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Football players' transfer price determination based on performance in the Big 5 European leagues

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Abstract

The existing literature on the determinants of football players' transfer prices considers bargaining theory and identifies buyer and seller characteristics as main influences. No attention has been brought to performance measures which were directly observable and quantifiable. This study uses a normalised position-specific performance measure to investigate the issue. It finds evidence that player performance does play a role in the determination of transfer prices although the model suffers from incoherencies. The model also investigates a player's previous contract duration's effect on the amount of the transfer fee paid. A positive relationship between months remaining on a player's contract and the fee paid for that player has been found.

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I. Introduction

Football is the world's most popular sport. According to FIFA, football's international governing organization, 3.2 billion people watched the FIFA World Cup 2014 final from their television at home. National football federations compete heavily on being awarded its organization and are ready to do almost anything to do so as shown by recent corruption scandals. Football is growing, clubs expand their fan base internationally and broadcasting revenues increase every year. The major European leagues (French Ligue 1, English Premier League, Spanish Liga, Italian Serie A and the German Bundesliga), referred to as the Big 5, concentrate the financially most powerful football clubs on the planet. The total international transfer expenditure in 2014 was estimated by FIFA at 3.6 billion USD which stresses the economic importance of the football market.

Academic researchers began showing interest around 1970 with the first influential analysis of the football industry made by Sloane (1969). With the growing media attention and the extensive regulation of the football labour market Fricks (2007) observes that statistical data on transfer and salaries has become readily available. Sports is considered a perfect environment to test competition and labour market theories (Sloane, 2015). Hence, a large body of the literature attempted to find the determinants of transfer prices and player salaries as well as analysing the industry in terms of competitive balance.

This research will focus on transfers. Transfer expenditure per clubs, as measured as the combined expenditure of all players who have been transferred to a club has been growing in the big five over the last five years (Poli et al., 2015a). Although most studies use bargaining theory to analyse the determinants of transfer prices, little attention has been given toward using performance as the main determinant. After all, it is a footballer's skill and talent which is acquired through a transfer and the price paid by clubs should in theory reflect that.

Therefore, this paper investigates to what extent performance determines a football player's transfer price in the major European football market.

Firstly, a description of football club's objectives and behaviour will be explained preceding a presentation of the regulatory nature of the football transfer market. Empirical evidence over the determinants of transfer prices will be highlighted. Secondly, the data shall be presented and the main variables explained. Thirdly, the performance indicators used will be described and the model proposed. Fourthly, the econometric model will be tested and results depicted. Those results will be subject to robustness checks to assess their reliability before their interpretation. Limitations of the research shall also be noted. The last part will cover concluding remarks and possible directions for future research.

II. Literature review

The following section highlights key assumptions and results presented in the literature about the economics of professional football. Mainly, the football club's maximization problem, the regulations of the football labour market and empirical evidence of the determinants of player transfer prices.

1. Club objectives

European football is organised in leagues across countries. Each country has a top professional league (for example the Barclays premier League in England or the Ligue 1 in France) followed by several professional minor leagues. Those leagues are separate entities with their own rules and decision making procedures in place to produce a product attractive to fans and potential

sponsors (Flynn et Gilbert, 2001). Each league is part of a broader regional organization, the European one being the UEFA, which organizes European wide competitions. It is itself dependent of the worldwide football organization FIFA which sets up regulation to be followed by the regional organizations and country leagues.

Clubs ascend or descend between their country leagues depending on their season's result and gain financial returns from the league for their performance. Given the competitive nature of sports and business, clubs compete for their relative position in those leagues to achieve sporting and economic success. The paradox is that not all can do so simultaneously which has led leagues to engage in cross-subsidization (or revenue sharing) such as parachute payments to descending teams or common bargaining of broadcasting rights (Sloane, 2015). Those are set to insure that competition within a league remains viable and games entertaining.

In this context the literature has identified assumptions under which football clubs operate and interact. The main debate takes place between whether football clubs are profit maximising or utility (success) maximizing. The former relates to a football club whose objective function is dominated by profits while the latter motivates that clubs can be driven by sporting success subject to a budget constraint of zero profits (Sloane, 1971). This distinction implies differences in the way clubs spend money on their players. For example, cross-subsidization in the form of collectively selling broadcasting rights, which allows for smaller clubs to earn more from broadcasting than they would if bargained for individually. Under a profit-maximising model a club would not be inclined to spend everything on new players but would rather increase dividend payments to shareholders (Leach et Szymanski, 2015). Sporting success is therefore sacrificed for shareholder returns. A success maximizing club would spend most if not all of that money on new players in order to guarantee a particular level of performance. This reasoning is also used by Leach and Szymanski (2015) to deduce that under success-

maximization reallocation of revenues between a league's clubs theoretically reinforce the competitive balance.

