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The Impact of the Digital Divide on the Adoption of e-Government in Greece

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Abstract

The adoption of e-government services and the active e-participation of citizens may be affected by the pre-dominant socio-economic inequalities. The current study examined the impact of the digital divide to the use of e-government and e-participation services. We used the micro-data from the national survey on the use of Information and Communication Technologies by the Greek households and individuals. This survey was conducted by the Greek Statistical Authority in 2017, in a representative sample of the Greek population (n = 3321). We analyzed the data using logistic regression equations. According to the results, the social exclusion factors may influence the use of e-government services. The most important socio-economic factors affecting the decision to use e-government services are the educational level, age and citizenship. The e-participation of the citizens in various democratic processes is only influenced by their educational attainment. This work highlights the impact of the digital divide to every aspect of our digital life. The state should implement policies to address the digital divide focusing on the vulnerable social subgroups, such as the low-educated and older people. The findings of our research may help the policymakers to conceptualize the effect of the digital divide to e-government adoption, in a multidimensional and integrative way.

Keywords: e-government, Greece, digital divide, e-services, digital skills

jel CLASSIFICATION codes: O33: Technological Change: Choices and consequences Diffusion processes

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1. E-Government and Digital divide

According to the World Bank [1], e-government is defined as the use of information technology to improve business processes and the service delivery of government entities. The citizens and businesses use e-government to engage in electronic transactions with government, participate in government decision making and access information [2].

Few years ago the government's executives claimed that the citizens will increasingly use the new electronic service channels. The traditional channels which are more expensive will be gradually replaced by the cost-effective e-government services [3]. However, according to a Capgeminini report [4] about the offering and usage of e-government services in Europe, there is a big gap between the supply of services (most of the countries reach 75 percent and above) and their usage (the adoption rate is below 30 percent).

According to [5], there are many barriers to e-government adoption, such as: digital divide, lack of citizens' participation, lack of legal bases, lack of policy cycle management, lack of measurement and evaluation and lack of trust and transparency.

The digital divide may be one of the most important obstacles. This claim is confirmed by the results of various surveys [6, 7]. Zhao et al. [7] found that the digital divide as a multidimensional construct, may have an impact on the adoption of e-government services. During the last years, the policy makers and the researchers have focused their interest to bridge the digital divide in e-government [8].

The term digital divide refers to a divide in the access and use of Information and Communications Technology (ICT) devices [9]. Many scholars define it as a complex and multidimensional term [10]. The dimensions of the digital divide are: the access divide, the skills divide and the usage divide [e.g., 8, 11, and 12]. The divide in access is diminishing in most of the developed countries. However, there is a gap between the actual and potential usage of capital enhancing activities, such as e-Government [13].

The extent of the digital divide may be influenced by various demographic and socioeconomic factors, such as gender, age, educational level, employment status, income and nationality. Individuals less likely to take part in online government interactions or e-participation activities, are women [14], older people [15, 16], low educated [8], not in the labor force (e.g., retired, inactive) [17], with a low income [8] and ethnic minorities [18].

The active use of e-government services may increase e-participation. According to [19], e-government maturity is positively associated to the dimensions of e-participation (i.e., e-information sharing and e-decision-making).

In 2020, Greece aims to build a more efficient and accountable administration through the use of ICT, increasing participation by offering enhanced electronic services. One of the strategic axes of the Greek e-Government strategy for the years 2014-2020 is the reconnection of the citizens with the public administration. In order to achieve this aim, the Greek State will adopt policies, regulations and business practices that promote digital inclusion and citizen's participation. However, Greece is underperforming in

digital skills and ICT usage and performs on average in the use of e-government services, compared to the other EU countries.

The aim of our research is to examine the influence of the digital divide in the adoption of e-Government and e-participation services.

According to [20], there is a literature gap of an integrative analysis of e-government development and the digital divide. The results of our research may help the Greek state to design more effective and diversified policy actions, to enhance e-government development and e-participation.

