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The Relation Between National Competition and International Competitiveness

Diána Ivett Fűrész

PhD Student, Doctoral School of Health Sciences, University of Pécs, Hungary.
https://orcid.org/0000-0002-0919-285X.

Pongrác Ács

Professor dr, Institute of Physiotherapy and Sport Science, Faculty of Health Sciences,
University of Pécs, Hungary. https://orcid.org/0000-0002-4999-7345

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Abstract

Purpose: The paper analyses two current topics in sport economics research and their relationship. Looking at the past 25 years and 21 countries as well as leagues in European football, it is worth looking for the answer to the question of whether there is causality between international competitiveness and competitive balance. In other words, whether an increase in the balance of the national league (namely in excitement) causes the development (better performance of the national team) of a given country's football or this causality is reversed.

Methodology: By measuring the extent of competitive balance and identifying the measure of competitiveness, the Granger causality was tested to analyse the relationship of the UEFA country coefficient, the FIFA World Ranking and the Herfindahl ratio of competitive balance (HRCB).

Findings: Based on the estimation and testing of vector autoregressions in panel data, it can be stated that the FIFA World Ranking Granger-causes HRCB. Better sports performance of a country's national team indicates that a given league will also be appreciated, meaning that better and better players will arrive in a better and better league, which will attract more exciting games, so a decrease can be observed in competitive balance.

Research limitations: The study focused on only two indicators of competitiveness, so it is worth examining causality with more measures in the future.

Value: From a management perspective, it is believed that the boards of leagues should consider the results presented in this study, such as that better presence of the national team will make the league more balanced, which will lead to a rise in demand.

Keywords: competitive balance, competitiveness, European football, Granger-causality.

JEL: Z20, L51, C22, Z21

Correspondence address: Faculty of Health Sciences, University of Pécs, H-7621 Pécs, Vörösmarty M. str 4., Hungary; emails: diana.furesz@etk.pte.hu; pongrac.acs@etk.pte.hu.

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Związek między konkurencją krajową a konkurencyjnością międzynarodową

Streszczenie

Cel: W artykule dokonano analizy dwóch aktualnych tematów badań w dziedzinie ekonomiki sportu i ich związku. Patrząc na ostatnie 25 lat i 21 krajów, a także na ligi w europejskiej piłce nożnej, warto poszukać odpowiedzi na pytanie, czy istnieje związek przyczynowy między konkurencyjnością międzynarodową a równowagą konkurencyjną. Innymi słowy, czy większa równowaga ligi krajowej powoduje rozwój piłki nożnej danego kraju, czy też ten związek jest odwrotny.

Metodologia: Poprzez pomiar stopnia równowagi konkurencyjnej i identyfikację miary konkurencyjności zbadano przyczynowość w sensie Grangera w celu analizy związku współczynnika krajowego UEFA, światowego rankingu FIFA i wskaźnika równowagi konkurencyjnej Herfindahla (Herfindahl ratio of competitive balance – HRCB).

Wyniki: Na podstawie oceny i testu modelu wektorowej autoregresji w danych panelowych można stwierdzić, że światowy ranking FIFA ma związek przyczynowy w sensie Grangera z HRCB. Lepsze wyniki sportowe reprezentacji danego kraju wskazują, że prestiż danej ligi również wzrośnie, co oznacza, że lepsze ligi będą pozyskiwać coraz lepszych zawodników, a drużyny będą rozgrywać ciekawsze mecze, a zatem dojdzie do obniżenia równowagi konkurencyjnej.

Ograniczenia badawcze: Badanie koncentrowało się tylko na dwóch wskaźnikach konkurencyjności, dlatego w przyszłości warto zbadać związek przyczynowy za pomocą większej liczby miar.

Wartość: Z perspektywy zarządzania uważa się, że zarządy lig powinny wziąć pod uwagę wyniki przedstawione w opracowaniu, np. to, że lepsza pozycja reprezentacji narodowej zwiększy równowagę ligi, co spowoduje wzrost popytu.

Słowa kluczowe: równowaga konkurencyjna, konkurencyjność, europejska piłka nożna, przyczynowość w sensie Grangera.

1. Introduction

Competitiveness is one of the most commonly used terms today, but its exact definition is still unclear. Thus, there is no consensus on what competitiveness really means, in some areas it is used as an indicator regarding the overall level of development in connection with an economy or a company, elsewhere it means market performance, business success, and economic growth.

