WAGE DETERMINATION IN A REGULATED LABOR MARKET: EMPIRICAL EVIDENCE FROM MAJOR LEAGUE SOCCER

Bernd Frick & Franziska Prockl

Paderborn University, Management Department, Chair of Organizational, Media and Sports Economics, Warburger Str. 100, D-33098 Paderborn.

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Abstract

The North American top tier Major League Soccer presents a unique research setting to study a regulated labor market. Contrary to the situation in Europe, where player salaries remain private and confidential (the only exception here is "Serie A" in Italy), the player unions regularly publish this kind of information for each of the US Major Leagues. In this paper we use an unbalanced panel with detailed player-season-information from the seasons 2006 to 2016 to estimate a multi-stage salary model for MLS players. We differentiate in the analysis between regular and designated players (aka DP, a status unknown in Europe) due to their heterogenic profiles. For regular players we find that the impact of age on salaries follows an inverted u-shape with a very late turning point at 33.6 years. In addition, we find a statistically significant positive of last season's performance and career performance. Experience abroad yields a significantly higher salary as does tenure with the current team (controlling for team-specific fixed effects). Perhaps surprisingly, career length in MLS is negatively associated with salary. Also, the results suggest that local player suffer a pay discrimination compared to similar players from Western Europe, Central and South America. Thus, we confirm most of the findings that have been reported in previous research using data from European football leagues (e.g. Lucifora &

Simmons, 2003; Frick, 2007; Bryson et al., 2014). This finding alone is not straightforward considering the various regulations that help the leagues to keep especially salary budgets in check. The effectiveness of salary regulations, e.g. put in place via Collective Bargaining Agreements, is shown for two instances, as is the impact of a regulatory change.

In contrast, the key driver of the unregulated DP salaries are club-specific fixed effects, explaining already 58 percent of the observable variation in player salaries. Next important drivers are career games played and the region of origin. Local superstar players earn a surprising premium over players from Western Europe, South America and the Carribean's. Neither for regular nor for designated players' positions are rewarded significantly different. This is a big difference compared to European leagues where Forwards are usually paid better.

***Keywords**:* Wage Differentials, Major League Soccer, Panel Study

***JEL Classification**:* J31, J49, Z20

1 Motivation

For many years now, salaries in professional sports have been studied to understand the economics of this popular labor market and to give advice to sport managers, organizations and leagues. However, often they have to base their analysis on imperfect data as in most European leagues player salaries are not published. For North America the situation is a different one because Player Unions publish player salaries on a regular basis. (Sports) economists have therefore studied different facets of labor markets in Football, Baseball, Hockey and Basketball[1]. In contrast, Soccer has been treated as "stepchild" for many years and deemed as rather unimportant within the North American sports landscape. One reason is that MLS has had issues to attract athletic talent. Other, North American, sports simply offer a better, frictionless and established development system (from high-school to college to university to pro-league) and are able to attract youngsters with high salaries once turning pro. This is something a European soccer fan can barely imagine. In Europe, soccer has played a predominant role in active and passive leisure activities for at least 60 years (Szymanski & Kuypers, 2000). Today, 20 years after the inaugural Major League Soccer (MLS) season in 1996, the tables have turned. MLS revenues grew rapidly from $13 million on average per team in 2007 to over $30 million in 2015 while the league manages operating income better. The development of various new, mostly soccer-specific stadiums, attendance records (Sung & Mills, 2017), and a rapid expansion of the team count from 12 in 2006 up to 20 in 2016 are evidence of the advancement. Additionally, a general movement from the highly regulated and centralized league to early forms of free agency and more and more exceptions on the salary cap can be observed. All of this brings MLS at least closer to the popular and very mature European soccer leagues in terms of set-up. Plus, it puts MLS on researchers' agenda. Recent research on MLS has dealt with the questions of career duration determinants (Goldstein & Wooten, 2016), and the impact of payroll (level and dispersion) on team performance (Coates et al., 2016; Sonntag & Sommers, 2014). A short paper (Kuethe & Motamed, 2010) has also dealt with the question of salary determination in MLS. This paper was limited to observations from one season. Moreover, the season directly after the introduction of the designated player

[1] Selection of relevant papers that use data from the major US Sports (excluding soccer): Hamilton (1997); Ertug and Castellucci (2013); Scully (1974); Lewis, Sexton, and Lock (2007); Vincent and Eastman (2009); Leeds and Kowalewski (2001); Kahane (2001)

(DP) rule was chosen. As a result, the applicability of the results to other periods is doubtful. The picture drawn by Lee and Harris (2012) is also incomplete, as they research at least three seasons but disregard the DP aspect. The missing piece to generate a profound understanding of the history, current situation and future of MLS is a detailed analysis on the determinants of player salaries over time. This will allow us, on the one hand, to withdraw similarities or dissimilarities between this special, young league and its European 'predecessors', and on the other hand, to better understand the impact of MLS regulations and its changes on salaries.

First, for salary determination in soccer, various studies have pointed out the relevance of different aspects (see Frick, 2011, Lucifora & Simmons, 2003, Bryson, Frick, & Simmons, 2013; Lehmann & Schulze, 2008). To understand in what ways the MLS is comparable, or not, with its European *role models*, the first research question investigates the influence of recent and career performance, experience, special talent, and region of origin on player salaries. Furthermore, the introduction of the DP rule in 2007, also called "Beckham rule", changed the salary structure of the league to a large extend. Therefore, it is vital to take the "superstar" effect into consideration for every MLS salary investigation.

Considering the second aspect, in what way are regulations important? In 2011, Frick picks up a condition established back in 1956 by Rottenberg in his seminal paper on "The Baseball Player's Labor Market": "In absence of labor market restrictions […] players will be paid according to their marginal product" (p. 90). As MLS presents a setting with multiple restrictions, it is questionable if MLS players are paid according to their contribution comparable to the findings for open labor markets and specifically for other soccer leagues. Coates et al. (2016) uphold this doubt when they note that MLS "regulations form a complex series of constraints on a team's choice of both wage bill and salary dispersion" (p. 725). The structure of MLS as single, limited liability entity combined with club operators, who own a financial stake in the league and their individual teams, put the following regulations in place:

1. **Contract centralization**. All players are employed by the league. This limits the power of the negotiating player. Since 2003, the MLS Players Association protects and promotes player interest and with that improves the power balance.
2. **Restrictions on roster composition**. Each team was initially given the right to eight international player spots, spots might be traded. Maximum number of designated players and minimum number of developmental players on the roster.

3. **Budget constraints**. Overall budget per team is capped. Exempt are the earnings of designated players above the maximum salary.
4. **Salary limitations**. Minimum and maximum salaries are effective, with extra rules for senior and reserve roster cohorts. Moreover, two types of Allocation Money, General and Targeted (GAM, TAM), can be used to buy down salaries to conform to budget constraints. GAM is partly conditional on team's performance while all teams receive the same TAM amount.
5. **Allocation process rules**. Fixed mechanism "to determine which MLS Club has first priority to acquire a player listed on the Allocation Ranking List". (Major League Soccer, 2016)
6. **Restrictions on player movements.** All trades have to be approved by the League Office and can only occur in one of the two transfer windows. For international trades a player has to be released by MLS. Right of first refusal and specific rules on inter-league trades and loans apply.

Not all restrictions differ tremendously from the rules in place in the different European soccer leagues. But for one, the league being the single employer for players is exceptional. Barr & Roy (2008) investigate the effect of such a set-up and show that monopsony drives wages below the marginal product of labor. For MLS's single entity structure, Twomey and Monks (2011) conclude that it is efficient in suppressing salaries as the teams only devoted approximately 25% of their revenues to salaries in 2007, which is very low compared to more than 50% in European soccer leagues as well as other US leagues. Apart from earning less, MLS players also face differences in terms of job security. Job security for a soccer player comes with the signing of a long-term contract in contrast to signing a short-term contract that is renewed yearly and is strongly dependent on last season's performance. All MLS regulations are structured by the Collective Bargaining Agreements that the league negotiates with the MLS Players Association. The first ever signed Collective Bargaining Agreement (CBA) between MLS and the MLS Players Association became effective on December 1st of 2004 and ran until 31st of January 2010. Following this, the parties never managed to draft a full-fledged new CBA but instead operated for the next five years under a memorandum that was signed five days before the 2010 season opener. The memorandum lists all agreed upon modifications that should alter previous contracts above the old CBA from 2004 during labor negotiations. Part of the difficulty of reaching an agreement in 2010 was the players' demand for

"free agency". In the end, a strike (but also free agency) was avoided by the league. Instead, a new "re-entry" process was put in place giving more freedom to players who are out-of-contract or whose contracts already expired. The re-entry process was connected to a bona-fide offer. Under this, a team is required to offer, depending on the players' age and tenure with the league, a minimum (around 100%) of the player's previous year salary if they want to retain a player whose contract has expired. The other important benefit from the memorandum was that from now on "the majority of players in the League will have guaranteed contracts each season" (Major League Soccer, 2010). To be precise all players who are at least 24 years old with three years of MLS service received guaranteed contracts after 2010. With regard to the 2004 CBA, having a guaranteed contract means that MLS cannot solely terminate the contract because of "the quality of the Player's on-field performance or the fact that the Player may have sustained an injury during the performance of his duties as an MLS Player" (Major League Soccer, 2004). This makes the "before 2010" MLS comparable to the NFL. Leeds and Kowalewski (2001) explain in their paper on free agency in the NFL that "the lack of guaranteed contracts in the NFL […] suggests that the impact of the change in the bargaining setting would have a more immediate impact than in baseball or basketball, in which a substantial number of players have long-term, guaranteed contracts". Following this stream of thought, the 2010 and following seasons should have differing salary determination results. While before 2010, last season performance should be an exceptionally strong indicator, relating to the changes the clubs can quickly apply favored by one-year contracts, the relation between last season performance and salary should be less significant in the period from 2010 onwards. If true, this would be evidence for improved job security in MLS due to longer-term contracts.

