

Price, Income & Unemployment Effects on Greek Professional Football

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Based on data of 26 Greek professional football clubs of Division A' and B' for 16 seasons (1991/92-2006/07), we investigate the effect of sporting and economic variables on the attendance in Greek football stadia. Price, income and unemployment are found to be statistically significant in the small Greek football market, while controlling for classic sporting determinants of demand such as success, entertainment and promotion/relegation. We include two more dummy variables; one for the new stadia constructed for the Olympic Games of 2004 and one for the enthusiasm effect of the EURO 2004 victory by the Greek National Team.

JEL Classification Codes: L83

Keywords: Greek Football, Football Demand, Attendance

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1 INTRODUCTION

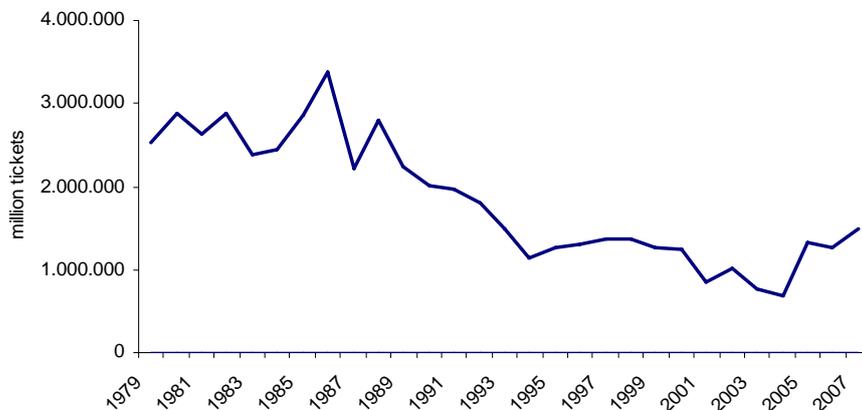
Football is the most popular spectator sport in Greece. As of May 2008, Super League Greece is ranked 14th in the UEFA ranking of leagues based on performances in European competitions over the last five-years. Greek professional football in its current form was established in 1979 by law 879/79 about football limited companies, with three divisions under the governance of "EPAE" (Association of Football Limited Companies). The new and promising "Super League Greece" (SLG) was formed in 2006, setting new financial and sporting goals for its 16 member clubs. The traditional EPAE has been renamed to "Hellenic League" and retains the governance of second and third division.

Profit maximization is not held to be a strong motive in Greek football. The majority of football clubs consumes returns earned in other industries by the club owners. At a glance, accumulated financial losses of the 16 top clubs in 2006 amounted to €204.3 million, with total equity capital of €130 million. Olympiakos F.C. is the dominant club and accounts for 1/3 of the losses (€ 71.2 million).

Ticket sales remain the largest source of revenue for the Greek professional football clubs (Kyriakos, 2007). Total revenues of the 16 football clubs of the SL amounted to €125 million in season 2005/06. 31% came from ticket sales (€38.8 million), 19% from advertising (€23.4 million), 18% from TV rights (€23 million), 12% from subsidies (€16.5 million), 11% from other sources (€13.2 million) and 8% from sponsorships (€10 million).

With capacity usage only 32.3% in 2005/06, which translates to 3 million unsold SLG tickets, it is interesting to investigate what attracts the Greek football fans to the game and draw some useful conclusions for the most important revenue source of the clubs. Football attendance was at its peak in the 1980s, experienced a sharp fall in the 1990s and has shown some positive upward trends in the new millennium, with a rise in interest after 2004 (year of the Greek National Football Team victory at the European Championship EURO 2004). The following figure depicts the total tickets sold in the first National Division (A') since 1979 (some changes in league size don't affect the trend significantly):

**Total tickets sold per season
A' National Division**



The financial instability and the unsold tickets can be attributed to reasons that are deeply rooted in Greek football for the last decades:

- The size of the market: half of Greece's population of 11 million lives in Athens, a city of 5 million people. With only one second big city, Thessaloniki of 1,5 million people, the rest of the Greek cities have populations no more than a couple of hundred thousands and thus provide a very small market for football clubs.
- Dominance of one club, Olympiakos F.C., rarely broken by two other clubs, AEK F.C. and Panathinaikos F.C.
- Rescuing from financial bankruptcy by the state (by avoiding insurance and tax debts and enjoying special treatment for political reasons) results in bad management.
- Frequent allegations of referees' malpractice and widespread reputation of match fixing.
- Hooliganism, that the state and the clubs have been unable to control throughout the years.

