



E-GOVERNMENT: A WAY TO COMMUNICATE WITH CITIZENS

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Information technology has become a very important issue in citizens' relations. It started with e-commerce followed by e-business and ended with e-government. Firms and consumers use Internet to provide information and perform many of their business actions. During the last years governments also started to communicate with citizens through Internet providing information and some services. After e-commerce and e-business now it is the public sector that should face new technologies through e-government.

In Spain in order to achieve the optimal technological level, municipalities and Autonomous Communities (ACs), have used financial aid from the Spanish Central Government and European Union institutions. This paper examines the evolution of e-government implementation during the last decade (2001-2012) in the Spanish ACs. It also assesses its effectiveness exploring different factors, namely research and development (R&D) investment, R&D workers at University and public administration or population Internet access, among others.

The study concludes that e-government has been adopted by all ACs but it is still at an early stage. Nevertheless we can also see from the results that institutional economic aid does not necessarily foster the development of e-government implementation. Therefore we suggest that when giving financial aid to promote specific economic aspects in an economy, Institutions should carefully look at efficiency rather than concentrating exclusively on income per capita or gross domestic product, as they tend to do.

Palabras Clave: *(máximo 6 palabras)*

E-government, information and communication technologies, government, e-democracy

Clasificación JEL:

H11, M15, O32, H89.



I. INTRODUCTION

Information and Communication Technologies (ICT) have become one of the most important issues in the last decades. The spectacular increase in the use of new technologies over the past few years has had a large impact on different aspects of society and economic activities through easing daily procedures and making them more efficient. It has also become one of the core elements for managerial reform since electronic government (e-government) and the use of information technology is the main aspect fostering efficiency in the provision of public services to citizens. For that reason e-government may figure in future governance. The advantages of using ICT within business processes have long been recognised in the private sector through e-commerce and e-business. There has recently been a growing participation of citizens in the information society, for that reason we think that it is important to see up to which level is public administration modernising itself and integrating into the future governance.

Over the past years economic development was driven by three foundational production factors: land, labor and capital. In the digital era we need to add one more factor, information technology. As Nanopolous (2009) says, technology defines the competitiveness of agriculture, the efficiency of industry and the productivity of the service sector, which includes governmental output. After that technical knowledge adds value to production and consumption cycles by pushing up aggregate demand, generating employment and increasing both company profits and tax revenues.

Under the current period of crisis there are two factors that are able to generate expanded production capacities; those are solid education systems and high levels of technological innovation. However in the new economy, the workplace is defined not only by its ability to produce profitable products and services but also by its capacity to make faster and better decisions through innovative ICT systems. Furthermore the New Public Administration, also called the New Public Management (NPM), consists



of five main aspects: several governmental reforms, including responsive services; a clear drawing of organizational structures; an objective evaluation of citizen-focused operating outcomes; a paradigm shift to electronic governance developing public policy through ICT; and a design of electronic government executing public policy through ICT.

Following United Nations e-Government Survey 2012 *“in the current recessionary world climate, in which the lives of people have become ever more interconnected, governments have been harnessing the power of information and communication technologies (ICT) for delivering much needed sustainability in social and economic services to their citizens. As part of this shift towards e-government, there has been an increasing recognition that efforts towards a holistic approach to governance for sustainable development require strategic national planning to ensure efficacy, transparency, responsiveness, participation and inclusion in the delivery of public services”*.

New technologies have opened up to a broader range of possibilities so as to improve managerial efficiency and quality of citizens’ service in public sector. ICT has positively contributed to changes in politics (Nye, 1999; Norris, 1999), government institutions (Fountain, 2001) and management performance (Brown, 1999). Despite this constant move towards e-government we need to know if development, implementation and effectiveness at local level are working. Public administration updating is usually done via central government. However in most European countries, ACs and municipalities are responsible for public services; hence it is important to see the evolution and maturity of e-government at this lower level.

Continuing with United Nations e-Government Survey 2012, *“one of the key functions of e-government is to provide an integrated framework of policies, laws and regulations as well as to develop institutions and processes in order for the private sector to capture the benefits from new technologies and citizens to partake of these benefits. E-government must be supported by an effective e-governance institutional*



framework in order to improve its internal workings by reducing financial costs and the number of transactions. This would help the integration of work flows and enable better processes and systems aimed at more efficiency (...) utilizing e-government can be the key to the achievement of the integration of economic, social and environment goals for development planning”.

