PERGAMON

Telecommunications Policy 25 (2001) 349–371

TELECOMMUNICATIONS POLICY

www.elsevier.com/locate/telpol

Developing the Internet: entrepreneurship and public policy in Ireland, Singapore, Argentina, and Spain

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Abstract

The Internet has not developed uniformly throughout the world. Data on 141 countries indicate that, after controlling for per capita income and installed telephone lines, cross-national differences in the numbers of Internet users and hosts have to do with favorable conditions for entrepreneurship and investment. We find little evidence that competition and privatization of telecommunications services matters. After examining international patterns of development for the world as a whole, differences between two matched pairs of countries are systematically compared: Ireland and Singapore, and Argentina and Spain. Patterns of entrepreneurship and public policy in each country are shown to have differed systematically, with distinctive consequences for the development of the Internet.

Keywords: Worldwide development of the Internet; Entrepreneurship; Privatization

1. Introduction

The Internet has not developed throughout the world in a uniform way. How many users and how many hosts are connected to the Internet are the two most widely used indicators of development of this emerging medium (ITU, 2000). For instance, the percentage of the population which is a regular user ranges from over 50% in Scandinavia to less than 1% in many underdeveloped African, Central American, and South Asian countries. The number of hosts, i.e. computers linked to the Internet, is also uneven, ranging from more than one for every 10 people to less than one for every 10,000 (ITU, 2000).

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0308-5961/01/$ - see front matter
PII: S0308-5961(01)00009-X

Previous research on the most advanced countries has established that differences in Internet development across countries are accounted for by per capita income, and by the existing infrastructure and competition in the telecommunications sector (Hargittai, 1999; Mosaic Group, 1998; Oxley & Yeung, 2000). One implication of these studies is that public policies that promote competition in telecommunications would reduce prices for access and use, and hence facilitate Internet development. Yet, the stereotypical image of the Internet is one of entrepreneurs putting together a new business venture to provide services such as Internet access, information, e-commerce, or chats. Research from economic and political perspectives suggests that predictable conditions for entrepreneurship, and democracy are likely to promote investment growth (Henisz, 2000; Henisz & Zelner, 2001; Lindblom, 1977; North, 1990; Shepsle, 1986; Suárez, 2000; Weingast, 1993, 1995). Investment in Internet activities, in turn, would contribute to an increase in the numbers of users and hosts.

In this paper we assess the effects of public policies in telecommunications and conditions for entrepreneurship first by looking at country-level data for the world as a whole, and then by examining in-depth the experiences of two matched pairs of countries, Ireland and Singapore, and Argentina and Spain. In combining large-sample statistical research with detailed case analysis we strive to understand cross-national differences in Internet development in terms of both the main trends in the world, and the specific effects of public policy and predictable conditions for entrepreneurship in concrete countries. Let us first formulate in conceptual terms the supposed benefits of public policies promoting competition and privatization in telecommunications, and of predictable conditions for entrepreneurship and investment.

1.1. Public policy in telecommunications

The growth of the Internet is certainly facilitated by the existence of a developed and well-functioning telecommunications sector offering affordable services to a majority of the population. Until 1980, growth rates and prices in the telecommunication industry remained relatively stable and, save for a few highly developed countries, most people did not use telecommunication services frequently. Basically, people could afford telephone services, for example, when their incomes grew as a result of industrialization. During the 1980s and 1990s privatization and competitive deregulation have changed this relatively stagnant situation. As a result, the use of telecommunications services has grown rapidly. Previous research has established that privatization and competition tend to enhance the operating and financial performance of public utilities in general (D'Souza & Megginson, 1999a; Megginson & Netter, 1999). The evidence on the telecommunications sector during the 1980s and 1990s seems to be overwhelming. In a study of 26 privatized telecommunications firms in 21 countries, D'Souza and Megginson (1999b) found that profitability, output, efficiency, capital expenditure, lines in service, and average salary per employee all increased after privatization. (Net employment remained roughly the same.) Furthermore, the reasons for such increases were not higher prices but efficiency gains, which were further enhanced if competition and deregulation accompanied privatization (see also Levy & Spiller, 1994; Gutiérrez & Berg, 2000).

According to the International Telecommunication Union (ITU, 2000), 19 countries have fully privatized their formerly state-owned telecommunications operators, and 74 others have privatized partially. (Ninety countries still have state-owned operators.) Governments have also

deregulated the various telecommunications services, forcing companies to compete with each other. In particular, privatization and competition in local telephone service are very important for the development of the Internet because most people still access it through a dialup connection. There are 44 countries in the world with full competition in local service, 19 duopolies, and 120 monopolies. It is important to note, however, that not all governments that privatize also deregulate and introduce competition. Only 33 countries have both privatized (at least partially) and introduced full competition in local services, while 52 privatized but kept a monopoly in place, and 8 privatized and allowed a second company to operate (duopoly). According to ITU (2000) a mere 10 countries have both fully privatized and deregulated.

The conventional economic wisdom suggests that enhanced competition and private ownership encourages investment and drives prices down, making use of a good or service more widespread. Therefore, cross-national differences in public policies promoting privatization and competition in telecommunications services are expected to affect the use of such services in general, and of the Internet in particular.

1.2. Predictable conditions for entrepreneurship and investment

As a new industry, however, the development of the Internet has also been shaped by the activities of private entrepreneurs and investors. Entrepreneurial activities and investments are key to Internet development because without the creation of new ventures offering connectivity, transmission, information, financial, and commercial services over the Internet, people and businesses would not find it attractive and possible to use the new medium. In fact, in some countries private entrepreneurs and investors have created the bulk of the Internet infrastructure and founded the most important ISPs, portals, and related services.

The role and stature of entrepreneurs and investors, however, varies from country to country. Research in political science (Lindblom, 1977; Shepsle, 1986; Suárez, 2000) and in institutional economics (North, 1990; Weingast, 1993, 1995) has argued and demonstrated that entrepreneurs have incentives to invest when the conditions for doing business in a country are predictable, that is, when the government can make a "credible commitment" to a set of policies, rules, and institutions that can be taken for granted. Case studies have indicated that the government's credible commitment to a predictable set of rules for investment and entrepreneurship facilitates Internet development (Press et al., 1998; Mosaic Group, 1998).

Henisz (2000) proposes that conditions for investing and doing business are predictable to the extent that political actors and policymakers are constrained by one another because of their preferences and the institutional characteristics of the political system, including veto points, and other similar constraints on policy change. Using data for 147 countries during the 1960–1994 period, Henisz and Zelner (2001) found that growth in the telecommunications infrastructure is faster for countries with predictable policymaking structures because they encourage entrepreneurial activities and investment. Similarly, predictable policymaking structures would enhance entrepreneurial activity and investment in the Internet, thus increasing access and use.

