Competing for water: golf courses in semi-arid regions.
The case in Spain

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ABSTRACT

The proliferation of golf courses in tourist areas in the Mediterranean has increased water needs substantially. The objective of this paper is to model the political process associated with water distribution decision-making in water-scarce areas. This has been done by developing a pressure group model. Results allow the relative importance of pressure group size and the relationship between size and resources devoted to political lobbying to be characterized. Empirical analysis confirms results of the model with respect to lobbying activities of golf promoters. The relative size of the different groups involved plays a significant role in the efforts made for political pressure. Water deficit becomes a very relevant variable suggesting that in water-scarce scenarios lobbying activity will be more important.

Key words | golf courses, irrigation, pressure groups, regulation, tourism, water

INTRODUCTION

Over the past few decades, tourism in Spain has become one of the Spanish economy’s most prominent driving forces. Spain, particularly on the Mediterranean coast, is especially well known for its ‘sun and sand’ tourism. The principal weakness of this kind of tourism is the seasonality of tourist flows; this has been documented predominantly in relation to European cold-weather regions (Jeffrey 1999; Kennedy 1999; Baum & Lundtorp 2001). Because seasonality has significant implications for employment and capital investment, establishing and opening golf courses has been one of the initiatives supported by public authorities and private investors as a way of lengthening the tourist season. Golf tourism has been singled out as a very apt approach to compensate the traditional imbalance of tourist flows and would also seem to be a very attractive segment from the point of view of tourist expenditure (Garau-Vadell & Borja-Solé 2008). The development of the golf industry has associated itself closely with real-estate projects near these golf courses. (Around 55% of golf courses are part of real-estate projects in Spain (Aguirre-Newman 2011).)

The development of this new tourist product has caused some considerable impact on the environment as golf projects are usually located in zones of outstanding natural and scenic value to make them attractive to golfers. Firstly, there are changes in land use. It is not that golf courses occupy vast areas of land (in fact the land used for the actual construction of a golf course takes up only a small portion of the land in the overall project), but that they are then complemented with real estate and tourist services. Secondly, soil erosion and the impact on vegetation are also important, as certain areas may have low agricultural production (Aramburu & Escribano 1995). Thirdly, there are major changes in water demand.

The construction and maintenance of golf courses, the lengthening of the tourist season and therefore the increasing number of tourists, imply an increasing demand on water and, as such, a corresponding impact on local wetlands and aquifers. When golf courses are located in humid areas, water distribution may not be difficult and the effects on wetlands and aquifers may be minimized, but if golf courses are built in semi-arid regions, or water-scarce areas, distributing the water available may bring about pressures from different interest groups as well as have a growing impact on water scarcity (Iglesias et al. 1999).
This trend in rising demand creates not only a tense situation, but also a need for integrated water management in the area (Torregrosa 2007). This is especially the case in Spain, where the total number of golf courses has been steadily increasing year after year. Since the 1990s, the number of golf courses has quadrupled and in the first decade of the 2000s, the rise in the number of golf courses was more than 60% (Real Federación Española de Golf 2014). The majority of these courses are located in leading tourist areas, which is, on the whole, the situation on the Mediterranean coast in the cases of Malaga (10%), Alicante, Cádiz and Barcelona (around 5%, respectively) (Real Federación Española de Golf 2014). This proliferation has clearly intensified the demand for water, resulting in golf courses being perceived as causing significant additional conflicts because of an increase in water abstraction, which may have a major impact on the environment and on others who also extract the water (European Golf Association 1997). Despite their proliferation, golf courses have always been subject of legal regulations because it is considered that the extension and maintenance needs demand strict monitoring parameters to minimize their environmental impact.

Policy makers, among others, respond to requests made by members of interest groups (Grossman & Helpman 2001). Anger et al. (2006) and Anger et al. (2008) show for instance how lobbying activities shape green-tax reform in Germany and the European Union emissions trading scheme respectively. Actually, there is a large volume of published studies primarily related to environmental issues which describe the role of pressure groups in shaping public policy. It has been conclusively shown that environmental pressure groups have a real impact on reducing air pollution levels (Binder & Neumayer 2005; Kassinis & Vafeas 2007). Recent research into water uses and allocation has concentrated on different water management systems where user groups play an important role (Zhang et al. 2013) as well as comparing the needs of and the revenue gained from watering golf courses as opposed to irrigating agriculture (Rodriguez Diaz et al. 2007, 2011). However, previous studies have not dealt with the interaction of various pressure groups, with differing interests, and how they behave in the struggle for water allocation.

