Canada, South Korea, Netherlands and Sweden: regulatory implications of the convergence of telecommunications, broadcasting and Internet services ☆

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Abstract

Canada, South Korea, Netherlands, and Sweden, are four of the five leading broadband markets in the world. For these four countries, this article reviews the status of telephony, video, and Internet service markets, and identifies the major issues related to government mandates, network access, ownership, and content issues. All four countries seek to create a regulatory environment that allows for effective competition in communications. All four countries have competition among different broadband platforms, whether these are wireline telecom network, cable network, wireless, or local area networks (LANS). Furthermore, several near-term policy challenges arise such as the scope and authority of regulatory and policymaking bodies, unresolved questions on network access, and content policy. However, debates on ownership issues, as related to convergence, appear to be deferred.
Published by Elsevier Ltd.

Keywords: Convergence; Regulation; Media ownership; Government

0. Introduction

The impending convergence of telecommunications, broadcasting,[1] and Internet services has been the subject of much hyperbole. However, there has been less systematic analysis of which

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[1] While in the United States, "broadcasting" often refers to terrestrial television and radio, here I use "broadcasting" as it is more commonly used internationally, encompassing terrestrial television and radio, cable television, and satellite broadcasting.
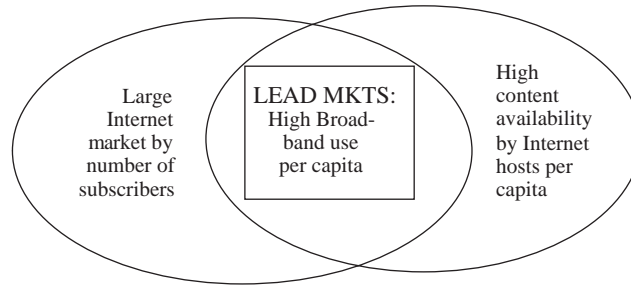
Fig. 1.

countries are experiencing convergence the most and the earliest. In part, this may be due to the novelty of the convergence phenomenon and, therefore, the lack of comparable international data to measure it. This paper uses major international organizations' data, which is likely to be updated regularly over time, to identify "lead markets," where from the users' point-of-view, convergence in communications services is occurring. There are many countries that are adapting their regulatory regimes in anticipation of convergence, but this may be a different, in some instances primarily rhetorical, effort compared to the work in countries which are actually experiencing significant effects from the merging of telecommunications, Internet, and broadcasting services. This paper uses data on the speed and deployment of Internet service to identify potential lead markets. By these measures, other than the United States, the four lead markets in the world are Canada, Korea, Netherlands, and Sweden. This article also includes for each of these four countries a short description of its service markets and key convergence related policy issues. (Fig. 1).

1. Identifying "lead markets"

In an effort to identify lead markets that will be instructive to examine closely, three sets of indicators were used to select a group of countries. All sets of indicators are published regularly by international organizations and, therefore, this method can be easily repeated as fresh data become available. The three indicators are the size of Internet subscribership, Internet host counts on a per capita basis, and broadband Internet use on a per capita basis.

Large Internet markets by number of subscribers. Fig. 2 shows the 30 countries with the largest number of Internet subscribers. This metric is used as an indicator of how large the Internet market is. This metric tends to screen out markets with the smallest populations, which often have special characteristics, such as being entirely urban. Markets with large Internet subscriberships are more likely to have a scale conducive to the development of convergent services. Of course, over time as Internet use matures internationally, which markets appear in the top 30 may change radically.

High availability of Internet content. Fig. 3 shows all markets with Internet host availability of greater than 100 per 10,000 people. As described by the OECD, "a host is a domain name that has an IP address "record" associated with it. This would include any computer system connected to the Internet (via full- or part-time, direct or dial-up access), although these hosts may not always
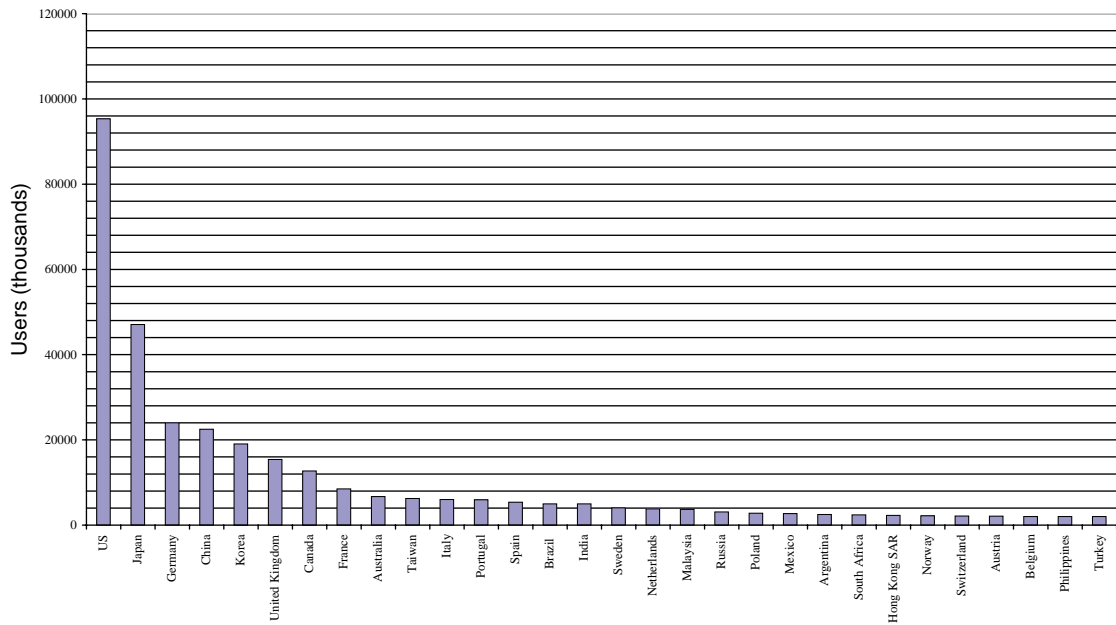
Fig. 2. 30 largest Internet markets. Source 2001: ITU.

be accessible due to technologies such as firewalls. Hosts can be thought of as an indicator of the minimum size of the Internet.''(Organization of Economic Cooperation and Development, 2001a, p. 100). Internet host measurements can be considered a proxy for the potential supply of Internet content in that market. As this indicator is measured on a per capita basis, it does not favor countries by population size.

