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European football: market potential and competition dynamics

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Abstract

The article discusses recent competitive dynamics of professional men professional football in Europe. Due to ongoing commercialisation process and institutional reforms reshaping the industry, combined with specific cultural and social role fulfilled by the discipline, numerous empirical analyses have shown that the hierarchy of the top teams have become more persistent over the decades. While dominance being arguably a natural outcome of professional sports due to its main aim, which is competing for wins, strong connection of the capacity of clubs to economic and demographic potential of cities and countries hosting them and asymmetric distribution of the development level of urban areas, it has been shown that European football is much less dynamically balanced than, for example, Northern American major leagues of team sports.

In the article, we employ dynamic panel modelling techniques and Elo ranking for European clubs, allowing for direct and dynamic comparison of their sport strength, to investigate interseason and within-league relations.

The results suggest that the dynamic relation is strong, supporting the thesis about existence of the self-reinforcing process of building level of teams. However, the support for identification of more complex intra-league relations is limited.

Keywords: football, sports economics, market potential, dynamic panel modelling

JEL Classification: C23, L83, Z21

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Introduction

The motivation for the described research stems from willingness to investigate dynamics of clubs' sport strength distribution in the professional European football.

As numerous authors have argued (e.g., Sass, 2014, Szymanski, 2015, Kuper, Szymanski, 2019) in as strongly commercialised sports discipline as the modern football is, 'success breeds success'. The reason for such a path dependence and persistence is both specific, long-run and exclusive relation between fans (as consumers) and teams (as sellers), and self-reinforcing circular relation between financial resources, sports strength and on-field success. For decades, since football became a service that could improve quality of leisure time of its viewers, a crucial determinant of clubs' capacity to compete for wins and championship was their market potential, first local, then national, and eventually global (Andreff & Staudohar, 2000). It is, therefore, coherent with the often found result that a GDP level of their country (or economic development of the hosting city) is the single most important driver of sports level of various teams and clubs in sports (e.g., Kuper, Szymanski, 2019). In the latter, modern and globalised model, top clubs compete for fans at the early stage of them shaping their preferences, and, with a subconscious willingness of fans to 'bask in reflected glory' (Kuper & Szymanski, 2019), teams currently competing for the top trophies are well positioned to build a global fanbase. In this sense, market potential of a sports club, can be perceived as not an exogenous, but endogenous, dynamically changing variable (Sass, 2014).

This supposed dynamic tendency for sport competition to diverge over time would constitute a process hindering so-called 'competitive balance'. The latter has been considered as a vital trait of sports markets by both academics and practitioners. It is understood as a capacity of as many teams (or players, in individual sports) from a given league (or any other format of competition) as possible to compete over single or series games, or, in the dynamic version, years or decades (Szymanski, 2015). Related to the concept of uncertainty of outcome, perceived as necessary condition for sports to be interesting for viewers (see, e.g., Groot, 2008), competitive balance is assumed to be a desired characteristic not only due to fairness or equity considerations, but due to business considerations. Therefore, the concept has been used by sport authorities a rationale for introduction of numerous regulations, from the restrictions on mobility of players to limitation of clubs regarding their expenditures. Interestingly, as academic analyses have often shown, the outcomes of these interventions have

often been opposite (see, e.g., Rottenberg, 2000). In particular, in case of European football, introduction of UEFA Financial Fair Play regulations at the start of 2010s that have formally tied capacity to spend by clubs on their senior men teams with their revenue, was criticized for hampering dynamic competitive balance in European football, and leading to a state, in which it is more and more difficult for non-elite clubs to became ones (Peeters & Szymanski, 2014).

Theoretical background[1]

The most fundamental observation about modern European football is that the sport level of competing teams is foremostly driven by the market potential of the clubs. Andreff and Staudohar (2000) argue that this was true for even for the pre-TV era, when the entities were mostly associations and sources of funding were mostly confined to a close surrounding. As they describe it, the 'Spectators-Subsidies-Sponsors-Local' model, depended on local fans willingness to purchase tickets to watch games, as well as financial support both from businessmen and local governments. Irrespectively whether the motivation was driven by image considerations or affinity for the club of the significant financial contributor, the potential to receive such funds was positively related with the number of supporters of the clubs. Politicians could benefit more in the election process if they supported popular teams and budget capacities were greater in more populated and economically developed areas. Moreover, effectiveness of promotional effort for businessmen sponsoring increased with the fanbase size, and, if the latter was greater, the chances that one of the fans would become a wealthy benefactor grew as well. Szymanski (2015) provides numerous examples from the relatively early history of football to show that importance of such events was evident even at the early stage of commercialisation of football.