Sloane (1971) argues that European football is closer to the success-maximization model because of limits on dividends received by shareholders and fees paid to directors. This claim has been tested in the English and Spanish top leagues. Using team performance and revenues to derive best responses for each club Garcia-del-Barrio and Szymanski (2009) showed that Spanish and English clubs operate following success-maximization. This debate is of relevance here because it has been predicted that there would be greater demand for talent under success-maximization as well as greater incentives for clubs to retain their talent (Sloane, 1971).

2. Football labour market and regulations

In 1995 the European Commission took interest in regulating the European football transfer market. Football players affiliated to a club have a contract. Transfers would happen during or at the end of a player's contract for a fee. A player would only get transferred if his club accepted the transfer for a price negotiated with the buying club. When a contract would expire, a buying club would still have to acquire the player at a fee negotiated by the relevant football association. That fee depended on the relative power of the clubs in order to insure competitive balance (Fees and Muehlheusser, 2002). In addition, each country league had its own rules over the number of foreign players allowed in a domestic team.

This mechanism infringed article 39 of the Treaty of Rome by hampering the free movement of players across European countries. The Bosman act abolished transfer fees for non-contracted players depending on the player's age. Should the player be below 24 years of age, the new club has to compensate the old one by paying a fee representing the investment the latter club has made in developing the player's talent and skills (Fees and Muehlheusser, 2003).

In 2001, the European Commission further regulated the market by allowing players to transfer within the period of their contract and without the approval of their club as well as limiting the maximum duration of contract to five years. This was orchestrated by EU Commissioner Mario Monti and is called the Monti system. A player can pay a fee for breach of contract and engage himself with another club under the condition that this club settles a training fee in the same sense as under the Bosman ruling. The aforementioned breach of contract and training fee together are generally significantly lower than the price determined through transfer negotiation between two clubs (Fees and Muehlhesser, 2003). In addition, it is not that easy for players to breach their contracts as there are many conditions about the timing of such action (Pearson, 2015).

3. Empirical evidence of the determinants of player transfer prices

Several academic articles focused on determining the determinants of football players transfer prices. These studies' main findings are best summarized by Fricks (2007) in Table 1 below. This section will focus on the diverging methodologies and the rationale behind the choice of variables.

Dobson and Gerrard (1999) observe that most research attempting to explain transfer fee variation between players have focused on four sets of variables; buyer and seller characteristics, player characteristics and control variables.

The first two sets evolve around club specific characteristics which are used to incorporate the relative bargaining power of the buying and selling club in the model. The aim is to test if and how bargaining power plays a role in the transfer market. Variables used in the literature are reflecting clubs' financial or sportive power. For example, Carmichael and Thomas (1993) use average attendance in the buying club's stadium. Dobson and Gerrard (1999) use the buying

and selling club's position in their respective leagues during the season preceding the transfer. In general, studies using bargaining theory to analyse the determinants of transfer prices have concluded that the more successful the buyer and selling clubs are financially or in terms of performance, the higher is the agreed upon price (Fricks, 2007). In addition, the bargaining power of the selling club is higher than the one of the buying club (Carmichael and Thomas, 1993)

The second category consists of player related characteristics. Researchers have used indirect proxies of player performance as well as other player characteristics and tested their relationships to transfer prices. Those include age, playing position on the field, career goals and number of games played in the previous season. All the research shows that age has a positive influence on prices and age-squared a negative one. This is due to the fact that a professional player's career is characterized by a peak after which performance declines. Goals are mostly scored by strikers and using it as a measure of performance can bias strikers' valuation upwards and other player's downwards. The main problem is that those variables are indirect measures of a player's contribution to the team (Fricks, 2007). In fact, no studies on the determination of transfer prices have introduced directly observable and position specific performance measures in their models. Researchers seem to try and alleviate the bias of goals scored by interacting it with a positional dummy variable. This is done to give goals scored by player's others than strikers more importance in the model. The third category pertains to control variables used to correct for time effect when the data covers multiple transfer periods or seasons.