To conclude, first, this paper sets out to reveal salary determinants for regular and designated players over the last 10 years and to contrast them with the results available for European soccer leagues. Results are analyzed along the lines of last-season performance, career performance, experience, special talent and region of origin. Secondly, the influence of MLS labor market regulations is investigated. We specifically aim to determine the impact of Collective Bargaining Agreements on player salaries, the effectiveness of the league to suppress salaries, and the level of player's job security in the form of long-term contracts.

2 Method

2.1 Data

We compiled a unique dataset from three main sources. First, the official MLS website provided performance data and information on player characteristics. Performance statistics include games played/started, minutes played, goals scored, shots (on goal), assists and MLS awards won. Individual player information includes country of origin, club, position and player status (e.g. international, DP, homegrown). Secondly, corresponding salary information was obtained from the official MLS Players Association reports that are published yearly. Thirdly, we complemented the dataset with information published on the individual player profiles and team overviews on www.transfermarkt.de. From transfermarkt.de, we collected specifically career performance data, preferred foot, height, birthday, and nationality for each player. Regarding transfermarkt.de, we rely on selected studies published over the last years which have shown that transfermarkt.de data is reliable (compare Frick & Prockl, 2017; Herm et al., 2014; Peeters, 2018).

This study includes performance data for the season 2006 until 2015. Salary data is included from 2006 until 2016. Due to necessary lags that will be discussed later, the dataset covers 10 consecutive seasons. With reference to Lucifora and Simmons (2003, p. 38), "goalkeepers are excluded from the analysis as their performances are not measured in the same way as outfield players'"[2]. The league is expanding rapidly. In 2006, 12 teams formed the league, while in 2015 the number was up to 20 teams. As a result, the number of outfield players increased from 286 in 2006 to 519 in 2015. At the individual level, the unbalanced panel consists of 1,612 outfield players, of which 1552 are regular players (RPs) and 95 are DPs that appear between one and 10 seasons in the dataset. Only 35 players (2.1%) change status from DP to RP or the other way around. The DP status is therefore close to time-invariant. In general, it is more likely to come to MLS as DP and stay on as RP than to start on a RP contract and become DP later. On a players-season basis the dataset holds 4,655 observations. 4,443 observations for RPs and 212 for DPs. With regards to turnover, the average player count for entering

[2] 554 player-season observations were deleted as 159 goalkeepers were excluded from the analysis.

the league is 143 while exits average at 123 players per season. Since 2009 the exits have increased steadily. Also, on average 80 players come into the league as new rookies[3] each year.

2.1.1 Variables and Descriptive Evidence

In the following section, all variables are introduced, and the summary statistics, general and time-series specific, provide first insights. The independent variables are split into the special categories under investigation, hence, performance, experience, origin, and talent. Due to the very different profiles of DPs, regular and designated player results are listed separately whenever relevant.

Dependent Variable

The dependent variable is a player's base salary[4] before tax and bonuses. All kinds of sponsoring money, the player might earn on the side, is not included. The gross wages used are the nominal values that the MLS Players Association reports each year. The distribution of the seasonal base salary for RPs is considerably skewed to the right and has thick tails. Therefore, the logarithmized salary is used for further analysis. As shown in Table 1, the median of 11.18 is slightly smaller than the mean of 11.24, reflecting still some skewness to the left. Also, value that describes kurtosis is close to three, which reflects normal distribution. The "Skewness and Kurtosis test for normality" in Stata confirms that *logSbase* is close to normal distribution. Checking the value distribution of the logarithmized base salary for the DPs holds similarly good results but with slight right skewedness and thinner tails. This suggest that the use of standard regression analysis is appropriate. To increase confidence in the results, the more robust quantile regressions, as used for example by Berri and Simmons (2009) for NFL, is an option. Also, worth mentioning is the larger between-variation of salary than the within-variation. Hence, individual players' earnings do not change as much, whereas the difference between salaries paid to different players is larger. This is true for designated and regular players.

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[3] Determined by zero career games played previously in a first or second division team

[4] Base Salary was chosen over Guaranteed Salary, as the letter includes additional fixed bonuses and other components of potential transfer fees that are spread over the contract length and added to the salary, to reflect minimum and maximum wages as listed in the CBAs.

Table 1 Summary Statistics Base Salary

	Sbase		logSbase	
	RPs	DPs	RPs	DPs
Min.	11,700	155,750	9.367	11.956
Max	900,000	6,660,000	13.710	15.712
Median	71,663	978,368	11.180	13.794
Mean	102,279	1,774,151	11.238	13.927
Std. Dev.	87,967	1,796,921	0.778	0.954
Between s.d.	81,438	1,690,730	0.785	0.906
Within s.d.	48,728	393,074	0.389	0.225
Variance	$7.74*10^9$	$3.23*10^{12}$	0.605	0.909
Skewness	2.529	1.336	-0.042	0.330
Kurtosis	13.839	3.381	2.889	2.145

Note: RP N=4,443, DP N=212

Three further things should attract immediate attention in Table 1:

1. The maximum salary of $900,000 for regular players despite the individual salary cap of $457,500 (in the season 2016[5]). The cap value was exceeded by two players in the data set. Firstly, Landon Donovan earned that amount in 2006, before the introduction of the DP rules. And secondly, Osvaldo Alonso earned that much in 2016. He should have been listed as DP with such a salary, but, Seattle had already three DPs on their roster for 2016 and therefore they used allocation money to pay down Alonso's salary below the maximum allowed for RPs.

2. The minimum wage of $11,700 for regular players. The thought that a first division pro athlete makes this little is hard to grasp, but, this is at least partly true. MLS distinguishes between two minimum wages. First, the senior minimum wage (from $28,000 in 2006 up to $62,500 in 2016) and secondly, the minimum wage for developmental players ($11,700 in 2006 up to $12,900 in 2009) which was later replaced by the 'reserve roster minimum wage' ($31,250 in 2010 up to $51,500 in 2016). About a third of

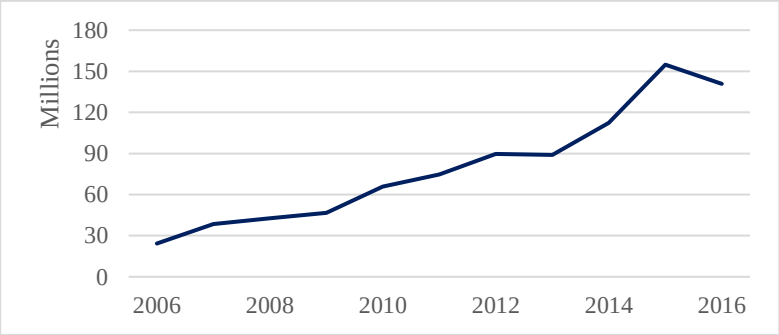
5 The individual salary cap fluctuated over the years under observation. It started with $400,000 in 2007, went down to $335,000 in 2010 and 2011, and since then increased again up to the 2016 value. This value defines on the one hand the maximum salary a regular player can earn and on the other hand the contribution that is added to the salary budget for a team's first and second DP (contribution for a second DP used to be lower but was raised to the same amount in 2010). For the third DP teams have to pay an additional tax, $150,000 in 2016. The "tax" money is distributed among all teams that have no third DP.

all players earn only the minimum wage each season. In 2015, that concerned 129 senior MLS players. Overall, this shows how effective the MLS is keeping salaries down by employing a substantial number of players at minimum wages.

3. The DP minimum salary of $155,750 that was paid by FC Dallas to 24-year-old striker Fabian Castillo in 2016. Rumors have it that he was paid around $700,000 thru different sources, anyhow, the official MLS records list him at the lower amount. From these examples we see that there are exceptions from the strict rules posted by MLS. This gives the league and the teams some flexibility for individual cases without giving up the general control over player salaries.

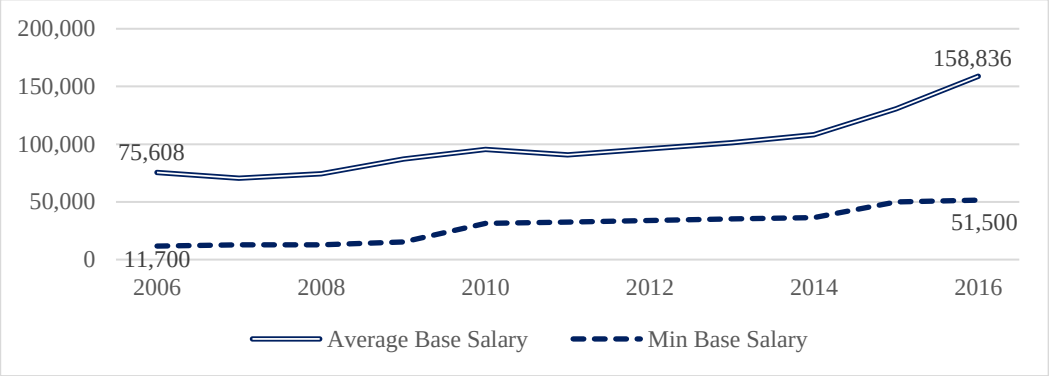
Over time, the amount spent by all MLS teams on player salaries increased substantially from $24 million to over $150 million (see Figure 1).