Therefore, the local market potential (e.g., defined by the city in which the club is based) was crucial for the rise of football clubs even at the start of the twentieth century. Operationally, it depended on population size, income of households (therefore, level of economic development) and interest in football as a sports discipline. Kuper and Szymanski (2019), and Szymanski (2015) argue that these three factors explain major part of variability in development of professional football even in the modern

[1] An early, partially overlapping version of the literature review constituting theoretical background of this article, written in Polish, has been included in the report which was commissioned by the football club Hutnik Warsaw and currently has a limited availability (Lubasiński & Skrok, 2021).

times. It is straightforward to show, for example, that the country's GDP explains close to two thirds of variability of national leagues' strength, as measured by UEFA Club Rankings, which are based on the outcomes of matches in the European club competitions (see, e.g., Lubasiński & Skrok, 2025).

At the country level, when we restrict our perspective to Europe, the discrepancies in terms of affinity for football are less substantial, but over the decades they have played a role in determining in which cities hosted the best teams. As Kuper and Szymanski (2019) argue, clubs from the capital cities of democratic countries were usually dominated by the ones from slightly smaller metropolitan areas. For example, in England, Liverpool and Manchester clubs were more successful than London ones, in Italy, the ones from Turin and Milan won more trophies than the ones from Rome, while the teams from Paris struggled for decades (see also Ranc, 2009). The reason for this was a more varied offer of leisure and cultural activities, once again proving that market processes have been crucial determinant of hierarchy of power in the European football for decades.

On the other hand, as Kuper and Szymanski (2019) argue, the strongest clubs emerged in rapidly industrialising cities, mining areas and ports – key points in the developing network of global trade. Amsterdam, Hamburg, Liverpool, Lyon, Marseille, Milan, Manchester, Munich, Ruhr area and Turin are all examples of such cities. In this sense, football has shown its other side – as a source of cultural and social values. It is consistent with discussions on the discipline's role in fostering local, regional, national, political and even continental identity (e.g., Hadas, 2000; Burdsey & Chappell, 2001; Phelps, 2005; Foot, 2007; Antonowicz & Wrzesiński, 2009; Storey, 2021; Biel et al., 2023; Biel et al. 2024). In some cases, direct links of a club to a specific, strong identity has arguably facilitated development, with the most important example being FC Barcelona and Catalonia (Ranachan, 2008). In the context of reason behind emergence of European hierarchy of football clubs in the twentieth century, the key observation made by Kuper and Szymanski (2019) is that identifying with new local football teams helped migrating workers and their descendants to create social rootedness in new environments.

One of the characteristics of the sports industry, resulting from a coexistence of specific traits of the production (low marginal cost of viewers and capacity limits), distribution (excludability from consumption) and consumption (vertical differentiation of product, non-rivalrousness in consumption) processes of a sport spectacle is the so-called superstar effect (Rosen, 1981). In line with it, even small differences in quality of the product result in substantial volume of sales and, therefore, revenue. As a result, as Szymanski (2015) argues, inequalities amounting to dominance of a few teams are

a 'natural' state of football market. Even relatively minor differences in market potential might result in fundamentally different position of football clubs in the hierarchy.

With imbalance being an expected state of sport competition, managing them using appropriate means gains importance. The fundamental role played by competitive balance – limited discrepancies in strength in a given competition – has long been a consensus in the sports economics literature (see, e.g., Rottenberg, 2000). With each sport spectacle being a joint product of competing teams and suspense, or uncertainty regarding the final outcome, being a desired trait of the match, avoidance of unequal competition can be perceived as paramount. By extension, whole competitions, organised either in the league or tournament format, are supposed to be of lower quality if they become too imbalanced. While defining an universal, optimal level of competitive balance might be practically impossible (Szymanski, 2007; Vrooman, 2013; Pawlowski & Nalbantis, 2019) and empirical results on its correlation with attendance are mixed (Buraimo & Simmons, 2015), numerous interventions have been invented with improvements in this dimension in mind.