In our study, we have evaluated the influence of the most important socio-economic factors to the use of the Internet for e-government and e-participation purposes. In particular:

The first research question (Q1) examines the influence of gender, age, educational level, employment status, income and nationality to the use of the Internet for e-government.

The second research question (Q2) examines the influence of gender, age, educational level, employment status, income and nationality to the use of the Internet for e-participation.

2. Methodology

2.1. Data analysis

We analyzed the micro data from the 2017 ICT Survey on households and by individuals, conducted by the Hellenic Statistical Authority (ElStat). The survey questionnaire was prepared in accordance with the guidelines and the proposed Eurostat questionnaire. Three-stage area sampling was applied by the ElStat (Primary unit: one or more building blocks, secondary unit: household and final unit: the person aged 16 -- 74). In total, 5443 persons participated in the survey, of which n=3321 used the Internet within the last 3 months.

We analyzed the data with the use of logistic regression. We have estimated the likelihood of an e-government or an e-participation activity for each independent variable (socio-economic factors), compared to a reference category [21].

The odds ratio estimate (Exp (b)) shows the probability of the logistic regression (Tables 3-4). If the estimation is higher than one, it shows a higher probability, while an estimation less than one shows a lower probability. For example, in 2017, people with a tertiary educational level are more than eleven times (11.49) as likely to use the

Internet for submitting completed forms online, compared to those with an educational level of at most lower secondary education (reference category) (Table 3). The data was analyzed with the use of the SPSS software (version 21).

2.2. Variables

The independent variables of our analysis represent the digital exclusion factors. These variables are: i) dichotomous (gender, employment status, citizenship) or ordinal (age, educational level, household income) (Table 1):

Table 1: Socio-economic characteristics of people who have used the Internet during the last three months. Data source: Hellenic Statistical Authority, Survey on the use of Information and communication technologies by the Greek households and individuals for the years 2017. Base: Individuals aged 16-74 years old (n=3321).

VARIABLE	TYPE	n	%
Gender	**Dichotomous**		
Man		1653	49,8%
Woman		1668	50,2%
Age	**Ordinal**		
16-24 years old		368	11,1%
25-34 years old		538	16,2%
35-44 years old		850	25,6%
45-54 years old		774	23,3%
55-64 years old		559	16,8%
64-75 years old		232	7,0%
Educational level	**Ordinal**		
Lowest quartile		525	15,8%
Second lowest quartile		1435	43,2%
Highest quartile		1361	41,0%
Employment status	**Dichotomous**		
Employee or self-employed		1816	54,7%
Inactive professionally (Student/ Unemployed/ Pensioner, etc.)		1505	45,3%
Household income	**Ordinal**		
Lowest quartile		609	18,3%
Second lowest quartile		665	20,0%
Second highest quartile		1087	32,7%
Highest quartile		960	28,9%
Citizenship	**Dichotomous**		
National		3200	96,4%
Non-national		121	3,6%

The dependent variables used in this research paper represent three different e-government and two different e-participation activities (Table 2). Each activity is a dichotomous variable (1=use of the activity else 0).

TABLE 2: People who have used the Internet during the last three months for e-government or e-participation services. Data Source: Hellenic Statistical Authority, Survey on the use of Information and communication technologies by the Greek households and individuals for the years 2017. Base: Individuals aged 16-74 years old (n=3321).

VARIABLE	n	%
e-Government		
Contact/interact with public authorities for private purposes, to obtain information from web sites or apps	2141	64,5 %
Contact/interact with public authorities for private purposes, to download/print official forms	1350	40,7 %
Contact/interact with public authorities for private purposes, to submit completed forms online	1188	35,8 %
e-Participation		
Post opinions on civic or political issues via websites (e.g., blogs, social networks, etc.)	444	13,4 %
Take part in on-line consultations or vote to define civic or political issues (e.g., urban planning, signing a petition)	193	5,8 %

During the year 2017, the majority of the Greek Internet users (64,5 percent) use first level e-government services (i.e., obtain information for web sites or apps), while very few prefer to use e-participation services (percentage of use varying from 5,8 to 13,4 percent) (Table 2).