Figure 1 MLS Wage Bill in Nominal Values, 2006 – 2016



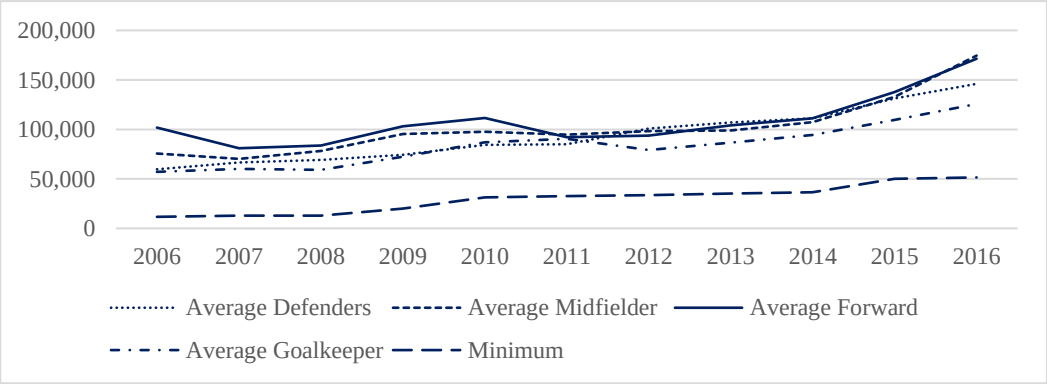
Part of this trend is due to the expansion from 12 to 20 teams in the period 2006 thru 2016. Another driver are the CBAs that increased salaries constantly, at least for RPs. Expectedly, the average salary of RPs (see Figure 2) more than doubled from $75,608 in 2006 to $158,836 in 2016.

Figure 2 Average Salary for Regular Players, 2006 – 2016



Unexpectedly, we see in Figure 3 that forwards are not the 'salary champions' in North American soccer. This is a big difference compared to evidence from Europe (e.g., Frick, 2011). Particularly from 2011 until 2015 midfielders' and defenders' average salary is almost identical and even surpasses the average forward salary in three years.

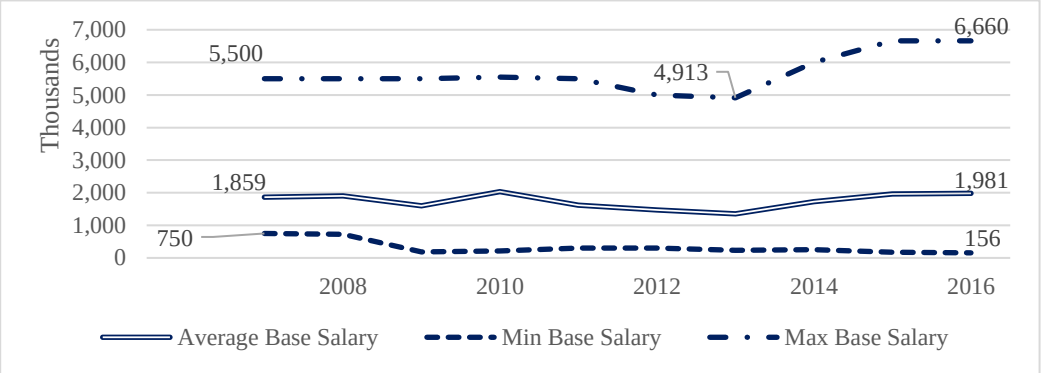
Figure 3 Average Salary for Regular Players by Position, 2006 - 2016



To conclude the salary overview, Figure 4 displays the development of DPs average salary. In contrast to the regular players, we see no exponential growth. The increase from 2007 to 2016 of 7% is marginal compared to the 110% for RPs. Even after excluding the exceptions that are below the maximum regular player salaries, the growth reaches only 12%. The main reason, again, is Beckham. Even 10 years after his arrival, his $5.5 million DP salary is only topped by a handful of players recently.[6]

[6] Players who earned more than $5.5 million: Kaka (2015-16), Steven Gerrard (2015-16), Frank Lampard (2015-16), Jermain Defoe (2014), Michael Bradley (2014-16), David Villa (2015-16), Andrea Pirlo (2016), Sebastian Giovinco (2015-16) and Rafael Marquez (2010).

Figure 4 Average Salary for Designated Players, 2007 - 2016



Performance

The basic performance summary statistics for the 1,612 players in the dataset are displayed in Table 2, for RPs, and Table 3, for DPs. DPs mean performance values are higher than RPs' on all dimensions, but especially for the career statistics[7]. The top RP in terms of career games played (=573) is Italian Alessandro Nesta. He played in 2012 and 2013 for Montreal and earned a base salary of $260,000 ($305,000 guaranteed salary) in his final season in MLS. In contrast, the top DP in this category, former English national team captain, Frank Lampard started the 2015 MLS season with 821 career games played and earned $6,000,000 (reflecting base and guaranteed salary). A total of 4,106 observations for RPs (172 for DPs) are recorded for the seasons 2006 – 2015. Salary information and control variables are obtained additionally for 2016 to match them with 2015 performance data (one-year lag) in the estimations.

[7] Career statistics cover senior records for 1st and 2nd division league games or cup performances. The reliability of statistics 'below' this level is low and therefore e.g. records for the German 'Regionalliga' are excluded.

Table 2 Summary Statistics Performance, Regular Players

variable	description	mean	sd	min	max
SmiSgp	Avg. minutes played per game per season	54.8	30.5	0	93.8[8]
Sgp	Games played per season	16.2	11.3	0	39
Sgs	Games started per season	12.7	11.1	0	39
Smin	Minutes played per season	1,141	965	0	3,476
Sgo	Goals per season	1.5	2.8	0	31
Sass	Assists per season	1.5	2.3	0	25
Sshts	Shots per season	14.6	19.2	0	153
Cgp	Career games played	81.9	94.8	0	573
Cmin	Career minutes played	5,979	7,421	0	48,696
Cgo	Career goals	8.9	17.4	0	160
Cass	Career assists	7.6	13.6	0	138

Notes: N=4,106, excl. 2016

Table 3 Summary Statistics Performance, Designated Players

variable	description	mean	sd	min	max
SmiSgp	Avg. minutes played per game per season	75.6	16.7	0	90.0
Sgp	Games played per season	22.2	9.0	0	39.0
Sgs	Games started per season	19.8	9.4	0	37.0
Smin	Minutes played per season	1,754	831	0	3,319
Sgo	Goals per season	6.4	5.9	0	22.0
Sass	Assists per season	4.6	4.5	0	21.0
Sshts	Shots per season	46.6	34.9	0	181.0
Cgp	Career games played	294.2	168.9	43	821
Cmin	Career minutes played	21,530	13,404	2,495	66,341
Cgo	Career goals	77.7	71.9	1	334
Cass	Career assists	38.0	33.2	0	176

Notes: N=172, excl. 2016

For the estimation later on, we follow the more detailed approach applied for example by Lucifora and Simmons (2003) and translate the basic performance measures. On the one side, we use rates, i.e. *SmiSgp* to avoid distortion from e.g. injuries and mid-season arrivals. On the other side, we use position specific rates, i.e. *FgoRate* (= goals scored per game by forward) to separate the effects by position. For career performance, *Cgp* and position specific rates for goals (e.g. *CFgoRate*) and assists (e.g. *CFassRate*) are the relevant variables. Descriptives for the 'variables in use' can be found in the Appendix (Table 16 and 17). Standing out from these descriptives is the RP maximum goal-scoring rate of 1; meaning a goal is scored in

[8] Number exceeds the regular 90 minutes game time due to included overtime.

every match. This is, firstly, achieved by two rather no-name players who played one game and scored a "lucky" goal and secondly by Taylor Twellman. According to Major League Soccer (n.a.), Twellman is "one of MLS' most lethal scorers in league history", and a former MVP, earning $395,000. He scored two goals in two substitute appearances in 2009 before being placed on the Disabled List for the rest of the season. The top 1% of DPs, Robbie Keane and Didier Drogba, both in 2015, range above a rate of 0.8 which is extremely good. While the regular players' top 1% range 'only' above 0.48, some are worth to be mentioned. Bradley Wright-Philipps scored outstanding 31 goals in 36 matches in his final season before turning DP, 2014, while earning $330,000. Chris Wondolowski scored 27 goals in 34 games in 2012 while also receiving a high RP salary of $300,000. A final example, the highest-ever earner in the league, Kaka, received $6,600,000 in 2015 and 2016. However, his performance stats are rather average. In 2015, he played 28 games, scored 9 goals, made 7 assists and logged 56 shots. But his career performance is excellent for a midfielder with a goal in every 3rd match and an assist rate of 0.22. Overall, the basic measures and 'variables in use' confirm that DPs perform on average better than RPs. This triggers the question, if they indeed perform that much better that warrants the abnormal salaries paid for them. Compared to Lucifora and Simmons' (2003) findings for the Serie A, our mean values are slightly higher across the board while our standard deviations are on average 30% higher. The FgoRate for all Serie A players has a mean value of 0.023 which compares to our 0.033 for RPs. But, this is far away from the mean FgoRate of 0.184 for DPs.

An additional performance variable is *D_Award.* This variable reflects if the player was named either Rookie of the year, Defender of the year, or Most Valuable Player (MVP) by MLS. The variable was added as awards showed significant results in various previous studies (compare Bryson et al., 2014, Ertug & Castellucci, 2013). Interestingly, the rookie and the defender award all have been received by regular players, with two Rookies and respectively three Defenders turning DP in the future but never immediately in the next season. The MVP title also went to four DPs directly, Spaniard David Villa in 2016, Italian Sebastian Giovinco in 2015, Irish Robbie Keane in 2014, and US-native Landon Donovan in 2009. Five additional awardees turned DP later. Finally, only two players (Mike Magee in 2013 and Christian Gomez in 2006) were RPs once they received the award and remained on regular player contracts throughout their MLS career.