Previous research has also established a link between the democratic form of government and policy predictability. In fact, democracies tend in general to be much more predictable in terms of their policymaking than other types of political regimes (Henisz, 2000). There are exceptions to this, to be sure. For instance, some totalitarian (e.g. China) or authoritarian (Chile) regimes have

in the past offered remarkably stable policymaking environments in which investors, especially foreign ones, have thrived. Conversely, some democracies, especially young ones, have proved unstable. It is interesting to note as well that previous research has demonstrated that democracy tends to promote the growth of communication media in which the user has discretion. For example, Buchner (1988) found that in democratic countries the telephone diffused more rapidly and to a greater extent than television; the assumption being that the telephone allows for more user autonomy and discretion, while television is a centralized medium. Thus, democracy may have two positive effects on Internet development. First, democracy encourages the growth of media in which the user has discretion, the Internet being similar to the telephone in this respect. Second, democracy generally provides for a stable and predictable institutional framework that fosters entrepreneurial activity and investment.

2. Worldwide development: data and results

We measure Internet development in two ways: the number of (regular) Internet users as a percentage of the population, and the number of hosts per 10,000 population (ITU, 2000). We control for the levels of economic and infrastructural development with, respectively, GDP per capita (adjusted for purchasing power parities), and the number of main telephone lines per capita (World Bank, 2000). These continuous measures are logged in order to normalize their distribution. We measure the level of competition in telecommunications with two dummy variables that represent choices every government must make. The first equals one for countries whose incumbent local telephone operator is fully privatized, and zero otherwise. The second equals one for countries whose incumbent local telephone operator is partially privatized, and zero otherwise (ITU, 2000). We also measure the level of competition in local telephone service with a set of two dummies. The first equals one for countries in which a monopoly exists, and zero otherwise. The second equals one for countries in which a duopoly exists, and zero otherwise (ITU, 2000). We chose local telephone service to measure levels of privatization and competition because most people access the Internet through a dialup connection.

We measure conditions for entrepreneurship and investment in two ways. We use Henisz's (2000) index of political constraints, which proxies the degree to which a country's political institutions and the preferences of elected and appointed officials constrain any one political actor from introducing a sudden change in government policy. This measure approximates the credibility of the existing policy regime, thus giving an indication of to what extent entrepreneurs and investors can take business conditions for granted and expect no change. Therefore, the index measures the extent to which there is predictability in policymaking. The index was calculated by Henisz (2000) using spatial modeling techniques and ranges between zero (no constraints) and one (maximum constraints). Given that democratic countries tend to impose more constraints, and also to facilitate the development of communication media in which the user has discretion and autonomy, we also use the 10-point democracy score developed by Gurr and Jaggers (2000).

We also include two additional dummy control variables to take into account levels of proficiency in the English language, which may facilitate Internet use (Hargittai, 1999). The first variable identifies countries in which English is an official language or is the most widely spoken language (Crystal, 1995, p. 109; Ethnologue, 2000). The second identifies the Scandinavian

countries, in which an unusually large percentage of the population knows English as a second language. Table 1 shows the variable definitions, sample statistics, and correlation matrix.

Table 2 presents the results of regressing Internet users and Internet hosts on the independent variables. We present results for two different samples. First, we report results for 141 countries (model A), which do not include Henisz's index of predictable policymaking and Gurr and Jaggers's index of democracy because these measures are only available for 112 countries. These two measures are very highly correlated with each other (+0.85), so we enter them separately in models B and C, respectively. It is important to point out that the models explain almost 90% of the variance in the proportion of users, and nearly 75% of the variance in the proportion of hosts. Thus, our explanatory variables capture most of the differences in Internet users and hosts across countries.

Model A provides only weak evidence for the importance of public policies in telecommunications. Controlling for GDP per capita, the number of telephone lines, and English language proficiency, partial privatization significantly increases Internet use, but not the number of hosts. Monopolistic local phone markets significantly reduce the number of hosts but not of users. (Excluding telephone lines from the regression analysis does not alter this pattern of results.) As would be expected, GDP per capita and English language proficiency increase Internet use, though not hosts. The level of the existing telephone infrastructure increases both use and hosts.

Model B reports results adding Henisz's index of predictable policymaking, an indicator of the extent to which conditions for doing business are unlikely to change without warning. This variable significantly increases the number of Internet users and of hosts. The competition and privatization variables lose significance. The democracy index also significantly increases the numbers of both users and hosts (see Model C). Overall, the empirical results reported in Table 2 provide evidence that, controlling for per capita income, telephone lines, and English proficiency, Internet development is enhanced by predictable policymaking and democracy.

Competition and privatization, however, do not seem to exert systematically significant effects. This result should not be too surprising given that not all countries that have privatized and/or deregulated telecommunications have attained high levels of Internet development, and vice versa. For instance, of the 10 countries that have fully privatized *and* deregulated local telephone calls, five are rich countries with high numbers of Internet users and hosts (Canada, Denmark, New Zealand, the UK, and the US), and five are poor countries with low numbers (Chile, Guatemala, Mexico, the Philippines, and Somalia). Once one controls for GDP per capita, the number of telephone lines, and conditions for entrepreneurship and investment, the effects of privatization and competition tend to disappear.

An interesting result of our regression results is that GDP per capita, a proxy for purchasing power, is highly significant when it comes to explaining the number of Internet users. Moreover, the coefficient estimate is above unity (1.03 in Model A, and 1.09 in models B and C). This implies that a 1% increase in GDP per capita results in a 1.03–1.09% increase in the number of Internet users per capita. In economic terms, this means that, as of the end of 1999, the Internet was a "luxury" good, because the estimated "income elasticity" was greater than unity. Although the Internet may not be a luxury in the richest countries, it is still beyond the reach of the bulk of the world's population. In the next section we further pursue the impact of income per capita, competition, deregulation, and pricing on the numbers of Internet users and hosts with a more detailed study of four specific countries.

Table 1
Variable definitions, descriptive statistics, and correlations ($N = 112$)[a]

Variable	Mean	Std Dev.	1	2	3	4	5	6	7	8	9	10	11
1. Log Internet users (per 10,000 population)	4.55	2.34											
2. Log Internet hosts (per 10,000 population)	0.93	4.40	0.85										
3. Log GDP per capita (US$)	8.44	1.18	0.92	0.82									
4. Log telephone main lines (per 1000 population)	4.28	1.81	0.90	0.82	0.95								
5. Local telephone service fully privatized = 1	0.11	0.31	0.27	0.28	0.27	0.23							
6. Local telephone service privatized in part = 1	0.39	0.49	0.26	0.20	0.29	0.24	−0.28						
7. Monopoly in local telephone service = 1	0.54	0.50	−0.33	−0.33	−0.33	−0.27	−0.26	−0.15					
8. Duopoly in local telephone service = 1	0.12	0.32	−0.07	−0.07	−0.08	−0.07	0.05	−0.12	−0.40				
9. Predictable policymaking index (0–1)	0.46	0.34	0.64	0.59	0.59	0.55	0.33	0.17	−0.23	−0.04			
10. Democracy index (0–10)	5.77	3.96	0.63	0.57	0.56	0.52	0.28	0.17	−0.30	−0.04	0.85		
11. English language country = 1	0.17	0.38	0.08	0.05	−0.03	−0.06	0.23	−0.02	−0.26	0.13	0.14	0.09	
12. Scandinavian country = 1	0.04	0.21	0.35	0.28	0.30	0.26	0.06	−0.08	−0.15	−0.08	0.19	0.23	−0.10

[a] Sources: ITU (2000) and World Bank (2000).

