

Commentary : Policy Levers and Demand Drivers in Korean Broadband Penetration

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Abstract

The drive to increase broadband penetration has reached a critical policy point in the United States, with President Bush, the Federal Communications Commission, and numerous industry groups all offering new agendas. Naturally, many eyes have turned to Korea, which has been the undisputed world leader in broadband deployment for several years.

The United States should consider the benefits of increasing on-line government services as well as the benefits of increasing computer education. These are costly projects to be sure, and so their prospects for adoption are uncertain, but they undeniably increase the attractiveness of broadband and decrease consumer reticence to subscribe. On the other hand, the United States should and probably will maintain its traditional skepticism for more direct market intervention, such as government provision of infrastructure or below-market rate loans to particular companies.

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The drive to increase broadband penetration has reached a critical policy point in the United States, with President Bush, the Federal Communications Commission, and numerous industry groups all offering new agendas. Naturally, many eyes have turned to Korea, which has been the undisputed world leader in broadband deployment for several years. The question for U.S. policy is to apply what lessons can be learned from Korea's success. The dominant explanation for that success, given by both those who favor the U.S.'s emulating Korea and those who do not, has been to point to Korean "industrial policy" as the critical factor - i.e., specific government policies through which Korea encouraged, facilitated, and financed broadband.¹⁾ An International Telecommunications Union report reflects the consensus: "Korea's emergence as the world leader in information and communications technologies (ICT) - in fields such as broadband Internet, semiconductors and third generation mobile and so on - is not an accident. The government has specifically targeted this objective."²⁾

In this commentary, I hope to bring into somewhat sharper focus Korean government policy promoting broadband deployment and to try to separate out the manner in which industrial policy may have helped accelerate Korean broadband penetration. In discussing industrial policy, I mean affirmative government "[m]easures attempting to speed the process of resource allocation among or within industrial sectors."³⁾ Industrial policy, at its most extreme and sometimes most

1) See, e.g., Harold Furchgott-Roth, *Telecom Troubles*, NRO, Mar. 18, 2004 ("The broadband industrial-policy advocates often point in alarm to the rapid adoption of broadband by consumers in Korea and Japan."); Ken Belson & Matt Richtel, *U.S. Broadband Dream Is Alive in Korea*, N.Y. Times, May 5, 2003 ("While often disdainful of government intervention, many high-technology leaders in the United States now argue that Korean policy makers got it right by actively promoting the technology.") (http://news.com.com/2100-1034_3-999695.html); George Gilder, FC NOW, April 3, 2004 ("Korea was enthusiastic about broadband. Their government was enthusiastic about broadband. They had industrial policies that were in favor of broadband.") (http://blog.fastcompany.com/archives/2004/04/03/broadband_penetration_in_Korea.html).

2) Int'l Telecomm. Union, *Broadband Korea: Internet Case Study* 53 (March 2003).

3) Donald Rutherford, *Routledge Dictionary of Economics* 270 (2d ed. 2002). The entire definition offered is: "Measures attempting to speed the process of resource allocation among or within industrial sectors *with the aim of correcting market distortions*." *Id.* I do not consider the italicized qualification to be particularly helpful in defining the term, for it assumes a shared definition of "market distortions" and what policies would serve to "correct" them. Economics might provide a sensible set of reference points, such as decreasing barriers to entry, solving public goods problems, or addressing natural monopoly. See, e.g., Daniel F. Spulber, *Regulation and Markets* 1-5 (1989) (proposing this limitation). But, in reality, advocates of particular government policies have no trouble describing virtually any problem as a market distortion.

successful, attempts to anticipate and accelerate market developments. In this sense, industrial policy is more than general competition law or the public provision of education, roads, and law enforcement. Rather, industrial policy involves the picking of winners and losers, and the deliberate use of government policy to further the winners. These government policies may take a wide variety of forms, ranging from government investment to government limits on competition to sector-specific regulation of incumbents to promote competition. But, to make the category of “industrial policy” coherent, the focus should remain on government policies designed to have particular market outcomes.

It is indisputable, as the ITU noted, that the development and proliferation of information and communications technologies has been one of the Korean government’s most public priorities, with each of its three “master plans for informatization” touting the manner in which “the government has brought Korea one step closer to the realization of the information society.”⁴⁾ But it is also the case that the Korean broadband market also has some important differences from the U.S. market, such as greater population density in Korea and the relatively recent vintage of much of its housing and public infrastructure. These market differences mean that the broadband possible in Korea is both faster and cheaper than the broadband currently deployed in the United States.

