Capital intelectual y valoración de mercado de futbolistas

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Los clubes de fútbol son instituciones tradicionales con la particularidad de tener a los principales protagonistas de sus éxitos como activos intangibles, es decir, sus jugadores. El objetivo de este trabajo es analizar los determinantes de los valores de mercado utilizando indicadores de capital intelectual y estructural como variables explicativas. Se utilizaron estadísticas descriptivas y estimaciones de modelos de datos en panel en los análisis para controlar los efectos fijos de los jugadores de fútbol, los efectos fijos del club, y los efectos de las interacciones entre el año del jugador y el año del club. Los resultados confirmaron que el valor de mercado de los jugadores de fútbol está determinado por un conjunto de variables que pueden explicarse mediante componentes de capital humano (habilidades individuales) y capital estructural (infraestructura que apoya al capital humano). Comprender la valoración de los jugadores puede ayudar tanto a los clubes como a los jugadores a mejorar su gestión y aumentar la posibilidad de éxito financiero.

Palabras clave: activos intangibles, capital humano, capital estructural, fútbol

Intellectual capital and market valuation of footballers

Football clubs are traditional institutions with the particularity of having the main characters of their successes as intangible assets, that is, their players. The aim of this work is to analyse the determinants of the market values using intellectual and structural capital indicators as explanatory variables. Descriptive statistics and panel data model estimates were used in the analyses to control the footballers' fixed effects, the club's fixed effects and the effects of player-year and club-year interactions. Results confirmed that footballers' market value is determined by a set of variables that can be explained by components of human capital (one's skills), structural capital (infrastructure that supports human capital). Understanding

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the players' pricing can help both clubs and players to improve their management and increase the possibility of financial success.

Keywords: intangible assets, human capital, structural capital, football

Capital intelectual e avaliação de mercado de jogadores de futebol

Os clubes de futebol são instituições tradicionais com a particularidade de terem os principais protagonistas de seus sucessos como ativos intangíveis, ou seja, seus jogadores. O objetivo deste trabalho é analisar os determinantes dos valores de mercado usando indicadores de capital intelectual e estrutural como variáveis explicativas. Foram utilizadas estatísticas descritivas e estimativas de modelo de dados em painel nas análises para controlar os efeitos fixos dos jogadores de futebol, os efeitos fixos do clube e os efeitos das interações entre ano do jogador e ano do clube. Os resultados confirmaram que o valor de mercado dos jogadores de futebol é determinado por um conjunto de variáveis que podem ser explicadas por componentes de capital humano (habilidades individuais) e capital estrutural (infraestrutura que apoia o capital humano). Compreender a precificação dos jogadores pode ajudar tanto os clubes quanto os jogadores a melhorar sua gestão e aumentar a possibilidade de sucesso financeiro.

Palavras-chave: ativos intangíveis, capital humano, capital estrutural, futebol

1. Introduction

More than a sport, football plays an important role in the economy, considering the emotional ties that lead supporters to consume the football market as well as the financial aspect that leads companies to invest in football clubs in exchange of publicity for their brands (Majewski, 2016). Football is the most popular sport in the world, moving over US$ 286 billion per year and opening many business possibilities that are essentially focused on the market formed by supporters and fans (Fédération Internationale de Football Association [FIFA]).

Despite the populism surrounding football, clubs as institutions have their fiscal responsibilities like other companies except for the treatment of their resources, in particular, their intangible assets – footballers. Therefore, the valuation and selling of footballers, promoted by a given club, becomes a goal to mitigate possible debts and/or to increase revenue and the opportunity of titles; the latter is the final goal of every supporter. According to Gerrard and Dobson (2000) the utility function of the football club has two arguments: team performance and club profits.

Selling footballers, especially from base categories, is common practice of clubs that aim to invest in their structural capital (training centers and equipped and structured stadiums) and to favor the development of their younger athletes for future sales. Some football clubs perform better than others and expand their financial advantages with the income from negotiating players (Nakamura, 2015). In general, European clubs invest more and have better financial-economic conditions, in terms of management and currency, compared to others, hence, they rapidly hire young footballers from countries that export their young talents, like Brazil.