Table 2
Robust regressions of worldwide Internet development[a]

Independent variables (expected sign)	Dependent variable					
	Model A		Model B		Model C	
	Users	Hosts	Users	Hosts	Users	Hosts
GDP per capita (+)	1.03***	0.78	1.09***	0.75	1.09***	0.75
	5.52	1.21	4.78	0.89	4.74	0.89
Telephone lines (+)	0.45***	1.26***	0.36**	1.27**	0.37**	1.28**
	3.90	2.69	2.45	2.08	2.51	2.11
Full privatization (+)	0.27	0.42	−0.12	0.27	−0.07	0.38
	1.20	0.63	−0.51	0.49	−0.31	0.73
Partial privatization (+)	0.37**	0.43	0.08	−0.20	0.10	−0.16
	2.14	0.82	0.38	−0.34	0.48	−0.29
Monopoly (−)	0.01	−0.86*	−0.04	−0.78	0.06	−0.59
	0.03	−1.90	−0.19	−1.54	0.29	−1.25
Duopoly (−)	0.01	−0.58	−0.06	−0.67	−0.01	−0.58
	0.04	−0.95	−0.22	−0.91	−0.04	−0.78
Predictable policymaking (+)			0.90**	1.79*		
			2.52	1.72		
Democracy index (+)					0.08***	0.16**
					2.82	2.00
English language country (+)	0.63***	0.42	0.62***	0.56	0.68***	0.67
	3.90	0.77	3.19	0.83	3.48	0.34
Scandinavian country (+)	1.28***	1.55***	1.05***	0.98**	1.01***	0.89*
	5.56	3.26	5.41	2.12	5.42	1.93
Constant	−6.42***	−10.76***	−6.79***	−11.26***	−6.93***	−11.57**
	−5.302	−2.87	−4.82	−2.33	−4.90	−2.43
R^2	0.87	0.66	0.89	0.72	0.89	0.73
Model F	176.6***	48.4***	220.1***	39.0***	234.0***	42.0***
Number of observations	141	141	112	112	112	112

[a] Student's t shown beneath each regression coefficient.
*** $p<0.01$; ** $p<0.05$; * $p<0.10$.

3. A comparison of two matched pairs of countries

While a multivariate statistical analysis of Internet growth in 141 countries provides a useful overview of the impact of key variables, a more detailed comparative study of specific national cases helps further assess the roles of conditions for entrepreneurship and public policy. The following sections compare the growth of the Internet in two matched pairs of countries. We analyze two countries in which conditions for entrepreneurship are generally assumed to be relatively unfavorable (Argentina and Spain) with two in which the reverse is true (Ireland and Singapore). For example, the widely cited World Competitiveness Report, jointly sponsored by the World Economic Forum and IMD (see IMD, 2000), ranks Singapore and Ireland in second and seventh, respectively, out of 47 countries in terms of how "appealing the business

Table 3
Entrepreneurship and public policy in four countries

Business/entrepreneurship conditions	Telecommunications and Internet policies	
	Relatively liberal	Relatively interventionist
Relatively unfavorable	Argentina	Spain
Relatively favorable	Ireland	Singapore

environment'' is. By contrast, Spain and Argentina are ranked only 24th and 41st. Public policy towards the Internet has differed in a way orthogonal to business or entrepreneurial conditions. Argentina and Ireland have pursued relatively liberal policies for the telecommunications sector while Spain and Singapore remain relatively interventionist in that the state regulates many aspects of the industry by restricting competition and ownership. Thus, the four countries differ in the combination of conditions for entrepreneurship and telecommunications policies (see Table 3).

Of the four cases, Singapore has achieved the highest level of Internet development, even though it has lagged behind in terms of privatization, deregulation, and competition. As of the end of 1999 nearly 30% of the Singaporean population was an Internet user, compared to 12% in Ireland, 7% in Spain, and 2% in Argentina. The same rank ordering was true for hosts, online advertising, and the Information Society Index, which is a composite measure. Ireland, however, led in terms of international Internet bandwidth, firms listed on the Nasdaq, and e-commerce spending per user (see Table 4). We first examine Internet development in Singapore and Ireland, and then turn to Spain and Argentina.

3.1. Singapore: relatively interventionist with favorable conditions for entrepreneurship

Perhaps no other country has pursued Internet development policies more aggressively than Singapore. A city-state of 3.2 million people, Singapore stands out not only as one of the most developed information economies in the world but also as a country with an interventionist state casting a long shadow over the telecommunications and Internet industries. While the state's policies have been very effective at creating a high-quality infrastructure for e-business, Internet access and use by the citizenry is relatively expensive and tightly controlled. The government itself or government-linked corporations (GLCs)—which are less than wholly owned by the state and report to the Primer Minister's Coordinating Board or the Ministry of Finance—continue to exercise a firm grip over most Internet-related activities. Singapore has become a hub for Internet-related activities. Scores of foreign companies have based their Asian operations in Singapore, but local private entrepreneurs have found it difficult to succeed.

The first experiments with the Internet began in 1990 with NUSNET, affiliated with the National University of Singapore. In 1991 the university offered access services (Technet). It was not until 1994 that Singapore Telecom (SingNet)—the telecommunications monopoly—launched the truly first ISP in the country. Unlike in Argentina and Spain, the government tightly controlled the supply of ISP services by granting only a few licenses. In fact, until early 1996 only 5 ISPs were allowed to offer services: SingNet, Technet, Sunsite Singapore (National University of

Table 4
Internet development in Ireland, Singapore, Argentina, and Spain, compared to the United States, end of 1999[a]

	Ireland	Singapore	Argentina	Spain	USA
Total population (mn)[b]	3.7	3.1	36.1	39.0	270.3
Per capita income (international $ at PPPs)[b]	21,482	24,209	12,013	16,212	29,605
Telephone lines per 1000 pop[b]	434.66	562.00	202.73	413.72	661.31
Privatization local phone service	Partial	Partial	Full	Partial	Full
Competition in local services	Full	Full[c]	Monopoly[d]	Full[c]	Full
World Competitiveness Rank[e]	7th	2nd	41st	24th	1st
Internet users ($\times 10^3$)	444	950	900	2830	110,000
Internet users (% population)	11.98	29.46	2.46	7.18	39.82
Internet hosts ($\times 10^3$)	63,913	148,249	142,470	469,587	53,175,956
Internet hosts per 10,000 pop	172.50	459.72	38.95	119.12	1925.14
International Internet bandwidth (Mbps)[f]	239.0	497.3	147.3	618.0	—
Per million Internet users	538	523	164	218	—
Per million hosts	3739	3354	1034	1316	—
E-commerce spending ($mn)	68.0	83.8	40.0	123.5	61,090.0
E-commerce spending per user ($)	153	88	44	44	555
Internet advertising ($mn)	7.3	0.8	n.a.	24.7	n.a.
Internet advertising (% total)	1.20	0.10	n.a.	0.25	n.a.
Internet-related firms on Nasdaq	4	2	0	0	642
Information Society Index rank[g]	19th	11th	33rd	24th	2nd

[a] Sources: ITU (2000), World Bank (2000), IMD (2000); www.nasdaq.com, www.telegeography.com, http://www.idc.com.8080/ITOver/ISIRanking_tbl.htm.
[b] In 1998.
[c] There is a dominant operator in terms of market share.
[d] Territorial monopolies.
[e] Out of 47 countries.
[f] From the country's largest Internet hub, i.e. Dublin, Singapore, Buenos Aires, and Madrid.
[g] Out of 55 countries.