While in the Northern American major leagues improvement of competitive balance has been aimed by complex systems of regulations, such as drafts, revenue sharing schemes, luxury taxes and salary caps (e.g., Vrooman, 2013), European leagues, including football ones have traditionally been less regulated. Their essential characteristic, distinguishing them from their counterparts from across the Atlantic, has been an open, hierarchical structure. At each national level, competition is organised in a system of tiered leagues, with the worst-performing clubs in a given season being relegated and the best-performing ones promoted. As Pomfret (2016) has noted, the setup emerged in England in the nineteenth century in response to intense rivalry between two newly codified sport disciplines, football and rugby, with numerous clubs being founded which, in turn, necessitated creating framework for them to compete in an ordered and sustainable fashion (e.g., needing a limited number of teams competing with each other, predictable schedule and manageable journeys to away matches). Most likely unintentionally, this created a system of theoretically equal opportunities, in which each club could potentially, gradually and organically, follow the path of promotions from the lowest tiers of competition to the top one (Szymanski, 2015).

Empirically, however, European football leagues have been significantly less dynamically balanced than the Northern American ones, which meant that a relatively small group of the same clubs competed for the top positions in the league table over years and decades (Buzzacchi, Szymanski & Valletti, 2003). The reason for it, apart from the mentioned system of regulations functioning in MLB, NBA, NFL, and NHL, is the

combination of hierarchical structure, cruciality of the market potential and the superstar effect taking place at the interleague level. Namely, top teams from each season in the national league are rewarded with a right to play in European club competitions organised by the continental association UEFA, in the following season next to further matches in the domestic league. Especially the top one of these, UEFA Champions League, bringing together the best and most popular clubs in Europe, has a significant market value and has been suggested as the key contributing factor to a general decrease of competitive balance in the Europe football over the last three decades (Pawlowski, Breuer & Hovemann, 2010; Ramchadani et al., 2018; Avila-Cano & Triguero-Ruiz, 2023). This was further reinforced due to introduction of the UEFA Financial Fair Play regulations in 2011 and the analogic national regulations at the national level in the following years. By limiting costs in relation to revenue, the rules further 'petrified' hierarchy in the European football, by making it much more difficult for clubs with a lower market potential to cover the costs of improving their teams using external funds (Peeters & Szymanski, 2014; Ramchadani et al. 2023). On the other hand, relegation, or even the prospect of it, in the national league systems exacerbates further the distance between the top and even mid-ranked teams. This is due to the significant drops in market potential of each lower tier, which results from lower quality of opponents and importance of the competition, but in modern football is also directly reflected in lower value of the broadcasting rights (Dietl et al., 2015, Lubasiński & Skrok, 2021).

The creation and then wide adoption of a new distribution channel, broadcasting, has had a profound effect on professional sports in general. In particular, co-emergence of premium TV and watching football as a leisure activity followed technological and legal changes that made it possible to broadcast numerous matches at the same time. As Clegg and Robinson (2018) show, this process has directly led to professionalisation and restructuring of European football, e.g., through emergence of companies managing top league competitions (like the Premier League) independently from national football associations (like the FA in England). Not only has it increased the revenue potential of clubs and competitions by opening sport spectacles to new audiences, but it has also changed the market structures. From the local monopolies or, in some cases, duopolies, the clubs began competing not only on the field or for talented players, but also for attention of fans, even on the global scale. Andreff and Staudohar (2000) have defined this stage as 'Media-Corporations-Merchandising-Markets', further reflecting increasing professionalisation of management, transformation of numerous clubs from associations to companies and deregulation (including consequences of the so-called Bosman ruling, which facilitated

mobility of players between clubs and countries, as well as limitation of possibilities to subsidise professional clubs using public funds). With the Rosen's (1981) effect strengthened due to a greater access to spectacles performed by the very best teams, financial inequalities between clubs and leagues, both between tiers of the national systems and internationally, were strengthened, which, in turn, reduced competitive balance and elevated political impact of the most successful European clubs. This, in turn, led to further reforms of the Champions League, allowing the revenues to diverge even further (Szymanski, 2015; Doidge, Nuhrat & Kossakowski, 2025).