Experience

Player's experience is captured by five variables. Three of them, *age*, *spellTeam*, and *spellMLS* are listed in Table 4 for regular players and Table 5 for DPs. Our results for the seasons 2006 – 2016 are mostly in line with (Goldstein & Wooten, 2016,) findings. They examine MLS career duration using a dataset covering the period 1996 (inaugural season) until 2014. For our RPs, mean age is 26, while the median age is slightly lower at 25 years. Only 7% of players are older than 33 years, and 1% is older than 36. On the other end of the spectrum, only 1% is younger than 18 years. The typical regular MLS player stays two seasons with his team and four seasons in the league.

Table 4 Summary Statistics Experience, Regular Players

variable	description	mean	sd	min	max
age	Age in years, calculated of mid-season	25.85	4.21	16	40
age2	Square of *age*	685.89	227.11	262	1643
spellTeam	Seasons player plays for current team	2.22	1.67	1	13
spellMLS	Seasons player plays in MLS	3.65	3.01	1	17
spellMLS2	Square of *spellMLS*	22.35	36.05	1	289

Notes: N=4,443

The average DP is substantially older with 31 years. The youngest-ever DPs were Argentinian Lucas Melano and Mexican Erick Torres. Both were 22 during their first DP season in 2015. Melano joined the Portland Timbers in 2015 from Argentinian first-division club CA Lanús and Torres played for Mexican club Deportivo Guadalajara, then two years for Chivas USA and then turned DP at Houston Dynamo. Interestingly the average DP stays a bit longer with his team, 2.7 seasons vs 2.2 for RPs.

Table 5 Summary Statistics Experience, Designated Players

variable	description	mean	sd	min	max
age	Age in years, calculated of mid-season	30.65	3.71	22	38
age2	Square of *age*	952.88	224.86	499	1468
spellTeam	Seasons player played for current team	2.65	2.01	1	10
spellMLS	Seasons player played in MLS	3.46	2.92	1	16
spellMLS2	Square of *spellMLS*	20.49	36.35	1	256

Notes: N=212

Taken together an average MLS player is 26 years old, stays 2.24 season with one club and 3.64 seasons in the league. Compared to the Bundesliga[9], average player age is ~0.5 years higher in MLS and the spell with the team is about 0.8 seasons lower (sd = 1). For Serie A[10] average age is a little bit higher at 26.95 years (sd = 3.85). Overall, mean age for MLS is not substantially different from more mature leagues. This might be driven by a general 'prime age' and respective limited age-range for soccer players. The lower spell in Bundesliga might come from lower barriers to switch. First, distances are shorter – a move from Hamburg to Munich is nothing compared to moving cross-country in the US from LA to NY. And secondly, as mentioned before, MLS controls and governs all player movements between clubs. Hence, league actions to keep players at certain clubs due to strategic reasons might decrease mobility. Ultimately, MLS therefore has huge control over team spells and can push it in the direction they consider valuable.

The additional two variables, *D_forexp* and *D_cap*, are created from information gathered from transfermarkt.de and a website that lists all national players since 1902 by national team[11]. *D_cap* is 1 if the player played at least once for his national team before or during his MLS time. While 60% of the DPs have been capped by their national team, only 20% of RPs have. If *D_forexp* equals 1 the player has foreign experience at a senior club-level. Less than half of all regular players have played abroad but 95% of DPs have. Only five DPs have not played outside the US in a first or second division, at least before turning DP: US nationals Chris Wondolowski, Graham Zusi, Kyle Beckerman, Matt Besler and the Grenadian-American Shalrie Joseph. Nevertheless, Kyle Beckerman is the on-field player with the most appearances in MLS history. Currently he has already over 400 and started his 17th MLS season in 2017, notably still being on the first squad.

Origin

"Among the five major team professional sports leagues in the United States, MLS is the most diverse" (Major League Soccer, 2017).

9 Frick and Wicker (2016) use a panel of 15 consecutive Bundesliga season from 1992/93 – 2006/07

10 Rossi (2012) uses a panel of 7 consecutive Serie A seasons from 2000/01 – 2009/10

11 http://www.rsssf.com/intlp-countrywise.html, Retrieved 07.08.2016

In the highly regulated MLS environment, diversity is an exemption. Not that there are no rules but they essentially take no effect. Since 2007, each team has eight initial international spots. 'Initial', because they are tradable. Hence, in 2016, a total of 160 spots were allocated but not all used. Another factor to consider are the required visa and working permits, which the teams have to secure before a player is eligible to play. Though this barrier is rather small, as players qualify for a P-1 visa as soon as they have signed a contract with an MLS team.

Even if the MLS praises itself today as the most diverse league in the US, in the beginning this was differently. One of the reasons for the NASL[12] bankruptcy in the 1980s was an overall too high wage bill, but especially the high pay for internationals. This might be a valid reason for MLS to develop a stronger international orientation in its roster composition rather slowly. In the 1996 inaugural season, the rosters hosted only about 22% internationals, in 2006 28% of players classified as foreign. Lastly, in 2016 only 57% of all players still came from North America. Across the teams and over time, local players accounted for 40% up to 76% on the rosters. While Houston, LA and DC are teams with a strong local roster, Orlando is at the bottom of the distribution with only 39% domestic players in 2016. With reference to Maderer, Holtbrügge, and Schuster (2014) we can compare those numbers to the development of national diversity in the top five European leagues from 1994/5 up to the season of 2010/11. In 1996, Italy ranked lowest with only 20% of internationals and England highest with over 40%, followed by Germany just under 30%. In 2006, Italy is still down with now just under 30%, Spain around 35%, France just under 50%, Germany at the 50% mark and England has an international share of over 60%. Until 2010, Germany and England remained quite stable, while Italy increased to just under 50%. Obviously, the increase in diversity in European soccer is driven by the Bosman ruling in 1995. Overall, the development in the MLS is not far apart from the one in Italy or Spain, but below the top 'import nations' Germany and England. In conclusion, two main reasons probably will keep MLS, also in the foreseeable future, from stepping up to Germany's or England's share of international players. First, the lower performance profile and popularity of MLS simply lures fewer players into the league. If Internationals can choose where to go, they most likely pick Europe due to the

12 The North American Soccer League was the top-level major professional soccer league in the US and Canada from 1968 until 1984.

higher financial rewards, more prestige and better development potential in terms of performance. Secondly, MLS was founded with the notion of nurturing US players for the local market but also for the international competition. To achieve this goal, the league needs to provide sufficient spots to local talents. Recently, this is clearly being promoted. MLS establishes more and more youth academies that are directly linked to an MLS team.

But where do the internationals come from? In the last 10 years, South America tops the foreign player list. It started with 6% of all players in 2006 and reached a peak of 14.5% in 2012. The share of Latin American & Caribbean players as well as the share of Central Americans has been more or less stable around 6% over time, whereas the percentage of Western Europeans fluctuates but increased over time. They started with 3% in 2006 and reached a current peak of 12% in 2015. In the ranks of the DPs, the South Americans are followed by Western Europeans and then by local players.

Table 6 Distribution of Region of Origin on Player Level, 2006 - 2016

(in %) Region	All MLS Players	RPs	DPs
Northern America	49.0	50.6	17.9
South America	15.0	14.2	33.7
Western Europe	11.9	10.8	28.4
Central America	7.5	7.5	7.4
Africa	6.1	6.1	7.4
Caribbean	5.5	5.7	2.1
Eastern Europe	2.4	2.5	2.1
Asia	1.4	1.4	
Oceania	1.2	1.2	1.1

Notes: All MLS Players N=1,612; RP N=1,552; DP N=95

Another major difference between the regions is the league tenure. While a local player stays on average 4.2 season in MLS, South and Central Americans stay 2.7. The Western Europeans stay shortest, on average only 2 seasons.

Talent

Footedness is a particular talent for a soccer player. According to Bryson et al. (2013) European clubs are even willing to pay a substantial premium for the ability to play alike with both feet. Reason enough to include the variable in our analysis. For 73% of RPs and 100% of DPs information on the preferred foot is available. The distribution, as can be seen in Table 7 is

heavily skewed towards the right foot as preference. The MLS distribution is quite in line with Bryson et al. (2013), who present a European Cross Section. The exception is a heavier concentration (18%) on both feet, while only 59% of players are right-footed in their sample of top European leagues. The higher concentration of extremely talented players in European leagues might be an explanation for that. European clubs are more mature and pay more, not necessarily on an individual level, but certainly overall[13]. As expected, among the DPs the share of player that are equally talented with both feet is higher, 22% compared to 9% for regular players.

Table 7 Distribution of Footedness, Regular and Designated Players

Preferred Foot	All MLS Players	RPs	DPs
both	10%	9%	22%
Left	23%	23%	15%
Right	67%	68%	63%

Note: RP N=1134, DP N=95

Turning to salary, Table 8 also confirms the European findings. Across all MLS sub-groups we find a "raw salary premium for two-footedness" (Bryson et al., 2013, p. 612). The premium is largest for DPs.

Table 8 Descriptive Statistics for Mean LogSbase and Standard Deviation

Preferred Foot	All MLS Players		RPs		DPs	
No record	10.87	(0.66)	10.87	(0.66)	n.a.	n.a.
Both	11.82	(1.27)	11.41	(0.75)	14.31	(0.92)
Left	11.34	(0.83)	11.28	(0.75)	13.40	(0.66)
Right	11.47	(0.97)	11.34	(0.79)	13.86	(0.96)

Note: RP N=4,443, DP N=212

Player Characteristics

Turning to the descriptives for the final two independent variables – height and position. For height we cannot see a substantial difference between RPs and DPs in Table 9.

