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The new regulation of public infrastructure services in the European Union. Challenges for territorial cohesion

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The new regulation of public infrastructure services in the European Union. Challenges for territorial cohesion

Thematic area: Regional policy in Europe

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Infrastructure services (or Services of General Economic Interest, SGEI) in the European Union (EU) have undergone significant reform in the recent period, including privatization, liberalization and deregulation. These reforms, however, have led to concerns about the potential impact of pursuing economic profitability over service quality, affordability, accessibility and universality. Traditionally, because SGEI have been understood as playing a key economic, social and strategic role, they have been subject to specific rules in the general interest: so-called Public Service Obligations (PSO). A key objective of PSO is to ensure equal access to services, independent of the place of residence, income or other factors. PSO are, therefore, a key instrument as regards ensuring equity and territorial cohesion. As such, it constitutes a fundamental concern in European regional policy. Traditionally, the regulation of SGEI has focused on the supply side, as it has been assumed competition in an integrated European market would benefit citizens. Despite this, little research has actually been done on evaluating regulation from the demand side, not to speak of applying a regional focus.

The aim of this paper is to evaluate SGEI provision and regulation in the EU from the perspective of citizens as consumers using a regional perspective. We focus on the region (NUTS1) and the urban/rural character of the place of residence as possible determinants of disparities. To do so, a microeconomic analysis of citizens' revealed and stated preferences is performed, focusing on three large European countries (Italy, Spain and the United Kingdom) for the services of electricity, gas, water, fixed phone, mobile phone and internet. First, disparities in spending on the services are analyzed, using National Household Budget Surveys. Next, differences in dissatisfaction with service price and access are analyzed, using the *Eurobarometer*. With this evidence, we analyze whether differences in consumption of a particular service in a particular region or rural area are related to problems of affordability, problems of accessibility or to other factors. Findings show different regional patterns of services use. Moreover, serious problems are observed regarding equal access to services such as gas and internet in rural areas, of relevant concern for the question of territorial and social cohesion.

1. Introduction

During the last decades, in the majority of the countries of the European Union (EU), most of the infrastructure services previously provided by public monopolies or private monopolies under concession regimes have experienced significant regulatory reforms. These reforms, through the privatization, liberalization and deregulation of markets such as electricity, gas, water and telecommunications, has led to a dominance of private provision of services (Clifton *et al.*, 2007). In parallel, there has been a growing concern about whether, as a result of the functioning of markets after the reforms, they have a negative impact on traditional aspects of public service provision such as quality, equity, affordability, accessibility and universality (Van de Walle, 2006). This debate is of a great relevance from the territorial point of view, as citizens living in peripheral or remote areas where the provision of the services offers lower economic returns, may face a higher risk of being excluded from it (Héritier, 2001; Clifton and Díaz-Fuentes, 2010). Due to these concerns and the relevant economic, social and strategic role of these services, the EU has defined as Services of General Economic Interest (SGEI) those which, as mentioned, with an economic nature, are subject to public service obligations (PSO) due to the general interest (EC, 2003). This implies they are subjected to specific rules to ensure compliance with certain specific objectives of social interest (Costas, 2007; CEEP, 2010). Thus, regulation has to ensure that the reforms influence on the supply, but, simultaneously, that their effects on the demand are subject to the PSO (Cremer, 2009). Among the PSO are key universal service obligations (USO), which aim to ensure equal access to a basic package of public services independently of income or the place of residence (Calzada *et al.*, 2009; Van de Walle, 2009).

For this reason, the regulation of access and quality of SGEI is key to equity and regional balance (Cremer, 2009) and, in particular, to economic development and quality of life in rural areas (CEMR, 2009). Consequently, it constitutes a fundamental element of policies for social and territorial cohesion in the EU (Faludi, 2006; EC, 2008a). Traditionally, the regulation of SGEI has focused on the supply side, assuming that it would be good for consumers if competition was promoted in an integrated European market. However, the demand side perspective has been ignored in the design and evaluation of regulatory policies. At present, nevertheless, according with the proposals of the OECD (2007 and 2008), the European Commission acknowledges limitations of competition policy and, therefore, is considering that complementing the supply side and demand side perspectives in the regulation of SGEI could improve the design of policies and the functioning of the markets (EC, 2008b). The subsequent greater attention to the decisions and perceptions of citizens towards these services is of interest in terms of the regional science concern regarding the spatial dimension, because this allows incorporating the context derived from it as a explaining factor of these decisions and perceptions (Strauss, 2008). To date, however, it persists a lack of empirical evaluation of the regulation of SGEI from the perspective of citizens as consumers and, what is also relevant for the scope of this paper, an insufficient analysis of these issues with a regional or territorial approach.

In this context, this paper aims to evaluate the provision and regulation of SGEI in the EU from the point of view of citizens (as real or potential consumers) with a regional perspective. Specifically, we analyze, from households revealed expenditure, the patterns of consumption of electricity, gas, water and telecommunications in the regions of three large European countries (UK, Spain and Italy) and, as an additional key aspect, the differences on this respect among residents in rural and urban areas.

Then, based on citizens stated preferences, we analyze the differences in satisfaction with price (affordability) and with access to services (accessibility). Thus, the contrast of citizens revealed and stated preferences enables to detect the existence of problems regarding equal access to services independently of place of residence. The combined analysis of revealed and stated preferences has been applied in areas such as environment, transport and marketing (Whitehead *et al.*, 2008), but it is an innovative approach to evaluating the regulation of SGEI. To address the objective described above, after this introduction, the second section is an approach to the impact of European reforms in the regulation of SGEI and to the literature that directly or indirectly, has analyzed these services from the demand side and with a regional perspective. Thus, the third section describes the hypothesis of the research and the sources and methodology used. After this, the fourth section estimates and describes, through a microeconomic analysis, the effects of certain explaining factors, focusing on those related to the place of residence, on spending on SGEI and on satisfaction with the conditions of their provision. Finally, the results allow to contrast the hypotheses of the paper and to obtain certain relevant conclusions in terms of the regulation of SGEI and its impact on social and territorial cohesion.