As the main goal of companies is to achieve the highest possible profits, which may not necessarily be achieved only through competing with other companies, the role of competitiveness in sport is inevitable as its main driver is mutual competition. The essence of teams is their rivalry to win as many matches and competitions as possible in both domestic and international events.

One of the most prevalent questions of today's research on professional sports is how competitive balance can be sustained. Balance can be considered as a prerequisite of demand as interest in games and other related revenue sources (such as merchandising, stock prices, ticket sales, the size of the audience, etc.) tend to be higher when their outcome is

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less predictable. To answer the initial question, methods need to be found that are designed to measure competitive balance, then the relation of competitiveness and competitive balance will be examined as well.

In this study, it will be examined whether the competitiveness of a country's football is related to the equilibrium of the country's national league, and if so, what direction (causality) it takes. In other words, whether an increase in the balance of the national league (namely excitement) causes the development (better performance of the national team) of a given country's football or this relationship is reversed. In this study, the following 21 countries' championships will be analysed as well as national performance from 1994 to 2018.

Austria	Germany	Portugal
Belgium	Greece	Romania
Croatia	Hungary	Russia
Czech Republic	Italy	Scotland
Denmark	Netherlands	Spain
England	Norway	Sweden
France	Poland	Switzerland

Tab. 1. List of the countries examined between 1994 and 2018. Source: The authors' work.

First, the tools and methods will be addressed that are currently used in measuring the extent of competitive balance; then these methods will be applied to explore whether competitive balance is related to competitiveness, based on empirical data regarding European football leagues and national teams. In this study, only those methods will be used that are directly necessary to explore this relationship. For those with a deeper interest in this field, it is recommended to see the publications listed under References.

2. Measure of International Competitiveness

Like in the business sector, there is no specific accepted indicator for measuring competitiveness in sport. However, due to the very nature of sport, sports statistics show a number of 'output' indicators which can even be understood as competitiveness indicators. The two chosen metrics are the UEFA country coefficient and the FIFA World Ranking, which measure the current performance of a country in football.

The UEFA country coefficient represents the collective performance of the clubs considering each European country, for assigning the number of places and determining at what stage clubs enter the UEFA Champions League, UEFA Europa League and the UEFA Europa Conference League.

The FIFA World Ranking is a ranking system for national teams in football. National teams are ranked based on their game results with the most successful teams being ranked highest.

It is assumed that in football, a measure of competitiveness for a certain country can be how its club or national team has performed over the last 5 years. In this sense, two indices have to be examined as a proxy for competitiveness.

Table 2 shows the value of the competitiveness indicator of the analysed countries for the first and last year.

Country	1994		2018	
	UEFA	FIFA	UEFA	FIFA
Austria	6.3	35	6.2	34
Belgium	3.8	22	7.8	1
Croatia	7.5	121	5.8	5
Czech Republic	4.0	41	6.5	48
Denmark	5.5	6	4.9	10
England	7.3	8	22.6	4
France	9.3	15	10.6	2
Germany	10.2	3	15.2	13
Greece	4.5	32	5.1	44
Hungary	4.8	50	3.3	51
Italy	13.3	1	12.6	17
Netherlands	7.4	2	8.6	16
Norway	4.3	5	5.4	50
Poland	3.5	26	2.3	20
Portugal	6.0	20	10.9	7
Romania	3.8	12	2.4	25
Russia	2.8	14	7.6	47
Scotland	2.0	25	6.8	41
Spain	8.6	7	19.6	9
Sweden	7.5	11	4.1	14
Switzerland	3.8	9	3.9	8

Tab. 2.The values of UEFA country coefficient and FIFA Ranking in 1994 and 2018. Source: Based on www.uefa.com and www.fifa.com.

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3. The Importance of Competitive Balance

Congruent with the axioms used in market theory, a league is considered to be perfectly balanced if every participant has an equal chance to lose or win against any other participant. This may also be referred to as equilateral power relations. The level or extent of balance or imbalance can be measured by the distance between the actual score distribution for individual teams and the theoretical distribution of scores that would apply if the probabilities of winning or losing were equal for every participant.

