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Management of Transfer Prices in Professional Football as a Function of Fan Numbers

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Abstract: The intention of this paper is to provide new academic insights regarding an economically explainable valuation of transfer prices for European football players based on mathematical modeling. Football is the most popular sport in the world followed by approximately 3.5 billion people. The increasing commercialization and professionalization of the industry implies that every area of a football club is constantly put to the test for improvements. Especially after suffering financially under the consequences of the worldwide pandemic, clubs focus not only on sporting success but also on financial survival. Only financially stable clubs have the resources to be more successful. An expensive team does not have to be successful in terms of sports performance. However, a successful team in sports is expensive in the long run. Increasing digitalization offers new revenue potentials for football clubs that focus on selling merchandise in addition to gameday revenues and its media exploitation rights. However, player transfers have become increasingly important because these costs and revenues increased substantially in the relevance of a club's financial situation. Regarding transfer costs, the question arises as to how transfer fees are determined and which factors have a major influence here. Clubs try to find new ways of evaluating the potential profit of player transfers to lower the risk of failed player investments. The aim of this article is to quantify the popularity of a football player in terms of his merchandising potential to amortize his transfer price. The mathematically formulated relationship calculates a reference value for a player, taking performance, age, number of customers purchasing merchandise, and player position into account. The information gained can be used by managers of European football clubs as a guide in transfer negotiations. For 6907 players of the European top leagues, we analyzed data in the period from 2003 to 2019. For 409 players in the season of 2018/2019 complete data sets were available, so that a model for calculating a theoretical transfer fee for a player during that season could be determined. The results of the study and the developed model suggest that, based on the available data, a football club should offer either one-year or three-year contracts to a transferred player, depending on the anticipated profit margin of merchandise sales and the quota of potential buyers of the products representing a percentage of the number of customers purchasing merchandise. This information gives football club's management the chance to make better transfer decisions for the individual situation of the player and the club itself. Due to the increased importance of transfers on a football club's financial performance, better transfer decision making leads to an improved financial stability of the respective clubs and eventually to sporting success.

Keywords: mathematical modeling; regression model; football player; transfer value; popularity; merchandising potential; superstar

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1. Introduction

The pandemic has given evidence to suggest that business models of football clubs are ill-equipped to mitigate the effects of unexpected events of such magnitude where certain

revenue streams disappear abruptly. A significant drop in spectator numbers, as well as declining revenues from transfers, have resulted in lower overall revenues for all clubs. Player transfers play one of the more important roles as they directly or indirectly affect all clubs and represent a significant cost. For example, the expenses of Bundesliga clubs fell from EUR 926.25 million in the season of 2019/2020 to EUR 361.8 million in the season of 2020/2021. Transfer income fell from EUR 656.05 million to EUR 337.27 million [1]. Based on these data and when comparing these numbers to other sources of income, it can be assumed that transfer prices represent an important parameter in the clubs' business models. The ultimate goal of a football club is to be successful on a sporting level which should also lead to financial success. Therefore, clubs are "forced" to use transfers as an optimization for sporting success. This raises the question of which source of income is suitable for football clubs to finance transfer fees.

According to sports.web-netz, with increasing digitalization, merchandise sales for football clubs in Europe, specifically in Germany, have been growing constantly over the last years. During the season of 2018/2019, the portion of merchandise sales increased to over 30 percent of total sales [2]. Vladimir Andreff (2010) [3] lists merchandising as a pillar of financing transfer fees and salaries, in addition to TV rights and classic financing instruments. Moreover, Hung Xuan Do et al. (2021) [4] state merchandising is a major source of revenue for clubs, in addition to TV revenues and ticket sales. Consequently, when decisions about possible transfers are made, merchandise potential is analyzed by the financial management of a football club to calculate the amortization of the transfer fee. Despite the well-known "mega transfers", such as Ronaldo and Neymar, numerous player decisions are made by the clubs every year. For example, the number of transfers in professional football increased from just over 12,000 to over 17,000 from 2012 to 2020. It could be suggested that newly developed marketing strategies in today's digital age would be advantageous for clubs since merchandising represents one of the most significant factors [5].