Between Figs. 2 and 3, 19 markets overlap. They are the following:

Australia	Italy	Sweden
Austria	Japan	Switzerland
Belgium	Korea	Taiwan
Canada	Netherlands	United Kingdom
France	Norway	United States
Germany	Portugal	
Hong Kong	Spain	

All these markets, with the exception of Hong Kong SAR and Taiwan, are members of the OECD.

High use of broadband Internet service Fig. 4 ranks countries by the availability of broadband service. Access to broadband service is a necessity for the deployment of certain kinds of convergence services. Webcasting, for example, is a much richer and more interesting service if the consumer has broadband Internet access, rather than a slower dial-up connection. The data for Fig. 4 are drawn directly from an OECD report, which ranks the availability of broadband
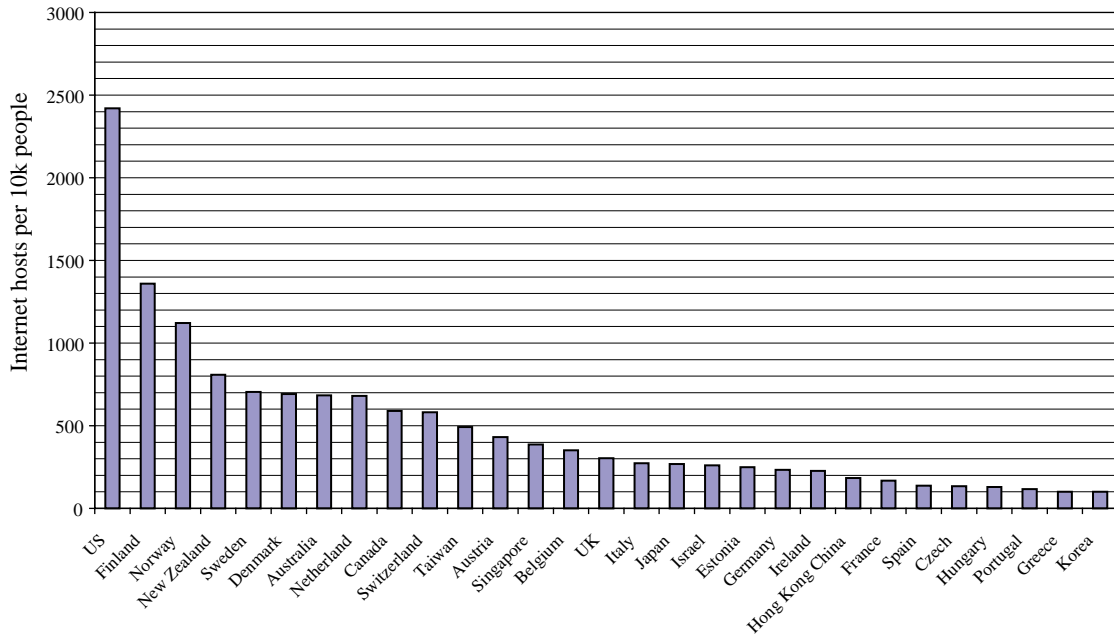
Fig. 3. Markets with largest number of Internet hosts per capita, 2000. Source: World Bank and ITU, 2003.

Internet service in OECD markets using the number of broadband subscribers per capita. For Taiwan and Hong Kong, broadband subscriber numbers are available from the media.[2] For this metric, I rely on the OECD's current definition of broadband Internet service, 256 kbps downstream and 64 kbps upstream.[3]

While all these markets could experience rapid growth in broadband, the services that make convergence possible, the list can be divided into three groups according to the status of broadband deployment. In the first group, along with the United States, the lead markets are Korea, Canada, Sweden, Netherlands, Austria and Belgium. The second group is Germany, Japan, and Switzerland. The final group is Australia, France, Hong Kong, Portugal, Norway, Spain, Italy, Taiwan, and United Kingdom. All these countries have large Internet subscriber and content markets. However, those in the lead group, followed by those in the second group, are most likely to have large segments of their population experience the practical effects of convergence earliest. The remainder of this paper compares the experience of four of the five markets in the first group—Canada, Korea, the Netherlands, and Sweden. Discussions of developments in the US have already been undertaken and, therefore, are not repeated here.[4]

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[2] The Hong Kong statistic is drawn from a Nua Internet Survey report (2001b). This reports that there are 1.2 million broadband Internet subscribers in Hong Kong. Hong Kong's population is 3.5 million. The Taiwan statistic is also drawn from a Nua Internet Survey report (2001a). This reports that there are greater than 600,000 broadband users as of July 2001. www.nua.ie/surveys

[3] Please note that this definition differs from the US FCC definitions (USFCC, 2002, paragraph 7).