Competitive balance (CB), particularly in research on professional sports, has begun to play an essential role. Over the last twenty years, several authors have looked at and examined the relationships between balance, the size of the audience, ticket sales, revenue, and even the beauty and enjoyability of games (Késenne, 2006; Vrooman, 2007; Hogan, Massey, & Massey, 2013). It is a generic conclusion that perfect balance, through high uncertainty regarding final rankings, leads to an increased interest on the part of fans and sports enthusiasts (Borland & Macdonald, 2003) whereas a less balanced league where outcomes can be predicted with greater accuracy is often followed by fewer viewers and decreased demand (Zimbalist, 2003; Késenne, 2006; Koenigstorfer, 2010). This statement, however, is held questionable by Szymanski (2001, 2007) as personal experience suggests that fans may show interest or even prefer winning streaks and continuous dominance to balance in some cases. For example, despite the continuously growing dominance of Manchester United in the English Premier League in the 1990s, the games lost little or none of their appeal, despite the non-decreasing imbalance. Even though such scenarios may undoubtedly exist, it is safe to assume that a positive relationship between imbalance and demand can only be sustained temporarily.

Major North American professional leagues (including those in the NBA, NHL, or the NFL) apply various financial measures (such as drafts, pay-out caps, luxury taxes, etc.) to sustain competitive balance, thereby protecting themselves from setting mechanisms in motion that may lead to a decrease in the size of the audience (Quirk & Fort, 1999).

They create an operating environment for sports businesses in which access to resources is restricted in order to minimize differences between weaker or worse-off teams and stronger teams. As uncertainty of outcome is a decisive factor from an economic point of view, they can maximize their profits overall on the league level.

In this case, players as input factors have the greatest impact on the output of organizations. As the largest item in the budget of sports organizations is the wage of players, one of the tools of labour market regulations is related to this.

The essence of the so-called salary cap is to maximize the amount that is spent directly on players, creating nearly similar conditions among clubs. This regulation prevents the richest team from getting all the star players, so the teams with a lower budget can also obtain good quality players. Of course, the salary cap only affects direct wages, and there is no way to prohibit or limit any other benefits paid to players under promotional or merchandising contracts. The limitations of the salary cap and luxury tax are the following: the former is the amount that each team can spend each season to build a team, while the latter is the "penalty" that each team pays if it exceeds the amount specified in the salary cap.

The second labour market regulation is "draft", which also aims to achieve a greater balance of power. This is achieved by giving the teams which performed worse during the last season the possibility to choose first from the rookies before the start of the next season, while the teams with the best results in the league are only the last. In principle, this allows physically and mentally stronger players not to end up in the strongest teams (Ács, 2015).

As opposed to the characteristics of the North American leagues, the European promotion/relegation systems seem to hinder the balance in national leagues by assigning teams to categories based on their revenue generating capabilities. Events from the past two decades (such as the Bosman case) appear to have led to an unstable balance to which the current rules and procedures of the Champions League only seem to contribute (see Késenne, 2007), along with the differences in attainable revenues from broadcasting rights (Noll, 2007).

4. Special Indicators of Competitive Balance

The measurement of market share in microeconomics can also be used ex post to determine the power of each team in the long term. In line with the considerations used in the market theory, a league is considered to be perfectly balanced when all participants have an equal chance of winning or losing to any other participant.

The competitive balance in a league under consideration is determined by how far the points obtained by the teams are distributed from the points obtained in a fully balanced environment (even distribution).

Nowadays, the measurement of competitive balance, which measures the balance of power, occupies a central place in professional sports research. Another way of measuring power relations is through an ex-ante approach, typically in the short term. Originally defined by Rottenberg (1956) and Neale (1964), the professional sports industry is special because the success of a team or sports company also depends heavily on the performance of its opponents. According to the uncertainty of outcome hypothesis,

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a smaller power difference between teams (balanced power relations) leads to more interest, thus increasing the number of spectators. However, as with long-term forecasts, the impact of short-term power ratio measurement is not clear: more than 40 studies collected by Borland and Macdonald (2003) show that there is only a significant positive relationship between output uncertainty and attendance. This may be due to the fact that few studies distinguish between short-term and long-term analysis, meaning that most of the articles confuse the concepts of competitive balance and foresight.

There are several measures in the literature for determining competitive balance, and their summary can be found in Goossens (2006).