2 THEORETICAL BACKGROUND

2.1 Demand

The literature on professional team sports demand is rich and dates back to 1974. Cairns (1990), Downward and Dawson (2000) and Borland & Macdonald (2003) provide extended surveys of the studies conducted in various sports and especially football. As economic theory suggests demand depends on determinants such as (a) price (plus travel costs), (b) size of the market, (c) income and other macroeconomic factors (rate of unemployment), (d) availability and price of substitutes, (e) consumer preferences. In sports we should add uncertainty of outcome (closeness of the competition), quality of the team and the stadium, success of the team and the weather.

The relationship between the economic determinants and attendance tends to be ambiguous (Dobson and Goddard, 2001) as some of the most supported teams are

Sporting variables

Attendance of last season	measure of the short-term loyalty effect as strength of persistence of attendance
Position	team's finishing position in this season and last season as a measure of success
Victories per game	victories divided by games played as a measure of the importance of winning
Goals	goals scored in season divided by games played as a measure of entertainment
Promotion/relegation	promotion/relegation in last season

Dummy variables

New or renovated stadium	home stadium built or renovated because of the Olympic Games of 2004 as a measure of the effect of the venue
EURO 2004 victory	measure of the enthusiasm effect of this victory in subsequent 2 seasons
League size	attempts throughout the years controlled

2 METHODOLOGY

2.1 General

Panel data have been widely used in recent years to estimate dynamic econometric models. Dynamic panel models are of interest in a wide range of economic applications, including household consumption, adjustment cost models for firms' factor demands, and empirical models of economic growth.

In general, panel data or longitudinal data typically refer to data containing time series observations of a number of individuals. Therefore, observations in panel data involve at least two dimensions; a cross-sectional dimension, indicated by subscript i , and a time series dimension, indicated by subscript t .

A simple panel data regression model is given by

$$y_{it} = \alpha + x'_{it}\beta + u_{it}$$

Where y_{it} is the dependent variable with subscript i denoting households, individuals, firms, countries, etc. ($i=1, \dots, N$) and t denoting time ($t=1, \dots, T$). The i subscript, therefore, denotes the cross-section dimension whereas t denotes the time-series dimension. x_{it} is the vector of K explanatory variables, α and β (dimension $K \times 1$) are the parameters of the model.

However, many economic relationships are dynamic in nature. The dynamic dimension can be included in the panel models by the presence of a lagged dependent variable among the regressors, i.e.

$$y_{it} = \delta y_{i,t-1} + x'_{it}\beta + u_{it}$$

where δ is a scalar. In addition it is assumed that the u_{it} follow a one-way error component model

$$u_{it} = \mu_i + \varepsilon_{it}$$

where $\mu_i \sim N(0, \sigma_\mu^2)$ and $v_{it} \sim N(0, \sigma_v^2)$. Here N denotes the Normal distribution.

Hsiao (2003) lists several benefits from using panel data:

- (1) Controlling for individual heterogeneity. Panel data suggests that individuals, firms, states or countries are heterogeneous. Time-series and cross-section studies not controlling this heterogeneity run the risk of obtaining biased results
- (2) Panel data give more informative data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency.
- (3) Panel data are better able to identify and measure effects that are simply not detectable in pure cross-section or pure time-series data.
- (4) Panel data models allow us to construct and test more complicated behavioral models than purely cross-section or time-series data.
- (5) Micro panel data gathered on individuals, firms and households may be more accurately measured than similar variables measured at the macro level. Biases resulting from aggregation over firms or individuals may be reduced or eliminated.

Limitations, on the other hand, of panel data include:

- (1) *Design and data collection problems*. It is easier to find aggregate time series data than to collect data from a panel for a time period; in general, the design of panel surveys as well as data collection and data management is an extremely difficult task.
- (2) *Short time-series dimension*. Typical micro panels involve annual data covering a short time period for each individual. This has an effect on the statistical assumptions. On the other hand, increasing the time span or the individuals in the panel also increases the computational difficulty.
- (3) *Cross-section dependence*. Macro panels on countries or regions with long time series that do not account for cross-country dependence may lead to misleading inference.