Singapore), Silkroute Ventures, and Accel Infotech. The latter two operated out of servers located in the United States. Competition among them did drive access prices down, especially after September 1995, when Technet was acquired by Sembawang, a GLC, and turned into Pacific Internet (PacNet). SingNet and PacNet are the two largest ISPs. The third largest, Cyberway (now owned by StarHub) started operations in March 1996. New licenses were given to DataOne, CWNS, and UUNET in 1999. Another GLC, Singapore Cable Vision (SCV), has the monopoly for cable TV and Internet access, a service it offers since January 2000. Given the strong grip on the residential market by the top three, however, new entrants are targeting business users (Blanning, 1999; ING Barings, 2000; Mesher & Zajac, 1997).

Internet traffic between local ISPs had to be routed via the United States until May 1996, when the three existing ISPs established a Singapore Internet backbone. While this development facilitated Internet development, some people saw in it a way for the government to better monitor the flow of information. In fact, Singapore is one of the countries in which citizens' daily use of the Internet is most tightly controlled by the government. Politically and socially undesirable content, as defined by the government, is forbidden. The use of proxy servers as a

censorship tool preventing access to forbidden sites has led to slower traffic of information (Hogan, 1999; Rodan, 1998). Citizens must show a national identify card in order to open an account with an ISP. Despite appearances, there is a great deal of resistance and discontent about censorship (Rodan, 1996; Hancock, 1999). The government has been more interested in creating an infrastructure to place Singapore at the heart of the Asian Internet and attract foreign companies than in allowing its citizens to use the Internet freely. Thus, in June 1998 SingTel, SCV, and various government agencies launched Singapore One, a national broadband network offering multiple services as well as connectivity with over 20 Asian cities and the United States (Tan & Subramaniam, 2000).

Although the government formally liberalized telecommunications in April 2000, the industry is dominated by a few firms with strong ties to the government (ING Barings, 2000). Singapore Telecom (SingTel) was created in 1992 when the government separated the operator and regulator roles, which it had monopolized for over a century. It then granted SingTel monopoly status until 2007. Singapore's keen interest in a successful completion of WTO negotiations, however, compelled the government to anticipate liberalization to 2000. In 1997 the government initiated the process of granting new telephony licenses (Ono & Aoki, 1998). A mobile license was granted to MobileOne, and both fixed and mobile licenses to StarHub (also a GLC). Broadband service was launched in 1998 by SingTel and SCV (also a GLC).

Conditions for entrepreneurship in Singapore have had paradoxical consequences. On the one hand, the country adopted the investor-friendly English common law (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998), keeps red tape to a bare minimum, and presents itself to the world as an excellent location for doing business. On the other hand, the government participates heavily in the economy, and has always been a key entrepreneur in telecommunications and the Internet. Observers of Singapore have long maintained that local entrepreneurs have a hard time, but that foreign firms thrive there. Factors such as risk aversion, the prohibition of using homes as offices (in a country where most apartments are developed by the government), and limited access to the local stock market have mitigated against local entrepreneurship (Wingrove, 1994; Asiamoney, 2000). Of the two Internet-related Singaporean firms listed on the Nasdaq, one is controlled by GLCs (PacNet), and the other started as a producer of PC audio systems and is now branching out into the Internet as a content and access provider (Creative Technology). Moreover, none of the 10 most visited websites were founded by entrepreneurs. Six are the local subsidiaries of foreign companies, and four are controlled by GLCs (Nielsen, 2000).

The government has not only limited the number of ISPs—and hence opportunities for entrepreneurship—but also controlled the top four because they are part of a GLC. SingNet is controlled by Singapore Telecom (which is still 80% government-owned). PacNet, Cyberway, and DataOne are controlled by a GLC (Sembawang, StarHub, and Singapore Press Holdings, respectively). Foreign telecoms have a minority presence in Cyberway (BT and NTT), CWNS (Cable & Wireless), and UUNET (MCI World Com). The three major Internet players (SingTel, PacNet, and Cyberway/StarHub) are not only access providers, they also dominate international connectivity, data transmission, mobile Internet (WAP), and network services. Although a variety of Internet services were liberalized between October 1998 and September 1999—including ISP, international Internet exchange services, and value-added network services—GLCs seem poised to continue their firm grip over the city-state's Internet.

The Singaporean government has pursued Internet development vigorously, and the state casts a long shadow. Privatization and deregulation have only been partial, a factor that has given an advantage to Hong Kong as an alternative Asian information hub (*Far Eastern Economic Review*, February 2, 2000, p. 49). In addition, the state has assumed the role of leading entrepreneur, even in areas of the Internet that are populated by start-up firms in most countries. The country's entrepreneurship conditions have favored the arrival of foreign firms, with local entrepreneurs lagging far behind. Still, Singapore is one of the most advanced information economies in the world, with a high number of users and hosts.

3.2. Ireland: relatively liberal with favorable conditions for entrepreneurship

By all accounts the Irish telecommunications market is very competitive and foreign firms are not discriminated against. Foreign investment has been welcomed in Ireland since the late 1950s when the government implemented an export-led economic policy based on the attraction of foreign capital. As a result of this policy shift, hundreds of multinationals have established operations on the island. During the 1990s, the country experienced unprecedented growth which has been the envy of other EU members plagued with high unemployment and low growth rates. In the period between 1994 and 1999, GDP grew at an annual average rate of 9% and the economy is approaching full employment (EIU, 1999). Not surprisingly, all political parties in Ireland support policies to attract foreign investment.

This level of economic growth has given the Irish a newfound confidence. The government is seeking to turn the country into the e-commerce hub of Europe, and an international Internet business center. With this in mind, the minority government of Fianna Fáil has taken a number of initiatives to promote the Internet. The telecommunications sector has been privatized and largely deregulated. The Information Society Commission, created in 1997, promotes greater personal and business use of the Internet. An investment in a state-of-the-art, high speed and high capacity global telecommunications network was announced in 1999. In an effort to make the country a more attractive location for startups, the government fast-tracked an e-commerce bill in early 2000 giving legal recognition to electronic signatures and legal standing to electronic documents (*Irish Times*, June 30, 2000). In addition, the Industrial Development Authority, the agency in charge of promoting foreign investment through some of the most attractive incentive packages in Europe, has added e-commerce to the list of businesses it targets (EIU, 1999)

As a result of these strategies the number of people using the Internet has grown rapidly in recent years. According to Amarach Consulting (2000), a Dublin-based market research firm, as of March 2000 there were 592,000 Internet users in Ireland, an increase of 33% from October 1999. In spite of this growth, Ireland's comparative standing has not changed much. Internet use was about 12% of the population at the end of 1999, behind most other European Union countries. There seem to be a number of obstacles that have prevented a more dramatic increase in the use of the Internet. Namely, the cost of local calls is still considered high partly because Ericom (the former state monopoly) has continued to control the local loop. Other obstacles include: low PC ownership, low credit card penetration, and a sales tax rate of 21%, higher than in most other EU countries (Reuters, 1999). By contrast, cable TV and mobile phone use are high, suggesting that there are perhaps other avenues for Internet growth.