When it comes to methodologies, researchers either use OLS regressions and/or a Heckman two step approach. The oldest research papers in Table 1 all used OLS estimations but Carmichael and al. (1999) argue that samples of transferred players cannot be considered as randomly selected because not all players have the same probability of being transferred. They

rather represent sub-populations and suffer from selection bias. To correct for this, Carmichael and al. (1999) use a Heckman two-step approach which first estimates the probability that a player gets transferred then uses the ensuing residuals to estimate the transfer fee equation. However, this method delivers results comparable with OLS estimates but an interesting finding is that players who get transferred for a higher fee also observed higher transfer probabilities (Carmichael and al., 1999)

In general, there is consensus in the literature about the influence of selling and buying club characteristics over the amount of the transfer fee. Yet no studies looked closely at the direct relationship player performance has with transfer price.

The International Centre for Sport Studies (commonly known under the French acronym CIES) in Switzerland, more specifically its Football Observatory under the direction of Dr. Rafaele Poli, has been studying the European football market extensively. Indeed, for several years now they have been publishing rankings of over- and under-paid football players in the transfer market among many other reports. Using data on 1500 European transfers over the last five years, the research centre's football observatory developed an algorithm which allows the pricing of players according to a series of factors. These factors are performance measured in goals scored and games played per season over the player's four past seasons. The level of the league where the player evolved and the team's points per game are also taken into account. International appearances and goals are also considered. They then contrast their results with actual transfer prices to determine which players are over- or under-paid.

The determinants of transfer fees in European football[a]

Author(s) and year of publication	Data	Dependent variable/ estimation technique	Significant findings
Eschweiler and Vieth (2004)	254 transfers in the German Bundesliga in the seasons 1997/1998–2002/2003	Log of transfer fee in constant 1996 prices; OLS regression	Positive: log sponsoring revenues and log attendance of buying club; buying/selling club qualified for European cup competition, defender, midfielder, forward (ref.: goalie), age, FIFA-coefficient of country of origin, international caps Negative: age^2, international caps^2
Feess, Frick and Muehlheusser (2004)	239 transfers in the German Bundesliga in the seasons 1994/1995–1999/2000	Log of standardized transfer fee; OLS regression as well as Heckman two-step estimation (with $n = 604$)	Positive: remaining contract years, remaining contract years interacted with 'Post-*Bosman*' regime, age, career games played, international caps, forward, buying club qualified for European cup competition, player is from south America Negative: age^2, career games played^2, player is a semi-professional
Frick and Lehmann (2001)	1,211 (out of 1,269) transfers in the German Bundesliga in the seasons 1983/1984–1999/2000	Log of transfer fee in constant 1985 prices; OLS regression	Positive: age, career games played, career goals scored, international caps, selling club from western Europe, south America, time trend Negative: age^2, career games played^2, international caps^2, selling club from German third division, north America, Asia
Dobson, Gerrard and Howe (2000)	114 (out of 198) transfers in semi-professional (non-league) English football, 1988–1997	Log of transfer fee; OLS regression	Positive: age, goals scored previous season, average attendance of selling club in previous season, number of seats in buying club's stadium, average attendance of buying club in previous season Negative: age^2, league position of selling club in previous season, goal difference of selling club in previous season, stadium capacity of buying club
Carmichael, Forrest and Simmons (1999)	240 mover as opposed to 1,789 stayer in the English football leagues in 1993/1994	Log of transfer fee; Heckman two-step procedure to control for selection bias	Positive: age, games played for current club, games played for other clubs, goals scored in league matches, goals scored in cup matches, international caps Negative: age^2, selling club playing in second, third or fourth division
Dobson and Gerrard (1999)	1,350 english football League transfer fees (out of 2,215 moves), June 1990–August 1996	Log of transfer fee in constant 1990 prices; OLS regression	Positive: age, career games played, career goal scoring rate, games previous season, goals previous season, international caps, under 21-international caps, goal difference of buying club previous season, buying club playing in first or second division, goal difference of selling club last season Negative: age^2, number of previous clubs, career games played^2, league position of buying club previous season, league position of selling club previous season
Speight and Thomas (1997a)[b]	217 arbitrated settlements on disputed transfers referred to the Football League Appeals Committee, 1978/1979–1991/1992 and 187 transfers settled by negotiation during 1990/1991 season	Log of transfer fee in constant 1990 prices; OLS regression, joint estimate (all cases) as well as separate estimates (arbitrated vs. negotiated cases)	Positive: age, games played previous season, average attendance of buying club in previous season, buying team playing in first, second or third division (ref. league: fourth division), average attendance of selling club in previous season, league position of selling club, selling club playing in first or second division Negative: age^2, league position of selling club previous season squared, arbitrated settlement (dummy)
Speight and Thomas (1997b)[c]	164 arbitrated settlements of disputed transfer fees for out-of-contract players in English football league, 1985/1986–1989/1990	Log of arbitrated fee, final buyer offer and final seller offer in constant 1989 prices	Positive: age, international caps, career goals scored, number of games played in previous season, average attendance of buying club, goal difference of buying club previous season Negative: age^2, selling club's goal difference, league position of buying club previous season, buying club playing in third or fourth division
Reilly and Witt (1995)	202 transfers in the English football leagues in 1991/1992	Log of transfer fee; OLS regression	Positive: appearances last season, goals scored current season, age, forward, full international, seller is a first, second or third division club; buyer is a first, second or third division club (ref.: club is from fourth division) Negative: number of previous clubs
Carmichael and Thomas (1993)[c]	214 transfers in the English football league in the season 1990/1991	Log of transfer fee; OLS regression	Positive: average attendance of buying club in previous season, goal difference of buying club in previous season, buying club playing in first, second, or third division (ref. league: fourth division), goal difference of selling team in previous season, selling team playing in first or second division, career games played, arbitrated fee (dummy) Negative: league position of buying club in previous season squared, league position of selling club in previous season squared, player age squared