This paper tries to fill this gap by analysing water distribution in regions where water resources are under stress. To analyse water distribution, a model of pressure groups based on the Becker (1983) model is developed. In this way, we are able to capture the conflicting interests of different participants in situations of water scarcity. Results mean that the relative importance of an interest group, its size and its relationship to the resources it devotes to its political lobbying campaigns can be characterized. These conclusions are discussed and linked to real data in order to have a better understanding of today’s situation and future prospects.

The paper is organized as follows. The second section describes the environment, while the third section presents the theoretical model, the methodology and results. The fourth section makes a descriptive analysis of the Spanish situation and then develops an econometric analysis starting from the model predictions and discusses empirical results. Finally the fifth section concludes the paper.

GOLF COURSES, TOURISM AND WATER

As with other Mediterranean countries, water resources in Spain are under intense pressure. Many river basins are already experiencing serious levels of water deficit (García 2004). Irrigated agriculture uses three-quarters (77%) of all freshwater withdrawals (abstractions), with public water supply (15.5%) and industry (6.8%) accounting for the remainder (INE 2001). Recently, the demand for water for agriculture has been growing steadily, (driven by both domestic and export market consumer demands for high-quality fresh food) and has resulted in increasing competition for irrigation water. Coupled together with this rising water demand, the development of golf tourism has forced agricultural water users into competing with a new, highly profitable water use: irrigation of golf courses. Interestingly, greenhouse areas coexist in those provinces with golf developments and are the golf developments’ real competitor for water (Rodriguez Diaz et al. 2007), making the political game between water users that much more intense.

It is important to bear in mind that there are three kinds of irrigating water, each differing in quality: rainfall, recycled wastewater and desalinated water. The quality of water affects agricultural production as well as the quality of turf and playability of golf courses (Rodriguez Diaz et al. 2007). Furthermore, the objectives that determine
irrigation water use on golf courses differ from those in agriculture. In contrast to maximizing crop yield, the main objective of sports-turf irrigation is to control the soil moisture content and to produce and maintain a safe, high-quality surface. Golf courses typically comprise 18 holes. In each hole, five areas can be differentiated, namely tees, fairways, approaches, greens and rough that surrounds the other four. In Spain, golf courses irrigate all five, while in more temperate countries only the tees and greens are irrigated (Weatherhead et al. 2006). Tees and greens are irrigated with surface water to assure normal growth and maintenance of the lawn. Greens and tees represent only 11% of the total irrigated surface (Rodriguez Diaz et al. 2007). However, acceptable golfing conditions have to be maintained year-round, so water requirements are significantly higher than those for agricultural crops. Clearly, in a country where water resources are already strained, the rising demand of irrigation for golf course developments and their associated real-estate investments will have implications for water allocation. This is especially true during the summer when the peak water demand for tourism coincides with the peak demand for agricultural and golf irrigation (Kent et al. 2002; De Stefano 2004).

Irrigation priorities are organized as follow: first, available rainfall water is used for agriculture, either from own-area basins or transferred from other basins. If there is any water left over, then the golf course receives it. Otherwise, golf courses are, with the exception of greens and tees, irrigated with wastewater. Water coming from the courses’ own basins is the cheapest source. Wastewater is more expensive because the water has to be treated in special plants, either built by the golf course or rented. Desalinated water is also more expensive and only accounts for 7% of the water used in golf courses (Rodriguez Diaz et al. 2011). However, due to the geographic proximity of most golf courses to the coast, increased dependence on this kind of water is feasible provided desalination costs fall. Water transfers from other basins are more expensive than using wastewater, yet golf courses prefer purchasing this kind of water where possible on the grounds of quality. Therefore, the main struggle among groups is for rainfall water.

Spanish water law sets an order of preference for water use, the most important being the urban water supply, followed by agriculture, power plants, industry and recreational purposes. However, this priority can be changed by the catchment regulators (Confederaciones Hidrográficas), although urban water supply must always be allocated first. Therefore, golf course owners will try to suspend this ruling and promote its replacement by aiming to have equal status with other irrigation beneficiaries. To justify this change in use, they will put forward the argument of tourism industry profitability compared to that of traditional agriculture profitability.

