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Which Internet Policy? Assessing Regional Initiatives in Spain

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We examine the effect of public policy on the growth of Internet use. Using a decentralized country—Spain—as an example, we compare the 17 Spanish regions to test different Internet policy designs, taking into account the quality and number of specific programs promoted by regional governments, as well as the presence or absence of strategic planning in each region. We treat the percentage of Internet users as a dependent variable to compare its diffusion in different territories. Our findings show that educational levels and economic differences explain about half of the variations observed. Furthermore, the regional policies play a significant role in explaining regional variations. We investigate which public policy instruments are more significant for the development of the Internet, and find that focused policy intervention and complex policy initiatives are more significant than other policy instruments in explaining the increase in the percentage of Internet users.

The repeated calls for public policy interventions to ensure widespread and equitable diffusion of the Internet have not fallen on deaf ears, as policymakers in a large number of countries have launched myriad initiatives to promote the growth of the Internet. However, there has been little or no empirical research so far to measure the impact of these policy interventions; only the impact of regulatory policy has been to a certain extent analyzed (Hargittai, 1999; Guillén & Suárez, 2001; Hawkins & Hawkins, 2003). In this article we seek to provide much needed insights about the effectiveness of Internet policies, aiming to chart the type and effects of different public policy interventions to foster the growth of the Internet. We propose to compare the ways in which different jurisdictions deal with this technological innovation via a comparative study of policy designs in 17 Spanish regions, and test the hypothesis that public policies designed to promote the use of the Internet can significantly influence Internet penetration.

A cross-regional study within a single country has some decided advantages over a cross-country study for a project like ours. While regions within a country often display significant economic, political and social differences, many other variables that might influence the rate of Internet diffusion in a cross-country situation remain constant. For a cross-regional study, Spain, a decentralized country, is a particularly good site. We find low central government activity in this policy area, and high cross-regional policy variation (Fundación AUNA, 2003; Telefonica, 2005). Thus we can observe significant diversity in cross-regional output directly related to the effects of regional public intervention, after controlling for regional socio-economic differences. Other European countries do not show similar contrasts. At the other extreme lies France, which is much more centralized in the promotion of the Internet.

In other cases, such as the United Kingdom, the number of autonomous regions is too small for a comparison. Germany, another large decentralized country, displays a high level of coordination and convergence, resulting in a lower degree of regional variation.

In Spain the telecommunications regulatory framework, which might have a significant influence on the diffusion of the Internet, operates at the national level (Jordana & Sancho, 2005), and there are no relevant differences at regional level in this policy area. This contextual factor allows us to concentrate on the role of a few crucial variables that can explain most of the existing differences in Internet diffusion across the regions. Taking into account notable socioeconomic differences between the regions, we are especially interested in variations in regional public policies designed to promote the Internet, which can be assessed that much more easily because we are not analysing cross-country differences.[1] Since we have fewer variables to control, the impact of public policy at the regional level is easier to study and yet we are able to generate insights that are relevant beyond Spain and its regions.

PUBLIC POLICIES TO ADVANCE INTERNET DIFFUSION

Before presenting our findings in more detail, we set out some conceptual distinctions in Internet policy that we relied on in our research. Three varieties of public policy interventions are frequently presented in the literature as capable of influencing the diffusion of information and communication technology (ICT), in particular the Internet, to all citizens (Dutton, 1999; Lyon, 1988; Mardsen, 2000; Dodge & Kitchin, 2001). They are:

Regulatory policies. Governments define the rules that control economic and social actors in the telecommunications arena and supervise their behavior. The main purpose of such policies is to define competition rules and facilitate the development of markets in a way that stimulates growth and increases sector activity. In addition, these policies should protect intellectual property rights in order to promote the creation of high-tech firms.

Promotion policies. These policies seek to stimulate the supply side of the digital economy. They promote the supply of productive factors necessary for the development of new activities that use information technologies intensively, not only in commercial sectors but also in nonprofit sectors such as government, health care, and education. Examples of such policies include fiscal incentives to create new enterprises, retraining to make workers more employable, and encouragement of innovative managerial strategies in high-tech sectors.

Dissemination policies. These policies seek to stimulate strong demand for the products and services that are associated with the development of the information society. They aim to expand the use of new ICT among citizens by providing them with state-of-the-art infrastructure, increasing their technical capabilities, offering customized information and/or specialized training, widening access facilities to communication networks, and so forth.