As of January 2022, football player Cristiano Ronaldo was the world's biggest influencer on Instagram with 390 million followers, according to fussballdaten.de [6]. Lionel Messi follows in third place with 302 million followers. Even though these two players might be exceptions, they are followed on social networks by Neymar Jr. with 237 million, Gareth Bale with 87.6 million, and Mesut Özil with 77.8 million followers. Clubs are benefiting just as much from digital development and can boast about impressive numbers of followers, e.g., 221.8 million for Real Madrid, 215.3 million for FC Barcelona, and 132 million for Manchester United. Every action and every player transfer are thus witnessed by an audience of millions worldwide illustrating the reach and the potential of merchandise sales.

In July 2018, the football superstar Ronaldo moved from Real Madrid to Juventus Turin for EUR 117 million with an annual salary of EUR 31 million. Within the first 24 h after the announcement of the transfer, Juventus sold more than 520,000 "CR7" (a well-known nickname for Ronaldo) branded jerseys, financing almost half of Ronaldo's transfer fee. A similar pattern can be seen during Ronaldo's move from Juventus to Manchester United, where jerseys worth EUR 38 million were sold on the first day. In the first seven days, the jersey is also said to be the best-selling in the world (in one season). Roughly EUR 220 million are said to have been collected from sales of the jersey at all points of sale of the club. Ronaldo thus beat Messi who brought in "only" EUR 121 million through jersey sales to his club Paris Saint-Germain [7]. There are also reports of other revenue streams increasing, such as other merchandising articles, tickets to games, or follower growth in social networks. For example, according to magnecon.de [8], PSG recorded a follower increase of 10.8 million after signing Messi. Historically, the highest transfer fee paid for Neymar was EUR 222 million in 2017 for his move from FC Barcelona to Paris Saint-Germain [9]. These examples show the financial impact of signings for football clubs.

At the same time, from the club's perspective, the strategic acquisition of a player entails a systematic investment risk. This risk is associated with the uncertainty of the

club's future success, for example, qualification and placement in the national league or Champions League, as well as the player's risk of injury. With transfer fees sometimes of more than EUR 100 million, the risk for a club needs to be proactively managed. The need to quantify the total revenue potential of a player in a fair and realistic manner has therefore raised the awareness of various practitioners in the industry. The focus of the empirical study in this paper is therefore on the merchandising potential of an individual player as a means of explaining their transfer value.

In order to provide the advantage of applicable practicality to the football club's management, the transfer value is expressed in terms of the monetary amount of merchandising potential that can be attributed to the individual player, depending on a sensitivity analysis related to different market shares and a flexible pricing strategy of merchandising items. Management should be supported through a model exploiting the merchandising potential of a football player to amortize transfer value.

2. Literature Review

The growing merchandising market for football players has proven to be a real "game changer" in the European football industry. With revenue streams accounting for 40% of the total EUR 8.3 billion market of the top 20 football clubs in the season of 2017/2018 [10], the value driver of transfer prices in European leagues has recently evolved from performance to popularity. He, Miao [11] and Cachucho (2015) already discussed the shift in their study as Ante, Lennart. (2019) [12] further elaborates on the determination of transfer values through merchandise sales potential. The tendency for a non-linear increase in transfer values of top players has been recognized in science in recent years with reference to the superstar phenomenon [13], claiming that the hierarchy of income is not related to the hierarchy of talent. According to Adler [14], fame is based on popularity rather than talent. He points to positive network effects of popularity that account for the dominance of superstars. In sports economics, numerous empirical studies focus on the performance and characteristics of players to determine the success and value of football players [11,15–17] and teams [18], which is commonly referred to as "moneyball" [19]. Moreover, the concept of superstars has been further recognized by the literature due to their extraordinary popularity in the football industry in publications by Brandes and Franck [20], Franck and Nüesch [21], Frick [22], Garcia-del-Barrio and Pujol [23], Herm et al. [24], and Lardo et al. [25] with extensions of media relevance [26], or option-based valuations [27]. The literature also already addressed the increased relevance of crowd ratings in online portals in transfer evaluations of football players [28,29].

However, the effects of growth patterns in the context of popularity-related network effects have not yet been included in an overarching empirical approach. The debate on the social value of football players is not new in academic research. The most frequently cited works of Rosen [13] and Adler [14] as well as Frenger and Follert [30] undoubtedly mark the starting point for the study of the additional market value attributable to fame and popularity. Nevertheless, Chmait et al. [31] point to a research gap related to the empirical analysis of the superstar phenomenon of popularity in sports economics and its monetary value.

