



COMMUNICATIONS
FORUM

TELECOMMUNICATIONS INVESTMENTS
AND ECONOMIC GROWTH

September 18, 1986

Seminar Notes

**MASSACHUSETTS INSTITUTE OF TECHNOLOGY
COMMUNICATIONS FORUM**

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**Charles Jonscher
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**Stephen Ettinger
The World Bank**

**Raymond Duch
University of Houston**

TELECOMMUNICATION INVESTMENTS AND ECONOMIC GROWTH

Charles Jonscher - MIT

Jonscher began by asserting that telecommunication infra-structure requires massive investments. Upgrading telecommunication networks is very expensive and cannot be accomplished with a few billion dollars like building a new generation of airliners. The replacement of a large proportion of the US telecommunication network he estimated as costing roughly \$200 billion. Similarly, the infra-structural cost in developing countries of providing telecommunication services to a majority of the population in the southern hemisphere was estimated to cost in the region of \$1000-\$2000 per line which adds up to a staggering number of billions of dollars.

He used a slide (exhibit A) to describe mechanisms by which telecommunication helps development. Though there are various mechanisms listed they basically fall into just two categories - one is business expansion, all the others have the general character of cost or resource saving. The first category (business expansion) beats all the others in terms of both private gain (to a business) and economic gain (to the nation). It is also uncontroversial in its macro impact when compared to the second group where for example the saving of labor (time) could cause unemployment problems. He went on further to describe with the use of slides some of the other mechanisms within the second category (resource/cost savings), and the relevant impact of telecommunications on each of them.

Jonscher based his subsequent remarks on the results of

four studies - two in developing countries (Costa Rica, Philippines), and two in developed countries (USA, UK). The studies analyzed the benefit versus cost of telephone use. The statistics were procured by going out and speaking to current business and residential users, and potential users. The first analysis of statistics is for an area in the Philippines called Northern Mindanao. The gross benefit for this area was estimated as 59 million pesos serving 1540 tiny businesses against the cost of \$171 million per 111,000 lines. The cost of course was calculated on the basis of the entire network whereas the benefits pertain only to the region. The resultant benefit/cost ratio of 25:1 was obtained for the business lines. When adding residential lines to the system the benefit/cost ratio works out to 1.5:1. The analysis of statistics for another region in the Philippines (Northern Luzon) revealed similar results. The benefit/cost ratio for business lines was 20:1 and for the whole system 1.5:1. (The benefit/cost ratios in both the above cases are very conservative because only the benefit attributable to businesses was taken into account). He then discussed the results of the Costa Rican study which in effect was a step up the socio-economic scale (being much better developed than the Philippines). Refer exhibits B and C for details on residential and business lines respectively. A significant increase was noted in the benefit/cost ratio for business lines - almost 50:1, and for residential lines - 5:1. Another useful observation arising from the above studies (Philippines, Costa Rica) is that 45% of the respondents reported business growth arising directly as a result of the telephone service.

The US and UK studies focussed more on business growth and development. The UK survey covered a small number of businesses; 8 in number but within it a total of 30-40 business units. The overall benefit/cost ratio for advanced networks (digital/data) was estimated as 5:1. The summary results of the survey indicated a substantial reduction in clerical/secretarial labor and a slight rise in blue collar employment (exhibit D).

The balance of trade impacts resulting from telecommunications investment referred to earlier was also investigated. The investment in telecommunication services will have a down stream effect on such areas as financial, insurance and other value added services. The corresponding up stream effect would be on communication equipment suppliers. Each of the three sectors (communication equipment, communication services and value added services) will in turn have their impact on the rest of the economy (the users) thereby affecting the balance of payments.

Jonscher said that the US study had just been finished. This study used conventional econometric procedures fitting a production function to a model which had as its output economic growth (GNP - value added). Inputs were such items as labor, capital, etc. (however distinguishing information capital and information laoor from ordinary production capital and labor). The study looked at each 10% drop in the real price (i.e. price/unit performance of information technology) and tracked its impact through the economy noting the resultant shifts. On the bottom line it gives an approximately 0.4% increase in GNP per

worker. This amounts to about \$14 billion gain per year in productivity.

In closing he emphasized a significant ratchet effect gain observed in the telecommunication and computer industries resulting from cost reduction giving rise to economic growth and development.

Stephen Ettinger - The World Bank

Ettinger began by stating that for a variety of reasons developing countries as a group have substantially under invested in telecommunications. As a result of this, as well as various technical advances, the economic returns to further investment are very high yields. However, he emphasized that in order to achieve these benefits, investments need to be combined with institutional and policy reforms to fully capitalize on these opportunities.