Eircom (formerly Telecom Eireann) was established as a separate corporate entity in 1984. The company was the exclusive provider of telecommunications services until the process of liberalization of the Irish telecommunications market began in the early 1990s. Since 1994 competition has existed for international and long distance telephone calls, and since 1997 in mobile communication. In 1997 the government permitted other companies to build their own fiber optic cable networks rather than use the lines leased from Telecom Eireann. The telecommunications market was liberalized in 1998, 13 months ahead of schedule because the Minister for Public Enterprise was afraid that Telecom Eireann's monopoly could delay the development of the industry (*Irish Times*, December 1, 1998). Today there are about 30 licensed telecom operators in Ireland. Among the global players with an Irish presence are MCI/World Com, BT, Stentor Communications (now based in Northern Ireland), and Cable & Wireless. In 1999 Telecom Eireann was fully privatized in the largest equity offer in the country's history. The company then changed its name to Eircom.

Esat Clear (a division of Esat Telecom) is considered the only alternative to Eircom in the residential market. Esat Telecom was created in 1991 and from the beginning it lobbied the EU and Irish governments to hasten the tempo of deregulation. Until the infrastructure restriction was lifted in 1997, the company had built its network on cables leased from Telecom Eireann (Esat Telecom, 2000). To fund the construction of its own infrastructure Esat Telecom raised millions of dollars on the Nasdaq and Easdaq stock exchanges. The company owns the country's first commercial Internet provider, Ireland on Line, founded in 1992. In January 2000 Esat was bought by British Telecom; it is estimated that the takeover gives the latter "an approximate 60% share of the [Internet] market, reversing almost exactly Eircom's dominance a year ago" (NMAER, 2000).

Since 1994 the costs of telephone calls have gone down but are still considered high, and an important impediment to greater use of the Internet. Basically, the cost of international and national calls has gone down dramatically (though Ireland still ranks 15 out of 19 OECD countries in terms of national call prices (*Irish Times*, September 2, 2000)), but this has not been the case for the local loop, the link between Irish homes or small businesses and the national telecommunications infrastructure and, ultimately, the Internet. Despite the Irish telecommunications market being generally competitive, the local loop is still effectively controlled by Eircom. In 1999 the Office of the Director of Telecommunications Regulation (ODTR) took Eircom to court claiming that the company was abusing its dominant position in the local loop. Eircom challenged an order by ODTR to lower the prices the company charges its competitors for access to its infrastructure (*Irish Times*, December 20, 1999). Last June the government announced its decision to end Eircom's control of the local loop and in July the European Commission announced that all member countries should have plans for the complete liberalization of the local loop by the end of the year, a move that was expected to dramatically lower Internet access costs (*Irish Times*, June 30, 2000 and July 13, 2000). Still, while the Irish government has pushed its own scheme to liberalize the local loop, Eircom and its competitors have not been able to reach an agreement on how much should the former charge for accessing the local network (*Irish Times*, January 8, 2001).

In an effort to attract foreign e-commerce investment as well as retain the existing foreign investment in the country, the Irish government announced in 1999 a new submarine fiber-optic super highway called Global Crossing that will increase the country's international network

capacity to the US and 24 European cities. The Irish government then sold the initial capacity it purchased to telecommunication providers at a price slightly above wholesale. An important factor explaining the government's underwriting of the purchase of capacity on the Global Crossing network was Microsoft's decision in 1998 not to add to its investments in Ireland "because of the lack of competitively priced broadband connections with the Internet" (*Irish Times*, June 24, 2000). The Irish vowed not to let that happen again. Global Crossing attracted a private investment in another transatlantic project. After the Global Crossing deal was announced, Canada's Network 360 announced its own investment in a transatlantic cable project predicting that the demand for bandwidth would exceed what Global Crossing would provide (*Irish Times*, July 14, 2000).

In addition to deregulation and investments in infrastructure, private efforts to increase Internet use have included offers of free Internet service. In 1999 Gateway revolutionized the market by offering free access to Gateway.net (through UUNet, which is owned by MCI/WorldCom) for purchasers of Gateway computers. Oceanfree.net (a joint venture between BT and the Electricity Supply Board) also offered free access to all Internet users and signed more than 30,000 customers in the first three weeks (NMAER, 2000). Within months other companies such as Esat Telecom and Eircom also began to offer free access to the Internet. The experiment with free Internet was first tried in Britain where Dixons' (an electronics retailer) Freeserve Internet service became the country's biggest ISP. Eircom, however, does not let its competitors offer their customers a cheaper access number that allows for net call for about one third of the cost of a regular phone call. Therefore, while Internet use is charged at a lower rate than the cost of local calls, this is not always the case primarily because of Eircom's monopoly (*Irish Times*, June 10, 1999). In spite of this, Yahoo and MSN are the two most visited websites by Irish users, followed by Eircom, Microsoft, Esat, Alta Vista, Lycos, AOL, Ocean (controlled by BT), and Indigo, part of Eircom (Nielsen, 2000). Moreover, as explained earlier, it is expected that the government's decision to end Eircom's monopoly of the local loop will give a boost to the Internet.

Other impediments to the growth of the Internet include the large number of people who do not own a PC. To combat this problem Esat Clear gives out new free PCs along with an Internet connection for a fixed monthly fee. Due to their high penetration rates, some speculate that mobile telephony and digital TV will turn out to be the primary providers of Internet access in Ireland (NMAER, 2000). Mobile-phone penetration per 100 inhabitants (37%) is above the European average. However, only about 2% of adults use WAP enabled phones to access the net (Amarack Consulting, 2000). Ireland's cable TV network covers about 80% of homes.

The growth of e-commerce in Ireland is hampered by the low rate of credit card ownership (about 11%), which is lower than the EU average. And while it has been suggested that e-commerce revenues will mostly come from business-to-business transactions, Irish businesses have a long way to go (NMAER, 2000). A recent survey by researchers at the University of Ulster found that, contrary to expectations, only 8% of Irish businesses have an e-mail address and only 4% have a website. Still, according to the Irish Internet Association, 62% of Internet users have bought on line in the past year (*Irish Times*, June 21, 2000).

Unlike in Spain and Singapore, Irish Internet policy has not privileged local firms. Yet, Ireland has produced more internationally successful Internet startups. Its entrepreneurial freedoms have been important factors. Among the most prominent examples are: IONA technologies, a designer of "interoperating" systems; Riverdeep Group and SmartForce, which offer e-learning solutions;

Trintech Group, a developer of secure transaction systems for e-commerce; and e-First, an electronic bank. The first four of these firms are listed on the Nasdaq.