The shift towards the MCMM model has also been reinforced by a transformation along the social dimension. Football, once a pastime of working class in most of the countries, became a leisure time activity for middle classes. As Kuper and Szymanski (2019) notice, capital cities of democratic and capitalistic countries, with their economic dominance and London and Paris being the prime examples, joined post-industrial powerhouses in the top echelons of European football. This was often accelerated by takeovers, often conducted by wealthy, individuals from different countries, made possible due to liberalisation of ownership rules (Franck, 2010) and stimulated by increased global visibility of the discipline. By covering operational losses, so-called 'sugar daddies' facilitated transition of perennial mid-table clubs, or even the lower-tier ones, to member of national and European elites. With their groundbreaking impact on the transfer market, wage levels and structure of competition, they most likely have played a substantial role in motivating football governing bodies to introduce regulations like the UEFA Financial Fair Play, even if such declarations have been avoided in public (Franck & Lang, 2014).

The shift to the new business model of the European football has also further emphasised that the market potential could be perceived as consisting of two key sets of factors. The first, demographic and economic characteristic of the hosting city, as explained above, became magnified due to increasing role of commercial aspects. The second, resulting from the specific nature of fandom and socio-cultural role of professional sports, means that in football a strong path dependence is visible. Both market changes and institutional reforms, such as the Bosman rulling and the UEFA Financial Fair Play, have reinforced this process through compound reproductive mechanisms, leading to a state of 'oligopolisation' of the elite European football clubs (Boeri & Severgnini, 2014; Barsch, 2015; Kaplan, 2015).

Furthermore, an interesting interplay between the two sets of factors can be identified. The most successful clubs of the twentieth century remain dominating powers (Szymanski, 2015), as long as the size of their city is big enough. As Kuper and Szymanski

(2019) point out, if the local markets were too small, past successes might turn insufficient, with the examples being AS Saint-Étienne who between 1964 and 1976 won the French championship eight times, and Borussia Mönchengladbach, who were the champions of West Germany five times between 1970 and 1977. Nevertheless, with the best clubs now mostly located in big or very big European cities, the dynamic competitive balance, reflected in changing hierarchy season-to-season has in general diminished in European football since the start of 1990s, coinciding with gain in relevance of broadcasting, professionalisation of leagues, creation and further reforms of the UEFA Champions League, the Bosman ruling and further reforms of the transfer market, and, later on, UEFA Financial Fair Play and its equivalents at the national levels (Buzzacchi, Szymanski & Valletti, 2003; Pawlowski, Breuer and Hovemann, 2010; Vrooman, 2013; Sass, 2014; Ramchadani et al., 2018; Avila-Cano, Triguero-Ruiz, 2023).

Szymanski (2015) and Kuper and Szymanski (2019) discuss that a further interesting example of a path dependence is the case of Real Madrid (and, to a lesser extent, Lisbon clubs). Seemingly the exception to the rule that the capital city clubs did not succeed in the twentieth century, the domination of the *Los Blancos* at the European level started when Spain was not a democratic country. Especially when coupled with non-market economy systems, market and demographic potential was often irrelevant in such institutional setups. As analysis of sports in general shows, autocratic or dictatorial regimes (or centrally managed economies) often willing and capable to concentrate resources and effort for the propagandist potential of this element of modern economic and social life (Tcha & Pershin, 2003; Tcha, 2004).

Data & Methodology

The dataset used for the analysis has been constructed using, foremostly, the European Football Club Elo Ranking by Schiefler (2025). This publicly available dataset has been based on an algorithm allowing for calculation of strength of competing rivals in dual competitions. It has been proposed by Arpad Elo (1978) for rating chess players, as it has been used by the International Chess Federation since 1970 (Elo, 1978; FIDE, 2025). It allows for comparisons of level in unbalanced competitions, by using information about opponents' ranking and outcomes to update measure's value after each game. Elo ranking has since been adopted by sport analysts and academics to use for evaluation of competitors in different sports disciplines and competitions and extended to reflect their specificity (e.g., Kovalchik, 2020).

Elo rankings have been also used for football analysis. For example, Hvattum and Arntzen (2010) have shown that, while not being the best among the tested, they have performed relatively well in terms of predicting games results when used with nonlinear regressions. Gásquez and Royuela (2016) have ELO ratings in a Blundell and Bond's dynamic panel model explaining strength of men's national teams.