In that case, municipalities have a unique direct interaction with citizens. The relationship between city councils and their citizens is unavoidable: business registrations, auto registry, real estate development or even the registration of a child at a school, for instance - all require citizens to come in contact with the municipality. E-government is aimed at creating a new dynamic relation between governments and citizens, a cycle that will become simpler and more participative for citizens. In order to achieve this, it is not only important the introduction of technology in the conventional tasks of city councils, but also in public sector management, with citizens and their needs as the focal point of this innovation; the catalyst of this public administration renovation being new technologies. The appropriate application of e-government allows for higher levels of effectiveness and efficiency in governmental tasks as well as processes and procedures improvements. It also increases the quality of public services, improves the use of information in decision-making processes and helps a better communication among different governmental offices.

This paper will explore the evolution of e-government and will examine its effectiveness at an infra-national (ACs, NUTs II) level in Spain. It will also discuss the institutional factors that contribute to the development of e-government at regional level. In the light of these benefits e-government is expected to grow. For that reason in this research we want to see the evolution of e-government implementation during the last decade (2001-2012) in the Spanish AC. In addition, our paper also assesses its effectiveness exploring different factors, namely research and development (R&D) investment, R&D workers at University and public administration or population Internet access, among others.



This study offers several practical outcomes for managers in the public sector facing the challenge of implementing e-government. New technologies and internet are nowadays a powerful instrument for economic growth. They may help increasing firm productivity, encouraging exportations and generating employment. For that reason governments must become active and promote new technologies in order to accelerate the economic recovery.

The paper concludes that e-government has been adopted by all ACs but it is still at an early stage, and consequently it does not yet exert any noticeable influence on economic growth. Moreover we might guess that institutional economic aid does not necessarily foster the development of e-government implementation.

II. THEORETICAL FRAMEWORK

Following Moon (2002), e-government has been defined as “(...) *an Internet driven activity that improves citizen access to government information, services and expertise to ensure citizen participation in, and satisfaction with the government process*” (UNDPEPA, 2002); he refers to the United Nations and the American Society for Public Administration (2001) when they consider e-government as “(...) *a permanent commitment by government to improving the relationship between the private citizen and the public sector through enhanced, cost-effective and efficient delivery of services, information and knowledge. It is the practical realization of the best that government has to offer*”; and also he quotes Jane Fountain (2001) suggesting the concept of “*virtual state*” defined as “*a governmental entity organized with virtual agencies, cross-agency and public-private networks whose structure and capacity depend on the Internet and web*”.

According to Schütten (2009) e-government has recently been a deeply analyzed field, especially when it comes to examining the goals of the NPM. However most of the



researchers conclude that e-government has not yet reached its full potential when providing all the likely benefits (Lane, 2000; Moon, 2002; Burn & Robins, 2003; Pillay, 2008). She adds that “(...) *in line with the idea of NPM, numerous change programs were started in governmental organizations all over the world to encourage cost efficiency, productivity and customer orientation in the public sector using ICT applications. However, the change processes that are part of the introduction of e-government are slow and difficult (Hood & Peters, 2004; Moon, 2002)*”.

More specifically, e-government must include some aspects like a secure government intranet and central database, an application of e-commerce for more efficient government, activities and digital democracy for more transparent government accountability or a web base service delivery. With respect to this last aspect, the usefulness of net technologies in public management can be divided into two categories: an internal and an external one. The intranet refers to collection, storage, organization and management of an enormous volume of data and information. The extranet includes web sites to facilitate linkages between government and citizens; hence it can be used as a communication tool for the general public. Data and information can be easily shared between the public sector and external stakeholders, such as businesses, nonprofit organizations, interest groups or citizens. Also, at a further stage, web pages may enable governments to promote public participation in policy-making processes.

Finally, in order to see the evolution and maturity of e-government we can find different models. Quoting Kaurahalme, Syväjärvi and Stenvall (2011), “*one of the first and most cited of these models is the one of Layne and Lee (2001). It defines the progressive phases of e-government from the simple online presence to the full integration of governmental processes. Among others, similar models are also presented by Andersen and Henriksen (2006), Moon (2002) and United Nations in the well-known e-government assessments (UN, 2008)*”.

Literature identifies five different stages of e-government which reflect the degree of technical level and interaction with users:



1. Emerging: Simple information dissemination with users, namely one-way communication. This is the first step because government just posts information or data on web pages. Much of the information is static and there is little interaction with citizens.

2. Enhanced: Request and response as a two-way communication. In this second stage there is interactive communication between government and citizens and firms. At this point municipalities incorporate the email and other data transfer technologies in their web sites. Government provides information on public policy and governance. They have created links to archived information easily accessible to citizens.

