July 2008

FOOTBALL POOLS' SALES: HOW IMPORTANT IS A FOOTBALL CLUB IN THE TOP DIVISIONS?*

Jaume García
Department of Economics and Business
Universitat Pompeu Fabra

Leví Pérez
Department of Economics
Universidad de Oviedo

Plácido Rodríguez
Department of Economics
Universidad de Oviedo

Working Paper version

If you wish to cite this article please refer to the published edition:

Jaume García & Leví Pérez & Plácido Rodríguez, 2008. "**Football Pool Sales: How Important Is a Football Club in the Top Division?**," International Journal of Sport Finance, Fitness Information Technology, vol. 3(3), pages 167-176, August.

Corresponding author:

Leví Pérez

lperez@uniovi.es

Laboral – Escuela Universitaria Jovellanos
Luis Moya Blanco, 261
33203 – Gijón (Spain)

* We wish to thank David Forrest; Brad Humphreys and two anonymous referees for helpful suggestions. We also have benefitted from the comments of participants at a seminar at the University of Oviedo. The authors wish to express their gratitude for financial support from grant SEJ2005-08783-C04-01. The usual disclaimer applies.

FOOTBALL POOLS' SALES: HOW IMPORTANT IS A FOOTBALL CLUB IN THE TOP DIVISIONS?

Jaume García
Department of Economics and Business
Universitat Pompeu Fabra

Leví Pérez
Department of Economics
Universidad de Oviedo

Plácido Rodríguez
Department of Economics
Universidad de Oviedo

Abstract

Having a professional sport team in the top divisions has a potential economic impact in its geographical area. In this paper we analyse the effect of having a professional football team of the Spanish First or Second Division in a certain province on the amount of sales of football pools in Spain (*La Quiniela*).
To carry out the empirical exercise we estimate a demand equation using a panel data set at provincial level for the years 1985-2005, merging the traditional economic models in the lotto demand literature: the effective price model and the jackpot model.
Our results show that having a club in the top divisions has a significant effect on sales of *La Quiniela.* Moreover, previous results using fixture (round) data are confirmed in this paper. We also provide evidence showing *La Quiniela* bets to be a normal good and, as an implicit tax, regressive.

Keywords: football pools, lotto, effective price, jackpot

JEL classification: D12, D80, L83

1. Introduction

The issue of the importance of the economic impact of a professional sports team on a geographical area has been extensively analysed in the empirical sports economics literature. No definite conclusion about the importance of this effect has been reached, and in some cases the effect is estimated to be negative. Most of these studies focus their attention on the effect of the main activity of the club (playing games) but far less attention has been given to the extent to which the sports gambling industry of a particular geographical area can be affected by the presence of a professional team in the top division. Thus even though the relation between sport consumption and sport gambling has also been discussed in the literature[1] - gambling is expected to be a complementary good with many sports -, the empirical evidence is limited. In this paper we analyse the effect on sales of football pools (*La Quiniela*) in a particular geographical area in Spain (a province) of having a professional football team.

The appearance of *La Quiniela* in the 1946-47 season was a milestone in the history of gambling in Spain, as until then the *Loteria Nacional*[2] was the only available lottery-type game. *La Quiniela* is a government-operated pari-mutuel game in which prizes are a percentage of the total revenue and in which players have to choose the final results for a list of football matches among three alternatives: home win (1), draw (X), and away win (2). The share of revenues not distributed as prizes could be interpreted as an implicit tax on Spanish football pools' players.

To measure the effect of having a professional football club in the top division on sales of *La Quiniela* we estimate a demand equation based on the same economic framework of the empirical models in the lotto demand literature[3], as has been done by García and Rodríguez (2007) in

[1] Forrest and Simmons (2003) review the relationship between gambling and sport.
[2] Beginning in 1812, the *Loteria Nacional* is a very famous lottery game with weekly draws in Spain.
[3] A review of this literature can be found in Clotfelter and Cook (1990), Walker (1998) and Forrest (2003).

a previous paper about *La Quiniela* in Spain. In this framework the economic variables considered to explain football pools sales are the effective price and the jackpot (the maximum prize).