[13] For total wage bills for the German Bundesliga, Spanish Premier League, Serie A, and EPL see Frick (2006); Garcia-del-Barrio and Pujol (2014); Lucifora and Simmons (2003); Feess, Gerfin, and Muehlheusser (2015); Pedace (2007).

Table 9 Player Characteristics, Regular and Designated Players

	description	mean	sd	min	max
height	Height measured in meters	1.81 / 1.80	0.06 / 0.07	1.58 / 1.64	2.01 / 1.96
height2	Square of *height*	3.27 / 3.23	0.23 / 0.24	2.50 / 2.69	4.04 / 3.84

Notes: Regular Players / Designated Players

Also, the position distribution is typical, at least for RPs. For the superstar group we see that predominantly forwards and midfielder are selected. This is in line with Lucifora and Simmons' (2003, p.51) superstar view. "Players who score goals gain higher profiles and recognition among fans and the media than players who do not". On a side note, in 10 years only one time a goalkeeper has received DP status. German Frank Rost played 14 matches in his sole MLS season of 2011.

Table 10 Distribution of Position, Regular and Designated Player

	Position	RP	DP
D	Defender	35%	6%
F	Forward	25%	51%
M	Midfielder	41%	46%

Note: RP N=4,443, DP N=212

2.2 Empirical Strategy

The first research question aims at salary determination in MLS, and how it compares to other markets. Due to the idiosyncrasies of designated players in MLS, illustrated with the descriptives statistics especially for salary and career performance, we expect to find substantial differences in the salary determination compared to regular players. Consequently, we estimate two individual sets of dynamic models, one for RPs and one for the special group of DPs.

Our general wage model for both groups is:

LogSbase = f(individual seasonal performance, individual career performance, experience, origin, talent, other player characteristics, team fixed effects, season dummies)

Based on this, we run a dynamic Fixed Effect (FE) model next to a basic dynamic OLS for RPs. The FE model is preferred in the setting of endogenous regressors as unobserved individual characteristics (e.g. talent) are usually correlated with explanatory variables (e.g. perfor-

mance stats).[14] The disadvantage of the FE model is that we cannot answer questions with regards to our various time-invariant variables (i.e. origin, position, footedness) which, in turn, the RE model can. The standard errors are likely to be correlated over the seasons for a given player. To prevent this pitfall, we cluster at the player level to produce standard errors that are robust to cross-sectional heteroscedasticity and within-panel (serial) correlation. To validate the standard conditional expectation models, we estimate quantile regression models at the 10^{th}, 25^{th}, 50^{th}, 75^{th}, and 90^{th} percentiles of the wage distribution. Quantile regression is a more robust way to deal with outliers and accurately present the impact of the independent variables along the wage distribution.

For the small group of designated players with 145 player-season observations, we use a stepwise approach. To understand the impact of our independent variables we test different specifications. This is preferable as the full model, with all variables included, reaches its statistical limits.

The second question this paper aims to answer, concerns the impact of the distinctive MLS regulations on salary determination. First, we illustrate the impact of the three CBAs (counting the 2010 memorandum as CBA) that occurred during our observed period. For this purpose, we plot dummies of the season coefficients, from our regular player OLS salary model as stated above, against time. Then, we look for any peculiarities in or before the CBA years. Secondly, we examine the impact before and after the major regulation change in 2010. The memorandum signed in 2010 increased the number of guaranteed contracts among regular players. The question is if this was an effective move to give more job security to the players? Did the pressure to perform season-by-season to interlock a contract for the following season, decrease? To answer this, we check the magnitude of last season performance in the period before 2010 and after 2010. Hence, the subset 'season 2006 – 2009' is compared with the subset 'season 2010 – 2015' by means of the previously discussed OLS and FE models. For this part we restrict the data to regular players again, as the restrictive contract rules in place before 2010 do not apply to DPs.

[14] The Hausman Test confirms the preference for a Fixed Effect over a Random Effect estimation.

3 Results and Discussion

The following section presents the results from the salary regressions first, and then the findings for the regulatory impact on MLS salary.

3.1 Salary Determination for Regular and Designated Players

For the group of RPs, the OLS and Fixed Effect estimations deliver similar results for most variables with some striking exceptions. Based on AIC/BIC results, we consider the Fixed Effect estimations superior to OLS. Nevertheless, for the results concerning the time-invariant regressors we have to refer to the OLS[15]. In Table 11 we show the full RP group results[16], which main findings are summarized below:

- *Last Season Performance:* As expected, we find a statistically significant positive impact of last season's performance, driven mainly by minutes played per game, forwards' goal rate and midfielders' shooting rate. Additionally, midfielders' assist rate and MLS awards won are significantly related to a higher salary but only in the OLS. Exceptionally large is the additional reward for scoring a goal compared to other plays.
- *Career performance*: Career games played is statistically significant to explain MLS players' salaries. The cubic relation and underlying S-curve, from positive to negative to positive, is a signal that there are outstanding players i.e., a superstar effect (Lucifora & Simmons, 2003), even in the group of regular players. Also significant is the coefficient of the career goal rate for forwards, but strictly linear. The career assist rate for forwards atypically influences income negatively. Potentially, a high assist rate for forwards is perceived less valuable compared to forwards who score more themselves. In turn, Frick's (2011, p. 97) finding of recent performance being more important than "historical merits", cannot be confirmed for regular MLS players.

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15 The authors also tested the Hausman-Taylor estimator to deliver more robust insights on time-invariant regressors. Unfortunately, no convincing model, free of misspecifications, could be estimated. Specifically, the variables *height* and *height^2* distort all estimations without reasonable explanation.

16 As a robustness check a sub-sample of RPs, which excludes player that earn only minimum wages, was estimated. The findings remain stable even if the sample is therefore reduced to two-thirds (see the Descriptives section for details on minimum wage players). Therefore, we can conclude that the big number of minimum wage earners do not distort the estimations but can be considered as part of the regular player's wage group.

- *Experience:* The impact of age on salary follows the typical inverted u-shape with a very late turning point at 33.6 years. Experience abroad yields a significantly higher salary, as well as tenure with the current team (linear effect, controlling for team-specific fixed effects), whereas MLS tenure has a significantly negative effect. Interestingly, age has no statistically significant influence on salaries in the OLS estimation. As noted by Lucifora and Simmons (2003), most North American studies even refrain from using age and experience with the team/league together as this is likely to cause multicollinearity. In the US this is driven by the fact that most players enter through the draft system directly out of college, hence around the same age. But for MLS, the situation is a different one. The MLS entry age for RPs averages at 24, while 50% of players enter at 23 and older. Also, *age*, *spellMLS* and *spellTeam* correlate moderately[17]. Overall, we can take that as a further indicator that the fixed effect model is superior as it allows for non-independence between the regressors (e.g. *age* and *spellMLS*).
- *Origin:* Based on the OLS estimations, local players earn significantly less than players from Central America, South America and Western Europe. Additionally, we find evidence that players from Asia and Oceania earn similarly less compared to the local players, when controlling for performance. The wage penalty for US-/Canadian-national players is analogous to results from the European leagues (compare Bryson et al., 2014). The pay premium for South American players (compare Pedace, 2007, for EPL findings) and Western Europeans (Frick, 2007 and 2011, for Bundesliga) also comes as no surprise, whereas the findings for players from Asia and Oceania seem to be MLS specific.
- *Talent:* Unusual are the findings for the preferred foot of players. Players, whose left foot is the strongest, earn significantly less compared to those players who have no foot preference registered on transfermarkt.com. This is also in contrast to our descriptive findings which revealed the highest mean for players who have the ability to play with both feet. With our results, we cannot confirm the premium that is paid in Europe for this special talent (Bryson et al., 2013).
- *Other Player Characteristics:* No significant results are found for height, nor the three on-field positions that were included in the estimations. Unexpectedly especially for

[17] Corr(age, spellMLS)=0.54, Corr(age, spellTeam)=0.26, Corr(spellTeam, spellMLS)=0.53

positions, since previous studies, using data from other soccer leagues, have repeatedly found a premium paid for forwards as well as midfielders over defenders. Nevertheless, it confirms the descriptive results (see Figure 3). After all, forwards are not the salary champions in MLS, at least among the regular players.

