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Club football and economic dynamism: a regional analysis for Europe

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Club football and economic dynamism: a regional analysis for Europe

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Abstract:

The connection between sports and development has long been highlighted in academia and policy debates. But the extent to which the success of professional sport teams can spur economic dynamism has hardly been studied in the literature. In this paper, we look at the potential connection between sporting success and economic development. We focus on club football and economic dynamism in European regions. To do so, we build a unique dataset with information for 395 football clubs, matched with economic information for 295 NUTS3 European regions, for the 2000-2020 period. Using several econometric techniques, we find robust evidence of a positive connection between club success and regional economic performance. This connection seems especially strong when sporting success comes from relatively modest clubs.

Keywords: sport; football; regions; Europe; development

JEL codes: O1, R1, Z2

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Introduction

Sport practice and entreteinment are widely considered as important factors for a better quality of life. Moreover, the connection between sports and development has long been highlighted by the United Nations, taking force in 2001 with the creation of the UN Office of Sport for Development and Peace (UNOSDP). In October 2010, the UN´s General Assembly recognised sport as an important tool to promote education, health, development and peace (resolution 65/4).

In Europe, in the last decades, the sports industry has accounted for around 3.7% of total GDP and 5.4% of total employment (Dimitrov et al. 2006). More recently, the European Sport Satellite Accounts suggested that sport accounts for between 3 and 3.7% of consumer expenditure, between 2.2 and 4.0% of gross value added, and between 2.0 and 5.8% of employment across countries (European Commission, 2011). In the EU, in 2018, the sport industry accounted for 2.12% of total GDP and 2.72% of employment (European Commission, 2018). Football, in particular, is the one, if not the most, important sport worldwide. Its importance is illustrated, for instance, by the FIFA World Cup audience. In 2012, the World Cup had over a billion television viewers worldwide (Hoffman et al., 2002b). In 2018, the World Cup held in Russia reached the 3.572 billion people in audience. Just the final was seen live by a combined 1.12 billion viewers worldwide.[3] Finally, the total attendance for the FIFA World Cup Qatar 2022 was 3.4 million spectators, with an average overall attendance capacity of 96.3%.[4]

In many European countries club-level football is also very popular. National football leagues move thousands of supporters to stadiums every week and millions to watch matches on TV, at home or in bars, being the match an opportunity to meet with friends. For many regions and cities, their football clubs are more than a team, being considered also a symbol or source of pride. For fans, there is a mental connection between club performance and city or region dynamism. Success in national or international competitions is understood also as a sign of regional success. But, to what extent is there a real statistical connection between football success and regional economic performance?

[3] https://digitalhub.fifa.com/m/31f1806ee5de0e32/original/kkiivoviltazeoild16x-pdf.pdf
[4] https://publications.fifa.com/en/annual-report-2022/tournaments-and-events/fifa-world-cup-quatar-2022/fifa-world-cup-qatar-2022-in-numbers/

In this paper, we aim at empirically exploring the potential connection between football success and economic performance at the regional level. To do so, we build a unique dataset with information for 395 football clubs, matched with economic information for 295 NUTS3 European regions, for the 2000-2020 period. Using this panel data, we provide, for the first time, and to the best of our knowledge, empirical evidence of the connection between football success and economic performance at the regional level.

Our resuts suggest a statistically significant association between club performance and regional dynamism, robust to different specifications, estimation techniques and sensitivity analyses. We show this connection looking at two measures of footbal success: the ELO rating and winning the national league. In both cases, we find especially strong results when success comes from relatively modest clubs. In this regard, we implement a simple *Difference-in-Difference* specification to show the impact on regional economic dynamics of "unexpectedly" winning the national league.

The remaining of the paper is structured as follows. Section 2 briefly reviews the literature on the connection between football success and economic dynamism and development. In section 3, we explain the data to be used. In section 4, we perform econometric analysis, show results, and discuss potential mechanisms for football success to spur regional economic performance. Finally, section 5 offers some conclusions.

2. Footbal and economic dynamism: theory and literature review

The theory

According to endogenous growth models, economic growth is driven by human capital accumulation and technical progress (Romer, 1986; Lucas, 1988; Rebelo, 1991; Barro, 1991). Sports, in general, and football, in particular, could therefore relate to economic growth if positively linked to human capital accumulation and technical progress, for instance by improving health (Blair and Brodney, 1999; Blair et al., 1989; Bouchard and Shephard, 1994; McAuley, 1994; Paffenbarger et al., 1986; Warburton et al., 2001a, 2001b, and 2006), education (Pfeifer and Corneliβen, 2010; Robst and Keil, 2000; Smith, 2009; Tucker, 2004; Long and Caudill, 1991; McCormick and Tinsley, 1987; Tucker and Amato, 1993; Mixon and Treviño, 2005; Anderson, 2001; Lipscomb, 2007) or productivity (Davis and End, 2010; Hirtz et al., 1992; Kavetsos and Szymanski,

2010; Kavetsos, 2012; Berument and Yucel, 2005; Oswald et al., 2009; Compte and Postlewaite, 2004; Wright and Staw, 1999; Royuela and Suriñach, 2013, and Amabile et al., 2005).