[4] See http://www.fcc.gov/wcb/iatd/comp.html for Federal Communications Commission reports on high-speed Internet access and local telecommunications services competition in the United States.
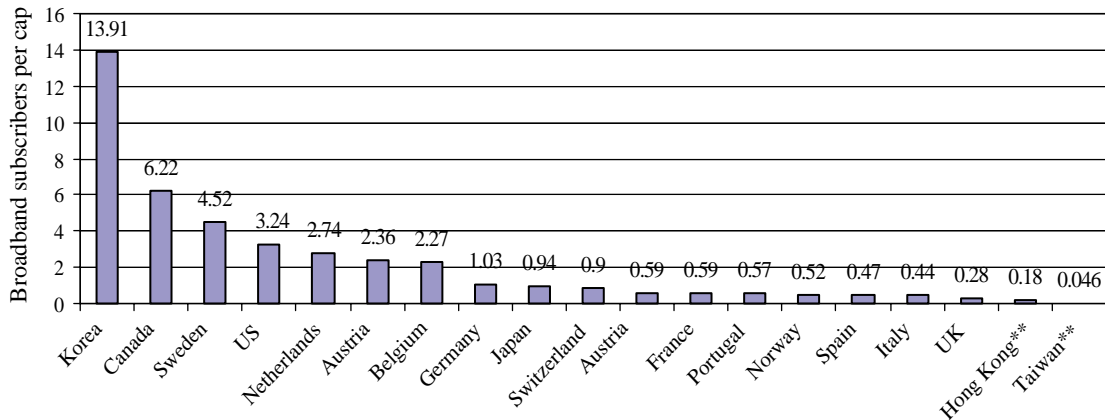
Fig. 4. Markets with high deployment of broadband Internet service, 2001. Source: OECD (2001b), and **NUA Internet surveys.

2. Markets: telephony, video, and internet

2.1. Telephony markets

This section covers briefly the state of telephony markets in these four countries, according to the technology used to convey the service. In all four countries, competition as a policy which benefits consumers has been the common regulatory and policy goal. Each has an incumbent wireline operator that faces competition in that market. Also, each has several wireless operators. Also, every one of these four countries has light regulation of IP telephony, if any at all. However, cable telephony appears to be significant only in the Netherlands (Fig. 5).

Wireline telephony service. In all four countries there is competition in the wireline telephony market, although each is dominated by a historic incumbent. In Canada, that incumbent is Bell Canada which generates over half of revenue from local and long distance service (CRTC, 2001). In Korea, the incumbent is Korea Telecom (KT). In the Netherlands, regulator OPTA has designated Koninklijke KPN (KPN) as a company with significant market. In Sweden, TeliaSonera is the incumbent wireline operator.

Wireless telephony. In wireless telephony, all four of these markets have several competitors. In Canada, there are four major operators, one of which is allied with incumbent Bell Canada. In Korea, there are five mobile telephone carriers, one of which is affiliated with wireline incumbent Korea Telecom. In the Netherlands, there are 5 operators, two of which—incumbent wireline operator KPN's mobile operator and Libertel, have been declared by regulator OPTA as carriers with significant market power. Sweden, has three main mobile operators, one of which belongs to the state-owned operator TeliaSonera.

Internet Protocol (IP) telephony. In all four countries, IP telephony is available, legal, and, at most, lightly regulated. In Canada there are no restrictions on the service, however, IP telephony providers which generate revenue are required to contribute to universal service funds. The only exception is that retail Internet service providers that provide IP telephony without charge are not required to contribute to universal service (CRTC, 2000a). In Korea Voice-over-Internet Protocol
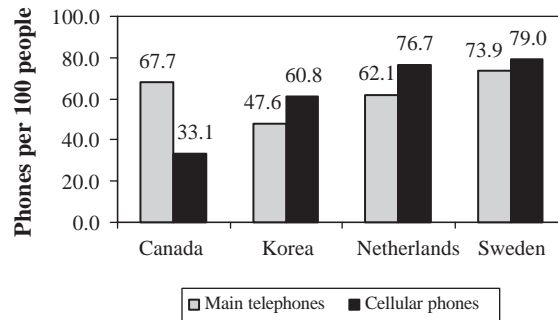
Fig. 5. Main and cellular telephones per 100 people. Source: ITU, data for 2001.

(VOIP) is regulated as a "special service." While providers must and register with the Ministry of Information and Communications (MIC), no government approval is required to begin service. The Netherlands follows the European Commission decision that IP telephony is not regarded as public telephony. Currently, IP telephony providers need only comply with an "obligation to register and to facilitate legal tapping and compliance with privacy regulation" (OECD 1999b). In Sweden, there are no restrictions on IP telephony, which regulator PTS reports as comprising one-third of all telephony revenue (PTS 2000a, p.16).

   Cable telephony. Cable telephony service appears not to be a popular offering in these four countries, with the exception of the Netherlands. In September 1999 the four largest cable companies—United Pan-Europe (UPC), Casema, CasTel, and Palet Kapelcom—formed a single front to provide telephony service in competition with telecom incumbent KPN. Together, these four cable companies served 4.3 million households or 68% total cable subscribers in the Netherlands. As of May 2001, there were 150,000, subscribers to cable telephony. The upgrading of the cable network to provide voice telephony that began under this initiative also lead to the provision of broadband Internet access over the cable network (Cable Europe, 1999).

2.2. Video markets

   This section briefly touches on networks that distribute video programming, organized by the transmission technology—terrestrial, cable, and satellite. In the section on terrestrial television, the main programming networks in each country are described. Also discussed are the status newer forms of video service—interactive television, video-on-demand, and webcasting.

