Regional Economic Differences as a Driver of Digital Divide

by

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Abstract

This paper investigates the role of the provincial economic situation on the adoption and frequency of use of technology (ICT). To this end, two-stage *Heckman Ordered Probit* models –which allow to control for potential self-selection bias– are applied to microdata drawn from the *Spanish Survey on Equipment and Use of ICTs in Households* for the period 2006-2015. Our results show an important role of regional economic differences –measured by means of the provincial unemployment rate– as a driver of digital divide, which is robust to the inclusion of many socio-economic individual variables. This effect is particularly stronger for the most vulnerable groups, such as unemployed, homeworkers, lower educated, women and individuals living in small towns.

JEL classification: I25, I28, J24, J28, O52.

Key words: ICT, Computer adoption, Computer usage, Internet adoption, Internet usage, Digital Divide, Unemployment

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1 Introduction

In Spain, a 75.9% of households with at least one member aged between 16 and 74 have a computer in 2015 (INE, 2015). This percent is slightly higher (1.1) than the previous year. During the last years, the number of population with computers are increased. 56% of individuals in Spain use computer in 2006, after 9 years (2015) the number has increased in 22% (EUROSTAT, 2016). It seems that the digital divide is decreasing, considering as this term refers to the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities (OECD, 2001). A 64.3% of population use Internet every day in Spain (INE, 2015) but Internet access may not necessarily imply it use, as individuals should have a certain knowledge of digital skills and abilities to use Internet services (DiMaggio et al. 2004). According to Internet World Stats the number of users has gone to 3,675 million in June of 2016, this means that the penetration rate is 50.1%, most of them come from Asia.

In this framework, there are two important factors to take in account. First, the possibility to have a computer, secondly, the possibility to have an access to Internet, Chinn and Fairlie (2006) expressed his views like" both closely related to the telecommunication infrastructures, which are important, but are not terribly important for the Internet digital divide—rather it is more critical to the computer divide". In this sense, it is necessary have a computer or another telecommunication device in order to get access to Internet. In order to analyse the digital divide, this could be proved by using a correlation analysis considering computer and Internet using, which show correlation between this factors (0.6949). If we consider this factors in terms of using, the correlation is even stronger (0.8945). But we have to take in account that getting access do not imply use (Ono and Zavodny 2007). The digital divide is mainly depending on the income differentials (Chinn and Fairlie, 2006). Income and education are important determinants of computer ownership and Internet use (OECD, 2001). So, we can observe different socio-economic characteristics are keys to understand the digital divide (see, e.g. Ono and Zavodny 2007; Orviska and Hudson 2009; Vicente and López 2011). Income as one of the major drivers of these digital inequalities on access, together with education, gender, and age (e.g. Chaudhuri, Flamm, and Horrigan 2005;

Vicente and López 2006; OECD 2001). Otherwise, Internet cost is an important barrier to go online for low-income individuals (Goldfarb and Prince 2008). In this paper, we analyse the effect of an unemployment rate in the technology using (computers and Internet) and measure the differences between provinces. This macro indicator is appropriate because we can observe a strong positive relationship between technology use and income across countries and within countries (OECD 2001). Results for the European Union show that the influence of GDP per capita and R&D intensity is positive and significant in explaining Internet usage (Demoussis and Giannakopoulos 2006; Vicente and López 2006). The using of technology depends, mainly, from the income and purchasing power, so in provinces with more unemployment this indicator is lower and the technology using is less in comparing with other in better situation. Empirical evidence shows that the higher the education and income levels, the higher the probability of Internet use (Goldfard and Prince 2008; Ono and Zavodny 2007; Rice and Katz 2003). As well, the benefits and utility from Internet use vary according to economic status and education level (OECD 2007). Otherwise, we consider more indicators a part of employment situation, such as education level, gender, age, size of town, immigration, province during a period considered.

The data set we use comes from "the Spanish Survey on Equipment and Use of ICTs in Households for the period from 2006-2015. For its analysis, we use a Heckman Ordered Probit econometric model, which allow us estimate the frequency of use of computers and Internet in two stages: use or no use (no use considered as no use for more than a year) and if use, how much? (Less than 1 year but more than 3 months, less than once a week, every week, every day). These two-stage model allows us fix the self-selection problems. We have done a test that allows us to compare the ordered model, and the ordered Heckman, the results shows that the second one is better than the first one.

