Department of Communication, University of Teramo

wpcomunite.it

Win the best, win the largest or win the richest. Some empirical evidence from Italian championships

Marco Di Domizio

Department of Communication, Working Paper No 47, 2008

Department of Communication Working Paper Series.

The Department of Communication Working Paper Series is devoted to disseminate works-in-progress reflecting the broad range of research activities of our department members or scholars contributing to them. It is aimed at multi-disciplinary topics of humanities, science and social science and is directed towards an audience that includes practitioners, policymakers, scholars, and students. The series aspires to contribute to the body of substantive and methodological knowledge concerning the above issues. Since much of the research is ongoing, the authors welcome comments from readers; we thus welcome feedback from readers and encourage them to convey comments and criticisms directly to the authors.

Working papers are published electronically on our web site and are available for free download (http://wp.comunite.it). Each working paper remains the intellectual property of the author. It is our goal to preserve the author's ability to publish the work elsewhere. The paper may be a draft that the author would like to send to colleagues in order to solicit comments or feedback, or it may be a paper that the author has presented or plans to present at a conference or seminar, or one that the author(s) have submitted for publication to a journal but has not yet been accepted.

Marco Di Domizio

Researcher in Economics at the University of Teramo - Faculty of Political Sciences.
Campus of Coste S.Agostino, 64100, Teramo, Italy.
E.mail address: mdidomizio@unite.it,
tel.+39 0861 266783, fax +39 0861 266033

ABSTRACT

This paper uses an econometric model to evaluate the impact of variables influencing the long period competitive balance in Italian football league. Using records of the last 75 tournaments and adopting as a measure of market size both a demand and a supply side perspective, the paper aims at establishing if the theoretical prescriptions on the long run competitive balance holds for the Italian championships. This approach allows us to evaluate if teams outperform their market size and to extract a ranking of the best and worst teams in the last 75 years.

I. INTRODUCTION

This paper focuses on the variables influencing the long period competitive balance in the Italian Football League (*Serie A*) by analysing the records of the championships from season 1929/30 to season 2006/07.[1] Built around a maximizing profit framework, our econometric model tests the theoretical prescription that the winnings ratio among teams strictly depends on the relative market size of any single team participating to the league. The empirical evidence is then used to establish a ranking of the best and worst teams in the last 75 *Serie A* tournaments, net of «national titles» won.

Two relevant features involving the empirical analysis are worth stressing. The first is the assumption of a profit maximizing behaviour by sports' professional teams. This approach, which has been widely debated in the analysis of the organization and management of North American sports' professional leagues,[2] might be questioned when applied to European sports teams and to the Italian football league, in particular for the period under investigation.[3] The reason is twofold. There is the obvious fact that only in 1996 the law 586 voided the previous preclusions to professional teams of distributing profits among shareholders. There is also the more relevant fact that the whole league has recently accumulated significant losses associated to more than €750.000.000 debt versus the fiscal authority.[4] Nevertheless, we believe that the profit maximizing approach is more appealing than the utility maximizing procedure. First, because it better grasps the determinants of the competitive balance even among teams aiming at social, political, demographical and cultural targets; and secondly because the same results obtained under the profit maximization hypothesis could be replicated in an utility maximizing framework if appropriate variables and constraints are choosen.[5]

The second issue concerns data collection. Since our estimates involve not only sports data, but also demographic and economic data at local level (province or town), for which homogeneous and complete time series are not available at our targeting collection, we used census returns at ten-years aggregation stage. Major details are given below for each group of data.

The paper is organised as follows. Section II describes the model. Section III presents data collection. Section IV discusses procedures and estimation output. Section V adds some relevant implications following from the sample restriction to the top-ten teams. Section VI concludes.

