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Why Competition Is Necessary in Telecommunications and How to Achieve It:

The Experience of the Advanced Economies

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Market competition is being introduced into the telecommunications sector in all of the advanced economies as the only means to navigate the profound, discontinuous technological and economic changes currently being experienced as digital information infrastructures emerge. Market competition is not an end in itself, although the US debate sometimes suggests otherwise. It is, rather, a means to generate and capture new opportunities for economic growth and industrial innovation opened by the new information technologies. The introduction of competition has been found to be necessary in the advanced economies because it is impossible to predict either what the value-generating new uses of information technologies will be or what optimum network and market structures are necessary to deliver them to users. Market competition is simply a decentralized logic for making technological and economic choices under conditions of substantial uncertainty. It provides answers that are more likely to be right over time, without having to predict or be omniscient. Below, in Part I, we develop this argument in greater detail. In Part II, based on the experience of the advanced economies, we discuss the six regulatory conditions that, at a minimum, must be satisfied if a nation is to successfully introduce market competition into the telecommunications sector. These six conditions make competition possible, make it work, make it real and effective, and make it enforceable. Finally, in Part III, we discuss the likely economic consequences for China if it fails to introduce sufficient competition in the sector. In particular, the failure to introduce substantial competition will mean, relative to the other advanced economies, that China will sacrifice both short-term revenues and, more important, opportunities for long-term innovation and growth.

In endorsing substantial market competition for China, we want to make it clear that there are a range of critical telecommunications issues with which markets cope badly due to market failures and competitive strategies. These include ensuring Universal Service, standards-setting especially for interoperability of the new infrastructures, property rights in information and applications, security and privacy. Although we do not address these issues in this paper, we do acknowledge that they will continue to require a substantial role for policy-making even as competition is introduced.

I. TELECOMMUNICATIONS AT A TIME OF DISCONTINUITIES

As traditional telecommunications, computing and media haphazardly intersect and stumble toward profitable new opportunities, advanced digital information infrastructures are emerging within the advanced industrial economies. The nascent, highly publicized commercialization of the Internet hints at how non-

traditional information infrastructures can spur a host of new economic opportunities that would not have been available formerly, and which blur traditionally neat economic and industrial lines. Indeed, far from a smooth "upgrade" of today's telephone, data, broadcast and print networks and the patterns of economic and social relations that rely on them, the transition to digital information infrastructures is proving to be highly discontinuous with established industrial practices, business models and governance structures. Wherever development of new possibilities is least constrained by regulation or the dominant position of a major market supplier, as for example on the Internet or in the corporate networks of major multinational firms, five sources of discontinuity are visible and are increasingly familiar:

- Drastic changes in the technological capabilities of the underlying network platforms (e.g., with digitization and new computer architectures, broadband, compression, cable modems, wireless technology, and innovations in network management)
- Major shifts in usage from explosive traffic growth combined with wholly new patterns of communication (e.g., cooperative computing, 'point-casting', browsers, agents and applets and other forms of executable code, multimedia MUDs -- all involving non-traditional combinations of synchronous, asynchronous, and isochronous interaction) [1](#)
- Evisceration of competitive boundaries between traditionally distinct sectors or between traditionally distinct sub-segments within sectors (e.g., between computing, communications, and mass media, between telecommunications carriers and CATV, between wireless and wireline, between print and networked information delivery)
- The dramatic change in governance paradigm from ex-ante regulation to market competition, and
- As a consequence of the preceding four, a shift in the balance of power shaping the evolutionary trajectory of information infrastructures from the supply to the demand side, from providers to users as drivers of network evolution.

The Java-equipped, VRML-enabled, World Wide Web is both a product and perfect expression of these discontinuities:[2](#) It is based, among others, on the technological shift toward client-server architectures and object-orientation in computing, the digitized integration of information formats and availability of higher bandwidth. It expresses wholly new patterns of communication that neither traditional broadcast nor telephony could possibly have delivered (i.e., Web applications are neither broadband phone calls nor interactive TV). It blurs mass media, computing and communications in ways that profoundly challenge established suppliers in each of those domains -- as even mighty Microsoft discovered. It rides on the infrastructure of the mostly unregulated 'public' Internet which is itself increasingly privately managed and the object of intense market battles to set de facto privately-controlled standards (and therefore subject to intellectual property and antitrust policies). And the Web's evolution is