Valuing and selling trained footballers, therefore, becomes a goal for clubs, to reduce debts and/or expand income and increase the chance of titles, which is also the goal for supporters. According to FIFA TMS (2020), In 2019, the last registered season free of COVID consequences, more than 18.000 footballers were transferred from one team to another based in a different country which generated a total of 7,35 billion dollars paid by clubs to recruit players protected by employment contracts.

Over the years, football clubs have become less capable of fighting for great assets (Nakamura, 2015), a feature bestowed upon the few who manage to evolve and professionalize by (i) creating a governance and management model that is suited to a club enterprise; (ii) adopting the best management practices to become competitive and efficient in what they do; (iii) exploring all possibilities of income and creating economic surplus to be efficiently applied in making a strong team.

In several countries, the government has adopted measures to improve club management. In Brazil, among the measures already taken, we can mention the Pelé Law (Law 9.615, 1998), The Modernization Program for Management and Fiscal Responsibility in Brazilian Football (Profut Law [Lei 13.155], 2015), and more recently, the SAF Law (Law 14.193, 2021), which encourages clubs to become sports corporations, providing governance, control, and specific financing regulations for football activities. These mechanisms aim to enhance the operational performance of football clubs, given that, in general, clubs are unable to meet their labour and tax obligations due to poor management by their executives.

In this scenario, the role of the football player, the primary asset of clubs and the largest revenue generator, stands out as an escape valve for clubs to improve their financial situation. As managing these assets is not an easy task, it is necessary to establish rules and regulations and comprehend the peculiarities within the player market. Therefore, the question of their valuation is of great interest for clubs who need to properly assess what the players are worth to efficiently engage in the transfer market. (Fernandes et al., 2017).

The interest and the importance of the topic of market valuation of footballers have increased jointly with the growth of the transfer market, however, further studies focusing on the determinants of the market value of football players are still needed (Franceschi et al., 2023). A significant portion of studies analyse the relationship between intellectual capital and the footballers' market value and adopt variables like effort, number of matches, goals per season, team value, like Carmichael et al. (1999), Carmichael et al. (2000), Kiefer (2012), Lucifora and Simons (2003), Majeswki (2015, 2016), Wicker et al. (2013), most of whom focus on the European football.

The problem of the study is based on the importance of maximizing the profitability of assets in companies operating in a multimillion-dollar transaction market that grows every year. In this case, the intangible assets are the players, the market is the player transfer market, and the companies are the football clubs. Therefore, understanding the pricing of its intangible assets is essential for the club to enhance its management and increase its profit potential, thereby enabling better sports performance.

The aim of this article is to analyze the determinants for footballers' market value regarding the indicators of intellectual capital. Unlike previous studies (such as Carmichael et al., 2000; Majewski, 2016; Wicker et al., 2013), this work contributes to the literature by analysing not a single football league, but rather to a group of players (in this case, Brazilian national players – that is, players who began their professional careers in a very similar economic and social context, which contributes to making the sample more homogeneous) and aimed to control, through the econometric strategy, the omitted factors that vary in time. Franceschi et al. (2023) highlight the importance of reporting the characteristics of clubs in determining player value and asserts that, surprisingly, this has not been included in more recent works, constituting a serious misspecification. Furthermore, the author emphasizes that the literature tends to focus on leagues from Big-5 countries, especially those in England.

To that end, we estimated a panel data model to control the players' fixed effects, the club's fixed effects and the effects of player-year and club-year interactions to control the variation of non-observed characteristics over time and to analyse which are the determinants for footballer's market value, following the strategy adopted by Baltagi et al. (2014). The database contains 10 years of information about the 500 most expensive Brazilian players at the end of 2019 – prior to the COVID-19 pandemic, which caused a meaningful change in market values (Metelski, 2021; Quansah et al., 2021).