   Terrestrial television. In terrestrial television, all four countries have public broadcasters who provide programming over terrestrial television. Ownership and concentration in these markets varies among the four countries. In Canada, there are 97 television stations, which are largely owned by five main ownership groups. The largest of these is CanWest/Global, which accounts for 88% of industry revenue. In terms of programming, there are four main national networks, Canadian Broadcast Corporation (CBC) and Societe Radio-Canada (SRC), the public broad-casters; CTV; and TVA. In Korea there are nine local terrestrial broadcasters and 840 privately owned relay cable operators who only re-transmit terrestrial broadcasters. The three major programming networks are public broadcaster Korea Broadcasting Service (KBS), government-owned Munhwa and Seoul Broadcasting Service (SBS, also known as the National Broadcast
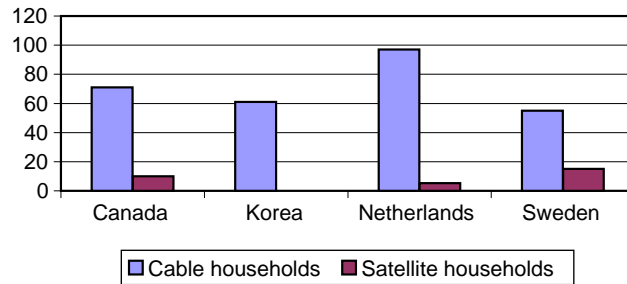
Fig. 6. Percentage of households with pay television. Sources: Canada, Kennedy, Helen, Heritage Canada (2001), Korea, Korean Broadcast Commission (2001b); Netherlands and Sweden, VECAI (2001b). All numbers for 2001.

Company or NBC). The Dutch can receive free-to-air channels from neighboring countries, including satellite channels. In terms of Dutch terrestrial broadcasting, there are only three channels managed by NOS (Nederlandse Omroep Stichting (2000) or the Dutch Broadcasting Association), for the eight public broadcasters, who provide content for these channels. All Dutch commercial video programming is carried by cable or satellite (Netherlands, Ministry of Education, 1999; NOS, 2000). In Sweden, there are two public broadcast channels, SVT1 and SVT2; the "commercial' public service broadcaster TV4; and commercial satellite channels, TV3, Channel 5, TV6, ZTV, and TV8 (Fig. 6).

Cable and satellite television. Of the four countries, Canada and Netherlands have the most extensive cable television network. All receive satellite television. In Canada, while there are 2056 cable systems, the five largest ownership groups dominate, led by Rogers, which generate 84.6% of industry revenue. About 10% of Canadian households receive television by satellite, either from Star Choice or Bell ExpressVu. In Korea, cable television began recently in 1995, therefore, over half the network is fiber optic and ready to provide advanced services. The two major cable network operators are Korea Telecom (KT) and Powercomm. Digital satellite broadcasting began in March 2002. As of January 2003, this service had 560,000 subscribers, or about 5% of all households in South Korea.[5] In the Netherlands, there is no commercial broadcasting over terrestrial television, all commercial broadcasting is cable or satellite. Ninty-seven percent of Dutch households subscribe to cable. There are three main cable operators. In Sweden 71% of households in Sweden receive television through cable or satellite. There are four major cable operators, including Com Hem, a subsidiary of telecom incumbent Telia. TV3, the first commercial television channel offered in Sweden, began in 1987 as a satellite service beamed from London by Modern Times Group (MTG), in order to circumvent the ban against commercial television at that time (Swedish Broadcast Commission, 2002; Moore, 1995).

Interactive television. While there were media reports of interactive television tests and experiments in all four countries, the most activity in this area is in Sweden. There are at least two services that report significant take up in Sweden. eTV (Europemedia.net, 2001) broadcasting reports that since it began digital service over satellite in February 2000, one in four Swedish households have watched every day and four in ten households have used the interactive services to make a purchase. Boxer TV, provided by state-owned company Teracom (2000), provides a

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[5] Correspondence with Su-jung Kim, Korea Broadcast Commission (2001b). January 2003.

service whereby customers can send email, purchase products, play games, view news, and other activities using a wireless keyboard or remote television controller as their input device. The digital television set-top box is equipped with a telephone modem and the telecom network is used as a return channel. This service began in 2000, with 41,000, subscribers by year-end. In October 2002, the Canadian Radio-television and Telecommunications Commission (CRTC) issued the results of an investigation into interactive television. These services were divided into three categories—enhanced programming, non-traditional stand-alone, and Internet-over-TV services. A central question, whether interactive television services are considered broadcasting and, therefore, subject to broadcasting content and other rules, remained unresolved. The CRTC suggested a final definition of interactive television services largely hinged on what was considered ''program-related'' content, and, therefore, possibly considered ''broadcasting.''

Video-on-demand. In all four countries, this service does not seem to have emerged beyond testing or, in the case of Canada, licensing procedures (CRTC, 1997, 2000b). In Korea, there is a popular service known as ''Internet video-on-demand,'' which is described under ''webcasting.''