In this article we focus mainly on the promotion and dissemination policies, since regulatory policies do not differ among the Spanish regions and hence cannot produce variations in our findings. We aim to identify the instruments in promotion and dissemination policies that are designed to create or support new Internet-based activities in any economic or social field, and also the incentives and provisions introduced to facilitate Internet use among the population. Thus both the demand and the supply sides of Internet policy are considered here as the independent variables that, in addition to socioeconomic variables such personal income and education levels, can explain Internet diffusion.[2]

Political Decentralization in Spain

With the transition to democracy and the promulgation of the new constitution in 1978, a significant process of decentralization began in Spain, based on the development of new political and administrative regional bodies (Vallés & Cuchillo, 1988; Aja, 1999). Spain was divided into 17 regions (autonomous communities), representative chambers were set up for each autonomous community, and they, in turn, selected and controlled the new regional governments. After a multifaceted process of decentralization that lasted more than two decades and created a complex web of intergovernmental relations, regional governments have taken on responsibility for many areas of public policy, especially broad social policies such as health care and education (Agranoff & Ramos, 1997).

The central government remained responsible for general regulatory frameworks, infrastructure, foreign affairs, the army, and so on. A quarter of century after the process began, the level of decentralization for policymaking in many areas exceeded those in most European countries (Jeffery, 1997; Le Galès & Lequesne, 1998). Nevertheless, there are some areas in which the distribution of responsibility is still unclear. New Internet policies are one such area. Responsibilities were not defined during the decentralization process because the Internet did not exist at that time. As a consequence, when Internet use began to spread in the late 1990s, governments at all levels believed they could legitimately launch new initiatives to support its development. This is, in fact, what happened: All levels of government in Spain engaged in policies promoting the

Internet, although national policies were not as aggressive or as far-reaching as regional ones in many cases (Jordana et al., 2003). Despite this involvement, levels of Internet diffusion within households are lower in Spain than in most European Union countries, and parity is not expected in the immediate future.[3] We find a similar trend for other indicators such as "schools connected" and "public services online," which also show rates below the European Union average (European Commission, 2003). These differences can be attributed to a country's overall level of economic development, as well as to its government's regulatory policy (Guillén & Suárez, 2001), but we also want to examine whether inadequate promotion and dissemination policies were also an important factor as well.

It should be added that promotion and dissemination policies at the national level did not improve the situation. At the end of 1999, with the aim of accelerating Spain's transformation into an information society, the central government launched a national action plan called Info XXI. However, Info XXI was not very successful because it suffered from coordination problems and enjoyed only modest political support. Only 3 years after its launch, it was widely conceded that the plan had not had a significant impact on the development of the Internet in Spain (Jordana et al., 2003; Fundación AUNA, 2003). Despite the limited growth of the Internet in the country, we examine whether it displayed any significant territorial variation because that would enable us to analyze the role of regional public policy and to identify which instruments of public policy were more successful.

Starting in 1998, many regional governments drew up action plans for the promotion of the Internet. They implemented them in a highly autonomous fashion with little regard for the central government's planning activities and programs. Other regional governments also launched policy initiatives with similar aims but without drawing up systematic action plans. In this article, we concentrate specifically on such policies, because they display strong differences and because of the advantages of cross-regional comparative analysis within a national case. However, we need to be mindful of the possibility that many cross-regional differences in Internet use rates may largely reflect social and economic differences that already existed among territories, rather than policy effects.

As we see from Table 1, the gap between the richest and the poorest regions in Spain is considerable—for example,

TABLE 1
Spain: Main indicators

Region	Internet use[a]		Per capita income[b]	Education[c]	Population[d]
	1997	2002	2002	2002	2002
Andalucía	1.5	20.3	64.93	18.3	7,403,968
Aragon	2.2	20.6	93.64	22.3	1,199,753
Asturias	3.4	20.5	75.2	21.6	1,075,329
Balearic Islands	4.3	24.7	110.01	16.5	878,627
Valencia	2.8	20.8	88.86	19.7	4,202,608
Canary Islands	1.9	24.6	76.43	17.9	1,780,366
Cantabria	1.2	23.0	80.14	22.7	537,606
Castilla-León	1.6	20.0	83.04	22.6	2,479,425
Castilla-Mancha	1.7	14.6	71.05	14.9	1,755,053
Catalonia	4.8	27.1	107.43	22.6	6,361,365
Extremadura	1.7	15.6	57.96	16.0	1,073,381
Galicia	1.6	18.9	74.68	17.7	2,732,926
La Rioja	4.0	23.3	99.84	21.9	270,400
Madrid	3.9	27.0	111.48	30.0	5,372,433
Murcia	1.7	18.9	69.57	21.0	1,190,378
Navarra	4.0	20.9	108.32	29.3	556,263
Basque Country	2.5	27.1	104.1	31.2	2,101,478

[a]Percentage of the population that has used the Internet at least once during last month. Source: AIMC.