THEORETICAL MODEL

The analysis of water distribution is carried out with a model of pressure groups. Within this setting we are able to capture the conflicting interests of different participants in situations of water scarcity.

Methodology

There are two different groups that need water and are affected by the way this water is distributed by the authorities. One group is formed by golf course promoters and managers. The second group includes farmers. Although we will focus on farmers and golf course promoters, there are other members of society who would agree with the demands of each group. For instance, tourist operators and construction companies would be in favour of the golf promoters’ group since their business would clearly improve, whereas environmentalists would be closely related to farmers because they both share some common interests concerning water and land use. It is also assumed that the number of members in each group varies. We consider that there are more farmers than golf entrepreneurs, therefore \( N_1 < N_2 \) (The number of agricultural exploitations is around 1 million in the case of Spain (INE 2014), and so, much larger than the number of golf courses, 416 official golf courses in 2011 (Real Federación Española de Golf 2014.) The wealth of a member of each group is given by

\[
W_i = B_i(V_i) - T(V_i) - F \quad i = 1, 2
\]

where \( B_i \) is the profit of a member of group \( i \) that depends on a volume of water, \( V_i \), that will be assigned to this agent. The
profit function is such that $B'(\cdot) > 0$ and $B''(\cdot) < 0$, that is, more water produces more profit, but that increase in profit declines. Water is a public good which is given free to the water board. The board charges the costs of channeling water to all its members. These costs usually include infrastructure maintenance, energy and administrative costs and variable costs depending on the quantity of water allocated. Therefore, members are charged a fixed payment $F$ and a variable fee $T$. $F$ is the fixed cost and depends on the number of members who benefit from irrigation. $T$ stands for the variable cost and depends on the volume of water received. $T$ is assumed to be a linear cost: $T(V_i) = P_i V_i$, where $P$ is the price charged for water. On the side of the water board, $C$ will stand for the costs of channeling water and will depend on the volume of water and on the number of members. It is assumed that the water board sets its prices to balance its budget, then

$$F \times (N_i + N_j) + P \times (N_i V_i + N_j V_j) = C \times (N_i V_i + N_j V_j)$$  \hspace{1cm} (2)

$i, j = 1, 2; i \neq j$

Solving $F$ and substituting in (1) gives

$$W_i = B_i(V_i) - T(V_i) - \frac{(C - P) \cdot (N_i V_i + N_j V_j)}{N_i + N_j}$$  \hspace{1cm} (3)

$i, j = 1, 2; i \neq j$

The optimum volume of water per agent in each of the groups can be determined by maximizing the above equation. For this calculation no water restrictions are assumed. The problem is

$$\text{Max } W_i(V_i) \hspace{1cm} V_i \hspace{1cm} i = 1, 2$$  \hspace{1cm} (4)

The first order condition in this case is

$$B'_i(V_i) = T'(V_i) - (C - P) \cdot N_i/N \hspace{1cm} i = 1, 2$$  \hspace{1cm} (5)

where $N$ is the total number of individuals in both groups. According to Equation (5) and assuming the profit obtained from water is equal in both groups (note that $C > P$ by Equation (2)), it can be concluded that the optimal water volume of an integrant of the golf course group is higher than that required by a farmer. This is consistent with previous empirical results that established greater average water needs per ha of golf course relative to agriculture in Spain (Rodríguez Díaz et al. 2007). The assumption of equal profit function deserves further discussion. Compared with traditional agriculture, the gross output of golf courses is much higher (Rodríguez Díaz et al. 2007, 2011). In this case, the derivative of the profit function would be greater for a golf course agent and this result would be conditional on the relationship between the size of the group and the difference in profit. However, the comparison of output from golf courses and from greenhouse agriculture shows more similar results (Rodríguez Díaz et al. 2007, 2011). Therefore, the assumption of equal profit function would be reasonable. In fact, this is the form of production that coexists with golf courses and is, as such, their real competitor for water (Rodríguez Díaz et al. 2007).