In addition to this introduction, the article is divided into four more sections. The next section is concentrated on the theoretical developments of intellectual capital, human capital and structural capital. Then, the method of the study is described

as well as the econometric models and data bases. Afterwards, we analyze the results. Finally, we report the conclusions of the investigation.

2. Theoretical developments regarding intellectual capital in football

Intellectual capital can be defined as every strategic knowledge turned to a company's operation, such as management and physical structural provided to employees either individually or collectively (Bontis, 2001). In the present investigation, we adopted the proposition of Edvinsson and Malone (1998) in which the intellectual capital is composed of human capital (which involves the individual's skills, knowledge and experiences) and structural capital (regarding the company's structure to improve their human capital)[1].

Human capital is the basis for a company's growth and where it should concentrate efforts to achieve better results. In football, human capital is characterized in variables like skills, experience, competence, productivity and goals, achieved through effort and a club's investment priority to build a strong team. Moreover, like other companies, human capital is particularly specific to each "function", that is, to each position played by footballers since, according to that position, they have exclusive human capital (Iellatchich et al., 2003).

Structural capital, in turn, is human capital's right arm, since the development of human capital depends on investments in structural capital (Bontis, 2001). In football, structural capital is conceived as the club's structure to support and to improve athletes' conditioning. In addition to structure, a good management and salaries are also important aspects for structural capital, as they help to develop human capital. Among the functions of structural capital, we emphasize the insurance of results and goals, to prevent individual variations and to highlight the employees' work. Structural capital is not equal within institutions, each company has its specificities regarding their profiles and organizational culture (Kanten et al., 2015).

In clubs, the organizational structure is fundamental for the development of athlete, since it is through them that the company outlines goals and focuses on coordinating operations and behaviors (Kanten et al., 2015). Clubs with smaller structural capital require means to attract investors and sponsors to overcome their financial limitations in order to make new investments. Therefore, we claim that all companies must

[1] Edvinsson and Malone (1998) add the relational capital (which directly handles the networking, client-employee and employer-supplier relationships). Due to the availability of information, the present article concentrates on the variables human and structural capital only.

have a consistent organizational structure, with a suitable model for professional management and for employees to have the chance of fulfilling their potential.

Majeswki (2015, 2016) and Wicker et al. (2013) have articles with similar goals, aiming at analysing the determinants of footballers' market value. In general, research has shown that human and structural capital are significant factors for market value. Therefore, we believe that footballers, considered intangible assets, are the ideal subjects for studies on intellectual capital, since their value takes into account their skills, the clubs they play for, and the relationship with supporters and teammates (Ricci et al., 2015).

Albeit clubs' main assets, footballers are not in the budget since intangible assets are not considered a measurement standard and clubs are not required to publicize them, which allows for differences on how the patrimonial budget is measured and their importance for the institution. In case the player holds positive characteristics regarding their intellectual capital, like their field qualities (human capital), and play for a well-managed club (organizational capital), he might become important for the financial and organizational performance of the club. Therefore, by using the market value's determinant factors as well as footballers' intellectual capital, clubs can optimize their profit among footballers and improve their visibility and financial performance.

3. Methodology

3.1. Econometric model

The applied econometric methodology aims to estimate the determinants of the market value of a football player. One of the first works with this purpose was conducted by Carmichael et al. (1999), whose econometric model estimated player transfer values based on their personal characteristics and productivity. Later, authors like Aydemir et al. (2022), Lucifora and Simons (2003), Majewski (2016), Metelski (2021), Ruijg and Van Ophem (2015) and Wicker et al. (2013) also aimed to analyze footballers' market value through different econometric models. They also work as theoretical guidelines in the selection of variables.