Using annual data at a provincial level, we also control for the effect of other variables, such as income, population, the composition of the coupon[4] and the number of football teams in the top divisions. The empirical results reinforce previous findings by García and Rodríguez (2007) in terms of the relevance of the composition of the coupon and the joint significance of the two economic variables we mentioned above. We also find a significant effect of the presence of a football club in either the First or Second Division of the Spanish football league on sales of *La Quiniela* and we identify the bets in this game as a normal good bringing some evidence of *La Quiniela*, as an implicit tax, being regressive.

The paper is organized as follows. The next section describes the structure of the game *La Quiniela* and its evolution over recent years. In Section 3 we present the economic framework for the demand equations we specify. The variables used in the empirical analysis are described in Section 4. The estimation methods and the main empirical results are discussed in Section 5. We finish with a summary of the more relevant conclusions.

2. Football pools in Spain

La Quiniela is managed by a public institution, *Loterias y Apuestas del Estado (LAE)*, which also manages most of the lotteries in Spain. For several years *La Quiniela*, together with the *Loteria Nacional* and the *Organizacion Nacional de Ciegos Españoles (ONCE)* lottery (a daily draw) were the only legal betting games available in Spain. Ever since 1985, *La Quiniela* has been competing with another lotto game, *La Primitiva*, and all the new games launched by LAE with a similar structure.

[4] Football pools' promoters use this name when referring to the paper grids which gamblers fill in to bet on the results of football matches.

The exceptional importance of the football pools industry in Spain lies in the scope of its economic and social benefits. In the beginning, Spanish charity organizations were the main institutions favoured by the funds obtained through sport betting. Later, these benefits were distributed to other institutions. During the 1950´s, sports organizations began to receive a share of total revenue and in the 1980´s the claims of professional football teams were considered. Also, special events like the Football World Cup in 1982 or the Olympic Games in Barcelona in 1992 benefitted from football pools, as did the *ADO* (the Spanish Olympic Sports Association) program. Generally speaking, the funds obtained have the objective of promoting sports activities. The Spanish Royal Decree of February 20, 1998, established the current distribution of *La Quiniela* revenues. The Spanish Professional Football League (*LFP*) receives 10% (in 2005 this amounted to approximately €50 million), the National Council of Sports gets 1%, and 10.98% goes to the provincial governments in order to promote social activities and sport facilities. The Public Exchequer takes in 23% of total revenues, once the administration and distribution expenses have been discounted.

Although *La Quiniela* shares some characteristics with lotto games in that both are pari-mutuel games, it is not a lottery in the sense that the winning combination is not the outcome of a draw but is instead related to the final results of several football matches. To win the maximum prize players must correctly guess the results of all 14 matches included in the coupon. It has been this way since the beginning of *La Quiniela* with exception of the period between the beginning of the 1988-89 season and the end of the 2002-03 season when 15 instead of 14 matches were included in the coupons. This extra match (*El pleno al 15*) to win the maximum prize was introduced again in the 2005-06 season. Up to the 1988-89 season, bettors that succeeded in correctly picking 14, 13 and 12 results won prizes. In addition, if there were no winners of the maximum prize, those picking 11 correct results also won a prize. Since then, if there are no winners of the first prize, the

quantity of this prize rolls over, and since the 1991-92 season those who get 11 results correct have won a prize. A lower prize for players just picking 10 correctly was also introduced in the 2003-04 season.

The distribution of revenues devoted to prizes (about the 55% of total revenues) among categories has changed over time. In 2005, 12% was assigned to those guessing correctly 14 results, 10% was for those that in addition got *El Pleno al 15*, and 24% was shared out equally among those who guessed correctly 13, 12 and 11. Finally, 9% went to those who got 10 results right.

Nowadays, according to *LAE* information the sales revenue of *La Quiniela* is about €500 million, slightly less than 2% of the total amount of gambling revenues in Spain. However, the evolution of the bets played in *La Quiniela* has shown a considerable variability over time. Figure 1 shows the number of coupons sold since the 1970-71 season. We can observe substantial variability in football pools spending, with bets ranging from 5,000 million in the 1979-80 season to 749 million in the 1989-1990 season. Although part of this variability can be explained by changes in the nominal price the large fall in sales, close to 80%, between the year 1985 and 1990 can largely be explained by the appearance of *La Primitiva* on the Spanish gambling market[5].