Webcasting. Of all four countries, Korea seems to have the most active webcasting industry. There are about 1000 webcasting stations, mostly providing music, and about 30 Internet movie companies, which purchase movie rights and stream them over the Internet. The policy debates provoked by webcasting's potential are varied. In Canada, the active debate concerns whether or not to regulate broadcast-like services delivered over the Internet. The regulator's 1999 New Media policy concluded that regulation of Internet, and implicitly services such as webcasting, did not need to be regulated. In 2001, the House of Commons Standing Committee on Canadian Heritage started a review of the Canadian Broadcast Act in light of international technological developments (Canada, 2001a, b). In the Netherlands the Media Authority has stated that Internet services, including webcasting, do not fall under the Media Act as it is currently worded. However, it believes some radio and television programs broadcast over the Internet, like those for radio and television, should be regulated in the public interest, recognizing the practical difficulties this might entail. Further, the Media Authority does have some jurisdiction over the Internet activities of public service broadcasters, as their commercial activities in general face some restrictions. The Korean Broadcast Act gives the Korean Broadcast Commission authority over the webcasting activities of traditional broadcasters, but not over the webcasts of other companies. In 2001, the KBC gathered volunteers to rate the webcasts of traditional broadcasters, but stopped in the face of strong public outcry against it. Nevertheless, the KBC now have four staff who review the webcasting of broadcasters. As of early 2003, these webcasts consist only of programs the broadcasters are airing on conventional television and radio, and no major difficulties have arisen. There is a debate in Korea over whether telecommunications and broadcasting regulatory authorities should be unified in one organization. In Sweden, webcasting is treated as cable broadcasting.

2.3. Internet services

In all four countries, Internet service is widely available (Fig. 7).

Furthermore, there are a variety of technologies used to offer broadband service. In each instance, regulators' reports indicate that competition among different transmission technologies for broadband has been important to spurring deployment.
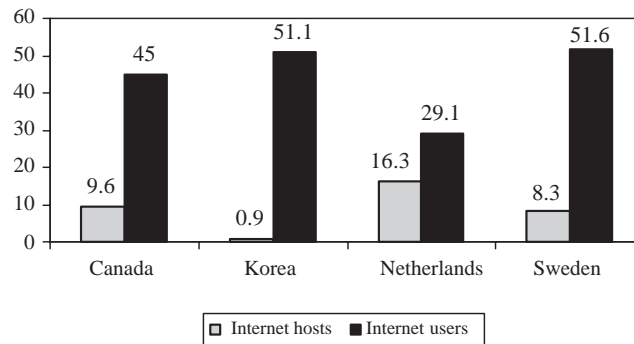
Fig. 7. Internet hosts and users per 100 people, 2001. Source: ITU.

In Canada, competition between cable companies and telephone companies was a key driver of broadband Internet access growth. Cable companies began offering in certain regions commercial cable modem services in November 1996. The first telephone company began offering DSL service in one province at about the same time. At the end of 2000, 69% households had DSL service available to them, and about 60% of households have access to cable modem services.

In Korea, competition among high-speed Internet service providers spurred its rapid development of broadband services. About 12% of the population subscribe to high-speed Internet services, which MIC defines as speeds greater than 1 mbps. There are five major types of networks deployed: aDSL with 55% of the total broadband subscribership, cable television networks with 32%, apartment local area networks (LAN) and wireless local loop with 13%, and satellite with 0.3%. As of August 2001, these services were offered at rates between US$19–34 a month, including satellite services for remote rural communities at US$23 a month. Also, in Korea, wireless Internet service, which began in 1999, is very popular. By December 2000, wireless Internet service had 15 million subscribers. There are about 300 content providers associated with wireless Internet, most of whom also provide content for wired Internet services.

KPN dominates the Internet access market in the Netherlands with 95% of subscribers, the remaining 7% subscribe through cable companies. Nine percent of all households have broadband service, of which 83% subscribe through cable companies and the remaining 17% subscribe to aDSL. Beginning in November 1999, cable companies experienced strong demand for Internet access. VECAI, the largest Dutch cable association, reports that this is because cable modem access to the Internet is cheaper for many users than dial-up Internet access.

In Sweden, PTS (2000a, b) reports that as of mid-2000, 4% of households have broadband Internet access. 38% of these have access by cable networks, 13% by xDSL service, and 49% by other fixed access. A significant portion of "other fixed access," is Ethernet LAN in property networks, such as apartment buildings. For cable access, the typical speed is 512 kbps, for property networks at least 2 mbps. For aDSL the service ranges from 128 to 512 kbps. A February 2002 media report indicates that Telia has found upstream and downstream traffic approximately equal on its DSL lines, perhaps because of the growing popularity of peer-to-peer activities, voice over IP applications, or the sharing of MP3 files (Fig. 8) (Pechy, 2002).
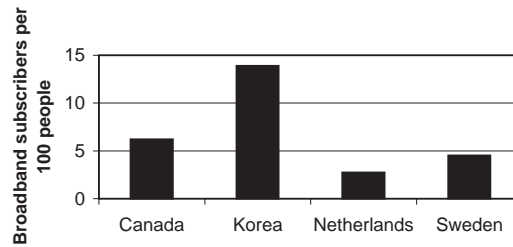
Fig. 8. Broadband subscribers per 100 people. Sources: General, OECD (2001b), Canada, OECD (2001b); Korea, Ministry of Information and Communications (2001a, b); Sweden and Netherlands, OECD (2001b).

3. Policy and regulatory issues: government authority, ownership, network access, and content

3.1. Organization of government authority

In Canada, Korea, Netherlands, and Sweden, government institutions for telecommunications, broadcasting, and Internet policy and rules are organized in a variety of ways. In all cases, there is some kind of distinction between the authorities for telecommunications and the authorities for broadcasting. Responsibility for the Internet tends to fall to the telecommunications authority, although there is some variation here.

In Canada, the federal Department of Industry is responsible for telecommunications; the Minister of Canadian Heritage is responsible for broadcasting. The regulator for both areas is the Canadian Radio-television and Telecommunications Commission (CRTC), an independent federal agency. In Canada, the House of Commons is reviewing the Broadcast Law.