According to neoclassical models (Ramsey, 1928; Solow, 1956; Cass, 1965; Koopmans 1965; Barro, 1996), there are also reasons to expect that sporting success may fuel economic development. Sports serve a social function, comprises a series of assets and provide a number of intangible effects, all of which are good for development. These include greater integration, civil pride among a country's citizens, community spirit, self-confidence, international status, national prestige, a unifying element to civic life, nation building, and even a potential selfsatisfying factor (Süssmuth et al., 2010; Johnson and Whitehead, 2000; Johnson et al., 2001a and 2001b; Rappaport and Wilkerson, 2001; Maennig and du Plessis, 2007; Walton et al., 2008).[5]

Beyond direct economic impacts, sports also have a unique power to attract, mobilize and inspire, as regognised by the UN (2011). Sport is synonymous with human values such as respect, acceptance of rules, teamwork and equity, all of which are principles enshrined by the UN. Similarly, sports play a fundamental role in the promotion of social integration and economic development in different geographic, cultural and political contexts. For this reason, sports can be considered as a powerful tool to strengthen social networks, as well as to spread the ideals of peace, brotherhood, solidarity, non-violence, tolerance and justice. All of these factors have been recognized by the literature as key factors for economic development.

The evidence

The literature to date has already shown some evidence of the connection between football, and sport in general, and development. One strand in the economics literature has shown the close connection between economic success (measured by the Gross Domestic Product –GDP)[6] and sporting success. In this line, several studies have analysed success in football or at the Olympic Games as a consequence of GDP (Hoffman et al., 2002a and 2002b; Houston and Wilson, 2002; Jiang and Xu, 2005; Leeds and Leeds, 2009; Li et al., 2009;

[5] Other variables (control variables) are analysed simply through their influence on the steady-state position (Barro and Lee, 1994).

[6] Apart from per capita wealth, other variables can be considered important to account for differences in sporting success between countries. GDP per capita is not the only variable that explains sporting success, government involvement, for example, is argued to be a fundamental factor (Li et al., 2009).

Monks and Husch, 2009; Rathke and Woitek, 2008; Condon et al., 1999). These studies conclude that GDP may indeed have an influence on sporting success and argue that, as richer countries are able to allocate greater resources to promote sport, they are more likely to be successful. In this line, and taking a cross-country approach, Gazquez and Royuela (2018) show how the success of the nationl football team (using the international ELO ranking) can be an indicator of development.

Another strand of the literature has focused on how sport might influence development. In this line, some studies have compared differences in terms of GDP per capita (or employment) between regions or cities that have sports colleges, franchises or mega-events and those that do not (Baade, 1996; Baade et al., 2006; Baade et al., 2008; Barclay, 2009; Coates and Humphreys, 1999, 2003 and 2008; Lertwachara and Cochran, 2007; Matheson, 2006; Matheson and Baade, 2004 and 2006; Jasina and Rotthoff, 2008, Propheter, 2012; Coates, 2015; Islam, 2019; Agha and Rascher, 2021). Hagn and Maennig (2008 and 2009) focus on football. Other works look at case studies showing suggestive evidence of the important role of sports in economic performance (Kang and Pardue, 1994; Gelan, 2003; Hotchkiss et al., 2003; Mondello and Rishe, 2004; Carlino and Coulson, 2004; Bohlmann and Van Heerden, 2005; Tu, 2005; Jasmand and Maennig, 2008; Feng and Humphreys, 2008; Laband, 2009; Baumann et al., 2009; Rosentraub, 2009 and 2014; Nicolau, 2012; Cantor and Rosentraub, 2012; Bradbury, 2022). For club football in Europe, there is some suggestive evidence of the economic impact of success in specific regions, for instance looking at the impact of Leicester Premier League title in 2016.[7] However, to date in the literature, there is no systematic analysis of the economic impact of club football success. We aim to fill this gap.

To summarize, the literature to date has shown a positive connection between the level of development and sport, as well as the potential role of sporting success on economic dynamism. With this paper, we contribute to the literature by empirically analysing the connectiong between sporting success and economic dynamism, this time focusing on football at the club level and looking at NUTS3 European regions during the 2000-2020 period.

[7] See https://www.premierleague.com/news/143055

3. Football clubs and regions in Europe: building a comparable dataset

For economic development, we follow the literature and consider Gross Domestic Product (GDP) per capita at the NUTS3 level. As we focus on evolution over time, we also look at GDP per capita growth. Data comes from EUROSTAT.[8]

To consider football success, we rely on several variables and sources. We begin by relying on information provided by clubelo.com (http://clubelo.com/). In particular, we use the ELO rating system (see Appendix A for more in how the ELO rating is calculated). We focus on clubs for which data is available for at least 10 years between 2000 and 2020. This gives us 395 football clubs in our 295 European NUTS3 regions.[9] In some regions we find only one football club, while in others there is more than one. For our analysis, we either consider all 395 clubs, or, alternatively, restrict to the best ranked team in each region. As a complementary measure of success, we also collect information on winners of national leagues by country and year between 2000 and 2020.

Table 1 presents descriptive statistics. The mean ELO rating in our sample is 1418, with the minimum being 656 and the maximum 2086. Figure 1 maps the ELO rating (as an average of the 2018-2020 period) for the top club in each of the NUTS3 regions considered, while Table A.1 in Appendix shows the *top 10* clubs in our sample (in 2018). We find many regions with high ELO ranking clubs in Spain, France, Germany, Italy (see Figure 1). In terms of ranking, we find FC Barcelona, Juventus and Bayern München in the top 3 (see Table A.1).

