example, electric utilities and cable TV companies both provide telephony services). Service suppliers are going international as the era of national monopolies passes. And the resale of network services is becoming an increasingly important business as separating network ownership from service delivery becomes operationally and commercially viable.

The future of telecommunications regulation

These trends in telecommunications markets mean that regulators will operate in a rapidly changing environment characterized by increased complexity, reduced scope for discretion, separating network ownership from service delivery becomes operationally and commercially viable.

The resale of network services is becoming an increasingly important business as separating network ownership from service delivery becomes operationally and commercially viable.

Managing the transition

In contrast to such utilities as power and water, telecommunications is now clearly a multiproduct sector with several alternative service delivery mechanisms that permit competition in service provision. Thus, the regulatory agenda has shifted from minimizing the price of subscribing to local telephone service or maintaining cross-subsidy to managing multiple issues related to competition, entry, pricing, and cross-subsidies:

- Determining whether entry in different market segments should be limited or open and setting the terms of entry—and thus creating market forces.
- Adopting processes for the award of licenses to service providers. (These may include bidding processes in which the evaluation criteria are clear and easily measured, as in price bids, or “beauty contests,” in which the bid evaluation criteria are subjective and the selection process is less transparent.)
- Resolving network interconnection issues and managing numbering plans to promote the emergence of a multioperator environment.
- Authorizing rate rebalancing (whereby prices are moved closer to costs by reducing prices for international and long-distance services and increasing them for local and network access service) in order to reduce economic rents and cross-subsidies.
- Applying new approaches to cross-subsidies, such as improved targeting of beneficiaries, bidding for minimum subsidies, and the administration of subsidies in a way that does not favor one operator over another.

A task of new significance is spectrum management. The wireless revolution, reflected in the rapid growth of cellular telephony, the increasing significance of wireless local loop systems, and the planned deployment of several new-generation global personal mobile satellite systems, demands that regulators respond to the increased need to manage radio spectrum. Typically, this task involves allocating portions of the radio spectrum to different uses, assigning frequencies and authorizing transmission power levels to transmitters at specified locations, maintaining standards to ensure that transmitters make optimum use of the radio spectrum, and implementing measures to control unauthorized use.

While the emphasis shifts to managing the transition to competition, the fundamental reasons for regulation of the sector—the need to protect customers from potential monopoly abuses and to allocate the scarce radio spectrum—have not gone away. Voice telephony remains widely regarded as an essential public service, and the sector is still a potential monopoly in which operators could adopt strategic behavior with...
respect to network interconnection, numbering plans, allocation of radio spectrum, and the use of cross-subsidies. Regulators are still gatekeepers of the transformation of the telecommunications market—they influence the speed, conditions, and areas of change, and they arbitrate conflicts that arise between winners and losers in that change. Consequently, regulators often must keep an eye on politically acceptable limits to change (for example, to the structure of cross-subsidies in the sector) while steering a course toward regulatory reform.

**Increased complexity and reduced discretion**

The transformation of telecommunications markets has made the job of regulating the sector much more complex. At the same time, it has reduced the scope for discretionary decisions. Market transformation is reducing the scope for regulators to maintain cross-subsidy, for example, as a result of the convergence of services within the sector. Traditionally, the clear segmentation of the market enabled regulators to treat different categories of customers and service providers differently, influencing the profitability of services and the flow of cross-subsidies. Thus, mobile telephone service prices were typically unregulated, while fixed telephone service prices were regulated. And monopoly international telephone service prices could be set very high in order to generate a pool of funds for cross-subsidy. But the convergence of services—reflected in the increasing substitutability of mobile and fixed services, the increasing ease with which high-priced international telephone service can be bypassed through private networks, the introduction of callback services, and the pending introduction of global personal mobile satellite services—creates pressures to reduce differential regulatory treatment and to push prices closer to costs.