Our study shows different results, but the main one is an existence of a digital divide in terms of using computer and Internet based on the following attributes. Women use less technology than men. High-aged people, immigrants, low-educated use less as well. Considering the employment status, we observe than unemployment, house workers and pensioners use less. Students use more ICTs. Among those workers who use the internet, self-employed people use it more frequently than salaried employees. In case of provinces,

we found significant effects. Using Huelva as a reference, most of the provinces present greater use of ICTs. Provinces with similar or inferior use are Melilla, Zamora, Segovia, Pontevedra, Lugo, Jaén, Cuenca, Ciudad Real, Cadiz, Badajoz or Avila. The period that we consider is 2006-2015, and we observe an increment of use through the years.

Our study contributes to the existing literature by analysing the differences between provinces, using a macro indicator (unemployment rate) per province and per year, so we can quantify the digital divide in provincial terms.

The reminder of the papers is structured as follows. Section 2 provides an overview of technology (computer and Internet) using worldwide. Section 3 we explain the data set and the methodology. In Section 4 we offer and discuss the results of our empirical analysis. Section 5 concludes.

2 Computer and Internet adoption, usage and employment effects

It has been published many different studies about the ITCs usage, otherwise more of them were focused in Internet. The Internet penetration rate has increased quickly over the last decade. Most of them identified that the most important driver is income (Chinn and Fairlie 2006, Vicente and López 2006, OECD 2007, Campos, Arrazola and de Heiva 2016). However other factors such as gender, education or age are significant as well. Chinn and Fairlie discover that the telecommunication infrastructure was so important in the disparity of Internet using between United States and Sub-Saharan Africa. Otherwise, the price of telecommunications access, statistically, don`t mean a barrier. Quality regulation was identified as an important driver comparing most developed countries, such as United States, with other as Sub-Saharan Africa. They also emphasize the positive correlation between education level and ITCs usage.

Likewise, Goldfard and Prince explained that income and education are high correlated with the probability of ICT adoption, but they confirm a negative correlation

referring to total of hours spending in social activities, proving it by the availability of more leisure time, such as chat, games and health information.

Considering labour situation, Campos, Arrazola and de Heiva (2016) confirm that the Internet access is more complicated for unemployment individuals. However, in terms of using, the results are mixed. Employed individuals use more Internet and high frequency, but the number of services that they demand are less. In case of specific activities for personal purposes, employed individuals use Internet looking for travel services, information and online banking with more probability than unemployed. Nevertheless, the probability of using in order to find health information, phone calls or software downloading are similar. In any case, they explained the importance of income, which is decisive for access and usage, emphasizing that access doesn't mean more intensive use in personal issues. Occupational status shows differences as well, non-ICT and non-manual individuals are more reluctant to be intensive users than unemployed.

Focusing in gender disparities, Gomez, Tobarra and Lopez find that the ICT has an effect on job market in Spain due to qualification level in men and women. In mechanical jobs, it has a negative effect for both, nevertheless in sector with ICT investment, the effect is negative for men and positive for women. In that way, in terms of employability, education and basic ICT skills increase women probability of finding a job due to higher value attached, which means an appearance of new tasks with not physical strength.

At European level, Vicente and Lopez highlighted some similar factors which has a direct effect on Internet and computer use. Education and income are key factors in order to adoption of ICT, an individual with university degree and high income have more probability to use Internet. They also confirm that the digital divide concerns unemployed, high-aged individual and women. Orviska and Hudson confirm that the Internet access depends more on socio-economic characteristics of each country than on individuals. Furthermore, the GNI per capita and rule of law are key factors because of the confidentiality. Otherwise, high education level and low unemployment rate play an important paper in order to Internet access and use, which seems to be more approachable. Focusing in individuals, for young and urban people with high education the probability to get Internet access is higher. In terms of using, high-aged individuals tend to search for health, banking and general information,

on the other hand, leisure activities tends to decrease over the years. Van Deursen, van Dijk and Peters point out that age is a significant factor arguing about Internet using. They confirm that young people have a better predisposition and performance related with the necessary skills in order to use Internet. However, considering content-related skills, the results are mixed. High-aged people tend to perform better than young ones because of the appropriate level of medium skills, but introducing Internet skills, their performance fall because of the predisposition.