2. Motivation

From the eighties, as part of the forging of the European Single Market, the European authorities agreed on the liberalization of infrastructure services. Privatization, configured as a national decision was addressed by the majority of Member States during the nineties. The three countries under analysis, despite their differences in their previous situation and in the time and the options of addressing this process, share in common having introduced recently intensive reforms in the markets of most of the SGEI and, in particular in telecommunications, configured as a paradigm of reforms (Clifton *et al.*, 2007). The United Kingdom (UK) was pioneer in this kind of reforms in the eighties, during the governments of Thatcher. In fact, the country implemented the liberalization and introduction to competition in the sectors of electricity and telecommunications previously to European directives that determined it. In the UK, at present, as described in CEEP (2010), the services analyzed in this paper are provided by private entities under the control and supervision of independent or quasi independent regulatory agencies. Markets, after their liberalization, are subject to a relatively high degree of competition, with the main exception of water, under private monopoly.

Spain and Italy, meanwhile, addressed the liberalization of SGEI after the UK, during the nineties, following the EU directives on this respect (Clifton *et al.*, 2007). Spain beginning with a role of public sector in the ownership and provision of these services under the European average, was in the nineties one of the most active countries in privatization. Consequently, at present, the presence of the public sector in the ownership of SGEI is very reduced. However, as privatization was implemented prior to market liberalization, it persists, although with differences among sectors, a general trend to market concentration in services as electricity production and marketing, gas and telecommunications, which limits effective competition (Bel *et al.*, 2006; CEEP, 2010). Water is a particular case, with various forms of provision organized locally, including private monopolies, public local monopolies and mixed forms (Bel *et al.*, 2010). With respect to Italy, it is remarkable the traditional strong role of the public sector in the ownership and direct control of the provision of infrastructure

services (Miniaci *et al.*, 2008). At present, after the reforms that have led to the liberalization of much of the infrastructure services, a distinguishing characteristic of the Italian case from the British and Spanish ones is that markets such as electricity, gas and water (in this case, a service organized as a local public service) are still dominated by public companies. The exception is telecommunications, where reforms, also in Italy, have led to a market dominated by private companies (CEEP, 2010).

After the reforms, the public sector has lost, in the European countries, much of their role on the ownership and provision of the SGEI. It maintains, nevertheless, a relevant role as strategic and regulatory agent in favour of the general interest and of the maintenance of citizens' rights as consumers that, in each case, are set out as targets of social interest, as described in CEEP (2010). In the cases of Spain and Italy during the decades preceding the reforms, the concept of "public service" implied the guarantee of the provision of certain minimum services. As noted by Costas (2007), a major objective in this period was equal access to services, which focused on people with lower economic resources and also on residents in rural areas. In Spain, the reforms, in parallel to remarkable technological improvements and the development of new services as mobile telephony and the internet, priorities of regulatory policies shifted to the pursuit of productive efficiency. In recent years, reforms have been followed by a limitation or even disappearance of the concept of "public service" ("*servicio público*"), substituted by the described PSO, according to the EU terminology (EC, 2003; Clifton *et al.*, 2005). At present, PSO, as the modes of organization of the SGEI under analysis, are determined at national level (with the exception of water, competence of the local governments), through the legislation and regulation of independent bodies. In Italy, although "public service" ("*servizio pubblico*") remains as the most common term, the EU terminology has also been introduced recently to distinguish between social and commercial services. The public sector plays an active role in the regulation and control of SGEI and the PSO. It is also considered the public ownership of companies providing these services, if this does not undermine the competitive functioning of the markets. The organization and regulation of services under analysis is set by the central government through regulatory agencies with the exception, as in Spain, of the case of water, competence of regional and local authorities. Finally, as regards the UK, the confidence in the functioning of the market forces is more consolidated, while the EU terminology in relation to the SGEI and their regulation is hardly used. The UK has been pioneer not only in the reforms, but also in implementing specific consumer policies, with the aim of supporting their decision making in the markets. Competences on services provision and organization belong to the central government, although it has also influence on it the transfer of certain policies to devolved governments, as policies for rural areas in Scotland and Wales (CEEP, 2010).

The reforms previously described on markets of infrastructure services were accompanied by increasing concerns regarding their possible consequences, which is a debate of great significance in terms of social and territorial cohesion in the EU. In the different Member States, these services have played a key role in historical and institutional evolution (Clifton *et al.*, 2006). Although there were many common elements regarding their organization, ownership and regulation, in countries like France and Italy the law has traditionally guaranteed citizens rights to these services while in others, such as the Netherlands and the UK, infrastructure services had a lower role in the legislation, but specific obligations regarding accessibility, quality and continuity of supply were established. Certain actors, led by the governments of France and Belgium feared that after the reforms, the public interest would be under the

commercial interests of supplier, to the detriment of the universality, quality and continuity of supply and the responsibility of it (Héritier, 2001). Therefore they aimed to legally define the role and nature of the SGEI and legal guarantees regarding them. These actors promoted a document which should end in a Framework Directive, which defended legally recognized rights to equity in access, universal provision, the quality of services and participation and democratic control of them, as key elements to solidarity and territorial and social inclusion that should characterize the EU (Clifton *et al.*, 2005).

Although the need of establishing a regulation from the perspective of citizens was shared, there was no common position on what elements should be regulated and by what means. Other actors, particularly governments of the United Kingdom and the Netherlands and important business sectors, did not consider necessary to ensure legal rights of citizenship, but only to apply certain tools to protect consumers. From the consumer perspective, this view would imply that the users satisfaction with the provision of services should be evaluated, and voice channels should be established for them to express their discontent (Clifton *et al.*, 2005). The most significant difference between the two perspectives was that while the “continental vision” focused in all the citizens, the “Anglo Saxon vision” focused only on consumers and not in non-users (Prosser, 2005).