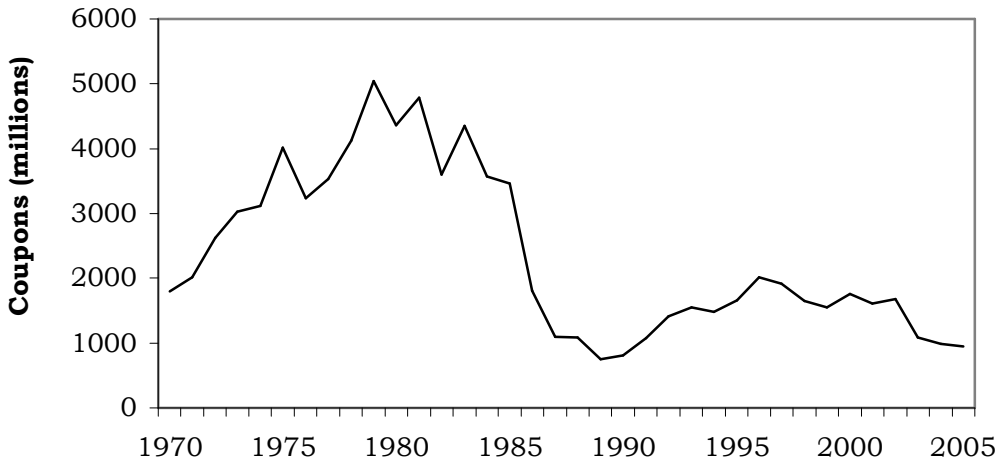

FIGURE 1: Number of coupons

[5] This also happened in the case of British football pools (Forrest, 1999).

With regards to the price, in 1970 the price of a *La Quiniela* bet was €0.03, whereas since the 2003-04 season the price has been €0.50. Between these two dates the real price has been characterized by a negative trend, but the last change introduced in the 2003-04 season, where the price increased by 66% (from €0.3 to €0.5), inverted this trend[6].

With respect to the provincial variability of *La Quiniela*, Figure 2 plots the average number of coupons per fixture per capita in each province (including autonomous cities) during the 1985-2005 period. The overall average is 0.88, with two provinces (Balearic Islands and the autonomous city of Ceuta) having a particularly high average (well above 1.5). This probably corresponds to the influence of some outliers due to the effect of sales corresponding to bets made by large groups of bettors (*peñas*).

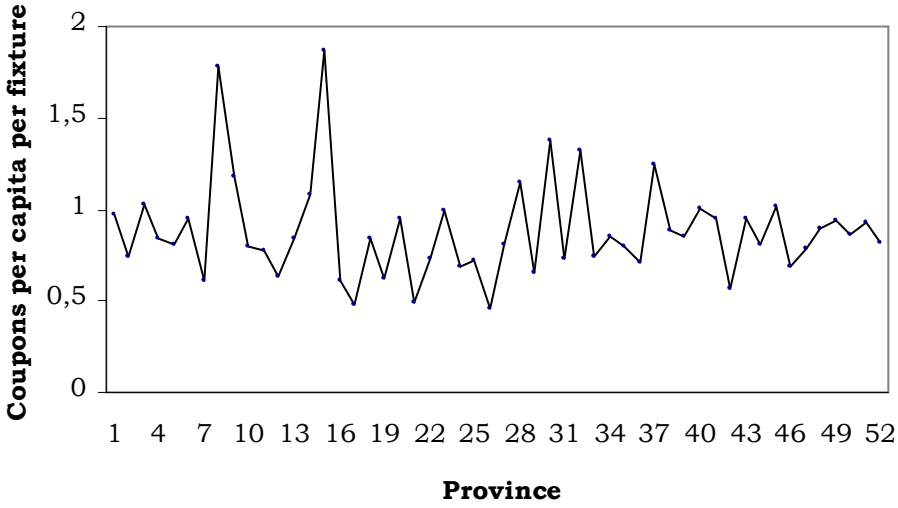

FIGURE 2: Number of coupons sold by province

[6] A detailed analysis of the evolution of price, as well as other variables related to *La Quiniela* can be found in García and Rodríguez (2007).