Unlike previous studies, we adopted a panel data model with fixed-effect control variable for footballers, clubs and club-year interactions in order to provide the variation of non-observed characteristics over the years to control the number of omitted factors that vary over time. Fixed control effect models aim to introduce proxies of individual skills and other factors to control omitted variables that could determine footballer's market values. Given the difficulties of controlling the non-observed variables in time through instrumental variables, the club-year variable was adopted to

provide the variation of non-observed characteristics of clubs over the years. This procedure was adopted in the work of Baltagi et al. (2014) to control the omitted factors that vary in time.

The equation 1 describes the panel data model with the footballers' fixed effects, the club's fixed effects and the effects of player-year and club-year interactions, containing the variables of intellectual capital described in the literature as determinants for a player's market value:

$$lnW_{ijt} = \beta_0 + \sum_{k=1}^{7} \beta_k CH_{it} + \sum_{k=8}^{11} \beta_k CE_{it} + \beta_{12} L_{it} + \beta_{13} C_{it} + \alpha_i + \delta_j + \alpha_{it} + \delta_{jt} + Window_t + \varepsilon_{ijt} \quad (1)$$

In that equation, *lnWitj* refers to a player's market value, *CH* are the human capital variables (age, age², matches, goals, and assists - defined as final pass before a goal is scored -, goals over minutes played, assists over minutes played and individual titles); *CE* are the structural capital variables (club value - sum of the market value of all players, updated based on the general price index (IGP-M) variation index, ignoring the analysed player; outside Brazil (footballer who is playing outside Brazil); played in the national team; club titles); *L* are the dummy variables of the leagues; *C*, the dummy variables for Continents; αi represents the player's fixed effects; δj, the club fixed effects; *t* is time; *Window* (designated time intervals)[2] and ε_{ijt}, the standard deviation.

The variables were chosen based, mostly, on the articles of Butler (2018), Carmichael et al. (2000), Kiefer (2012), Lucifora and Simons (2003), Majewski (2015, 2016) and Metelski (2021). As dependent variable, the logarithm for the player's market value per year was used - according to the inflation index IGP-M (FGV). As explanatory variables, we selected: (i) human capital variables (age, age², matches, goals and assists, goals over minutes played, assist over minutes played and individual awards); (ii) structural capital variables[3] (club value – the sum of all players' market value according to the inflation index IGP-M (FGV), excluding the analysed player. Outside Brazil – dummy Variable that assumes value "1" when the footballer is hired internationally and value "0" when they play in Brazil; played in the national selection – dummy variable that assumes value "1" when players are draft to play and value "0" when they are not; awards for the club - dummy variable that assumes value "1" when players win championships for the

2 Data was grouped in six windows of seven years (2013/2010; 2014/2011; 2015/2012; 2016/2013; 2017/2014; 2018/2015; 2019/2016) to prevent missing observations, which would happen if only the players in the sample for the entire interval were considered, in accordance with the procedure adopted by Schank et al. (2010).

3 The endogeneity test proposed by Hausman (1978) was applied.

club and value "0" when they do not. Control variables regarding the players field position (keeper, defense, midfield and strikers) were also included; the league they play at (German, Italian, Chinese, Spanish, English, French, Turkish, Brazilian, Portuguese and others[4]) and the continent (North America, South America, Europe, Asia and Africa). In order to allow non-linear relationships between the dependent variable and the explanatory variables in addition to minimizing outliers, the logarithm was applied to the variables of footballers' market value and club's market value. The summary of the variables selected in the interval from 2010 to 2019 for the descriptive analysis and estimation of the econometric model is presented in table 1.

Table 1. *Explanatory variables used to identify the determinants of footballer's market value*

Variable	Description
Market value	Footballers' market value log (in 1,000 euros)
Age	Age
Age²	Age square
Matches	Number of matches per year
Goals and assists	Number of goals and assists per year
Goals over minutes played	Number of goals divided by minutes played per year
Assists over minutes played	Number of assists divided by minutes played per year
Individual awards	Dummy that assumes value "1" for individual awards per year
Club value	Club value log (in 1,000 euros)
Outside Brazil	Dummy that assumes value "1" when playing outside Brazil
National team	Dummy that assumes value "1" when drafted for the national team
Club award	Dummy that assumes value "1" when awarded titles for the club
Dgoal	Dummy for goalkeepers
DDefenser	Dummy for defend players
Dmidfield	Dummy for midfielders
Dstriker	Dummy for strikers

[4] Other leagues with smaller numbers of Brazilian players.