The Irish Internet has grown quickly thanks to deregulation and a set of institutional structures that foster innovation and entrepreneurship. The country realized soon that its domestic market is not large enough to sustain growth without attracting foreign firms to do business there. While the ultimate success of the policy of turning Ireland into an Internet hub remains to be seen, the country seems to have adopted a set of policies that make sense as a long-term strategy.

3.3. Spain: relatively interventionist with unfavorable conditions for entrepreneurship

Internet development in Spain is lower than its per capita income would suggest. Although the government has embraced the goal of universal access for the general population and for small firms, telecommunications policies and regulations have either purposefully or unintentionally benefited the dominant telecommunications operator (Telefónica), which is partially privatized. Entrepreneurs have played a very limited role. Currently, no Spanish Internet company is listed on the Nasdaq. In addition to Telefónica, the large domestic banking, multimedia, and energy groups have become key Internet players.

The first full-fledged Spanish connection to the Internet was made in 1990 by the research-oriented RedIRIS, although the first commercial ISP did not appear until 1992 (Goya). Internet development languished during the early 1990s due to low PC ownership, expensive telephone rates, and scarcity of Spanish-language content. A couple dozen ISPs were offering connectivity services by the end of 1995 to fewer than 250,000 regular Internet users (0.7% of the adult population). Faced by the underdevelopment of an industry identified as critical to the country's social and economic well being, the government of the then flagging Socialist Party (PSOE) moved in early 1996 to require the state-owned telephone monopoly company to set up Infovía, a network parallel to the Internet and based on its same protocols and tools, which enabled users to log on through a local phone call. For users located far from an access node, this system could represent savings of up to 95% (Rodríguez, 1997). Infovía also enabled access by information and service providers, with several hundred of them getting connected within a year. Users could also navigate the worldwide web and other parts of the Internet once on Infovía by using the services of an ISP.

While the overriding goal guiding the creation of Infovía was to facilitate universal access at an affordable price, it had the side effect of solidifying the position of the telephone company. Telefónica had been awarded the telephone monopoly in 1922, and was nationalized in 1946. The company operated under the regulatory and policymaking authority of the Ministry of Public Works. Historically one of the largest companies in the country and, by the early 1990s, the largest operator in Latin America, Telefónica was in the process of being privatized when the Internet fever hit the world. Infovía contributed to a proliferation of ISPs. At the end of 1997, some 450 ISPs (compared to 150 in the US) provided connectivity services to no more than half a million Spaniards. No provider accounted for more than 5% of the total market (Escobar Espinar, 1999, pp. 182–191; Rodríguez, 1997; Solá, 1988). ISP fragmentation helped Telefónica in at least four ways. First, the small size of the ISPs eliminated one possible source of competition for the future, and also made it difficult for new network or telephone service providers to enter the market via acquisition. Second, it discouraged BT and Global One—the two international

connectivity providers—from investing in their own access network, and thus forced them to pay Telefónica for the service. Third, although the accounting cost of calls to Infovía was five times greater than the actual revenues (at local-call rates), the increased traffic was in part channeled through underutilized circuits, thus helping Telefónica improve the overall profitability of its infrastructure. Fourth, users started to associate the names of Infovía and Telefónica with the Internet and its fabulous opportunities (Solá, 1998). ISP proliferation resulted in price competition (access rates were among the lowest in the world), but poor quality and frequent service interruption.

After seeing Internet use rising seven-fold in three years of operation (to more than 5% of the adult population), the government of the right-of-center Popular Party (elected in 1996) terminated Infovía in January 1999. At the time, it accounted for 85% of all Internet access calls (about one million daily). The new network providers (BT's Interpista and Retevisión's Retenet) found themselves at a huge disadvantage relative to Telefónica's Infovía Plus (the newly branded network service based on the old Infovía), both of whom had obtained a license for basic telephony and were busy buying ISPs in order to grow their presence in the Internet market.

Telecommunications policymaking during the 1990s was inspired in market principles, but it exhibited a decisively regulatory and interventionist bent aimed at maintaining certain aspects of the "status quo", especially regarding Telefónica, which easily maintained its status as the "dominant" operator (Souvirón & María, 1999). The transition from "statist" to "market" principles, however, did not come naturally. Its pace was primarily dictated by European liberalization directives. Initially, the government engaged in piecemeal legislative and regulatory changes, mostly in the areas of satellite and cable, and managed to obtain in 1993 a five-year waiting period to begin in 1997, which it later agreed to anticipate to November 1998 in exchange for Telefónica's participation in the Unisource consortium, which turned out not to materialize (Cuétara Martínez, 1999). In 1996 the European Union intensified its deregulation drive, and the newly elected conservative government of the Popular Party (PP) committed itself to privatization, deregulation, and the end of the monopoly regime for the telecommunications industry. A 1997 law allowed for a second telephone operator (Retevisión), and in 1998 a new General Law of Telecommunications was passed, providing for the gradual liberalization of most markets.

Liberalization and deregulation, however, have mostly followed the model of "restricted competition", i.e. initially allowing only a limited set of competitors (licensees) selected on the basis of their technical and economic strengths. Thus, this approach has tended to create oligopolistic market structures, tempted firms to collude in prices, and helped Telefónica reposition itself as the dominant player in most Internet-related activities (Cuétara Martínez, 1999).

The government has proclaimed its "information society" strategy repeatedly during the late 1990s—in line with European Union policies—and translated it into actual legislation and regulation (Souvirón & María, 1999). The latest initiative—Info XXI, the Information Society for All—is a government-wide effort to make the Internet accessible to all, and to turn it into a tool to increase employment, develop infrastructures for business, promote culture, enhance quality of life, improve public services, and help Spanish firms (especially small ones) become more international (Robles, 1999). In June 2000, the government announced that it would mandate a

monthly flat access fee of 2750 pesetas but applicable only during off-peak hours (weekends and 6 pm–8 am weekdays). At current local-call rates, a user needs to be logged on for an average of at least 55 min daily in order for the flat fee to make sense. Users, however, are not happy because the flat fee is not available during peak hours. Large ISPs (which tend to be controlled by long-distance and mobile operators) are not enthusiastic either because they have to pay Telefónica an interconnection fee (*Cinco Días*, June 17, 2000, p. 16).

Internet development in Spain bears not only the imprint of government policy, but also the impact of long-standing patterns of business and entrepreneurship. The Spanish business scene is characterized by a tendency towards ownership concentration, especially when banks, utilities, and other large companies become shareholders in other companies (La Porta, Lopez-de-Silanes, & Shleifer, 1999). This pattern of corporate development has been extended into Internet-related activities, with banks, power utilities, and multimedia groups becoming key players (CMT, 2000). The two top banks—BSCH and BBVA—are among Europe's largest, and have set their eyes on the Internet. BSCH was the largest shareholder of Airtel—the mobile phone operator and Internet services provider—until 2000, when it allowed Vodafone to take over in exchange for a 2.8% stake in the world's largest mobile phone operator. BSCH acquired patagon.com, Latin America's largest financial portal. Spain's second largest bank, BBVA, is one of Telefónica's "strategic" shareholders, and participates in Uno-e, an electronic banking site in collaboration with Ireland's e-First Group. Similar to the banks, the country's top power utilities (Endesa, Iberdrola, Fenosa) have expanded throughout Latin America in their traditional business, and taken stakes in telephone operators and Internet companies (Retevisión and Amena, in collaboration with Telecom Italia). They have also invested in data transmission networks leveraging their access to the high-voltage electricity transportation network. The large Spanish multimedia groups—Prisa, Unidad Editorial, Prensa Española—were pioneers in Internet development with the electronic editions of their newspapers. They are now turning these sites into full-fledged portals carrying information, e-commerce, chats, and other services. The portals and websites controlled by the multimedia groups and the telecoms are among the most visited by Spaniards.

