

THE .IT REGISTRAR MARKET

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ABSTRACT

In order to analyze the diffusion of the Internet in Italy we have used the number of Registrars as indicators. The Registrant requests the registration of a new domain name through a Registrar accredited by the Registry.

The data are extracted from the databases managed by the Institute of Informatics and Telematics (IIT) of the National Research Council of Pisa (IIT-CNR). Furthermore, in this article we want to identify which are the factor contributing to the differences about Internet use (digital divide) in Italy.

To define the factors that determine the digital divide we have used the regression multivariate model by using the stepwise method. The dependent variable taken into consideration is the penetration rate (PR) at the regional level and the independent variables are regional economic, cultural, demographic and technological factors.

Our research, in line with other studies concerning this field in Italy, shows that few regions and few provinces are specialized in ICT services provision, compared to the national average. Above all the regions and the provinces with a low jobless rate and with high economic values such as for example added value per employee and high per capita income. The level of education in regions is a decisive factor, as a matter of fact, regions with a high number of graduates specialized in ICT fields are more inclined to utilize the Internet technology than those that register a number of ICT graduates below the average.

Keywords

Domain names, Digital Divide, Diffusion of the Internet, Registrars

1. INTRODUCTION

The Internet has become the protagonist of our days. A simple definition that analyzes the Internet diffusion process states, “any entity (household, individual, or firms) is considered connected to the Internet if it has the capability of communicating with other entities (information in and/or information out) via the physical structure of the Internet ” (Greenstein, Price 2003). This article analyzes diffusion of the Internet in Italy by using as indicator the number of registrars that register domain names under the ccTLD .it. The Web has undeniably entered our everyday life forcefully, ceasing to be an instrument used by a limited circle of academics to become a new and versatile example of mass media. As a matter of fact, according to Greenstein, Price, 2003 the Internet “has relative advantages along many dimensions”. It provides written communication that is much faster than ordinary postal mail, it allows for purchases on line without a direct interaction with the shop, and increases the speed of information gathering. The Internet is also easy to use (for example from a PC of a friend or at work), easy to observe, and compatible with consumers’ needs (information gathering, communication speed). Furthermore, its complexity is decreasing considerably. All these attributes have contributed to an increase in the diffusion of the Internet. According to Greenstein, Price, 2003 there are five attributes which, on average, are considered as the most influential for speed of adoption of a technology across different types of users: relative advantage, compatibility, complexity, trialability, and observability. Any increase in the relative advantage over the previous technology, the compatibility of the new technology with the needs of potential adopters, the ability of adopters to experiment with the new technology and the ability of the users to observe the new technology, are all attributes that will speed up the diffusion process. In a similar way, Rogers, 1995 affirms that any decrease in technological complexity will accelerate the diffusion process and according to other sociological literature authors, the heterogeneity of the adopters will decrease when technology is spread and becomes user friendly (Roper Starch, 1998, Clemente, 1998, Bimber, 2000, NTIA, 2000). However, even if the Internet has the above mentioned advantages not everyone exploits them. According to Greenstein, Price, 2003 Internet distribution is not geographically uniform in a country. “Specifically, we see differences between rural and urban areas” (Greenstein, Price, 2003). According to these authors, people living in rural areas might find greater relative advantages from the use of the Internet than people living in urban areas. However, rural citizens are less motivated to use the Internet as they find the new mass media more difficult to try out or observe and possibly more complex if they have less experience with PCs.

According to Jiminez, Greenstein, 1998, the heterogeneity of potential Internet users strongly depends on the diffusion of personal computers. According to Strover (2001) low Internet adoption is caused not only by factors such as lower education and income levels, but also by socioeconomic factors and by low levels of technological knowledge. Greenstein, Price, 2005 infer that rural citizens are less inclined to use the Internet because of lower income and education levels and lower technological knowledge compared to those living in urban areas. Furthermore Wilhem (2000), indicating the significant differences of the Internet use among different ethnic groups (the research was performed in the United States), states that access to telecommunications instruments and absence of easy access to Spanish language contents, indicate low rate of Internet use among Hispanics. Taking into account the literature, this article verifies if in Italy it is possible to sub-divide Internet users on the basis of the categories proposed by the generic diffusion theory of a technology: innovators, early adopters, early majority, late majority, and laggards (Greenstein, Price, 2005, Rogers, 1995). Furthermore, in this article we define the factors contributing to the differences in Internet use (digital divide) in Italy at a provincial level. In conclusion, the following hypotheses are verified:

H1: The adoption is higher in areas where income level is high;

H2: The adoption is higher in areas where education level is high;

H3: The adoption is higher in areas where the jobless rate is low;

H4: The adoption is higher in urban areas than in rural ones.