driven almost entirely by its users who have pioneered all of the new emerging applications -- a distinct departure from the supply-centric traditional model in which a PTT or broadcaster offers a limited menu of service options to subscribers. In the bargain, the Web transcends national boundaries, has fostered applications in every imaginable industry, and has spread like wildfire since its primitive origins in the search for Higgs' Boson at Europe's CERN. Greater discontinuity with past practices is hard to imagine. The challenge it represents to established business models is obvious in the way that its commercial and economic potential has been most effectively exploited by entirely new businesses operating with new models which force even dominant existing players to adjust, like Netscape and Macromedia (rather than Microsoft or IBM), or C|NET and UUNet (rather than the BBC or France Telecom). And the Web is but one manifestation of the digital networks that are emerging. The Web would never have emerged as a service conceived and provided by a single phone company or TV broadcaster. Indeed, profound, discontinuous technological changes like those currently experienced in telecommunications make it impossible to predict either what the value-generating new uses will be or what optimum network and market structures are necessary to deliver them to users. Rather, the uses and optimal structures can only be effectively determined under such conditions of extreme economic and technological uncertainty, through decentralized processes of trial and error, experimentation and learning by doing, search and discovery. The recent history of the advanced industrial economies suggests that market competition is the best means of providing the necessary experimentation and learning under conditions of uncertainty. In short, there really is no effective alternative to the widespread introduction of market competition as a necessary means to navigate through the technological and market discontinuities identified above .

II. THE PREREQUISITES OF COMPETITION

Most of the advanced economies have introduced some degree of competition in the deployment and operation of their domestic telecommunications networks. Key differences exist in the character of competition, in who is allowed to compete, in what areas and on what terms, and in the timing of developments. However, in no country in which competition has been introduced have market forces survived and prospered without substantial ongoing assistance from government. In the U.S., new entrants were systematically favored by regulation, in some cases over several decades, until they could survive on their own competing against the dominant carriers, AT&T and the local Bell companies. Although EU and some Asian countries like Japan have gradually liberalized competition over the past decade, the former PTTs still thoroughly dominate in the national markets, even in the UK which favored a second infrastructure provider and nurtured a duopoly market structure. Indeed, so frustrating has been the UK attempt to introduce competition to British Telecom,

that regulators eventually turned to favoring foreign entry as the only effective means to promote competition.

The competitive experience has been frustrating in many cases largely because incumbent dominant carriers have huge advantages of network scope, scale and connectivity, and the capacity to block competition by controlling the terms of access to that advantageous network. In the face of such advantages, introducing and maintaining competition has typically required, as a bare minimum, fulfillment of six key conditions that make competition possible, make it work, make it real and effective, and enforce it:

Make Competition Possible

Real access to domestic local and long-distance telecommunications distribution networks is the key to creating the possibility of competition. Access means two things:

1. **Unrestricted re-sale (and re-use) of a dominant carrier's facilities and services**
2. **Facilities-based competition**

Without resale rights, new entrants would not have access to the existing local distribution network. They would therefore be unable to terminate or originate calls, unless they build alternative facilities. This would require costly, complex acquisition of rights of way, resulting in substantial delays before entry. Unrestricted resale is the easiest, most cost-effective way to introduce competition.

If, however, new entrants could only gain local access from the dominant carrier, they would ultimately be broadly subject to the discriminatory behavior of the dominant carrier. In such a situation, it is extremely difficult, even for an independent regulator, to prevent discrimination. Ultimately, the availability of alternative facilities is the only possible guarantee to keep the incumbent honest.

Make Competition Work

Simply making competition possible by the existence of rights to resale or to build and operate facilities is not enough, however. Two additional conditions are essential if that competition is to work effectively:

3. Non-discriminatory, transparent terms of interconnection between all competing networks

4. Non-discriminatory, reasonable pricing of access and interconnection

Even if resale and facilities-based competition are unrestricted, new entrants will need access to the dominant carrier's facilities, at least to begin competing. Any form of discrimination between the conditions under which the dominant carrier offers access to new entrants, and the conditions it grants to itself, places the new entrant at a disadvantage that will handicap competition. In the presence of discrimination, the monopolist retains the power to prevent real competition by unfairly manipulating the terms of access to customers to make a new entrant unattractive. This can be done in a myriad of ways by, for example, manipulating the timeliness of interconnection, providing incomplete technical specification or incompatible standards necessary for effective interconnection, or pricing network interconnection to raise new entrant's costs and discourage use.