[a]For ease of presentation, significant interaction effects are not reported in column 'major findings'.
[b]Results from estimations with selling club's last offer and buying club's last offer are virtually identical and are not displayed here for sake of brevity.
[c]Table includes only results from preferred estimation.

Table 1 *The determinants of transfer prices in European football*, Fricks (2007)

III. The data

The sample was collected from www.transfermarkt.co.uk. The period under consideration is the 2015 summer transfer period which lasted from 1st of July 2015 to 31st of August 2015 for France, Spain, Italy and Germany. In England the transfer period lasts from the 1st of July 2015 to the 1st of September 2015. All players transferred for a fee to or from the Big 5 leagues were gathered with the following information:

fee	amount of the transfer fee in pounds
name	player name
dob	date of birth
position	playing position on the field
transfer date	date the transfer took place
previous contract end	time remaining on a player's contract with the selling team

Table 2 *Player characteristics*

Observations excluded from the dataset are players who moved as free agents, players sent on loan by their clubs and young players signing their first professional contract. Performance data was collected from www.whoscored.com for the remaining players. The performance measures range across almost all aspects of a footballer's game.

Apps	number of matches started (number of substitutions in a game)
Mins	minutes played
Goals	goals scored
Assists	assists made
SpG	shots per game
MotM	number of times elected man of the match
Tackles	tackles per game
Inter	interceptions per game
KeyP	key passes per game
Drb3	dribbles made per game
AvgP	passes per game

Table 3 *Performance variables*

The advantage of these variables is that they are directly observable and quantify a player's performance. 406 players are included in the dataset.

A few variables needed to be created using the information gathered. The age of a player at the time of his transfer was obtained using the date of transfer and the date of birth of a player. The remaining months on a player's contract at the time of the transfer was obtained similarly using the expiry date of a player's previous contract. The number of days between the transfer and the end of the transfer window, 1st September 2015, was also computed. The creation of player performance indicators measuring their direct contribution to team effort is explained in the next section.

Observations for which the data was incomplete were deleted. The resulting dataset includes 137 players used in the subsequent regression.

IV. The model

Since the existing empirical literature covered bargaining theory extensively, this research will focus on player performance characteristics as explanatory variables for the determination of transfer prices in the Big 5 European leagues. Firstly, player performance needs to be defined and modelled.

1. Player performance

Measuring individual performance in team sports is a complicated matter. Hassan and Trenberth (2013) identify three problems when attempting to measure individual contributions in sport team's efforts. Firstly, the tracking problem which arises with the difficulty to identify, categorize and enumerate player actions. Secondly, the attribution problem which refers to successfully allocate individual actions to joint and interdependent actions. Lastly, the

weighting problem which embodies the difficulty of assessing the significance of different actions in the determination of match outcomes.

A framework designed by the Football Observatory (of the CIES) to evaluate the performance of football players according to their roles on the pitch will be used to tackle the first of these issues. The table below effectively enumerates and categorizes player actions.