[8] Data available in https://urban.jrc.ec.europa.eu/trends?lng=en&is=Default&ts=EU&tl=3&dtype=udpp&i=91&db=171&it=metadata&ctx=udp&d=23&cwt=line-chart

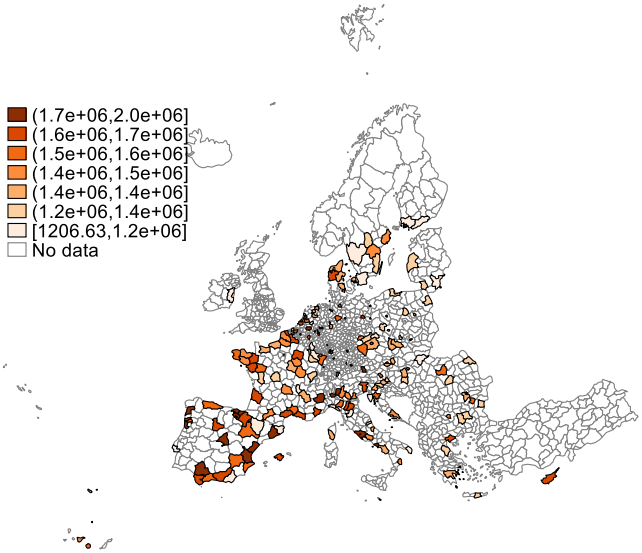
[9] Our data includes clubs (and regions) in Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Spain, Estonia, Finland, France, Germany, Greece, Hungary, Irland, Italy, Latvia, Lithuania, Luxemburg, Malta, Nederland, Poland, Portugal, Romania, Slovak Republic, Slovenia and Sweeden. In some regression we also test to the inclusion of clubs in the UK.

Table 1: Summary statistics

	Obs	Mean	Std Dev	Min	Max
ELO rating	13048	1418	203	656	2086
GDP per capita	6886	27003	13612	2600	166500
Economic growth	6491	3.09%	4.66%	-24%	43.74%

Note: Summary statistics for all 395 clubs and 285 regions for the 2000-2020 period.

Figure 1: ELO ranking, top club per NUTS3



Note: Map shows the level of ELO rating (as average of 2018-2020) for the top club in each NUTS3 with available data.

Regarding GDP per capita, the mean of our sample is 27003 euros, but with high variability among regions; the lowest region-year observation is 2600 euros while the highest is 166500. Similarly occurs when looking at economic growth, with a mean of 3.09% per year, but high variability across region-year observations.

4. Football club succes and regional dynamism: analysing European data

Football success and economic performance: bivariate associations

In this section, we use our unique dataset to empirically explore the connection between the success of (professional) football clubs and the economic

dynamism of their regions.[10] Figures 2.a and 2.b show the raw association between the club's ELO rating and the GDP per capita of its region: in Figure 2.a for all clubs while in Figure 2.b restricting to one club by region. As shown, there is a clear positive association between ELO rating and regional GDP per capita.

Figures 1.a and 1.b: Association between ELO and GDP pc

Figure 1.a: all clubs

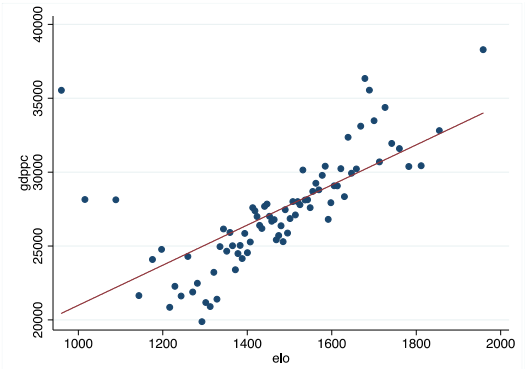
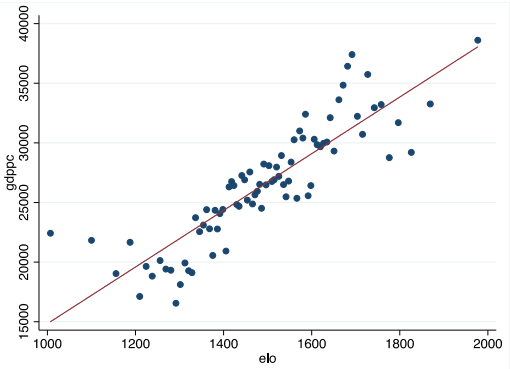


Figure 1.b: one club per region



Note: Binnscater using our panel data. Each dot is a "bin" representing 80 observations in our dataset.

In Figures 3.a and 3.b, we now look at the connection between ELO rating and economic growth (i.e., growth in the GDP per capita): in Figure 3.a for all clubs while in Figure 3.b restricting to one club by region. As in these figures we look at growth, we now control for regional as well as year fixed effects. Regional fixed effects control for time-invariant characteristics of regions, while year fixed effects control for year-specific shock affecting all regions. In this way, the associations rely only on changes over time. As it can be seen, there is also a positive association between increases in ELO rating and regional economic growth.