3.2. Data

The database contains a panel with 10 years of information on the 500 most valuable Brazilian players at the end of 2019. This allows for the control of a greater number of factors in pursuit of a more reliable outcome. To create the data panel, the following methodology was used: the most valuable Brazilian players in 2019 were selected (before the COVID-19 pandemic, which caused an average devaluation of 18% in the market of the greatest players in the world [KMP Football Benchmark (2021)]), and their player data was tracked back to the year 2010; containing approximately 5,568 observations in total.

All the necessary information for the analysis was sourced from Transfermarkt (2023), a British website that contains data on the market values of football players and is regularly utilized in international sports journals. Furthermore, Transfermarkt also publicizes data on the players' performances in clubs and national teams, as well as their personal characteristics, widely used in academic research (Majewski, 2016; Wicker et al., 2013).

4. Results and discussions

Table 2 shows the average values of the main variables in different time periods (windows), which allows a longitudinal analysis. In general, regarding the individual performance variables, it is observed that their behaviour has remained relatively constant over the years (number of goals and assists, goals over minutes played, assists over minutes played). The player's market value and club's value variables also showed similar values over the years. The only variables that showed significant growth were age (due to the data collection methodology) and number of matches (it is believed that its increase is related to the development of the player's career, who tends to play more in the coming years of the research collection).

Football distinguishes the players' market value according to their position on the field. Generally speaking, the most decisive players, the strikers, have more visibility compared to defense players. Hence, to better capture the differences in market value, Carmichael et al. (1999) and Majewski (2015), among others, conducted separate analyses by field position.

The average market value of the 500 most valued Brazilian players in 2019 is presented in table 3. The averages are obtained according to the intervals created to estimate the econometric model. The increase in market value according to field position is evident. The goalkeeper was the only position to have its market value

increased over the years, which is explained by the longevity of the career. An older goalkeeper represents experience, hence the delayed prime compared to other positions. Following goalkeepers are defenders and full backs, who also play defense; midfield players (defensive midfielder, midfielder, attacking midfielder) and; offensive players, who respectively form the crescent order of most valued players[5]. In general, more visible players are "closer" to the opponent's goal, who are most valued as they are directly responsible for scoring the goals necessary to make their teams winners.

Table 2. *Determinants of the market value of the 500 most valued Brazilian players. 2010-2019*

Variables	1ª Window	2ª Window	3ª Window	4ª Window	5ª Window	6ª Window	7ª Window
	2013/ 2010	2014/ 2011	2015/ 2012	2016/ 2013	2017/ 2014	2018/ 2015	2019/ 2016
Market value (log) at US$ 1,000	15,67	15,55	15,45	15,34	15,29	15,17	15,10
Age	23,18	23,88	24,47	24,88	25,43	25,76	26,26
Age²	545,22	578,43	607,75	628,88	656,83	675,19	702,62
Matches	28,61	29,17	28,86	29,20	29,22	29,10	29,67
Goals and assists	7,18	7,38	7,19	7,04	7,27	7,51	7,71
Goals over minutes played	678,23	670,31	633,81	636,23	621,64	640,25	652,55
Assists over minutes played	638,30	626,63	623,95	640,97	641,39	664,48	699,51
Individual titles	0,02	0,02	0,02	0,03	0,02	0,02	0,02
Club value (log)	18,81	18,69	18,61	18,51	18,39	18,29	18,22
Outside Brazil	0,53	0,53	0,52	0,55	0,54	0,54	0,55
Played in the national team	0,27	0,27	0,22	0,17	0,15	0,11	0,10
Titles in the club	0,45	0,44	0,39	0,33	0,29	0,28	0,27
Observations	1.387	1.184	877	724	567	461	368

Note. From *Transfermarkt*, by Transfermarkt, 2023 (https://www.transfermarkt.com/).