H5 The probability of adoption is higher in areas with higher technological knowledge.

2. METHODS

In order to analyze Internet diffusion in Italy we have used as an indicator the number of registrars registered up until 2005-12-31. The data are extracted from the databases managed by the Institute of Informatics and Telematics (IIT) of the National Research Council of Pisa (IIT-CNR). The IIT, on the basis of its high level technical and scientific expertise, obtained in 1987, the management of country code Top Level Domain (ccTLD) .it from IANA (Internet Assigned Numbers Authority)/ICANN (Internet Corporation for Assigned Names and Number, internationally organized, non-profit corporation that delegates the management of ccTLD and generic Top Level Domains - gTLD).

The database managed by IIT until 2005-12-31 counted 2,693 registrars of which 2,552 were Italian and 141 foreign. The registrars that have been considered in this analysis are the service companies that have an active contract with IIT and therefore offer, as a service, the registration of domain names under the ccTLD .it.

The choice of using registrars as indicators instead of, for example, the number of domain names, which is one of the indicators most used in the literature (Naldi, 1997; Zook, 1999; Bauer, Berne and Maitland, 2002) together with the hostcount (see studies published by Internet Software Consortium or by RIPE-NCC), derives from the fact that the number of registrars is an indicator that appears to be more effective in order to identify the real extent of the Internet phenomenon in Italy. In fact, registrars, in addition to registering domain names, can supply other services related to ICT, such as Internet connectivity, selling of hardware and software products, electronic mail services, website design, and so on. However, much international research on Internet adoption and diffusion have taken into consideration the number of Internet Service Providers (ISP) existing on the territory (Downes and Greenstein, 1998, 2002; Greenstein, 2000a, 2000b). One of the advantages of this choice is to have a good geographic characterization of the phenomenon and to have the possibility of measuring the positions of single provinces and regions. On the contrary, it is not possible, except by means of targeted questionnaires, to single out the characteristics of Registrants (individuals, households, firms, and so on). This research intends to achieve two main goals. On the one hand, to analyze the extent of the Internet phenomenon in Italy, through which we can compare the Italian situation with the international one and on the other hand, to identify the situation of Italy within the international ranking of Internet use. The grouping of data at regional and provincial levels allows comparison of the penetration and specialization rate of registrars in single geographical areas and measures the possible technological gap (the so-called digital divide). Moreover, it defines the factors that cause the digital divide in Italy. The second purpose of this research is to identify in which geographical areas, among the registrars, there are the highest number of domain name registrations. This establishes the specialization rate of registrars in the domain name registration service supply and determines if in Italy there exists a competitive market in the domain name registration field.

It is necessary to highlight that in this research we will examine only data concerning the number of registered domain names. Some registrars, as matter of fact, focus their business on other types of services such as the xDSL access supply for retail customers, hardware and software sales, VoIP services or e-commerce and so on.

3. RESULTS

The indicators used to identify in detail the existence of the digital divide in Italy at the provincial and regional level and in macro-areas, are the penetration rate (PR), the specialization rate of a geographical area in ICT services supply (TS1) and the specialization rate of registrars in domain name registration (TS2): entries that allow to analyze in detail the existence of digital divide in Italy at provincial and regional level and in macro-areas (North, Center, South). As penetration rate we have used the ratio between the number of registrars and the number of service companies existing in Italian national territory:

$$PR = \text{penetration rate} = \text{number of registrars} / \text{number of service companies} \times 100$$

As specialization rate of a geographical area (TS1) in ICT services supply, we have used the ratio between PR at provincial and regional level and PR at national level:

$$TS1 = \frac{\text{number of registrars/ service companies per geographical area (province, region)}}{\text{total number of registrars/ service companies at national level}}$$

The specialization rate is much used in economics literature (Zook, 2001).