Table 11 Estimation Results for Regular Players I: OLS and FE

Log Base Salary	(1) OLS		(2) Fixed Effect	
L.Smi/Sgp	0.0049***	(0.00)	0.0037***	(0.00)
L.FgoRate	0.6295***	(0.16)	0.5502***	(0.13)
L.MgoRate	0.2437	(0.23)	0.2223	(0.23)
L.DgoRate	0.6330**	(0.31)	0.3893	(0.24)
L.FassRate	0.3934*	(0.23)	0.1877	(0.23)
L.MassRate	0.5722***	(0.17)	0.2148	(0.17)
L.DassRate	-0.1849	(0.21)	0.0388	(0.19)
L.FshtsRate	0.0341	(0.03)	0.0052	(0.03)
L.MshtsRate	0.0995***	(0.04)	0.0791**	(0.04)
L.DshtsRate	0.0640	(0.05)	0.0475	(0.05)
L.D_Award	0.3144***	(0.08)	0.0731	(0.09)
L.Cgp	0.0094***	(0.00)	0.0124***	(0.00)
L.Cgp2*100	-0.0026***	(0.00)	-0.0025***	(0.00)
L.Cgp3*10000	0.0002***	(0.00)	0.0002**	(0.00)
L.CFgoRate	0.3159**	(0.15)	0.6522***	(0.19)
L.CMgoRate	0.0149	(0.33)	0.4015*	(0.39)
L.CDgoRate	0.6552*	(0.34)	0.4809	(0.47)
L.CFassRate	-0.2430	(0.30)	-0.6042*	(0.35)
L.CMassRate	0.3816*	(0.23)	-0.2943	(0.27)
L.CDassRate	-0.1409	(0.23)	-0.0347	(0.46)
Age	-0.0512	(0.04)	0.3630***	(0.08)
Age squared	0.0006	(0.00)	-0.0054***	(0.00)
spellTeam	0.0266***	(0.01)	0.0255***	(0.01)
spellMLS	0.0012	(0.02)	-0.1373***	(0.05)
spellMLS2	-0.0012	(0.00)	0.0009	(0.00)
D_forexp	0.0642**	(0.03)		
L.D_cap	0.2283***	(0.03)	0.1435***	(0.04)
Africa	0.0047	(0.06)		
Asia	-0.1464***	(0.05)		
Caribbean	-0.0699	(0.05)		
Central America	0.1354***	(0.05)		
Eastern Europe	0.0115	(0.08)		
Oceania	-0.2814***	(0.11)		
South America	0.2467***	(0.05)		
Western Europe	0.1861***	(0.07)		
Both	0.0100	(0.05)		
Left	-0.0809**	(0.04)		
Right	-0.0285	(0.03)		
Height	9.0694	(9.01)		
Height2	-2.3754	(2.48)		
Constant	2.3705	(8.17)	5.1173***	(1.23)
N		2809		
Obs. per Players			1-10	
R2*100	68.8		64.0 *(within)*	
F-Value	53.28***		35.82***	

Continued next page

Notes for Table 11 continued:

*Notes: Clustered robust errors in parentheses, Two-tailed test: * p < 0.1, ** p < 0.05, *** p < 0.01.*
North America and 'missing information' for Footedness are the reference categories.
Control included if team reached play-offs, hence played more games.
Fixed effects at the player-level are incorporated into the FE estimations.

The quantile regression is run with 200 bootstrap replications. The results, in Table 12, show mixed results compared to the standard regression estimates. Generally, we find stable results for last season performance, career performance (exception: no cubic relation in lower quantiles which supports the assumed superstar effect) and team spell. The other variables' impact is lost across the income distribution. Particularly, league tenure becomes insignificant across all quantiles, while foreign experience is now only significant from the median upwards. Height is now associated with a higher salary in the lowest quantile with a turning point at 1.86 meters. However, the null hypothesis i.e., no significant difference between the quantiles, is only rejected based on the Stata test results (F-Value in brackets) for *SmiSgp* (2.38**), *age* (2.71**), *D_cap* (2.6**), *Western Europe* (7.53***), *South America* (5.04***), and *Africa* (3.32**). *SmiSgp* impact is substantially stronger at the top of the income distribution, but otherwise confirms the FE results. Also, national team caps have a significant impact throughout the distribution, but peak at the median and top quantile. *Age* is only significant at the median and upper quantiles, but the negative coefficient (positive for the square) is unusual. Finally, African, South American and Western European origin has a significant positive influence at the top of the distribution (Western European also at the median). For South Americans the premium is apparent throughout but is strongest at the top of the income distribution.

Table 12 Estimation Results for Regular Players II: Quantile regressions.

			Quantiles		
Log Base Salary	0.1	0.25	0.5	0.75	0.9
L_SmiSgp	0.0034***	0.0036***	0.0044***	0.0050***	0.0049***
L_FgoRate	0.4452*	0.5955**	0.7614***	0.6312***	0.6028**
L_MgoRate	0.2080	0.1407	0.1373	0.4573	-0.0362
L_DgoRate	0.5124	0.6835**	0.5484	0.3440	0.3934
L_FassRate	0.8154***	0.4976*	0.3240	0.2062	-0.0005
L_MassRate	0.6919***	0.5153***	0.3617**	0.2660	0.2135
L_DassRate	-0.0735	-0.2077	-0.1537	-0.2903	-0.0430
L_FshtsRate	0.0578	0.0485	0.0054	0.0593	0.0736
L_MshtsRate	0.1177**	0.1272***	0.1315***	0.1067**	0.1103**
L_DshtsRate	0.0586	0.0528	0.0029	0.0887	0.1678*
L_D_Award	0.2862	0.3809***	0.3436***	0.2222**	0.2410**
L_Cgp	0.0071***	0.0084***	0.0104***	0.0099***	0.0093***
L_Cgp2*100	-0.0010	-0.0015**	-0.0030***	-0.0030***	-0.0028***
L_Cgp3*10000	-0.0001	0.00028	0.00026***	0.00029***	0.00025*
L_CFgoRate	-0.0185	0.1213	0.2891	0.4909**	0.2860
L_CMgoRate	-0.4343	-0.3244	-0.2335	0.4005	1.0074**
L_CDgoRate	0.6738	0.7289*	0.8356**	0.6534	0.6064
L_CFassRate	-0.0377	-0.0921	-0.3210	-0.5462	0.3052
L_CMassRate	0.2887	0.8550**	0.3583	0.2264	0.2108
L_CDassRate	0.5210	0.0836	0.0070	-0.4899	-0.6330
Age	0.0253	0.0078	-0.0716*	-0.1288***	-0.1135**
Age squared	-0.0010	-0.0005	0.0009	0.0020***	0.0017*
SpellTeam	0.0269***	0.0276***	0.0170***	0.0232***	0.0341***
SpellMLS	0.0340	0.0251	0.0028	-0.0098	-0.0333
SpellMLS2	-0.0033*	-0.0035*	-0.0013	-0.0000	0.0008
D_forexp	0.0249	0.0331	0.0505*	0.0657**	0.1247***
L_D_cap	0.2125***	0.1848***	0.2609***	0.2430***	0.2840***
Africa	-0.0657	-0.0247	-0.0012	0.1104**	0.1321*
Asia	-0.0253	-0.1137	-0.0951	-0.2177***	-0.0202
Caribbean	-0.1512**	-0.1064**	-0.0531	-0.0052	0.0165
Central America	0.1317**	0.1145**	0.1556***	0.1545***	0.0422
Eastern Europe	0.0024	-0.0157	0.0518	0.0391	-0.0062
Oceania	-0.3150***	-0.3718***	-0.2553**	-0.0818	-0.0493
South America	0.1059*	0.1413***	0.2489***	0.3578***	0.4605***
Western Europe	0.0722	0.0401	0.2134**	0.4187***	0.3304***
Both	0.0600	0.0024	-0.0066	0.0039	-0.0545
Left	-0.0635	-0.0765**	-0.0854**	-0.0856**	-0.0431
Right	-0.0364	-0.0338	0.0018	-0.0221	0.0091
Height	16.3577*	9.2600	3.9231	10.7483	6.8346
Height2	-4.3995*	-2.4649	-1.0055	-2.8734	-1.7747
Constant	-5.5793	1.3582	7.5961	2.2493	5.6826
	Position, team and season dummies included				
N			2809		
Pseudo R2 *100	43.8	44.4	47.2	47.3	45.7
Raw Sum of Dev.	323.1	598.0	794.1	631.3	338.5
Min. Sum of Dev.	181.7	332.8	419.3	332.5	183.8

*Notes: Two tailed test: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.*

Defender, North America and missing information for Footedness are set as reference categories.

Control included if team reached play-offs, hence played more games.

For the interesting findings around origin, the main hypothesis is that the premium paid for South American players is driven by local demand. Cities with a high percentage of Hispanics are prone to employ more Hispanics to increase attendance and merchandizing sales. However, as shown in Table 13, even in cities with a low percentage of Hispanics population, e.g. Columbus or the Canadian cities, the share of Hispanics is high. As exception, the new team New York City FC (first season in 2015) has a low share of under 10% Hispanic players. Another explanation might be the established connections of MLS player agents to south American clubs that persist even if not justified from a demand perspective.

Table 13 Share of Hispanics in Population and MLS

Club	City	State	Share in Population	Share in Team	Dif.
COL	Commerce City	Colorado	47%	19%	-28%
HOU	Houston	Texas	44%	17%	-27%
NY	Harrison	New Jersey	44%	18%	-27%
DAL	Frisco / Dallas	Texas	42%	39%	-3%
CHV	Carson	California	39%	38%	-1%
LA	Carson	California	39%	16%	-23%
SJ	San Jose	California	33%	27%	-6%
CHI	Bridgeview / Chicago	Illinois	29%	23%	-6%
NYCFC	New York	New York	29%	8%	-20%
ORL	Orlando	Florida	25%	26%	0%
RSL	Sandy / Salt Lake City	Utah	22%	29%	7%
NE	Foxborough / Boston	Massachusetts	17%	17%	-1%
PHI	Chester / Philadelphia	Pennsylvania	12%	27%	14%
KC	Kansas City	Missouri	10%	18%	8%
POR	Portland	Oregon	9%	30%	21%
DC	Washington	D.C.	9%	21%	11%
SEA	Seattle	Washington	7%	31%	24%
CLB	Columbus	Ohio	6%	22%	17%
VAN	Vancouver	British Col.	5%	25%	20%
MTL	Montreal	Quebec	4%	17%	13%
TOR	Toronto	Ontario	3%	14%	12%
Average			*23%*	*23%*	

Notes: Population based on Census data from 2011, MLS data from 2006 – 2016, depending on club tenure

The premium paid to Western Europeans is most likely driven by the quality pretense that those players generally carry in the US. The long-standing history of soccer in Europe is the reason for this. As discussed before, MLS controls all player movements. Hence, the league might limit the options for the local players and in turn, is able to pay them less than an international player with comparable profile and more outside opportunities.