3. Interactive: Service and financial transactions. This third level allows government to undertake online service and financial transactions like downloading forms for renewing licenses, paying fines or applying to financial aid.

4. Transactional: Governments begin to transform themselves by interacting with citizens and business. For instance, at this stage citizens can pay online fines, taxes, apply to ID cards or birth certificates.

5. Connected: Political participation. Governments transform themselves into a connected entity that responds to the needs of its citizens and enterprises, namely vertical and horizontal integration. This is the most sophisticated situation, where government includes in the web page online voting, public forums and opinion surveys. At this very last stage citizens participate into political issues. They can also communicate with government agencies (horizontal) and with central and local government agencies (vertical).

But not all the governments should follow this order. Many studies indicate the diffusion and adoption of technology as a curvilinear path (Rogers, 1995), whereas others refer to the evolution in companies Nolan (1979) and Quinn and Cameron (1983).



E-government has a wide range of economic benefits from reduced transaction costs, to better capacity to target services, increased coverage and quality of service delivery, enhanced response capacity to address issues of poverty, and increase in revenue.

Other benefits, less often considered in selecting applications, include the intended economic spin-offs that e-government may bring to the business sector, which can become more competitive in the national and international environment. Lower transaction costs and simplified procedures will translate in comparative advantages by the private sector. In the same way, increased interaction or transactionability with government can help create new businesses.

Furthermore, economic benefits may also derive from increased accountability and transparency, which may greatly reduce the risk of corruption and raise the perception of good government among citizens. Citizen's trust in their government may impact on their willingness to invest, and to pay taxes and levies for services.

III. E-GOVERNMENT BACKGROUND IN SPAIN

Since 1997, Castells (1997, 2001) had developed the network society theory that sets out the new society structure. This new structure changes industrial society for network information. The appearance of information age stressed the roles of businesses, society and state.

The progress of e-government in Spain has been favoured by users and by the planning and legislative efforts made by Spain's public sector.

When talking about new technologies infrastructures arise as a priority. That is one of the reasons why the broadband is so important. The figures for Spain illustrate its massive evolution with today's coverage reaching 99 per cent of the country versus the UE average of 95 per cent. Recent studies indicate that an increase of 10 per cent in broadband penetration can be translated into a 1 to 1.5 percentage points increase in GDP, which could correspond to an increase of 1.5 percentage points in labor productivity in the next 5 years. As we have said e-government has an important role in developing this infrastructure and involving firms and citizens with new technologies.

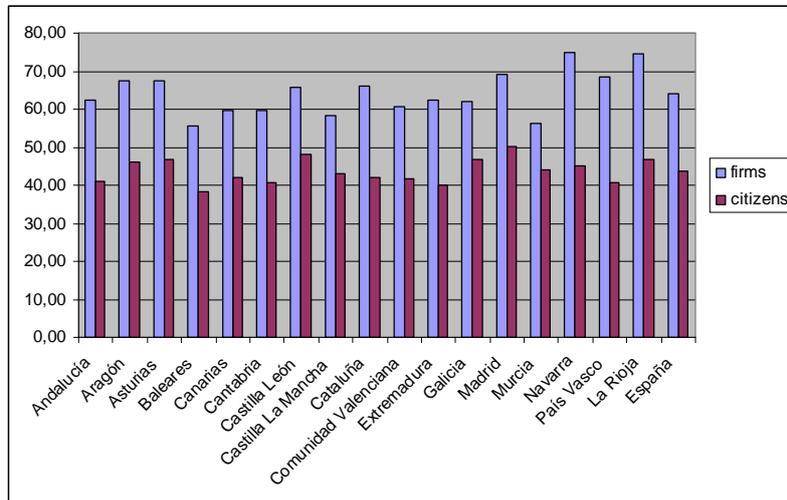


According to the 2012 UN survey, which assesses a vast quantity of indicators grouped along four stages, the Republic of Korea (0.9283) ranks the first position in e-government development followed by three European countries: the Netherlands (0.9125), United Kingdom (0.8960) and Denmark (0.8889). The United States (0.8687), France (0.8635) and Sweden (0.8599) are close behind. Europe as a whole has been in the vanguard of information technology and set the pace for others to follow. Well founded on a strong basis of high human capital levels and infrastructures, the role of ICT has been recognized and adopted by e-government services. Moving beyond improving public sector efficiency, Europe is now looking to adapt innovative technologies to human development and economic sustainability.