Make Competition Real and Effective

Even if competition exists and can be made to work, foreign experience suggests that it will not become real and effective unless *foreign* competition exists in the domestic market. This requires a fifth condition:

5.Non-discriminatory foreign access and participation on WTO terms.

Foreign access transfers crucial technological, market and managerial know-how which is essential for stimulating growth of the domestic market, local production and innovation. Without foreign competition bringing in the appropriate know-how and resources, the advantages of the incumbent dominant carrier tend to be overwhelming even against sophisticated domestic competitors. Thus, in England, Germany and Scandinavia, the only really effective competition to the incumbent includes significant foreign participation.

Make Competition Enforceable

Obviously, all the above conditions are worthless to stimulate competition if there is no power to enforce them, without interference from the dominant carrier. This requires a sixth and final condition:

6.Independent, neutral regulatory authority (vested with the power to settle disputes, set and enforce the rules transparently, and fairly allocate scarce resources like spectrum)

We believe these six key conditions are necessary for the introduction and maintenance of competition. Without them, competition can not effectively exist. The six conditions are obviously also an interrelated package: The effectiveness of each rests on the existence of all; if any one is missing there is a substantial likelihood that competition will be frustrated.

We also emphasize that there are numerous means to achieve the six key conditions. Indeed, they have been achieved in a variety of different ways in different countries. Thus, the US has focused on reforms that encourage competitors to use the incumbent provider's network, e.g., requiring that unbundled network elements be made widely available or that bulk resale occur at rates based on total element long-run incremental cost (TELRIC). By contrast, Canada has instead created incentives to encourage alternative facilities-based competition, e.g., limiting network unbundling to so-called essential facilities.

III. COMPETITION AS THE MEANS TO ECONOMIC GROWTH AND SUSTAINED INNOVATION

China will sacrifice growth and innovation if telecommunications competition is substantially restricted. There are several ways in which the Chinese economy loses if it substantially restricts competition in the domestic telecommunications services market. We distinguish between static losses and dynamic losses.

The static losses are a sacrifice of the near-term economic benefits that competition stimulates. They essentially reflect lost sales opportunities, and the accompanying upstream and downstream effects on suppliers and businesses that sell complementary products and services.

Dynamic losses reflect the long-term, cumulative handicap a domestic economy suffers when lack of competition fails to stimulate USER innovation -- i.e., innovation by the business customers who use telecommunications services in their industry activities. These consequences are both more profound (resulting in long-term, cumulative decreased competitiveness for BOTH domestic Chinese carriers and their business customers), and less obvious (while static demand growth can be measured, "innovation" is less tangible).

Static losses from lack of Competition

Competition stimulates demand and grows the market. In all countries in which substantial competition has been introduced, incumbents have seen increased revenues and profits even while losing market share. This is because the telecom 'pie' has grown as competition has stimulated declining prices. Declining prices increase demand in two ways -- they stimulate more use and they stimulate longer use, both of which result in a much larger total market. The failure to introduce competition sacrifices these economic benefits.

In turn, there are significant upstream impacts on the telecommunications equipment, data communications and semiconductor industries, among others. Competition tends, as it so clearly has in the US case, to stimulate the market for (and innovation in) the supply of communications equipment to network providers because multiple sources of demand stimulate multiple efforts to supply the required technological capabilities. By contrast, the failure to introduce competition means that the local economy gives-up all of the

associated upstream effects. The equipment market is smaller, and local suppliers are smaller and less innovative.

For similar reasons -- lower demand and fewer sources of supply-- a lack of competition also hurts industries that sell downstream products and services that complement the supply of telecommunications services (e.g., software, telemarketing, maintenance services).

Long-term, dynamic losses from lack of Competition

As indicated at the outset, joint experimentation and learning is key to telecom innovation. Joint, cumulative learning between telecom service providers and their customers is the fundamental dynamic fueling innovation in telecommunications. This is especially true with respect to large, leading-edge corporate customers, who often operate on a multinational scale. We illustrate this dynamic process with the case of Software Defined Network (SDN) services, a network offering which was first developed in the US, largely as a result of the increasing competitive openness of the US telecom service market.