In addition, the involvement of the World Trade Organization (WTO) in setting rules for regulating basic telecommunications services further reduces regulators' scope for discretionary decisions relating to, for example, preventing anticompetitive practices, providing interconnection with a major operator on nondiscriminatory terms, and allocating scarce resources such as radio frequencies and telephone numbers.¹

**Privatizing regulation**

With the increased complexity, the option of privatizing some aspects of telecommunications regulation is increasingly attractive. Two main approaches are possible. One is to create private property rights over the radio spectrum, which has been implemented to some extent in the United States and other countries through radio spectrum auctions. Once such property rights are established, the new owners of the spectrum may wish to take an increased role in sublicensing to other users and in policing the use of the spectrum. Establishing property rights increases the commercial value of the spectrum and thus provides incentives for more efficient use. An important extension of this approach, proposed by advisers to the government of El Salvador in 1996, calls for creating rights over designated commercial radio spectrum bands not just for specific uses, but for any use. This gives owners of designated commercial bands an incentive to assign frequency to the most profitable (or highest-value) use. Creating property rights thus substitutes a market process for the government role in assigning radio spectrum for specific uses such as broadcasting, cellular telephony, or private telecommunications networks. The government role could be limited to managing the initial sale of spectrum, ensuring compliance with international agreements on spectrum use, and ensuring that ownership of the radio spectrum is not monopolized.
The second approach for privatizing regulation is outsourcing. While regulatory authority would remain with a government agency, many functions could be contracted out, such as auditing the performance of operators, preparing public consultation documents, or implementing alternative dispute resolution mechanisms. The multioperator environment emerging in most countries promises a heavy workload for regulators in adjudicating billing, numbering plan, and interconnection issues. Alternative dispute resolution mechanisms and other forms of outsourcing are important options for reducing that workload as well as the budgetary burden on telecommunications regulators.

**Convergence of regulation**

Multisector public utility boards have been around for many years in the United States. These utility boards often have a mandate over telecommunications, natural gas, and electric power supply. And in some jurisdictions, communications regulators have a mandate over transport or broadcasting as well as telecommunications.

Now, new pressures for convergence in regulation are arising from four main sources. First, the overlap between regulation of carriage (telecommunications) and regulation of content (broadcasting) will increase as both telephone companies and cable TV operators begin to provide services previously provided only by the other and as the Internet’s capability to deliver video improves.

Second, the substitutability of services across subsectors or market segments, particularly between telecommunications and cable TV, broadcasting, satellite broadcasting, or Internet, also creates pressures for harmonizing regulation across communications subsectors.

Third, the critical issues that are emerging in telecommunications relate to promoting competition: interconnection arrangements, revenue settlement, numbering plans, number portability, and the like. Although the implementation of procompetition policies in telecommunications is sector-specific (or in some cases, specific to network industries) in important ways, the policy itself is essentially competition policy. This pressure for regulatory convergence is an outcome not only of the changing technology and market structures, but also of the increasing role of international agreements on telecommunications regulation. And as a result, telecommunications regulatory agencies will increasingly become specialized competition policy agencies.

Fourth, the high level of insularity or compartmentalization that has been possible at the national and international level as well as the sectoral level is being eroded. Until recently, for example, France could have a completely different regulatory approach than the United Kingdom. But the recent completion of the WTO agreements setting out commitments for regulating basic telecommunications services is a step toward international harmonization of regulation in the sector. And in the European Union, the application of European competition policy has played a key role in liberalizing basic telecommunications. These recent EU and WTO initiatives, though not comprehensive, are important steps in harmonizing national approaches to telecommunications regulation.

**Conclusion**

Regulation is profoundly changing the telecommunications sector. But change in the sector is also driving the agenda for regulation. In time, it is not inconceivable that telecommunications regulatory agencies will eventually disappear, absorbed into multisector antitrust agencies.