In case of Latin America, Nishijima, Macedo and Mori present another intersect factor beside the others below. They show that, apart from income, employment status and education level, the number of household members its important in order to access to ICT. This affirmation is based on the use of a mobile phone and the possibility of getting an Internet access via smartphone, so for households with higher number of individuals the probability of use is less. Beside this, H.A. Botello-Peñaloza analyse Ecuador households and finds that the existence of a telecommunication infrastructure is determinant in order to Internet access. It is easier to get access in urban areas, where the cost of using is less. Furthermore, the gender digital divide is high. The probability to use Internet by women is less likely.

Finally, our study is focused on the regional disparities in Spain, considering all the key factors such as income, education, age and others as well. Lera-López, Billón and Gil (2011) include some regional variables. They confirm the importance of GDP per capita for Internet using, a part of employment status, nationality, age, students and urban situation. Regions with higher GDP are more likely to use Internet. Likewise, they consider the frequency is directly and positively depending on the ICT skills, gender, broadband connection and urban dwellers. Besides, the family structure is another factor which explain the frequency of Internet usage, but seems to have any impact on its use. A part of that, they confirm that the Internet skills, is closely related with the predisposition of learning and the courses which are offered by employers. Another study that consider GDP per capita was published by Vicente and Lopez in 2011. They confirm that higher levels of GDP together to workforce with well-developed skills. Beside, and focusing in our study, they show that

unemployment has a negative relation to the access, considering as well, retired individual (more than 65).

The next section is focused on the micro data analysis and the inclusion of a macro indicator.

3 Data and Methodology

The data we used to perform this study is the Spanish Survey on Equipment and Use of ICTs in Households (ICT-H), which is have been available sin 2002 and accomplished by the Spanish Statistics Institute (INE: Instituto Nacional de Estadística). The reference period that we use is 2006-2015. This survey is annual, the sample size is composed by 2500 census tracts and about 20.000 households. The gathered information is the availability and use of ICT (computer, phones, broadband, etc...), the Internet (its use, availability, and patterns), e-government, e-commerce, electronic skills and social characteristics of individuals as well. Likewise, the data consists in 207.862 observations. We created some Dummies in order to catch different effects in during the period considered.

Firstly, we explain which variables are dependent and which ones are independent. The group of first ones are: Computer availability or not and Internet availability or not at household, if the individual has ever used computer or Internet and their frequencies (not use, a little bit, quite or a lot). The second ones are composed by gender, age, education, employment status, urban municipality or not, origin (immigrants or nationals) and years. We separate education level in Basic, Medium and High levels. The labour situation is divided in unemployed, self-employed, students, house-workers and retired individuals. Otherwise, the possible regional disparities arouse great interest because of the lack of results in this scope, so we introduce an unemployment rate as another variable, substituting the province dummies. However, the time dummies will remain. Finally, in order to understand the behaviour of the labour market, we modified the variable age towards to individuals which are available to work (16-65). (see Table A1 in Appendix for more detailed definition

for all variables we have considered. See Table A2 and A3 for descriptive statistics in terms of employment status and gender).

Following we explain the empirical specification. We mention below that our model is Heckman Ordered Probit. In order to provide the methods and formulas in the correct way, we use De Luca and Perotti (2011) as source.

The ordinal outcome equation is:

$$y_j = \sum_{h=1}^{H} v_h 1\left(k_{h-1} < X_j\beta + u_{1J} \leq k_h\right)$$

Where x_J is the outcome covariates, β is the coefficients, and u_{1j} is a random-error term. The observed outcome values $v_1,\ldots, v_H$ are integers such that $v_i < v_m$ for $i < m$. $k_1,\ldots, k_{H-1}$ are real numbers such that $k_i < k_m$ for $i < m$ is taken as - ∞ and k_H is taken as + ∞.

The selection equation is

$$s_j = 1\left(z_j\gamma + u_{2j} > 0\right)$$

Where $s_j = 1$ if we observed y_j and 0 otherwise, z_j is covariates used to model the selection process, γ is the coefficients for the selection process, and u_{2j} is a random-error term.