To sum up, panel data models are not a panacea and will not solve all the problems that a time series or a cross-section study could not handle. However, is a combined approach that produces more accurate inference of model parameters because they contain more degrees of freedom and more sample variability than cross-sectional or time series models.

Note that panel models can be considered as a general class of models that contains time series models and also cross sectional models. In detail, the cross sectional models can be viewed as a panel with $T = 1$, and the time series model as a panel with $N = 1$, hence improving the efficiency of econometric estimates.

2.2 Arellano and Bond (1991) Estimator for Dynamic Panel Models

For the estimation of the parameters of the Dynamic Panel Models, Arellano and Bond (1991) proposed a GMM-type (Generalized Method of Moments) estimator, which will be presented in brief in this section. Let the following model:

$$Y_{it} = \sum_{k=1}^K a_k Y_{i,t-k} + X_{it} \beta + \lambda_t + \eta_i + u_{it},$$

$$i = 1, 2, \dots, N$$

$$t = 1, 2, \dots, T$$

Where, Y_{it} is the dependent variable for the i -th observation at time t , X_{it} is the matrix of independent variables for the i -th observation at t , β is the vector of model parameters, λ_t is the unobserved longitudinal effect (time-specific effect), η_i is the unobserved cross-sectional effect and u_{it} is the random term.

In the above model the independent variables X_{it} are correlated with the unobserved longitudinal effect (λ_t). In order to overcome this problem Arellano and Bond (1991) proposed to use the first differences of the data as instrumental variables because of the fact that the first difference of Y_{it} are not correlated with the term λ_t .

Based on the above suggestion, the model can be rewritten as:

$$y_i = W_i \delta + \iota_i \eta_i + u_i, \quad i = 1, 2, \dots, N$$

Where, δ is a vector that contains a_k , β και λ_t , W is a matrix with the independent variables, the time lagged variables and the dummy variables and ι is a vector with 1

The GMM estimator of the model is given by:

$$\hat{\delta} = \left[\left(\sum_i W_i^* Z_i \right) A_N \left(\sum_i Z_i' W_i^* \right) \right]^{-1} \left(\sum_i W_i^* Z_i \right) A_N \left(\sum_i Z_i' y_i^* \right),$$

where

$$A_N = \left[\frac{1}{N} \sum_i Z_i' H Z_i \right]^{-1},$$

and W_i^*, y_i^* are transformations of the initial W_i and y_i (e.g. first differences, orthogonal differences etc). Z_i is the matrix of instrumental variables and H_i is a matrix of weights.

For the specific case where the dimension of Z is equal to W_i^* , the GMM estimator is simplified to the following:

$$\hat{\delta} = \left[\sum_i Z_i' W_i^* \right]^{-1} \left(\sum_i Z_i' y_i^* \right),$$

In case that we use as transformation the first differences we have the following:

Equations	Instrumental Variables
$\Delta y_{i3} = a \Delta y_{i2} + \Delta u_{i3}$	y_{i1}
$\Delta y_{i4} = a \Delta y_{i3} + \Delta u_{i4}$	y_{i1}, y_{i2}
\vdots	\vdots
$\Delta y_{iT} = a \Delta y_{i,T-1} + \Delta u_{iT}$	$y_{i1}, y_{i2}, \dots, y_{i(T-1)}$

Then $y_i^* = (\Delta y_{i3}, \dots, \Delta y_{i,T-1})'$, $W_i^* = (\Delta y_{i2}, \dots, \Delta y_{i,T-1})$ and

$$Z_i = Z^D = \begin{bmatrix} y_{i1} & 0 & 0 & \dots & 0 & 0 & \dots & 0 \\ 0 & y_{i1} & y_{i2} & \dots & 0 & 0 & \dots & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \dots & y_{i1} & y_{i2} & \dots & y_{i,T-2} \end{bmatrix}$$

For matrix H_i Arellano and Bond proposed

$$H_i = H_i^D = \frac{1}{2} \begin{bmatrix} 2 & -1 & \dots & 0 \\ -1 & 2 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & \dots & -1 & 2 \end{bmatrix}$$

Arellano and Bond (1991) also proposed - for the dynamic models that include independent variables apart from the time lagged variables – to include in matrix Z_i the independent variables that are correlated with the cross-sectional effect (η_i).