In related studies, the most popular means of quantifying the extent of competitive balance is by taking the (relative) standard deviation of the ratio of winnings (Scully, 1989; Quirk & Fort, 1999)

However, this is not a fully appropriate index in many cases as a considerable number of games can result in a draw in certain leagues, especially in European football. An alternative solution to this problem is to replace the ratio of winnings with the ratio of points obtained by each team within the same league.

Schmidt and Berri (2007) use the well-known Gini coefficient (originally used to measure income inequalities) to determine the inequality regarding the distribution of winning percentage.

Humpreys (2002) and Eckard (2003) developed the competitive balance ratio (CBR) since the standard deviation only takes into account the seasonal uncertainty without the league uncertainty. Therefore, the "within-team standard deviation" includes the standard deviation of winning over seasons per team. The CBR is the ratio of the within-team standard deviation and the within-season standard deviation. Horowitz (1997) suggested applying the relative entropy (index of information theory) to determine seasonal competitive balance, as follows

$$R = \frac{H}{H_M} = \frac{-\sum_{i=1}^{n} p_i \log_2 p_i}{-\log_2 \frac{1}{n}} \tag{1}$$

where i represents a given team; n is the total number of teams; p_i represents the proportion of the league victories of a team and H_M is maximal entropy, which is found when every team has the same share of winning.

The Herfindahl-Hirschman Index (HHI), another indicator of concentration, is based on the sum of squares of the relative scores achieved by each individual team.

Besides frequent draws between teams, another factor of ambiguity in measuring competitive balance is stems from the fact that the number of teams within a league or a championship is not necessarily constant or identical. This can make balance comparisons between seasons, championships or leagues problematic. Throughout time, including recent decades, there have been frequent changes to the size of each leading league, which imposes methodological difficulties with regard to comparing leagues within and across nations as well as across seasons.

In order to address and resolve these methodological challenges, Depken (1999) suggested some modifications to the HHI when measuring CB. The author's approach to obtaining a more plausible index is to introduce the subtraction of the smallest HHI (dHHI). Lenten (2009), based on similar considerations, suggests a ratio where the minimum value receives a dedicated role in the denominator (HICB). However, as Hall and Tideman (1967) pointed out, concentration indices need to meet several expectations and satisfy certain axioms one of which is that their values should fall between 0 and 1. This criterion is not satisfied by either Depken's dHHI or Lenten's HICB. The purpose of Adjemian, Gayant and Pape (2012) was to develop an index that satisfies all of these criteria.

In order to better understand how it is constructed, one should look at the original HHI. If p_i denotes the total score reached by a given team in a given championship, its share of the total points within the league that consists of n teams can be written as

$$s_i = \frac{p_i}{\sum_{i=1}^{n} p_i} \tag{2}$$

where $0 \leq s_i < 1$.

The Herfindahl-Hirschman index is defined as

$$HHI = \sum_{i=1}^{n} s_i^2 \tag{3}$$

If every team in the league achieves the very same score, ($\sum_{i=1}^{n} p_i = np_j$, for all $j = 1, 2, \ldots n$), then $HHI = 1/n$, which is referred to as Perfect Competitive Balance (PCB). If PCB applies, then

$$HHI = \sum_{i=1}^{n} s_i^2 = \sum_{i=1}^{n} \left(\frac{p_i}{\sum p_i} \right) \tag{4}$$

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becomes

$$HHI_{\min} = \sum_{i=1}^{n} \left(\frac{1}{n}\right)^2 = n\left(\frac{1}{n}\right)^2 = \frac{1}{n} \tag{5}$$

as $s_1 = s_2 = \ldots = s_n = \frac{1}{n}$.

Since the lower bound ($1/n$) depends on the number of teams in a given league, appropriate adjustments are needed when comparing leagues of different sizes.

In sports economics, just like in regular economic analyses, *HHI* is used for comparative purposes. In this case, it is to aid comparisons between seasons of a given league, or even between different leagues. Therefore, a desirable index would take up its values between 0 and 1, and would actually equal zero when perfect competitive balance is present and would reach exactly 1 in the case of Perfect Competitive Imbalance (PCI).

Depken (1999), Lenten (2009), and later Pawlowski, Breuer and Hovemann (2010) attempted to provide a solution to this problem; however, all of their suggestions remained sensitive to the size of leagues. The indices could not overcome the difficulties imposed by the nature of the industry, specifically, that it is not possible for any team to accrue all of the points in a league; therefore, the upper bound of the concentration index cannot be 1 (as opposed to the characteristics of this industry, monopolistic organizations are bound to have a 100% market share and therefore an *HHI* of 1).