II. THE MODEL

Our theoretical model builds around the teams' profit maximizing behaviour provided by Rottenberg (1956) and extended by many others such as El Hodiri and Quirk (1971), Fort and Quirk (1995) and Vrooman (2000). Following Wrooman (1995) and Dobson and Goddard (2001), we consider an open league of N teams. Each team maximizes profits consisting of the following total revenues (R) and costs (C) functions:

$$R_i = rM_i^{\alpha} W_i^{\beta}, \qquad \alpha > 0,\ \beta \leq 1 \qquad (1)$$

$$C_i = cM_i^{\gamma} W_i^{\delta}, \qquad \gamma \geq 0,\ \delta \geq 1 \qquad (2)$$

where i indicates the *i-th* team $(i = 1,2,...N)$, r and c are constants, M_i is the market size, W_i is the winnings ratio, α and β are the elasticities of total revenues with respect to the market size and the winnings ratio, respectively, γ and δ the elasticities of total cost to the market size and the winnings ratio.[6]

The winnings ratio is taken to be a multivariate function depending on both deterministic (teams' talents) and stochastic variables. Thus

$$W_i = f(T_i, T_j, \varepsilon) \qquad j \neq i, \tag{3}$$

where T_i is the talent of team i, T_j is the talent of each other team and ε a stochastic variable with the usual properties

$$E(\varepsilon) = 0 \qquad \text{and} \qquad Var(\varepsilon) = \sigma^2. \tag{4}$$

From (4), the expected value of winnings ratio depends only on the league's relative available talent, and can therefore be written as

$$E(W_i) = \frac{T_i}{\sum_{i=1}^{N} T_i}. \tag{5}$$

First order condition for profit maximization implies the following solution for each single team's winnings records

$$W_i = (M_i)^{\frac{\alpha-\gamma}{\delta-\beta}} \left(\frac{\beta r}{\delta c} \right)^{\frac{1}{\delta-\beta}}. \tag{6}$$

In relative terms, the solution can be summarized by

$$\frac{W_i}{W_j} = \left(\frac{M_i}{M_j} \right)^a \tag{7}$$

where $M_i \geq M_j$, and

$$a \equiv \frac{\alpha - \gamma}{\delta - \beta} \geq 0.$$

Equation (7) is the standard equation for competitive balance between team i and team j in a profit maximizing framework. This relationship implies the following propositions:

i) *the winnings ratio between two teams in the long period is strictly related to the ratio of theirs market size*;

ii) *a perfect competitive balance is possible only in the presence of teams of equal market size*.[7]

Log-linearizing equation (7) yields

$$\log\left(\frac{W_i}{W_j}\right) = a\left(\log M_i - \log M_j\right), \qquad (8)$$

which is the equation we used in the econometric investigation to test propositions *i)* and *ii)*. In order to establish how much of the variability in the long period records between teams in Italian *Serie A* can be explained by the difference in their market size, we performed the following OLS equation

$$\log\left(\frac{W_i}{W_j}\right) = b_1 \log M_i + b_2 \log M_j + \sum_{n=1}^{N} d_n D_n + \varepsilon\,, \qquad (9)$$

which allows the coefficients $b_{1,2}$ to be estimated. The equation (9) also includes dummy variables (D) in order to control for the specific contribution of each team to its records.[8]

III. THE DATA

We investigated the records of the last 75 championships of Italian *Serie A* from 1929/30 to 2006/07.[9] The teams in the sample have been chosen among those with at least 20 appearances in *Seria A*.[10] This involves a sample of 20 teams, 11,850 matches played and 190 cross-records.[11] For each registered record we need not to distinguish between home and away matches, so that the match records of «*Team 1 vs. Team 2*» implies also «*Team 2 vs. Team 1*». Data are ordered increasingly with the number of matches played. The records are registered taking in the left hand side (*i.e.*, in position of Team 1) the team with the relative biggest market size.

Although the theoretical model suggests as the best proxy for competitive balance the winnings ratio between Team 1 and Team 2, we nonetheless used a number of alternative proxies. This links to the difficulty of classifying the concept of the «winnings» in football, where the draw is also a possible result. Indeed, while in sports like basketball or baseball or American football the draw is not allowed or is a rare event, in football the draw is not only a frequent result, but also double faced. For example, a team could take the draw as a quasi-victory if obtained away from home, but as a quasi-defeat if obtained at home. Alternatively, the draw could be taken as a quasi-victory by the home team if it is relatively small, poor of talent or less titled with respect to its competitor. We therefore used different measures of competitive balance. The first is the standard one. In this case the variables *W1* and *W2* (hereafter numbers *1* or *2* denote, respectively, the team on the left and on the right hand side) are the ratios between the absolute number of winnings and matches played. The second, denoted by *W&D2*, summarizes the winnings and draws of each team appearing on the right hand side.[12] The last, denoted by *W&AD* (followed by *1* or *2*) indicates the number of winnings and the away draws of each team. This last specification follows from the different weight given to results obtained at home and away from home. It reflects the so called «English Average» measure, a scoring table often used by specialized sports magazines and newspapers, which defines an optimal profile for records including the victory at home and draws away. The variable *W&AD* therefore weights the draw away just like a victory.