2.3 The data and the model

Our dataset is a typical example of panel data because it is a combination of time-series and cross sectional data. Here the individuals are the Greek football teams (cross-sectional component). For each team, variables like average attendance, goals per game, finishing position in the championship and average admission price of the tickets have been recorded. These variables have been collected for a time period of sixteen years from 1991 to 2007 (time-series component). Therefore, our dataset is a two dimension matrix where one dimension is the teams (29 teams) and the other dimension is the time period (16 years).

Initially, we apply a simple time-series model in order to study the attendance for each team separately. Unfortunately, the majority of the estimated parameters of these time series models were not statistically significant. This was caused mainly by the short time period that the variables have been recorded for each team (16 years).

For the reason we choose to fit a panel data model. In detail, we choose a linear dynamic panel-data model (Baltagi 1995, Wooldridge 2002) with unobserved fixed panel-level effects. As dependent variable we use the attendance and the remaining variables as independent variables. The dynamic nature of the dependent variable attendance is considered by including 1 lag of the team attendance as covariate.

The full specification of the applied model is:

$$y_{i,t} = u_i + \delta y_{i,t-1} + \beta_1 l_{i,t} + \beta_2 l_{i,t-1} + \beta_3 v_{i,t} + \beta_4 p_{i,t} + \beta_5 g_{i,t} + \beta_6 gdp_t + \beta_7 e_{i,t} + \beta_8 ol_{i,t} + \beta_9 pr_{i,t-1} + \beta_{10} r_{i,t-1} + \beta_{11} leag_{i,t} + \beta_{12} un_t + \varepsilon_{i,t}$$

where, the subscripts i and t denotes the club and the time respectively, $y_{i,t}$ is the natural logarithm of the average attendance, u_i is the fixed effect for each team, $l_{i,t}$ is the team i 's finishing position, $v_{i,t}$ is victories per game, $p_{i,t}$ is the natural logarithm of team i 's average admission price (deflated by CPI) in season t , $g_{i,t}$ is team i 's average goals per game, gdp_t is the natural logarithm of the Greek gross domestic product (in current prices) in season t , $e_{i,t}$ is a dummy variable with value 1 for the seasons 2004/2005 and 2005/2006, 0 otherwise (Greek National team was the European Champion in EURO 2004), $ol_{i,t}$ is a dummy variable with value 1 for the teams that played in an Olympic venue, 0

otherwise, $pr_{i,t-1}$ is promotion, $r_{i,t-1}$ is relegation, $leag_{i,t}$ is the league size, un_t is the unemployment rate at year t , $\varepsilon_{i,t}$ is the error term.

Concerning the estimation methodology of the dynamic panel models, the standard estimators like OLS (Ordinary least Squares) are inconsistent because the unobserved panel-level effects (by construction) are correlated with the included lagged dependent variables. In order to overcome this problem, Arellano and Bond (1991) proposed a consistent generalized method-of-moments (GMM) estimator for the parameters of this model. This Arellano and Bond estimator is provided by a specific econometrics program and for our dataset we use the procedures of the STATA software.

Applying the above model to our dataset using Arellano and Bond (1991) estimator we obtain the following results:

$$\begin{aligned}
 y_{i,t} = & u_i + 0.166^a y_{i,t-1} - 0.0665^a l_{i,t} - 0.0000314 l_{i,t-1} - 0.3112 v_{i,t} - 0.4035^a p_{i,t} \\
 & + 0.28^b g_{i,t} + 0.456^a gdp_t + 0.1857^b e_{i,t} + 0.5643^a ol_{i,t} + 0.1948^b pr_{i,t-1} \\
 & - 0.392^a r_{i,t-1} - 0.3453^a leag_{i,t} - 0.929^a un_t + \varepsilon_{i,t}
 \end{aligned}$$

$$obs = 302 \quad R^2 \approx 0.74$$

Notes: ^a = significantly different from zero, two tail, 1% level, ^b = 5%, ^c = 10%.