What about Spain? Even though it dropped some places in the ranking (23rd in the world rankings from 190 countries), Spain (0.7770) remained the leader in Southern Europe, followed by Slovenia (0.7492) and Croatia (0.7328). The official web site of Spain is available in five languages with information services and easy-to-navigate features. Thus we can say that the evolution of e-government in Spain is in the third stage, where citizens and firms can interact with government, as we can observe in *Graph 1*. Moreover we see that the number of interactions between business (B2G) and government is higher than that between citizens and government (C2G), which is normal, since firms started to work with IT earlier than citizens.



Graph 1: Percentage of firms and citizens interacting with government through Internet (2002-2012)



Source: self-elaborated.

Navarra (74.9%) and La Rioja (74.5%) are the ACs with the highest percentage of interactions between firms and government. On the opposite site there are Murcia (56.3%) and Illes Balears (55.7%). If we now have a look to citizens' interactions Madrid (50.3%) and Castilla-León (48.2%) are the regions with a higher percentage. At the end of the ranking we find Extremadura (39.8%) followed by Illes Balears (38.4%).

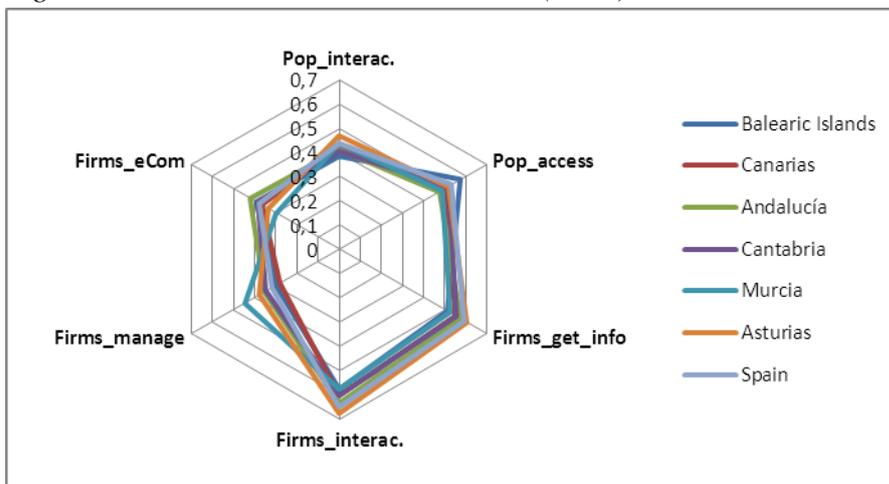
When comparing firms and population the main aspect that arises is the lower population interaction level with government with respect to firms. If we analyse its evolution throughout the last 10 years, we can see how both groups increase their interaction level but population figures are still relatively far away from those coming from firms. In 2012 only 59.4% of the population interacted with government compared to 85.1% of firms. It has certainly been a huge increase if we compare these data with the ones at the beginning of our analysis, in 2003, with 21.6% and 48.1% respectively and a clear gap reduction. The reasons for this discrepancy should be cautiously analysed but we might point at three main aspects. First of all population could be somehow reluctant to interact with government through the net. Needless to say that there is a large part of the population, especially aged-people, which prefer a direct contact with public administration rather than dealing with a machine, since they do not



feel confident enough with new technologies. On the other hand and focusing on the administrative side, it could be the case that they may not be covering the population needs in such a vast way they do with the enterprises' needs. Finally we may refer to internet access. The percentage of population access in 2012 was around 65%, clearly higher than the interaction level and lower than firms' interaction level. Therefore it is probably a mix of these three aspects what is at the bottom of this discrepancy.

On the other hand it is also interesting to analyse the different behaviour firms have with respect to managing information or getting it from public administration (Figures 1, 2 and 3). The fact that the percentage of firms getting information is lower could be due to two different aspects. First of all, a reduced level of e-government implementation, especially in certain AC, that hinders the possibility to obtain it. Secondly, a low training level inside the firms. This could be either because of a lack of means or motivation, although at the end of the period under analysis the crisis might be exerting a certain degree of influence.