Ettinger outlined the following striking facts relating to developing countries and telecommunication investment:

- o Developing countries have
 - 70% of the world's population
 - 16% of world GDP
 - 7% of telephones
- o Developing countries have invested 0.3% of their GDP annually in telecommunication services compared with 0.6% invested annually by developed countries out of their GDP.
- o Telephone densities per 100 people are as follows:
 - 80 for the US
 - 50 for Western Europe
 - 10 for middle income developing countries (Argentina, South Korea)
 - 5 for rest the of Latin America
 - 2 for Asia (average)

- <1 for Africa

However some of the larger Asian countries (India, Indonesia, China, Pakistan, Bangladesh) have a density of approximately 0.3-0.4 telephones per 100 people.

o While developed countries have more telephones than televisions the developing countries ironically have a larger number of television sets than telephones.

o In a number of developing countries the cause for a lack of telephones is not the lack of demand. For example, the waiting time in most major African and Asian cities is 2-5 years.

o Many developing countries experience very poor quality of service. As an example he quoted Calcutta, where the chance of getting through on a direct dial is approximately 5% while an operator assisted call takes an average of 10-12 hours.

Ettinger then addressed the question as to why developing countries had such "under-investment" in their telecommunication services. First he suggested that decision makers (planners) have difficulty dealing with the telecommunication sector where benefit and output are not easily quantifiable. Often telecommunication is perceived as a luxury (not a basic need) and governments specializing in helping the poor tend to put telecommunication low on their list of funding priorities. Second, in many poor developing countries the telecommunication agencies are weak institutions often tied to the postal service and also unable to pay competitive salaries to its employees. Often the telecommunication agencies are political tools due to their large employment. They are weak in arguing for resources, and overall weak as institutions in

management terms. Thirdly, due to low tariffs and high costs, telecommunication agencies in developing countries don't generate the surpluses they could, and in addition they tend to be heavy foreign exchange users not producers. This is especially a problem to a number of developing countries that are restricted in their foreign reserves.

Turning to the benefits arising from expansion/upgrading, Ettinger stated that the World Bank conservatively estimates an average rate of return on its telecommunication investment of about 27%. For telecommunication companies he estimated a financial return of about 18%, which he said could well rise higher. Another benefit is the large consumer surplus due to shortages. Benefit related externalities discussed were - expansion benefits to existing customers, improved functioning of markets (lower transaction costs), emergency use available to neighbors etc., transport savings, linkages and regional operations reducing megapolis diseconomies. Further benefits from expansion could be derived by improving benefit/cost due to economies of scale, and technical advances. Also particularly from a developing country's point of view, good telecommunication services could attract foreign investors who usually rate telecommunication services high on their list of requirements.

Finally Ettinger enumerated the actions that developing countries need to take. He suggested that developing countries increase their annual average network growth rate from 8% to between 10%-12% (which would cost approximately \$15 billion per year). Telecommunication agencies he recommended, should be moved away from government departments and be allowed to operate

as autonomous agencies or else they should be privatized (as is happening in Sri Lanka, Malaysia, Chile and Western Samoa for example). Many agencies should raise tariffs to finance investment, and revise the tariff structure to promote efficiency. Governments should also encourage competition in ancillary areas.

Ettinger said that the World Bank is a relatively small telecommunication financier, with annual lending to the sector of \$300-\$400 million. Its larger role is that of catalyst for other funds, and for helping developing countries review their policies and objectives.

Raymond Duch - University of Houston

Duch stated that his research looked at the political structures related to telecommunication systems. The objective was to study the effect of political structures on the quality of telecommunication services provided. He said that recently a lot of interest has been expressed in the organizational status of telecommunication structures in four developed countries, namely Japan, Canada, France and the UK.

- Japan - Privatization of NTT
- Competition: shared use, value added networks
- Canada - Proposed privatization of Teleglobe
- Competition in basic network services - CN-CP-Limited to certain regions.
- France - Privatization of DGT under consideration by new government
- Separation of network from service providers
- Establishment of separate subsidiaries within DGT structure (e.g. France Cable et Radio)
- UK - Privatization of British Telecom (51% t

- public)
- Competition in basic network services - Mercury Communications Ltd.
- Competition: limited resale value added networks

Looking at the factors that shape investment decisions of government owned/regulated telecommunication entities it is observed that there are three distinct factors - economic constraints, political constraints, and public interest goals. Duch restricted his remarks to the last two categories between which he said there existed a high level of tension. The management of telecommunication services constantly faces this tension. On the one hand the political demands of elected decision makers and on the other hand public interest goals (the need to provide better service, universal service, etc.). Depending on how the particular organization is set up either the political demands or public interest goals will be considered more important. The government can influence telecommunication services in its decisions relating to pricing, investment, fund raising and management. It can accordingly exercise such influence to achieve its political goals in areas such as Political Stabilization Policy (macro policy goals) and Political Business Cycle demands (re-election planning). To support the Political Business Cycle theory he cited results from research into government telecommunication expenditure of about 15 countries including Austria, Germany and the UK, where telecommunication investment showed significant jumps in election years. Duch described different levels of government influence on organizations ranging from ones that are self sufficient to ones that are government dependent and the extent to which

'political constraints' win over the 'public good'. The level of influence he stated, is related to the agency's government dependence. The dependence is also related to the discretionary authority - governmental or managerial.