As far as the overall fit of the model is concerned, the Wald- X^2 test indicates that the set of the explanatory variables that were included in the model are statistically significant. The overall- R^2 (Wooldridge, 2002) which corresponds to the usual R^2 of OLS regression, is 0.73. This means that the 73% of the variability of the data is explained by the applied model. Based on these results, the above model seems to be a good description of our data.

In addition, we apply two specific tests:

- the Sargan's test (Wooldridge, 2002) of over-identification restrictions (p-value < 0.001).
- the Arellano-Bond test (p-value = 0) to examine the residuals of the model for high-order autocorrelation.

In addition to the above tests, the scatter-plot of the residuals (Figure 1) is presented with the corresponding Normal-Probability plot (Figure 2). Finally, the plot of the dependent variable and the predictions from the model (Figure 3) is also presented for a visual inspection of the fit.

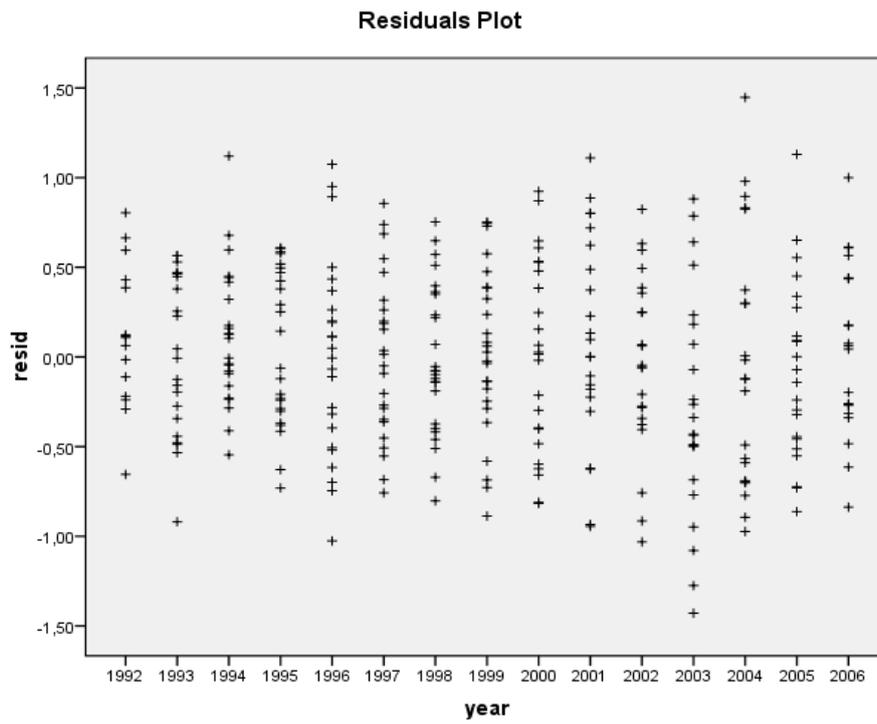


Figure 1: Residuals Plot

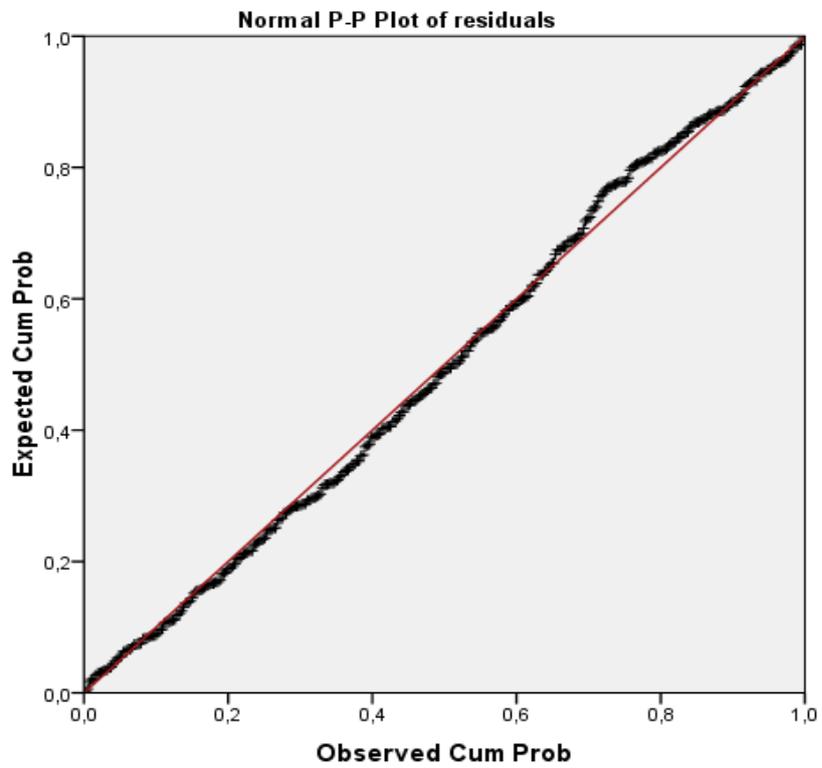


Figure 2: Normal Probability Plot of the Residuals

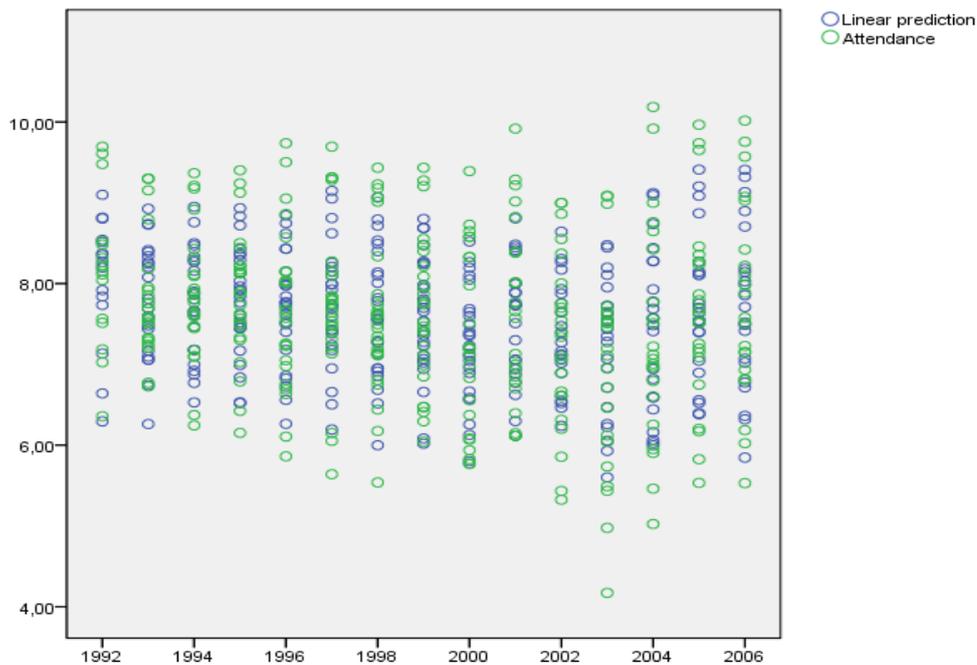


Figure 3: Dependent Variable and Predictions

3 RESULTS/FUTURE RESEARCH

Results indicate a low price elasticity of -0.40 , which is consistent with previous studies of professional sports, and a positive income elasticity of 0.46 , suggesting that Greek football is a normal good. The rate of unemployment in Greece negatively affects football attendance. Short-term loyalty and success within the season (although not known at the time of the purchase of the ticket) are the strongest determinants of demand, in contrast to winning. Entertainment measured by the goals scored, positively affects attendance. Promotion boosts attendance whereas relegation has negative effects. The EURO 2004 Championship victory, as intuitively expected, significantly affected attendance in the following two seasons, as did playing in a new or renovated stadium because of the 2004 Olympic Games constructions. A bigger league reduces attendance.

Year 2009 is the 30-year anniversary of Greek professional football. We recently found attendance data for the years 1979-1991 in the hard-copy archives of EPAAE. Future research will include the investigation of the full 30-year period in order to be able to confirm our findings, especially for economic determinants that require longer time horizons.

Endnote

This paper is an extension of a former model of demand for Greek professional football.

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