The independent variables also need some explanations. Generally, the market size is viewed from a demand side perspective. This implies that the market size refers to what in demography is called «catchment area», namely the largest cities associated to the biggest market size.[13] We used two demographic indicators derived from the town and province resident population of each team.[14] The first is a proxy of the town population [*TP*(*1* or *2*)]. It is obtained as a moving average of the ratio between the town resident population and the

Italian population, using census returns of *ISTAT* (Italian Institute of Statistic) with the weights given by the number of matches played in the period of reference. To better illustrate, let us give an example of the calculus of the market size relative to the match «*Milan vs. Juventus*». They played 144 matches distributed over time as shown in the column «*matches played*» of table 1, whereas the town population ratio for each team for the period of reference is reported in the other two columns.

TABLE 1

The final row indicates the computed market size of A.C. Milan versus Juventus F.C. (0.02685), and the market size of Juventus F.C. versus A.C. Milan (0.01750). This implies finding different population data associated with the same team for different matches played with the opponents in different periods.

In computing the population associated to the teams we also used, as a demographic proxy the province population since the «catchment area» involves not only the town, but also its hinterland. The independent variable related to the province population, called *PP*(*1* or *2*), was obtained as a moving average ratio between the team's province population and the Italian population. The procedure is the same as for the calculus of *TP*.

We believe, however, that demographic data catch up only demand effects. The supply side effect of the market size should also be considered. This can be sized up by weighting the attitude of a specific «area» to support the team financially. The idea is that the richest area might be associated with the richest team and hence with better scores.[15] This idea has been tested by selecting another variable to the regressors denoted by *VA*(*1* or *2*), which estimates the impact of province income on teams records. Since complete time series data are not available for this variable,[16] we used as a proxy a moving average of the ratio between total Value Added in team's province and Italian Value Added. The procedure replicates the one just used for town and province population, except for the periods relating to matches.

IV. ESTIMATION OUTPUT

Our econometric investigation aims at two targets. First, we want to evaluate how much of the long run competitive balance variability is explained by the variables used as a proxy for the market size. This allows us to identify also the variables that better approximates the market size. Second, introducing dummy variables for each team in the sample, we aim at testing if each team adds some specific performance to its records other than the one summarized by demographic and economic features. This way, a ranking of the best and worst teams for the whole sample period can be provided, using estimated coefficients for the dummies.

To show let us dwell on the results given in table A. The table reports the results of twelve regression equations - shared out in four set of three - which differ for the dependent variables used as a proxy for the winnings ratio, and for the independent variables used as a proxy for the relative market size.

TABLE A

It can be noted that, independently of the measures adopted for competitive balance, the better proxy for the market size is given by the economic variable summarizing the potential of the supply side of the team's area. This result seems to suggest that «*have a richer owner*» is more important than «*be located in a largest area*». On the other hand, we can not neglect that in the best fitted equation (regression 3), the market size can explain only a 25 per cent of the whole variability. This lead us to introduce dummy variables to control for some additional or specific single team performance.

The inclusion of dummies involves the following steps:

a) From each single regression carry out a test for omitted variables (one for each team), obtaining twenty probabilities in order to assess the null hypothesis that the team performance does not contribute to explain the variation in the dependent variable.
b) From step a) get a rank of probabilities associated to each team, establishing the order of the inclusion of each dummy.
c) Introduce the dummy one at a time and, for each one, carry out a test for redundant variables.
d) Once the omitted and redundant tests confirm the significance of the dummy, replicate steps a) and b) for the dummy variable (team) positioned in the second place, and so on.[17]

The results are summarized in the following table B.

TABLE B

Since observations are ordered by the number of matches played, we see that about all the regressions suffer from heteroskedasticity.[18] We therefore corrected the estimations with the Newey-West Method, after the White Test confirmed the presence of heteroskedasticity.[19] This way we preserved the robustness of the estimation method, selecting a level of statistical significance higher than 99 per cent for all regressions.