Given the strength of the telecommunications operators, banks, multimedia groups, and power utilities, it should be no surprise that, with only a few exceptions, individual entrepreneurs have not become important actors on the Spanish Internet, even when annual venture-capital flows to the industry exceed $3 billion (*El País*, June 25, 2000, p. 8). Individual entrepreneurs played a leading role during the heroic early and mid-1990s, when fewer than a 100,000 Spaniards used the Internet. ISPs or search engines that managed to stand out for their growth were quickly acquired by Telefónica (Olé), Retevisión (Servicom, RedesTB), or foreign firms (Arrakis by BT, and CTV-Jet by Uni2, a relatively small telephone operator controlled by France Télécom). Foreign firms like Vodafone, BT, Telecom Italia, and France Télécom are building their presence, but they rarely find themselves among the top four providers of Internet-related services.

Although the government has attempted to make the Internet universally available, the principle of "restricted competition" has by and large guided deregulation of telecommunications and the Internet, thus allowing for telecom operators, banks, multimedia groups, and power utilities to become the key actors even though individual entrepreneurs had been the first movers into the new economy. Despite the fact that policy has encouraged price competition over service quality, Internet use in Spain remains low by European standards. The government is presently

considering tax incentives to facilitate PC ownership and hopes that the four new WAP-based mobile telephone licensees will accelerate Internet growth in the near future—there are 20 million mobile phone users compared to 4.3 million Internet users.

3.4. Argentina: relatively liberal with unfavorable conditions for entrepreneurship

As in Spain, slow Internet growth during the mid-1990s prompted the Argentine government to introduce a series of initiatives to facilitate universal access and use. Unlike in Spain, however, telecommunications privatization and partial deregulation had taken place in the early 1990s. Thus, Internet-related government policy was not affected by the presence and strategic reactions of a dominant telecommunications operator. As a result, local entrepreneurs have played more of a role in Internet development than in Spain, with foreign telecommunications operators and banks becoming the key actors. Internet access and use, however, remain relatively low in Argentina due to high cost of telephone calls and low hardware ownership.

The national telephone company (ENTel) was originally created in 1946 as part of President Perón's nationalization drive. It operated as an increasingly inefficient and ineffective monopoly until President Menem (1989–99) singled it out to be the first major state-owned company to be privatized. In 1990 ENTel was split into two territorial monopolies. Telephone services in the Southern part of the country and half of the Buenos Aires metropolitan area were awarded to a consortium led by Telefónica of Spain, while the Northern part and the other half of the Buenos Aires area went to Telecom of Italy. Each foreign operator took a 60% stake in their respective Argentine company. In late 1991 and early 1992 the government floated in the stock market an additional 30% of each company, and in 1992 the remaining 10% was given away to employees. The two monopolies were granted seven-year licenses to expire in 1997 (later extended to 1999), with rates updated following the evolution of the US consumer price index. In order to keep their license, they would need to step up infrastructure investments (Moyano, 1999). In fact, investment in telecommunications reached a massive $16.7 billion between 1990 and 1998, with telephone lines growing from 3.6 to 8.0 million (CEP, 1999, pp. 152–153; Petrazzini & Guerrero, 2000). Telefónica and Telecom were asked to set up joint companies for value-added services (Startel), and international network connectivity and data transmission (Telintar).

The first Internet connection in Argentina was provided in 1991 by a consortium of academic, research, and government institutions. Although bulletin board services had become available by 1993, the first commercial Internet (dialup) service did not become available until 1995, with Startel (owned by the two licensed telephone companies until the late 1990s). Other firms, Compuserve and Datamarkets, followed shortly thereafter. Internet use, however, remained low due to high prices for local calls and leased lines (Bassi, 1998; Petrazzini & Guerrero, 2000).

In June 1997 the government declared the Internet a "matter of national interest", and issued a Presidential decree asking the Secretary of Communications to explore the possibility of turning Internet access into a "universal service obligation". Policies to increase Internet use would include both price cuts and infrastructure development. Unlike in Spain, however, both the government and the private sector took the initiative during the 1990s. However, in 1997, the government passed a decree regulating leased line prices, effectively bringing them down by as much as 45%, and mandated the creation of a special dialing number (0610) for Internet calls,

with savings of up to 58%, although mostly applicable to users in the large metropolitan areas (Secom, 1998; Petrazzini & Guerrero, 2000, pp. 96–97, 108).

Several dozen ISPs began to offer Internet access at the time, but their services were hampered by the fact that traffic between each other had to be channeled through the United States. The dire need for a local network access point (NAP) enabling the local interconnection of ISPs was finally met in March 1998 by the private-sector Argentine Chamber of Data Bases and Online Services (CABASE), which included 18 ISPs among its 35 members. (Nowadays 25 ISPs are connected to the NAP, and they account for 90% of domestic traffic.) Although these public and private initiatives contributed to the proliferation of ISPs (136 by the end of 1998 and 170 by mid-1999), fragmentation never reached Spanish levels. The top four ISPs controlled about 50% of the market in late 1998 and more than 80% by the end of 1999 (Bassi, 1998; Petrazzini & Guerrero, 2000, p. 103). Moreover, the ISPs created by the telephone operators acquired other successful providers. For example, Telefónica's Advance purchased Satlink, Compuserve, and Overnet (*Mercado*, April 1998, pp. 82–88). CABASE's ambition is to establish direct links to other Latin American countries, and hence be able to negotiate with backbones in the US and Europe on a better footing (CABASE, 1999).

Access has remained unevenly distributed by socioeconomic and rural–urban strata. For example, 85% of users were located in the Buenos Aires area, which is home to about 40% of the population (Bassi, 1998), 41% have a university degree, and 86% are men (Secom, 1998). In response, the government launched in 1998 a program to open a thousand Technological Community Centers (CTCs) providing basic computing, audiovisual, and Internet services in relatively small towns (argentin@Internet.todos). A 1999 decree mandated the recently privatized Post Office to provide each citizen with a free email address and to install PCs at 6500 post offices throughout the country. And in 2000 the government set up a $1 billion subsidized loan program to enable citizens to buy a PC (CACE, 1999; Petrazzini & Guerrero, 2000, pp. 98–99; *Industry Standard*, May 15, 2000, p. 152).

Prices of Internet-related calls have dropped since the mid-1990s as a result of government regulation. Dial-in rates decreased from $32.50 an hour in 1995 to $2.38 in 1998 (Bassi, 1998). A 1997 resolution cut international link rates by 45%. Unlike in Spain, a flat rate for Internet access has been available in Argentina since March 1996, when ImpSat challenged the telephone operators with its satellite link. Competition in long-distance calling was enhanced in 1998 with the approval of two additional licenses, and local calls will be liberalized in November 2000 (CACE, 1999).