### Water restrictions

We will now consider that the amount of water is fixed and that it is insufficient to fully cover the needs of every member. To analyse this situation a function of redistribution of wealth is characterized. This function evaluated at $V_i$, the volume of water assigned to member $i$, measures the difference between the income obtained with the optimum volume of water and this volume $V_i$ and is defined as follows:

$$R_i(V_i) = W_i(V_i) - W_i(V^*_i) \hspace{1cm} V^*_i > V_i \hspace{1cm} i = 1, 2$$  \hspace{1cm} (6)

where $V^*_i$ is the optimum volume of water with no restrictions. Substituting the definition of wealth (3) we have

$$R_i(V_i) = B_i(V_i) - B_i(V^*_i) - (T(V_i) - T(V^*_i))$$

$$- \frac{(C - P) \cdot (N_i(V_i - V^*_i) + N_j(V_j - V^*_j))}{N}$$  \hspace{1cm} (7)

$i, j = 1, 2; \hspace{1cm} i \neq j$

whenever $V_i$ is less than $V^*_i$ the redistribution function is negative, $R_i(V_i) < 0$, and becomes 0 at the optimum. To simplify the calculation we normalize the total volume of water to 1, and the distribution for each group will be considered...
as a percentage. Differentiating Equation (7) with respect to $V_i$, and taking into account that $V_i = 1 - V_j$, we obtain

$$R_i'(V_i) = B_i'(V_i) - P - \frac{(C - P) \cdot (N_i - N_j)}{N}$$

(8)

The sign of the derivative depends on the volume of water. The function is defined for volumes that are smaller than the optimum, and then the derivative decreases as we approach the optimum: $R_i' < 0$ when $V_i < V_i^*$. Total transfers to the two groups will depend only on $V_i$ (or $V_j$) because the amount of water is fixed. Therefore

if $V_i < V_i^*$, then $|N, R| > N_i R_j$  \(i, j = 1, 2; i \neq j\)

(9)

This relationship means that lost wealth will always outweigh the profit gained. The existence of a redistribution cost means that whatever the redistribution, the loss is always greater than the profit.

The optimum water volume for each group has been characterized. However, water distribution is managed by the water board according to legal standards established by the public authorities (in the case of Spain: RDL 1/2000): first, water for irrigation, and then any extra volume for the golf courses. As long as the volume received by the golf courses is greater than or equal to the optimum, there is no problem, whereas if this is not the case, conflict will arise. Promoters of golf courses will probably put pressure on the administration to change the rules of distribution. Farmers will react by doing the same to prevent anything being done differently. The greater the pressure by a group, the closer it will be to its desired solution.

The new water distribution chosen by the authorities could be defined as a function of political pressure $PR$, evoked by each group. It is assumed that influencing political decisions has a cost. The pressure will be applied according to the resources available and the number of members in each group. We define the function of pressure as

$$PR_i = f(g_i, N_i) \quad i = 1, 2$$

(10)

where $g_i$ accounts for expenditure on pressure. The following assumptions are made about the function determining the level of pressure:

$$\frac{\delta PR_i}{\delta g_i} > 0 \quad \frac{\delta^2 PR_i}{\delta g_i^2} < 0$$

$$\frac{\delta PR_i}{\delta N} > 0 \quad \frac{\delta^2 PR_i}{\delta g_i \delta N} > 0 \quad \frac{\delta^2 PR_i}{\delta N^2} < 0 \quad i = 1, 2$$

(11)

The pressure exerted increases with funds and the size of the group, but does so at a decreasing rate. It is also assumed that $PR (0, N) > 0$, that is, the relevance of a group, although not organized as such, can influence decision-making through political elections. A group will allocate funds to political pressure, if the increase in wealth is sufficiently large. If not, no funds will be devoted to it. The elasticity of pressure, with respect to expenditure, can be defined as

$$\varepsilon_i = \frac{\delta PR_i}{\delta g_i} \frac{g_i}{PR_i} \quad i = 1, 2$$

(12)

Then, the volume of water for each group will be proportional to the pressure from this group and inversely proportional to that from the other

$$V_i = V(PR_i/PR_j) \quad i = 1, 2$$

(13)