Zook has measured the existence of the digital divide among firms in the United States by using as indicator the so-called Domain Name Specialization Ratio. According to Zook the "Domain Specialization Ratio" can be referred to as "a useful technique for comparing regions which indicates the extent to which a region is specialized in domain names compared to the United States as a whole" (Zook, 1999). The specialization rate can be greater than one, equal to one or lower than one. An index value greater than one indicates a high specialization in ICT services supply in a particular geographical area (macro-area, province, region) compared to the national average, while an index value lower than one indicates a low specialization. In order to identify maintainer specialization in the registration of domain names registered under the ccTLD .it, we have calculated the specialization rate (TS2). It is calculated in the following way:

$$TS2 = \frac{\text{number of domain names registered by registrars in a geographical area/ number of registrars in that geographical area}}{\text{total number of domain names registered by Italian registrars/ number of Italian registrars}}$$

Also in this case, an index value greater than one indicates a high specialization in domain name registration compared to the national average, whereas an index value lower than one indicates a low specialization.

Our research shows that in Italy, only some regions register the highest penetration rates. In particular northern and central regions register penetration rates greater than one. Southern regions, except for Campania, are all below the twentieth position. In order to reach the second purpose of this research, we have taken into consideration the number of domain names registered by registrars under the ccTLD ".it". However, even if we are taking into consideration the above mentioned indicator, the digital divide proves to be significant. Only some regions of the North and of the South register, on average, many domain names; there is scarce propensity by the South except for Sardinia, which proves to be the first region that registers, on average, the highest number of domain names.

Through our research we have obtained the important result of identifying the degree of concentration of the number of domain names registered by Italian registrars in the different regions. In order to achieve this, we have used as indicators two concentration indexes: the Herfindahl-Hirschman index (HHI) and the Ghini concentration index. The HHI index, widely used in literature, measures the degree of competition in the market. Let us suppose an industry with N firms and suppose it is possible to measure the market share of each firm. HHI is calculated by adding the square of the market shares of each firm and can be obtained through the following formula:

$$HHI_k = S_1^2 + S_2^2 + S_3^2 + \dots + S_k^2$$

where S_k is the market share of a firm measured in percentage terms. For example, in the case of a market formed by four firms with shares respectively of 30%, 30%, 20%, 20%, HHI is equal to 2600 ($30^2 + 30^2 + 20^2 + 20^2$). The index is structured in a way that it increases both when the number of firms in the industry decreases and when the gap between firm size widens. An HHI index lower than 1000 indicates a market that is close to a competitive context. The markets in which HHI ranges from 1000 to 1800 are usually considered moderately concentrated. If HHI is greater than 1800, the degree of monopoly power becomes more significant. The HHI index at national level is equal to 542.75, this shows that, at national level, there are registrars that are similar in size (in terms of registered domain names). Therefore it is not possible to talk about monopoly, and moreover the number of firms at national level proves to be high (2552 registrars). Another concentration index used in this analysis is the Gini index. The Gini index is 0 if we are in a situation of even distribution. This means that if we take into consideration, for example, income distribution in a country, all individuals will earn the same level of national income. The index is equal to 1 if there is the maximum concentration. This happens exclusively when it is only one individual that earns the entire amount of income. The Gini concentration index, unlike HHI, is a standard index (in statistics a standard index ranges from 0 to 1 and from -1 to 1). As a matter of fact it ranges from 0 to 1. Because of this feature, this index is widely used in statistics literature because it renders better the concentration measurement in concrete situations and above all, it is better for comparing the degree of concentration among heterogeneous situations. The Gini index at national level, calculated on the basis of the number of registered domain names, is equal to 0.87, which indicates that the index, although very high, does not reach the unit. Therefore, it is not possible to talk about maximum concentration, that is to say, it is not possible to state that only one maintainer registers all the domain names under the ccTLD ".it" in Italy. However, the index that is equal to 0.87, is justified by the fact that only ten registrars out of 2,552 register 46.30% of domain names. The analysis of concentration is clearer if we analyze in particular the three macro-areas (North, Center, South). There is no doubt that there exists a difference concerning the concentration level in the three macro-areas. In the Center, the Gini concentration index and the HHI concentration index are high and quite significant in depicting a situation of monopoly in the market of domain name registration. The Gini index equal to 0.93 and close to the unit, shows that only few registrars register the total