In particular, the positive network effects associated with global social media reach raise questions about professional athletes' current endorsement contracts with global players such as Nike and Adidas. In parallel, the academic literature has widely recognized the social value of popular athletes in digitalized marketing. Carlson et al. [32] explain the digital trend of using social media strategies to increase brand value by influencing target customers. From this perspective, they invest in popular athletes to market their bundled products [33] tailored to their target audiences. Yadav and Rahman [34] demonstrated that these social media marketing activities had a positive impact on purchase intentions as well as brand equity as they took advantage of the scaling capabilities of social media networks. In addition, Wakefield and Bennett [35] and Babutsidze [36] show the impact and speed of initiating positive electronic word-of-mouth (eWOM) from followers within their social

media communities. Finally, the study by Koronios et al. [37] highlights the power of sports sponsorship to drive revenue in digital marketing.

Overall, these studies provide further evidence of the potential of football superstars to influence their respective followers and drive sales for companies like Nike and Adidas on a global scale. It is clear that the social network value of today's football players builds on and exceeds the athletic performance of the top athletes. However, the combination of a player's social network value in terms of merchandising potential for the football club to amortize transfer fees has not been analyzed in academic research, because of which further scientific research is relevant. Finding a model for the explanation and valuation of transfer fees would support the transfer decision making of a club's management. Since this is a new approach to this subject no comparable models are currently known.

3. Materials and Methodology

Parallel to business valuations in emerging network industries [38,39], the total value of a football player is composed of the sum of their net present value based on the various revenue streams for the acquiring football club. According to Ross et al. [10], three pillars of revenue streams are the subject of their study:

First, it is assumed that football players' salaries are financed by match-day sales. However, the capacity of sold seats in a stadium is limited, regardless of whether the match is played by one or five top football players. For example, the marginal revenue of a Champions League match does not depend solely on the presence of Cristiano Ronaldo. Consequently, the individual value added by a football player in a match is not considered in this empirical study. Second, the revenue stream of broadcasting rights is concentrated on the league and not on individual players; therefore, this stream is also not included in this study. In parallel with the strong growth in transfer values, the third revenue stream, merchandise, has experienced the strongest growth in the recent past [10]. Thus, this study focuses on the individual value contribution of a football player to their football club which is reflected in the transfer value.

The following milestones of this empirical investigation are planned: First, a regression model will be used to address whether high popularity, measured by the number of followers on the social media channels Instagram and Twitter, correlates positively with transfer value. To build on the findings of previous research, the parameters of performance, age, and position of the player are also included.

Second, the question of the financing potential of a highly valued player through extraordinary merchandise sales is addressed. This is achieved using sensitivity analysis to show the marketing potential along the dimensions of different market shares and merchandise profits. The analysis exemplifies the discussion and visualization of the transfer value of the football superstar Cristiano Ronaldo. To validate the results regarding the "superstar phenomenon", a complementary reference group test is conducted.

The used model is based on Schneider's [39] equilibrium formula to determine enterprise value in network industries. The assumption is made that Schneider's model is a starting point for an equilibrium model to determine the economically fair transfer value of a professional football player. More specifically, Schneider's model establishes the following functional link between profit margins and the number of customers to determine the value of a firm:

$$\pi_j = (p_j - c)n_j \tag{1}$$

In the figurative sense, the value π_j corresponds to the value of the player. It is defined as the potential to increase merchandising sales for the player's club by monetizing the externalities of player popularity on social media. The data for π_j is taken from the transfermarkt.com (accessed on 17 June 2022) [40] database. The difference $(p_j - c)$ symbolizes the profit margin of the merchandising potentials as well as additional sponsoring potentials. The sales prices and additional sponsorship income are denoted by p and the production costs of the merchandising products by c. Merchandising refers to all types of products,

jerseys, scarves, coffee mugs, etc. as well as ticket prices for matches. n_j is the number of potential customers or fans who buy the merchandising products.

Since there is no information about the number of customers, the following functional relationship is established, which allows determining their number recursively:

$$\pi_j = \alpha + \beta_1(Performance) + \beta_2(Age) + \beta_3(n_j) + \beta_4 f(Position) \quad (2)$$

Equation (2) considers that performance, age, number of customers purchasing merchandise and player position explain the value of the player on the transfer market and determines a regression. These factors are also considered in earlier studies by Felipe, J.L et al. (2020) [41] and Ante, Lennart (2019) [12]. Player performance is the quotient of the sum of total minutes played in a season and the total number of minutes played. The closer this quotient is to 1, the better the player's performance. Another relevant input parameter is the age of the player. Since the number of customers n is not available, the average number of followers on Instagram and Twitter is used to obtain the regression coefficient. It is assumed that the β_3 coefficient for customers and the sum of followers in the two social media networks Instagram and Twitter are similar. Finally, dummy variables are used in the regression model to reflect the different positions of striker, midfielder, defender, and goalkeeper.