Both groups will hold a pressure level that maximizes the difference between redistribution of wealth and expenditure per person in each group

$$\text{Max}_{R_i} (V(PR_i/PR_j) - g_i) \quad i = 1, 2$$

(14)

where $R_i$ is

$$R_i(V(PR_i/PR_j)) = B_i(V_i(PR_i/PR_j)) - T(V_i(PR_i/PR_j)) - \frac{(C - P) \times (N_i V_i(PR_i/PR_j) + N_j V_j(PR_j/PR_i))}{N} - R_i(V_i^*)$$

$$i, j = 1, 2; i \neq j$$

(15)

We assume that both groups have a Nash–Cournot behaviour. The decision as to the level of expenditure in each pressure group is taken independently, i.e. expenditure
of the other group is considered exogenous. The first-order condition in this problem is

$$\frac{\delta V_i}{\delta PR_i} \times \frac{\delta PR_i}{\delta g_i} \times \frac{1}{PR_j} \times R'_j = 1 \quad i, j = 1, 2; i \neq j$$  \hspace{1cm} (16)$$

By introducing the elasticity in the equation above and rearranging terms, we arrive at the following expression:

$$R'_j \times \frac{\delta V_i}{\delta PR_i} \times \frac{PR_1}{PR_2} \times \frac{1}{PR_i} \times \frac{1}{g_i} = g_i \quad i = 1, 2$$  \hspace{1cm} (17)$$

From Equations (16) and (17) we have

$$- \frac{R'_i}{R'_j} \times \frac{\delta V_i/\delta PR_i}{\delta V_j/\delta PR_j} \times \frac{1}{\delta g_i/\delta g_j} = g_i \quad i, j = 1, 2; \ i \neq j$$  \hspace{1cm} (18)$$

Since the marginal increase of water due to a marginal increase in pressure exerted is equal for both groups, the second factor on the left side of Equation (18) is equal to one. We finally have an expression that relates the way in which water is redistributed among the agents to the relationship between expenses and elasticity of pressure. In particular, the ratio of the level of expense to the elasticity of pressure for both groups is equal to the ratio of marginal redistribution of a change in the volume of water received

$$- \frac{R'_i}{R'_j} \times \frac{g_i/\delta g_i}{g_j/\delta g_j} \quad i, j = 1, 2; i \neq j$$  \hspace{1cm} (19)$$

In general, the elasticity will change with the level of expenditure; however, for simplicity we will assume that it is constant. The examination of the first-order condition offers some conclusions about the behaviour of groups, level of expenditure and the effectiveness of the pressure exerted.

**Theoretical results**

The results derived from the model are presented in the following three propositions. (Proofs of propositions are available as supplementary material, online at http://www.iwaponline.com/ws/014/047.pdf.)

**Proposition 1.** As the number of members in a group increases, individual spending on pressure tends to zero.

The expense to each member within a group will depend on the number of individuals who make up that group. Then, Proposition 1 establishes that the larger the group is, the less expenditure per member there is. Provided that golf courses increase in number, individual expenses on pressure will subsequently decrease. However, it is not only golf course promoters who are interested in developing new facilities, in fact there are other agents who would also be interested in golf courses developing successfully. Tourist operators and construction companies would clearly be interested in the development of this kind of facility as their own business would undoubtedly benefit. More tourists would come to visit these resorts and construction companies would participate in the development of urban areas alongside golf courses. Although these agents would not contribute directly to the pressure exerted by golf promoters, they would help to improve the results obtained from such pressure simply because they represent a greater share of the economy and society.

**Proposition 2.** The expenditure on pressure of the smaller group is greater than that of the bigger group.

This is because there are fewer golf promoters than farmers. If the expenditure of the smaller group was less than that of the bigger group, \( g_2 < g_1 \), we could not say that they would have a greater volume of water, \( V_1 > V_2 \). The function of pressure depends both on \( g_i \) and \( N_i \), then if \( g_i > g_2 \), and \( N_1 < N_2 \), we cannot conclude that \( V_1 > V_2 \), as it will depend on the shape of the function of pressure.

Apart from golf courses initially being, with respect to farmers, in a disadvantaged position, the willingness to invest greater expenditure on pressure can also be linked to relative gross return for each kind of business. As mentioned above, golf courses are much more profitable per unit of water used than average agricultural lands. This could also help explain the willingness of golf promoters to assume a greater expense in applying pressure to try to increase the volume of water received. Yet, compared to greenhouses, differences in profitability are not so relevant. When competing with this kind of exploitation, the relative resources of golf course promoters, with respect to farmers, will not be so different and could modulate the difference in
expenditure between both groups. In general, water boards serve both traditional farmers and greenhouse owners. The importance of the latter within the water board will determine just how close they are, in terms of resources, to the golf course owners.