amount of domain names under the ccTLD .it. As shown in the table, the variation field and the standard deviation turn out to be higher than that in the North and South, although the Center has a lower number of registrars than the North and South. As a matter of fact, if we analyze data at an individual level in the Center, only two registrars out of 561 register more than half the domain names, 55.10% out of the total amount of domain names registered by the registrars of the Center. This result can be proven also by observing the index that measures competition in a market of reference (HHI). HHI in the Center is greater than 1800, this means that, as mentioned above, in the Center the degree of monopoly power is relevant. The North, on the contrary, is the macro-area in which there is more competition compared to the other macro-areas. As a matter of fact, analyzing the two concentration indexes, the HHI and the Gini index, we can see that they are lower than in the Center and in the South. The Gini is equal to 0.78 and 'HHI is equal to 103.51. In fact, if we observe data at an individual level, the first two registrars of the North register only 7.8% of domain names under the ccTLD “.it”, compared to the Center, where the two first registrars register more than 50% of domain names of the total amount of the Center.

In conclusion, the Center in comparison with the North and South is less competitive.

3.1 Factors that cause the digital divide

To define the factors that cause the digital divide we have used stepwise regression, taking into consideration the penetration rate as a dependent variable (PR) at regional level and as independent variables economic, cultural, demographic and regional technological factors. Stepwise regression is a combination of Forward selection¹ and Backward elimination². In our research we define four models:

-Model 1, which takes into consideration as independent variables economic factors; model 2 which takes into consideration cultural factors; model 3 demographic factors and model 4 technological factors.

The economic factors that have been taken into consideration in this analysis are: added value per employee, total added value, total income, per capita income, total amount of tourist businesses, firms with >= 250 employees, patents every 100 firms, entrepreneurial density every 100 inhabitants.

Table 1. Regression Model 1 results. Hypothesis H1
R² = 0.703

| Model | | Unstandardized coefficients | | Standardized coefficients | t | Sig. |
|-------|-------------------|-----------------------------|------------|---------------------------|-------|-------|
| | | B | Std. error | Beta | | |
| 1 | (Constant) | 0.139 | 2.401 | | 0.058 | 0.955 |
| | Per capita_income | 0.001 | 0.000 | 0.646 | 4.452 | 0.000 |
| | Total_added_value | 1.954E-05 | 0.000 | 0.330 | 2.272 | 0.036 |

Dependent variable: penetration_rate_registrars

Table 1 shows that the only two economic variables that express the linear relation with the penetration rate are the total added value and per capita income. The remaining variables do not express in a significant way a linear relation with the penetration rate. Our results agree with what the economic literature (Chinn and Fairlie (2004) Hargittai, 1999; Guillèn & Suarèz, 2001, Maitland & Bauer, 2001, Norris, 2001): economic values such as per capita income are the factors that greatly affect Internet diffusion in a country. This means that regions with a high per capita income are in the first positions in the Internet use ranking. Model 1 explains approximately 70% of total variability (R² = 0.703), the fit to the model³ proves to be good and significant.

-Model 2, takes into consideration, as independent variables cultural factors, that is to say number of ICT graduates, number of graduates, number of ICT graduates every 100 graduates, employees involved in research and development. According to the economic literature (Hansons (2000)) education consolidates skills necessary for Internet use, characterizes professions that encourage Internet use and pastimes that motivate its use. According to the AMD Global Consumer Advisory Board (2002) in Germany the type of education received is one of the most discriminating elements affecting use of the Internet: 86% of people with a University degree by the year 2000 were on-line against 8% of people with a lower education level. In China education seems to be more discriminating than income. In Korea the gap between users with a university education level and users with lower education is of 40%. Other studies on the digital

¹ We start by taking into consideration the model that includes all the variables. A level of significance is fixed. The variable with the lowest significant regression coefficient is eliminated, therefore we estimate the remaining variables coefficients and the procedure is repeated until when there are no non-significant variables left in relation with the preset level.