The final results show that the inclusion of dummies significantly improves the goodness of fit. In particular, using the standard measure of the winning ratio (*W1/W2*) as the dependent variable, the regression catches about 2/3 of the phenomenon variability. This independently of the demographic or economic variable chosen.

The results also show that (*W1/W2*) and (*W&AD1/W&AD2*) are better approximations of competitive balance when expressed in terms of market size. The impact of demographic data is significantly reduced or go to zero if alternative measures of competitive balance, as (*W1/W&D2*) and (*W1/W&AD2*), are used. This supports our hypothesis that different views

of the competitive balance in terms of records require different explicative variables. For the independent variable, we can see that the inclusion of dummies reduces the impact of demographic and economic factors, although retaining the standard level of significance, and that the province population shows to be a better proxy for the market size with respect to the town population and the province Value Added, particularly when the competitive balance is measured by the standard winnings ratio.

Let us now deal with the issue of which is the best and/or the worst team(s) of the Italian football league of the last 75 years. Specifically, the best team is the one that adds to its performance more than its demographic and/or economics features suggest. On the contrary, the worst team(s) is the one whose records are below the expectations related to its demographic and/or economic environment. From the demographic perspective, and focusing only on regressions with the standard competitive balance measure (*W1/W2*), we see that five teams performed more than it was predicted by their market size: Juventus F.C., Inter F.C., A.C. Milan, A.C.F. Fiorentina and Bologna F.C.; the worst teams were U.S. Palermo, Brescia C. and A.S. Bari. However, while the order of the worst teams changes if other independent variables are used, the order of the best teams is confirmed for each regression selected.

Alternatively, if we adopt an economic perspective we see that no other team adds to the «black list», while three teams performed more than what is implied by their economic features: in decreasing order S.S.C. Napoli, A.S. Roma and Torino F.C..

V. SAMPLE ADJUSTEMENT AND EXTENSIONS

The natural extension of the previous econometric estimations is to restrict the sample to the top teams to test for the hypothesis that the theoretical prescriptions do not depend on the sample selected. This way we replicated the previous estimations selecting the first ten teams

in terms of appearances in *Serie A* and repeated the above procedure selecting the winnings ratio (*W1/W2*) as a proxy for competitive balance. The results are quite amazing. First, the demographic features fail to explain any records in terms of competitive balance. The hypothesis that its coefficient is different from zero is rejected in all regressions. This seems to suggest that the impact of the market size on competitive balance holds only when the market sizes are very different and disappears in presence of teams located in the largest towns. On the contrary, the impact of economic factors summarizing the supply side effect remains confirmed. The results are shown in table C.

TABLE C

Although the variability explained by the Value Added is lower with respect to the previous case shown in table A, the results appear more satisfying in terms of team specific performance. Adding each team one at a time we see that starting from a value of R^2 of about 15 per cent, the dummy of Juventus F.C. pushes the index above the 50 per cent![20] This is the only case in which a team adds specific performance to the Value Added variables. Other teams, such as S.S. Lazio, A.S. Roma, U.C. Sampdoria and Torino F.C., performed below the standards suggested by the economic data. What is surprising is that, although the observations reduced from 188 to 45, the estimation output caught almost the 80 per cent of the phenomenon variability! This rises the question of why Juventus F.C. adds so great performance to its records with respect to other teams. A list of factors might be: management ability, richness, talents' market monopoly power, referees' psychology subjection, illegal behaviour, and so on.[21] We let the reader to chose the preferred one and, if possible, to test for it.

VI. CONCLUSION

In this paper we have tested the hypothesis that the long run competitive balance is determined by the relative market size of the team participating to the league. We concentrated on Italian *Serie A* records of the last 75 tournaments selecting a sample of 20 team with the largest appearances to the championships. We introduced different measure of market size. We adopted both a demand side and a supply side perspective, using demographic data as a proxy for demand effects, and the richness of the team's area for evaluating the potential supply side effects. We also used several measure of competitive balance in order to assess the relevance of draws in football matches. We find that the market size explain at best a quarter of the phenomenon variability with no much differences in the contribution of demographic and economic features. We also investigated the ability of each team to add specific performances to its own records beyond those predicted by demographic and economic features. This way, identifying the best and the worst team of the last 75 years, a «gold and black list» was obtained.