The evidence from Figure 1 and Figure 2 show that the dependent variable in our empirical model (the number of coupons sold) has enough variability in both dimensions to allow us to distinguish between temporal and geographical effects.

3. Economic background

As we have mentioned, in this article we consider a model which nests both economic models proposed in the empirical literature on the demand for lotto. The effective price model, based on expected utility theory, has been the most frequently used in this type of analysis[7]. Within this theoretical framework the lottery tickets or coupons are considered to be financial assets with risk and the prizes are considered as the returns to a certain investment (the price of a bet). The effective price of a bet is then defined as the difference between the nominal value and the expected prize.

Consider the simple case where there is only one prize and where we assume a unit price for each bet to simplify the presentation. Following Cook and Clotfelter (1993) the expected value (EV) of a bet is the amount of the prize adjusted by the probability of having a winning ticket and divided by the expected number of winners. Farrell et al. (1999) reinterpret this expected prize as the value of the total amount of prizes (the maximum prize or the jackpot (J) in this case) multiplied by the probability of having at least one winning ticket (1-P) and divided by the total number of tickets sold (A), i.e.,

$$EV = (1 - P)\, J/A \qquad (1)$$

with the jackpot defined as

$$J = B + (1 - \tau)\, A \qquad (2)$$

[7] Empirical applications of the effective price model appear in Cook and Clotfelter (1993), Gulley and Scott (1993), Scott and Gulley (1995), Walker (1998), Farrell et al (1999), Forrest et al (2000) and García and Rodríguez (2007).

where B is the rollover from a previous fixture without winners, τ is the *take-out rate* (the share of the revenues that is not distributed as prizes) and P is the probability of not having a winner ticket.

La Quiniela is a peculiar game in which the results of the matches are not usually chosen in a random way given that the bet has to do with the results of a set of football matches. Thus, the composition of the coupons is relevant, meaning that each bet has different winning probabilities. The probability of having a winning ticket (π) is therefore not known exactly *ex ante*, depending instead on the forecast (1, X, or 2) chosen for each match included in the coupon. Additionally, there is the issue of conscious selection which is probably more important than in lotto games (Farrell et al, 2000). Given that there are no data available for these *ex ante* probabilities, we will assume that they are the same for all tickets and we will disregard the problem of conscious selection. Consequently, the probability of not having a winning ticket (P) is:

$$P = (1 - \pi)^A \qquad (3)$$

Notice that P decreases with both the number of tickets sold (A) and the difficulty of the game (π). Also, according to the definition of the jackpot in expression (2) the expected prize increases with the amount of the rollover and decreases with the take-out rate. An increase of sales will have two effects: on the one hand, the prize will increase with sales, but on the other hand, the expected number of winners also increases, dominating the first effect. The difficulty of the game has a negative effect on the expected prize.

As mentioned by Forrest et al (2002), the main limitation of the effective price model is that in the case of having several prizes a change in the structure of prizes could not generate a change in the effective price and therefore could not cause a change in demand[8]. Forrest et al (2002) specify an alternative model where the jackpot is the main economic variable on the demand for lotto. This model is based on a previous idea

[8] Empirical evidence for the lotto in the UK seems to contradict this (Forrest et al, 2002)

by Clotfelter and Cook (1989) who consider that bettors are buying a hope (or a dream) each time they buy a ticket and that hope has to do with the amount of the jackpot. Rather than the effective price they propose using the amount of the top prize as the main economic variable affecting sales.

As the effective price model and the jackpot model have different implications in terms of policy changes in the structure of prizes, we will consider, as in García and Rodríguez (2007), the specification of a model including both variables (the effective price and the jackpot), whose identification is discussed in the section of empirical results.