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The Private Sector and the Internet

Carlos A. Primo Braga and Carsten Fink

Advances in telecommunications and informatics have transformed the Internet from an academic experiment into a household name in most industrial countries. The number of computers connected to the Internet grew from 535,000 in July 1991 to close to 16 million by January 1997 (figure 1), and it is estimated that the number of Internet users has already exceeded 50 million. Although still concentrated in industrial countries, this "network of networks" is rapidly expanding in the developing world. Many now believe that it provides a window into a future in which access to information will be independent of geographic location and interactivity in a multimedia environment will be ubiquitous.

This Note briefly reviews the history of the Internet and its evolution from an academic experiment into the main application behind the emerging global information infrastructure. It discusses the role of the private sector in these developments and the regulatory environment required for the Internet to fulfill its promise. It concludes with some lessons for expanding the Internet in developing countries.

The rise of the Internet

The origins of the Internet can be traced to the 1960s, when the U.S. Department of Defense decided to fund the development of a packet-switching data network that would allow networked computers of different sizes and types to communicate efficiently. In packet-switching networks, data files are broken into small packages that are sent independently over the network and then reassembled at the final destination. This permits efficient use of communications lines because, unlike circuit-switching, an architecture typically used for voice telephony, it does not require an open, or point-to-point, connection. Packet-switching allows many users to share a circuit, with no particular connection dedicated for a given communication session. Moreover, it increases the network's reliability, allowing it to operate even under catastrophic conditions (for example, amid a nuclear war).

The resulting network, Arpanet, began operation in 1969, linking four sites. In the 1970s, other government-supported networks emerged in the United States, but access remained restricted to the research community connected with the Department of Defense and other

![Figure 1: Growth of the Internet](http://example.com/fig1.png)

*Note: An Internet host is a computer that acts as an information and communications server and has a direct connection to the Internet. Top-level domain names identify hosts by type or origin—for example, .com (commercial), .edu (educational), and .net (network), the three most frequently used. Others include .org (organization), .gov (U.S. government), and country domains such as .uk (United Kingdom) and .de (Germany). But top-level domain names can be misleading: a host might not be located in the country indicated or might be either a public or a private institution. Source: Network Wizards (http://www.nw.com).*
government agencies. This changed in 1986 with the creation of the NSFNet, also subsidized by the U.S. government. The idea of the NSFNet was to provide high-speed backbone services connecting regional networks as well as campuses and research centers. The network of networks communicating through the Internet protocol began to expand rapidly.

In the early 1990s, the management of the NSFNet backbone was subcontracted to private firms, which were allowed to route commercial traffic through the Internet. The explosive demand for network service in the 1990s—mainly from the private sector—led to the emergence of several commercial Internet backbone networks (such as Alternet, PSNet, and SprintLink), and in October 1995, the NSFNet backbone was shut down. U.S. government subsidies for the Internet have fallen to an insignificant amount, and almost all the costs of the Internet are now borne by its users.

Supporting the explosive growth of the Internet and of the demand for Internet services have been the rapidly evolving network architecture and user interfaces. This technology has benefited from the decline in computing costs relative to transmission costs. On the user side, the growth of the Internet has been promoted by the appearance of powerful programming languages, new network "tools," and user-friendly interfaces. The World Wide Web, a sophisticated application that allows users to access any kind of digitized information (text, picture, sound, video) and configure it for display with a mouse click, has given multimedia capabilities to the Internet. The growth of the Web has been astounding: between June 1993 and January 1997, the number of Websites leapt from 130 to roughly 200,000. Fostered by the improving multimedia capabilities, commercial use of the Internet overtook research and educational use and has been growing exponentially in the 1990s (see figure 1). By January 1997, there were close to 4 million hosts in the .com domain. The private sector has clearly taken the driver's seat in providing both the Internet's infrastructure and its content in the United States.

**Regulation**

The Internet has blossomed in a relatively regulation-free environment. Most regulatory activity has concentrated on defining standards for the formats and protocols necessary to operate the network. But as the commercial presence on the Net increases, regulatory issues relating to the provision of the network's infrastructure and services become increasingly important. The development of a regulatory framework is critical in three areas: provision of Internet backbone access; Internet service providers (ISPs); and information services.