² We start with only one variable, the one with the greater significant correlation (test t) with the dependent variable. A level of significance is fixed. The second variable that has to be inserted is the variable with the greatest and most significant partial correlation coefficient, then we insert an independent variable. The procedure ends when the partial correlation coefficient of the last inserted variable is not significant anymore in relation with the preset level; the final model is the one obtained with the second last step.

³ R² indicates the fit to the model of reference.

divide draw the same conclusions. Chinn & Fairlie, 2004, Norris, 2001 find that the education level of a country together with the average standard of living are important factors that affect Internet use. Robinson et al (2000b), after multivariate controls, affirm that the impact that educational level has on Internet use is two times greater than income. Other studies highlight that people that are in the last positions in terms of Internet adoption have a lower education level and income in comparison with people that are in the first positions (Howard et al, forthcoming, Katz et al, forthcoming). Moreover, De Arcangelis et al., 2002 show that in addition to economic variables a high number of employees involved in research and development is a decisive factor that influences Internet use. Table 2 shows that the only variable that expresses in a significant way the linear relation with the penetration rate is the number of ICT graduates at the regional level.

However, as shown in table 2, the fit to the model is very weak and it explains approximately 37% of the variability of Internet diffusion at a regional level ($R^2 = 0.370$).

Table 2. Regression model 2 results . Hypothesis H2

$R^2 = 0.370$

| Mode 1 | | Untandardized coefficients | | Standardized coefficients | t | Sig. |
|-----------|----------------------------|-------------------------------|------------|------------------------------|--------|-------|
| | | B | Std. error | Beta | | |
| 2 | (Constant) | 10.464 | 0.938 | | 11.156 | 0.000 |
| | Number_of_ ICT _gradiuates | 0.003 | 0.001 | 0.608 | 3.249 | 0.004 |

Dependent variable: Penetration_rate_registrars

- Model 3 takes into consideration demographic factors. In the economic literature Bimber (2000) states that income level and other resources are important but the status of employees with a permanent job affects Internet use in a country. According to Greenstein and Price (2003) inhabitants of rural areas are less inclined to use the Internet than those living in urban areas. According to Kraut et al (1996) teenagers are more online than adults when they have Internet access at home. Our research attempts to verify if also in Italy demographic factors are significant in relation with Internet diffusion. In order to achieve this goal we have extracted population, the percentage of men and women (to verify for example if regions with a higher percentage of men are more inclined to use the Internet than other regions that have a higher percentage of women), population density per Km² and the total amount of foreign people at regional level. Table 3 shows that the significant model that explains variability regarding Internet diffusion at regional level in Italy is constituted by independent variables such as jobless rate and population. The other variables analyzed in the model have been eliminated as scarcely significant. Results are shown in table 3. The model proves to be significant. As expected, the correlation between penetration rate and jobless figures proves to be negative and rather different from zero (Beta is equal to -0.750). Therefore our research is in accordance with the economic literature (Bimber, 2000) and shows that job status in Italy affects Internet diffusion and also in Italy urban areas, as stated by Greenstein and Price, are more inclined to use the Internet.

Table 3. Results regression model 3. Hypothesis H3-H4

$R^2 = 0.733$

| Model | | Unstandardized coefficients | | Standardized coefficients | t | Sig. |
|-------|------------------|--------------------------------|------------|------------------------------|--------|-------|
| | | B | Std. error | Beta | | |
| 3 | (Constant) | 15.361 | 1.034 | | 14.851 | 0.000 |
| | Penetration_rate | -0.599 | 0.100 | -0.750 | -5.969 | 0.000 |
| | Population | 7.119E-07 | 0.000 | 0.474 | 3.768 | 0.002 |

Dependent variable: Penetration_rate_registrars

In order to define the technological factors that cause the digital divide in Italy we have taken into consideration different indicators: the degree of digitalization calculated as weighted average by the indexes of territory coverage of infrastructures and connectivity services, such as optical fibre and broadband (ADSL, HDSL, SHDL) (Assinform, 2005), the degree of ICT specialization measured through the ratio between the concentration of ICT employees and the concentration of employees of all productive fields (Iuzzolino, 2001), the employees concentration index measured through the ratio between the number of ICT employees of the region and the number of national ICT employees (Iuzzolino, 2001), investments in IT made by the regions, IT expenditure on the regional added value, IT expenditure per employed person.