[b]Data measures differences in respect of per capita European income mean (100). Source: Fundación de las Cajas de Ahorro (FUNCAS).

[c]Percentage of the adult population having higher education (university degree). Source: Ministry of Education, Culture, and Sport.

[d]Source: Spanish National Statistic Institute.

Extremadura ranks 42 points below the European mean per capita income, whereas Madrid ranks 11 points above. Similar differences also exist in education levels: The Basque Country, where 31% of the population have university degrees, and the Castilla-La Mancha region, where only 15% do, lie at the opposite ends of the spectrum. The regions are also of unequal size: The most populous region in Spain, Andalusia, with 7.4 million inhabitants, also has very low rates of per capita income (65), whereas La Rioja region is the least populous region with 270,000 habitants. Catalonia and Madrid are two other regions with significant shares of the Spanish population, relatively high education levels, and high per capita incomes. Table 1 also shows that most of the territories with the highest Internet usage rates also have the highest levels of economic development.

However, we already know from other studies that not all variations in Internet usage are caused by socioeconomic differences (Castells & Himanen, 2002; Harggittai, 1999; DiMaggio et al., 2001), and this is true of the Spanish regions too. A linear relationship between income and Internet use does not hold for all cases. For example, Table 1 shows that Andalusia had the same level of Internet use as Aragon in 2002, although its per capita income was 30 points lower. Also, Valencia and Navarre had the same levels of Internet use, but Navarre had 10 points more graduates than Valencia. These observations confirm that no single variable can explain the entire variance in Internet usage; other factors play a role as well.

Our basic hypothesis is that public policies at the regional level that included new institutions, agendas, and initiatives have been very important in spreading the use of the Internet, and have a predictive significance over and above regional socioeconomic levels. We wish to examine how this effect was produced, taking into account the differences in the intensity and quality of regional public policies. To this end, our analytical framework includes different variables that characterize the policy instruments designed by different regions to foster Internet use. On the one hand, we consider whether regions developed strategic plans that directly or indirectly included Internet diffusion among their aims. On the other hand, we take into account and characterize particular policy programs promoted by regional governments.

The Policy Initiatives Database

Some account of information sources and database construction must be given before we go deeper into our analysis of the impact of regional Internet policy. To construct the database we recorded all public policy programs, plans, and actions aimed at fostering the Internet at the regional level for the period 1999–2002. Because most of these initiatives were measures for mobilization rather than fully implemented interventions with easily identified and measured outcomes, we also included in the database policy initiatives in advanced stages of formulation and design as a pragmatic option for analyzing achievements in this emerging area.

These data allowed us to describe the structure and content of Spanish regional public policies that were designed to have an impact (both quantitative and qualitative) on Internet use, by selecting different variables related to each plan, program or action. The selection of observations for our database does not correspond to a formal statistical parameter. Because of the relatively small number and strong heterogeneity of the plans, programs, and actions, we opted to include all existing initiatives that were designed to promote the Internet directly or indirectly, for the period considered, for all the Spanish regions. To be included in the database, plans, programs, and actions had to meet the following four criteria.

Temporality. we included all plans, programs, and actions that were active in Spain during the period January 1999–July 2002, under the auspices of any of the 17 regional governments. We included plans, programs, or actions that started before that period but were effective during it, as well as those that were initiated during the period. As active policy initiatives, we considered their formulation, design, and implementation stages (but always controlled for the fact that some effort and resources had already been expended).

Relevance. This criterion measures the importance of the plan, program, or action in order to identify those that were designed to have a social, political or economic impact, on the basis of their goals and intentions. With this parameter we tried to avoid the inclusion of plans, programs, and actions without innovative components (such as a single computer purchase by the public administration or the launching of a very simple information website), but included initiatives such as procurement policy and heavy use of web sites.

Being online. Most of the research was carried out online, and when necessary we contacted the policymakers directly. We made it a condition that information about the plan, program, or action must be found on the Internet because we considered this to be proof of a genuine interest in promoting the Internet itself.

Public policy. We selected only plans, programs, and actions designed and formulated by public administrations. We did not include policy initiatives by nongovernmental organizations (NGOs) or the private sector unless they included a significant participation by public institutions.

TABLE 2
Types of policy instruments

Policy instrument	Complexity degree
1 Strategic planning	(7)
2 Governmental planning	(6)
3 Sector focused program	(4)
4 Inter-sector program	(5)
5 Single action	(3)
6 Organizational action	(4)
7 Support to external actions	(1)
8 Pilot program	(2)
9 Coordination action	(4)

The observations we obtained using these criteria included a heterogeneous range of public policy plans, actions, and programs, from large strategic plans to isolated events, as well as projects that combined a specific series of objectives. The final database we obtained sums up a total of 261 observations, including cases from all Spanish regions. Within each observation, we identified several characteristics. One was the type of policy instrument used. In Table 2 we identify nine different types of policy instruments; additionally, we tried to capture the level of complexity of the instruments involved, from the simplest to the most complex.