Proposition 3. The fewer members of group 2 there are the more effective the pressure of group 1 is.

This result seems very intuitive. If the opponent group is smaller, ceteris paribus, the economic effort needed to obtain the same results will also be inferior. Therefore, from the point of view of golf course promoters, the way agricultural cultivation land is structured, especially in those areas subject to water restrictions, will be relevant.

EMPIRICAL ANALYSIS

In this section we make a double analysis. First, we relate the Spanish water scenario and evolution of golf to model characteristics and results. Second, we carry out an econometric analysis to test the predictions of the model.

Descriptive analysis

To better describe water and golf in Spain, we distinguish seven different geographic areas: Andalusia, the Balearic Islands, the Canary Islands, Catalonia, the Mediterranean coast (this includes the regions of Valencia and Murcia), the Interior and the northern regions. The first five geographic areas are the foremost tourist destinations for both domestic and international tourists and these are areas whose water resources are under intense pressure, especially in the summer. The Interior includes the following regions: Madrid, Castilla la Mancha, Castilla León and Extremadura. The North comprises the northern Spanish regions of Galicia, Asturias, Cantabria, the Basque Country, Navarra and Aragon. These latter regions are considered wetlands and present the lowest water deficit in all the Spanish territories.

Figure 1 presents the recent evolution of golf courses and hotel rooms. A positive time trend can be observed both in golf courses and hotel rooms. In addition, there is a positive correlation between both measures (0.22). Therefore, the size of the golf interest group has increased in the period analysed and this trend would suggest reduced individual lobbying, as suggested by Proposition 1. Despite this reduced individual spending, the group increase might imply a greater total spending on lobbying.

Table 1 presents evidence on the composition of both groups: farmers and golf course promoters in 2013 and the percentage change over the past decade. As can be observed, despite the increasing trend in the number of golf courses (see Figure 1), the percentage of land they actually use is still small compared to agricultural uses, although it has increased by 47% over the past decade, suggesting a

Figure 1 | Expansion of golf courses and hotel rooms, 2002–2013. Source: National Statistical Office.
weaker position for golf promoters. Therefore, the willingness of the golf group to invest in lobbying should be higher, since they are smaller, and have more room to improve (Proposition 2).

Furthermore, the Mediterranean region, despite being a region with serious water scarcity problems, presents the highest increase in golf courses and a 36% increase in the number of hotel rooms (Figure 1). Therefore, the struggle for water will be fiercer than in other areas and might imply increased lobbying by the golf course promoters.

The third result from the model claims that the smaller the competitors for water are, the more effective the lobbying is. Therefore, golf courses would be better off the smaller the size of agricultural cultivations is. Figure 2 presents the average size of agricultural cultivation. Looking at the data, it can be observed that the average size has remained nearly constant over the years analysed. Cultivation size is smaller for the areas where golf courses have most proliferated, i.e. on the Mediterranean coast, whereas the Canary Islands present the smallest size. Furthermore, the average size of an area under cultivation is smaller than the average golf course size. A course with 18 holes covers between 50 and 100 hectares. Therefore, an average member in the agricultural group is even smaller that their golf competitors. This evidence would suggest that golf promoters’ pressure is more effective because their competitors, although important as a group, are smaller in size and therefore might have fewer financial resources to invest in political lobbying.

This evidence confirms that the actual scenario of Spanish regions is an interesting case study to empirically test the predictions of the model, especially in those with higher water deficits.

Econometric analysis

Hypothesis

The model studies the lobbying activities in water-restrained areas and suggests that lobbying activities of the incumbent group will depend not only on its size but also on the size of the competing group. It also claims that if the competing group is smaller, lobbying activities will be more effective.
In particular, from Propositions 1–3, one testable implication can be derived. 

Hypothesis 1: The larger the established competing group, the greater the pressure of the incumbent group. 

We consider golf and tourist sectors as the incumbent ones and agriculture the established competing group for water. 