As is usual in the EU, it was necessary to reach a compromise that would satisfy both perspectives. The debate was intensified with the publication of the Green Paper on Services of General Interest (EC, 2003), but the lack of consensus and, at the end, the rejection of the European Constitutional Treaty, implied the gradual disappearance of the aspiration to establish rights to SGEI linked to the concept of citizenship at the European level. Thus, at present, the rights to these services must be guaranteed by national authorities, or promoted at the European level through other instruments. Therefore, European regulatory policies, aimed by the Treaty of Lisbon (EU, 2007) to promote universal access to the SGEI and to protect the rights of their users, are currently prioritizing the search for alternatives to the legal-based solutions.

In recent years, in this context, significant problems have been detected in the markets of SGEI (Ilzkovitz *et al.* 2008), of a particular relevance given the complexity and social importance of these services (Sappington, 2005). This has led to the European Commission to recognize the inadequacies of competition policy alone and, therefore, to seek its integration with consumer policy (EC, 2008b). Within this growing interest on the consumer perspective, the evaluation of their satisfaction with the SGEI, conducted through various Eurobarometer surveys, is configured as a fundamental aspect. The latest editions of these surveys (EC 2005 and 2007) allow to relate the perceptions of respondents regarding aspects such as accessibility and affordability of services to factors such as the place of residence and thus to assess satisfaction with the SGEI from a regional perspective. Furthermore, these previously described trends in European regulatory policies of the SGEI have been largely influenced by the emergence of new contributions regarding understanding of consumer behaviour, such as those derived from Behavioural economics (EC, 2008c). Regarding the focus of regional and territorial policy, Strauss (2008) has argued in a recent paper by incorporating to regional science this kind of new contributions on the behaviour of consumers, with the aim of improving the integration of economic and geographic analysis through a greater attention to the social context that conditions decision making. This is related with the institutionalist conception of individuals not as isolated elements, but as agents socially and institutionally constituted and influenced by its

context and environment (Hodgson, 2000). On this regard, the Treaty of Lisbon (EU, 2007) mentions in relation to the SGEI, “the differences in the needs and preferences of users that may result from different geographical, social or cultural situations”.

The social relevance of SGEI, reflected in the PSO, along with the increasing interest of European regulatory policies in the perspective of citizens as consumers of these services, make necessary a better understanding of how demand-related factors such as place of residence and the condition factors derived from its impact on citizens decisions and attitudes towards SGEI. As previously described, the provision of these services in rural areas in equal conditions of accessibility, affordability and quality is key in terms of the PSO. Also, the political-administrative structure and the differences among countries and regions is another relevant element to consider, as there are differences in the degree of centralization and in the competences of the regional and local authorities. However, despite this political and scientific interest, few analysis of the SGEI regulation have been made from the demand side perspective, and even in a lesser extent, with a regional perspective. One of the exceptions is the analysis of Fiorio *et al.* (2007), who observed that, within the EU, countries population density tends to be positively related to satisfaction with the services and stressed the complexity of the economic, institutional and social environment as determinant in these opinions. Regarding the behaviour of consumers, Giulietti *et al.* (2005) found that in the UK, residents in areas of low population density were less likely to change gas supplier, which they related to difficulties in the searching process derived from the policies of the providers. In other research, applied to the case of Italy, Miniaci *et al.* (2008) have highlighted the impact of geographic and social differences between regions on the consumption patterns of SGEI as electricity, gas and water and on the definition of relevant indicators for regulation assessment, such as affordability.

However, most of the research that have addressed this kind of analysis from a regional perspective has focused in the case of new technologies of information and communications, which is related with the broad awareness of the positive impact of their extension on economic development and social and territorial cohesion (Cuadrado-Roura and García-Tabuenca, 2004; Surinach *et al.*, 2007). In this regard, authors as Mills and Whitacre (2003) for the case of United States and Demoussis and Giannakopoulos (2006) for the EU, have observed a persistent difference, related to the place of residence and with an impact on living conditions, in the use of services like internet. Lera-López *et al.* (2009), for the case of Spain, have analyzed the factors affecting internet use and found significant differences, which then they related to factors as the weight of the service sector, regional per capita GDP, public spending on R&D and regional technological and business capital. From these results, these authors obtained a series of recommendations that aim to improve social and territorial cohesion through the development of new technologies of information and communications. In general terms in the context of developed countries, it has been detected a remarkable difference between urban and rural areas in access and use of internet, which led to the concept of “digital divide”. This gap, as emphasized by Picot and Grove (2010), given the increasing economic and social importance of this service requires the implementation of any kind of policy to tackle the problem. The paradigmatic case of internet highlights the importance, from the point of view of regulation of PSO and USO, of assessing the equal access to the SGEI depending on the place of residence, an objective that aims to constitute the main contribution of this paper.

3. Methodology

With the motivation described above and in relation to the objective of this paper of evaluating the provision and regulation of SGEI from the point of view of citizens as consumers and with a territorial perspective, the following hypothesis are addressed for each of the services and countries analyzed:

- I. To live in a rural area conditions spending on the SGEI under analysis.
- II. To live in a rural area is related to lower satisfaction with the price of the SGEI under analysis (problems of affordability), which would be an explanatory factor of disparities in spending.
- III. To live in a rural area is related to lower satisfaction with access to the SGEI under analysis (problems of accessibility). The existence of these problems would determine a lower spending.
- IV. There are observed, among the regions of the three countries under analysis, differences in spending on SGEI, and in satisfaction with price and access to them.