(u_{1j}, u_{2j}) have bivariate normal distribution with mean zero and variance matrix

$$\begin{bmatrix} 1 & p \\ p & 1 \end{bmatrix}$$

Let $a_j = z_{j\gamma} + \text{ofsett}_j^{\gamma}$ and $b_j = x_{j\beta} + \text{ofsett}_j^{\beta}$. This yields the log likelihood

$$\ln L = \sum_{j \notin 5} w_j + \ln\{\Phi(-a_j)\} + \sum_{h=1}^{H} \sum_{\substack{j \in S \\ y_j = vh}}^{H} w_j \ln L \{ \Phi_2 (a_j, k_h - bj, -\rho) - \Phi_2(a_j, k_{h-1} - bj, -\rho)\}$$

where S is the set of observations for which y_j is observed, $\Phi(\cdot)$ is the standard cumulative normal, and w_j is an optional weight for observation j.

In the maximum likelihood estimation, ρ is not directly estimated. Directly estimated is atanh ρ:

$$\text{atanh } p = \frac{1}{2} ln \left(\frac{1+p}{1-p}\right)$$

From the form of the likelihood, it is clear that if $\rho = 0$, the log likelihood for the ordered probit sample-selection model is equal to the sum of the ordered probit model for the outcome y and the selection model. We can perform a likelihood-ratio test by comparing the log likelihood of the full model with the sum of the log likelihoods for the ordered probit and selection models.

4 Results and Discussion

After applying our models, we explained our findings in matter of adoption and using of ICT (computer and Internet mainly). Our results are focused in two aspects. In section 4.1 we explain the implications that determine the digital divide in the use of computers and the Internet on the following attributes: gender, age, origin of the individuals, education level, employment status, disparities per province and year. Following, in Section 4.2 we discuss and compare the situation of provinces controlling by the unemployment rate and present an empirical justification of possible differences.

4.1 Determinants of digital divide

Next, we display the determinants which facilitate the digital divide in Spain according to the ICT-H data during 2006-2015. We find eight determinants as key ones. Talking about socio-economic factors, we can confirm that women use less technology (ICT) than men, -3.5% in computer use, -4.3% in Internet use. In terms of frequency the results are even notorious, -12.1% in computer use and -14.6% in Internet use. A possible explanation of this phenomenon could be a reduction of demand of strength labour force and increase of office work (Gomez, Tobarra and Lopez 2014). Focusing on age, older people tend to use less Internet than young ones. A biggest fall we can see using marginals effects band observe an important difference between 36-45 and 45-55 aged individuals in both terms of ICT using. Many times, it is necessary to acquire basic ICT skills in order to use it (DiMaggio et al. 2004, Campos, Arrazola and de Heiva 2016). In terms of origin, in Spain, immigrants are less likely to use technology. -17.8% in computer use and -16.9 in Internet use. A plausible explanation could be the less income or lack of language. Education level is a key, individuals with higher education use more ICT. There are different explanations, but more of them confirm the theory before explained (Goldfard and Prince 2008; Ono and Zavodny 2007; Rice and Katz 2003). We propose another possible hypothesis, the current crisis has modified the labour market, reducing the physical labour force and less educated by another more educated with high technological knowledge. K. Sabbagh, R. Friedrich, B. El-Darwiche et al. expressed his views in this terms: “The demand of ICT services requires high level of ICT literacy and skilled human capital.”. Another key indicator is employment. After analysing our three dummies related to employment status, we can show disparities between students, those who use the most ICT, and unemployment individual, house-workers and pensioners, those who use least. With respect to self-employed and employees, we have identified a difference in use of Internet. Among those workers who use the Internet, self-employed people use it more frequently than employees, the first ones use it 4.3% more. It is interested to mention that the unemployment rate decrease the use of Internet by self-employed (3.3%). Felstead, Jeswon and Walters affirmed that Self-employed individuals usually work at home as well, so this could be a justification of higher use. In year dummies, we find that the digital divide tends to decrease through over the years, that means a greater openness of technology to individuals.

These results, while expected, are interesting insofar as we can quantify differences in use between groups.