[5] In the present article, we gathered midfield players (midfield, defensive and attacking midfielder). Similarly, defenders and full-backs were considered defence players.

Table 3. *Log of the mean market value (€ 1.000) for major league players in the Brazilian cup by field position from 2010 to 2019*

Variables	1ª interval	2ª interval	3ª interval	4ª interval	5ª interval	6ª interval	7ª interval
	2013/ 2010	2014/ 2011	2015/ 2012	2016/ 2013	2017/ 2014	2018/ 2015	2019/ 2016
Goalkeeper	14,633	14,570	14,819	14,785	14,857	14,914	14,923
Defender	15,609	15,485	15,360	15,314	15,304	15,163	15,081
Midfielder	15,834	15,769	15,615	15,403	15,343	15,191	15,103
Striker	15,831	15,640	15,520	15,467	15,349	15,214	15,161

Note. From *Transfermarkt*, by Transfermarkt, 2023 (https://www.transfermarkt.com/).

There are factors capable of influencing players' market value, such as age, since football is a high-performance sport in which physical conditioning is crucial. This, however, does not mean that older players cannot be productive. As previously cited, players' experience (human capital) is a decisive element to matches and championships. For that reason, it is not uncommon to find older players in the best clubs.

In sequence, we summarize the estimation strategy adopted in two tables that display the results of estimations for the market value determinants by the player's field position (table 4) and the complete model without limiting the sample to field position (table 5).

The main results in table 4 indicate that, among the human capital variables, age was most significant and positive for all positions, whereas age square presented negative and significant coefficient. This suggests that, after reaching a certain point in their careers, players devalue. The coefficients estimated for the game variable were positive and significant, suggesting that starting games increase the players' market value.

Regarding the structural capital variables, we highlight the importance of the club for market value, thus indicating that players from bigger clubs increase their market value. Another structural capital variable was the participation in the national team, which also increases players' market value.

Table 4. *Results of the OLS regression for market value determinants for the most valued 500 Brazilian players in 2019, by position - 2010 to 2019*

Variables	Models without fixed effects				Models with fixed effects control			
	Goalkeeper	Defender	Midfield	Strikers	Goalkeeper	Defender	Midfield	Strikers
Age	0,588*	0,540*	0,268*	0,128*	2,252*	1,084*	0,928*	0,948*
Age²	-0,009*	-0,010*	-0,005*	-0,002*	-0,038*	-0,017*	-0,016*	-0,016*
Matches	0,027*	0,020*	0,015*	0,023*	0,018*	0,015*	0,010*	0,014*
Individual titles	0,205	0,382	0,236	0,316**	1,015***	0,237	0,140	0,173
Club value (log)	0,584*	0,487*	0,540*	0,547*	0,225	0,297*	0,220*	0,283*
Outside Brazil	-0,498	-0,021	0,751**	-0,092	0,004	0,179	0,524***	-0,738
National team	0,194	0,720*	0,798*	0,889*	-0,085	0,481*	0,508*	0,531*
Club titles	0,080	0,119***	0,119***	0,125***	-0,069	0,072	-0,011	0,016
Leagues, continents and windows (dummies)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects (club and players)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	144	870	827	770	144	870	827	770
R^2	0,803	0,633	0,634	0,648	0,927	0,848	0,876	0,898

Note. From *Transfermarkt*, by Transfermarkt, 2023 (https://www.transfermarkt.com/).

*, ** and *** Significance at 1%, 5% and 10%, respectively.

Next, table 5 shows the results of the complete model for different controls. Specifically, results for model III, after the addition of club-year interaction, indicate that the variables age and number of matches remain positive and significant, thus emphasizing the importance of experience (despite decreasing over time) and field presence (line-up players, except for goalkeepers). The structural variable club value highlights the club's importance to determine players' market value. Moreover, playing Outside Brazil (especially in European leagues), playing for the national team, and being awarded club titles are the most important determinants of market values considering club-year interactions.