This error is corrected by the generalized (standardized) Herfindahl-Hirschman Index, and is referred to as the Herfindahl ratio of competitive balance (HRCB). As described in Alfano and Baraldi (2011), it is defined as

$$HRCB = \frac{HHI - HHI_{\min}}{HHI_{\max} - HHI_{\min}}. \tag{6}$$

Since $HHI_{\min}$ is known ($1/n$), the generalized *HHI* can be obtained by finding $HHI_{\max}$.

While the CB value can easily be determined, the determination of the maximum concentration achievable in each league is not so easy. In a sports league, it is not conceivable for a team to obtain all the points while the others do not get any, which means that measures of concentration cannot assume a theoretical maximum of 1. The $HHI_{\max}$ values that can occur in a PCIB depend on the size of the league (number of teams) and the scoring system specific to the given league.

In the 3–1–0 scoring system relevant to this study, the maximum score in a league of 18 teams is (Bundesliga) $HHI_{\max}^{(18)} = 0.084$ while in a league

of 20 teams it is $HHI_{\max}^{(20)} = 0.075$ (for evidence, see e.g. Fűrész & Rappai, 2018; Triguero-Ruiz & Avila-Cano, 2018). Based on these, HRCB values can be determined for each European top league.

So in the 3-1-0 scoring system, the above value ($HHI_{\max}$) changes as

$$\frac{\frac{3}{2}n(n-1)(2n-1)-\frac{1}{2}m(m-1)(4m-1)}{\left(\frac{3}{2}n(n-1)-\frac{1}{2}m(m-1)\right)^2} \tag{7}$$

where m is the number of teams without any victory.

This *HRCB* index falls between 0 and 1 by definition, and satisfies the criteria regarding both the upper and lower bounds.

After all, the values of *HRCB* can be calculated for each league in every season.

5. Methodology

In order to find out whether there is causality between the competitive balance and the competitiveness of a country, it is worth first to examine the relationship between the competitive balance and the competitiveness indicators. Figure 1 shows the relationship between competitive balance and FIFA World Ranking (the pairwise representation of HRCB values and countries is provided in the Appendix).

Figure 1, as well as the individual figures in the Appendix, clearly show a positive relationship between the two variables.

The first step in this analysis concerns the stationarity of the *HRCB*, FIFA Ranking and UEFA coefficient series. Granger causality requires that the series have to be stationary, so the following tests have been calculated. The results are presented in Table 3.

Method	***HRCB***		**FIFA Ranking**		**UEFA coefficient**	
	Statistic	**Prob.**	**Statistic**	**Prob.**	**Statistic**	**Prob.**
Null: Unit root (assumes common unit root process)						
Levin, Lin & Chu t	–3.293	**0.0005**	–2.746	**0.0030**	–5.4100	**0.0000**
Null: Unit root (assumes individual unit root process)						
Im, Pesaran and Shin W-stat	–5.034	**0.0000**	–3.744	**0.0001**	–6.1723	**0.0000**
ADF – Fisher Chi-square	105.046	**0.0000**	78.952	**0.0005**	112.0710	**0.0000**
PP – Fisher Chi-square	193.918	**0.0000**	110.500	**0.0000**	222.7330	**0.0000**

Tab. 3. Panel unit root tests for HRCB, FIFA Ranking and UEFA coefficient. Source: The authors' work.

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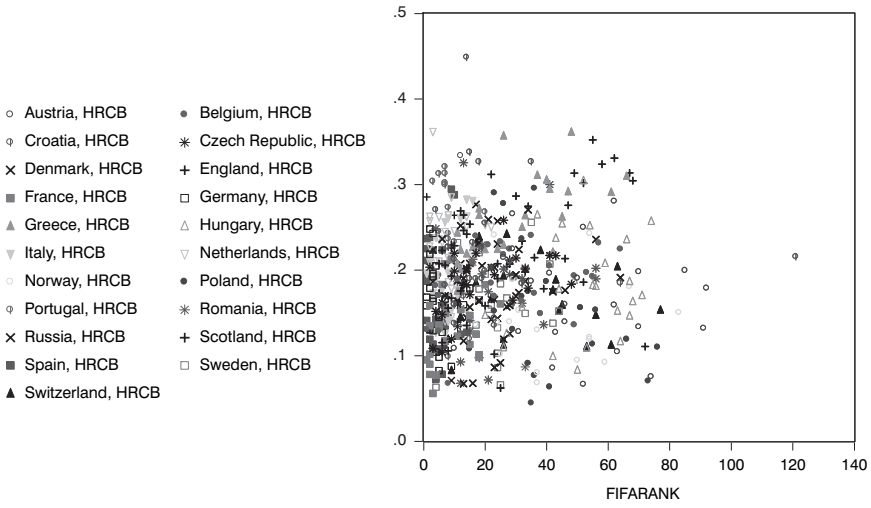