4. The determinants of sales of *La Quiniela*

To carry out the empirical exercise we use an annual panel data set for all the Spanish provinces (52 in total, including the two autonomous cities) for the period from 1985 to 2005 in order to identify the determinants of the average number of bets per fixture per capita for *La Quiniela*. Descriptive statistics of the variables used in the estimation of the demand equations are reported in Table 1.

In Table 2 we report the amount of the face value (*FV*) – the price of a bet - and the definition of the effective price (*EP*) and the jackpot (*J*) for each fixture in the sample period we consider. Notice that the rollover (*B*), introduced in the 1988-89 season, is taken into account in the definitions of these variables[9]. As mentioned in the previous section, to calculate the expected prizes we have to weight prizes by the probability of having at least one winner of each prize (1-P). Given that *La Quiniela* is not a draw and given the presence of conscious selection processes, we approximate this probability by the proportion of fixtures with winners of a particular prize (P_{14} and P_{15} for the prize of 14 and 15 correct guesses, respectively) for the whole sample period (0.928647 and 0.7953529, respectively). Since the 1991-92 season, when the

[9] Given that we are dealing with annual data, we use the average yearly value per fixture of EP, J and B in the estimation procedure.

amount of the prize corresponding to 11 correct guesses is below a certain quantity, winners of this prize do not receive the amount and the total corresponding to this pool is rolled over. In this way we approximate the probability of the prize for 11 correct guesses not rolling over (P_{11}) by the proportion of fixtures with prize for those correctly guessing 11 results (0.964045). The same was applied to the prize for those who guess 10 correctly in the 2005-06 season, so we approximate the probability that the amount for this prize does not roll over, P_{10}, in the same way as we did for P_{11} (0.968254). Furthermore, during the 1986-87 and 1987-88 seasons a new prize for those correctly guessing all the results at half time was introduced. This new prize reduced the amount devoted to prizes for the correct guess of the end-of-match results, except in the case where there were no winners of this new prize. We approximate this probability (P_{noHT}) in a similar way as we did for the other probabilities.

To control for the impact of the presence of a professional football team in a province on the volume of sales of *La Quiniela* in that province we define a variable which captures the number of teams in the First Division and another one for teams in the Second Division. Given the Spanish professional football league promotion and relegation system the number of teams in the top divisions in a province varies across provinces and throughout time. As we use yearly data whereas the football pools season in Spain starts in August and ends in June or July the following year, it is possible for a team to be in a certain division for only half a year. Thus, we can consider that there are two "mid-seasons" in every year. This way, the variable that controls for the presence of First Division teams in each province takes the value zero if a province does not have a team in this division the whole year and 0.5 for each "mid-season" and team in the First Division. The same values are used in the case of the variable that controls for the number of Second Division teams.

In order to capture the geographical effects in the demand for football pools, we include the provincial household gross income per capita, as well as that of the population, in the estimations to control their possible effects on sales of *La Quiniela*. Also, following García and Rodríguez (2007), we consider the relevance of controlling for the number of fixtures in which First Division teams are not included in the coupon to account for the importance of the illusion of control in *La Quiniela*, where bettors use their knowledge on Spanish football teams to try to correctly guess the results of the matches included in the bet.

Finally, we consider the potential impact of unobserved individual (provincial) effects in the models to capture other features of the geographical distribution of the demand for *La Quniela* apart from income and the population. We do this by including provincial dummies in the demand equation, which is equivalent to using the within-group estimator. It should be pointed out that although the within-group estimator of a dynamic linear model with panel data is inconsistent in the case where the number of time periods is short (Nickell, 1981), we rely on asymptotic results for both individuals and time periods tending towards infinity, which imply that as the number of time periods increases, the bias tends to zero. In particular, the asymptotic bias becomes very small (not relevant in relative terms) when the number of time periods is around 20, as in our case (we have 21 periods), according to the expression of the asymptotic bias for a simple autoregressive model (Nickell, 1981).