In particular, the equation we estimate is:

\[
\text{Incumbent pressure}_i = \alpha_1 + \beta_1 \times \text{water deficit} \\
+ \beta_2 \times \text{golf group size}_i + \beta_3 \times \text{tourism group size}_i \\
+ \beta_4 \times \text{agriculture group size}_i + \beta_5 \text{per capita g dp}_i + \epsilon_i 
\]

(20)

where \( i \) indicates province.

Data and empirical methodology

The central explanatory variable of the model is the pressure exerted by the incumbent group. According to Grossman & Helpman (2001) one example of financial support by interest groups is information transfers to policy makers. This information revelation is understood as an important channel of political influence by lobby groups. As a proxy for this variable we use the number of tournaments organized in each province validated by the Spanish National Golf Federation (data available from the Spanish National Golf Federation). Golf tournaments are linked to tourism offers and their organization and maintenance reveals the interests of the incumbent groups. Similar proxies based on information transfers have been developed and used in studies on green tax (Anger et al. 2006) and the EU emissions trading scheme (Anger et al. 2008). Following previous literature we think this is a good proxy for potential lobbying activities since data on financial budgets of interest groups are not available.

Spain is characterized by very different water regimes depending on the geographic area considered. Water demand has important regional differences and is mainly met by surface resources, although groundwater extraction has been increasingly used. To account for water needs we use an index developed by the national geographical institute (IGN 2014) that includes surface and groundwater use and reposition. Higher values indicate higher water surface deficit and therefore greater exploitation of groundwater resources.

The size of the groups is included through the number of federal licensee golf players, the number of tourists received and the number of agriculture workers. All data are collected from the National Statistical Office and are scaled by province population. The year of analysis is 2009, which is the last available year for the agriculture census (INE 2014). We also include per capita gross domestic product (gdp) to control for economic development. Table 2 presents the summary statistics and correlation of the main variables.

It can be seen that in average terms, golf and tourism groups are small compared to agriculture, which supports our decision to consider them as incumbent groups. Mean water deficit is higher than index average value indicating a fierce struggle for water as suggested in the descriptive analysis. Correlations in panel B indicate that lobbying activities are positively and significantly correlated with the incumbent groups’ size. Both incumbent groups present a high correlation between them as well, yet they correlate negatively with the agriculture group.

Looking at data on agriculture group size and golf tournaments (presenting the highest standard deviation), three provinces present highly influential observations: Lugo for agriculture group size and Malaga and Madrid for golf tournaments. We therefore run a robust regression so that the most influential points are dropped, and cases with large absolute residuals are down-weighted. In particular, any observation with Cook’s distance greater than 1 is dropped during the estimation process. Then, two consecutive types of weights are used: Huber and bi-weights. Since Huber weights can have difficulties with severe outliers, and bi-weights can have difficulties converging or may yield multiple solutions, using the Huber weights first helps to minimize problems with the bi-weights.

Empirical results

Results are presented in Table 3. Column (a) collects the coefficients and standard errors of the baseline specification. First of all, water deficit presents a positive and significant coefficient, suggesting that in water-scarce scenarios lobbying activity will be more important. Second, incumbent group size (coefficient of golf and tourism groups) affects lobbying activity positively and significantly. The size of
the competing group (agriculture group) also has a positive and significant effect on the lobbying activities realized by the incumbent group. All these results favour Hypothesis 1 and follow the theoretical predictions of the model. Per capita gdp does not affect pressure by the incumbent sectors.

Columns (b) to (e) include interaction terms between different groups’ size and water deficit. Mostly, the main results with respect to water deficit and group size remain unchanged in the different specifications. Column (b) introduces an interaction term between golf group size and water deficit. Results for the golf sector size are maintained and the interaction term is positive and significant. Hence, golf group size is relevant in determining lobbying level but it is more important in provinces with more severe water deficits indicating that a fierce struggle for water will lead to more lobbying activity. However, the direct effect of water deficit is no longer significant.

Column (c) introduces the interaction between tourism group size and water deficit. Results for water deficit and golf and tourism are maintained, but now agriculture group size and its interaction are not significant. Finally column (e) introduces all interaction terms together. Interaction terms are not significant except for the tourism one. The sign is negative, indicating that in more water-scarce provinces the relevance of the tourism group is reduced compared to the other incumbent group.