To determine the coefficients in (2), a total of 18,843 records from a database with a total of 6907 players were analyzed. This study is limited to the top European leagues over the period from 2003 to 2019. Data points from the German Bundesliga, the English Premier League, the Spanish Primera Division, etc. including players of all teams of the respective leagues were recorded. To be able to determine the most accurate model, the composed data was analyzed to identify a season where all relevant details about the players were known. The findings showed complete datasets with the input parameters performance, aging, Instagram and Twitter followers, transfer market values, and playing position only for the season of 2018/2019 because of which the study was limited to those years. In total, a sample of 409 players in the year 2018/2019 was generated.

The regression carried out provides the input parameters for calculating the expected potential number of customers or fans who buy merchandising articles from the club. With these input values, Formula (2) can be converted into:

$$n_j = \frac{\alpha + \beta_1(Performance) + \beta_2(Age) + \beta_4 f(Position)}{(p_j - c) - \beta} \quad (3)$$

where

$$\pi_j = (p_j - c)n_j$$

By substituting the regression coefficients from Equation (2) into Equation (3), we calculate the fair expected number of customers for each player.

The model for calculating the fair transfer fee φ_j considers not only the profit margin per season and the number of potential buyers, but also the quota of buyers γ_j and the number of years τ_j for which the player is committed to the club. The formula for calculating the fair transfer fee is as follows:

$$\varphi_j = n_j \gamma_j \tau_j (p_j - c) \quad (4)$$

γ_j and τ_j are variables that arose from held conversations with football club business managers. The duration of a contract τ_j plays a corresponding role in the transfer fee. The longer a contract is concluded, the more merchandising products and tickets a club can sell. The rate of potential buyers of the merchandising products γ_j is also an important variable. The higher the number of fans who come to the stadium due to a newly transferred player the more fans buy the merchandising products, consequently increasing the club's earnings. Both variables could therefore also have an impact on the transfer fee. However, according to the held conversations with football club managers from the German Bundesliga, both

variables are subordinate to the performance on the field of a transferred player. For example, a defensive player is less attractive to fans than a forward player in terms of marketing merchandise products. However, the defensive player is at least as important for the team as a forward player.

Due to the lack of reliable data, both variables are used as sensitivities in the calculation as part of further analyses.

To check the validity of the model, the last transfer fees actually paid by new football clubs are added to the sample. The transfer fees were collected from transfermarkt.com (accessed on 17 June 2022) [40]. After further adjustment, due to missing transfers and the fact that players can also transfer free of transfer fees, a sample size of 249 data records is obtained.

Subsequently, we calculate the sensitivity of the transfer fees for the combinations of the ratio of buyers γ_j = {1; 0.75; 0.5; 0.25; 0.1}, the profit margin per merchandise $(p_j - c)$ = {10; 20; 30; 40; 50}, and the contract term in years τ_j = {1; 2; 3; 4; 5}. This results in 25 combinations, which are scientifically analyzed with a paired *t*-test and finally compared to the actual transfer fees paid.

4. Results

The empirical studies were carried out using SPSS statistical software and started with the multivariate regression analysis of Formula (2) to obtain the coefficients for further calculations (Tables 1–3).

Table 1. Multivariate regression of market values of football players. Model summary [b].

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.610 [a]	0.372	0.363	21916507.56433	1.976

[a]. Predictors: (Constant), Position=Midfield, Avg_Follower, Performance, Age, Position=Goalkeeper, Position=Defense. [b]. Dependent Variable: Market_Value.

Table 2. Multivariate regression of market values of football players. Anova [a].

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	114,411,731,718,778,000.00	6	19,068,621,953,129,700.00	39.699	0.000 [b]
	Residual	193,093,988,134,522,000.00	402	480,333,303,817,220.00		
	Total	307,505,719,853,300,000.00	408			

[a]. Dependent Variable: Market_Value. [b]. Predictors: (Constant), Position=Midfield, Avg_Follower, Performance, Age, Position=Goalkeeper, Position=Defense.

Table 3. Multivariate regression of market values of football players. Coefficients [a].