4.2 Disparities between provinces in Spain

The differences between provinces catch our attention, so we delve in the determinants of disparities between provinces. In order to achieve this purpose, we create the variable unemployment rate, which captures the unemployment situation per province and per year. We introduce this variable in our model in replace of province dummies. The dummies of year are maintained in the model. This variable is significant and negative, that means, as unemployment rate increases, the use of ICTs decreases. In other words, we have identified that in hose provinces with highest unemployment rate, ICTs are used less, or, what is the same, a bad economic situation of the nearest environment (province) increases the technological gap (digital divide), being this effect independent from proper effect of the individual characteristics of the individual: gender, age, education level, employment status, etc.…, and from the year of interview, owing to we have maintained the year dummies.

Likewise, we wonder if the effect of the unemployment rate is different among specific groups according to their employment status, education level, gender, municipality size or origin. With respect on employment status, we can see that the negative effect of the unemployment rate is higher in the unemployed and house-work individuals. Conversely, the effect is less on students and on employees. It is interesting that in the self-employed individual the effect is almost null. On the other hand, the negative effect of the unemployment rate is higher in individuals with basic education, possibly owing to the theory below. It is worth mentioning, the effect in individuals with higher education is almost null. In case of gender, we observe that the unemployment rate adversely affects women. Depending on the municipality size, the negative effect of the unemployment rate is higher in smaller municipalities. Finally, considering the origin of individual, the result is surprising, because the effect is a little lower in immigrants.

With the exception of the last result, our findings indicate that the effect of the unemployment rate as a determinant of the technological gap (digital divide) is stronger for

the most vulnerable groups, such as unemployed and housework individuals, women and individuals from smaller municipalities.

5 Conclusions

In this paper, we analyse the reasons of the digital divide including the unemployment rate as a key factor in Spain. The main question is focused in the adoption and using of available technology such as computers and Internet. Our source of data is the Spanish Survey on Equipment and Use of ICTs in Households and the period considered is 2006-2015. We have identified different patterns related to computer and Internet access and using, most of them focused in characteristics of individuals. We include an unemployment rate and province dummies for analysing regional effects. In case of age and education differences, a possible solution could be the implantation of policies to improve learning by less educated and older individuals, this allow the increasing of skills and probability of find a job. With respect to employment, those individuals who use less Internet, such as unemployed individuals, must be target of the policies. Their inequalities in ICT using must be a serious problem for labour market and they are in danger of exclusion. Digital enhancement for these segments of labour market could lead to a reduction of the unemployment rate. The same procedure has to be develop for the regional disparities, some of them could be explain by socio-economic characteristics, but another reason which conditioning access is telecommunication infrastructure, understanding this in terms of demand of ICT. If individuals from rural regions do not have knowledge or access, they won't develop an interest or necessity in ICT. So, it is necessary an infrastructure development in these areas.

Our main goal is referring to the findings in matter of digital divide in provinces with high unemployment rate, where the own characteristics of each individuals are independent, that in other words means following: "A bad economic situation for closest environment involve, such as provinces, increases the digital divide". So, we discover provincial digital divide based on economic situation. Here we can observe possible solution to mitigate the crisis effects, proposing policies which are focused in the digital improvement of the unemployed individuals that increase their probability of job finding.