[10] Our aim in this chapter is purely exploratory. The identification of causal effects is left for further research.

4Figures 3.a and 3.b: Associations between ELO and eco growth

Figure 3.a: all clubs

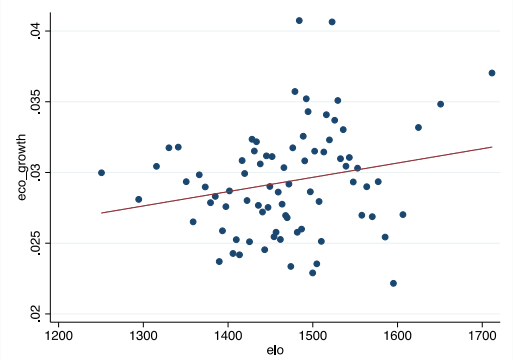
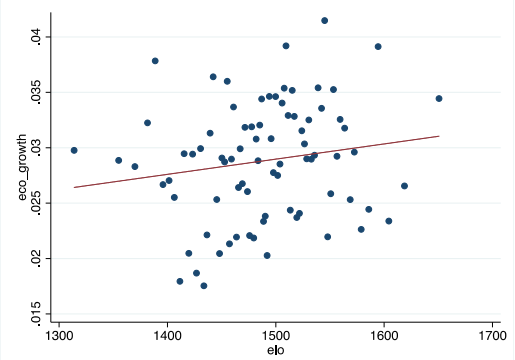


Figure 3.b: one club per region



Note: Binnscater using our panel data. Each dot is a "bin" representing 80 observations in our dataset. Both *binscatters* control for time-invariant region-specific characteristic (i.e., regional fixed effects) as well as annual shocks that are common across all cities (i.e., year fixed effects).

Football success and economic growth: regression analysis

To complement our empirical exploration, we perform regression analysis following a simple neoclassical economic growth model. We regress regional economic growth on the (preceding) success of football clubs in the region, and including initial GDP per capita (in logs) to control for conditional convergence (as standard in neoclassical growth models). This is specified in Equation (1):

$$GDPpcGrowth_{it} = \alpha_1 + \beta_1 GDPpc_{it-1} + \beta_2 Success_{it-1} + \gamma_t + \theta_i + \epsilon_{it} \quad (1)$$

For club football success, we consider either the ELO rating or national league titles. Results for the ELO rating are presented in Table 2. In column 1, we include regional fixed effects to control for time-invariant characteristics of regions, and year fixed effects to control for year-specific shock affecting all regions. In column 2, we replace regional fixed effects with club fixed effects, to control for time-invariant characteristics of clubs. In column 3, we aggregate over 3-year periods to reduce noise and consider longer dynamics between club performance and regional dynamism (as standard in the economic growth literature). Finaly, in columns 4 and 5, we consider only one club per region. Results show a consistent positive and significant coefficient for the ELO rating across all models. These results reinforce the idea of a positive association between club performance (as measured by the ELO rating) and regional dynamism (as measured by GDP per capita growth).

Table 2: ELO rating and economic growth, panel regressions

	(1)	(2)	(3)	(4)	(5)
Dep. variable:	Growth	Growth	Growth_3y	Growth	Growth_3y
ELO rating	0.0013*	0.0024**	0.0114***	0.0027**	0.0121***
	(0.0007)	(0.0011)	(0.004)	(0.0011)	(0.004)
GDP pc (in logs)	-10.594***	-10.734***	-32.416***	-11.169***	-33.701***
	(1.075)	(1.052)	(2.971)	(0.867)	(2.538)
Time Fixed Effects	YES	YES	YES	YES	YES
Regional Fixed Effects	YES	NO	NO	NO	NO
Club Fixed Effects	NO	YES	YES	YES	YES
Observations	5175	5175	3944	3849	2982

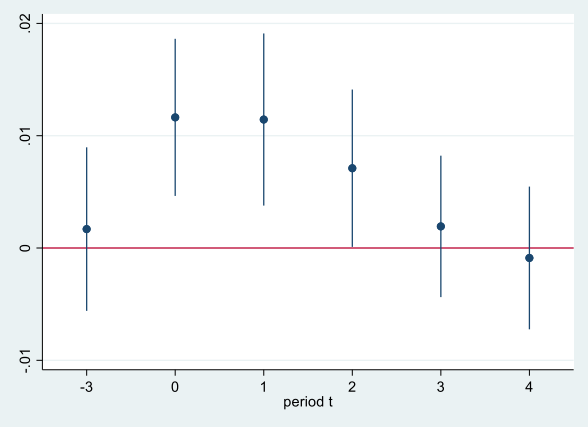
Note: Columns 1 to 3 estimated with all clubs, while columns 4 and 5 with one club per region only. GDP pc is measured at the beginning of the growth period. Standard errors, custer by region, in parentheses *** p<0.01, ** p<0.05, * p<0.1

Looking at the size of the coefficient for ELO rating, our results suggest that a standard-deviation-increase in the ELO rating (around 170 points) is associated with around 1.7-points increase in the rate of economic growth over the subsequent 3-year period. This is non-negligeable, as the average growth rate over 3-year periods in regions in our samle is 9%.