To investigate the dynamic of competition in men's European football at the club level, a similar setup to Gásquez and Royuela's has been used, in particular, both the Arellano and Bond (1991) estimation approach, based on instrumenting differenced equations with lagged levels, as well as Blundell and Bond (1998) one, which uses first differences as instruments for levels in equations. In particular, the following specification has been estimated:[2]

$$Elo_{t,i} = \boldsymbol{\beta_1} Elo_{t-1,i} + \boldsymbol{\beta_2} f\left(Elo_{t-1,l(i)}\right) + \boldsymbol{\beta_3}\text{level}_{\text{t-1,i}} + \boldsymbol{\beta_4}\text{level}_{\text{t-2,i}} + \boldsymbol{\beta_5} \cdot \text{level}_{\text{t-1,i}} \times Elo_{t-1,i} + \boldsymbol{\beta_6} \cdot \text{level}_{\text{t-1,i}} \times f\left(Elo_{t-1,l(i)}\right) + \boldsymbol{\beta_7} \cdot \ln(\text{GDP})_{\text{t,l(i)}} + \epsilon_{t,i}$$

With t standing for seasons, i for clubs, l(i) for particular leagues (and countries), f(Elo) being moments (in the final specification, coefficient of variation, CV – defined as standard deviation divided by mean – and maximum value have been used) of the measure's values distribution for a given league, and level being denoted by a set of binary variables grouping separately top 4 teams from a given league and season, teams ranked between 5 and 8, teams ranked below 12th place and teams playing in a second tier national league. The latter were included to account, inter , for qualification to the European competitions – UEFA Champions League (for the top leagues the top four teams), UEFA Cup / UEFA Europe League and, in later seasons, UEFA Conference League (in general, apart from qualifying through national cup competitions, teams ranked below those advancing to the most prestigious Champions League have played in those in the following season). The interaction of this set of dummies for a previous season with lagged Elo value and moments of its distribution in the league have been included to test for dynamic independencies between competitive balance in a league and capacity of teams to improve their quality over time. In general, the chosen set of variables was constructed to test whether competitive imbalance (substantial variation or dispersion of strength within a sports competition) has a dynamically self-reinforcing nature.

[2] To avoid the issue of weak instruments and following Roodman (2009), number of internal instruments has been limited to two lags, with a collapse option used. Furthermore, options twoway and robust have been used.

To control for changes in economic conditions, relevant for market potential of clubs, data on GDP at market prices measure in a common currency reflecting start of a season has been used. It was preferred to GDP per capita, since, as numerous analysis show, scale of the market has a great significance for development of sport leagues (see, e.g., Lubasiński & Skrok, 2025). For majority of countries in sample, World Bank (2025) data have been used. To calculate GDP for England and Scotland from UK data, ratios based on the ONS data (2025b) have been used. Furthermore, in the alternative specifications, data on population size of regions was used. For UK, data from ONS (2025a) has been used, while for the other countries Eurostat (2025).

For the analysis, ELO values from the last day July for years 2001-2025 was used, which meant a moment between two seasons for most of the European leagues (with the exception of season 2019/2020, when European cup games were played in August 2020 due to the lockdown in Spring 2020). Only the clubs that have been included in the whole analysed period have been included in the analysis, which meant the sample consisted of 140 European clubs that could be seen as consistently top over the period of 25 seasons. The clubs were located in 26 countries.

R has been used for data preparation (R Core Team, 2023), while Stata 19.5/Now has been used for econometric analysis (StataCorp, 2025) with package xtabond2 (Roodman, 2003).

Table 1. Descriptive Statistics for continous variables

Variable	Mean	Median	SD	Min	Max
Elo rating	1613.55	1620.64	162.23	1136.14	2089.27
log (GDP) *(=log(100) for UE)*	1.75	2.19	1.34	-1.45	3.24
log (regional population)	13.52	13.40	1.01	11.39	16.58
CV of Elo	.060	.056	.020	.024	.133
Top Elo	1789.60	1825.88	173.18	1317.40	2089.27

Source: Own elaboration.

Table 2. Descriptive Statistics – distribution over league levels

Variable	Fraction
Top 4	.455
Ranks 5-8	.208

Variable	Fraction
Ranks 9-12	.119
Ranks below 12	.110
Second tier	.109

Source: Own elaboration.

As table 2 shows, within the sample used for analysis, the clubs that were included in the sample have been overrepresented in the top 4 cluster, confirming the persistence of hierarchy of power at top echelons of European football (i.e., clubs that often finished the season in one of the top four positions in the national league top competition, were less often relegated over more than two decades than other clubs, including those that were rather ranked at positions 5-8, which, in turn were less often relegated than those that were often ranked at lower positions, not necessarily directly leading to a relegation).