Fig. 1. The scatter plot of HRCB and FIFA World Ranking in 1994–2018. Source: The authors' work.

For all of the series, the null hypothesis of non-stationarity can be rejected at 1% confidence level, so it can be stated that all of the variables are stationary.

In order to explore the relationships (causality) between the indicators, a vector autoregression model was constructed based on the panel data (Sims, 1980). This model allows further exploration of Granger causality (Granger, 1969), and the causality within the panel data can be tested in multiple ways, depending on the structural conditions and the characteristics of the data set. For a generic two-variable VAR model, the following can be formulated:

$$\begin{aligned} y_{i,t} &= \alpha_{0,i} + \alpha_{1,i} y_{i,t-1} + \ldots + \alpha_{l,i} y_{i,t-1} + \beta_{1,j} x_{i,t-1} + \ldots + \\ &\quad + \beta_{1,i} x_{i,t-1} + \varepsilon_{i,t}^{y} \\ x_{i,t} &= \alpha_{0,i} + \alpha_{1,i} x_{i,t-1} + \ldots + \alpha_{l,i} x_{i,t-1} + \beta_{1,j} xy_{i,t-1} + \ldots + \\ &\quad + \beta_{1,i} y_{i,t-1} + \varepsilon_{i,t}^{x} \end{aligned} \tag{8}$$

where t denotes the time dimension and i is a cross-sectional dimension of the panels.

Depending on the homogeneity conditions of the cross-sectional coefficients, there are multiple VAR models to consider. There are two main directions regarding what methodology may be applicable.

1. The first approach considers the panel data as a large data set, and Granger causality is tested the usual way; however, identical data points are ignored when transitioning from one cross section to another. This method utilizes the assumption that all coefficients are identical for each cross section, i.e.

$$\begin{gathered}\alpha_{0,i} = \alpha_{0,j}, \alpha_{1,i} = \alpha_{1j}, \ldots \alpha_{l,i} = \alpha_{l,j}, \forall i,j \\ \beta_{1,i} = \beta_{1j}, \ldots \beta_{l,i} = \beta_{l,j}, \forall i,j\end{gathered} \tag{9}$$

2. The second approach takes the opposite direction, and in accordance with Dumitrescu and Hurlin (2012), each coefficient is considered unique.

$$\begin{gathered}\alpha_{0,i} \neq \alpha_{0,j}, \alpha_{1,i} \neq \alpha_{1j}, \ldots \alpha_{l,i} \neq \alpha_{l,j}, \forall i,j \\ \beta_{1,i} \neq \beta_{1j}, \ldots \beta_{l,i} \neq \beta_{l,j}, \forall i,j\end{gathered} \tag{10}$$

With this method, Granger causality is tested on each individual cross section using time series regression, and takes the average of the test statistics (Wbar-statistics).

In this case, the length of the time series allows the use of the second (Dumitrescu-Hurlin Panel Causality test) approach.

After applying the vector autoregression model to the panel data while not excluding the possibility that either of the six causal directions may be valid, the following results are obtained (Table 4).

Null Hypothesis	W-Stat.	Zbar-Stat.	Prob.
HRCB does not homogeneously cause FIFA Ranking	1.80408	–0.80176	0.4227
FIFA Ranking does not homogeneously cause HRCB	**4.30612**	**3.68895**	**0.0002**
UEFA coefficient does not homogeneously cause FIFA Ranking	3.19369	1.69234	0.0906
FIFA Ranking does not homogeneously cause UEFA coefficient	2.35881	0.19387	0.8463
UEFA coefficient does not homogeneously cause HRCB	2.54715	0.53191	0.5948
HRCB does not homogeneously cause UEFA coefficient	2.84708	1.07022	0.2845

Tab. 4. Dumitrescu-Hurlin panel causality test (1994–2018). Source: The authors' work.