When market differences are taken into account, the United States is still behind Korea in broadband penetration, but (perhaps) not terribly so. This is important for drawing policy prescriptions for the United States, for, while some of Korean industrial policy would fit comfortably within American regulatory paradigms, other features of Korean policy would not. My tentative conclusion is that the United States should consider the benefits of increasing on-line government services as well as the benefits of increasing computer education. These are costly projects to be sure, and so their prospects for adoption are uncertain, but they undeniably increase

4) Ministry of Information and Communication, Republic of Korea, *e-Korea Vision 2006: The Third Master Plan for Informatization Promotion (2002-2006)*, at 9 (April 2002). Professor Christopher Yoo has addressed the extent to which U.S. trade policy has been responsible for some of Korea’s steps to open telecommunications markets to competition, and the interaction between those steps and broadband deployment. See Christopher S. Yoo, *The Unfulfilled Promise of Korean Telecommunications Reform*, in *Korean Legal Reform* (Thomas Ginsburg, ed., forthcoming 2004). It is undeniable, however, that Korean government policy has independently sought to advance the information and communications industries.

the attractiveness of broadband and decrease consumer reticence to subscribe. On the other hand, the United States should and probably will maintain its traditional skepticism for more direct market intervention, such as government provision of infrastructure or below-market rate loans to particular companies. Unlike in Korea, backbone capacity was and is plentiful in the United States, and difficulties in picking successful technologies have generally resulted in beneficial market diversity.

Part I of this commentary briefly describes the Korean broadband market, its successes, and the manner in which some U.S. policy makers are looking to Korea for lessons. Without a doubt, Korea has been very successful at getting broadband in the hands of individual consumers, with perhaps as many as three-quarters of all households subscribing to broadband. Part II then discusses, in a qualitative manner, a model of broadband supply and demand. Broadband uptake, like the uptake of any other product, ought to depend upon consumer taste for the good and its price. Korean government policy has significantly shaped both of these characteristics, through direct government subsidies and indirect government leadership. But the structure of the Korean market, and particularly its high-population density, is a significant part of the explanation as well. Part III draws some conclusions, suggesting which parts of Korean industrial policy might profitably be emulated in the United States.

I. The Korean Broadband Success Story

Popular press sources report that up to 73% of Korean households subscribe to high-speed Internet services.⁵⁾ Precise quantification is difficult, but there is no doubt that Korea leads the world - and by a significant margin - in broadband penetration. The most recent OECD survey, which is widely accepted, found that as of June 2003 Korea's broadband penetration was 23.17 per 100 inhabitants.⁶⁾ Only one other

5) See Steve Rosenbush, *et al.*, *Broadband: What's the Holdup*, Bus. Wk., Mar. 1, 2004, at 38 ("The world's broadband leader is South Korea, where 73% of households subscribe to high-speed Internet."); see also Irene M. Kunii, *Where Broadband Is Really Booming*, Bus. Wk., May 5, 2003, at 88 ("Two-thirds of South Korea's 15 million households boast broadband connections").

6) OECD, *Broadband Access in OECD Countries per 100 Inhabitants (June 2003)* (available at <http://>

country (Canada) had broadband penetration even one-half that high (at 13.27). By comparison, the OECD average was 6.06, and the United States penetration rate was 8.25. (In absolute numbers, “the U.S. leads the world with close to 20 million subscribers for all broadband services [which] represents more than one-third of all of the subscribers in all OECD countries.”⁷⁾)

That Korea now leads the world by such a wide margin broadband deployment is remarkable on some levels. On the one hand, Koreans are highly educated and technologically sophisticated, which is strongly associated with broadband usage.⁸⁾ And Koreans are younger on average than Americans or Europeans, which is also correlated with technology and Internet use.⁹⁾ On the other hand, Korean gross national income per capita remains less than one third of that in the United States.¹⁰⁾ And fewer than ten years ago, fewer than one percent of Koreans were Internet users.¹¹⁾

In Korea, the dominant broadband technology is DSL, with an almost 2-1 advantage over cable modem service,¹²⁾ although cable modem was the technology first to market.¹³⁾ In the United States, cable modem remains the dominant technology for residential access.¹⁴⁾ More importantly, Korean broadband is provided at higher speeds than broadband in the United States. Speeds of 3 megabits/second are typical,¹⁵⁾ but service with speeds of 8 or even 20 megabits is also widely available.¹⁶⁾ In the U.S., consumer DSL is typically provided at 768

www.oecd.org/document/33/0,2340,en_2649_34225_19503969_119656_1_1_1,00.html).