Turning to the estimations for the designated players, we see in Table 14 that in a simple model club-specific fixed effects explain already about 50% of the observable variation in player salaries. While seasonal effects play no role, region of origin, career performance as well as league tenure are statistically significant. In detail this means:

- First, the substantial influence of club-specific fixed effects on DP salary supports the frequent argument that certain teams use the option to hire special players more excessively. The big spenders, according to our analysis, are LA Galaxy and Toronto. To a lesser extent, once controlling for performance, Orlando City FC, New York City FC, and New York Red Bulls also range at the top. In contrast, Chivas USA, Dallas, DC United, Montreal, Philadelphia Union, and Real Salt Lake pay substantially less than our reference team New England Revolution (chosen due to its average mean value for salary). The latter result is found once controls for performance, origin, experience, talent and position are included.
- Secondly, over the last 10 years pay for DPs did not substantially change. The positive upward trend that is driven by the CBAs for the regular players does not play a role for the superstars.
- Thirdly, as expected, career achievements (i.e. career games played) influence DP salaries positively, while last season performance appears to have no significant impact on the salaries of MLS superstars.
- Fourthly, the coefficients of player age and other individual characteristic like position on the pitch fail to reach conventional levels of significance, suggesting that they do not contribute to the explanation of the observable variation in player salaries.
- Finally, in contrast to the findings for regular players, and also the findings for European leagues, domestic players seem to earn a premium at least over players from the Caribbean, South America and Western Europe[18].

[18] The findings for *South America* and *Western Europe* are not significant across all specifications. However, in the best model (based on AIC/BIC criteria) the coefficients are statistically significant.

Table 14 Estimation Results for Designated Players I: Various OLS models

Log Base Salary	(1)	(2)	(3)	(4)	(5)
CHI	0.0558	0.0438	0.0288	0.3229	0.1360
CHV	-0.8061	-0.6973	-0.3957	-1.0709**	-1.0936**
CLB	-0.2432	-0.2072	0.1673	0.0325	-0.1072
COL	0.1903	0.1018	-0.1108	0.0850	-0.1932
DAL	-0.8075*	-0.7265	-0.5157	-0.6554*	-0.6657*
DC	-0.7601*	-0.7474*	-0.5722	-0.7458**	-0.6870*
HOU	-0.4266	-0.4986	-0.7735	-0.8447**	-0.5986
KC	-0.4178	-0.4044	-0.6424	-0.4149	-0.1358
LA	1.0745***	1.1409***	0.8048**	0.5571*	0.5900*
MTL	-0.2556	-0.2767	-0.1790	-0.7242**	-0.9730***
NY	0.9094**	0.9679**	0.7513*	0.3793	0.2347
NYCFC	1.8644***	1.7758***	1.5632***	0.7095*	0.5272
ORL	2.0141***	1.9256**	2.4246***	1.2707**	0.9834
PHI	-0.4135	-0.3840	-0.7033	-0.7455*	-0.8350*
POR	-0.2262	-0.2900	-0.1019	-0.1040	-0.2296
RSL	-0.6668	-0.6343	-0.7803*	-1.1612***	-1.1977***
SEA	0.1857	0.2289	0.3624	0.0742	-0.0478
SJ	-0.2797	-0.2854	-0.5723	-0.1609	-0.1909
TOR	1.0875***	1.1620***	0.7932**	0.8492**	0.5766*
VAN	-0.1570	-0.1582	0.0501	0.1183	0.0222
2008		0.5735			
2009		0.3669			
2010		0.3728			
2011		0.2878			
2012		0.2142			
2013		0.3109			
2014		0.4615			
2015		0.5021			
2016		0.5353			
Africa			-0.1205	0.0229	-0.2715
Caribbean			-1.0500**	-0.6515*	-0.6576*
Central America			0.1143	0.3952*	0.0139
Eastern Europe			-0.5433	-0.0408	-0.2966
Oceania			0.3297	0.3693	-0.1159
South America			-0.7002***	-0.1484	-0.4441**
Western Europe			0.0114	-0.3431**	-0.7365***
L.Smi/Sgp				0.0053	0.0064
L.Cgp				0.0031***	0.0027***
Age					0.0478
Age squared					-0.0002
spellMLS					-0.1678**
spellMLS2					0.0067
L.D_cap					0.0612
both					-0.0585
left					-0.4138
F					-0.0684
M					-0.1081
Constant	13.6975***	13.2507***	13.9873***	12.7259***	12.4178***

Continued next page

Table 14 continued

N	145	145	145	145	145
R2*100	57.67	59.18	66.04	77.79	80.70
R2 adjusted*100	50.84	48.89	58.20	71.95	73.54
F-Value	8.44***	5.75***	8.43***	13.31***	11.26***
aic	313.4	326.1	295.4	239.9	237.5
bic	375.9	415.4	378.8	332.1	356.5

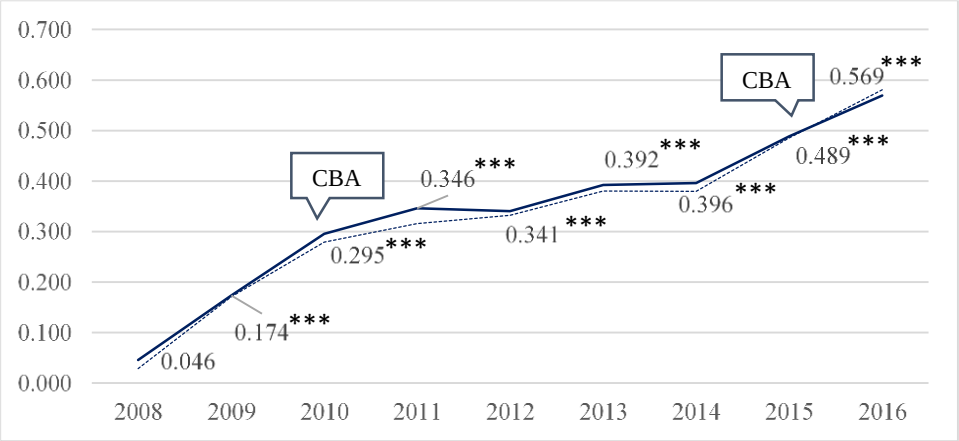
Note: Two tailed test: * p < 0.1, ** p < 0.05, *** p < 0.01.
Defender, New England Revolution, Northern America, and Right Foot are reference categories.
Control included if team reached play-offs, hence played more games.

3.2 Impact of Regulations

Figure 5 illustrates the seasonal influences on salaries. Displayed are the regular player model (dotted line) as presented above in 3.1 and a joint model with DP interaction effects (solid line and coefficients) to test the effects holistically[19]. The differences are marginal. For both, the 2008 season is not yet statistically different from the reference category, season 2007. However, from 2009 onwards each season is statistical different with constant salary increase. The graph also shows the over proportional change from 2009 to 2010 and from 2014 to 2015. One factor is the leap in clubs' salary budgets set by the league of more than 12 percent with each new CBA. In contrast, the regular yearly increase is set to five percent. The impact in 2015 and the following season(s) is particularly strong. This is driven by a lucrative new TV deal, the rise in popularity exemplified by attendance records and new fan movements, and finally, new investors' arrival pushing to accelerate the expansion and the providing substantially more resources. All in all, each Collective Bargaining Agreement has had a substantial impact.

[19] The estimation results for the joint model are available upon request from the authors.

Figure 5 Seasonal Coefficient from the General Wage Model Over Time



Secondly, we present the results for the comparison of salary determinants between the period before 2010 and after. Table 15 shows that the magnitude of last season performance (*SmiSgp*) is reduced to almost half from the time until 2010 and after 2010. This is true for both model specifications. The interpretation of the other interesting coefficients is less straightforward. *FgoRate* and *MshtsRate* are only significant in the second period. *Cgp*'s influence is stronger in the second period. And *CFgoRate* is only significant in the second period for the Fixed Effect model. The same is true for team tenure, in the OLS specification it is significant in the second period, but the influence in the FE model is unchanged from before 2010 to after 2010. Overall, we can conclude that the memorandum and the increased number of guaranteed contracts seems to have had an effect, but limited to the main driver of last season performance and minutes played per game.

Table 15 Estimation Results for Regular Players III: OLS and FE, split by 2006 – 2009 and 2010 - 2016

Log Base Salary	OLS 2006-2009	OLS 2010-2016	FE 2006-2009	FE 2010-2016
L.Smi/Sgp	0.0071***	0.0039***	0.0043***	0.0022***
L.FgoRate	0.6601	0.6203***	0.2916	0.7316***
L.MgoRate	0.0845	0.4020	0.7075*	0.1096
L.DgoRate	1.6865***	0.4105	-0.0184	0.1012
L.FassRate	0.3454	0.2996	-0.2639	0.0559
L.MassRate	1.0163***	0.3622**	-0.1310	0.2957
L.DassRate	0.0968	-0.3699*	0.0460	0.0413
L.FshtsRate	-0.0427	0.0618*	-0.0694	0.0125
L.MshtsRate	-0.0739	0.1348***	-0.0557	0.1147***
L.DshtsRate	0.1565	0.0396	0.0760	-0.0177
L.D_Award	0.2306*	0.3322***	-0.0053	0.1016
L.Cgp	0.0104***	0.0094***	0.0060*	0.0120***
L.Cgp2	-0.0000**	-0.0000***	-0.0000	-0.0000***
L.Cgp3	0.0000	0.0000***	0.0000	0.0000
L.CFgoRate	0.5599	0.1917	0.3124	0.8028***
L.CMgoRate	1.3985***	-0.3901	0.2096	0.0441
L.CDgoRate	-0.5109	0.8255*	0.3624	0.1976
L.CFassRate	-0.2819	-0.3907	-0.8358	-0.7364
L.CMassRate	0.1156	0.2397	-0.5415	0.1933
L.CDassRate	-0.3848	-0.2234	-1.4276**	0.6882
Age	-0.1783**	0.0326	0.5663***	0.2678***
Age squared	0.0031**	-0.0011	-0.0118***	-0.0054***
spellTeam	0.0162	0.0345***	0.0377**	0.0327***
spellMLS	0.0489	-0.0224	0.1162*	-0.0691
spellMLS2	-0.0049	0.0001	0.0036	0.0023
D_forexp	0.1158*	0.0601*		
L.D_cap	0.2475***	0.2049***	0.0108	0.0900*
Constant	12.0939***	10.3897***	3.4032**	7.4655***
	Position, footedness, team, region and season dummies included			
N	632	2177	632	2177
Obs. per Players			1-3	1-7
R2*100	75.72	66.40	49.88	55.96
R2 adjusted*100	73.31	65.33	46.03	54.84
F-Value	30.6***	47.5***	.	26.8***
aic	744.7473	1910.7389	-433.3487	-689.4368
bic	1002.7829	2297.3667	-242.0465	-382.4088

*Notes: Two tailed test: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.*

Control included if team reached play-offs, hence played more games.