We also classified each observation according to variables such as the target group to which it was oriented (see Table 3), the number of public actors implied, the role of social participation in its design or implementation, and the specific economic, social or cultural sector to which the action, program or plan was directed (we identified 15 such sectors). Unfortunately, we were not able to obtain complete data about the economic resources devoted to each initiative in way that would have allowed us to compare the cases.

INTERNET POLICIES IMPLEMENTED BY REGIONAL GOVERNMENTS

In this section we present in detail the results of our case study of Internet policies launched by regional

TABLE 3
Targeted groups

1 Citizenry, in general
2 Citizenry, focused in a specific group
3 Firms, in general
4 Firms, focused in a specific group
5 Professionals, in general
6 Professionals, focused on a specific group

governments in Spain during 1999–2002 and consider some hypotheses about which policies were most effective. To clearly specify this challenge, we deal with the rationale and contents of regional strategic planning and other policy instruments employed for the promotion of the Internet, as well as their institutional settings, identifying the existing regional variations and communalities in Internet use. In the next section we test this interpretive framework with some statistical analysis in order to evaluate whether public intervention contributes to the diffusion of Internet use and, if so, which types of intervention have stronger impacts, if any.

Strategic Planning at the Regional Level

A regional strategic plan for fostering an information society has typically been conceived as a general plan for several ICTs—not the Internet alone. Such plans are seen as generating high degree of policy coordination and also personal investment of policymakers who must be mindful of the high level of visibility it begets. Therefore we hypothesize that the rate of Internet usage increases after the introduction of a strategic plan in a region.

Murcia and Extremadura were among the first Spanish regions to adopt strategic planning specifically designed to foster an information society, including specifically the Internet. Their planning activities, developed under the auspices of the RISI European Program, were launched in 1996–1997. At around the same time, Valencia region also developed a plan under the RISI program, but it was designed exclusively to modernize public administration and improve public services (specifically by bringing ICT into the administration itself). It is interesting to note that the regional governments that developed strategies for promoting the Internet were not among the wealthiest. Catalonia was the first rich region to implement a strategic plan in 1998. The Catalonia plan was specifically designed to promote information society-related activities, and its main objective was to introduce ICT, especially the use of the Internet, to all sectors of society.

In the years after these initial cases, many other regions decided to adopt strategic plans as a way to promote ICT, including the Internet, in their territories. As we can see from Table 4, by the end of 2002, 10 Spanish regions had adopted a strategic planning approach. The existence of specific planning activity indicates the importance that regional governments attached to ICT-Internet in that period. Launching a plan signified a centralized political initiative at the regional level, and also some global vision about the role of ICT applications in social and economic development. Within these plans were many programs in different fields surrounding the Internet, such as Internet access, educational websites, e-commerce promotion, and the development of e-government. In most instances, before these

TABLE 4
Regions with strategic planning
(1996–2002)

Murcia	1996
Extremadura	1997
Valencia	1997
Catalonia	1998
Canary Islands	2000
La Rioja	2000
Basque Country	2000
Navarra	2001
Cantabria	2002
Andalucía	2002

strategic plans were implemented discussion groups were organized involving individuals from both public and private sectors, who thereafter also participated in the final design of the plans.

Policy initiatives in other policy fields (such as technological innovation, regional development, or scientific research) can also be effective and contribute to the diffusion of the Internet by different means. For example, in Aragon the technology development plan included some programs for transferring Internet research expertise to small and medium-size enterprises. Other experiences, such as that of the Basque Country and Andalusia, combined the two modalities, with actions geared toward developing the Internet both directly by means of a specific strategic plan and indirectly through some actions within frameworks of other programs.

Institutional Building for Regional Internet Policy

Another important factor is the body that implements Internet policy, since different institutional models might have an impact on Internet development. Here we find a heterogeneous field among the Spanish regions: While some regions created new institutions, such as public agencies or departments, for the promotion and development of Internet policies, others used already existing public organizations, which previously had different objectives and purposes, for these goals. For example, in Catalonia a new Department of University, Research, and Information Society (DURSI) was set up and it opened an Information Society Office. In Extremadura, by contrast, a new Office for Information Society was set up within the existing Education Department.