The analysis was then restricted to the top ten teams participating to the league. We found that only five teams, among «the biggest», significantly contributed to the goodness of fit, and that only one adds positive performance to its records, Juventus F.C..

NOTES

1. A comprehensive discussion of competitive balance is in Downward and Dawson (2000), Sandy et al. (2004) and Leeds and Von Allmen (2005). See also the articles published in the volume 3, n.2, of the *Journal of Sports Economics* (2003).

2. See for example Sloane (1971) and his exceptions to the previous contributions of Rottenberg (1956), Neale (1964) and Jones (1969). On this theme see also Scully (1974).

3. The issue of a profit maximizing behaviour involves not only professional teams, but also firms in general. See, for example, the amusing contribution of Romer (2006) who uses sport's environment as a proxy for irrational firms behaviour.

4. See Lago et al. (2004).

5. The relationship between the winnings ratio and the market size can be derived from a utility maximizing framework if the objective function is directly related to the winnings, subject to a non negative constraint on profits which, in turn, are related to revenues and market size. On this point see Kesenne (2000 and 2005).

6. The standard hypothesis considers that the price for unit of talent is the same for each team imposing $\gamma = 0$. In our formalization we only restrict $0 \leq \gamma \leq \alpha$. For the others parameters restrictions see Vrooman (1995).

7. The limit case of perfect competitive balance, where $\alpha = \gamma$ and/or $\beta \to \delta$ and hence $a = 0$, is omitted.

8. The dummy variables are equal to 1, -1 or 0. It is 0 if teams is not involved. It is 1 or -1 if the match under investigation includes the team and it is positioned on the left or on the right hand side, respectively.

9. The data for the period 1929/30 to 1998/99 are from Tommasi (2000). The data from 1999/00 to 2006/07 are from Almanacco Illustrato del Calcio – Panini - 2000 and ss..

10. Remember that the Italian football league admits relegation to/promotion from a lower series, so that great changes in the rooster are possible. Only Inter F.C. participated to all tournaments in the period under investigation. The team with the least number of participation is U.S. Palermo, which appeared in 20 tournaments.

11. Among the 20 teams only two matches have never been played in *Serie A*, Triestina-Verona and Triestina-Cagliari, so that the number of observations reduces to 188.

12. Recall that position 2 refers to the team with the relative smallest market size.

13. See Leeds and Von Allmen (2005).

14. For data about town and province resident population see the Italian Institute of Statistic web site at *www.istat.it*.

15. Obviously it might be the case that the owner of the team is not located in the team's area, but typically there is a strong link between the ownership and the team's area.

16. There are only six data at the province level available at ten years aggregation: 1951/61/71/81/91/99. For economic data at province level we refer to Tagliacarne Institute.

17. Note that, in order to maintain the powerful of the regression, all the null hypothesis are accepted only if significance is at least of 99 per cent.

18. The first records come from a limited number of matches, while the final records were obtained from a much higher number of matches (the range is 6-148).

19. See White (1980) and Newey and West (1987).

20. Obviously, we also in these cases performed the test for omitted and redundant variables.

21. The political and economic weight of the Juventus F.C.'s ownership and management has been and still is one of the more debated issue in Italian sport environment. Recently the team was relegated in *Serie B* and the national title of 2005/06 has been revoked for illegal behaviour of its team's management. See Tavella (2006) and Ghirelli (1990).

REFERENCES

Almanacco Illustrato del Calcio (2000 and ss.). Panini, Modena.

Baroncelli, A., Lago, U. & Szymanski, S. (2004). *Il Business del Calcio*, Egea, Milano.

Dobson, S. & Goddard, J. (2001). *The Economics of Football*. Cambridge University Press, Cambridge (UK).

Downward, P. & Dawson, A. (2000). *The Economics of Professional Team Sports*. Routledge Edition, London.

El Hodiri, M. & Quirk, J. (1971). An Economic Model of a Professional Sports League. *Journal of Political Economy*, 79, 1302-1319.