	Rigour	Recovery	Distribution	Take on	Chance creation	Shooting
Centre Backs	****	****	****			
Full Backs	**	**	**	**	**	**
Defensive midfielders	***	***	***	*	*	*
Attacking midfielders	*	*	*	***	***	***
Forwards				****	****	****

Table 4 *Key performance indicators according to the CIES Football Observatory (Poli and al., 2015)*

Football players are ranked in five positions and form the rows of Table 4 while individual skill is broken down into six areas. Rigour refers to strength in duels which here will be measured by tackles per game. Recovery embodies the ability of players to intercept passes and will be measured by interceptions per games. Distribution represents the ability to pass the ball efficiently as to keep possession. It will be measured by passes per game. Take on represents to ability to challenge opponents to create space and opportunities which will be measured in dribbles per game. Chance creation is the ability to pass the ball to create scoring opportunities for team members. It will be measured by key passes. While shooting reflects the ability of players to capitalize on shooting opportunities. It will be measured by shots per game. To create

the performance indicator each skill will be weighted according to the table above. For example, for full-backs, each skill will be weighted equally. The final player performance indicator will be as close as one could get to an observed and direct measure of performance and was computed for 240 players with complete performance data.

A problem with the performance indicator is that each subsample defined by a player's position presented different ranges as can be seen in Table 5 below. It prevents performance comparisons across the whole sample. The best defender has a performance score of 21,3 while the best forward's performance is measured at 3.06. Hence the need to normalize each subsample's performance score to bring the whole sample on the same scale. Performance scores are normalised to fit between 0 and 1. The best player at each position has a performance score of 1 and the worst player of 0.

Full Backs performance indicator	
Mean	6,9031
Standard Error	0,3237
Median	7,2333
Mode	8,3166
Standard deviation	1,9692
Sample variance	3,8780
Minimum	1,95
Maximum	10,183
Sample size	37

Defenders performance indicator	
Mean	14,2629
Standard Error	0,5869
Median	14,8
Mode	16,833
Standard deviation	3,5218
Sample variance	12,4031
Minimum	7,5
Maximum	21,3
Sample size	36

Defensive midfielder performance indicator	
Mean	10,375
Standard Error	0,4645
Median	10,288
Mode	8,1555
Standard deviation	3,3173
Sample variance	11,004
Minimum	3,2222
Maximum	17,877
Sample size	51

Offensive midfielder performance indicator	
Mean	3,7759
Standard Error	0,1906
Median	3,9777
Mode	5,2333
Standard deviation	1,4887
Sample variance	2,2164
Minimum	0,1111
Maximum	7,1777
Sample size	61

Forwards performance indicator	
Mean	1,0563
Standard Error	0,0702
Median	1
Mode	1,3666
Standard deviation	0,5207
Sample variance	0,2711
Minimum	0,1
Maximum	3,0666
Sample size	55

Table 5 *Descriptive statistics of positional subsamples.*

2. Model specification

Goals scored and assists made are included in the analysis as well as minutes played. They are expected to have a positive influence over the dependent variable. In addition, the literature did not yet account for an analysis of the relationship between duration left on a player's contract before he gets transferred and the transfer fee (Fricks, 2007). The variable "Timerem" will allow us to investigate this relationship. It is suspected to have a negative relationship with transfer price since clubs would prefer to sell their player rather than let him walk out for free at the end of his contract. Date of the transfer is also an interesting variable to be considered as it can portray the influence of the timing of the transaction on its value. It is expected to have a positive relationship with the dependent variable to reflect the loss of bargaining power of the selling club as the transfer deadline approaches. Age is suspected to have a negative influence over transfer prices as already established in the literature. Minutes played is expected to show a positive relationship to transfer prices to reflect the added experience that time on the pitch brings to a player.

The model tested is the following.

$$Log(fee_i) = \beta_0 + \beta_1 Perf_i + \beta_2 Goals_i + \beta_3 Assists_i + \beta_4 Timerem_i + \beta_5 mins_i + \beta_6 Age_i + \beta_7 DeadlineTime_i + \varepsilon_i \quad (1)$$

Notice the absence of "agesquared". Including it would allow to incorporate the reversal of the age effect after a certain threshold representing the loss of value a player is subject to when approaching the end of his career. It was included in previous trials but was found to be severely insignificant and hampered the fit of the model. That variable was therefore dropped in this model. More information about previous trials is available in the appendix file submitted along with this research. The next section presents the results of the model described above.