7) Sherille Ismail & Irene Wu, *Broadband Internet Access in OECD Countries: A Comparative Analysis*, FCC Staff Report, at 3 (Oct. 2003) (reporting on Dec. 2002 OECD data).

8) See *id.*

9) ITU, *supra* note 2, at 33.

10) World Bank, GNI-PC 2002 (reporting Atlas methodology) (<http://www.worldbank.org/data/databytopic/GNIPC.pdf>).

11) ITU, *supra* note 2, at 1.

12) OECD, *supra* note 6.

13) Ismail & Wu, *supra* note 7, at 5.

14) See Dawn Kawamoto, *Broadband Make Inroads Into U.S. Households*, CNET.com, April 7, 2004 (cable has 58% of market) (http://news.com.com/2102-1034_3-5186692.html).

15) Rosenbush, *supra* note 5, at 38.

16) *Id.* (“Most Koreans pay \$27 a month for a connection speed of up to 3 megabits. But a few thousand choose to pay \$52 a month for a 20-megabit advanced DSL connection, which is much faster and cheaper than anything available to Americans.”); see also Ismail & Wu, *supra* note 7, at 8 (Korea’s Hanaro offers 8mbps downstream/8

kilobits downstream, and cable modem service is offered at approximately 1.5 megabits. A Federal Communications Commission staff report calculates that one megabit of downstream service costs \$3.88 in Korea, but \$29.45 in the United States.¹⁷⁾

The Korean success story has been a focus of those in the United States that seek to increase the level of broadband deployment. The OECD places the United States tenth in penetration rate,¹⁸⁾ and President Bush has gone so far as to use this relatively low ranking as impetus for new federal policy to accelerate broadband.¹⁹⁾ Similarly, the Federal Communications Commission's most recent call for commentary on broadband policy explicitly asks what other governments' policies do to contribute to higher rates of broadband penetration.²⁰⁾ Commentators asserting that "Americans get a raw deal" call for "[a]ctivist government policy [to] make a huge difference . . . as it has done in Korea and Japan."²¹⁾

In pointing at the Korean success story, commenters generally focus on three elements of Korean policy. First, the Korean government itself made a variety of direct investments in the broadband network. The total amount of government funding is difficult to discern, although some estimates run into the tens of billions of dollars.²²⁾ Using public funds, it constructed a significant broadband backbone, which it then donated to telecommunications carriers, receiving in return certain

kbps upstream for \$31 [adjusted for purchasing power parity].").

17) Ismail & Wu, *supra* note 7, at 6 (figure 3).

18) OECD, *supra* note 6. The ITU places the United States eleventh. See International Telecommunications Union, *ITU Internet Reports: Birth of Broadband*, Sept. 2003, at 1 (figure 1.1).

19) See President Unveils Initiatives for Technology, Health Care, Internet, April 26, 2004 (available at <http://www.whitehouse.gov/news/releases/2004/04/20040426-6.html>) ("by the way, we rank 10th amongst the industrialized world in broadband technology and its availability. That's not good enough for America. Tenth is 10 spots too low as far as I'm concerned.").

20) FCC, Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans, FCC No. 04-55, at 43 (Mar. 17, 2004).

21) Mark Bearn, *Americans Get a Raw Deal*, *New Statesman*, May 31, 2004, at xxxii.

22) A researcher at the Korean Information Strategy Development Institute states that the government investment was only \$1.5 billion, although the government also directed substantial amounts of private investment. "The initial plan was to provide broadband networks to all households in the form of FTTH (fiber-to-the-home) by 2015, but amended in 1999 with a target of 2010, amounting to 24.5 billion dollar in total, among which the government investment accounted for 1.5 billion dollar." Nae-Chan Lee, *Broadband Internet Service: Korea's Experience* 6 (Feb. 2002).

service commitments.²³⁾ Additionally, the Korean government made loans to service providers at prime rates,²⁴⁾ and it actively ensures the funding of projects that its ministry believes might be successful in technology markets.²⁵⁾

Second, the Korean government took steps to open its broadband markets to competition. Some of the ease of entry was due to the pre-broadband law that forbade the owners of cable television companies from also being content providers. “The two state-owned cable infrastructure owners - Powercomm and Korea Telecom were not permitted to offer services, but instead leased capacity to programmers. Therefore, new entrants to the broadband market, such as Thrunet in 1998 and Hanaro in 1999, initially leased cable capacity to reach their earliest customers.”²⁶⁾ Although these rules ended in 2000,²⁷⁾ Korean law made the licensing of broadband service providers relatively easy. In 2002, local loop unbundling went into effect. Overall, an ITU staff report concludes that “Korea’s telecommunications market is arguably as open as any in the Asia-Pacific region.”²⁸⁾

