

Demand-Side Telecommunications Analysis

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There are essentially four concepts in telecommunications analysis which are the golden calves worshipped by different professional denominations. For technologists, -- and I apologize for the over-simplification in advance -- the primary organizing concept in telecommunications policy are economies of scale and their cousin, standardization.

Economists, on the other hand, worship at the altar of competition, in this case to the triad of structure, conduct, and performance. And while there is increasing disenchantment with this view, it is more represented in academia than in the regulatory environment.

Thirdly, lawyers in this field judge policy issues in terms of "conflict of interest," which translates here to "potential for cross-subsidies." Structures that makes such cross-subsidies theoretically possible must be avoided. Hence, the AT&T divestiture, Computer I, II, III, and counting.

Finally, many other social scientists, as well as most politicians and journalists, organize reality in telecommunications policy around the concept of income distribution, that is, around the question who pays more and who pays less.

All of these concepts have legitimacy, but have been carried by their proponents to the edge of their explanatory power, -- and then some. Used single-mindedly, these notions have degenerated from tools of analysis to rallying slogans.

What I would like to do here is to add three concepts: that of "user associations" as the agent of change; that of the "tragedy of the common network" for the process of change, and that of "normalization" as the outcome.

Perhaps the greatest common failing of the four traditional organizing principles is that they are engaged in what I'd like to call "supply-side" telecommunications. That is, they look at the subject from the angle of production and producers: AT&T vs. OCCs; interchange carriers vs. local exchange companies; LECs vs. by-passers; Intelsat vs. Orion; enhanced vs. basic service providers; voice vs. record carriers, etc., etc.

It is not surprising that this would be the natural way to look at things. After all, regulators deal primarily with carriers, technologists with networks, economists with competitors, and journalists love a horse-race angle to their coverage. But this supply-oriented perspective obscures its flip side. What we need to do is to engage in what could be called a demand-side telecommunications analysis. What does this perspective mean? At its most basic, we shouldn't think of telecommunications as a service produced by carriers, but as an inter-action of groups and subgroups in society, facilitated by service vendors called carriers. The supply structure, if left

to its own devices, is a reflection of the underlying interaction of communication users with each other, whether in an all-encompassing user coalition, or in several user groupings. A universal public network that inter-connects everybody with anybody, under a single organizational roof, is technically and financially merely one arrangement out of several.

Thus, we should not see deregulation as a policy of primarily liberalizing the entry of suppliers. Just as importantly, it is the liberalization of exit, by some partners, from a previously existing sharing coalition of users which has become confining.

Two basic types of forces -- call them communalism vs. particularism, order vs. diversity, integration vs. centrifugalism -- are the ying and the yang of many social processes, including the changes in telecommunications. Here, their purest expressions at present are the moves toward the Integrated Digital Services Network (ISDN) as the super-pipe, on the one hand, and on the other hand, the establishment of an Open Network Architecture (ONA) as the move of segmentation into the very core of the public network.

Telecommunications are only one instance for the wide-spread ascendancy, in recent years, of centrifugalism in previously shared arrangements. Wherever you look, people break up all kinds of networks of interaction and form new ones.

Examples abound:

the public school system

the mass transit system

public safety and dispute resolution

old age and health provisions

and also: electrical power and gas distribution

The departure from the public school system, for example, is not explained primarily by the supply of new options, or by new technology, but rather by increased demand to exit. Similarly, recent policy developments in electric power co-generation have very little to do with technology.

It would go beyond the scope of these 20 minutes to discuss the general factors underlying these changes. I will confine myself to telecommunications, but implicitly to the others, too. Perhaps it is useful to ask ourselves why it seems that there is usually only one public telephone network in each country. It's not the inter-connectedness of participants -- or else we would have only one large bank for all financial transactions. No, interaction does not usually require institutional integration. This was one of Adam Smith's major insights. To distinguish telecommunications from this observation by labelling it "infrastructure" requires one to define that term in a way that is not vacuous or circuitous, and that is almost impossible.

Another explanation is "natural monopoly." Maybe it exists for a local exchange area. But the examples of the US, Canada, Denmark, and Finland show that this does not prove that a wide-

spread horizontal integration of local exchange areas is required. And if it were, why do they end miraculously at the national frontier? Has there been a national monopolist that has gone to its larger neighbor and said: " why don't you run my system for me, too, so that I can benefit from your economies of scale?" Nor is the case established that an integration of local and long distance service is based on economies. These services are institutionally separated in several countries, and life has gone on efficiently.

No, if you look into the birth of the monopoly system -- as I have done, going back to the establishment of European postal monopolies in the 16th and 17th centuries -- you'll see that the monopoly was very "unnaturally" caused by politics and the revenue needs of the state, rather than by the second order conditions of the production functions.

Perhaps the best way to look at a network is as a cost sharing arrangement between several users. Fixed costs are high, marginal costs low, and a new participant C helps A and B to lower their cost. In that it is similar to a swimming pool or national defense, that is, to "public goods," to use the terminology of Samuelson and Musgrave. But note that while there is only one national defense system (plus, of course, Oliver North), there are many swimming pools, some public-communal, others private communal, and others private-private. There is a wide spectrum between the pure private good and the pure public good. (Buchanan, 1965) We may want to share the pool with a few

dozen families, but not with thousands. A pure public good admits everyone, a pure private good, only one. But many intermediate cases are in between, and a telecommunications network is one intermediate example. It is not a private good, yet it does not meet the two main conditions for a public good, namely non-rival consumptions and non-excludability. In fact, non-excludability had to be established as a legal requirement, and we call it the universal service obligation. What has been happening in recent years to telecommunications, and what goes by the more dramatic labels of divestiture and deregulation, is merely a shift in the degree of its intermediate position, a shift toward the direction of private good.