V. Results

Table 6 below shows the regression statistics and variance analysis of the model. It shows that the variables in the model explain 46% of the variations in the dependent variables as represented by the adjusted R-squared. In addition, the F-statistic shows that the joint significance of the variables of the model is very high. The probability that the results of the model occurred by chance are close to zero.

Regression Statistics	
Multiple R	0,6982
R squared	0,4875
Adjusted R squared	0,4597
Standard error	0,8118
Observations	137

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	7	80,8999	11,5571	17,5349	3,4678E-16
Residual	129	85,0230	0,6590		
Total	136	165,9229			

Table 6 *Regression results*

1. Main findings

Table 7 below summarizes the estimated coefficients and their significance. The first striking result is that when attempting to use performance to explain variations in transfer prices age has become insignificant at 10% significance level. This result is in striking contrast with all the results established in the literature.

	Coefficients	*P-value*
Intercept	14,5117	1,0479E-44
Age	-0,0334	0,1574
Timerem	0,0406	1,5343E-10
Mins	-0,0001	0,0768
Goals	0,0632	0,0006
Assists	0,0930	0,0024
Perf	1,3280	0,0006
DeadlineTime	-0,0023	0,4233

Table 7 *Main findings*

Time remaining on player's contract is the most significant variable of the model and is so at a 1% significance level. One extra month on a player's contract is suspected to increase his transfer fee by approximately 4% all else remaining equal. Minutes played show a counter intuitive result. It is significant at a 10% significance level and shows a negative relationship.

According to the model an extra minute on the pitch decreases a player's transfer fee. Even if the coefficient is incredibly small. Dividing that variable by 90 (minutes in a football game) and re-estimating the model neither improves it nor the variables coefficient. Goals, as suspected, is a highly significant variable (significant at a 1% level) and shows a positive relationship to transfer price. The model estimates that an extra goal increases the price of a player by 6%. What is surprising is that an extra assist seems to bring about an increase of 9% in the price. The model predicts that assists are more valuable than goals. That coefficient is also significant at a 1% level of significance.

The number of days between the transfer date and the transfer deadline appears to be completely insignificant. The aim was to capture the shift in bargaining power as the deadline approaches. That effect might depend on other factors such as the willingness of a club to sell a player. As the deadline approaches, the selling club might drive up the price should the buyer pursue the player aggressively. On the other hand, it might be that good players get traded at the beginning of the transfer window and that at the end only average or bad players remain which would decrease the transfer price over that period. The effects seem more ambiguous than previously theorized which may explain the insignificance of that variable in this model.

Performance has a positive and significant estimated coefficient. An increase of 0.1 in the performance score of a player is estimated to increase the transfer fee by 13%. It can thus be considered as the main determinant of transfer price according to this model since it has the largest influence given a unit increase.

2. Robustness checks

This section investigates whether the assumption constant variance holds. This is of importance because it will guarantee the unbiasedness of the estimated coefficient presented above. A

White test for heteroscedasticity was performed and yielded a F-value of 1,3574 which allows us to not reject the null hypothesis of homoscedasticity (See Appendix 2). Since cross section data is used, autocorrelation is not an issue in this model.

Another issue which might hamper the reliability of the variable estimates is endogeneity. Should a variable correlated with both one of the independent variables and with the dependent variable be omitted from the model then an endogeneity problem occurs. It could be possible that the performance of a player relative to the rest of his team members is one of those variables. Should a player's performance be among the best of his team, this would lead him to be fielded more often hence increasing his minutes on the pitch. In addition, such high relative performance will decrease his club's willingness to sell him and increase his transfer price. Since the data gathered does not include measures of relative performance it is impossible to investigate the issue further but it might explain why the estimate of minutes is significantly counter intuitive.

3. Interpretation and limitations

The relatively low fit of the model, compared to the studies presented earlier in Table 1, shows that performance is not as effective as club characteristics at explaining variations in transfer prices. In addition, when performance is considered, some key variables whose effects were intuitive and significant in the literature, turn out to be counter intuitive and insignificant. This may be due to sample characteristics as well as to the number of observations.