In Korea, the Ministry of Information and Communication (MIC) is responsible for regulating and planning of telecommunication, information, and multimedia industries. Korea's new Broadcasting Act went into effect in 2000 and established the Korean Broadcasting Commission (KBC), licenses operators and regulates program content. It has authority over broadcasters' use of the Internet, but not over the Internet more broadly. As a result, in conversations with the author, both staff in the Korean Broadcast Commission and citizens groups both believe some change and clarification of the KBC's mandate is needed, even though the Korean Broadcast Law went into effect only in 2000.[6]

In the Netherlands, the Independent Post and Telecommunications Authority (Onafhankelijke Post en Telecommunicatie Autoritei or OPTA) (Netherlands, OPTA, 2000) is responsible competition policy in telecommunications. In addition, since 1998, OPTA is responsible for settling access disputes between program providers and cable operators. Established in 1998, the Commissariat voor de Media's (Media Authority) primary task is the supervision of public broadcasters, private broadcasters, and cable network operators, with primary attention paid to their compliance with advertising and sponsorship rules.

The Swedish National Post and Telecom Agency (Postoch Telestyrelsen or PTS) grants licenses for telecommunications operators, radio transmitters, and allocates radio frequencies. The Ministry of Culture issues licenses for national television and radio services in accordance with its

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[6]Interview with Su-Jung Kim, Administration Bureau, KBC (2001b) October 30. Remark by Kim Joo-Eun (2001).

objectives to support diversity, quality and freedom of expression, and guarantee the independence of the mass media. For cable and satellite networks, no license is required. The Broadcasting Commission reviews and monitors radio and television programs, *after* they have been broadcast, for compliance with advertisement and sponsoring rules and hears complaints from viewers. The Radio and Television Authority issues licenses for local radio broadcasting and appoints non-commercial local cable television stations and determines must carry rules (Swedish Radio and Television Authority, 2001).

3.2. Ownership issues

Government ownership of companies varies in these four countries. In Canada, all major telecommunications operators are privately owned. Among the largest broadcasters are government-owned broadcasters Canadian Broadcast Corporation (CBC) and Societe Radio-Canada (SRC). In Korea, the privatization of incumbent telecommunications operator Korea Telecom began in 1993 and concluded in 2002. Korea Telecom also had owned one of the two largest cable network operators, but sold its interest to other cable service providers. The owner of the other large cable network is Powercomm, a government-owned company which operates the communications network for KEPCO, the Korean Electric Power Corporation. Two of the three major television channels are owned by the government; Korean Broadcasting Service is supported from government funds and Munhwa is supported by advertising and program sales. In Netherlands, the incumbent telecommunications operator KPN is 35% owned by the government. On the broadcasting side, all three Dutch terrestrial television channels are operated by NOS (Nederlandse Omroep Stichting or the Dutch Broadcasting Association), an umbrella organization for public broadcasters through which several public broadcasters provide a variety of content. In Sweden, incumbent telecommunications operator TeliaSonera is 46% owned by the Swedish government and 19% owned by the Finnish state. TeliaSonera also owns one of the largest cable companies in Sweden. There is a government owned public broadcaster SVT (Sveriges Television) which produces two major channels SVT1 and SVT2, and several digital-only channels. Furthermore, the transmission operations for Swedish terrestrial broadcasting is operated by Teracom, a state-owned company, on behalf of public and privately owned broadcasters.

With regard to foreign ownership, media ownership limits, and cross-media restrictions on telecommunications and broadcasting networks, again there are a variety of approaches. In Canada, there are significant foreign ownership restrictions in telecommunications and broadcasting. Foreign ownership in facilities based telecommunications carriers is limited to 20%. Foreign investment in Canadian broadcasting in non-voting interest faces no limits, but in voting interest is limited to 20% of the licensee or 33% of the parent or holding company. Furthermore, control in fact must be retained by Canadians, for both telecom and broadcasting companies. In Canada cross-media ownership is evaluated on a case-by-case basis. In Korea, there are both foreign investment and cross-media restrictions in telecommunications and broadcasting. Cable service operators, satellite operators, and program providers, foreign investment is limited to 33%. For cable network providers, those who own the physical infrastructure, foreign ownership up to 49% is permitted. No foreign ownership is permitted for terrestrial broadcasters or producers of general programming channels or news programming. In the Netherlands, while

there is no explicit rule prohibiting foreign ownership, all terrestrial broadcasting is undertaken by "public broadcasters." In order for an organization to receive a "public broadcaster" license, it must have at least 60,000 members in the Netherlands. Broadcasting: Regulatory Issues. Netherlands, (OECD, 1999a). Public broadcasters receive government funding. There are no such restrictions on cable or satellite television. In Sweden, there are no foreign ownership, media concentration, or cross-media ownership restrictions.

3.3. Network access issues

While there is no consistent approach toward the various types network access in these four countries, it is the case that in every market there was some opportunity for new competitors to use an incumbent's network to access subscribers. It varies whether that incumbent was a telecommunications operator or a cable television operator.

Access to telecommunications infrastructure—unbundling local loop. In telecommunications, the regulatory objective of all four countries is to create an environment that allows for effective competition. In general, they all have well-established interconnection regimes. Specifically, with regard to unbundling of the telephone local loop, Canada's rules have been in effect since 1998, the Dutch rules since 2000, the Swedish rules since January 2001, and the Korean rules in 2002. While broadband deployment is still in its early days today, the Swedish and Korean case suggest that having unbundling local loop policies are not necessarily a prerequisite to rapid deployment.