3. Results

3.1. First research question results

The socio-economic factors influence significantly the use of e-government activities by the Greeks (Table 3). In particular, older people (aged 55-64) are less likely to use the Internet for obtaining information from websites, downloading official forms and submitting completed forms online (odds ratios varying from 0.39 to 0.63).

The educational level is a very important predictor of e-government use. People who are well educated (tertiary education), are more likely to use the Internet for all the e-government activities (odds ratios varying from 7.72 to 11.49).

A consistent predictor of the use of e-government services is the country of citizenship. The people with non-Greek citizenship are less likely to use the Internet for e-government services (odds ratios varying from 0.36 to 0.52).

Those who work are more likely to use the Internet for the e-government activities (odds ratios varying from 1.39 to 1.50), although this difference is not that important. The household income is another not important socioeconomic predictor. The only difference is that those with a low income (highest quartile), are more likely to use the Internet for obtaining information from websites or download official forms, compared to those with a high household income (odds ratios varying from 0.36 to 0.52). Gender is also a rather not important predictor of e-government use in Greece. The only difference in the use of e-government services, is that women are less likely to use the Internet for submitting completed forms online compared to men (odds ratios = 0.79).

The most important factors of e-government use in Greece are the educational level and age. The socioeconomic factors affect significantly the use of e-government purposes, since the percentage of explained variance (Nagelkerke R^2) of the three logistic regressions is important (Nagelkerke R^2 varying from 21 to 24 percent) (Table 3).

3.2. Second research question results

The use of Internet for e-participation is not affected by the socioeconomic factors, since the percentage of explained variance (Nagelkerke R^2) of the two logistic regressions is very low (Nagelkerke R^2 = 6 percent in both logistic regressions) (Table 4).

The only discrete difference, is that people who are well educated (tertiary education), are more likely to use the Internet for all the e-participation activities (odds ratios varying from 3.65 to 4.06). Another minor difference in the use of e-participation services, is that women are less likely to use the Internet for posting opinions on civic or political issues, compared to men (odds ratios = 0.59).

4. Discussion

According to the results of the first research question, those who are well educated are more likely to use e-government services. In general, the educational level is a consistent and very important socio-economic predictor of Internet access and use [16]. This fact may be related to the inadequacy of the educational system, to provide all the necessary knowledge and skills to the Greek students.

Age is also a significant factor. Young people are connected to the Internet with many mobile devices, they are more digitally skilled, and they prefer to use Internet for e-transactions with the government. This corresponds to the literature [8], and may be

TABLE 3: Odds ratios estimates of logistic regressions, for e-government activities in Greece. Source: Hellenic Statistical Authority survey on the use of Information and Communication Technologies by the Greek households and individuals for the years 2017. Base: Individuals aged 16-74 years old who are using the Internet during the last three months (n=3321).
Significance levels: * p<.05 ** p<.01 ***p<.001.

Explanatory Factors	Obtain information from web sites or apps		Download/print official forms		Submit completed forms online	
	b	Exp(B)	b	Exp(B)	b	Exp(B)
Gender (Reference: Man)						
Woman	-0,12	0,88	-0,14	0,87	-0,23	0,79**
Age (Refeference: 16-24)						
25-34	-0,11	0,90	0,18	1,20	0,17	1,18
35-44	-0,20	0,82	0,22	1,24	-0,03	0,97
45-54	-0,41	0,67**	0,01	1,01	-0,15	0,86
55-64	-0,93	0,39***	-0,51	0,60**	-0,56	0,57**
65-74	-0,76	0,47***	-0,38	0,68	-0,46	0,63*
Education Level (Reference: At most lower secondary education)						
Upper secondary and post-secondary non-tertiary education	0,93	2,54***	1,08	2,94***	1,26	3,51***
Tertiary education	2,20	9,00***	2,04	7,72***	2,44	11,49***
Employment status (Reference: Not in the labor force (unemployed, student, professionally inactive, etc))						
Employee or self employed	0,40	1,50***	0,33	1,39***	0,38	1,46***
Household income (Reference: Lowest quartile)						
Second lowest quartile	-0,03	0,97	0,01	1,01	-0,24	0,79
Second highest quartile	0,04	1,04	,095	1,10	-0,05	0,95
Highest quartile	0,48	1,61***	,476	1,61***	0,22	1,24
Country of citizenship (Reference: National)						
Non national	-0,86	0,42***	-1,01	0,36***	-0,64	0,52**
Constant	-0,47	0,62**	-1,99	0,14***	-2,21	0,11***
Nagelkerke R^2	0,24		0,21		0,23	
Chi-square	17,39*		15,25*		4,61	