Dynamics

In Figure 4, we look at dynamics performing a simple event study, showing the association between football success and economic growth for different lags and leads of the ELO rating. We find a significant association up to 2 lags (of 3-year windows), suggesting a significant role of football success in the evolution of regional economic growth in the succeeding 3 to 6 years, vanishing afterwards. By contrast, as a simple placebo test, we look at the association between economic growth in any given 3-year window and changes in the ELO rating 2 periods ahead, finding no significant association, as expected.

Figure 4: ELO and economic growth, dynamics



Note: The figure shows the association between ELO rating and economic growth following specifications like those in Eq (1) in main text but playing with different lags (positive values in horizontal axis) and leads (negative ones) of the ElO rating.

Sensitivity analysis and robustness checks

In Tables B.1, B.2 and B.3 in Appendix B, we perform sensitivity analisis and some robustness checks. In columns 1 and 2 of Table B.1, we look, separately, at major leagues (France, Germany, Italy and Spain) vs. the rest of leagues. In coumns 3 and 4, we perform a similar excecise, this time looking separately at clubs with high vs low ELO rating. In all cases, we find a positive and significant association between ELO rating and economic growth. In other words, our results do not seem driven by particular leagues or groups of clubs. However, looking at the size of the coefficient, the association between ELO rating and growth seems signigicantly larger in the low-ELO group.

In columns 1 and 2 of Table B.2, we split between rich vs poor regions. In both cases we find a positive coefficient for the ELO rating, and of virtually the same magnitude. In columns 3 and 4, we test for the consistency of our results over time by considering, separately, the 2000-2010 and the 2010-2020 period. Once again, the coefficient for the ELO rating remains positive and significant. In column 5, we add clubs in the UK; main results also hold.[11]

[11] We merge data for 35 additional clubs in 22 UK regions. For these regions, we use GDP per capita data for Internal Territorial Levels (ITL) 2.

Finally, in Table B.3, we perform alternative specifications and estimation techniques. In column 1, we include region-specific time trends, while in column 2 we include club-specific time trends. These are very demanding specifications. In column 3, we estimate a simple dynamic model and in column 4 we implement System GMM estimation to (partially) address endogeneity concerns. In all cases our key coefficient remains positive and significant.

The impact of winning the national league: a Difference-in-Differences analysis

Results so far suggest at positive association between club football success, measured by the ELO rating, and economic dynamism at the regional level. But what about winning the national league? Does it spur regional economic growth? Using our panel of clubs and regions, we look at the impact of winning the national league on subsequent economic growth (over 3-year periods) and as specified in Equation (2):

$$Growth_{it} = \alpha_1 + \beta_1 GDPpc_{it} + \beta_2 ELO_{it-1} + \beta_3 Title_{it-1} + \gamma_t + \theta_i + \epsilon_{it} \quad (2)$$

Results are presented in Table 3 (for our main sample) and Table B.4 (including UK clubs), and suggest a positive and significant impact of winning the national league.[12] However, when splitting the sample between clubs with high vs low ELO rating (columns 2 and 3), the impact of winning the national league is only significant, and more than three times higher, in the subsample of clubs with relatively low ELO rating. In column 4, we look at all clubs and introduce an interaction term between League Title and a dummy for clubs with a relatively low ELO rating. We find a non-significant coefficient for high-ELO clubs but a highly significant one for low-ELO ones.

Results in Tables 3 and B.4 suggest that the impact of winning the national league on regional economic growth is especially important for relatively modest clubs (i.e., with a relatively low ELO rating). Moreover, in this group of low-ELO clubs, winning the league makes the coefficient for the ELO rating no longer significant. In our sample, these clubs are 3.5 times less likely to win the national league compared to those clubs with relatively high ELO rating. Hence, for modest clubs, winning the league represents a less frequent (in many cases unique) event. In this case, it is expected that winning the league will have a stronger impact on regional economic dynamics. As noted in Section 2, there is case-study evidence of the regional economic impact of modest clubs

[12] In our sample, we record 362 national league titles.

winning the national league. As an example, it is estimated that the Premier League title of Leicester in 2016 boosted the local economy by more than £140million, supported over 2,500 jobs, and generated over £78million in tax revenues.[13]

Table 3: National title and economic growth

Dep. variable:	(1) All Clubs Growth_3y	(2) High ELO Growth_3	(3) Low ELO Growth_3y	(4) All Clubs Growth_3y
GDP pc (in logs)	-31.99***	-32.14***	-36.95***	-32.03***
	(1.828)	(3.779)	(3.454)	(2.482)
ELO rating	0.004*	0.005*	0.005	0.004
	(0.002)	(0.003)	(0.004)	(0.003)
LeagueTitle	0.842*	0.414	1.614**	0.422
	(0.442)	(0.432)	(0.817)	(0.407)
LeagueTitle*ELO Low				3.017***
				(0.944)
Time Fixed Effects	YES	YES	YES	YES
Club Fixed Effects	YES	YES	YES	YES
Observations	4558	3141	1417	4558

Note: In all columns, LeagueTitle, GDP pc and ELO rating are measured at the begginig of the period. ELO low identifies whether a club is below the mean of ELO rating. Column 4 controls for ELO Low. Standard errors, custer by region, in parentheses *** p<0.01, ** p<0.05, * p<0.1