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Appendix

Table A1. Variable definitions

Variable	Definition
Dependent Variables	
TICs	
Computer use	*Dummy* variable: 1 if the individual has used a computer in the last 12 months, and 0 otherwise
Computer use frequency	Discrete ordered variable: 0 if the individual has not used a computer in the last 12 months, 1 if the individual has used a computer in the last 12 months but not in the last 3 months, 2 if the individual has used a computer in the last 3 months but uses it less than once a week, 3 if the individual uses a computer every weeks but not on a daily basis, and 4 if the individual uses a computer on a daily basis (at least 5 days a week).
Internet use	*Dummy* variable: 1 if the individual has used Internet in the last 12 months, and 0 otherwise
Internet use frequency	Discrete ordered variable: 0 if the individual has not used Internet in the last 12 months, 1 if the individual has used Internet in the last 12 months but not in the last 3 months, 2 if the individual has used Internet in the last 3 months but uses it less than once a week, 3 if the individual uses Internet every weeks but not on a daily basis, and 4 if the individual uses Internet on a daily basis (at least 5 days a week).
Independent Variables	
ECONOMIC SITUATION	
Unemployment rate	Continuous variable: unemployment rate per province and per year (min. 3.02; max. 41.26)
DEMOGRAPHIC CHARACTERISTICS	
Female	*Dummy* variable: 1 for females, 0 for males
Age 16-25	*Dummy* variable: 1 for individuals between 16 and 25, 0 otherwise
Age 26-35	*Dummy* variable: 1 for individuals between 26 and 35, 0 otherwise
Age 36-45	*Dummy* variable: 1 for individuals between 36 and 45, 0 otherwise
Age 45-55	*Dummy* variable: 1 for individuals between 46 and 55, 0 otherwise
Age 56-65 (*ref.*)	*Dummy* variable: 1 for individuals between 56 and 65, 0 otherwise
Basic education (*ref.*)	*Dummy* variable: 1 for individuals with first stage of secondary education but not completed high school, 0 otherwise
Medium education	*Dummy* variable: 1 if the individual finished high school education but not completed university studies, 0 otherwise
Higher Education	*Dummy* variable: 1 if the individual finished university studies, 0 otherwise
Foreigner	*Dummy* variable: 1 for foreign citizens, 0 for Spanish citizens
Urban (>50,000 inhab.)	*Dummy* variable: 1 for individuals living in municipalities with more than 50.000 inhabitants, 0 otherwise

Table A1. Variable definitions (*cont.*)

Variable	Definition
MAIN ACTIVITY	
Paid employee (*ref.*)	*Dummy* variable: 1 for paid employed individuals, 0 otherwise
Self-employed	*Dummy* variable: 1 for self-employed individuals, 0 otherwise
Unemployed	*Dummy* variable: 1 for unemployed individuals, 0 otherwise
Student	*Dummy* variable: 1 for students, 0 otherwise
House-worker	*Dummy* variable: 1 for house-workers, 0 otherwise
Pensioner	*Dummy* variable: 1 for pensioners, 0 otherwise
PROVINCE DUMMIES (52 dummies; *ref.* Huelva)	*Dummies* equal 1 for individuals living in the named province, and 0 otherwise
YEAR DUMMIES (10 dummies; *ref.* 2015)	*Dummies* equal 1 for individuals interviewed in the referred year, and 0 otherwise

Table A2 **Descriptive Statistics***

	Employed	Unemployed
Computer and Internet		
Availability of Computer	0.6079	0.6138
	(0.4882)	(0.4868)
Availability of Internet	0.6241	0.5691
	(0.4843)	(0.4952)
Use of Computer	0.7257	0.7286
	(0.4462)	(0.4447)
Use of Internet	0.6719	0.6781
	(0.4695)	(0.4672)
Urban		
>50,000	0.4788	0.4995
	(0.4484)	(0.4973)
>100,000	0.4061	0.3719
	(0.4911)	(0.4833)
Immigration	0.5267	0.0949
	(0.2233)	(0.2931)

Table A3 **Descriptive Statistics***

	Men	Women
Computer and Internet		
Availability of Computer	0.6094	0.6079
	(0.4878)	(0.4882)
Availability of Internet	0.6203	0.6147
	(0.4853)	(0.4866)
Use of Computer	0.7445	0.7094
	(0.4361)	(0.4539)
Use of Internet	0.6949	0.6528
	(0.4604)	(0.4760)
Urban		
>50,000	0.4614	0.4872
	(0.4985)	(0.4998)
>100,000	0.3892	0.4133
	(0.4875)	(0.4924)
Immigration	0.0582	0.0575
	(0.2341)	(0.2329)

*As the variables are defined as dummy variables, the mean values represent the percentage of individuals for which the variable takes the value 1

Table 1. Determinants of ICTs use and use frequency *–Heckman Ordered Probit Models–*