Table 5. *Results of the OLS regression for market value determinants for the 500 most valued players in 2019. 2010 to 2019*

Variable	All players			Lineup players only		
	Model I	Model II	Model III	Model I	Model II	Model III
Age	0,277*	0,942*	0,858*	0,274*	0,936*	0,858*
Age ²	-0,005*	-0,016*	-0,018*	-0,005*	-0,016*	-0,018*
Matches	0,020*	0,015*	0,015*	0,011*	0,008*	0,015*
Goals and assists	-	-	-	0,025*	0,018*	0,198*
Goals over minutes played	-	-	-	0,001	0,001	0,261*
Assists over minutes played	-	-	-	0,001	0,001	0,194
Individual titles	0,308*	0,151	0,198*	0,087	0,017	0,440*
Club value (log)	0,544*	0,308*	0,261*	0,531*	0,287*	0,049
Outside Brazil	0,157	0,200	0,194	0,162	0,249	1,267***
National team	0,763*	0,465*	0,440*	0,731*	0,459*	2,851*
Club titles	0,122*	0,047	0,049	0,090***	0,020	2,053**
Goalkeeper (dummy)	-0,456*	-2,688*	-1,267***	-	-	-
Defender (dummy)	-0,265**	-3,168*	-2,851*	-0,102***	-2,764*	0,858*
Midfield (dummy)	0,124**	-3,532*	-2,053**	-0,003	-3,107*	-0,018*
League, continents and windows (dummies)	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects (club and player)	No	Yes	Yes	No	Yes	Yes
Fixed effects (club) and interaction (club-year)	No	No	Yes	No	No	Yes
Observations	2.586	2.586	2.586	2.446	2.446	2.446
R^2	0,631	0,784	0,796	0,638	0,789	0,801

Note. From *Transfermarkt*, by Transfermarkt, 2023 (https://www.transfermarkt.com/).

*, ** and *** Significance at 1%, 5% and 10%, respectively.

5. Discussions

The research identified that players who play near the opposing goal (for example, strikers) are more valued and sought after by the market, while goalkeepers are less valued and less contested, corroborating Carmichael et al. (1999). Franceschi et al. (2023) justify this by stating that the possibility of scoring goals and assists is not

among the goalkeeper's duties, which results in less visibility in the transfer market. These results were observed both in the descriptive and econometric estimates (Models I and II) which indicated that the market value of strikers (the omitted variable) is higher than that of other players (goalkeepers, defenders, and midfielders), given the negative signs observed in the estimated coefficients. However, overall, the results emphasize that the human capital of football club assets is a crucial variable in estimating a player's market value, regardless of their position on the field.

Given that football is a high-performance sport, one of the most important factors influencing players' market value is their age. The younger the player, the higher their market value, as the return on investment is greater. Furthermore, younger players tend to have better physical conditions, a crucial factor in a high-performance sport. Carmichael et al. (1999) found an average age of 23 years for players in the English league in 1993 and 1994, however, this does not mean that older players cannot be productive since the average age varies between clubs and has increased in recent years with the development of sports medicine.

As previously mentioned, players' experience (human capital) is a decisive factor in matches and championships, then, for this reason, it is not uncommon to find older players in top clubs. More recent articles like Franceschi et al. (2023), Kiefer (2012) and Majewski (2015, 2016) indicate age as a determinant factor for a player's market value but do not specify the prime age or when players begin to decline in productivity.

Other significant factors in determining market value include appearance (number of matches played by time period) and number of matches played by national team. In other words, players who participate in more matches, whether for their clubs or national teams, are highly valued. Gerrard and Dobson (2000) and Wicker et al. (2013) emphasize the importance of appearance and minutes played with the national team, respectively, in assessing a player's market value, indicating that players with these characteristics send a positive signal to the transfer market, showcasing their qualities, and attracting attention during national team matches. The results obtained confirm the importance of the variable "played for the national team" which has positive and significant coefficients ranging from 0,720 to 0,889 (table 4). This shows that a player being called up and participating in matches for the Brazilian national team is a determining factor in increasing the market value of outfield players. Furthermore, also note that all explanatory variables demonstrated statistical significance in at least one of the estimated models, confirming their relevance as determinants of market value.