- Model 4, as shown in table 4, only one variable has been inserted - "the number of firms ICT every 1000 inhabitants" because it is the only relevant one. It expresses approximately 58% of Internet diffusion variability. As shown by our research and in accordance with the literature (Guillén and Suárez, 2001; Kiiski and Pohjola, 2002; Chinn and Fairlie, 2004) infrastructures play an important role in causing the digital divide in provinces. However, even if the model is significant the fit to the model does not prove to be very high (it explains approximately 58% of the total variable), it is however greater than the model that takes into consideration factors related to education (see table 2). This means that

as the penetration rate registered by single regions increases, there is a slight increase, in a directly proportional way of the number of ICT firms every 1000 inhabitants. That is to say there exists a linear relation but it is not strong.

Table 4. Regression model results 4. Hypothesis H5
R²=0.581

| Model | | Unstandardized | Standardized | | t | Sig. |
|-------|------------------------------|----------------|--------------|-------|-------|-------|
| | | coefficients | Std. error | Beta | | |
| 4 | (Constant) | 0.151 | 2.553 | | 0.059 | 0.953 |
| | Firms_ICT_ogni_1000_abitanti | 7.606 | 1.522 | 0.762 | 4.998 | 0.000 |

Dependent variables: penetration_rate_registrars

5. CONCLUSIONS

Our research, in line with other studies concerning this field in Italy, see Istat, 2006, Assinform 2005, identifies once again a serious issue, the existence of a digital divide in Italy. The penetration rate calculated in relation with the number of registrars and the specialization rate, appears to confirm this trend. Few regions and few provinces are specialized in comparison with the national average in ICT services supply. This true, above all, of regions and provinces with a low jobless rate and with high economic values such as, for example, high added value per employee and per capita income. Educational level in regions is crucial. In fact, regions with a higher number of graduates specialized in ICT fields are more inclined to use Internet technology than those which register a number of graduates in ICT fields lower than the national average. Furthermore, regions that have a higher number of firms specialized in ICT fields in relation to the number of inhabitants, are more inclined to use the Internet.

Therefore, regions and provinces that are in the last positions in economic terms are in the last position in technological terms. This is probably also due to the fact that low economic development is also associated with a lower interest in new technologies and their adoption. These results could be of great relevance in giving a strong impulse to Italian local administrations in boosting underdeveloped areas from a technological point of view and in making substantial investments in ICT technologies in order to reduce the clear gap that exists (at national, regional and provincial levels). As a matter of fact, according to a report drawn up by OECD (OECD, 2005), government policies hold an important position in affecting Internet diffusion phenomenon in a country. According to this report, city plans in a number of areas are necessary to promote competition and the growth of the Internet market (OECD, 2005). According to this report, governments can increase Internet diffusion through policies aimed at the deregulation of the telecommunications market, network interconnections, in those markets in which the regulations permit effective competition in the Internet Service Provider market. Furthermore, although our research shows that the concentration of domain names registered under the ccTLD “.it” is very high, only few registrars register the total amount of domains at national level. As a matter of fact, analyzing the specialization rate, we see that few provinces or regions have a specialization rate greater than the unit. Moreover our research shows that there is a high rate of registrations in those areas where there is absence of competition. The absence of competition has been measured by the portion of domain names owned by registrars in a given geographical area (North, Center, South) and by the number of actors that supply ICT services, registrars, in a given geographical area. Our research, at the macro-area level, shows that in the Center where the competition level is lower than the North and South (HHI index, the index that measures competitiveness in a territory, is greater in the North than in the South) the number of registered domain names on average in this geographical area is greater than the national average. These results are not in line with the economic literature (Greenstein, Price, 2003), which affirms that where there is absence of competition, ISPs are less motivated to intensify their services. However, it is necessary to remember that we have taken into consideration only the domain name registration service. Maintainers could be specialized in other types of services. Moreover, it must be underlined that areas that are more specialized in domain name registration are those that have an economic, cultural and technological competitive advantage over the others. In fact, Greenstein e Price, 2003, affirm that rural area ISPs are less motivated to intensify their services and the presence of infrastructures is stronger in urban areas. In conclusion, we can say that also Italy confirms this trend.

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