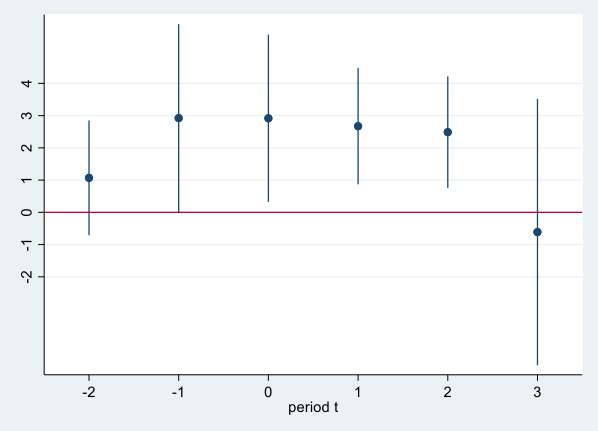
Buildng on the above, we explicitly test the impact of "unexpectedly" winning the national league by only looking at regions whose clubs didn't win the league between 2000 and 2005. Among this group of clubs, winning the league afterwards can be considered as a special event. This strategy allows us to implement a simple (staggered) *Difference-in-Difference* specification, in which we asses the impact of (unexpectedly) winning the league in any year after 2005 (39 cases in our sample), comparing relatively similar clubs (i.e., that had not won the league in the 2000-2005 period). Results are presented in Figure 5 (and Tables B.5 and B.6 in Appendix B). The figure shows not only the immediate impact of winning the league, but also the dynamics of this impact (performing a simple event study). We find a positive and significant impact of

[13] https://digitalhub.fifa.com/m/31f1806ee5de0e32/original/kkiivoviltazeoild16x-pdf.pdf

(unexpectedly) winning the league on subsequent regional economic growth. And the coefficient is significant for up to two lags of league title. As we measure economic growth in 3-year periods, this suggests an impact of up to 5 years, vanishing afterwards. Reassuring for identification, before winning the league, we also find no significant differences in economic growth between regions whose clubs *will* win the league and those whose clubs that *won't* (i.e., non-significant impact over 2-period leads of treatment).[14]

In terms of the magnitude of the impact, our coefficient suggests an average increase of between 2 and 3 points in the rate of economic growth over 3 years after winning the national league. This impact is non-negligeable and coincides with our results on the impact of winning the league among low-ELO clubs (column 4 of Table 3).

Figure 5: League Title and economic growth, event study



Note: The figure shows the association between winning the League Title and economic growth following specifications like those in Eq (2) in main text but playing with different lags (positive values in horizontal axis) and leads (negative ones) of the League Title.

Discussion of potential mechanisms

Our empirical analysis provides evidence of a clear connection between club football success, either measured by the ELO rating or by winning the national league, and regional economic dynamism in NUTS-3 European regions. And

[14] We also perform simple balance tests and find no significant differences in economic growth before 2005 between treated and controls regions (i.e., between regions with clubs that win the league post-2005 and those that do not).

this connection seems to be especially relevant in regions with modest clubs (i.e., relative low ELO or unexpected title winners).

Before concluding, we discuss potential mechanisms behind this connection. We do so by relying on theoretical insights from related works, as reviewed in Section 2. First, sporting success comes with money, for instance in the form of prizes. Winning the Premier League, for instance, comes with a check of around 150 million pounds. In Spain, winning "La Liga" can yield a prize of more than 60 million euros. Second, success also yields bonus from sponsors and can be expected to attract investments of all sorts. It is not uncommon that winning regions see their stadiums and related facilities renovated, spilling over to museums and retail. Third, and related, club success is likely to increase local consumption, for instance in bars or buying merchandise, and attract international visitors, boosting the touristic sector (including expenditure in hotels, restaurants, attractions and more). Fourth, the increase in investments and expenditure is with most probability likely to increase employment. Finally, beyond these tangible and direct impacts, there are also other more indirect and intangible effects that could also be important, including confidence, region relevance and publicity, pride and the contribution to social capital that sporting success creates.

There are multiple examples of the different impacts of winning the national league. Leicester victory in 2016, as already highlighted, is one of them. But others can be found elsewhere in Europe, like Valencia's La Liga title in 2004, Wolfsburg's Bundesliga title in 2009 and Gent's title of the Belgium league in 2015, just to mention a few. Being from secondary cities, and not usual champions, the victories of these clubs represented a unique event for their regions. In all these cases, we can see a temporary increase in regional dynamism after their title victories, as reflected in higher rates of economic growth in our data.

Using our panel dataset, in Table 4, we provide some empirical evidence of these mechanisms, based on data availability. In particular, we look at employment and investment. We find that winning the league title is positively associated with subsequent growth in employment and investment (significantly for the former and border-line significant for the latter – see columns 1 and 2). And once we control for employment and investment growth, the coefficient for the impact of the league title lowers in around 45% in magnitude (comparing column 3 with 5). This suggests that higher employment and investment may

explain part of the impact of winning the title on regional economic growth. But as the coefficient for the league title remains positive and significant, other mechanisms, as discussed, may also play a role.