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	36,321,635.54	8,211,232.658		4.423	0.000		
	Performance	22,777,278.35	3,922,202.072	0.233	5.807	0.000	0.967	1.034
	Age	−793,591.7657	300,324.719	−0.109	−2.642	0.009	0.911	1.097
	Avg_Follower	1.598586393	0.134968133	0.487	11.844	0.000	0.925	1.081
	Position=Defense	−11,101,445.83	2,739,542.109	−0.189	−4.052	0.000	0.719	1.391
	Position=Goalkeeper	−8,462,367.349	4,496,323.3	−0.082	−1.882	0.061	0.829	1.206
	Position=Midfield	−5,139,211.442	2,824,938.443	−0.084	−1.819	0.070	0.740	1.351

[a]. Dependent Variable: Market_Value.

With a corrected R Square of 36.3%, the regression analysis is of sufficient quality. At the same time, all independent variables are significant. The coefficients are used to calculate the expected number of customers according to Equation (3). In the context of these calculations, the respective expected numbers of customers for profit per merchandise

$(p_j - c)$ = {10; 20; 30; 40; 50} are determined. Consequently, the number of expected customers decreases as the profit margin increases, since fewer and fewer fans are willing to pay the profit margins as prices increase. This simulates a proportionally elastic price elasticity.

This is followed by the calculation of the appropriate replacement value by using Equation (4). It is considered that the profit margin used to calculate the expected number of customers always corresponds to the profit margin in Equation (4). Equation (5) explains the procedure for the player Christian Pulisic with a profit margin $(p_j - c)$ = 20, with the number of contract years τ_j = 3, the expected number of potential customers n_j = 1,463,353 as calculated in Table 4, and the assumed rate of potential buyers γ_j = 0.25.

$$\varphi_{Pulisic} = n_j \gamma_j \tau_j (p_j - c) = 1,463,353 * 0.25 * 3 * 20 = 21,950,295 \quad (5)$$

Table 4. Calculation of the expected number of customers depending on the profit margin (extract from the database of the first eight players—$(p_j - c)$).

Name	n(proxy)	n(proxy)	n(proxy)	n(proxy)	n(proxy)
	10€	**20€**	**30€**	**40€**	**50€**
Abdul Rahman Baba	1,035,229.74	472,635.458	306,220.382	226,477.568	179,685.648
Amine Harit	2,164,822	988,352.244	640,353.144	473,598.855	375,749.874
Andrej Kramaric	2,489,688.56	1,136,670.48	736,448.49	544,670.023	432,137.22
Bobby Wood	2,080,717.16	949,954.069	615,474.977	455,199.209	361,151.729
Branimir Hrgota	1,966,911.26	897,995.845	581,811.258	430,301.855	341,398.35
Christian Pulisic	3,205,233.49	1,463,353.43	948,106.283	701,210.035	556,334.922
Corentin Tolisso	1,543,900.3	704,869.649	456,684.85	337,759.601	267,976.001
Davie Selke	2,257,929.77	1,030,860.72	667,894.371	493,968.074	391,910.663
...	...	...	...	...	...

The combination of these input variables leads to 25 different samples, which are further compared to a reference value: the last known realized transfer price of a football player (real_last_Transfer). The variable name (g_01_t_1_pc_10) understands g as the gamma (γ_j = 0.1), t as the tau (τ_j = 1), and pc as the profit margin ($(p_j - c)$ = 10) (Tables 5 and 6).

Table 5. Sample comparison test of transfer values.

		Mean	Std. Deviation	Std. Error Mean
Pair 1	real_last_Transfer - g_01_t_1_pc_10	18,166,907.6	24,218,432.1	1,534,780.77
Pair 2	real_last_Transfer - g_025_t_1_pc_20	14,362,015.3	24,010,875.6	1,521,627.42
Pair 3	real_last_Transfer - g_05_t_1_pc_30	7,972,155.52	23,783,980.6	1,507,248.53
Pair 4	real_last_Transfer - g_075_t_1_pc_40	1,665,694.77	23,713,048.1	1,502,753.36
Pair 5	real_last_Transfer - g_1_t_1_pc_50	−4,609,059.49	23,794,690	1,507,927.21
Pair 6	real_last_Transfer - g_01_t_2_pc_10	15,200,722.9	24,052,044.5	1,524,236.39
Pair 7	real_last_Transfer - g_025_t_2_pc_20	7,590,938.23	23,775,348.2	1,506,701.47
Pair 8	real_last_Transfer - g_05_t_2_pc_30	−5,188,781.34	23,809,863.1	1,508,888.76
Pair 9	real_last_Transfer - g_075_t_2_pc_40	−17801702.8	24,451,292.8	1,549,537.72
Pair 10	real_last_Transfer - g_1_t_2_pc_50	−30,351,211.3	25,643,504	1,625,091.03