Results

Table 3 presents the results of the baseline estimation. Four specifications have been reported – without (1 and 2) and with interactions (3 and 4), and estimated using only differentiated equations, in the classical Arellano-Bond style (1 and 3), as well as the Blundell and Bond (or "system GMM") one (2 and 4).

In general, the results suggest, unsurprisingly, a strong a definite dynamic relation between ELO values for sequential seasons. Since the measure itself is based on historic results, it could be perceived as a tautology. Nevertheless, this result is also achieved for the specifications based on differences, implying that, in line with expectations, 'success has bred success' in European football over the last two and a half decade. Furthermore, clubs competing in lower leagues have very limited opportunities to improve ratings over the following seasons.

For specifications without interactions there is no significant impact of past inequality (measured by CV) or dominance (or quality) of one top team (measured by the maximum ELO), which would suggest that there are no visible self-reinforcing (or self-weakening) processes of competitive imbalance.

Nevertheless, specifications with interactions reveal further interesting dependences. Autoregression is significantly stronger for the middle-ranked clubs than both higher and substantially lower ranked ones. This might suggest that over time clubs usu-

ally converge either to the top echelons of league tables (which often means qualifying to European competitions and, therefore, increasing their revenue potential substantially), or to lower tiers of the national league systems. To some extent, this result, again, reflects the nature of the Elo rating in combination with the league system – higher ranked teams, by definition, play more games with lower-valued teams, therefore reducing the capacity to further increase their rating. But, on the other hand, competing in UEFA competition might expose them to teams of substantially varying ratings, though in a relatively low number of games. Similarly, relegated teams lack access (apart from rare matches in the national cups) to competition with highly evaluated teams, once again limiting possibilities to improve theirs Elo rating substantially.

Furthermore, for specifications with interactions, a varied relation with CV and the top rating is revealed. It is, once again, the middle-ranked clubs that seem to be affected by both. In particular, greater variability of ratings in the league seems to positively influence path of growth of such clubs, while dominance of the top team negatively. Together, it might suggest that middle-ranked clubs dynamically benefit from their own advantage over weaker clubs. No such effects are observable for any other groups of clubs, with interactions brining the total effects of analysed distribution measures close to zero. If anything, second tier seem to benefit from stronger top club in the national system.

Somewhat surprisingly, there is no significant impact of GDP for the differential specifications. The 'system' frameworks, however, reveal very strong positive relation between level of football clubs and GDP level of their countries. Together, these results suggest that while market potential of a given league is crucial, the impact is not instantaneous, but rather long-term.

Table 3. Estimation results for a full samplE (2000/2001-2024/2025)

	(1)	(2)	(3)	(4)
ELO (last season)	0.701***	0.697***	1.134***	0.979***
	(0.07)	(0.05)	(0.24)	(0.14)
Second tier (last season)	-21.426.	-32.460***	124.978	-100.833
	(10.03)	(7.61)	(249.60)	(180.70)
Ranks below 12 (last season)	10.277.	8.669.	181.608	29.955
	(6.24)	(5.15)	(151.84)	(109.76)
Ranks 5-8 (last season)	-2.896	-0.074	213.830	47.801

	(1)	(2)	(3)	(4)
	(6.02)	(5.12)	(153.23)	(64.94)
Top4 (last season)	-4.749	0.797	252.814	54.907
	(8.80)	(7.13)	(180.31)	(77.85)
Second tier (2 seasons ago)	7.193	4.278	4.674	0.814
	(7.35)	(6.97)	(6.86)	(6.94)
Ranks below 12 (2 seasons ago)	4.697	3.183	3.892	4.355
	(4.98)	(4.85)	(4.96)	(5.03)
Ranks 5-8 (2 seasons ago)	5.276	3.103	4.565	3.968
	(4.73)	(4.92)	(4.50)	(4.95)
Top4 (2 seasons ago)	6.093	5.666	4.925	6.576
	(5.95)	(5.40)	(5.45)	(5.89)
Top (last season)	0.086	0.005	-0.219	-0.244.
	(0.12)	(0.04)	(0.15)	(0.11)
CV (last season)	-203.693	-79.039	1656.826.	1199.436.
	(568.96)	(238.03)	(962.66)	(568.44)
log GDP	-15.818	21.784***	-14.273	23.516***
	(52.14)	(6.59)	(48.49)	(5.76)
Second tier x ELO (last season)			-0.515.	-0.286.
			(0.22)	(0.13)
Ranks below 12x ELO (last season)			-0.321	-0.105
			(0.21)	(0.15)
Ranks 5-8 x ELO (last season)			-0.448.	-0.297.
			(0.21)	(0.14)
Top4 x ELO (last season)			-0.444.	-0.279.
			(0.22)	(0.14)
Second tier x top (least season)			0.417.	0.320.
			(0.19)	(0.13)
Ranks below 12x top (least season)			0.232	0.104
			(0.15)	(0.12)
Ranks 5-8 x top (least season)			0.321.	0.267.
			(0.15)	(0.12)
Top4 x top (last season)			0.296.	0.250.
			(0.14)	(0.12)
Second tier x CV(last season)			-1861.176	-1469.361