5. Empirical results

Given that the dependent variable (number of coupons per fixture and per capita) is included in the definition of both economic explanatory variables (the effective price and the jackpot) we estimate the model by instrumental variables. We use the amount of the rollover, its square, and the number of rollovers as instruments. Moreover, we also consider the number of fixtures throughout the year to instrument both variables

(the effective price and the jackpot). All of these are clearly exogenous variables because they have been previously determined. As proposed in Garcia and Rodriguez (2007), the use of a polynomial of order two of the instruments ensures the matrix of instruments to be of a sufficient rank to obtain consistent estimates, as well as allowing us to simultaneously include both variables (the effective price and the jackpot) in the model and estimate their effect consistently[10].

Following the empirical literature on lotto demand we also consider, as in Forrest et al. (2002), two versions of the model differing in terms of the economic variables which are included in the specification. In one of them we use the effective price as the main economic determinant of sales, while in the other we include the amount of the jackpot. The estimation results of these models are reported in Appendix A.

Additionally, Walker (1998) suggests that in the case of lottery there are reasons (addiction, inertia or habit) to expect sales in one period to be correlated with sales in the next one. We consider dynamic versions of the model by adding lags of the dependent variable allowing us to get both short and long run conclusions.

In Table 3 we report the results of the estimation of the model including two lags of the dependent variable, whose coefficients are allowed to be different for each province[11]. The unobserved geographical effects are controlled by including dummies for each province[12].

According to the results the coefficients of the economic variables have the expected sign: negative for the effective price and positive for the jackpot. It is important to point out that both coefficients are significant, which means that this specification is preferred to the other specifications considered in the literature, where only one economic variable is included (see Appendix A). As found in García and Rodríguez

[10] Following Kelejian (1971), the nonlinearity in variables (but linearity in parameters) of the model allows us to use polynomials of the original instruments and the predetermined variables to form the final set of instruments.
[11] We test these coefficients to be equal and non-significant and reject both null hypotheses.
[12] The estimates of all the coefficients of these variables are available on request.

(2007) using fixture data, the goodness of fit measures are better when eliminating the effective price variable compared to what happens when eliminating the jackpot variable.

In Table 4 we report the estimated elasticities (short and long run) for the effective price and the jackpot[13]. Since we allowed for a different dynamic structure for each province, the long run elasticities have geographical variation, which is significant. The effective price elasticity varies from –0.571 to –1.275 with an average close (and not significantly different) to –1, implying that LAE behaves in a revenue–maximizing way. The long run jackpot elasticity is also significant, varying from 0.452 to 1.008 with an average of 0.714, implying that changes in the jackpot have substantial effects on sales.

As mentioned in the introduction, the main objective of the paper is to evaluate to what extent having a club in the top division has an influence on the amount of coupons of *La Quiniela* sold in the corresponding province. The evidence in Table 3, shows that having a team in the province competing in the First Division increases the sales per capita of *La Quiniela* by approximately 4.5% in the short run and 10.8% in the long run. This means that in terms of revenue from *La Quiniela* for LAE, it is more profitable to have teams in the top division in those provinces with a large population suggesting a relation of complementarity between household consumption of football and betting on football, as it is proposed in Forrest and Simmons (2003). This positive effect is also found when we consider teams in the Second Division. In that case the increase in sales is slightly above 2% but it is only significant at the 10% level. In any case, the difference between the coefficients of the variables capturing the number of teams in a particular division is significant and the effect is more important for the number of teams in the First Division. Betting on football appears to be

[13] Given the functional form chosen for the demand equation the estimated coefficient of the economic variables in logs could be interpreted as short run elasticities. Long run elasticities are calculated by dividing these coefficients by 1 minus the sum of the lagged coefficients of the dependent variable.

more exciting when locals can also bet on the local team. The coupon is more attractive for an individual when it includes games (in general, First and Second Division games) which are played by teams which are geographically close to that individual.

A more general aspect of the composition of the coupon has to do with whether games of First Division clubs are included or not. Since we are dealing with annual data we proxy this variable by the number of fixtures without these clubs obtaining a highly significant negative effect, i.e. the presence of First Division teams in *La* Quiniela increases the number of bets[14].