Alternatives to the basic telephone network have developed rapidly in Argentina, although few use them to access the Internet. At the end of 1999 more than one in two Argentine families had access to cable TV (CEP, 1999). Mobile telephony licenses were granted for the Buenos Aires metropolitan market to Movistar (1988) and Miniphone, created jointly by Telefónica and Telecom in 1992, and split in 1999. In the interior provinces, the government licensed CTI Móvil (GTE, AT&T, and Grupo Clarín) in 1994, and Unifón (Telefónica) and Telecom Personal (Telecom) in 1996 (Moyano, 1999). CTI was allowed in 1999 to offer services in the Buenos Aires area. Broadband DSL access will become available in some areas during late 2000 at a cost comparable to that for cable.

In spite of sharp reductions in access cost and multiple government initiatives, Internet use remains low in Argentina (2.3% of the adult population). Revenues from e-commerce are limited

because of low use but also because of traditional distrust for direct and catalogue sales, and uneasiness with remote transactions involving credit cards.

The Argentine Internet has, as in Spain, become dominated by vertically integrated groups. The main difference is that foreign groups play an important role in Argentina. The most important groups are Stet/France Télécom (which controls Telecom), Telefónica, and Agea/Clarín, a local multimedia conglomerate which publishes the world's largest Spanish language newspaper. They offer a range of Internet-related services. Stet/France Télécom and Telefónica dominate basic telephony, international calls, data transmission, and ISP, and are key players in mobile telephony. Telefónica is well positioned in cable TV and its Terra subsidiary has a specific portal for Argentina. Together with CEI Citicorp Holdings, Telefónica controls several publishers, radio and TV stations, and directories (Atlántida Comunicaciones, Torneos y Competencias, and Telinver). Stet/France Télécom differs from Telefónica in its absence from the ISP, portal, and content stages, and in its presence in satellite data transmission. The third main group, Agea/Clarín, started by building up its presence in multimedia content, cable and satellite TV, and data transmission. It obtained licenses for mobile telephony in 1994 and for long-distance telephony in 1998, and operates Ciudad Internet, the third largest ISP and the second largest portal. Clarín controls three of the 10 most visited sites. The country's second largest newspaper, La Nación, also has a site among the top 10. Exxel Group controls the country's largest music chain, Musimundo, which operates one of the most visited websites. Local entrepreneurs launched one of the top 10 sites (ElSitio). Unlike Spain, there are two foreign-controlled sites among the top 10 (Yahoo, Terra), and two government sites (Universidad de Buenos Aires and Biblioteca Nacional).

Internet entrepreneurship in Argentina has been somewhat more vibrant than in Spain, but successful entrepreneurial startups have been acquired by larger players, as in Spain. Some estimates indicate that about 350 of the 600 Latin American Internet startups are located in Argentina, and many have customers or specific sites in other Latin American countries (*The Industry Standard*, May 15, 2000, p. 52). Several firms and funds are playing the role of venture capitalists: Cima Investments, Citigroup, Southern Cross, Quantum (controlled by George Soros), Dolphin, and Federal de Invesiones (owned by the Massot family). The most successful startups include: patagon.com and latinstocks.com (financial portal), MercadoLibre and DeRemate.com (auctions), and ElSitio.com (portal and ISP). Foreign firms have acquired several of these startups: the Spanish bank BSCH (patagon, and a minority stake in Musimundo, together with Exxel Group), Terra (gauchonet, donde, DeRemate), AoL (latinstocks, together with Exxel Group), and Cisneros (ElSitio, with IMPSA).

Internet development in Argentina compares favorably to other Latin American countries. (Argentina is one of the wealthiest and best educated countries in the region.) Early privatization has helped, but deregulation measures were timid until the late 1990s. While entrepreneurs have contributed to Internet development, their ventures were taken over by domestic media groups, and foreign telecoms and banks.

4. Conclusion

Internet development, measured in terms of the numbers of users and hosts, is higher in countries with conditions that favor entrepreneurship and investment, and with a democratic

political system. These effects hold after taking into account levels of per capita income, installed telephone lines, and English language proficiency. Both our regression analysis and our case studies indicate that liberal telecommunications policies aimed at maximizing affordability and quality via privatization and competition do not automatically translate into high numbers of Internet users and hosts. The reason is straightforward: privatization and competition have been introduced both in rich countries with many Internet users and hosts, and in poor countries with few of them. The cases of Argentina and Singapore further illustrate the lack of statistical significance of privatization and competition. Argentina has implemented relatively liberal telecommunications policies, but Internet development lags seriously behind. Singapore, by contrast, harbors one of the world's most developed Internet sectors, and yet there is little competition and deregulation of telecommunications. Other countries with similar uncompetitive telecommunications markets but high levels of Internet development include Iceland, Israel, the United Arab Emirates, Slovakia, and Slovenia.

Our detailed analysis of two pairs of matched countries differing in terms of telecommunications policies and the conditions for entrepreneurship reveals a number of other important contingencies and peculiarities in the growth of the Internet worldwide. The Singaporean state has created favorable business conditions and attracted foreign multinationals, although the practice of protecting government-linked firms has stifled local entrepreneurs. Government-linked corporations and foreign firms control virtually every stage of the Internet value chain, including access, international connectivity, data transmission, network services, and WAP telephony. In contrast to Singapore, the Irish government has combined free foreign investment with deregulation and privatization. Low PC ownership and credit card use and high costs of local calls, however, seem to have slowed down Internet development to levels that are still far from Singapore's. Irish entrepreneurs, however, have thrived both because of the English-based corporate legal tradition and the lack of an interventionist state such as Singapore, which tends to privilege state-owned and foreign firms to the detriment of local entrepreneurs.

Internet development in Argentina and Spain has followed a very different path than in Ireland and Singapore, largely because of the prominent role played by telecom firms, and other large domestic firms and business groups, which have accumulated extensive stockholdings across the Internet value chain. In Spain, the incumbent telecom operator is a dominant force in most Internet-related activities, and banking, media, and utility groups are also important. In Argentina, ownership concentration has also put telecom and media groups at the center of the country's Internet. Internet use and e-commerce are still low in both Argentina and Spain. It is important to notice that membership in a supranational bloc does not seem to produce identical results. Both Ireland and Spain are members of the European Union, subject to the same directives concerning telecommunications and the Internet. Moreover, their incomes and numbers of installed telephone lines per capita are fairly similar (see Table 4). Yet, government policy and the relative strength of local entrepreneurs differ substantially, and Internet development in Ireland is considerably higher than in Spain.

The statistical and comparative analyses reported in this paper suggest that Internet development is a complex phenomenon shaped not so much by public policy in telecommunications as by income per capita, infrastructure, proficiency in English, and conditions for entrepreneurship. While our empirical results based on a large sample of countries and on four

case studies are consistent with each other, more research is needed to better understand how the Internet has developed in different countries, and how this most promising medium can be made more widely available.

Acknowledgements

Guillén acknowledges the support of the Wharton eBusiness Initiative (WeBI), and Suárez that of Temple University.

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