These hypotheses are empirically contrasted by the combined analysis of citizens revealed and stated preferences towards the SGEI. Revealed preferences, resulting from observable decisions made by individuals in the markets, provide indicators that can be considered objective. Stated preferences, on the other hand, consisting of individuals' self-assessment of their own perceptions towards services, make possible to analyze aspects that revealed decisions alone are not able to detect, as the motivation of a lower or nonexistent consumption or the satisfaction obtained. To consider stated preferences is of particular interest in the case of these services, since, as has been described by Costas (2007) and Clifton and Díaz-Fuentes (2010), they are not competitive markets, but quasi-markets: in them, both exit and change of provider are not easy and for this reason consumption decisions do not always reflect citizens' real preferences. Consequently, according to Hirschman's Exit, voice and loyalty framework, voice (satisfaction) is an essential aspect to consider. With this motivation and as suggested by Fiorio and Florio (2008), this paper considers that both sources provide elements of particular interest. Thus, the combined analysis of these sources, in a complementary and not in a competitive way allows, as pointed out by Whitehead *et al.* (2008), maximizing the strengths of both sources while minimizing their limitations, this leading to enrich interpretation of data and results.

The information on revealed preferences is derived from microdata, for 2006 of the Household Budget Surveys (HBSs) of the countries under analysis: the British Expenditure and Food Survey (ONS, 2006), the Spanish Encuesta de Presupuestos Familiares (INE, 2006) and the Italian Indagine sui Consumi delle Famiglie (ISTAT, 2006). These surveys, with a large sample size (6,645, 19,435 and 23,639 observations, respectively), collect the expenditure of households resident in their respective countries, widely disaggregated into the different categories of goods and services defined in the COICOP classification, as well as the main socioeconomic characteristics of households. From this information, it is considered as the dependent variable the

logarithm of households spending on electricity, gas, water and telecommunications, expressed in euros per year¹.

With respect to stated preferences, the source considered are microdata of Eurobarometer of the year 2006 (EC, 2007). This survey provides information about the perceptions of citizens of the EU-25 regarding different aspects of the provision of SGEI, as their accessibility and affordability. It also incorporates information on the socioeconomic characteristics of individuals. As dependent variables, we consider two different aspects of each of the services of electricity, gas, water, fixed telephone, mobile telephone and internet. First, we analyze the probability that an individual states to be satisfied with the price of the service, from a binary variable that equals 1 when the individual states that the service is “affordable” and 0 otherwise. Then, we analyze the probability of satisfaction with access to each of the services from a binary variable that equals 1 if the individual believes that access is easy and 0 otherwise.

With respect to independent variables, those referred to the place of residence are:

- Country. Taking the UK as the reference category, the binary variables “*SPAIN*” and “*ITALY*” reflect the effect on each dependent variable associated to living in these countries, in relation to living in the UK.
- Region. It is used as level of territorial disaggregation, the NUTS1 of the three countries under analysis². This variable reflects the effect of living in each of these NUTS1, with respect to living in that where the capital city of each country is, selected as reference category.
- Residence in a rural area. In this regard, we introduce a binary variable (“*RURAL*”), which equals 1 if the respondent lives in a rural area and 0 otherwise. The definition of “rural area” is established based on the information provided by the surveys analyzed and regarding the criteria used in each of the territories to which they are referred. With respect to the HBSs, in the case of England, this variable is derived from the residence in a “village” or an “isolated area”, versus a “urban” area or a “small town”. In the case of Scotland, it is referred to the residence in a “rural” area, versus “urban” or “small town”. For Spain, it is referred to the residence in a rural area (“*rural*”), versus an urban area (“*urbana*”). With respect to Italy, it is derived from the residence in a village (“*nucleo abitato*”) or an isolated area (“*case sparse*”) versus a city or town (“*centro abitato*”). Finally, in the Eurobarometer, the variable is derived from the respondents own definition regarding their place of residence, taking value 1 for individuals who state living in a “rural area or village” and 0 otherwise.

¹ The categories analyzed correspond, according to the COICOP classification of goods and services followed by EUROSTAT (2003), with the subgroups of Electricity (4.5.1.), Gas (4.5.2.), Water (4.4.1.) and Telephone and telefax services (8.3.1.) – which includes spending on internet-.

² According to NUTS1 classification, the UK is divided in 12 regions (Northwest, Northeast, Yorkshire, East Midlands, West Midlands, East England, London, Southeast, Southwest, Wales, Scotland and Northern Ireland), Spain in 7 regions (Noroeste, Noreste, Madrid, Centro, Este, Sur and Canarias) and Italy in 5 regions (Nordovest, Nordest, Centro, Sud and Isole). In the case of the UK, in order to reduce the number of variables needed, the regions Northeast and Yorkshire, on the one hand, and East Midlands and West Midlands, on the other, are aggregated for the analysis.

Both in terms of revealed and stated preferences, the variable “*RURAL*” is analyzed considering the interaction effect with the country of residence. This enable to correct any disparities arising from the definition of the variable, but specially to analyze in a separated manner and then to compare the effect on the dependent variables associated with living in a rural area in each of the countries analyzed.

In addition to these independent variables related to the place of residence, we introduce the following control variables in order to correct the effect of other factors on the dependent variables. Household size, from the number of members (*NMEMBERS*) and this variable squared (*NMEMBERS2*) in the case of revealed preferences, and a series of binary variables that represent the number of members (being two members the category of reference) regarding stated preferences. The age, through the variables corresponding to intervals of less than 35 years, from 50 to 64, from 65 to 74 and more than 74, being those from 35 to 49 the reference category. Housing tenure, which differentiates non-owners and owners. And finally, only available regarding revealed preferences, equivalent household income, from the logarithm of total annual expenditure adjusted by household size, through the modified OECD scale. Also, estimations incorporate population weights included by the surveys, which provides results representative of the whole population of the countries under analysis.

Through these variables, with respect to revealed preferences, it is carried out the following estimation for each of the services analyzed:

$$\ln(Sp_{ij}) = f(x_i) = f(C_i, N_i, R_i * C_i, Z_i^R) \quad (1)$$

Where:

Sp_{ij} = spending of household i in the service j , expressed in euros per year.

Being j = [electricity, gas, water, telecommunications].

C_i = Country of residence of household i .

N_i = Region (NUTS1) of residence of household i .

R_i = binary variable representing residence in a rural area.

Z_i^R = vector of control variables derived from HBSs.