This learning-based innovation process can be thought of as a three-step *cycle*, and described as follows.

Automation

Corporations first use networking technologies to automate their business processes. These processes themselves are not substantially changed by the technology, but work is now supported by information technologies.

As they automate, companies put in place an information infrastructure. Typically in the 80s, US companies have established private networks to support the automation of processes such as design, production, or distribution and sales.

Experimentation

Once their initial infrastructure is in place, companies typically experiment with its possibilities, seeking to better take advantage of the technology they have invested in. For example, while they may have initially deployed a private network to support their marketing organization, they may try to use that network to support the design and manufacturing process.

The private networks deployed by US companies in the 1980s could only support limited experimentation. Typically, they were not flexible enough to support communications patterns substantially different from those they had been designed for. As a result, corporate network users quickly were limited in how much experimentation they could undertake. *Re-configuration*

Once they have run into the limits of their network, companies must be able to re-configure them. This is key to their ability to continuously adapt and remain competitive. Network re-configuration often accompanies and complements corporate re-organization.

Because their private networks were seldom flexible enough to support such reconfiguration, US companies have embraced hybrid private/public networks, using services such as SDN to achieve the flexibility they require for this re-configuration phase.

Once the network is re-configured, the corporate network user can engage in further rounds of automation, experimentation, etc.

The various steps of this innovation cycle generate two distinct kinds of learning. First, as they automate and begin to experiment, corporate clients learn "*by using*" networking technology. Second, as they increasingly rely on their network service provider to further experiment and to re-configure the network, both provider and customer jointly learn "*by doing*" the network.

Tight interaction between provider and customer is key to the success of that process. Successful re-configuration of the network combines knowledge the customer has accumulated *by using* the network, with technical knowledge of what can be achieved which the network provider has accumulated *by doing* the networks of many clients.

Both provider and customer learn a great deal through this tight, cumulative interaction. Network providers learn better to understand the needs of clients, better to anticipate future needs, and can therefore develop better network products. Network customers learn better to understand the technology's potential, and can re-organize their work processes better to harness these possibilities.

This joint, cumulative learning process has worked especially well in the US competitive environment, as evidenced by the dynamic and diverse uses of information networking which have emerged in US corporations. It has been less successful in countries which have restricted telecom competition. There, corporate customers have been prevented from experimenting with new technologies (haven't learned as much *by using*), and providers have had less incentives to explore new ways of applying networking technologies to business problems (and haven't learned as much *by doing*). In essence, we conclude from the comparative experience of the advanced economies, that only sustained market competition is likely to generate the variety of provider-user interactions that lead a domestic economy onto a sustained path of economic growth and increased innovation.

Endonotes

1. Cooperative computing is the shared use of dispersed computing resources to accomplish a common purpose by physically remote users as in the development of an auto subsystem (e.g., antilock brakes) where designers in several different locations may be simultaneously working on and modifying the database that describes the subsystem for computer-aided design purposes -- any change made by one to the common database must be simultaneously reflected in the work of all, hence the computing is shared and cooperative. Pointcasting is the broadcast of information tailored to individual or small group preferences (in contrast to traditional broadcasting which features the broadcast of undifferentiated information to a mass audience. Browsers like Netscape Navigator are interfaces that facilitate access to information embedded in databases in a manner analogous to browsing for goods in a department store; agents are

software tools that automatically sift through databases looking for specific kinds of information specified by a user; applets are self-contained, executable software routines that carry with them both a specific application and the operating instructions necessary to execute it. A MUD, or multi-user domain, is a virtual meeting place where on-line computer users gather to interact -- in simplest form an on-line chat room, in most elaborate form a virtual reality world.

[2.](#) Java is a programming language developed by SUN Microsystems which permits World Wide Web applications to 'come alive' through applets, thus permitting animation, continuous updating and an endless variety of other non-static functions. Java is machine-independent, i.e., applets written in Java can be interpreted or compiled to any computer platform. VRML or Virtual Reality Mark-up Language permits the Web to provide a 3-D experience (like rotating objects to see all sides), and is one of the emerging complements to Hyper-Text Mark-up Language (HTML), the basic language used to create Web documents.