Given that we have panel data of provinces we considered some socio-economic variables to capture the geographical dimension. Gross household income per capita and population are the variables included, both having geographical and time variability. The results show a positive and significant effect for the income variable though with an elasticity (both short and long run) clearly below one, i.e. *La Quiniela* is a normal good, although the demand is not very sensitive to changes in income. The estimated income elasticities show, as in Clotfelter and Cook (1990), that per capita sales increase less than proportionately with income which makes *La Quiniela*, as an implicit tax, regressive.

Finally, with respect to the population variable we obtain a negative effect, meaning that provinces with a large population have smaller sales per capita of *La Quiniela*. This could reflect a larger supply of alternative leisure activities (substitutes for *La Quiniela* and gambling in general) in highly-populated provinces. It should be pointed out that this effect becomes significant if we do not include the set of dummies for the provinces. Thus, part of the geographical variability of the population is captured by these dummies, although the sign of the coefficient is not affected. This is also the case for the effect of the income variable, which also has a large geographical variability. We

[14] This result goes in the same direction as that in García and Rodríguez (2007) using fixture data.

reject the null hypothesis of the non-significance of the coefficients of the provincial dummies (p-value = 0.000).

6. Concluding remarks

In this paper we estimated a dynamic panel data model in order to measure the impact of having a football team in the top divisions (First and Second Division) on Spanish football pools (*La Quiniela*) sales at a provincial level. We also analysed the main economic determinants of the demand for football pools in Spain controlling for geographical effects given the nature of the data we use. We considered a model in which both usual economic variables – the effective price and the jackpot - are simultaneously included in the demand equation for *La Quiniela*. The model is estimated by instrumental variables.

Evidence on the complementary character of the relation between Spanish football consumption and betting on Spanish football is shown. The empirical findings are robust enough to conclude that, in the long run, having a football team in the top divisions causes a significant impact on sales of football pools in a province. In particular, having a team in the First Division implies a long run increase in *La Quiniela* sales of approximately 10.8%.

On the other hand, the composition of the coupon also appears as an important determinant of sales, since not including First Division teams in the coupon implies a reduction in sales of 4.7% in the long run. This has to do with the active role of bettors in *La Quiniela* in that they use their knowledge on football teams to try to guess the results of the matches included in the coupon.

Finally, we identify a significant effect for some socio-economic variables referred to the province. In particular, we find *La Quiniela* bets to be a normal good and regressive as we estimate a positive (less than one) and significant income elasticity.

References

Clotfelter, C.T. and Cook, P. (1989), *Selling Hope: State Lotteries in America*. Harvard University Press, Cambridge.

Clotfelter, C.T. and Cook, P.J. (1990), "On the economics of state lotteries". *Journal of Economic Perspectives*, 4, 105-119.

Cook, P.J. and Clotfelter, C.T. (1993), "The peculiar scale economics of lotto". *American Economic Review*, 83, 634-643.

Farrell, L., Morgenroth, E. and Walker, I. (1999), "A Time Series Analysis of U.K. Lottery Sales: Long and Short Run Price Elasticities". *Oxford Bulletin of Economics and Statistics*, 61, 513-526.

Forrest, D. (1999), "The past and future of British football pools". *Journal of Gambling Studies*, 15, 161-176.

Forrest, D. (2003), "Time series modelling of lotto demand". In L. Vaughan Williams (ed.). *The economics of gambling,* London: Routledge, 182-203.

Forrest, D., Gulley, O.D., and Simmons, R. (2000), "Elasticity of demand of national lottery tickets". *National Tax Journal*, 53, 853-863.

Forrest, D. and Simmons, R. (2003), "Sports and Gambling", *Oxford Review of Economic Policy*, 19, 612-624.

Forrest, D., Simmons, R., and Chester, N. (2002), "Buying a dream: alternative models of demand for lotto". *Economic Inquiry*, 40, 485-496.

García, J. and Rodríguez, P. (2007), "The Demand for Football Pools in Spain: The Role of Price, Prizes, and the Composition of the Coupon". *Journal of Sports Economics*, 10, 1-20

Gulley, O.D. and Scott, F.A., Jr. (1993), "The demand for wagering for state-operated lottery games". *National Tax Journal*, 45, 13-22.

Kelejian, H.H. (1971), "Two-stage least squares and the econometric systems linear in parameters but nonlinear in the endogenous variables". *Journal of the American Statistical Association*, 66, 373-374.