Regarding stated preferences, the probability of stating satisfaction with respect to the affordability and accessibility to each of the service under analysis is estimated, assuming that the random disturbance follows at any case a normal standard distribution $u_i(0, \sigma^2)$, through two probit models of the form:

$$P(y_i = 1) = \Phi(\beta'x_i) \quad (2)$$

Where Φ is a normal standard distribution function. Marginal effects associated to each independent variable k , defined as the expected changes in the dependent variables generated by a unitary increase in k , are estimated in the following way:

$$\frac{\partial}{\partial x_{ik}} \Phi(x_i' \beta) = \Phi(x_i' \beta_k) \beta_k \quad (3)$$

For the analysis of the satisfaction with respect the affordability and accessibility of the services, they are performed, for each service j , two probit models of the form:

$$P(\text{SatPRICE}_{ij} = 1) = \Phi(x_i) = \Phi(C_i, N_i, R_i, Z_i^R) \quad (4)$$

$$P(\text{SatACCESS}_{ij} = 1) = \Phi(x_i) = \Phi(C_i, N_i, R_i, Z_i^R) \quad (5)$$

Where:

SatPRICE_{ij} = Satisfaction with the price of service j by individual i .

SatACCESS_{ij} = Satisfaction with access to service j by individual i .

Being j = (electricity, gas, water, fixed phone, mobile phone, internet).

C_i = Country of residence of individual i .

N_i = Region (NUTS1) of residence of individual i .

R_i = binary variable representing residence in a rural area.

Z_i^D = vector of control variables derived from Eurobarometer.

From the estimations previously described, it is carried out a comparison analysis of revealed and stated preferences, as defined by Whitehead *et al.* (2008), in which both sources are analyzed separately and then the results obtained are contrasted. To do this, first regarding evidence on revealed preferences, it is considered that household i spending on service j (Sp_{ij}) is the product of two elements: the unit price paid for the service (P_{ij}) and the quantity consumed of the service (X_{ij}). Thus, the observation of a level of spending in a particular territory (for instance, rural areas of a certain country) may be due to three different reasons, whose existence and importance can be contrasted from the results of stated preferences:

- a) A different unit price (P) of the service, which is observed through estimations on satisfaction with the price (affordability). The existence of a higher unit price would lead *ceteris paribus* the quantity consumed, to a higher spending. However, it is possible that this reduces the demand and, thus the quantity consumed (X), so much that the final spending is lower. In both cases, this would evidence problems (in these cases, related to affordability) regarding the access to the service in equal conditions independently of the place of residence.
- b) Consumption of a quantity (X) of the service lower than the desired, due to problems of access to it, what is contrasted through the estimations on the satisfaction with the accessibility. This evidence would imply a problem in terms of the compliance with the PSO, in this case regarding the accessibility of services.
- c) Consumption of a different quantity (X) of the service, due to differences in the demand derived from different preferences or consumption needs. This motivation would allow to explain those differences in spending not explained by the existence of problems of affordability or accessibility of the services.

4. Results

First, table 1 shows estimations derived from the revealed preferences in relation to spending on services. Regarding regional differences, it is observed in the three countries that spending on electricity tends to be higher (*ceteris paribus* all the other factors considered) in the Southern regions (with the main exceptions of lower spending in London – UK – and Canary Islands – Spain –). Spending on gas, by contrast, is

particularly higher in Northern regions of each country. Both patterns are presumed to be derived from the climatic characteristics and their consequences in terms of summer cooling and winter heating needs. Derived from a lower extension of the use of the service, it is remarkable how spending on gas is significantly lower in Spain (being particularly low in Canary Islands) and in Northern Ireland. Regarding water, spending on water is non-existent in Northern Ireland, as there is no direct payment for the service. Finally, with regard to spending on telecommunications, in which differences between countries are smaller, it is remarkable the higher spending observed in those regions where the capital city of the countries is located and also in Northern Ireland.

Another aspect of particular interest is the analysis of differences in spending on services between the urban and rural areas of each country. Regarding spending on electricity, no intense differences are observed, although it is particularly lower in Spain among rural regions, on contrary than in the UK and Italy. Spending on gas, however, is observed strongly reduced in rural areas in the three countries, and in particular in the UK. Spending on water, meanwhile, is lower in rural areas in the UK and Spain, although not in Italy. Spending on telecommunications, finally, is lower in the rural areas of the three countries and in particular in Spain, although the intensity of these effects is lower than in the case of gas.

Regarding the control variables, it is observed that household size is positively related to spending on the services. The age and housing tenure also show significant effects, particularly with regard to spending on energy services (electricity and gas). The coefficient associated with income, finally, shows a direct relation to spending on the services. However, their relatively low income elasticity reflects that they are necessity goods.