Fort, R. & Quirk, J. (1995). Cross-subsidization, Incentives, and Outcome in Professional Team Sports Leagues. *Journal of Economic Literature*, 33, 1265-99.

Ghirelli, A. (1990). *Storia del calcio in Italia*, Einaudi, Torino, 1990.

Jones, J. C. H. (1969). The Economics of the National Hockey League. *Canadian Journal of Economics*, 2, 1-20.

Kesenne, S. (2000). Revenue Sharing and Competitive Balance in Professional Team Sport. *Journal of Sports Economics*, 1, 56-65.

Kesenne, S. (2005). The organization of European football and the competitive balance within and between the nations. University of Antwerp Working Papers, 2005/001.

Leeds, M. & Von Allmen, P. (2005). *The Economics of Sports* – 2nd ed., Addison Wesley Publishing, Boston (MA).

Neale, W. C. (1964). The Peculiar Economics of Professional Sports: A Contribution to the Theory of the Firm in Sporting Competition and in Market Competition. *Quarterly Journal of Economics*, 78, 1-14.

Newey, W. & West, K. (1987). A Simple Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix. *Econometrica*, 55, 703–708.

Romer, D. (2006). Do Firms Maximize? Evidence from Professional Football. *Journal of Political Economy*, 114, 340-365.

Rottenberg, S. (1956). The Baseball Players' Labor Market. *Journal of Political Economy*, 3, 242-258.

Sandy, R., Sloane, P.J. & Rosentraub, M.S. (2004). *The Economics of Sport – An International Perspective*, Palgrave Macmillan, London.

Scully, G. W. (1974). Pay and Performance in Major League Baseball. *American Economic Review*, 64, 915-930.

Sloane, P. J. (1971). The Economics of Professional Football: The Football Club as a Utility Maximiser. *Scottish Journal of Political Economy*, 18, 121-146.

Tavella, R. (2006). *Il libro nero del calcio italiano*. Newton & Compton, Roma.

Tommasi, R. (2000). *Storia della Serie A – Il Calcio del Girone Unico*. Marchesi Grafiche Editoriali, Roma.

Vrooman, J. (1995). A General Theory of Professional Sports Leagues. *Southern Economic Journal*, 61, 971-990.

Vrooman, J. (2000). The Economics of American Sports Leagues. *Scottish Journal of Political Economy*, 47, 364-398.

White, H. (1980). A Heteroskedasticity-Consistent Covariance Matrix and a Direct Test for Heteroskedasticity. *Econometrica*, 48, 817–838.

TABLE 1: town population ratio (*TP*) calculus			
Period	**Matches played**	**TOWN POPULATION RATIOS**	
		MILAN	**JUVENTUS**
<1931	4	0.023064	0.0141831
1932-1936	10	0.0259517	0.0146326
1937-1951	24	0.0268153	0.0151381
1952-1961	20	0.0312583	0.0202636
1962-1971	20	0.0319929	0.0215743
1972-1981	18	0.0283744	0.0197527
1982-1991	18	0.0241155	0.0169521
1992-2001	20	0.0220403	0.0151811
2002-2007	10	0.0220431	0.01523
Total	**144**	**0.02685**	**0.01750**

TABLE A: OLS ESTIMATION
188 OBSERVATIONS

Dependent variables	LOG (*W1/W2*)			LOG (*W&AD1/W&AD2*)			LOG (*W1/W&D2*)			LOG (*W1/W&AD2*)		
Independent variables	1	2*	3	4*	5*	6*	7*	8*	9*	10	11*	12*
LOG(*TP1*)	0.267 (0.0634)			0.222 (0.0547)			0.252 (0.5008)			0.278 (0.0589)		
LOG(*TP2*)	-0.271 (0.0494)			-0.225 (0.0402)			-0.109 (0.0382)			-0.197 (0.0458)		
LOG(*PP1*)		0.540 (0.0841)			0.424 (0.0706)			0.453 (0.0636)			0.517 (0.0746)	
LOG(*PP2*)		-0.514 (0.0663)			-0.407 (0.0535)			-0.252 (0.0485)			-0.390 (0.0568)	
LOG(*VA1*)			0.513 (0.0638)			0.380 (0.0554)			0.411 (0.0539)			0.478 (0.0592)
LOG(*VA2*)			-0.488 (0.0499)			-0.373 (0.0433)			-0.212 (0.0394)			-0.354 (0.0436)
$\overline{R}^2$	0.092	0.172	0.254	0.088	0.148	0.203	0.091	0.198	0.238	0.103	0.185	0.245
Standard error of regression	0.6125	0.5922	0.5362	0.5218	0.5121	0.4650	0.4756	0.4565	0.4398	0.5689	0.5478	0.5099
Akaike info criterion	1.868	1.801	1.602	1.547	1.510	1.317	1.362	1.281	1.206	1.721	1.645	1.501
Jarque-Bera prob.	0.659	0.288	0.403	0.881	0.872	0.722	0.200	0.225	0.392	0.946	0.665	0.475
White heteroskedasticity test	0.819	0.079	0.597	0.322	0.004	0.138	0.368	0.112	0.013	0.642	0.033	0.098