Duch described agencies with varying degrees of government involvement ranging from wholly private to totally public. This he termed the Public - Private Continuum and gave examples of telephone companies falling into the different categories (exhibit E).

Finally moving on to the further infra-structural development of telephone companies in developed countries, Duch suggested three factors that contributed to this drive - institutional, geographic and economic. Referring to the results of regression analysis using "telephones per capita" as the dependent variable, he concluded that the driving factor for telephone penetration in the pre infra-structural development stage is per capita GDP (economic factor) and in the post infra-structural development stage it is the organizational status (institutional factor).

Speakers' Comments And Responses To Questions

The issue was raised about the dark side of privatization, including such items as the potential/eventual loss of universal service, and telephone companies "dropping" those aspects of the business that are not profitable. Jonscher responding said that privatization could be interpreted very widely. However in its purest form he said that it had been

useful for fund raising and pricing. Regarding universal services he cited examples (UK and Japan) where the licensing agreement specifically requires the continuation of universal services. As in the US, the problem he said is not with privatization but with competition. Ettinger referring to privatization in the developing countries commented that the advice the World Bank gives "was not whether to privatize but how", because among other things most developing countries don't have adequate capital markets to finance privatization, and would need to develop regulatory systems if they privatized.

Referring to the issue of telecommunication development in developing countries, a member of the audience asked why it was that telecommunication had not at least kept in step with other forms of development. Ettinger agreed that at the macro policy level there exists a great dilemma. However, countries with large debt problems tend to focus available resources on direct foreign exchange earning activities, and all LDCs must pay attention to critical areas such as health, education, etc.

A point was raised by a member of the audience from France, who asserted that telecommunication development does not require privatization. He cited the example of the government owned French telecommunication system (DGT) which was innovative in that it went to the money market to raise funds for development. Its success enabled it to take massive strides forward. Duch while agreeing also pointed out that currently the French government was once again attempting to restrict DGT's independence.

Mechanisms Considered in the Study Through Which Quality and Availability of Telecommunications Services Affect Efficiency Results of the Firm

Mechanism	Hypothesis on Impact of Telecommunications
Business expansion	Improved telephone service allows better access to markets
Management time	Less time is wasted and hence management productivity is improved
Labour time	Productivity is improved through substitution of telecommunications for labour-intensive forms of communications
Inventory levels	Required levels of inventory are reduced
Production stoppages	Stoppages are reduced in frequency and duration
Vehicle fleet scheduling	Wasted mileage and vehicle-hours are reduced, fewer vehicles are needed for a given volume of work
Purchasing decisions	Buyers obtain better quality and price
Selling prices	Producers obtain better prices
Distribution costs	Overall costs of distributing goods and services to and from the firm are reduced

Costa Rica: Net Economic Benefits per 1000 Additional per Annum

A. Benefits per 1000 residential lines

Occupational category	Number of subscribers '000c pa	Gross user benefits '000 pa	Gross economic cost '000 pa
1 Unskilled	206	2,514	2,313
2 Skilled/Lower technical	152	2,522	1,626
3 Higher technical/ professional	188	8,588	2,093
4 Self-employed	145	3,470	1,582
5 Non-employed	175	2,621	1,972
Residences with commercial activity	134	40,004	1,864
TOTAL	1,000	59,719	11,450

Economic benefit: cost ratio = 5.2:1

Costa Rica: Net Economic Benefits per 1000 Additional per Annum

B. Benefits per 1000 business lines

Sector	Number of subscribers '000c pa	Gross user benefits '000 pa	Gross economic cost '000 pa
1 Industrial	166	201,690	2,631
2 Commercial	513	140,562	6,089
3 Other	321	266,109	3,982
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TOTAL	1,000	608,361	12,702

Economic benefit: cost ratio = 47.8:1

U.K. Study: Summary of analysis of business user survey (monetary figures expressed in millions 1982 pounds sterling)

Benefit/cost ratio	5
Communications expenditure	900
Benefit	4,500
Equipment expenditure	630
Employment changes*	
Professional/managerial	-45
Clerical/secretarial	-180
Blue collar	9
TOTAL	-216

* thousands of jobs; increase (positive) or decrease (negative) in number of jobs assuming constant output.

**Classification of Public and Private Telcos
1964-1980**

<u>Status</u>	<u>Telco</u>	<u>Comments</u>
Government Agency	* Direction Generale de Telecommunications (France)	
	* British Post Office (UK)	
	* Department of Posts and Telegraph (Ireland)	
Government Corporation	* Regie des Telegraphes et des Telephones (Belgium)	
	* Bundespost (West Germany)	
Government Enterprise	* Televerket (Sweden)	
	* Nippon Telegraph and Telephone (Japan)	
	* ASST and SIP (Italy)	
Semi-Private	* Telefonica (Spain)	
	* Finland (many local companies)	
	* British Telecom (UK)	1985-Present
Private	* A.T.& T. (US)	