Table 5. *Cont.*

		Mean	Std. Deviation	Std. Error Mean
Pair 11	real_last_Transfer - g_01_t_3_pc_10	12,234,538.2	23,918,214	1,515,755.23
Pair 12	real_last_Transfer - g_025_t_3_pc_20	819,861.155	23,715,203.8	1,502,889.97
Pair 13	real_last_Transfer - g_05_t_3_pc_30	−18,349,718.2	24,492,270.9	1,552,134.6
Pair 14	real_last_Transfer - g_075_t_3_pc_40	−37,269,100.4	26,511,261.7	1,680,082.95
Pair 15	real_last_Transfer - g_1_t_3_pc_50	−56,093,363.2	29,502,234.8	1,869,628.16
Pair 16	real_last_Transfer - g_01_t_4_pc_10	9,268,353.49	23,817,489.6	1,509,372.07
Pair 17	real_last_Transfer - g_025_t_4_pc_20	−5,951,215.92	23,831,770.2	1,510,277.07
Pair 18	real_last_Transfer - g_05_t_4_pc_30	−31,510,655	25,779,119.2	1,633,685.3
Pair 19	real_last_Transfer - g_075_t_4_pc_40	−56,736,498	29,618,448.5	1,876,992.9
Pair 20	real_last_Transfer - g_1_t_4_pc_50	−81,835,515	34,706,843.2	2,199,456.82
Pair 21	real_last_Transfer - g_01_t_5_pc_10	6,302,168.77	23,750,292.3	1,505,113.62
Pair 22	real_last_Transfer - g_025_t_5_pc_20	−12,722,293	24,122,485.8	1,528,700.42
Pair 23	real_last_Transfer - g_05_t_5_pc_30	−4,4671,591.9	27,585,948.4	1,748,188.45
Pair 24	real_last_Transfer - g_075_t_5_pc_40	−76,203,895.6	33,482,565.4	2,121,871.37
Pair 25	real_last_Transfer - g_1_t_5_pc_50	−107,577,667	40,744,798.5	2,582,096.69

Table 6. Sample comparison test of transfer values, part A.

		Lower	Upper	t	df	Sig. (2-tailed)
		95% Confidence Interval Difference				
Pair 1	real_last_Transfer - g_01_t_1_pc_10	15,144,040.8	21.189.774.5	11.837	248	0.000
Pair 2	real_last_Transfer -g_025_t_1_pc_20	11,365,055	17.358.975.6	9.439	248	0.000
Pair 3	real_last_Transfer - g_05_t_1_pc_30	5,003,515.52	10.940.795.5	5.289	248	0.000
Pair 4	real_last_Transfer -g_075_t_1_pc_40	−1,294,091.66	4.625.481.2	1.108	248	0.269
Pair 5	real_last_Transfer - g_1_t_1_pc_50	−7,579,036.2	−1.639.082.77	−3.057	248	0.002
Pair 6	real_last_Transfer - g_01_t_2_pc_10	12,198,624.1	18.202.821.8	9.973	248	0.000
Pair 7	real_last_Transfer -g_025_t_2_pc_20	4,623,375.69	10.558.500.8	5.038	248	0.000
Pair 8	real_last_Transfer - g_05_t_2_pc_30	−8,160,651.91	−2.216.910.76	−3.439	248	0.001
Pair 9	real_last_Transfer -g_075_t_2_pc_40	−20,853,634.6	−14.749.771.1	−11.488	248	0.000