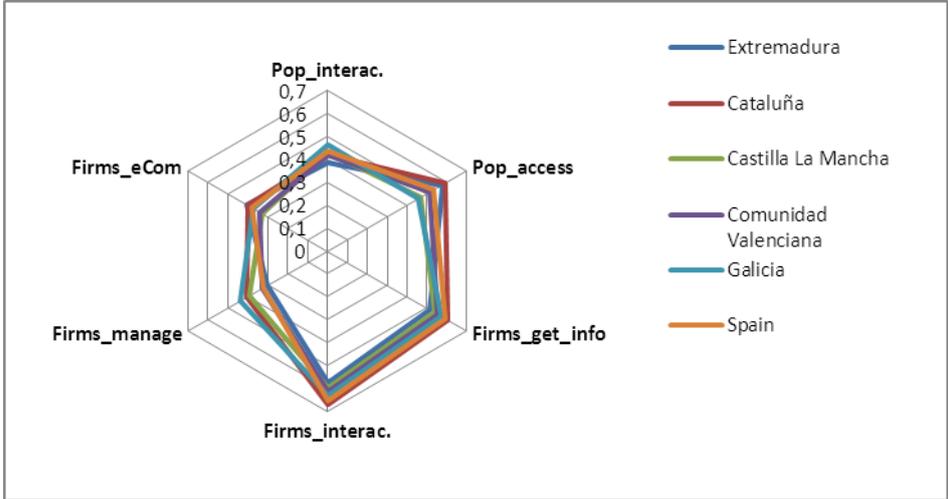
Figure 1: Index value between 75 and 90 (2012)



Source: self-elaborated

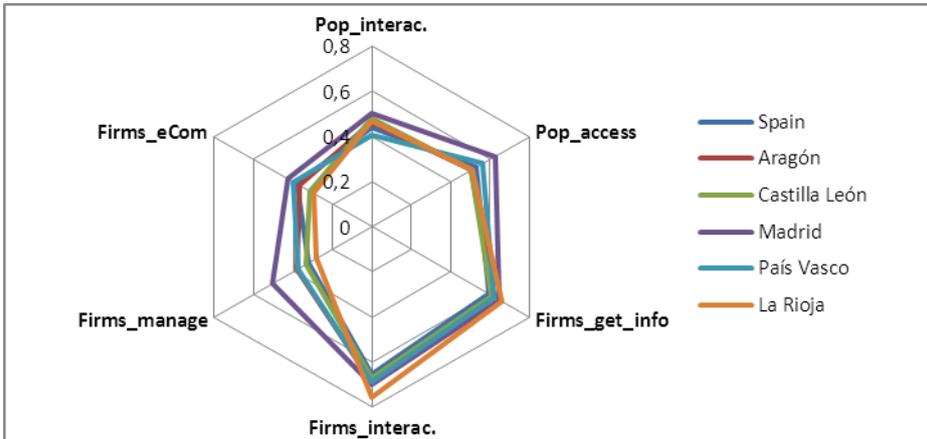


Figure 2: Index value between 90 and 100 (2012)



Source: self-elaborated

Figure 3: Index value between higher than 100 (2012)



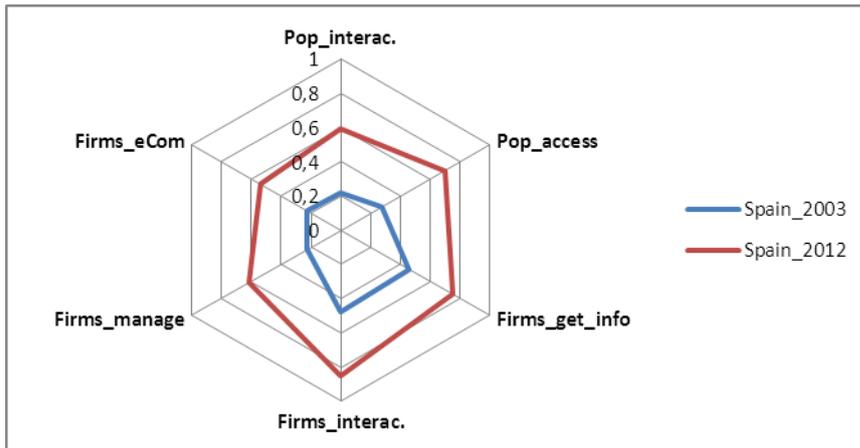
Source: self-elaborated

When referring to the temporary evolution (Figure 4) we can clearly see a huge improvement from 2003 to 2012. Nevertheless one thing should be taken into account: the fact that those aspects where AC performed worse are still the ones with a lower level of performance. This might explain the difficulties in improving certain areas related with e-government. It could be happening as a result of what Morgeson III and Mithas (2009) qualify as different preferences between public and private sector. According to them public sector expenses are much lower, and furthermore



they are highly centred on telephony infrastructures rather than on web-site development and upgrading.