Third, the Korean government itself has repeatedly emphasized the importance of broadband and its support for developing broadband, not only giving the service significant publicity but also raising the relative prestige of companies providing the services. “It is part of [Korean] business culture to listen to the government.”²⁹⁾ This

23) Jim Hopkins, *Other Nations Zip by USA in High-Speed Net Race*, USA Today, Jan. 19, 2004, at 1B (“South Korea’s \$50 billion program first linked 80 major cities and towns with superfast cable.”); Irene M Kunii & Moon Ihlwan, *Where Broadband Is Really Booming*, Bus. Wk., May 5, 2003, at 88 (“South Korea’s government invested \$9.2 billion in broadband infrastructure over the past four years and will spend another \$11 billion to deliver 20-Mbps service to 90% of households by 2005.”); Karlin Lillington, *South Korea Shows the Way on Broadband*, Irish Times, Nov. 22, 2002, at 55 (“The Korean government sank hundreds of millions of euros into helping create the world’s most advanced telecommunications network.”).

24) See ITU, *Broadband Korea: A Case Study* 32 (March 2003) (“In 1999 and 2000, the government provided Facilities-based Service Providers (FSP) with US\$ 77 million, at a very low interest rate, to invest in broadband access networks.”); see also Lee, *supra* note 22, at 8 (noting \$77 million in loans in each of 1999 and 2000, and an additional \$923 million to be spent by 2005).

25) See, e.g., *id.* (“The Informatization Promotion Fund, established by the MIC, is used to support projects selected by a special committee on a competitive basis.”); *id.* (“The initiative, called e-Silkroad, will select 50 projects that are most likely to be a success and ensures the manufacturer receives financial funding.”).

26) Ismail & Wu, *supra* note 7, at 12.

27) *Id.*

28) ITU, *supra* note 2, at 7.

29) Quoted in ITU, *supra* note 2, at 32 (box 3.1).

unique public-private partnership is credited with spurring the initial provision and uptake of broadband. “Although the impact of government involvement on the private broadband Internet service market may not be easily quantified, early commitment and promotion by the government has given sufficient momentum for creating the recognition on the importance of informatization.”³⁰⁾

Although, as I discuss below, Korean government policy had many more dimensions than these, government funding, competition policy, and explicit priority setting are the three factors most often discussed in the U.S. debate over its broadband policy. An early academic commentary on Korean and United States broadband diffusion argues that “it is critical for the government to provide not only the infrastructure and technical standard but also a ‘fertilized soil.’ ... Korea’s current status as the [Information and Communications Technology] nation could not have been a reality if the government had not cultivated such fertile soil.”³¹⁾ In U.S. policy-making circles, Congressman Bob Goodlatte, chairman of the Congressional Internet Caucus, has said that “[i]t is very obvious that we are behind They [Japan and Korea] have the answers out there. We just have to go out and ask the questions.”³²⁾ The Technet CEOs group, an organization of 150 technology company leaders, has called for increased government spending on broadband networks, stating that “Governments have an important role to play in fostering broadband penetration. South Korea and Canada lead the world in terms of broadband penetration, and one of the major reasons for their leadership has been the active role the respective governments have played.”³³⁾ The Computer Systems Policy Project, which includes Dell, IBM, HP, and others, has similarly called for “a national policy to promote high-speed broadband communications networks, as Japan and Korea have done.”³⁴⁾ And the Telecommunications Industry Association announced a 5-point plan, derived in part from Korea’s experience, that includes “(1) [a] national

30) Lee, *supra* note 22, at 12.

31) Gwang-jub Han, *Broadband Adoption in the United States and Korea: Business Driven Rational Model Versus Culture Sensitive Policy Model*, 11 Trends in Commun. 3 (2003).

32) William New, *Look To Asia For Broadband Ideas, Panelists Urge*, National Journal’s Technology Daily, Nov. 20, 2003.

33) Technet CEO, *Broadband Primer*, Jan. 15, 2002 (available at http://www.technet.org/news/newsreleases_/2002-01-15.63.html).