	(1)	(2)	(3)	(4)
			(1287.70)	(893.47)
Ranks below 12x CV (least season)			-1492.050	-695.816
			(933.26)	(625.27)
Ranks 5-8 x CV(least season)			-1792.198.	-1168.602.
			(934.14)	(530.55)
Top4 x CV (last season)			-1935.440.	-1223.376.
			(992.44)	(578.88)
Constant		446.127***		379.885***
		(55.52)		(78.81)
Wald test	208.47***	1717.69***	383.99***	2185.17***
Obs.	3220	3360	3220	3360
Nr of instruments	19	31	43	67
AR(1)	0.00	0.00	0.00	0.00
AR(2)	0.49	0.57	0.38	0.42
Sargan p-val	0.28	0.12	0.66	0.30
Hansen p-val	0.27	0.24	0.57	0.46

. p<0.10, * p<0.01, ** p<0.005, *** p<0.001.

Teams ranked 9-12 has been set as a benchmark.

Source: Own elaboration.

Alternatively, the analysis was also conducted for a shortened sample, covering seasons from 2014/15 (which, essentially, means that only the period during which the UEFA Financial Fair Play regulations were fully implemented are covered) with additional explanatory variable describing population size of the region, measured at NUTS-3 level for countries covered by the Eurostat database and ITL 3 level for the UK. In this sample, 229 clubs and 9 seasons were included, with early observations on population size missing for the Serbian clubs. Since the approach to defining statistical areas varies strongly between countries, the Blundell and Bond specifications were not reported, with a focus put on Arellano-Bond estimations. Models (1) and (3) do not include additional variable, but the estimation has been conducted on a shortened sample and a different set of clubs than for the results reported in Table 3.

Several minor differences might be observed. Firstly, autoregression process seems to have less varied strength for particular groups of clubs, as revealed by specifications 3 and 4. Furthermore, autoregression coefficient seems to be lower than for the original sample, to some extent contrary to expectations with respect to inclusion of only the seasons covered by the FFP regulations. On the other hand, the set of

clubs covered was significantly broader due to the inclusion of 'newcomers' to the Elo ranking. This result seems to confirm that for such clubs, joining the broad group of top European clubs, it was more difficult to remain consistency across seasons.

One result that is consistent with the thesis about increasing difficulty of joining the narrow elite of clubs is the statistically significant and positive coefficient of the second-order lag of the Top 4 binary variable. It means that teams finishing in one of the top positions in the national competitions (which, for the top leagues meant qualification for the UEFA Champions League) on average improved more two seasons later. On the other hand, first-order lag of the same variable is either insignificant or even negative. This might be interpreted as a difficulty in managing the teams and being able to sustain the success after a one-off qualification, often discussed for some lower ranked Europan leagues (Zachodny, 2024).

Lastly, relation between Elo ranking and population size of the region was positive and statistically significant, in line with expectations. It suggests that regions that have growing in the demographic dimension were the ones for which level of football clubs was improving as well. It provides a further argument for the crucial role played by market and social environment for development of the discipline. In particular, point estimates of the coefficients imply that an increase of the regional population size by 1 percent meant an increase of Elo rating of the club by 1.6-1.8 (depending of specification) standard deviations of the measure.