The formation of such intermediate collective consumption and production arrangements is something analyzed by theorists of clubs. (Schelling, Buchanan, Tullock, Rothenberg, Tiebout, and McGuire). The club analysis, applied to networks, can show various things¹:

1. Different users groups will cluster together in associations according to associations of quality, size, price, interactive density, and ease of internal decision-making, provided that they are given mobility of choice. This can be referred to as "voting with one's telecommunications node." The

¹(These and the other results, it should be clarified, would not hold if the marginal costs of new network participants drops continuously more than their marginal benefit to an existing network user, and this is unlikely, since marginal cost, beyond a certain range, is either flat or very slowly decreasing, or in fact increasing.)

economically optimal association size need not encompass the entire population. Alfred Kahn used to put this as follows: "People who don't have a telephone I don't want to talk to." (I report this not as a recommendation. In New York I played a major role in making service universal by instituting a life-line plan under which poor people can get telephones installed for \$2/month, and pay a basic subscription of \$1/month.

2. Service quality and optimal group size are interdependent. Thus, if different user classes seek different quality levels, their optimizing size of network membership is different.

3. Optimal group size depends on the ratio of marginal utilities for different services, set equal to the ratio of transformation in production, and in turn related to size. [Buchanan 1965, p. 4, 5]. Thus, if different network services operate on different layers of the physical network, they will have different optimal sizes.

4. Perhaps most important: it is generally not-Pareto-efficient to attempt income transfer by integrating diverse groups and imposing varying cost shares according to some equity criteria. It is more efficient to allow homogenous groups to form their own associations and then re-distribute by imposing charges on some groups and distribute to others. The set of possible utility distributions among separate groups dominates (weakly) the set of such distributions among integrated groups (McGuire, JPE, p. 124). User group separation with direct

transfer is more efficient than the indirect method of enforced togetherness with different cost shares. (Politically, of course, the latter may be easier to accomplish because of its lack of transparency.)

These incentives to group formation can lead, where they are permitted to do so legally, to alternative sharing arrangements of alternative network associations. It is a process that might be called "the tragedy of the common network," because it is not the failing of the traditional system, but rather its very success which undermines it. The success of communalism creates the forces for particularism. But this takes time to evolve. At the early stages, the existing first network participants affirmatively seek additional participants to share costs and enhance their reach. In time, however, they will pay a price for this, because democratizing participation leads to democratizing the control of cost-sharing in a re-distributory direction, and this re-distributory burden grows as the last participants get on the network. Perhaps more importantly, the largest of users increase their electronic communications at a faster rate than the small ones, and their technical requirements are increasingly differentiated from those of average users. Because the combined volume of large users has risen so much, they can account for much of cost savings of sharing just between themselves. They form alternative network associations for large parts of their communications needs, first in-house, then with their closest suppliers, customers, or market partners.

In the United States, the "golden age," of the public network, in which universal service coincided with substantial monopoly was a brief period, from about 1950 and lasting for about 20 years. In the mid 60s, centrifugal forces began their assault in Above 890, Specialized Networks, Execunet. This coincides with the beginning of computer data communication as a major form of usage. In Western Europe and Japan, universal service has been achieved only in the past 5-10 years, and centrifugal forces have now begun to gather.

Where does all this lead to?

It leads to normalization. Normalization means that telecommunications network provision will resemble much of the rest of the economy: no welfare state, but no laissez-faire either.

The network environment will be, essentially, a pluralistic network of user associations, or network of networks which are part overlapping, part specialized along various dimensions such as geography, price, size, performance, software value-added, ownership status, access rights, specialization, etc. Some people will call this Balkanisation. I'd rather think of it as the Switzerland of networks, even more balkanized than the Balkans, but where things tend to work quite well, and often better than in its large neighbors, despite their economies of scale and greater centralism. This is not to say that economies of scale and scope will become irrelevant: there will still be broad-based public networks, and powerfully integrated networks

with broadband capability. But just as important will be the economies of group specialization and of clustering. [The latter have been discussed by people such as Piore and Sabel in geographical contexts, but it is equally applicable to functional network specializations and the ability, by packagers, to put together specialized network building blocks of hardware, software, and transmissions rather than have those organizationally integrated under one roof. The Open Network Architecture Concept is an important step in that direction. These differentiations will permit users with similar needs, or with frequent interaction, to operate on more efficient networks. It will also permit public networks to be more efficient for their clientele, since they need not be all things to all people.]

[It may be asked why the public network provider couldn't supply each user association with whatever it needs, without requiring new network entrants. Theoretically this is possible, and indeed some of the change is taking place on private networks supplied by the monopolists. But institutionally it is unlikely to be adequate, because it would, first, require heroic willingness to collaborate with schemes designed to reduce its revenue. Second, it would require a substantial lowering of its cost-structure which has crept up over time as suppliers and employees shared in the monopoly profits. And third, it would require an enormous upgrading of innovativeness and speed, and large organizations are not usually best equipped for that.]

Where does such normalization leave future regulators? It would be naive to expect less regulatory tasks. Many disputes become less intramural and more regulatory in nature. The main regulatory tasks which normalization raises are:

1. Protection of interconnection and access.
2. Establishment of New mechanisms of redistribution.
3. Establishment of global arrangements to match the global scope of networks.
4. The prevention of oligopolistic behavior and of cyclical instability.

None of these tasks is beyond our grasp in terms of complexity or political feasibility. But they require us to end the nostalgia for the simplicity of the golden age, and to imagine a very different network environment.