34) See Carolyn Lochhead, *Economists Back Tech Industry’s Overseas Hiring*, S.F. Chron., Jan. 9, 2004, at A3.

broadband policy,” (2) deregulation, (3) tax incentives, (4) spectrum allocation, and (5) additional research and development funding.³⁵⁾ Even the U.S. labor unions have pointed to Korean policy of government priority and funding as the next phase for U.S. policy.³⁶⁾

II. Government Policy and Market Structure

This section sets out, in a qualitative manner, a rough model of broadband demand, in order to illuminate the manner in which Korean industrial policy assisted in developing its advanced broadband market. This section also relates the importance of population density to broadband deployment, both as it affects the quality of broadband and the cost of its deployment. It has sometimes been noted that Korean broadband penetration is due in part to its greater population density. This section develops some statistics to show, first, just how great the density differences are between the Korean and American markets, and, second, that broadband penetration in U.S. city centers is much higher than the gross national numbers might suggest.

As with any good, consumer demand for broadband depends upon two factors: consumer preferences and relative price. Consumer preferences, in turn, depend upon the quality of the good (as perceived by consumers) and consumers’ budget constraints.³⁷⁾ To make this more concrete in the case of broadband service, consumer demand for the service depends upon (1) consumers’ perception of the quality of the good, (2) their income level, and (3) the price of broadband. The second of these factors, the general income level, cannot be affected by government policy, at least in the short run. But it is interesting to note that Koreans, despite their lower per capita income, are apparently willing to spend twice as much of their household income on broadband.³⁸⁾ Of course, consumer willingness to spend

35) See Telecom Manufacturers Push Jobs Benefits of Broadband Deployment, *Commun. Daily*, Oct. 9, 2003.

36) See CWA Calls for Change of Policies To Boost Broadband Deployment, *Commun. Daily*, Mar. 8, 2004.

37) See generally Robert S. Pindyck & Daniel L. Rubinfeld, *Microeconomics* 77-78 (4th ed. 1998).

38) Ismail & Wu, *supra* note 7, at 7 (“Within this sample, Americans are spending a relatively small percentage - 0.04% of their household income - on broadband. Swedes and Koreans appear to have the highest willingness to spend - up to 0.08% of monthly household income.”).

depends upon the perceived utility of the good, and the difference can be explained if broadband is considered to be a necessary good.

As to the first and the third factors, government policy can have significant effects, and it is important to analyze these characteristics more closely to focus on the contribution Korean industrial policy has made. Consumer preference for broadband - the perception of the quality of the good versus all other goods - is difficult to observe directly; but a few observations on the qualities of broadband as a good can help to identify how policy or market factors might influence preference.

First, “broadband” is not a uniform good. Rather, the term is used to describe just about any transmission speed that is significantly faster than a dial-up modem. The principal characteristic of a broadband connection is speed, and, of course, faster is better. As noted above, Korean broadband is, in general, significantly faster than broadband offered on the consumer market in the United States. Indeed, while Koreans generally enjoy multi-megabit, bi-directional broadband, the United States Federal Communications Commission’s official reporting focuses on “high-speed” Internet services defined as more than 200 *kilobits* per second.³⁹⁾ A direct comparison between the penetration rates of the two products may be somewhat misleading, because, for example, Korean broadband is fast enough to provide full-motion video, whereas the broadband product available in the United States is not. In all events, however, Korean broadband is a superior good - and consumers therefore place a higher value on it — because it is faster.

Second, part of the reason that faster is better is that one can do more, different things the faster the connection is. That is, consumer preference for broadband is not simply for broadband as an ultimate good: having a high-bandwidth connection into one’s home is not, in and of itself, of much value. Rather, the demand for broadband depends crucially upon the availability of and consumer preference for the services and applications that can be provided over broadband.⁴⁰⁾ People use telephone lines for conversations and to send faxes; broadband is used to access websites, play games, take classes, have video conferences, and many other activities. A faster broadband connection not only increases the quality of some of the services that are

39) See FCC, *supra* note 20, at 1 n.1.

40) See, e.g., James B. Speta, *Handicapping the Race for the Last Mile?: A Critique of Open Access Rules for Broadband Platforms*, 17 Yale J. on Reg. 39 (2000).

otherwise available over slower services (such as faster web-page loading), but a faster connection also means that additional services may be available.⁴¹⁾ In particular, Korean broadband generally supports reasonably high-quality video applications, while residential broadband in the U.S. generally does not. The availability of video significantly increases the desirability of broadband.

In other words, the two principal characteristics of broadband which drive consumer perception of its quality - and hence also drive consumer demand - are its speed and the quality and variety of services available to be used. Of course, these factors are not the only variations that might explain preference differences between Korean consumers and American consumers. Even controlling for differences in demographics, income, and education, there may be factors particular to the Korean culture or society that result in higher value for broadband.⁴²⁾ And it may not be possible to separate out these social aspects from government policy.