Table 4. Estimation results for a shortened samplE (2014/2015-2024/2025) and population SIZE of REGION as an additional explanatory variable

	(1)	(2)	(3)	(4)
ELO (last season)	0.538***	0.447***	0.620.	0.441.
	(0.14)	(0.13)	(0.27)	(0.26)
Second tier (last season)	-43.834**	-50.569***	-132.151	-337.898
	(13.89)	(14.09)	(284.57)	(270.05)
Ranks below 12 (last season)	-7.006	-10.075	129.663	85.320
	(9.13)	(9.19)	(145.30)	(138.89)
Ranks 5-8 (last season)	-3.403	-2.787	-44.140	-107.660
	(7.41)	(7.32)	(123.14)	(114.36)

	(1)	(2)	(3)	(4)
Top4 (last season)	0.818	5.337	-138.572	-247.910.
	(11.63)	(11.50)	(151.76)	(142.49)
Second tier (2 seasons ago)	0.972	-1.004	4.812	3.572
	(8.50)	(8.22)	(9.76)	(9.75)
Ranks below 12 (2 seasons ago)	3.976	4.555	5.499	5.484
	(5.80)	(5.71)	(6.25)	(6.31)
Ranks 5-8 (2 seasons ago)	8.161	8.271	7.249	10.077.
	(5.85)	(5.58)	(5.67)	(5.97)
Top4 (2 seasons ago)	15.544.	17.177.	16.484.	21.287**
	(8.10)	(7.77)	(7.33)	(7.47)
Top (last season)	-0.195	-0.287.	-0.275	-0.279
	(0.12)	(0.11)	(0.17)	(0.18)
CV (last season)	1744.592.	1657.522.	1459.134	1076.606
	(825.30)	(692.80)	(1140.78)	(1124.50)
log GDP	-154.052.	-151.160.	-158.048.	-170.630*
	(60.78)	(60.02)	(64.47)	(62.89)
log population size of region		258.898.		292.916*
		(107.70)		(110.51)
Second tier x ELO (last season)			0.107	0.286
			(0.27)	(0.26)
Ranks below 12x ELO (last season)			-0.174	-0.012
			(0.24)	(0.24)
Ranks 5-8 x ELO (last season)			-0.199	-0.087
			(0.25)	(0.24)
Top4 x ELO (last season)			-0.117	0.051
			(0.26)	(0.25)

	(1)	(2)	(3)	(4)
Second tier x top (least season)			-0.045	-0.113
			(0.21)	(0.21)
Ranks below 12x top (least season)			0.086	-0.061
			(0.19)	(0.19)
Ranks 5-8 x top (least season)			0.207	0.136
			(0.19)	(0.19)
Top4 x top (last season)			0.186	0.090
			(0.20)	(0.19)
Second tier x CV (last season)			386.666	1038.900
			(1207.24)	(1206.60)
Ranks below 12 x CV (last season)			-397.923	671.032
			(1280.60)	(1239.74)
Ranks 5-8 x CV (last season)			-397.761	47.940
			(1087.84)	(1057.31)
Top4 x CV (last season)			-177.475	372.131
			(1162.31)	(1111.02)
Wald test	88.64***	82.54***	183.27***	169.06***
Obs.	2059	2030	2059	2030
Nr of instruments	19	20	43	44
AR(1) p-val	0.00***	0.00***	0.00***	0.00***
AR(2) p-val	0.33	0.45	0.34	0.45
Sargan p-val	0.64	0.72	0.44	0.58
Hansen p-val	0.73	0.81	0.25	0.27

. p<0.10, * p<0.01, ** p<0.005, *** p<0.001
Teams ranked 9-12 has been set as a benchmark.

Source: Own elaboration.

Conclusions and limitations

To conclude, presented study provides further evidence that strength of men's teams at the top echelons of European football is persistent over time. This is most visible for the teams consistently competing in the UEFA Champions League. There is, however, no clear and strong evidence suggesting that quality of the top teams dynamically shape level of their national leagues (either positively, through a trickle-down effect, or negatively, due to their multi-dimensional dominance). Similarly, competitive imbalance, measured by standard deviation of Elo ratings normalized by their mean, has only a limited dynamic influence.

The limitations of the study result from the nature of the dataset used, in particular, the way in which Elo rating is calculated, which is dynamic by its construction. To some extent, this is alleviated due to use of the Arellano Bond specification. Nevertheless, it would be worthwhile to replicate the study using alternative, static – for example, season-based – estimates of strength of European clubs.

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