In other regions, however, departments have taken on the implementation of Internet policies as part of their own sector objectives. Internet policies can be seen, across the board, as a tool for other policy objectives, such as economic promotion, regional development, improvement of education, and so on. In Navarre, for example, policy proposals were centralized by the Department of Public Works, Transport and Communications. In Andalusia, which has an unemployment problem, the agency most involved was the Department for Work and Technological Development; in Aragon, where the main objective was regional development, the agency most involved was the General Directorate of Economy. As a consequence of this institutional variety, policies oriented toward different consumers are likely to have different impacts on the rate of Internet usage.

Outside the realm of public administration, we also traced the creation of special promotion agencies during the period considered, which included private and public actors like FUNDARCO (La Rioja), OVSI (Valencia), and Integra (Murcia), all specifically created to promote Internet applications and services. Other such agencies—SODERCAN (Cantabria), IBIT (Balearic Islands), or CEDETEL (Castilla-León)—had already been set up to promote, respectively, regional development, technological innovation, and telecommunications, but during the years of our study they were redirected to promote the Internet directly.

Policy Initiatives to Promote the Internet

We often observed that regional Internet policy was articulated by means of strategic plans and implemented by specialized institutions, but this was not always the case. Policy initiatives related to Internet development can appear in many different settings and styles, having relevant impacts as well. At least, this is a possibility that we should consider. For these reasons, we focus our case selection on the design and implementation of the plans, actions or programs, regardless of whether they were formally located within the regional administration. We focus first on the number of cases detected in each region, considering whether more policy initiatives foster an increase in its Internet users. We then consider how influential other characteristics are, such as sectoral dispersion, the degree of complexity of the policy instrument employed by each initiative, or other aspects of its design or implementation.

Catalonia, which launched 49 policy initiatives during the period considered, is by far the most active region in the promotion of the Internet based on the number of cases identified. The second most active region is Valencia, with 38 initiatives. Castilla-La Mancha region is at the other end of the scale, with one policy initiative for the whole period. As for sector coverage, Table 5 shows that even though Catalonia has 23 more policy initiatives than La Rioja, they cover only 13 policy sectors (we defined 15 such sectors). La Rioja's policy initiatives or programs are spread over a wider range of policy sectors—14—yet they are relatively few in number. Cantabria displays a similar pattern,

TABLE 5
Number of initiatives by regions (1999–2002)

	Number of policy sectors with initiatives	Total number of initiatives
La Rioja	14	26
Catalonia	13	49
Valencia	12	38
Basque Country	10	25
Murcia	10	22
Cantabria	10	12
Navarre	9	19
Extremadura	9	13
Andalucía	6	9
Balearic Islands	6	7
Castilla-León	5	12
Canary Islands	5	8
Galicia	5	6
Asturias	4	8
Aragon	3	3
Madrid	2	3
Castilla-La Mancha	1	1
Total		261

with 10 sectors covered by only 12 policy initiatives. At the opposite end of the spectrum we find Castilla-León (5 sectors covered with 12 initiatives) and Asturias (4 policy sectors covered with 8 initiatives). Clearly, the Spanish regions adopt a widely varying number of initiatives, and these initiatives are applied to a widely varying number of policy sectors.

WHAT ABOUT INTERNET POLICY OUTCOMES?

Specifying the Explanatory Model

To relate the results for regional Internet policies to the rate of Internet usage at the regional level in Spain, we specify a statistical model in which the dependent variable (the use of Internet at regional level) is explained by a function that combines different types of variables at the regional level, basically traditional economic and social variables plus indicators from our public policy initiatives database. Since the direct impact of the new Internet policies is difficult to measure, in our explanation of Internet use we utilize an aggregate indicator, "Internet use," which measures the number of Internet users as a percentage of the adult population in each region. We chose this indicator as the dependent variable because longer series were available, and we chose not to combine it with the number of hosts or PC users for which yearly data series were much less available at the regional level. These data have been available at the regional level yearly since 1997.[4]

As we are interested in the effects of regional policies on the level of Internet use, we have two options for capturing variations of the dependent variable. One option is to focus on Internet growth rates in the regions; the other is to measure the differences between each regional rate and the Spanish mean. The former obliges us to specify a nonlinear temporal model of diffusion (S-shaped), while the latter does not require any such procedure. To specify the dependent variable, we calculate for each year between 1997 and 2003 the mean usage rate among the Spanish regions. Then we compute the differences between each region's Internet usage rate and the Spanish mean usage rate for each year.[5] With this procedure we observe yearly regional divergences from the national mean, and avoid assuming a specific growth pattern for each region. Our dependent variable measures only how many percentage points a region is below or above the Spanish mean for every year between 1997 and 2003. For example, under this approach, the higher value of this standardized measure corresponds to Catalonia in 1998 and is equal to 0.868. This means that in 1998 Catalonia's rate of Internet diffusion was 86.8 per cent above the Spanish mean (in 1998, 4.38% of the Spanish population was using the Internet). The lowest level corresponds to Castilla-La Mancha in 1998 and is equal to −0.726. This means Castilla-La Mancha region had an Internet diffusion rate that was 72.6% below the Spanish mean (also in 1998). Our dependent variable, therefore, measures a region's divergence from the Spanish mean, whether above or below it, for each year, avoiding any specification of the growth path of Internet usage for each region. Thus we are able to measure changes in regions' value as produced by different independent variables, avoiding the inclusion of changes derived from the nonlinear dynamic of growth.[6]