Nevertheless, Korean government policy has certainly been designed to affect both the transmission speed and the quality and number of services available. First, the government established an explicit multi-megabit goal for broadband service, and the infrastructure that it constructed was designed for those speeds. Current government certification of apartment buildings as broadband ready, which certification is used in marketing the apartment complexes, requires a minimum of 10 megabits speed to the consumer.⁴³⁾ Similarly, Korean policy has aggressively created broadband services to drive demand, the most notable being a very strong e-government program. According to an ITU report, almost all government documents are available on-line, and almost all government services - ranging from property transactions to automobile registration to tax payments - can be conducted on-line as

41) Indeed, Korean broadband is so much faster than that routinely available in the United States that it might not be fair to consider the two to be the same product, such that direct comparisons of penetration rates might not be appropriate. Compare Beam, *supra* note 21, at xxxii (“America, the joke goes, doesn’t have broadband. At best, it has ‘middleband’ - overpriced, sluggish internet connections, transmitting tinny grainy video and tinny music over ageing technology.”); Rosenbush, *et al.*, *supra* note 5, at 38.

42) Some commentators suggest that Koreans are culturally attuned to adopt new technologies on a rapid basis and that Koreans particularly respond to government promotion of particular policies. See, *e.g.*, Han, *supra* note 31, at 19. I am not in a position to evaluate these claims, but, if true, they suggest caution in adopting Korean policy based solely on higher broadband penetration rates.

43) See ITU, *supra* note 2, at 32 (box 3.1).

well.⁴⁴⁾ The government has also encouraged e-commerce development, through subsidies, low-cost loans, and technological assistance.⁴⁵⁾ All of these services help drive demand by increasing the value of a broadband connection.

Apart from these policies that operate directly on preferences for broadband, the government has, perhaps even more importantly, indirectly affected consumer preferences by funding extensive computer education. The government has wired all schools for Internet access and has provided extensive free education to all citizens on the use of computers and the Internet.⁴⁶⁾ These measures surely affect consumer preferences by increasing familiarity and comfort with broadband services. And, the Korean government's continual emphasis on the need for education, for the advancement of information education, and for the concomitant advancement of Korean society probably has some effect on consumer preferences. One of the current government campaigns emphasizes informatization as the means by which Korean per capita income might reach new heights. This too probably helps shape consumer preferences.

As to the price element of consumer demand, it is obvious that government subsidy decreases the need for private sector investment funds and thereby decreases the cost of constructing a broadband network.⁴⁷⁾ But all of the foregoing government policies may help decrease the private sector costs of deploying a broadband network as well, for government education, promotion, and content services stimulate demand and may therefore decrease the need for private companies to provide such services on their own.

As important as government policy has been to furthering broadband penetration in Korea, it is also essential to note important structural differences in the markets that affect demand. The most important of these is population density, for population density directly affects both the quality and the price of broadband service. Both the Korean and U.S. markets are dominated by the "wired" technologies of cable modem and digital subscriber line ("DSL"); wireless has relatively small share.⁴⁸⁾

44) See *id.* at 33-36.

45) See, *e.g.*, *id.* at 54-56.

46) *Id.*

47) This is true even if the sole form of government subsidy is low-cost loans, although it does appear the Korean government has directly subsidized some infrastructure.

48) See OECD, *supra* note 6.

The costs of deploying a wired network depend upon the costs of wire and electronics, which should be relatively equal in the two markets. But, importantly, the costs of *installing* the wire and the types of installation that might be undertaken are substantially different.

In particular, “[t]he costs of passing a home with a broadband network are highly sensitive to the population density of the area surrounding the home. Houses and other buildings that are spread further apart require more cabling and, because signal strength and quality decline over distance, more electronic components.”⁴⁹⁾ Moreover, high density allows companies to use more fiber optic cabling in the network, with shorter copper-wire feeds into individual residences. These short copper feeds mean that broadband services have greater potential speeds, which, as noted above, increases the quality of the service.⁵⁰⁾

In order to attempt a rough approximation of the total effect of Korean government policy on broadband, one would like to control for all of the variables that might affect both preference and price. This is probably impossible. A recent study suggests that demographic variables such as age and education of the population, income levels, availability of electricity, and regulatory transparency all affect Internet uptake.⁵¹⁾ Nevertheless, some rough statistics can confirm that population density is an important driver in broadband penetration, and a direct comparison of the most dense areas of the United States suggests that the gap between U.S. and Korean broadband penetration is less than the gross numbers suggest.