This evidence confirms the hypothesis and shows the relevance of the theoretical predictions in the actual scenario of Spanish regions. The model helps in understanding the strategy of golf course promoters and agricultural groups. On one hand, there are the aggressive golf marketing campaigns, the hiring of famous players to design/redesign courses or to participate in exhibitions. On the other hand, hotel promotions and reports on positive economic impact in different regions all serve to promote the courses and their interests.

The findings observed in this study mirror those of previous studies that have examined the effect of lobbying in other settings such as green taxes and the European Union

### Table 2: Descriptive analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel A: Summary statistics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water deficit</td>
<td>50</td>
<td>2.21</td>
<td>0.79</td>
<td>1.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Lobbying activitya</td>
<td>52</td>
<td>1.94</td>
<td>5.71</td>
<td>0.00</td>
<td>39.15</td>
</tr>
<tr>
<td>Golf group sizea</td>
<td>52</td>
<td>0.57</td>
<td>0.37</td>
<td>0.09</td>
<td>1.57</td>
</tr>
<tr>
<td>Tourism group sizea</td>
<td>52</td>
<td>1.92</td>
<td>2.46</td>
<td>0.05</td>
<td>11.05</td>
</tr>
<tr>
<td>Agriculture group sizea</td>
<td>52</td>
<td>29.54</td>
<td>21.04</td>
<td>0.07</td>
<td>83.40</td>
</tr>
<tr>
<td>GDPa</td>
<td>52</td>
<td>45.90</td>
<td>74.91</td>
<td>1.78</td>
<td>377.69</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B: Correlations</th>
<th>Water deficit</th>
<th>Lobbying activity</th>
<th>Golf group size</th>
<th>Tourism group size</th>
<th>Agriculture group size</th>
<th>GDP</th>
</tr>
</thead>
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<tr>
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<tr>
<td>Lobbying activitya</td>
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<td>1</td>
<td>0.3224b</td>
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<td>0.3412b</td>
<td>0.2776b</td>
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<tr>
<td>Tourism group sizea</td>
<td>0.2089</td>
<td>0.4203b</td>
<td>0.4566b</td>
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<tr>
<td>Agriculture group sizea</td>
<td>0.0658</td>
<td>–0.1806</td>
<td>–0.4203b</td>
<td>–0.4566b</td>
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<tr>
<td>GDPa</td>
<td>–0.0727</td>
<td>–0.1489</td>
<td>0.122</td>
<td>–0.2761</td>
<td>0.1601</td>
<td>1</td>
</tr>
</tbody>
</table>

*aScaled by population.

*bSignificant at 5%.
emissions trading scheme. The relative importance of potential interest groups appears to have a significant impact on lobbying activities in these two scenarios (Anger et al. 2006, 2008). In addition, this study offers some insight into the competition for scarce resources between different uses of water that is present in the debate on the economic model for a water-efficient Europe (CEPS Task Force Report 2012).

CONCLUSIONS

This paper studies the problem of water scarcity in areas with golf course developments. It tries to reflect the conflicting process that is already underway in various tourist areas, especially on the Mediterranean coast. By adapting the Becker model, we are able to obtain three clear conclusions. First, we established a relationship between group size and individual spending within the group: they move in opposite directions. Second, in equilibrium, golf course promoters will devote more resources to political pressure. Third, we proved that the political effectiveness of the owners of golf courses increases when the agricultural cultivation size decreases. This implies that the final result in this economic scenario will be more efficient, that is, fewer resources will be invested in the struggle for water and can be devoted to more profitable uses.

Descriptive analysis shows that there has been a considerable increase in the number of golf courses in recent years, especially in water-restricted areas. Agricultural cultivation land is large compared to golf courses, consequently increasing the golf promoters’ incentives to invest in political lobbying, as they would benefit from any changes in water distribution. But average cultivation size is small compared to the areas of golf courses, so golf promoters’ lobbying efforts would have greater effectiveness. Econometric analysis confirms this preliminary evidence and the results of the model with respect to lobbying activities of golf promoters. The relative size of the different groups involved plays a significant role in the efforts made to apply political pressure. Water deficit becomes a very relevant variable suggesting that in water-scarce scenarios lobbying activity will be more important. Moreover, water deficit modulates the effects of the relative
significance the different groups have in the degree of the incumbent group’s lobbying activity.

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