Regarding structural capital variables, it is necessary to highlight the importance of the club for market value, demonstrating that players from bigger clubs increase

their market value. Carmichael et al. (1999), Kiefer (2012), Majewski (2015, 2016), Wicker et al. (2013) also found a significant and positive relationship between human and structural capital variables and players' market value. This corroborates the hypothesis that being in a club with greater structural capital increases the market value of outfield players. In conclusion, these results support the argument that the player transfer market determines the value of a club's asset based on attributes of human and structural capital.

5. Conclusion

Football is the most popular and widely practiced sport in the world, and as such, it has become a highly valued business capable of generating billions of dollars annually through player transfers (signing and sales), broadcasting rights, fan merchandise, matchday revenues, among other commercial means of generating income. According to Franceschi et al. (2023) and Gerrard and Dobson (2000), football players are core assets for clubs, and their valuation is an important and significant determinant of clubs' financial status.

Clubs are responsible for managing their revenues and expenses, but unlike many private companies in the productive sector, clubs have their most important assets in intangible form. For this reason, their financial situation is different because the intangible assets are their players, who are also responsible for the financial prosperity and on-field performance of the clubs.

Based on this, this work aimed to analyse the market value of footballers through a set of variables related to human capital (football abilities) and structural capital (the club's infrastructure that supports the footballers' human capital development). Using a dataset containing information on the 500 most valuable Brazilian football players in 2019 (data was collected by Transfermarkt) and econometric techniques (panel data model estimations with player fixed effects, club fixed effects, and club-year interaction effects controlled for), the results indicated that human capital (skills and performance) is positively related to a player's market value, independently from their position on the field. Variables like matches, goals and assists showed that a part of the players' value is related to their performance and success. This has a positive impact on their market values along with the better organizational structure (Structural Capital) provided by the clubs for which they play.

We can cite as major limitations of the present investigation: (i) the impossibility of building the relational capital variable (player-supporters relationship) due to social media limitations, which did not allow access to a player's number of followers,

for instance; (ii) the choice of most valued players in one year only (2019) and monitoring previous years rather than choosing the 500 most valued players in each year. We aimed to prevent losses for the data panel analysis; (iii) profit from trading players does not necessarily belong to clubs. There are players who have their rights sold to businessmen and companies, situations that were not analysed because that information was not stored in any databases; (iv) the impossibility of estimating the effects of the combined interaction club-year and player-year due to the numerous dummy variables that would hinder the estimation with multi-collinearity issues.

Finally, considering the fixed effects controls for clubs and club-year interactions, the combination of human capital and structural capital expands its economic importance in pricing the value of footballers. In practical implications, the results emphasize that football clubs, like any business, are utility maximisers subject to financial constraints. In these terms, the club's goal is to maximize its sporting gains, and, to do so, increasing its financial capacity contributes to achieving its objectives. To achieve this, it is necessary to understand the determinants of their assets in order to price them appropriately. Understanding the pricing of its assets is essential for a company to enhance its management and increase its potential for financial success. In football, this understanding is even more crucial since player transfers, for many clubs, constitute the primary source of income. Therefore, it is pivotal for clubs to improve their management in order to profit from selling players in the future.

Author contributions:

Lopes, L.L.: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft. **Do Monte, P.A.:** Conceptualization, Methodology, Software, Writing, review, and editing, Visualization, Supervision, Project administration.

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Conflict of interest statement

Authors declare that, throughout the research process, there has not been any sort of personal, professional, or economic interest that may have influenced the researchers' judgement and/or actions during the elaboration and publication of this article.

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