Standard error in parenthesis – Significance level > 99%
*Newey-West HAC Standard Errors correction

TABLE B: OLS ESTIMATION
188 OBSERVATIONS

Dependent variables	LOG (*W1/W2*)			LOG (*W&AD1/W&AD2*)			LOG (*W1/W&D2*)			LOG (*W1/W&AD2*)		
Independent variables	1	2*	3*	4*	5*	6*	7*	8*	9*	10*	11*	12*
LOG(*TP1*)	0.204 (0.0367)			0.117 (0.0338)			0.156 (0.0068)			0.093 (0.0084)		
LOG(*TP2*)	-0.200 (0.0279)			-0.167 (0.0256)								
LOG(*PP1*)		0.359 (0.0639)			0.254 (0.0519)			0.346 (0.0554)			0.344 (0.0600)	
LOG(*PP2*)		-0.342 (0.0517)			-0.244 (0.0404)			-0.142 (0.0440)			-0.222 (0.0476)	
LOG(*VA1*)			0.152 (0.0558)			0.182 (0.0480)			0.396 (0.0474)			0.303 (0.0520)
LOG(*VA2*)			-0.144 (0.0466)			-0.183 (0.0377)			-0.199 (0.0381)			-0.184 (0.0399)
ATALANTA												
BARI	-0.455 (0.1207)	-0.454 (0.1274)	-0.309 (0.1188)	-0.456 (0.1209)	-0.435 (0.1162)	-0.328 (0.0993)	-0.270 (0.1023)	-0.305 (0.1143)		-0.323 (0.1245)	-0.428 (0.1257)	-0.340 (0.1153)
BOLOGNA	0.193 (0.0603)	0.329 (0.0636)	0.366 (0.0634)	0.230 (0.0531)	0.355 (0.0555)	0.360 (0.0489)	0.300 (0.0516)	0.274 (0.0567)	0.281 (0.0566)	0.438 (0.0575)	0.346 (0.0629)	0.341 (0.0547)
BRESCIA	-0.503 (0.1082)	0.555 (0.1108)	-0.460 (0.1121)	-0.417 (0.0917)	-0.483 (0.0957)	-0.429 (0.1111)	-0.227 (0.0799)	-0.248 (0.0843)	-0.329 (0.1075)	-0.354 (0.0900)	-0.429 (0.1026)	-0.492 (0.1227)
CAGLIARI									0.335 (0.1202)			
FIORENTINA	0.300 (0.0582)	0.338 (0.0595)	0.449 (0.0625)	0.286 (0.0553)	0.383 (0.0574)	0.388 (0.0621)	0.434 (0.0469)	0.388 (0.0493)	0.388 (0.0486)	0.545 (0.0532)	0.434 (0.0555)	0.431 (0.0606)
GENOA	-0.327 (0.0839)			-0.274 (0.0736)								
INTER	0.566 (0.0779)	0.527 (0.0730)	0.756 (0.0963)	0.430 (0.0543)	0.462 (0.0607)	0.462 (0.0644)	0.586 (0.0486)	0.342 (0.0505)		0.872 (0.0474)	0.484 (0.0542)	0.379 (0.0587)
JUVENTUS	0.845 (0.0780)	0.891 (0.0840)	1.043 (0.0928)	0.652 (0.0733)	0.736 (0.0726)	0.736 (0.0734)	0.841 (0.0630)	0.732 (0.0630)	0.559 (0.0549)	1.086 (0.0763)	0.849 (0.0752)	0.770 (0.0707)
LAZIO	-0.273 (0.0678)	-0.193 (0.0730)		-0.193 (0.0643)						0.203 (0.0739)		
MILAN	0.511 (0.0522)	0.475 (0.0554)	0.700 (0.0751)	0.351 (0.0467)	0.385 (0.0514)	0.381 (0.0681)	0.571 (0.0622)	0.318 (0.0630)		0.787 (0.0572)	0.394 (0.0547)	0.281 (0.0646)
NAPOLI			0.325 (0.0693)			0.227 (0.0735)	0.195 (0.0573)			0.368 (0.0802)		0.222 (0.0698)
PALERMO	-0.528 (0.0933)	-0.417 (0.0891)	-0.270 (0.0951)	-0.457 (0.0965)	-0.332 (0.1009)						-0.326 (0.1150)	-0.236 (0.0915)
ROMA			0.307 (0.0716)				0.190 (0.0536)			0.364 (0.0523)		
SAMPDORIA	-0.206 (0.0594)			-0.174 (0.0600)								
TORINO			0.261 (0.0590)		0.153 (0.0426)	0.145 (0.0510)	0.327 (0.0639)	0.219 (0.0686)		0.443 (0.0542)	0.210 (0.0521)	
TRIESTINA	-0.273 (0.0987)			-0.274 (0.0823)								
UDINESE												
VERONA												
VICENZA												
$\overline{R}^2$	0.667	0.666	0.643	0.645	0.647	0.576	0.569	0.559	0.512	0.629	0.638	0.596
Standard error of regression	0.3708	0.3760	0.3711	0.3257	0.3296	0.3391	0.3276	0.3384	0.3519	0.3649	0.3650	0.3731
Akaike info criterion	0.925	0.938	0.922	0.666	0.675	0.732	0.664	0.723	0.786	0.832	0.879	0.923
Jarque-Bera prob.	0.005	0.013	0.008	0.067	0.058	0.001	0.000	0.000	0.000	0.000	0.000	0.000
White heteroskedasticity test	0.068	0.003	0.006	0.001	0.001	0.003	0.172	0.008	0.001	0.114	0.010	0.006