Table 4: Ligue title and growth, potential mechanisms

Dep. variable:	(1) All Clubs Emp_growth	(2) All Clubs Inv_growth	(3) All Clubs Growth_3y	(4) All Clubs Growth_3y	(5) All Clubs Growth_3y
LeagueTitle	1.22*	3.930	3.421**	2.060**	1.946*
	(0.712)	(2.421)	(1.342)	(0.999)	(1.109)
Emp_growth				0.554***	0.406***
				(0.041)	(0.041)
Inv_growth					0.087***
					(0.012)
Time Fixed Effects	YES	YES	YES	YES	YES
Club Fixed Effects	YES	YES	YES	YES	YES
Observations	4502	4502	3526	3526	3526

Note: In all columns, right-hand-side variables are lagged. Column 1 controls for initial employment (in logs), column 2 controls for initial investment (in logs), and columns 3, 4 and 5 control for initial GDP pc (in logs). All columns control for ELO rating. Standard errors, clustered by region, in parentheses *** p<0.01, ** p<0.05, * p<0.1

5. Conclusions

In this paper, we have looked at the potential connection between sporting success and economic development. We have focused on club football performance and economic dynamism in European regions. To empirically explore the connection between football success and economic dynamism, we have built a unique dataset with information for 395 football clubs, matched with economic information for 295 NUTS-3 European regions.

Our resuts suggest a statistically significant association between club performance (as measured by the ELO rating and winning the national league) and regional dynamism (as measured by GDP per capita growth). Our results are robust to different specifications and estimation techniques and are not driven by a particular group of regions or clubs. However, we do find that the impact on regional economic dynamics of winning the national league is especially important in regions with relatively modest clubs (i.e., with relatively

low ELO rating or where winning the league is a rare event). This positive association between football club success and regional economic performance is, to the best of our knowledge, novel in the literature and provides evidence of the role of football in regional economic dynamics.

Our results reinforce the importance of sporting success, not only on its own, but also as a potential driver of economic performance, in line with insights from the literature and with important policy implications. We have shown empirical evidence for European clubs and regions over the first two decades of the 21st century. Further research, for instance for other world regions, levels of analysis or other sports, would be welcome to better understand the connection between sporting success and economic dynamism.

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Appendix A: additional information to Section 3 (Data)

The World Football Elo Rating System:

The World Football Elo Ratings are based on the Elo rating system, developed by Dr. Arpad Elo. This system is used by FIDE, the international chess federation, to rate chess players. In 1997, Bob Runyan adapted the Elo rating system to international football and posted the results on the Internet. He was also the first maintainer of the World Football Elo Ratings web site. The system was adapted to football by adding a weighting for the kind of match, an adjustment for the home team advantage, and an adjustment for goal difference in the match result.

The ratings are based on the following formulas:

$\mathbf{R_n = R_o + K \times (W - W_e)}$

$\mathbf{R_n}$ is the new rating; $\mathbf{R_o}$ is the old (pre-match) rating.

K is the weight constant for the tournament played. ClubElo uses a weight index of k = 20.

K is then adjusted for the goal difference in the game. It is increased by **half** if a game is won by two goals, by **3/4** if a game is won by three goals, and by **3/4 + (N-3)/8** if the game is won by four or more goals, where **N** is the goal difference.

W is the result of the game (**1** for a win, **0.5** for a draw, and **0** for a loss).

$\mathbf{W_e}$ is the expected result (win expectancy), either from the chart or the following formula:

$\mathbf{W_e = 1 / (10^{(-dr/400)} + 1)}$

dr equals the difference in ratings plus **100** points for a team playing at home.

Table A.1: *Top 10* clubs by ELO rating, 2018.

Club	Country	NUTS3 name	ELO rating
Barcelona	ESP	Barcelona	2017.5707
Juventus	ITA	Torino	1962.1682
Bayern	GER	München, Kreisfreie	1942.2761
Real Madrid	ESP	Madrid	1927.0408
Paris SG	FRA	Paris	1897.0479
Dortmund	GER	Dortmund, Kreisfreie	1847.8518
Napoli	ITA	Napoli	1842.4071
Porto	POR	Área Metrop. do Porto	1813.2972
Sevilla	ESP	Sevilla	1804.5923
Ajax	NED	Groot-Amsterdam	1785.7057

Note: Best ranked clubs according to the ELO rating in 2018.

Appendix B: additional information to Section 4 (Empirical analysis)

Table B.1: ELO and economic growth, sensitivity (1)

Dep. variable:	(1) Major leagues Growth_3y	(2) Rest of leagues Growth_3y	(3) High ELO clubs Growth_3y	(4) Low ELO clubs Growth_3y
ELO rating	0.0157***	0.0108*	0.013***	0.020**
	(0.004)	(0.006)	(0.004)	(0.007)
GDP pc (in logs)	-61.54***	-29.39***	-32.88***	-34.93***
	(5.57)	(2.86)	(4.65)	(4.19)
Time Fixed Effects	YES	YES	YES	YES
Regional Fixed Effects	NO	NO	NO	NO
Club Fixed Effects	YES	YES	YES	YES
Observations	1481	2463	2745	1199

Note: Results estimated with all clubs. Major leagues include Spain, Italy, France and Germany. Standard errors, custer by region, in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table B.2: ELO and economic growth, sensitivity (2)