We specify different independent variables in our model to capture social and economic influences and to measure the impact of the policy initiatives on regional differences in Internet usage. After many attempts to employ different regionalized variables to capture the influence of economic and social context on the variations of our dependent variable (the divergence of the standardized regional Internet usage rate from the Spanish mean), we finally decided to control only for two basic socioeconomic variables. These two variables are "GDP per capita" and "educational level," which are explained in more detail next along with other independent variables referring to the policy initiatives that are focused on promoting the Internet.

GDP per capita. This variable is employed to measure the influence of economic wealth on the spread of the Internet, which often has been considered to be the most important determinant of Internet usage rate (Kiiski & Pohjola, 2002; Beilock & Dimitrova, 2003). Our

variable has been redefined in the light of regional variations as a percentage, for each year, of Spanish GDP per capita (we gave Spanish GDP a value of 100 each year). It ranges from 64% (Extremadura in 1997) to 134% (Madrid in 1999). Observe that this procedure is quite similar to the way we present the dependent variable (regional divergences from the mean Spanish Internet usage rate).

Educational level. We measured this variable as the percentage of the adult population that has a university degree in each region. It ranges from 13.7% (Balearic Islands in 1997) to 31.2% (Basque Country in 2002). Although some studies of Internet diffusion show that educational levels are related to the use of the Internet (see, for example, U.S. Department of Commerce, 2002), cross-country comparisons indicate that education is not a statistically significant predictor of Internet diffusion (Kiiski & Pohjola, 2002). Considering an educational system that is similar across regions, we discuss here whether cross-regional differences are significant or not.

Public policy initiatives. This variable refers to the number of policy initiatives identified in each region as documented in our database. It ranges from 1 (Castilla-La Mancha) to 49 (Catalonia) for the period 1999–2002. There is only one value per region for the whole period.[7]

Complexity of the initiatives. This variable measures managerial differences in policy initiatives, according to the degree of complexity we assigned to each type of policy instrument in Table 2. We assign different degrees to each policy initiative in our database according to the type of policy instrument on which it is based. For example, a single isolated policy action is considered to have less complexity than a strategic plan or a broader policy program. This variable shows the average complexity of the initiatives launched in each region, and there is only one value per region for the whole period, with the mean of all initiatives in a region taken into account; data have been normalized from 0 to 1.

Intergovernmental relations. This variable measures the proportion of policy initiatives per region that are designed within a formal relationship with other governments (local governments, other regional governments, or the central government). There is also a value per region for the whole period.

Planning. This variable measures the presence of a strategic plan for the development of the Internet, for any region and any year from 1997 to 2002. This is a dummy variable, with a different value for each year and each region. We assumed that such plans would need some time to take effect; accordingly, the variable has been lagged by one year.

Institution. This variable refers to the presence of a specialized regional public organization, with a clear, specific identity, dedicated to fostering the information society and Internet from 1997 to 2002. This is also a dummy variable, with a different value for each year and each region. We assumed that such organizations would need some time to take effect; accordingly, this variable has also been lagged by one year.

Targeted groups. This variable measures the client orientation of policy initiatives carried out in a region. We identified only three different cases for this variable: (1) initiatives that are specifically targeted to a concrete group; (2) initiatives that are targeted to the whole citizenry; and (3) initiatives that are targeted directly to the public administration.

Once we have specified the variables that we bring into play, and after confirming that the regions with high scores on the socioeconomic variables have rates of Internet usage above the Spanish mean, we propose to test our two basic hypotheses with the regression models. Our first hypothesis maintains that the regions with higher levels of public policies in that area would have also higher values of Internet usage, independently of their socioeconomic level; the second one holds that some characteristics of Internet public policies are influential enough to have a major impact on regional levels of Internet usage.