Mean of residuals = 0 prob.	0.952	0.789	0.901	0.963	0.852	0.855	0.893	0.901	0.993	0.940	0.892	0.937

Standard error in parenthesis
Significance level > 99%
**Newey-West HAC Standard Errors Correction*

TABLE C: OLS ESTIMATION
45 OBSERVATIONS

Dependent variables	LOG (*W1/W2*)					
Independent variables	1*	2*	3	4	5*	6*
LOG(*VA1*)	0.452 (0.1335)	0.361 (0.1296)	0.405 (0.1097)	0.413 (0.1012)	0.315 (0.0968)	0.316 (0.1005)
LOG(*VA2*)	-0.417 (0.1068)	-0.345 (0.1039)	-0.387 (0.0868)	-0.404 (0.0803)	-0.318 (0.0743)	-0.323 (0.0754)
JUVENTUS		0.609 (0.0561)	0.569 (0.1000)	0.532 (0.0931)	0.506 (0.0522)	0.461 (0.0625)
LAZIO			-0.304 (0.1015)	-0.355 (0.0951)	-0.371 (0.0828)	-0.422 (0.0797)
ROMA				-0.276 (0.0960)	-0.297 (0.0739)	-0.350 (0.0623)
SAMPDORIA					-0.307 (0.0687)	-0.343 (0.0780)
TORINO						-0.264 (0.0398)
$\overline{R}^2$	0.155	0.507	0.586	0.648	0.724	0.789
Standard error of regression	0.4207	0.3215	0.2947	0.2717	0.240	0.210
Akaike info criterion	1.150	0.633	0.479	0.336	0.110	-0.137
Jarque-Bera prob.	0.347	0.464	0.655	0.628	0.821	0.224
White heteroskedasticity test	0.451	0.314	0.811	0.903	0.248	0.016
Mean of residuals = 0 prob.	0.888	0.661	0.697	0.715	0.707	0.818

Standard error in parenthesis – Significance level > 99%
*Newey-West HAC Standard Errors correction