Indeed, it has sometimes been observed that greater Korean population density is one of the reasons for increased broadband penetration there,⁵²⁾ but developing the

49) Gerald R. Faulhaber & Christiaan Hogendorn, *The Market Structure of Broadband Telecommunications*, 68 J. Indus. Econ. 305, 311 (2000).

50) See, e.g., Speta, *supra* note 40, at 55.

51) Mezie D. Chinn & Robert W. Fairlie, *The Determinants of the Global Digital Divide: A Cross-Country Analysis of Computer and Internet Penetration*, Yale University Economic Growth Center Discussion Paper No. 881 (March 2004) (available at <http://ssrn.com/abstract=510182>).

52) See, e.g., Rosenbush, *et al.*, *supra* note 5, at 38. Han mentions greater Korean density and propensity for living in apartment buildings, but concludes that government policy is the key difference and the principal explanation for Korea’s success. Han, *supra* note 31, at 20. Junseong An concludes that government policy has been important, but tentatively concludes that Korea’s “magic formula would not be necessarily applicable to the United States.” Junseong An, *E-Korean DSL Policy: Implications for the United States*, 20 J. Marshall J. Comp. & Info L. 417, 433 (2002).

comparative numbers reveals the truly striking difference. On a country-wide basis, Korea's population density is more than 16 times that of the United States (471 people per square kilometer versus 29).⁵³⁾ Nearly half of Koreans live in cities of more than one-million people, compared to 37% for Americans.⁵⁴⁾ And more than half of Koreans live in large apartment buildings.⁵⁵⁾ This difference in multi-unit dwellings is a particularly sharp, for roughly 75% of housing in the United States is in single-family structures, and only 3.2% of all housing units are in structures with more than 50 units.⁵⁶⁾ Even in central cities in the United States, 58% of all housing units are single family dwellings, and buildings of more than 50 units account for only 7% of the total number of units.⁵⁷⁾ Junseong An notes in technical terms that, in Korea, "ninety-three percent of residents live within four [kilometers] from" a telephone company switching office."⁵⁸⁾ The differential in population density means that Americans live farther away from switching offices. And this distance translates into a higher price or lower quality product, or both.

Population density in the United States is quite strongly associated with broadband penetration.⁵⁹⁾ In the most densely populated areas, broadband is readily available, and usually from at least two suppliers. By contrast, in many of the least densely populated areas, no broadband service is available at all.⁶⁰⁾ Moreover,

53) World Resources Institute, Country Profiles (2000 data) (available at http://earthtrends.wri.org/text/POP/country_profiles/).

54) World Bank, 2004 World Development Indicators, table 3.10 (urbanization) (available at http://www.worldbank.org/data/wdi2004/pdfs/table3_10.pdf).

55) See *Overview of Korea Housing* (http://www.korea.net/learnaboutkorea/society/housing_rel.html); Korea National Housing Corp., Housing Construction, Significance (http://www.jugong.co.kr/bojo/engllf_engl_signif.html). It appears to have been national policy both to construct apartment buildings and to encourage the construction of apartment buildings in order to increase the quality of housing rapidly. See *id.* Moreover, according to a study by Dr. Heejin Lee, government regulations have, since the 1970s, required apartment buildings to have dedicated communications rooms, which makes upgrading service to the building much easier. The study, which cannot be printed, is available at <http://www.dis.unimelb.edu.au/staff/heejin/DTI%20Mission%20Report.pdf>.

56) U.S. Census Bureau, *American Housing Survey for the United States: 2001*, table 1A-1 (available at <http://www.census.gov/hhes/www/housing/ahs/ahs01/tab1a1.html>).

57) *Id.*, table 1B-1 (available at <http://www.census.gov/hhes/housing/ahs/ahs01/tab1b1.html>).

58) An, *supra* note 52, at 425.

59) FCC, *High-Speed Services for Internet Access: Status as of June 30, 2003*, at 4 (Dec. 2003) ("High population density has a positive association with reports that high-speed subscribers are present, and low population density has an inverse association.").

60) The FCC reports data only by postal zip code, which suppresses some of the details, and its data specifies

according to a recent analyst report, U.S. cities are about to see broadband subscribership exceed dial-up,⁶¹⁾ meaning that home-based broadband penetration in these cities is approximately 33%.⁶²⁾ These numbers are not directly comparable to the statistics available for Korea, although they do suggest that the difference is not as great as the gross numbers suggest.