Dep. variable:	(1) Rich Growth_3y	(2) Poor Growth_3y	(3) <2010 Growth_3y	(4) >2010 Growth_3y	(5) inc UK Growth_3y
ELO rating	0.0104***	0.0105*	0.015*	0.008**	0.006*
	(0.003)	(0.006)	(0.008)	(0.003)	(0.004)
GDP pc (in logs)	-48.985***	-26.573***	-32.439***	-65.975***	-40.737***
	(4.939)	(3.494)	(9.036)	(4.125)	(3.685)
Time Fixed Effects	YES	YES	YES	YES	YES
Club Fixed Effects	YES	YES	YES	YES	YES
Observations	2259	1685	1648	2296	4511

Note: Results estimated with all clubs. Standard errors, custer by region, in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table B.3: ELO and economic growth, robustness

Dep. variable:	(1) Growth_3y	(2) Growth_3y	(3) GDP pc	(4) SysGMM GDP pc
ELO rating	0.0124**	0.0102**	0.001**	0.001**
	(0.005)	(0.005)	(0.000)	(0.00)
L.GDP pc	-89.314***	-88.269***	0.886***	0.989***
	(4.113)	(4.111)	(0.012)	(0.003)
Time Fixed Effects	YES	YES	YES	YES
Regional Fixed Effects	NO	NO	NO	NO
Club Fixed Effects	YES	YES	YES	YES
Region-specific Trends	YES	NO	NO	NO
Club-specific Trends	NO	YES	NO	NO
Observations	3944	3944	5175	5175
AR(1) p-value				0.000
AR(2) p-value				0.675
Hansen test				1648

Note: Results estimated with all clubs. GDP pc is measured in logs and at the beginning of the growth period. Colum 4 is estimated with two-step version of the System GMM estimator, with small-sample correction and collapsing the instrument set. Standard errors, custer by region, in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table B.4: National title and economic growth, Europe+UK

Dep. variable:	(1) All Clubs Growth_3y	(2) High ELO Growth_3	(3) Low ELO Growth_3y	(4) All Clubs Growth_3y
GDP pc (in logs)	-39.81***	-43.68***	-37.06***	-39.82***
	(2.167)	(5.089)	(3.349)	(3.072)
ELO rating	0.002	0.002	0.007*	0.002
	(0.002)	(0.003)	(0.004)	(0.003)
LeagueTitle	0.791	0.561	1.465*	0.422
	(0.561)	(0.479)	(0.807)	(0.407)
LeagueTitle*ELO Low				2.787***
				(0.880)
Time Fixed Effects	YES	YES	YES	YES
Club Fixed Effects	YES	YES	YES	YES
Observations	5164	3719	1445	5164

Note: Sample includes UK. In all columns, LeagueTitle, GDP pc and ELO rating are measured at the begginig of the period. ELO low identifies whether a club is below the mean of ELO rating. Column 4 controls for ELO Low. Standard errors, custer by region, in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table B.5: Unexpectedly winning the league, Diff-in-Diff results

	(1)	(2)	(3)	(4)
Dep. variable:	Growth_3y	Growth_3y	Growth_3y	Growth_3y
GDP pc (in logs)	-38.32***	-43.53***	-48.24***	-38.32***
	(2.832)	(3.225)	(3.280)	(2.283)
ELO rating	0.008**	0.006	0.006	0.008**
	(0.004)	(0.004)	(0.004)	(0.004)
Post2005	13.034***	12.291***	11.622***	13.010***
	(1.047)	(1.155)	(1.054)	(0.956)
LeagueTitle*Post2005	3.285***			
	(1.142)			
L.LeagueTitle*Post2005		2.314***		
		(0.801)		
L2.LeagueTitle*Post2005			2.365***	
			(0.747)	
F2.LeagueTitle*Post2005				0.888
				(0.985)
Time Fixed Effects	YES	YES	YES	YES
Club Fixed Effects	YES	YES	YES	YES
Observations	3408	3212	3016	3048

Note: Only regions whose clubs didn't win the league between 2000 and 2005 are included. UK clubs included. In all columns, LeagueTitle, GDP pc and ELO rating are measured at the begginig of the period. Standard errors, custer by region, in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table B.6: Unexpectedly winning the league, Diff-in-Diff results, Europe + UK

Dep. variable:	(1) Growth_3y	(2) Growth_3y	(3) Growth_3y	(4) Growth_3y
GDP pc (in logs)	-30.61***	-35.06***	-38.29***	-30.63***
	(2.422)	(2.462)	(2.483)	(2.426)
ELO rating	0.012***	0.011***	0.010**	0.004
	(0.004)	(0.004)	(0.004)	(0.003)
Post2005	12.126***	11.549***	10.813***	12.202**
	(1.047)	(1.064)	(0.960)	(1.062)
LeagueTitle*Post2005	2.917**			
	(1.317)			
L.LeagueTitle*Post2005		2.672***		
		(0.917)		
L2.LeagueTitle*Post2005			2.487***	
			(0.878)	
F2.LeagueTitle*Post2005				1.077
				(0.904)
Time Fixed Effects	YES	YES	YES	YES
Club Fixed Effects	YES	YES	YES	YES
Observations	2989	2817	2645	2989

Note: Only regions whose clubs didn't win the league between 2000 and 2005 are included. In all columns, LeagueTitle, GDP pc and ELO rating are measured at the begginig of the period. Standard errors, custer by region, in parentheses *** p<0.01, ** p<0.05, * p<0.1