Access to cable networks. Of the four markets, three have rules which allow competitors to have access to cable networks—Canada, Korea, and the Netherlands. The Canadian Convergence Policy, dating from August 1996, aimed to foster competition among all communications service providers through interconnection and interoperability policies, clearing the way for cable and telephone companies to compete with each other. On September 14, 1999, the CRTC issued a direction requiring incumbent cable carriers providing higher speed Internet retail services to make these services available for resale within 90 days of the date of this decision at a 25% discount from the lowest retail Internet service rate charged by the cable carrier to a cable customer in its service area. In 2000, the CRTC established tariffs for "large cable companies' higher speed access" for Internet service. These disputes remain unresolved as of early 2003 and the CRTC proceedings remain open. The same committee, the "CRTC Interconnection Steering Committee," which holds discussions for telecommunications, also handles cable access. In the meantime, at least one cable company, Persona, which services about 350,000 households in 1200 communities, in 2000 was the first Canadian cable system to offer Internet service using a third-party competitive access business model. Persona's reports state that this model eliminates the administrative cost of offering Internet service, while allowing it to leverage its existing network (Canada Industry Canada, 2003; Regional Cable Systems, 2001).

In the Netherlands, regulator OPTA has worked to prevent cable operators from entering into exclusive arrangements with one Internet service provider. They are required to open their networks to other Internet service providers. As of early 2003, ISP's and cable operators were still in discussion over access terms. In Korea, when cable television operations began in 1995, the government kept separate the ownership, operation, and programming provision functions. State-owned companies Korea Telecom and Powercomm owned the cable television infrastructure, but were not permitted to provide services over the network. Other companies, not permitted to own

the underlying infrastructure, provided video and, later on, Internet services, over the cable network. The earliest providers of broadband service in Korea—Thrunet and Hanaro- leased cable network from Powercomm. Subsequently, the structural separation rules were relaxed and Korea Telecom's cable network was sold to cable service providers (Lee, Korea Information Society Development Institute, (KISDI), 2002).

Access to Internet infrastructure. In 2001, Swedish regulator PTS (2001a, b) identified possible concerns including conditions of Internet interconnection, referring to peering and transit; insufficient capacity for national Internet exchanges; and shortage of dark fiber in city networks. Also, PTS expressed concern that real estate owners who enter into long term contracts with cable television operators or broadband operators who finance new apartment blocks on condition of exclusive rights to offer content services may be harming competition. PTS stated it would continue to monitor developments and encourage consumer education on the issue.

Access to terrestrial television infrastructure. In Canada and Korea, there are privately owned terrestrial television stations. In the Netherlands, NOS the public broadcaster, is responsible for all terrestrial television broadcast in the country. In Sweden, state-owned distributor, Teracom, a Ministry of Culture-affiliated corporation, is responsible for distributing pictures, sound, text and data via radio spectrum. Public service broadcast channels SVT1, SVT1; and "commercial" public service channel TV4 are required to broadcast over Teracom's network. Several commercial Swedish channels are beamed in from the United Kingdom and, formally, are not licensed in Sweden.

Programming access to video networks. It is common among all four markets to require cable and satellite television operators to carry terrestrial and other channels, usually known as "must-carry" requirements.

All Canadian cable television systems must provide a standard package with a number of mandatory ("priority") Canadian programming services, including the CBC English and French network services, local and regional stations and educational services. In addition, cable operators with more than 6000 subscribers must generally distribute all Canadian specialty and pay television services appropriate for their markets, such as those in the predominant official language of that market. Satellite broadcasters are also required to provide a basic package of Canadian programming and carry all Canadian specialty and pay television services appropriate for their markets. Furthermore, foreign satellite services can be offered only if packaged with Canadian specialty or pay television services.

In Korea, cable operators and satellite television operators must carry two public broadcasting channels, KBS and its educational channel EBS. Satellite operators are prohibited from carrying SBS, the private commercial broadcaster, thus protecting the network of local terrestrial broadcasting stations that only broadcast SBS programs.

Must carry rules in Netherlands are linked to the history of cable television, which began in that market in 1971. In the beginning, networks were owned by communities and public service organizations. In the late 1990s, government liberalization policies allowed private companies to own cable networks and, later on, to provide services over these networks. According to the Media Act, cable operators' must carry requirements include 15 channels, seven designated nationally and eight designated by local program councils. While cable networks in the Netherlands have been consolidated in recent years, the program councils remain organized according to localities. Different program councils will request different channels be included in

the basic must-carry package for their community.[7] In the Netherlands, cable operators are required to have a 15-channel must carry package. Seven channels are determined nationwide, the eight remaining channels are chosen at the request of community-based program councils. According to current rules, if cable operators digitize their networks, they cannot disrupt the provision of these 15 channels to customers who require analog signals (Netherlands OPTA, 2001).

In Sweden, cable operators are required to transmit local and national broadcast channels.

3.4. Content policy

All four countries have some rules and designated public authorities with mandates to promote national culture and identity in the media. Public broadcasting services are key tools of this policy objective. In addition, there are a variety of quotas for domestic programs and limits on foreign programs that are used for these objectives.

In Canada the Broadcasting Act requires public, private and community broadcasters to contribute to the creation and presentation of Canadian programming. To ensure that these goals are achieved, the Commission has established quantitative requirements, known as the ''MAPL'' (Music, Artist, Production, Lyrics) system. To qualify as Canadian content, a program is evaluated using criteria based on the producer and key creative personnel used, the amounts paid to Canadians for services provided to make the program and on post production, as well as amounts spent in Canada on lab processing. For example, private television licensees generally must achieve a yearly Canadian content level of at least 60% overall, measured over the broadcast day, and 50% between 6 p.m. and midnight. As the national broadcaster, the CBC must ensure that at least 60% of its program schedule consists of Canadian productions (CRTC, 1999b). On December 17, 1999, CRTC issued an Exemption Order for New Media Broadcasting Undertakings, which found that all ''new media'' undertakings, defined as ''those undertakings that provide broadcasting services delivered and accessed over the Internet,'' are exempted from regulation in Canada and are not subject to licensing by the CRTC, because there CRTC believes there is ample Canadian new media content (Canada, 1996, 1999; CRTC, 1999a).