The main limitation of the research at hand may be that buyer and seller characteristics were not investigated jointly with performance. This might explain the relatively low fit of the model. Incorporating them could picture a more realistic model of the determinants of transfer prices. Another limitation is the data. Lack of cooperation from the main data centres forces

the manual collection of the data which is extremely time consuming. Another limitation of this paper, and of the existing literature, is that football players are considered as a labour force. While in today's football world it may also be coherent to consider them as financial products. The data set compiled for this study did present several cases where a player who was loaned during the 14/15 season was then bought by the club where the loan took place and then sold at a profit less than two weeks later. Last but not least, the sample contains player transferred to clubs playing in the Big 5 leagues. Those include players arriving from other continental federations. It might be more instructive to consider players transferred only within the Big 5.

VI. Conclusion

This study attempted to establish the relationship between performance and transfer prices paid for football players transferred to the European Big 5 leagues. Setting the context that football clubs in Europe are success-maximizers as opposed to profit-maximizers, demand for quality players should be high and competition to get them fierce. A performance indicator is computed per position and normalised to enable cross-position comparisons. The model finds evidence that player performance is an important determinant of transfer prices and has the largest effect. Another key finding is that the influence of the remaining months on player contract is positive.

Despite the results, further research is needed to combine bargaining theory and performance into a realistic model of the determinants of transfer prices. In addition, these researches could focus on the effect of the timing of the transaction on its value as the effects seem ambiguous. Another interesting angle would be to consider player performance relative to their teammates when investigating the determinants of transfer prices.

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Appendices

1) Residual analysis

Observation	*Predicted ln(fee)*	*Residuals*	*residuals squared*	*Observation*	*Predicted ln(fee)*	*Residuals*	*residuals squared*
1	14,7789275	-0,1524867	0,02325219	69	15,5273625	-0,05362387	0,00287552
2	14,3725961	0,94699187	0,8967936	70	15,7565625	1,35478494	1,83544223
3	15,1655661	-0,38307167	0,1467439	71	15,6985409	-0,66515463	0,44243068
4	16,3311785	-0,72390844	0,52404343	72	14,7194526	0,41781381	0,17456838
5	15,1738179	-0,61637003	0,37991201	73	18,711521	-0,8796274	0,77374437
6	14,6717527	0,36163354	0,13077882	74	15,6497209	0,27600284	0,07617756
7	16,3041258	0,05691604	0,00323944	75	14,8177649	-0,59678922	0,35615737
8	15,5234955	1,22320883	1,49623984	76	15,9949478	-0,67535983	0,4561109
9	15,4392071	-1,12292121	1,26095204	77	15,3414835	-0,22306019	0,04975585
10	15,1336971	1,72633594	2,98023578	78	14,73946	-0,11301922	0,01277334
11	15,8665723	0,65698848	0,43163387	79	15,3884113	-0,94162896	0,88666511
12	14,3252921	-0,4609914	0,21251307	80	14,1597474	1,24090837	1,53985358
13	17,0822001	0,58876309	0,34664197	81	15,8633166	-1,23687582	1,5298618
14	15,6092335	0,3164903	0,10016611	82	16,0109677	0,73573658	0,54130832
15	16,5326868	0,90716465	0,82294771	83	14,6784887	-2,35463306	5,54429686
16	15,3931178	-1,17214216	1,37391725	84	14,4374764	0,88211157	0,77812083
17	15,5184721	-0,4850858	0,23530823	85	14,6036694	-1,07584087	1,15743357
18	15,585644	1,46854503	2,1566245	86	15,2241191	-0,77733675	0,60425243
19	15,5116819	-0,54876893	0,30114734	87	14,8387624	-0,39198006	0,15364836
20	15,6579305	1,4808159	2,19281572	88	15,2785731	0,26504694	0,07024988
21	15,8251661	0,78640555	0,61843369	89	16,7735613	-0,25000055	0,06250027
22	15,8370568	-0,922934	0,85180717	90	16,1543943	0,31787321	0,10104338
23	15,3478574	0,3771957	0,1422766	91	14,4378382	-1,60315689	2,57011202
24	15,7895357	-0,10994505	0,01208791	92	15,0904333	-1,30024051	1,69062539
25	16,8348598	0,09416606	0,00886725	93	16,5633352	0,33178912	0,11008402
26	15,0895169	0,92321824	0,85233192	94	15,4367265	0,34309528	0,11771437
27	15,7045219	1,66290229	2,76524402	95	14,90532	1,5128802	2,2888065
28	16,8542814	-0,67980541	0,4621354	96	14,9831334	0,68554525	0,46997228
29	16,1570511	-0,32663753	0,10669207	97	16,2524374	-0,42202383	0,17810411
30	14,8246606	-0,88693245	0,78664917	98	16,4157788	-0,40304368	0,16244421
31	15,1473336	-0,30937207	0,09571108	99	17,6149017	-0,77264477	0,59697995
32	15,339812	-0,42568916	0,18121126	100	15,4642147	-0,83777388	0,70186508
33	14,7554909	-0,63987578	0,40944101	101	14,7180858	-1,7010829	2,89368302
34	15,786101	1,14292484	1,30627719	102	15,7673851	-0,04233204	0,001792
35	14,697993	-0,7602648	0,57800257	103	14,1785914	0,73553146	0,54100653
36	14,7934533	0,3438131	0,11820745	104	16,0644998	1,26106256	1,59027879
37	14,4476524	-0,91982389	0,84607599	105	14,9189863	-0,69801068	0,48721891
38	15,3068736	0,40775493	0,16626408	106	14,7949001	-0,01240568	0,0001539
39	16,3097295	-0,33897443	0,11490366	107	14,7278656	0,74587306	0,55632663
40	14,809354	1,08934104	1,18666391	108	14,8458309	-0,39904856	0,15923976
41	15,8289356	-0,99097413	0,98202973	109	14,1725753	0,60991915	0,37200137