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The p-values suggest the lack of causality except one case: FIFA Ranking "Granger-causes" *HRCB*. Thus, it can be stated that past values of FIFA Ranking contribute to the prediction of the present value of *HRC*B even with past values of *HRCB*.

6. Conclusions and Implications of the Study

In summary, it can be seen that FIFA Ranking Granger-causes *HRCB*, but the sign of the relationship is only shown in the scatter plots presented in Figure 1 and the Appendix. A positive direction of the relationship suggests if the value of FIFA World Ranking decreases (the country moves forward), *HRCB* decreases (the league becomes more balanced).

One reason for this is presumably that as a result of the success of a country's national team, that league will also be appreciated, meaning that better and better players will arrive in a better and better league. With the appearance of star players, teams will be stronger, which will attract more exciting matches, meaning a decrease in competitive balance.

Another interpretation of the relationship is that an increase in balance increases demand, so as the league's popularity increases, more and more sponsors appear on the football league market. In addition, revenue growth provides more and more opportunities for good players to be purchased, which will eventually lead to a more balanced league.

From a management perspective, it is believed that the boards of leagues should consider the results presented in this study. First of all, support for the national team should be mentioned. Better presence of the national team will make the league more balanced, which will lead to a rise in demand (increasing attendance), thus justifying the basic principle of operations management that part of the profit should be spent on improving operational processes. In order to achieve this, consideration may be given to the regulation of foreign players, mandatory inclusion of young domestic players or the introduction of a salary cap.

7. Appendix

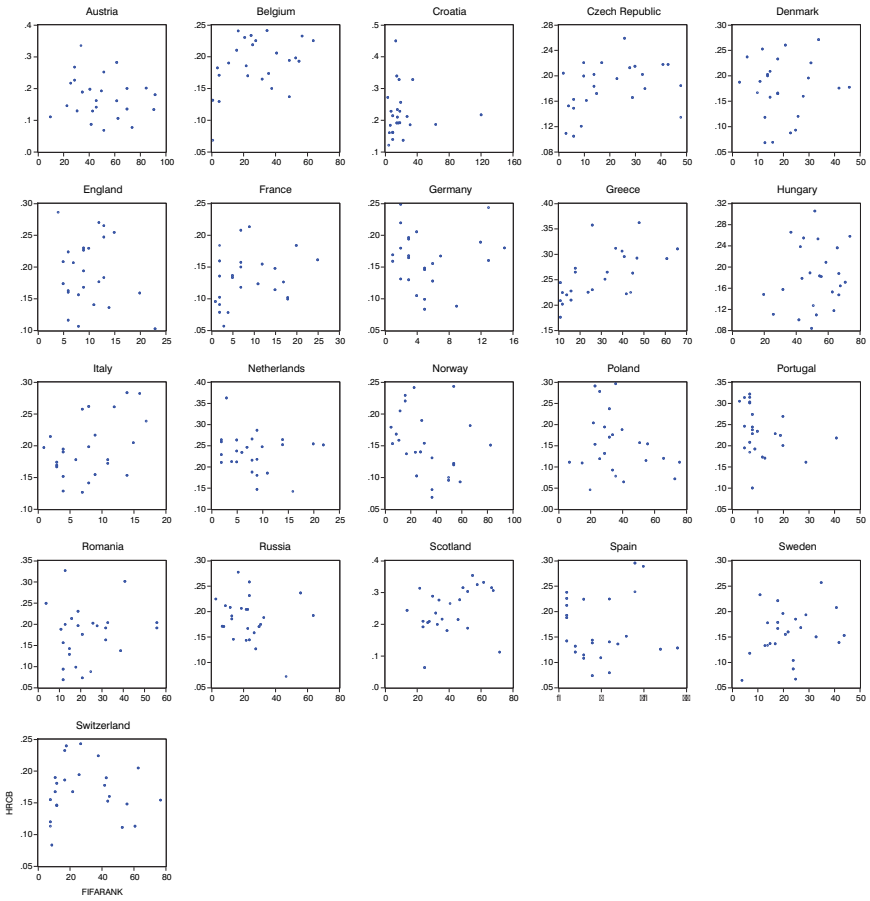

Fig. 2. The relation of HRCB and FIFA Ranking in each country. The authors' work.

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