Figure 4: Comparison 2003-2012



Source: self-elaborated

The temporary evolution also gives us a clear idea of the performance of each AC, which could be defined as slightly homogenous, since those regions performing better than the others at the beginning of the time-span continue performing better at the end of the time span. There are some exceptions, though, mainly dealing with the level of firms' interaction and management.

IV. METHODOLOGY

The primary objective of this study is to address the relation and influence existing between the stage of government and the long-run growth of an economy. Since the last goal of all these changes is to improve the performance of an economy, we want to focus our analysis and try to clarify the role of all these technological advances in government administration across Spain, at a NUTs II level, in improving its long-run performance. Once the analysis is carried out we would like to be able to describe the



influence of these technological variables on the main aspects of the economy, that is to say, productivity of enterprises or employment among others.

With respect to the time span used, 2001-2012, we were hardly constricted by the availability of data. Besides, we have to take into account that analysing together the two parts of the economic cycle may induce mistakes when trying to find out the exact relationships. That is the reason why we have introduced a dummy variable called “crisis” to capture these effects. In this sense, we have used a panel data approach, in order to minimize these likely errors. The following equation has been estimated:

$$\begin{aligned}
 GDPpc_growth_{it} &= \alpha + \beta_1 Pop_dens_{it} + \beta_2 R\&D_growth_{it} + \beta_3 R\&D_W_U_PA_{it} \\
 &+ \beta_4 Pop_access_{it} + \beta_5 Unemployment_{it} + \gamma_1 Pop_send_info_{it} \\
 &+ \gamma_2 Firms_get_info_{it} + \gamma_3 Firms_eCom_{it} + \mu_1 Gov_intro_Index_{it} \\
 &+ \mu_2 Crisis_{it} + v_t + \epsilon_{it}
 \end{aligned}$$

where the index i ($i=1,\dots,18$) denotes the Autonomous Community plus Spain (altogether) and the index t ($t=2001,\dots,2012$) denotes the period under analysis.

$GDPpc_growth_{it}$	is the growth rate of GDP per capita
Pop_dens_{it}	is the population density
$R\&D_growth_{it}$	is the growth of R&D total expenses
$R\&D_W_U_PA_{it}$	is the log of R&D workers at university and public administration (data available from 2003 to 2010)
Pop_access_{it}	is the percentage of population with Internet access
$Unemployment_{it}$	is the unemployment rate
$Pop_send_info_{it}$	is the percentage of population filling documents from public administration through Internet (data available for 2003 and from 2005 to 2012)
$Firms_get_info_{it}$	is the percentage of firms downloading documents from a public administration through Internet
$Firms_eCom_{it}$	is the percentage of firms with e-commerce (data available from 2003 to 2012)
$Gov_intro_Index_{it}$	is an index that calculates the introduction level of ICT at public administration
$Crisis_{it}$	is a dummy variable, which takes value 0 for periods before 2008
v_t	are the fixed time effects
ϵ_{it}	is the error term



The estimation technique is panel fixed-effects corrected for heteroskedasticity. The results are presented in table 1. We focus on the 17 Spanish Autonomous Communities (NUTs II).

V. RESULTS

As we can see in Nkwe (2012) the use of ICT for e-government implementation pursues the development of the public sector. In this sense the use of new technologies will provide countries with a tool to achieve a better position in order to follow the path towards long-run economic growth.

Our results show that an increase in Research and Development spending encourages per capita growth and development. The percentage of population who has access to Internet and the percentage of population filling documents from public administration through the net also have a positive influence on growth. This means that the more extended new technologies are the better for an economy, since it ends up benefitting their citizens. However our results denote a negative influence on GDP growth of enterprises getting information through Internet from public administrations or the percentage of e-commerce, as well as the number of workers in R&D government sectors. These results give an overall picture of the Spanish technological level and shed some light on the stage at which our economy is located in terms of Internet use by enterprises and government. ICT reveals how the use of Internet fosters economic growth, firms' productivity and employment. In this sense we have analysed the effect of unemployment. Its influence on growth has the expected negative sign. This negative effect arising in all the models is easy to interpret in a country such as ours, with one of the highest levels of unemployment in the OECD countries: idle resources always exert a negative influence on growth.



We can also think about the effect of the recent crisis negatively influencing and biasing our results. If we move to Model 2 we see how it severely hampers the economy both directly and through some other variables. More specifically, when we take the crisis into account, coefficients related to the percentage of population with Internet access and to the percentage of enterprises interacting with public administrations to get information, as well as to the e-Commerce level become non-significant. This would be reinforcing the idea of our country being at a low stage of technological development. On the other hand, this variable shows up as relevant, therefore denoting the impact of the crisis on the economy as a whole. However, its presence introduces more correlation among the variables, thus worsening the model, as we can see looking at the Durbin-Watson statistic for the two models (the second model displays an increase of 0.5 points in the DW-statistic).