Assessing the Role of Public Intervention

In this section we examine several explanatory models, based on regression analysis, using the variables previously detailed. The models are shown in Table 6. In the simplest model (1), we try to explain differences in regional levels of Internet use by means of socioeconomic variables only. Using GDP per capita variations and educational levels for all the regions in the period 1997–2003 as the only independent variables, we find we are able to explain about half the yearly divergence of Internet regional usage rates from the Spanish mean. We also find that the educational level is not significant for the model, although it has some influence on the overall results. Speculating on why education is not significant is beyond the scope of this article, but the results probably reflect the impact of the relatively high levels of Internet usage in some regions that specialize in tourism, such as Canary Islands or Balearic Islands, which have low educational levels. All in all, however, there is no doubt that regional wealth is the variable that has the strongest influence on Internet usage levels.[8]

From this baseline, we wish to explore the extent to which the results change when certain policy variables are added to the model. Thus we analyse the contribution of public policy to the variations in Internet usage rates for our regional comparison. A more detailed model (2), in which we include GDP per capita, education, and the number of

TABLE 6
Regression models (regional differences to Spanish Internet users rate as dependent variable)

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5
Control Variables					
GDP per capita	.0106***	.0101***	.0105***	.0087***	.0085***
	(.0010)	(.0009)	(.0010)	(.0011)	(.0011)
Education	−.0016	−.0018	−.0017	−.0046*	−.0079***
	(.0023)	(.0022)	(.0022)	(.0023)	(.0022)
Public policy variables					
Number of initiatives (log)		.0673***	.0749**	.1117***	.2221***
		(.0187)	(.0238)	(.0254)	(.0310)
Institutional character					
Planning (lagged 1 year)			.0508	.0202	.0476
			(.0555)	(.0540)	(.0497)
Institution (lagged 1 year)			−.0978	−.0436	−.1552*
			(.0626)	(.0632)	(.0610)
Complexity of initiatives					
Quality				.0555*	.2214***
				(.0011)	(.0392)
Intergovernmental relations				.0036***	.0065***
				(.0270)	(.0065)
Focus of the initiatives					
Targeted on specific collectives					.8188***
					(.1519)
Targeted on public administration					1.0570***
					(.2791)
Constant	−1.0061***	−1.1011***	−1.1616***	−1.2565***	−2.4488***
	(.1100)	(.1081)	(.1156)	(.1304)	(.2502)
R^2	.506	.5557	.5552	.608	.691
Adjusted R^2	.4975	.5441	.5459	.5839	.6655
F	59.41	47.95	29.37	24.66	27.09

*$p < .05$, **$p < .01$, ***$p < .001$.
Standard errors in parenthesis.

policy initiatives for each region, can explain 55% of the variability of the dependent variable, 5 percentage points more than model 1, and we also find the policy variable highly significant. The result of model 2 shows that if we consider only the number of regional policy initiatives, Internet usage level is directly proportional to the number of initiatives launched. Alternatively, when we look at the relationship between the number of policy initiatives and the Internet usage rate (regional deviations each year from the Spanish mean), we obtain a relatively high Pearson coefficient of Correlation of .34. In addition, from these results, we infer that more details about the nature of the policy initiatives could improve the fit of our model.

Next, we investigate whether the inclusion of more variables related to public policy significantly improves our model and whether we can identify which policy characteristics have a stronger influence in promoting Internet

diffusion at the regional level. We wish to test three different types of variables related to different aspects of Internet policy: (1) their institutional character, (2) the complexity of the initiatives, and (3) the focus of the initiatives.

For the institutional variables, we consider whether the previously defined "planning" and "institution" variables have the effect of producing a better adjustment than the previous model, model 2. Thus we present model 3, in which we find that there are no improvements and that these two variables are not significant. A first conclusion from these results might be that launching strategic plans and creating specific agencies does not seem to have the effect of improving the level of Internet usage at the regional level vis-à-vis the national mean.

Our next step focuses on the complexity variables, which describe the nature of Internet policy initiatives. Specifically, we add the variables of "complexity of

initiatives" and "intergovernmental relations" to model 3, resulting in model 4. We find that both variables are highly significant in model 4, and improve the explained variance in differences in regional levels of Internet usage by almost an additional 5 percentage points. When we exclude the variable "number of public policy initiatives" from the model, the remaining complexity variables are no longer significant and do not strengthen that part of the explanation provided by socio-economic variables. Thus the number of initiatives and the complexity variables appear to have a compound effect in explaining the increase of variation (together they add 10 points to the *R*-squared we found in model 1). In any case, our findings show that these variables are relevant: Regardless of the number of policy initiatives launched to foster the Internet in each region, more sophisticated initiatives produce better results than simpler ones. The role of the "intergovernmental relations" variable, a second measure of complexity, is also highly relevant and we could infer that multilevel policy initiatives have a highly positive impact on fostering Internet usage levels, despite their typically higher coordination costs.[9]