	Model 1a				**Model 1b**				**Model 2a**				**Model 2b**			
Dependent variables (*y*)	Computer use (0-1)		Computer use frequency (0-4)		Internet use (0-1)		Internet use frequency (0-4)		Computer use (0-1)		Computer use frequency (0-4)		Internet use (0-1)		Internet use frequency (0-4)	
Pr[Computer use=1 **]**	0.740		---		---		---		0.739		---		---		---	
Pr[Computer use frequency=4 | Computer use=1 **]**	---		0.598		---		---		---		0.602		---		---	
Pr[Internet use=1 **]**	---		---		0.698		---		---		---		0.697		---	
Pr[Internet use frequency=4 | Internet use =1 **]**	---		---		---		0.561		---		---		---		0.567	
Independent variables (*x*)	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.
ECONOMIC SITUATION																
Unemployment rate	---	---	---	---	---	---	---	---	-0.8	-23.2***	-0.4	-8.5***	-0.8	-20.8***	-0.3	-6.1***
DEMOGRAPHIC CHARACTERISTICS																
Female (0-1)	-3.5	-9.0***	-12.1	-21.9***	-4.3	-9.7***	-14.6	-23.8***	-3.4	-8.7***	-11.9	-21.8***	-4.1	-9.4***	-14.2	-23.6***
Age 16-25 (0-1)	39.9	124.8***	11.2	8.8***	49.4	139.3***	28.7	21.8***	39.8	123.5***	9.9	7.8***	49.3	138.8***	26.3	20.2***
Age 26-35 (0-1)	35.3	97.2***	2.9	2.8***	43.7	104.5***	17.8	15.6***	35.2	96.5***	2.3	2.2**	43.5	103.9***	16.4	14.6***
Age 36-45 (0-1)	30.6	73.3***	-3.3	-3.3***	36.6	74.5***	7.6	6.8***	30.5	72.8***	-3.7	-3.7***	36.4	74.0***	6.7	6.1***
Age 45-55 (0-1)	17.6	38.3***	-2.7	-2.6**	22.1	40.8***	1.8	1.5	17.5	38.0***	-3.1	-2.9***	21.9	40.4***	1.1	0.9
Age 56-65 (0-1) (*ref.*)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Basic education (0-1) (*ref.*)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Medium education (0-1)	41.2	93.2***	29.5	35.6***	46.1	90.2***	27.6	28.6***	41.2	93.6***	29.1	35.3***	46.2	90.7***	27.0	28.5***
Higher education (0-1)	57.6	205.5***	62.8	88.8***	67.2	213.2***	64.7	75.4***	57.7	206.6***	61.6	87.4***	67.3	216.5***	62.8	74.4***
Foreigner (0-1)	-17.8	-20.9***	-17.1	-15.0***	-17.7	-19.1***	-16.9	-13.6***	-16.1	-19.2***	-15.3	-13.8***	-15.2	-16.7***	-14.6	-12.0***
Urban (>50,000 inhab.) (0-1)	8.4	21.2***	-1.3	-7.0***	10.0	22.0***	-2.4	-10.0***	9.8	26.2***	-1.1	-5.3***	12.1	28.1***	-2.1	-8.0***
MAIN ACTIVITY																
Paid employee (0-1) (*ref.*)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Self-employed (0-1)	-0.1	-0.1	0.8	0.9	-0.3	-0.4	4.3	4.6***	-0.6	-1.1	0.1	0.1	-1.0	-1.5	3.3	3.6***
Unemployed (0-1)	-14.4	-23.3***	-16.6	-19.4***	-14.2	-20.7***	-13.6	-14.4***	-14.9	-23.9***	-16.9	-20.0***	-14.7	-21.5***	-14.1	-15.1***
Student (0-1)	28.5	42.8***	18.0	15.6***	32.8	41.0***	19.6	15.1***	28.4	42.1***	17.9	15.8***	32.5	40.0***	19.3	15.2***
House-worker (0-1)	-29.7	-40.5***	-35.4	-30.8***	-33.1	-41.2***	-28.2	-21.2***	-30.4	-41.7***	-35.3	-31.0***	-34.1	-42.5***	-28.2	-21.5***
Pensioner (0-1)	-25.8	-28.4***	-19.8	-12.0***	-26.2	-25.9***	-10.3	-5.6***	-26.3	-28.9***	-19.9	-12.2***	-26.7	-26.6***	-10.6	-5.8***
PROVINCE DUMMIES (*52 categ.; ref. Huelva*)	Yes				Yes				No				No			
YEAR DUMMIES (*10 dummies; ref. 2015*)	Yes				Yes				Yes				Yes			
No. observations	150,219				150,219				150,219				150,219			
Censored / uncensored observations	51,324 / 98,895				56,199 / 94,020				51,324 / 98,895				56,199 / 94,020			
Log likelihood	-137,274.5				-134,452.3				-137,931.1				-135,327.5			