Notwithstanding the best variable representing the process in which town councils are involved to being able to achieve the goal of becoming e-governments should be the Index that calculates the level of new technologies being incorporated at the public administration. In order to check its influence and the robustness of the model we have proceeded introducing it in our estimation (Models 3 and 4). Nevertheless in any of the models it seems to exert any relevant influence. Consequently it confirms our suspicion about the fact that Spain still has a long journey to go and gradually build up to the desired level of ICT development that is the *connected* stage. In order to do so we need to improve our efforts to detect the handicapped regions in which it is necessary to pump both private and public investment into R&D areas. It is then a serious task, also because regions are not at the same level of development. Moreover it is observed a large variability within each region, which translates into the fact that there are different stages of ICT development among their municipalities. All in all, the gaps that should be filled are different and therefore the government should undertake individualized actions if it is to close them.

VI. CONCLUDING REMARKS



In Spain, public sector is making continuous efforts to jump on the Information Society wagon but even though we start to see the impact of new technologies in the economy we are still far away from other European countries, partly due to the economic crisis we are experiencing. Nevertheless it is fully necessary for the government to adjust public investment devoted to new technologies, since Spain ranks very bad in this aspect. The reason why it has many more difficulties than other countries when it comes to increase public investment in ICT and e-government is not clear and deserves further analysis. However it is clear that Spain should make an effort to improve this aspect, like other countries did, with a view to increasing competitiveness and productivity, since without a doubt e-government will certainly play an important role in fostering economic growth.

As we have seen the literature talks about five stages according to the degree of technology adopted by the government in order to interconnect internal (public employees) and external (citizens, businesses and other social actors) economic actors. These stages go from the simplest one, where government only facilitates information to the highest sophisticated, where government web pages enables citizens' political participation in public forums and elections. Our country is now at an intermediate stage of e-government.

We need to detect the handicapped regions in which it is necessary to pump both private and public investment into R&D areas. It is then a serious task, also because regions are not at the same level of development. Moreover it is observed a large variability within each region, which translates into the fact that there are different stages of ICT development among their municipalities. All in all, the gaps that should be filled are different and therefore the government should undertake individualized actions if it is to close them.

E-government not only improves public administration efficiency but also their effectiveness. It is not only a way to reduce costs but also about delivering the services through the channels that citizens prefer. Government needs to have the ability to anticipate citizens' needs.



This study offers several practical outcomes for managers in the public sector that are facing the challenge of implementing e-government. New technologies and Internet are nowadays a great instrument for economic growth. For that reason governments must activate and promote new technologies also in order to accelerate the economic recovery.

E-government generates important benefits for economic development such as new employment, better health and education, improve wellbeing and prosperity. For that reason government must also focus on the demand side that are citizens, and become catalysts for change instead of mere service provider.

E-government also encourages firms to create jobs and invest in new technologies and applications. If it developed ICT the country will need and investment in human capital in the form of training and education. When e-government is in the last stages promotes private industry to invest in information infrastructure. For a good economic development we need a partnership between people, government and private sector. In that case ICT is a good example of partnership being the role of the government as a regulator, facilitator, investor and educator.

The road to economic development starts in good infrastructures, expertise and skilled workers and legal framework that government convert into e-products and e-services and e-governance.

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Table 1. Dependent variable: GDPpc_{it}_growth. Robust (HAC) standard errors. All CCAA.

	<i>Model 1</i>		<i>Model 2</i>		<i>Model 3</i>		<i>Model 4</i>	
<i>Variables</i>	<i>Coefficient</i>	<i>p-value</i>	<i>Coefficient</i>	<i>p-value</i>	<i>Coefficient</i>	<i>p-value</i>	<i>Coefficient</i>	<i>p-value</i>
Intercept	0.419	0.000 ***	0.245	0.008 ***	0.411	0.000 ***	0.243	0.008 ***
Pop_dens _{it}	0.000	0.794	0.000	0.749	0.000	0.819	0.000	0.762
R&D_growth _{it}	0.043	0.063 *	0.040	0.049 **	0.042	0.068 *	0.039	0.045 **
R&D_W_U_PA _{it}	-0.040	0.001 ***	-0.026	0.026 **	-0.040	0.001 ***	-0.026	0.026 **
Pop_access _{it}	0.084	0.022 **	0.060	0.106	0.085	0.024 **	0.060	0.111
Unemployment _{it}	-0.418	0.000 ***	-0.228	0.000 ***	-0.423	0.000 ***	-0.230	0.000 ***
Pop_send_info _{it}	0.115	0.005 ***	0.067	0.094 *	0.113	0.007 ***	0.066	0.095 *
Firms_get_info _{it}	-0.161	0.008 ***	-0.040	0.460	-0.158	0.010 **	-0.040	0.462
Firms_eCom _{it}	-0.122	0.030 **	-0.048	0.397	-0.126	0.027 **	-0.049	0.399
Crisis			-0.043	0.001 ***			-0.043	0.001 ***
Gov_intro_Index _{it}					0.000	0.588	0.000	0.857
N	126		126		126		126	
Adjusted R ²	0.6775		0.716		0.674		0.713	
Durbin-Watson	2.302		2.795		2.296		2.793	