In Korea, the number of foreign broadcasting channels a provider offers cannot exceed one-tenth of total operating channels. Korean language subtitling of foreign channels is permitted, but Korean language dubbing is not. There are also requirements to produce independently produced programs (Table 1).

The Korea Broadcast Commission (2001a) has responsibility for protecting youth and has established rules for classifying programs, which appear on a television screen corner while the program airs. The KBC enforces regulations such as a 10-min per hour limit on television advertising and prohibitions on breaking programs with ads, (KBC, 2001c). The 2000 Broadcast Law also gives KBC the authority to regulate the Internet services of broadcasters, but not other companies' Internet services. The other Internet services are regulated by the Korean Communications Commission. It arranged to have 200 volunteers rate these webcasts by

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[7] Interview with Ad Van Loon, Manager, Legal and Regulator Affairs; and Prinsen Geerligs, VECAI (2001a, b). October 25.

Table 1
Annual requirement for domestically produced programs[a]

Type of content	Terrestrial broadcasters	Others
Overall time	80%	50%
Movies	25%	30%
Animation	42% or 45%	40%
Popular music	60%	60%

[a] Korean Broadcast Commission (2001a).

traditional broadcasters. There was negative public reaction to this activity, however, and now the KBC is re-considering how to handle its responsibilities regarding webcasting.

Dutch public and commercial broadcasting are carefully segregated. All three Dutch terrestrial television channels are operated by NOS (Nederlandse Omroep Stichting or the Dutch Broadcasting Association), an umbrella organization for public broadcasters through which several public broadcasters provide a variety of content. In order for an organization to receive a "public broadcaster" license, it must have at least 60,000 members in the Netherlands. Public broadcasters receive government funding and must produce programs that meet certain quotas of information and education, arts, minority programs, European and original Dutch and Frisian productions, and other kinds of programming. In contrast with public service broadcasters, Dutch commercial broadcasting faces few restrictions. For commercial broadcasters, the major content requirement is fulfillment of the European Commission rules of broadcasting at least 50% European content and 10% independent producer content.

In Sweden, for cable television service, half of the annual transmission time must be occupied by programs of European origin and at least 10% of the annual transmission time, or at least 10% of the programming budget must be related to programs of European origin and produced by independent producers. Cable network operators are required to carry one channel with programming time divided among the Sweden's 27 public organizations. Anyone can become a member of these public organizations, which offer access ordinary citizens access to the media.

4. Implications

While the convergence of broadcasting, telecommunications, and Internet, is still in its early stages and although the ranking of the countries in this study are shifting quickly, it is still useful to draw a few preliminary conclusions from this survey.

First, the mandate and authority of government organizations in the fields of telecommunications, broadcasting, and Internet, are in flux. In Canada, the implications of new technologies for broadcasting legislation are under discussion. In Netherlands, the Media Authority has expressed concern about Internet content, now beyond its reach (Netherlands Media Authority, 1999, 2000, 2003). In Korea, the Korea Broadcast Commission is stymied as to how to implement its responsibility for broadcasters' Internet content. Convergence is resulting in a re-definition of the relevant government authorities and their mandates.

Second, broadband has rattled network access rules and regulators are working toward resolving some of these issues. Local loop unbundling has been pursued in all four countries, although in Korea and Netherlands so recently as to not likely have had an effect on their international broadband ranking as reflected in this article. Three countries also have access requirements on cable networks. In Canada and the Netherlands these rules are in the early stages. In Korea, structural separation of infrastructure ownership and service provision allowed new entry into the broadband service market via the cable network. The development of technologies that allow more than video programming service to be offered over cable networks has resulted in a rise in regulatory and policy interest in cable networks which is not likely to subside soon.

Third, countries with significant content policies are beginning to see challenges—mostly in discussion of how to define content. As long as Internet content is *not* defined as broadcasting, content policies are evaded. However, for example, in Canada has had to be explicit in stating that "new media" services are not considered broadcasting. Its recent investigation of interactive television also reflected a discussion over these definitional issues. The other country with elaborate content rules is Korea, here the Broadcast Commission is unwilling at this time to impose its broadcast rules on the Internet. For the moment, these discussions focus on content evading the definition of "broadcasting" rather than expanding the reach of broadcast content rules.

Interestingly, while ownership—government, private, and foreign—is a significant policy issue for telecommunications and broadcasting, it is not yet a major center of debate as these services converge. The discussion of the various rules that apply reveal a considerable unevenness of approach, even within a single country. Korea's telecom companies are all private, but there are two government-owned broadcasters. The same is true for Canada. Sweden is the most consistent, with the government holding large shares in the major telecom company and running the public broadcaster. This appears to be an issue left for the future, although a pre-cursor debate may be the role and importance of the government-funded public broadcaster. Given the important role public broadcaster have as protectors of national culture and identity, resolution of their function in a converged services environment may need to be resolved first, before other issues of increased private and foreign ownership can be addressed fruitfully.

A survey of only four countries cannot hope to be the basis for identifying all the issues that stem from the convergence of telecommunications, broadcasting, and the Internet. Furthermore, international rankings of lead markets no doubt will change. There is ample opportunity for future work on the implications of the various policy choices taken both on the regulation of communications infrastructure and the applications and programming that travel across them.

challenges facing them. While any errors in this article are my own, I appreciate the multitude of advice and insight that they shared with me.

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