Notes: * $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$

Table 2. Predicted probabilities of ICTs use and use frequency and the impact of unemployment rate on these probabilities for different groups
–Heckman Ordered Probit Models–

		Model 2a for different groups						Model 2b for different groups					
Groups	**Individuals**	**Pr[**CU=1**]**	$\frac{dy/dx}{y}$%	t-stat.	**Pr[**CUF=4|CU=1**]**	$\frac{dy/dx}{y}$%	t-stat.	**Pr[**IU=1**]**	$\frac{dy/dx}{y}$%	t-stat.	**Pr[**IUF=4|IU=1**]**	$\frac{dy/dx}{y}$%	t-stat.
ALL SAMPLE	150,219	0.739	-0.79	-23.2***	0.602	-0.41	-8.5***	0.705	-0.98	-20.8***	0.583	-0.38	-6.1***
MAIN ACTIVITY													
Paid employee	71,289	0.856	-0.46	-14.4***	0.685	-0.30	-5.5***	0.822	-0.66	-13.6***	0.641	-0.28	-3.5***
Self-employed	17,884	0.748	-0.53	-5.6***	0.659	-0.08	-0.6	0.703	-0.79	-5.5***	0.632	-0.02	0.3
Unemployed	18,458	0.662	-1.37	-14.0***	0.519	-1.04	-7.4***	0.656	-1.43	-12.3***	0.546	-0.86	-5.5***
Student	10,213	0.988	-0.08	-4.5***	0.781	-0.26	-2.8***	0.982	-0.07	-3.0***	0.794	-0.38	-3.9***
House-worker	17,259	0.248	-2.37	-8.8***	0.317	-0.93	-2.8***	0.213	-2.74	-7.0***	0.345	-0.77	-1.3
Pensioner	10,883	0.225	-1.75	-4.9***	0.480	-0.03	-0.1	0.210	-2.09	-4.0***	0.497	-0.62	-1.7*
EDUCATION													
Basic education	37,570	0.246	-2.97	-16.9***	0.410	-0.92	-5.1***	0.214	-2.76	-14.2***	0.395	-0.25	-1.3
Medium education	77,985	0.757	-0.70	-16.7***	0.607	-0.46	-7.5***	0.712	-0.80	-16.6***	0.558	-0.49	-6.9***
Higher education	34,664	0.972	-0.05	-3.4***	0.836	-0.10	-2.3**	0.961	-0.05	-2.6***	0.798	-0.03	-0.5
GENDER													
Female	79,303	0.709	-0.92	-18.0***	0.549	-0.51	-6.9***	0.664	-0.91	-15.6***	0.511	-0.51	-6.2***
Male	70,916	0.771	-0.65	-14.7***	0.662	-0.30	-5.0***	0.733	-0.69	-13.8***	0.629	-0.16	-2.4**
TOWN SIZE													
Urban (>50,000 inhab.)	71,371	0.813	-0.50	-12.6***	0.654	-0.23	-3.7***	0.783	-0.42	-9.3***	0.613	-0.24	-3.4***
No urban (<50,000 inhab.)	78,848	0.659	-1.11	-19.7***	0.546	-0.47	-6.4***	0.606	-1.22	-19.1***	0.510	-0.27	-3.3***
NATIONALITY													
Foreigner	8,693	0.677	-0.16	-1.0	0.506	-0.26	-1.0	0.656	-0.02	0.1	0.501	-0.35	-1.3
Spanish	141,526	0.744	-0.84	-24.3***	0.607	-0.42	-8.6***	0.700	-0.88	-22.3***	0.570	-0.34	-6.3***

Notes: CU = Computer use, CUF = Computer use frequency, IU = Internet use, IUF = Internet use frequency;* $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$