Table 1. Effects estimated on spending on SGEI

		Electricity	Gas	Water	Telecom
	Constant term	-0.588**	-1.936***	1.166***	-1.839***
NUTS1	UKINGDOM				
	NORTHWEST	0.304**	0.235*	0.169***	-0.498***
	NEAST&YORKS	0.301***	0.223*	0.146***	-0.352***
	MIDLANDS	0.304***	0.304**	0.163***	-0.209***
	EASTENGLAND	0.440***	-0.159	0.170***	-0.189**
	LONDON				
	SOUTHEAST	0.410***	0.039	0.091**	-0.316***
	SOUTHWEST	0.530***	-0.281*	0.149***	-0.185**
	WALES	0.539***	0.228	0.285***	-0.432***
	SCOTLAND	0.367***	-0.293*	-0.010	-0.149*
	NIRELAND	0.397***	-4.378***	-5.844***	-0.092
	SPAIN	0.726***	-0.708***	-0.557***	0.039
	NOROESTE	-0.479***	-1.363***	-1.500***	-0.306***
	NORESTE	-0.628***	-1.161***	-1.363***	-0.352***
	MADRID				
	CENTROSPA	-0.390***	-1.537***	-1.121***	-0.418***
	ESTE	-0.121***	-1.306***	-0.190***	-0.271***
	SUR	-0.073*	-2.314***	-0.262***	-0.343***
	CANARIAS	-0.585***	-3.552***	-0.118**	-0.252***
	ITALY	0.589***	0.476***	-2.583***	-0.259***
	NORDOVEST	-0.121***	-0.004	-0.483***	-0.100***
	NORDEST	-0.038**	-0.044	0.427***	-0.074***
	CENTROITA				
	SUD	0.190***	-0.297***	-0.019	-0.179***
	ISOLE	0.427***	-0.533***	-0.341***	-0.135***
Rural residence	RURAL*UK	0.123*	-2.496***	-0.389***	-0.096*
	RURAL*SPA	-0.045*	-0.769***	-0.637***	-0.206***
	RURAL*ITA	0.079***	-0.423***	0.050	-0.078***
Household size	NMEMBERS	0.303***	0.484***	0.307***	0.517***
	NMEMBERS2	-0.018***	-0.036***	-0.025***	-0.039***
Age	<35	-0.089**	-0.134**	-0.082***	-0.003
	50-64	0.191***	0.188***	0.141***	0.083***
	65-74	0.282***	0.306***	0.254***	-0.025
	>74	0.348***	0.382***	0.192***	-0.104***
Housing ten.	NOPROP	-0.397***	-0.596***	-0.045*	-0.116***
Income	lnSPENDeq	0.549***	0.654***	0.415***	0.751***
N		49,719	49,719	49,719	49,719
F		224.72	637.91	4,385.39	195.06
Prob>chi2		0.000	0.000	0.000	0.000

* significance level at 10%, ** significance level at 5%, *** significance level at 1%

Source: Own calculations based on ONS (2006), INE (2006) and ISTAT (2006)

Then, with respect to stated preferences, table 2 shows the effects estimated on satisfaction with services affordability. In general, this is systematically lower in Spain (except with respect to electricity and water) and especially in Italy (except with respect to mobile telephony) than in the UK. These results may be due to differences between countries in the pessimism in perception, because citizens do not have, in general, information about the markets of other countries in order to make comparisons. Also, some regions are systematically related to higher satisfaction (as Northwest and Southeast in the UK and Nordovest in Italy) or lower satisfaction (cases of Noreste in Spain and Isole in Italy) with the price of services. As other significant aspects, they are remarkable the particularly low satisfaction with the price of gas in Northern Ireland and in the Canary Islands, which permit relate the lower spending on these regions with a problem of affordability of the service.

Beyond the differences between regions, the most relevant results in relation to the affordability of services are referred to the differences between urban and rural areas. As it is observed, particular problems are identified in relation to gas affordability in rural areas of the UK and Italy, although not in Spain, reflected in lower satisfaction with the price. There is also less satisfaction (although with a lower significance) with the price of fixed telephony in rural areas of the UK and the price of water in Italy. They are not detected, on the other services, problems of affordability in rural areas statistically significant. As a particular case, satisfaction with the price of electricity and water in Spain is higher in rural than in urban areas. This can be related to the lower spending previously observed in Spain in these areas, particularly in the case of water. It occurs that in certain rural areas of the North of the country with relative abundance of water due to the combination of low population and frequent rainfalls, service autonomous management by local communities leads to provision with a lower price or even free. Something similar occurs in some areas of Scotland, which could explain the joint evidence observed in this region: higher satisfaction with the price of water and spending on the service substantially lower than in most of the UK regions. In contrast, in Northern Ireland, despite the lower spending on water, satisfaction with price is similar, since the service would be paid indirectly by other means.

Table 2. Marginal effects estimated on satisfaction with SGEI affordability

		Electricity	Gas	Water	Fixed Phone	Mobile Phone	Internet
NUTS1	UKINGDOM						
	NORTHWEST	0.133***	0.199***	0.115**	0.196***	0.155***	0.134**
	NEAST&YORKS	0.069	0.125**	0.057	-0.004	0.068	-0.063
	MIDLANDS	0.064	0.082	0.059	0.154***	0.103**	-0.031
	EASTENGLAND	0.063	-0.069	0.042	0.031	0.027	-0.092
	LONDON						
	SOUTHEAST	0.133***	0.205***	0.087*	0.127**	0.101*	0.038
	SOUTHWEST	0.130**	0.074	0.053	0.120**	0.141**	0.133*
	WALES	0.039	-0.094	0.005	0.001	-0.110	-0.134
	SCOTLAND	0.095*	0.027	0.109**	0.078	0.046	-0.099
	NIRELAND	0.155***	-0.358***	0.065	0.067	0.014	-0.069
	SPAIN	-0.030	-0.109*	0.055	-0.194***	-0.146**	-0.222***
	NOROESTE	-0.150**	-0.079	-0.214***	-0.036	-0.025	-0.023
	NORESTE	-0.161**	-0.063	-0.281***	0.131***	0.118**	0.075
	MADRID						
	CENTROSPA	-0.012	0.068	-0.107	0.013	0.093*	0.075
	ESTE	-0.021	0.042	-0.174***	-0.007	0.018	0.006
	SUR	-0.039	-0.048	-0.105	0.031	0.041	0.067
	CANARIAS	-0.063	-0.545***	-0.153	-0.116	-0.039	-0.001
	ITALY	-0.201***	-0.172***	-0.147***	-0.274***	-0.090	-0.264***
	NORDOVEST	0.127***	0.210***	0.130***	0.105***	0.065	0.158***
	NORDEST	0.063	0.098**	0.065*	0.089**	0.062	0.054
	CENTROITA						
	SUD	-0.019	-0.013	-0.051	-0.128**	-0.100*	-0.124**
	ISOLE	-0.075	0.001	-0.145**	-0.153**	-0.182***	-0.294***
Rural residence	RURAL*UK	-0.018	-0.149***	-0.029	-0.074*	0.012	-0.003
	RURAL*SPA	0.071**	-0.024	0.089***	0.026	0.007	-0.031
	RURAL*ITA	0.001	-0.145***	-0.076*	-0.056	-0.057	-0.044
Household size	1PERSON	-0.020	-0.044	0.002	-0.051*	-0.076**	-0.079**
	3PERSON	-0.022	0.044	-0.007	0.020	0.034	0.030
	4PERSON	-0.088***	-0.035	-0.047*	0.018	0.027	0.089***
	>4PERSON	-0.037	-0.012	-0.036	0.016	-0.006	0.041
Age	<35	-0.003	0.013	-0.011	0.006	0.040	0.063**
	50-64	-0.026	0.030	-0.012	0.026	-0.060**	-0.091***
	65-74	-0.084**	-0.035	-0.070**	-0.015	-0.241***	-0.325***
	>74	-0.112**	-0.079*	-0.085*	-0.077*	-0.416***	-0.455***
Housing t.	NOPROP	-0.093***	-0.087***	-0.084***	-0.136***	-0.146***	-0.142***
N		3,367	3,367	3,367	3,367	3,367	3,367
Wald chi2		256.22	312.59	220.35	387.42	334.65	537.01
Prob>chi2		0.000	0.000	0.000	0.000	0.000	0.000