The Internet backbone servers are the highest-level network servers—those to which ISPs pay connection charges. The basic regulatory options are to provide public support for backbone access to promote connectivity or to leave backbone service provision to the market. As mentioned, the original backbone in the United States, NSFNet, was government-funded until rapid growth in networking demand led to the
emergence of commercial backbones. A similar pattern can be found in other industrial countries. In Germany, for example, the first Internet backbone—UNIDO, for Universität Dortmund—was run by the university and later replaced by commercial backbones.

ISPs provide Internet services to the end users. In the United States, ISPs are competing private firms. In other countries, the major ISP is the state-owned telecommunications operator, often a monopoly. Regulatory options for ISPs depend on the market structure in telecommunications. In many cases, the telecommunications operators are well positioned to provide Internet services. But it is worth pointing out that OECD countries with more competitive telecommunications sectors tend to have greater Internet connectivity than countries with a monopoly (figure 2).

Policymakers have to decide whether telecommunications network operators should be permitted to offer information services in direct competition with independent information service providers. As a rule of thumb, if a telecommunications operator has market power in the transport network, structural or at least accounting separation should be required to avoid anti-competitive cross-subsidization. In other words, the Internet services unit of the operator should be required to buy access to the transport network on an “arm’s-length” basis. Another, very sensitive issue is voice telephony over the Internet, which may become a serious threat to the traditional circuit-switched network.

**Box 1 Intellectual Property in Cyberspace**

The rise of the Internet gives new relevance to the issue of extraterritoriality and increases the demand for convergence among national intellectual property rights regimes. The Internet not only opens new possibilities for dissemination of information; it also expands the scope for activities that may infringe on someone’s intellectual property rights. With a few keystrokes, an Internet user can anonymously download copyrighted material in bulletin boards around the world. Prosecuting Internet service providers can discourage infringement, but it may inhibit the expansion of the value added services that make the Internet so powerful.

The most important international treaty on copyright protection is the Berne Convention for the Protection of Literary and Artistic Works of 1886, which provides for national treatment of domestic and foreign copyright holders and sets minimum standards for copyright protection. The World Intellectual Property Organization (WIPO)—a specialized United Nations agency that administers the Berne Convention—held a diplomatic conference in December 1996 to revise the convention and to clarify the scope of copyright protection in the digital environment. The main outcome of this conference was the WIPO Copyright Treaty. This treaty makes clear that the reproduction rights of copyright owners encompass the right to make digital copies. But its language is broad enough to allow national legislation to limit (or remove) liability at the level of network providers with respect to, for example, temporary digital storage. The treaty thus achieves a balance between the concerns of content providers and those of content carriers.


**Appropriability of Content**

Digitized information can be easily reproduced and redistributed on the Internet, and providers of information find it difficult to charge users directly. Most private content providers recover costs indirectly—by providing information to potential customers about other goods and services. The indirect incentive structure is strong given the low cost of disseminating information on the Internet relative to the number of users and the bright future prospects of the Internet.

But the conventional remedy for the cost recovery problem is intellectual property rights protection. Copyright, for example, protects an author’s work—whether a book, a performance, a recording, or a computer program—from unlicensed copying. In principle, traditional copyright
law applies to the Internet environment. But such major industrial economies as the United States and those in the European Union have revised or are now revising their intellectual property rights laws to address specific needs of electronic networks. Moreover, the global character of the Internet demands international legal governance (box 1).