Table 6. *Cont.*

		Lower	Upper	t	df	Sig. (2-tailed)
		95% Confidence Interval Difference				
Pair 10	real_last_Transfer - g_1_t_2_pc_50	−33,551,951.1	−27,150,471.6	−18.677	248	0.000
Pair 11	real_last_Transfer - g_01_t_3_pc_10	9,249,143.62	15,219,932.8	8.072	248	0.000
Pair 12	real_last_Transfer -g_025_t_3_pc_20	−2,140,194.35	3,779,916.66	0.546	248	0.586
Pair 13	real_last_Transfer - g_05_t_3_pc_30	−21,406,764.7	−15,292,671.7	−11.822	248	0.000
Pair 14	real_last_Transfer -g_075_t_3_pc_40	−40,578,150.9	−33,960,050	−22.183	248	0.000
Pair 15	real_last_Transfer - g_1_t_3_pc_50	−59,775,737.3	−52,410,989.1	−30.002	248	0.000
Pair 16	real_last_Transfer - g_01_t_4_pc_10	6,295,531	12,241,176	6.141	248	0.000
Pair 17	real_last_Transfer -g_025_t_4_pc_20	−8,925,820.86	−2,976,610.97	−3.940	248	0.000
Pair 18	real_last_Transfer - g_05_t_4_pc_30	−34,728,321.8	−28,292,988.2	−19.288	248	0.000
Pair 19	real_last_Transfer -g_075_t_4_pc_40	−60,433,377.5	−53,039,618.5	−30.227	248	0.000
Pair 20	real_last_Transfer - g_1_t_4_pc_50	−86,167,511.6	−77,503,518.5	−37.207	248	0.000
Pair 21	real_last_Transfer - g_01_t_5_pc_10	3,337,733.63	9,266,603.9	4.187	248	0.000
Pair 22	real_last_Transfer -g_025_t_5_pc_20	−15,733,184.1	−9,711,401.85	−8.322	248	0.000
Pair 23	real_last_Transfer - g_05_t_5_pc_30	−48,114,781.3	−41,228,402.5	−25.553	248	0.000
Pair 24	real_last_Transfer -g_075_t_5_pc_40	−80,383,081.8	−72,024,709.4	−35.914	248	0.000
Pair 25	real_last_Transfer - g_1_t_5_pc_50	−112,663,302	−102,492,032	−41.663	248	0.000

The results show that the null hypothesis, which assumed that the differences in transfer values are equal to zero, must always be rejected with the following exceptions:

1. The combination of a profit margin of EUR 20, a contract period of three years, and 25% buyers from the number of customers.
2. The combination of a profit margin of EUR 40, a contract period of one year, and 75% buyers from the number of customers.

Thus, the management has the option to sign a "superstar" for a short period of time or to hire a more average player fitting the setup over a three-year period.

The sensitivity of these combinations is illustrated in the following figure for the example of Robert Lewandowski. Based on the data calculated above, a club would have to pay a transfer fee of EUR 15.9 million for a one-year contract and EUR 16.6 million for a three-year contract. The current estimation of the transfer fee for Robert Lewandowski is mentioned to be around EUR 40 million which is more than double the amount the study would show under the given parameters [42]. When the profit margin and quota of buyers are set differently, the result of the formula would be closer to the current transfer fee estimation by the media. However, for this analysis these two factors are just rough estimates, management of the buying club would be able to pinpoint these factors more accurately (Figure 1).