explained by the fact that older people did not grow up with internet technologies and are therefore, not familiar with it. The other side is that the Internet is quite complex and the elderly tend to learn more slowly than young people.

The employment status is also another socio-economic predictor. A person who is working may be more skilled, and prefers to use the Internet for e-government purposes.

Finally, those who are not Greek citizens do not use e-government services, compared to the Greek citizens. This shows that the digital divide or digital inequality [22] is closely related to social inequality, and that the use of Internet and ICTs in general, may reproduce or even enlarge social inequalities.

Table 4: Odds ratios estimates of logistic regressions, for e-participation activities in Greece. Source: Hellenic Statistical Authority survey on the use of Information and Communication Technologies by the Greek households and individuals for the years 2017. Base: Individuals aged 16-74 years old who are using the Internet during the last three months (n=3321).
Significance levels: * p<.05 ** p<.01 ***p<.001.

Explanatory Factors	**Post opinions on civic or political issues via websites**		**Take part in on-line consultations or voting to define civic or political issues**	
	b	**Exp(B)**	**b**	**Exp(B)**
Gender (Reference: Man)				
Woman	-0,52	0,59***	-0,23	0,79
Age (Refeference: 16-24)				
25-34	-0,10	0,90	-,043	,958
35-44	0,15	1,16	,579	1,784
45-54	0,11	1,11	,524	1,690
55-64	-0,22	0,80	,038	1,038
65-74	-0,23	0,79	-,208	,812
Education Level (Reference: At most lower secondary education)				
Upper secondary and post-secondary non-tertiary education	0,94	2,56***	0,69	2,00*
Tertiary education	1,40	4,06***	1,29	3,65***
Employment Status (Reference: Not in the labor force (unemployed, student, professionaly inactive, etc)				
Employee or self employed	-0,06	0,94	-0,05	0,95
Household income (Reference: Lowest quartile)				
Second lowest quartile	-0,21	0,81	-0,17	0,85
Second highest quartile	-0,08	0,93	0,09	1,09
Highest quartile	0,21	1,24	0,47	1,60
Country of Citizenship (Reference: Non National)				
National	-0,47	0,62	-1,11	0,33
Constant	-2,65	0,07***	-4,02	0,02***
Nagelkerke R^2	0,06		0,06	
Chi-square	6,06		8,13	

In line with the results of the second research question, the influence of the socio-economic factors to the use of Internet for e-participation purposes is insignificant. The educational level is the only important socio-economic predictor of using the Internet to participate in various democratic processes, while the gender is a factor with a smaller effect. In order to enhance digital skills and attitudes towards technology, the state should focus to the reform of the educational system and adopt technology-enhanced teaching and learning.

According to the results of our study, the use of e-government services is influenced by the existing socio-economic disparities. The policymakers should try to help the

citizens realize the benefits of e-government use. The Greek government should adopt policy actions which will improve the level of digital skills for the low educated, non-employed, elderly and non-Greeks. They should also promote e-government services in parallel with the traditional channels, because not all people have the skills or the willingness to learn how to use internet and take advantage of its available services.

On the contrary, the use of e-participation services is not related to social exclusion. A qualitative survey researching the use of e-participation services may reveal the attitudes and motives of the Internet users, and evaluate the results of our quantitative survey.

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