Finally, we examine the more complete model 5, in which we include two variables related to different "targeted groups." These variables measure the groups to which Internet policy initiatives are directed, and we observe that they are positively significant in the model. Also, the addition of these variables to model 4 permits a significant increase in the proportion of variance explained, reaching 70% of the dependent variable. Policy initiatives directed at specific groups have more intense impacts on the levels of Internet usage than policy initiatives directed at the general population. We also observe a significant effect when an initiative is targeted directly to the public administration sphere (i.e., e-government, e-procurement, e-democracy). This means that those regions that targeted proportionally more initiatives to specific groups or to the public administration itself had significantly higher rates of Internet use than those regions that did not do so. However, it is not easy to interpret these results; on the one hand, we could attribute them to be the demonstration effect of the public administration itself using the Internet in its economic and social environment; on the other hand, there is no doubt about the important role that stimulating directly targeted groups can have on creating new foci of attraction for Internet users.

CONCLUDING REMARKS

In this article we have developed a framework for the analysis of Internet policies that allows us to understand differences in the degree of Internet penetration among Spain's 17 regions (in relation to the national mean), using variables such as levels of education and economic development, and the nature of public policies designed to foster Internet use. Although income-driven factors could play a significant role in explaining the difference in the level of Internet usage (50% of the variance was explained by socioeconomic variables), we found that different policy variables also contributed significantly to explain Internet usage differences in the Spanish regions.

A detailed statistical analysis suggests that the quantity and complexity of initiatives is more important in explaining the level of Internet usage in a given region vis-à-vis the Spanish mean than the presence of a strategic plan or of a single-purpose promotion and implementation agency. These results suggest that the introduction of strategic plans and the establishment of new specialized agencies during these years are more related to emulation processes than to effective learning based on a study of the results obtained by pioneering regions. In other words, we found no clear effects from strategic planning for Internet expansion or setting up new agencies, but a clear impact was found when we observed the level of activities measured as the number of policy initiatives for each region during the period examined. In addition, more complex initiatives had more intense impacts than simple ones on the regional Internet usage rate, and policy initiatives based on intergovernmental relations had more intense impacts than those based on a single level of government. The lack of significance of institutional characteristics is intriguing, as one might have expected that handling a large number of complex and targeted policies would require institutional preconditions to be met.[10] However, in an emerging policy field like this, direct efforts to drive policy are probably more important than the creation of new organizations for implementing them, and more can be done to gear up existing institutions to meeting the policy objectives.

These are highly relevant results in so far as they shed some light on the effectiveness of public policies in this area. Recognizing that our indicators of public policy are not the best possible (but the only reasonably reliable ones that we were able to obtain), we conjecture that stronger indicators—like the volume of economic resources invested in this policy—could explain a larger share of the variance in the dependent variable. Thus, to our original question of whether public policy matters for the development of the Internet, our answer is definitively "yes."

NOTES

1. Gibbs, Kraemer, and Dedrick (2003) provide a conceptual framework of factors relevant to a cross-country comparison of e-commerce diffusion.

2. Although we deal with aggregate data, we do not address directly the issue of the digital divide (Norris, 2001; OECD, 2001). However, some implications related to the territorial dimension of the digital divide can be derived from our analysis.

3. In June 2002 Spain had a residential usage rate of 29.5%, compared with 40.4% for Europe; more than 2 years later, in September 2004, we still found a difference of more than 10 points: 34.2% in Spain compared with 44.7% in Europe (http://www. internetworld-stats.com/stats4.htm#eu, accessed June 30, 2005).

4. The data source for Internet usage is the AIMC panel. It has provided regular data for Internet users in Spain since 1997, which is reliable also at the regional level on a yearly basis. Data are accessible online (http://www.aimc.es, accessed June 30, 2005).

5. We finally standardized this coefficient (from −1 to 1) in order to have data that are comparable among different years, with the Spanish mean for each year taken as zero.

6. We should note that from 1997 to 2003 the differences among regional rates of Internet usage progressively fell. The dispersion was smallest in the last year. This effect is easy to understand: As the average usage rate grows, the percentage regional differences in Internet usage diminish. This variance reduction in the dependent variable can somewhat distort the regression results.

7. To obtain a better fit in the model we have estimated (approaching a normal distribution), these data have been normalized by a logarithmic transformation.

8. When we add another control variable such as regional population (size), we find the new variable is significant, but R-squared does not increase strongly (it reaches .55).

9. To confirm the role of Internet policy variables we ran the model without the control variables (GDP and education), and still obtained an R-squared of .52, which has the same significance for all the policy variables as the original model 4.

10. We also checked model 5 without the two institutional variables, and found that all the remaining variables were highly significant, and the variation explained fell only a few points (R-squared: .645).

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