III. Conclusions

Although the foregoing does not quantify the significance of density as a factor in the deployment of broadband, it is undeniable that this accounts for much of the difference between broadband penetration in the United States and Korea. This suggests caution in adopting those elements of Korean industrial policy that are most different from the general regulatory presumptions in the United States. Chairman Michael Powell has expressed doubts about the FCC's affirmatively stimulating broadband deployment, given its general deregulatory stance.⁶³⁾ This surely reflects the general consensus in America - that deregulation is preferred and that government can and should do little to invest in particular companies and sectors.

Moreover, it bears noticing that true broadband deployment in the United States is still awaiting what would be one of its key drivers - the full cooperation of content industries. As the litigation over music file-sharing has revealed, the content industries in the United States are concerned that broadband, if combined with widespread copyright infringement, would eliminate their economic livelihood. Indeed, the motion picture industry, in a variety of venues, has sought the adoption

only the presence of "high-speed" lines, defined as more than 200kbps in one direction, which is not true broadband. Nevertheless, the FCC's data still shows that 30% of postal zip codes in the least densely populated areas have no broadband service.

61) See comScore Networks, *Broadband Usage Poised To Eclipse Narrowband in Largest U.S. Markets*, Press Release (Mar. 10, 2004) (<http://www.comscore.com/press/release.asp?press=439>).

62) Based on an overall Internet access rate of 67%. See also John B. Horrigan, *Pew Internet Project Data Memo. 7* (April 2004) ("Just 10% of Americans who live in rural areas have broadband connections at home, compared with 28% of those living in urban or suburban locations.").

63) See George Leopold, *U.S. Takes Hard Look at Broadband Deployment*, *EE Times*, May 23, 2002 (available at <http://www.eetimes.com/article/showArticle.jhtml?articleId=16504852>).

of digital rights management technologies that would protect their copyrighted works.⁶⁴⁾ Although none of these efforts obstruct broadband directly, the lack of high-quality video programming from traditional sources such as television and media studios means that one of the most important services is missing. In Korea, an accommodation has apparently been reached, such that traditional video programming is widely available over broadband connections. If, through technological or legal means (or both), domestic content industries can be assured of protecting their copyrighted materials, then broadband is likely to grow.

Despite the foregoing, I do think that some of the more indirect government policies that Korea has successfully used to stimulate broadband can be emulated in the United States. For example, despite deregulation being its general theme, the important 1996 Telecommunications Act re-committed the United States to universal service.⁶⁵⁾ This universal service commitment is currently limited to voice telephone service, while, in Korea, the government's explicit goal is universal broadband and is backed by government funds to wire poorer and more remote areas. Similarly, although federal and state funds are currently available in the United States to provide high-speed services to schools, libraries, and hospitals,⁶⁶⁾ no comprehensive program assures the availability of computers and information education in schools. As noted, Korea has been very successful at introducing technology education not only in schools, but also to almost every member of the population through a "life-long learning" ethos. Finally, although the federal and state governments have made strides toward e-government, the U.S. commitment is not nearly as extensive as that in Korea. Invigorating each of these programs could provide a substantial boost to broadband adoption, without violating the U.S. view of government staying out of markets. Of course, this proposal would require an increase in government funding, which is always controversial in the U.S., but the expected returns to the economy as a whole from greater broadband deployment might provide the needed persuasion.

But what about direct government subsidies, or at least loans, to enable private companies to build networks? Here, I suggest that the evidence in favor of this part

64) See, e.g., Susan P. Crawford, *The Biology of the Broadcast Flag*, 25 Hasting Comm/Ent. L.J. 602 (2003).

65) See 47 U.S.C. § 254.

66) See 47 U.S.C. § 254(d).

of Korean industrial policy is not so compelling that it overcomes the general reluctance in this country to pick winners and losers. As an initial matter, a significant part of the Korean government's infrastructure investment appears to have been in the construction of a nationwide backbone network.⁶⁷⁾ In the United States, by contrast, backbone capacity is oversupplied; the speed bottleneck is almost entirely in local access networks.⁶⁸⁾ Additionally, some Korean access providers continue to struggle toward profitability. Although the telecommunications industry in the United States is not any healthier, the difference is whether public funds or private are stranded if business plans do not succeed.

The Korean experience with broadband is truly impressive, for its quick growth, high quality, and significant penetration, and the government's use of industrial policy has been undeniable. But market differences have been important as well. The United States should probably emulate some of the more indirect means that Korea has employed to foster broadband. But the experience also does not conclusively show that more market interventionist activities are necessarily beneficial, and these therefore should be approached with caution.

67) See *supra* note 24.

68) Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans, Third Report, 17 F.C.C. Rcd. 2844 (2002) (appendix B).