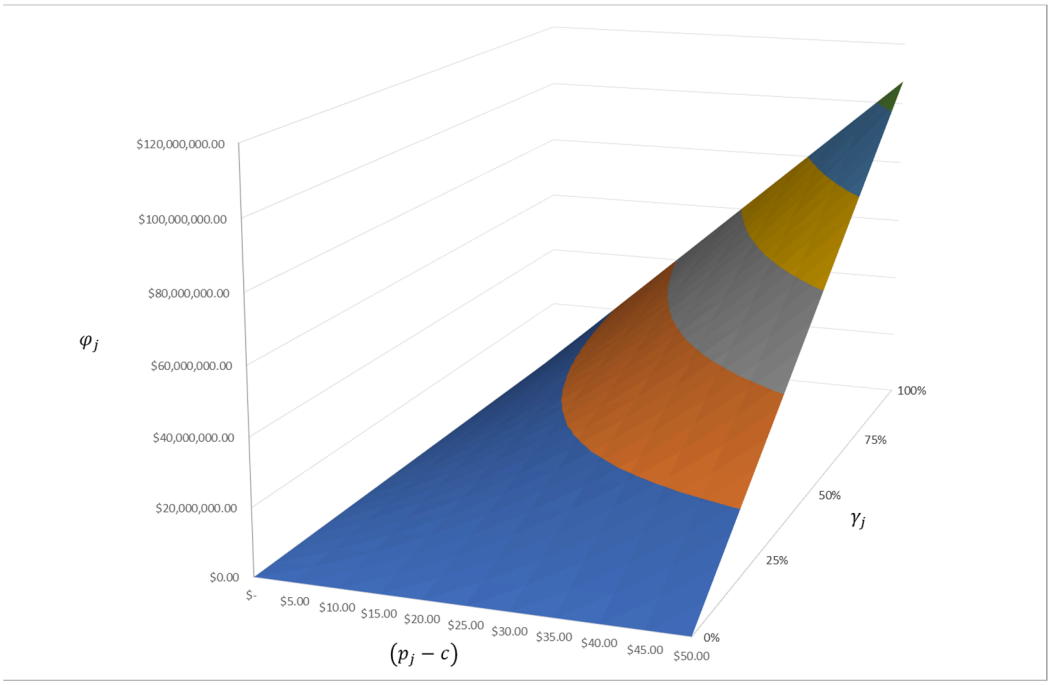

Figure 1. Expected transfer value of Robert Lewandowski depending on the profit margin of merchandising products and the quota of potential buyers (own calculation).

5. Discussion

Overall, this study provides a model for the explanation and valuation of transfer fees to improve the decision making of a club's management regarding a possible transfer. Since this is a new approach to the subject of marked value evaluation based on merchandise potential there is no comparable model currently known.

However, there are factors that need to be taken into account when interpreting the results. The model component age could be adjusted. Squaring the age factor makes sense in the context of examining performance effects in gambling. In this case, a non-linear concave course of a regression function in quadratic form (inverted U) can be assumed. In contrast, age has no such slope in the case of player's popularity. The study did not show a relationship either between age as the independent variable and market values as the dependent variable, or between age and followers on social networks (Twitter, Facebook, Instagram) as part of research for a working paper "The Social Network Value of Professional Soccer Players" [43].

Furthermore, it should be noted, that the uncertainty about the made assumptions of merchandise profit margin and buyer's quota limit the accuracy of the formula. When profit margins decrease substantially due to unforeseen events, a calculated marked value might deflate drastically. Additionally, the development of a player after a transfer is not taken into account, Merchandise sales can increase substantially with the success of a player and a team. Therefore, this formula needs to be seen as a risk evaluation of the amount spent for a transfer.

The presented results were determined exclusively for the 2018/2019 season. Deviating correlations may be ascertainable for other periods. This study would need to be repeated on a yearly basis including all relevant data points.

6. Conclusions

The severe impact of the Covid-19 pandemic on all sectors of the economy has also left its mark on professional football. Due to the growing uncertainty of revenue streams, football clubs will have to adapt and further incorporate business aspects into their decision-making process more than ever before. The objective of this paper is to present a statistical

model that could be used as a quantifiable method for determining an appropriate transfer fee for a football player, based on an analysis of their predicted impact on the merchandising revenue for their club.

The presented model offers the management of a football club a method to appropriately determine the transfer price for a potential player based on the individual player's statistics and the anticipated merchandising potential.

While the individual statistics of a player, such as age, position, and performance are known quantifiable factors, the merchandising potential is defined by the profit margin of merchandise sales and the quota of potential buyers of the products. The two factors of profit margins of potential merchandise sales and the assumption of a buyer's quota are usually appropriate assumptions by a club's management but are subject to inaccuracies.

If management can appropriately assume the level of inaccuracy, it could decide on the level of risk they are willing to take with a player's acquisition, either by allocating the transfer fee on the first season's prediction only or by spreading it over several seasons, for example over the duration of a multi-year contract.

The examined correlations in this study show that not only the player position, the number of followers, the age, and the performance of a player are highly significant variables in determining and explaining a player's market value but also that merchandising potential of a player directly impacts the calculation of the transfer fee. Using the coefficients from the regression analysis, Schneider's [37] model was modified to allow for a transfer fee to be calculated.

The comparison between the modeled transfer fees and the actual transfer fees paid identified two strategies that the management of football clubs could pursue:

1. With a profit margin of EUR 20, a contract term of three years, and 25% buyers from the number of customers.
2. With a profit margin of EUR 40, a contract term of one year, and 75% buyers from the number of customers.

These results imply that a player with an anticipated higher merchandise potential and higher profits—superstar potential—should receive a one-year contract while an average player with lower expected profits and a smaller customer base should receive a multi-year contract.

By providing management with this tool to facilitate the decision making of transfers, the economic situation of the club can be stabilized and sustainably enhanced. Therefore, they can mitigate transfer risks, allowing them to manage their financial resources for sustainable growth and to secure employment of their staff also during times of financial uncertainty.

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