* significance level at 10%, ** significance level at 5%, *** significance level at 1%

Source: Own calculations based on EC (2007)

Finally, table 3 shows the effects estimated on satisfaction with the accessibility of the SGEI under analysis. As observed, again this is significantly lower in general in Italy, except with respect to mobile telephony, although in this case not in Spain. These effects may also be related to a more pessimistic perception. Also, the regions of Noreste in Spain and Sud and Isole in Italy show generalized negative results on the perception of access to services. Beyond these specific cases, electricity, water, fixed telephony and mobile telephony do not show lower satisfaction with access in any of the regions of the countries analyzed. The problems of accessibility in certain regions are concentrated in two services: gas and internet. With regard to gas, satisfaction with access is particularly low in the whole of Spain and Italy, which, in the case of Spain, would be related to the lower spending on the service generally observed. In the UK, there are significant differences between regions, with less satisfaction with access in Northern Ireland, Southwest, Scotland (where spending was significantly lower), as well as in Eastern England and Wales. The differences between countries and, in the British case, also between regions within a country in the accessibility of this service are closely related to population density. Regarding internet, satisfaction with access is particularly low in Italy (and especially in Isole), as well as in Wales, Scotland and Northern Ireland in the UK and Noroeste in Spain.

Regarding the differences among rural and urban areas, the problems of accessibility in the first ones are mainly concentrated also in the gas and internet services. In the case of gas, satisfaction with access is particularly lower in rural areas in the three countries analyzed, although particularly in the UK and Spain. Consequently, the combined evidence shows that in the UK, the much lower spending in gas in rural areas would be related both to a problem of affordability as to a problem of accessibility of the service. In Spain and Italy, there were also disparities in spending on gas between rural and urban areas, although smaller. The evidence shows that these disparities, in Italy, would result from a problem of affordability (similar to the UK) and a minor problem of accessibility. Meanwhile, the problem in the case of Spain would be only regarding accessibility, but with similar intensity than in the UK. With respect to internet, rural areas of Spain and Italy show lower satisfaction with access to the service. In these places there is also a trend towards lower satisfaction with access to mobile telephony, although not significant enough, which thus could be not a widespread phenomenon. In any case, problems of accessibility to telecommunications services (and, specifically, internet) detected in Spanish and Italian rural areas would explain the lower spending on telecommunications observed in them. In contrast, in the UK, where spending on telecommunications were also lower in rural areas, no particular problems are identified regarding accessibility to these services, so the lower spending can be due to affordability problems identified in the fixed telephony or to other factors. Finally, with regard to electricity, water and fixed telephony, no statistically significant accessibility problems are detected in rural areas of any of the countries analyzed.

Table 3. Marginal effects estimated on satisfaction with SGEI accessibility

		Electricity	Gas	Water	Fixed Phone	Mobile Phone	Internet
		Ef. Marg.	Ef. Marg.	Ef. Marg.	Ef. Marg.	Ef. Marg.	Ef. Marg.
NUTS1	UKINGDOM						
	NORTHWEST	0.032	0.120**	0.020	0.033	0.054	0.039
	NEAST&YORKS	0.028	0.011	0.047	-0.047	0.010	-0.069
	MIDLANDS	-0.038	-0.058	-0.014	0.023	-0.024	-0.093
	EASTENGLAND	-0.134	-0.341***	-0.084	0.008	-0.057	-0.077
	LONDON						
	SOUTHEAST	0.051**	-0.012	-0.026	-0.026	-0.059	0.046
	SOUTHWEST	-0.019	-0.248**	-0.081	-0.059	0.071*	0.109*
	WALES	-0.048	-0.277**	-0.063	-0.023	-0.034	-0.165*
	SCOTLAND	0.029	-0.163*	0.049*	-0.020	-0.029	-0.157**
	NIRELAND	0.007	-0.657***	0.051***	-0.018	0.012	-0.115*
	SPAIN	0.021	-0.224***	-0.011	0.034	0.062	0.008
	NOROESTE	-0.138	-0.157**	-0.067	-0.135	-0.051	-0.269***
	NORESTE	-0.456***	-0.226***	-0.313***	-0.061	-0.002	-0.086
	MADRID						
	CENTROSPA	-0.079	0.066*	0.025	-0.088	-0.024	-0.047
	ESTE	-0.078	0.097***	0.027	-0.071	-0.050	-0.018
	SUR	-0.042	-0.030	0.049**	-0.057	0.028	0.001
	CANARIAS	-0.030	-0.042***	0.050*	-0.033	-0.067	0.001
	ITALY	-0.198***	-0.327***	-0.176***	-0.112**	-0.083	-0.228***
	NORDOVEST	-0.022	0.035	-0.012	-0.058*	-0.054	0.044
	NORDEST	-0.017	0.002	-0.019	-0.004	0.000	0.081*
	CENTROITA						
	SUD	-0.046*	-0.025	-0.041	-0.200***	-0.172***	-0.101*
	ISOLE	-0.069*	-0.119**	-0.081**	-0.263***	-0.303***	-0.331***
Rural residence	RURAL*UK	-0.029	-0.236***	0.014	0.016	-0.021	-0.019
	RURAL*SPA	0.005	-0.182***	-0.053	0.003	-0.050	-0.078*
	RURAL*ITA	-0.016	-0.061*	-0.021	-0.039	-0.042	-0.103**
Household size	1PERSON	-0.013	-0.026	0.008	-0.002	-0.020	-0.017
	3PERSON	-0.018	0.002	0.004	0.001	0.008	0.045*
	4PERSON	-0.011	0.028	0.003	0.018	0.005	0.093***
	>4PERSON	-0.032	-0.024	-0.005*	-0.011	-0.018	0.059*
Age	<35	-0.012	-0.004	-0.003	-0.002	0.027	0.091***
	50-64	0.013	0.052***	0.016	0.004	-0.048**	-0.100***
	65-74	-0.006	-0.033	0.001	-0.048*	-0.251***	-0.358***
	>74	-0.008	-0.009	0.012	-0.073**	-0.455***	-0.515***
Housing t.	NOPROP	-0.002	-0.002	0.003	-0.047***	-0.031*	-0.076***
N		3,367	3,367	3,367	3,367	3,367	3,367
Wald chi2		334.22	453.23	327.49	376.66	380.95	570.46
Prob>chi2		0.000	0.000	0.000	0.000	0.000	0.000