Nickell, S.J. (1981), "Biases in Dynamic Models with Fixed Effects". *Econometrica*, 49, 1417-1426

Scott, F.A., Jr., and Gulley, O.D. (1995), "Rationality and efficiency in lotto markets". *Economic Inquiry*, 33, 175-188.

Walker, I, (1998), "The economic analysis of lotteries". *Economic Policy*, 13, 359-392.

Table 1. Descriptive statistics

	Mean	*Standard Deviation*
Number of coupons per capita and per fixture	0.882	0.496
Effective price (€)	0.129	0.030
Jackpot (thousands €)	2555	8865
Gross household income per capita (thousands €)	9.989	2.362
Population (thousands)	775	947
Number of football clubs in the First Division	0.384	0.612
Number of football clubs in the Second Division	0.398	0.593
Number of fixtures without First Division teams	4.286	2.354

Note: All economic variables are in real terms (base year 2001).

Table 2. Definition of the Face Value, the Jackpot and the Effective Price

Season	*Face Value (FV)*	*Jackpot (J)*	*Effective Price (EP)*
1985-86	€ 0.09	J=(0.50325/3)R	EP=FV-0.50325 FV
1986-87 1987-88	€ 0.12	$J=(0.44/3)R+P_{noHT}0.063R$	
1988-89		J=0.25R+B	$EP=FV-[(0.3R+P_{14}*0.15R+P_{15}(0.1R+B))/A]$
1989-90 1990-91	€ 0.18		
1991-92 to 1993-94			$EP=FV-[(P_{11}*0.1R+0.2R+P_{14}*0.15R+P_{15}*(0.1R+B))/A]$
1994-95 to 1997-98	€ 0.24		
1998-99 to 2002-03	€ 0.30		
2003-04 2004-05	€0.50	J=0.15R+B	EP=FV- [(0.4R+P14*(0.15R+B))/A]
2005-06		J=0.22R+B	$EP=FV- [P_{10}*0.09R+0.24R+P_{14}*0.12R+P_{15}(0.1R+B))/A]$

Note: R = total revenue (number of bets times the face value); B = the rollover; A = sales. An empty cell means no change in the definition of the variable with respect to the previous period.

Table 3. Estimation results for the demand equation for La Quiniela
Dependent variable: *Number of coupons per fixture per capita sold (log)*

	Coefficient	p-value
Effective price (log)	-0.378	0.000
Jackpot (log)	0.299	0.000
Gross household income per capita (log)	0.191	0.015
Population (log)	-0.130	0.181
Number of teams in the First Division	0.044	0.009
Number of teams in the Second Division	0.021	0.057
Number of fixtures without First Division teams	-0.020	0.000
Adjusted R^2	0.930	
Sample size	988	

Note: All the economic variables are in real terms.

Table 4. Estimated elasticities

	Effective price	*Jackpot*	*Gross household income per capita*
Short run	- 0.378	0.299	0.191
Long run	- 0.903 (-0.571; -1.275) *0.132*	0.714 (0.452; 1.008) *0.104*	0.457 (0.289; 0.645) *0.067*

Note: The value for long run elasticities is the average of the elasticities of the provinces. The range of the variation of the long run elasticities is shown in parentheses. The standard deviation is in italics.

Appendix A. Estimation results for the demand equation for La Quiniela (Effective price model and Jackpot model)

Dependent variable: *Number of coupons per fixture per capita sold (log)*

	Effective price model		*Jackpot model*	
	Coef.	p-value	Coef.	p-value
Effective price (log)	-0.527	0.000		
Jackpot (log)			0.348	0.000
Gross household income per capita (log)	0.845	0.000	-0.249	0.000
Population (log)	0.195	0.058	-0.478	0.000
Number of teams in the First Division	0.030	0.100	0.049	0.004
Number of teams in the Second Division	0.021	0.089	0.022	0.052
Number of fixtures without First Division teams	-0.053	0.000	-0.015	0.000
Adjusted R^2	0.915		0.925	
Sample size	988		988	

Note: All the economic variables are in real terms.