42	15,0877128	-0,46127206	0,21277191	110	16,5592071	0,43435728	0,18866624
43	15,2310336	0,08855431	0,00784187	111	15,0386679	-0,17583831	0,03091911
44	15,8566208	1,10519486	1,22145567	112	16,1887219	1,47437976	2,17379566
45	16,7267026	-0,20314181	0,04126659	113	14,3227613	-0,53256859	0,2836293
46	15,4555721	-0,13598415	0,01849169	114	15,1656422	-0,2515194	0,06326201
47	14,6538454	0,560382	0,31402798	115	15,1145602	0,89817498	0,80671829
48	14,5629867	0,91075198	0,82946917	116	16,3373381	-0,66865945	0,44710546
49	14,7501964	-1,57904289	2,49337646	117	15,21185	-1,14947932	1,3213027
50	14,9786593	-0,03821913	0,0014607	118	15,8273784	-0,22010835	0,04844768
51	16,1484156	-0,17766052	0,03156326	119	14,4865256	0,29596881	0,08759754
52	16,2511874	0,67783848	0,459465	120	14,1264582	0,43098974	0,18575216
53	15,8551073	0,38077135	0,14498682	121	15,4242921	0,40612146	0,16493464
54	15,6305605	0,66985675	0,44870806	122	15,5789371	0,43379801	0,18818071
55	15,8032891	-0,66602267	0,44358619	123	14,9450293	0,98069448	0,96176167
56	15,0542283	-0,78129293	0,61041864	124	16,407638	0,01056221	0,00011156
57	15,4518545	0,78402418	0,61469392	125	14,191417	0,25536532	0,06521145
58	14,8795288	-0,51589684	0,26614955	126	15,3403244	-0,42620159	0,1816478
59	15,5538813	0,4588538	0,21054681	127	15,0711672	0,53610283	0,28740624
60	13,7727415	0,09155926	0,0083831	128	14,8526082	1,44780905	2,09615103
61	14,1734889	-1,15648605	1,33745998	129	14,7708385	-0,14439774	0,02085071
62	15,0410929	-0,41465209	0,17193635	130	15,4072069	0,54601412	0,29813142
63	15,391988	0,53373572	0,28487382	131	14,8026786	-0,02018423	0,0004074
64	16,7124608	-0,69972565	0,48961598	132	15,5337986	-0,06005993	0,00360719
65	15,8442616	-0,013848	0,00019177	133	15,220667	-0,18728068	0,03507405
66	16,3581082	-0,34537311	0,11928259	134	16,3406168	0,02042501	0,00041718
67	14,1940819	-1,02292838	1,04638248	135	15,4564739	0,0172647	0,00029807
68	15,1637188	-0,71693646	0,51399789	136	14,9622528	1,19794408	1,43507001
				137	14,7445878	0,24340493	0,05924596

2) White's test

White's test

Regression statistsics	
Multiple R	0,14091763
R-squared	0,01985778
Adjusted R-squared	0,00522879
Standard error	0,80844483
Observations	137

ANOVA

	df	*SS*	*MS*	*F*	*Valeur critique de F*
Regression	2	1,77438208	0,88719104	1,35742664	0,26083721
Résidus	134	87,580128	0,65358304		
Total	136	89,3545101			