* significance level at 10%, ** significance level at 5%, *** significance level at 1%

Source: Own calculations based on EC (2007)

5. Conclusions

This research contributes to show that revealed and stated preferences are complementary sources and the interest of their combined analysis for evaluating the provision and regulation of SGEI in a territorial perspective. From the application of this methodology for the contrast of the hypothesis is proved, first, how to live in a rural area is a determinant of spending on all the SGEI under analysis. This is observed with particular intensity regarding gas, where spending is considerably lower in rural areas of the three countries. The same applies, although with less intensity to water (except in Italy) and telecommunications. By contrast, spending on electricity is higher in rural areas (except in Spain). Regarding the second hypothesis, the existence of problems of affordability in rural areas is confirmed with a wide significance only for one service (gas) and only in the cases of the UK and Italy. By contrast, satisfaction with the price of water and electricity in Spain is, as a particular case, higher in rural areas. Regarding the third hypothesis, it is detected the existence of accessibility problems in rural areas regarding the services of gas (especially in the UK and Spain) and internet (only in the cases of Spain and Italy). The combined evidence shows that, for electricity, there are not problems of accessibility and affordability in rural areas, but different consumer preferences and needs, which would explain the higher spending in these areas in the UK and Italy. Regarding water, no access problems are detected, but there may be problems of affordability in rural Italy. By contrast, in Spain, service organization and management by local communities has led to higher affordability in rural areas, which functions as an element of positive discrimination and rural development derived from the use of their own resources. Gas, meanwhile, concentrates the higher gap regarding consumption in equal conditions in rural areas, motivated by problems of accessibility and in the cases of Italy and especially the UK, also of affordability. Finally, in the case of telecommunications, the problems are concentrated on internet accessibility in Spanish and Italian rural areas.

On the other hand, in relation to the fourth of the hypothesis analyzed, it is observed the existence of differences in spending on the SGEI not only among the three countries analyzed, but also among their different regions. Some of these differences, such as those related to the consumption of energy services would be heavily influenced by the climatic conditions of the regions. This, according to an institutionalist perspective, shows the relevance of the social context and social environment (in this case, the place of residence and its social and geographical characteristics) as a condition of the consumption needs and preferences, as reflected in the Treaty of Lisbon. However, regional disparities in the use of the SGEI are not solely due to different needs and preferences, but there are other determining elements that do not allow citizens living in certain places to take alternative consumption decisions that, presumably, would be more satisfactory. In this regard, it is key the character of network services of the SGEI, which requires the existence of supply networks to enable the extension of the service. The results show the problems of affordability and accessibility of services such as gas and internet in certain territories and, in particular, in certain places where relatively low population density could lead to lower profitability of the services.

In terms of regional policy and territorial cohesion, according to the Treaty of Lisbon (EU, 2007) statements to avoid the negative effects of privatization and liberalization of SGEI, these results highlight the need to reinforce PSO guarantees

regarding the provision of these services in equal conditions, independently of the place of residence and the unit costs inherent to it. Larger inequalities in this regard with negative effects on rural areas are found in gas and internet. The extension of these services has coincided in time with regulatory reforms designed to prioritize the achievement of efficiency through market instruments, applied in parallel to an expansion of the use of emerging services (cases of mobile phone and internet) at an unprecedented rate. Nevertheless, the results show the importance of developing sources of information that enable to explore in detail the problems identified with respect to satisfaction with services. These advances, as pointed by the OECD (2008), will allow to a better understanding of the needs of consumers, especially those most vulnerable as residents in rural or low population density areas. The improvement in the evaluation of these aspects and an increase in the emphasis on regulation and supervision of the PSO that affect this kind of territories, are key for advancing to the social and territorial cohesion both at the EU level and within the different member countries.

It is also relevant to refer to alternative regulatory paradigms observed regarding the organization and regulation of SGEI. It is the case of water in Spain, where there are different regimes of ownership and service organization associated with the traditional definition and regulation of the local communities, acting as a favouring mechanism for rural areas in terms of spending and satisfaction, derived from the use of their own resources. Against this, the privatization reforms in the water sector, aimed to provide homogeneous market solutions independently of the territorial context in which they arise, are particularly discussed in terms of service efficiency (Hall and Lobina, 2008). Institutional definitions of services organization as observed in certain Spanish rural communities in the case of water, reflecting a historical tradition based on an economic logic as the relative abundance of the resource, is one of the many regulatory alternatives to consider for pursuing access to SGEI on equal conditions independently of the place of residence.

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