Source: N-Economia and INE.

Table 2. Dependent variable: GDPpc_{it}_growth. Robust (HAC) standard errors. CCAA with lower than 100 index.

<i>Variables</i>	<i>Model 1</i>		<i>Model 2</i>		<i>Model 3</i>		<i>Model 4</i>	
	<i>Coefficient</i>	<i>p-value</i>	<i>Coefficient</i>	<i>p-value</i>	<i>Coefficient</i>	<i>p-value</i>	<i>Coefficient</i>	<i>p-value</i>
Intercept	-0.410	0.144	-0.167	0.363	-0.377	0.249	-0.130	0.566
Pop_dens _{it}	0.124	0.062 *	0.052	0.244	0.115	0.150	0.041	0.468
R&D_growth _{it}	0.073	0.003 ***	0.069	0.001 ***	0.072	0.003 ***	0.067	0.001 ***
R&D_W_U_PA _{it}	-0.038	0.010 ***	-0.017	0.272	-0.037	0.011 **	-0.016	0.315
Pop_access _{it}	-0.040	0.461	-0.025	0.526	-0.045	0.435	-0.030	0.457
Unemployment _{it}	-0.463	0.000 ***	-0.252	0.010 ***	-0.462	0.000 ***	-0.251	0.011 **
Pop_send_info _{it}	0.056	0.269	0.030	0.485	0.054	0.310	0.027	0.548
Firms_get_info _{it}	-0.052	0.425	0.040	0.501	-0.046	0.521	0.048	0.450
Firms_eCom _{it}	-0.132	0.026 **	-0.046	0.500	-0.134	0.021 **	-0.048	0.478
Crisis			-0.042	0.029 **			0.000	0.460
Gov_intro_Index _{it}					0.000	0.640	-0.042	0.027 **
N	77		77		77		77	
Adjusted R ²	0.659		0.690		0.653		0.685	
Durbin-Watson	2.427		2.867		2.411		2.857	

Source: N-Economia and INE.

Table 3. Dependent variable: GDPpc_{it}_growth. Robust (HAC) standard errors. CCAA with higher than 100 index.

Variables	Model 1		Model 2		Model 3		Model 4	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Intercept	-0.410	0.144	-0.167	0.363	-0.377	0.249	-0.130	0.566
Pop_dens _{it}	0.124	0.062 *	0.052	0.244	0.115	0.150	0.041	0.468
R&D_growth _{it}	0.073	0.003 ***	0.069	0.001 ***	0.072	0.003 ***	0.067	0.001 ***
R&D_W_U_PA _{it}	-0.038	0.010 ***	-0.017	0.272	-0.037	0.011 **	-0.016	0.315
Pop_access _{it}	-0.040	0.461	-0.025	0.526	-0.045	0.435	-0.030	0.457
Unemployment _{it}	-0.463	0.000 ***	-0.252	0.010 ***	-0.462	0.000 ***	-0.251	0.011 **
Pop_send_info _{it}	0.056	0.269	0.030	0.485	0.054	0.310	0.027	0.548
Firms_get_info _{it}	-0.052	0.425	0.040	0.501	-0.046	0.521	0.048	0.450
Firms_eCom _{it}	-0.132	0.026 **	-0.046	0.500	-0.134	0.021 **	-0.048	0.478
Crisis			-0.042	0.029 **			0.000	0.460
Gov_intro_Index _{it}					0.000	0.640	-0.042	0.027 **
N	42		42		42		42	
Adjusted R ²	0.694		0.711		0.696		0.707	
Durbin-Watson	2.771		2.986		2.738		2.938	

Source: N-Economia and INE.