An important problem in legal protection for copyright holders on the Internet is enforcement, given the speed and magnitude of data transmission. This is an area where digital rights management technologies can be of help. These hardware and software devices control access to information and the ability to use and further distribute it. In principle, these “encryption” technologies are attractive because, unlike intellectual property rights, they can provide digital protection across national boundaries. Increasingly sophisticated digital rights management technologies are becoming available on the World Wide Web. But national security reasons have been invoked to limit the dissemination of cryptographic capabilities. The United States has been trying to address the national security issue by promoting data encryption standards that can be broken by intelligence agencies and by controlling the export of encryption technology, restrictive measures that may inhibit widespread commercial use of these technologies.

A third way to recover costs is through the sale of advertising space on information pages. Commercial advertisements first appeared on the Web in 1994. Although this step toward pure commercial use of the Internet initially

FIGURE 3 GLOBAL INTERNET DENSITY, 1996

The boundaries, colors, denominations, and any other information shown on this map do not imply, on the part of the World Bank Group, any judgment on the legal status of any territory or any endorsement or acceptance of such boundaries. Source: Network Wizards (http://www.nw.com/zone/WWW/top.html).
met with strong resistance from the research and education communities, growth has been rapid, and advertising revenues are estimated to have exceeded US$250 million in 1996.

Internationalization

Although the Internet is still most widely used in the United States, the 1990s have been marked by its rapid internationalization. The share of non-U.S. hosts increased from 20 percent in July 1991 to 36 percent in July 1996. But most non-U.S. hosts still reside in industrial countries, and in July 1996, roughly 96 percent of all Internet hosts were in OECD countries.

Most developing countries are connected to the Internet—if only through email—though penetration is still low (figure 3). In 1996, there was on average only 0.5 Internet host per 10,000 inhabitants in developing countries, compared with 101 in industrial countries. The low penetration is due mainly to the poor information infrastructure in developing countries—the roads and ports that carry and process digitized information. Average teledensity (telephone lines per person) is thirteen times lower, and average PC density thirty-eight times lower, than in industrial countries.

For developing countries, establishing the right regulatory environment is as critical as it is for industrial countries—though the relevance of the regulatory experience of industrial economies discussed above is open to debate for countries with poor telecommunications networks, low computer penetration, and inefficient state-owned telecommunications monopolies. But a few developing countries have managed to rapidly expand Internet connectivity despite weak information infrastructure, such as Brazil, Chile, the Czech Republic, Malaysia, Mexico, and South Africa.

Brazil, for example, successfully adopted a model of public-private partnership to diffuse the Internet, and it has increased Internet connectivity despite its dominant state-owned telecommunications operator. Recognizing the economic benefits of electronic networking, the Brazilian government supports an Internet backbone open to commercial connectivity and traffic while limiting the dominant carrier's activity in the direct provision of Internet services to the public. The number of Internet hosts in Brazil (.br domain) grew from 300 in January 1992 to more than 50,000 in July 1996, of which some 20,000 are commercial (.com.br domain). By the mid-1990s, Brazil had a higher ratio of Internet hosts to PCs than such economies as France, Germany, Hong Kong, and Singapore.

By the mid-1990s, Brazil had a higher ratio of Internet hosts to PCs than such economies as France, Germany, Hong Kong, and Singapore.

There are, of course, many obstacles to the diffusion of the Internet in developing countries. National laws regarding privacy and intellectual property rights protection must be refined. And the predominance of English-language content may deter local researchers or local firms that could use the Internet to add value to their goods and services.

The critical bottleneck, however, continues to be the weak information infrastructure of developing countries. Government activism to promote Internet connectivity at the level of the research and education communities may help jump-start the national information infrastructure. And governments should support community access in public libraries and community centers. But an increasingly important role for governments in fostering the Internet revolution is that in the regulatory arena. Most important here is to promote a competitive environment for Internet service providers, establish adequate rules of the game for electronic
commerce, and ensure effective incentives for the provision of content—essential measures for attracting private investment in the infrastructure and in content generation. Those countries able to attract such investment will be better positioned to benefit from the emerging global information infrastructure.

1 This understates the number of commercial hosts, since the .net domain (with more than 1.5 million hosts) and some of the country domains also include commercial hosts.

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