4 Conclusion

Founded in 1996, the rather low profile North American professional soccer league MLS has continuously evolved. For example, MLS adjusted their regulatory framework over time and expanded their footprint. Those measures have helped to get a better standing among the American sports but also in comparison to more mature soccer leagues around the world. One of the more notable changes happened in 2007 when MLS departed from its highly regulated salary cap system by introducing the designated player rule. From then on, teams could upgrade their roster by employing up to three superstars, named designated players, and pay them outside of the tight salary cap and other regulations negotiated with the MLS Players Association. In contrast, regular player salaries are still tightly governed by the valid Collective Bargaining Agreement up until today. Every player negotiates directly with the league, instead of the team like it is the case in European soccer, in line with the MLS Players Association's negotiated basic 'deals'. Minimum salaries, different for developmental and senior players, maximum salaries, from which only designated players are exempted, and the salary cap play an effective part in keeping total payrolls under control for the league and support competitive balance across teams. On a positive note, CBAs also aided a substantial growth in regular players' average salaries of 110 percent between 2006 and 2017. At $158,836 in 2016, RPs average salary is still far below the DP's average of $1.9 million, but notably DP average salaries remained more or less stable over the last 10 years with a minor growth of 7 percent.

Consequently, MLS functions based on a two-class player system. We have shown first, in the descriptives and secondly, in the regression results, how regular and designated players differ. They differ with regard to salary levels but also the performance statistics, especially for the career, experience, region of origin, and footedness dimensions shows the group's heterogeneity.

Dynamic fixed effect and OLS regressions was employed to analyze time-variant and –invariant determinants of players' salaries. A quantile regression model confirmed how robust the results are along the salary distribution. We started our analysis with the standard Mincer earnings function, but extended this model to include MLS-specific combinations of performance drivers and other player characteristics that contribute original findings. This results into the following main determinants for MLS regular players' salaries:

- Minutes played per game in the last season, forward goal rate, and awards won (not relevant for the lowest quantiles);
- Career games played (cubic relation) and the career forward goal rate;
- Experience abroad (only significant at the median and upper quantiles), spell with the current team, and national team caps.

Additionally, age influences salaries positively until a very late turning point of 33.6 years. Moreover, we find that locals are paid less than players from Central and South America as well as Western Europe. The impact differs across the salary distribution but is strongest at the median and upper quantiles. Overall, we confirm various findings that have been reported in previous research using data from European soccer leagues (e.g., Bryson et al., 2014; Frick, 2007; Lucifora & Simmons, 2003) with two exceptions. First, the finding that recent performance is not a stronger predictor of salaries than historical merits. An explanation might be the changes in regulations as shown in section 4.3.2. From 2010 onwards, job security increased tremendously for a regular MLS player as more guaranteed contracts were negotiated. This limited the ability of teams to act upon bad performances. Also, a sub-analysis including longer lags to test the robustness of our findings has shown no difference in results. Thus, on the one side, MLS has found a way to control salary budgets overall, but on the other side it seems that they compromised noticeably with the Player's Association to improve player's employment conditions. The result is a lower sensitivity to players' last season performance. Secondly, and probably the largest difference compared to European leagues, is the insignificance of the position dummies. Among the regular players, forwards are not paid substantially more than defenders or midfielders. Once these findings are placed into the bigger MLS picture they make more sense: In MLS, a disproportionate high amount of DPs are forwards, over 50 percent. Therefore, the highest earners in the league are predominantly forwards. Within the group of DPs, the regression analysis reveals, again, no unexplained pay differential between the positions. In a simple model, the main driver of DP salaries are club-specific fixed effects. Most likely, the club dummy stands for the ability of certain clubs to pay more than other clubs, e.g. driven by market size. Hence, clubs like LA Galaxy, Orlando City FC, New York Red Bulls, New York City FC, and Toronto FC come out at the top. The club's choice to employ a superstar, or even more than one, presents a worthy setting for further investigation. Future research on this should surely build upon Coates et al. (2016) findings.

They highlight a team's conflict to decide between a higher wage bill that favors team performance, and a better salary equality among players, as the opposite influences performance negatively. Initial evidence that local superstars earn a premium compared to players from the Caribbean, South America and Western Europe also need further confirmation. So far, the group of designated players is still very small as only 145 observations could be used for the results. With time, MLS expansion and team's revenue growth will help to put more DPs on the rosters and in turn allow for more reliable results.

A first attempt was also made to investigate the influence of regulations in MLS. Clearly, Collective Bargaining Agreements have a substantial effect and govern the whole MLS salary system. Tentative evidence was found that changes in regulations have an immediate impact. Before 2010, job security and salary levels were low and career spans very short. As mentioned above, from 2010 onwards more guaranteed contracts improved the situation from a player perspective and led to longer career spans and increased salary levels.

Our findings are relevant for managers involved in the human resource policies of the clubs. Understanding the key determinants of player salaries should help to evaluate potentially over- and underpaid characteristics, e.g. premiums paid for South American players even if performance is controlled for. Furthermore, our research hopefully helps to increase the interest in MLS and position it as a league that is worth to be followed and researched in the broader context of soccer and sports economic research. In this spirit, further research can complete the picture that we started to draw for MLS. An open field, for example is using evidence from 'inside the locker room' or other off-the-pitch influences. Insights on team dynamics, players influencing each other and qualitative aspects might help teams to enhance productivity even further. The combination of a highly regulated labor market, substantial expansion, and data availability makes MLS a very special and worthwhile research setting.

APPENDIX

Table 16 Summary Statistics as Used, Regular Players

variable	description	mean	sd	min	max
SmiSgp	Average minutes played p.g. p.s.	54.8	30.5	0	93.8
FgoRate	Goals scored by forward p.g. p.s.	0.033	0.095	0	1.000
MgoRate	Goals scored by midfielder p.g. p.s.	0.023	0.063	0	1.000
DgoRate	Goals scored by defender p.g. p.s.	0.008	0.030	0	0.500
FassRate	Assists by forward p.g. p.s.	0.019	0.057	0	0.806
MassRate	Assists by midfielder p.g. p.s.	0.032	0.077	0	1.000
DassRate	Assists by defender p.g. p.s.	0.013	0.043	0	1.000
FshtsRate	Shots by forward p.g. p.s.	0.273	0.631	0	4.135
MshtsRate	Shots by midfielder p.g. p.s.	0.287	0.535	0	3.971
DshtsRate	Shots by defender p.g. p.s.	0.108	0.241	0	2.667
Cgp	Career games played (excl. last season)	81.9	94.8	0	573
Cgp2	Square of *Cgp*	15,680	30,683	0	328,329
Cgp3	Cube of *Cgp*	3,973,955	$11{,}400*10^3$	0	$188{,}000*10^3$
CFgoRate	Career goals scored by forward p.g.	0.040	0.103	0	2.000
CMgoRate	Career goals scored by midfielder p.g.	0.024	0.055	0	0.500
CDgoRate	Career goals scored by defender p.g.	0.010	0.030	0	0.500
CFassRate	Career assists by forward p.g.	0.019	0.050	0	0.667
CMassRate	Career assists by midfielder p.g.	0.028	0.060	0	0.400
CDassRate	Career assists by defender p.g.	0.012	0.035	0	1.000

Note: N=4,106, p.g. p.s. = per game per season

Table 17 Summary Statistics as Used, Designated Players

variable	description	mean	sd	min	max
SmiSgp	Average minutes played p.g. p.s.	75.6	16.7	0	90.0
FgoRate	Goals scored by forward p.g. p.s.	0.184	0.237	0	0.857
MgoRate	Goals scored by midfielder p.g. p.s.	0.072	0.136	0	0.667
DgoRate	Goals scored by defender p.g. p.s.	0.003	0.017	0	0.148
FassRate	Assists by forward p.g. p.s.	0.097	0.146	0	0.593
MassRate	Assists by midfielder p.g. p.s.	0.085	0.142	0	0.633
DassRate	Assists by defender p.g. p.s.	0.006	0.027	0	0.238
FshtsRate	Shots by forward p.g. p.s.	1.203	1.370	0	4.600
MshtsRate	Shots by midfielder p.g. p.s.	0.713	1.016	0	5.485
DshtsRate	Shots by defender p.g. p.s.	0.039	0.191	0	1.833
Cgp	Career games played (excl. last season)	294.2	168.9	43	821
Cgp2	Square of *Cgp*	114,907	125,911	1,849	674,041
Cgp3	Cube of *Cgp*	$54{,}200*10^3$	$85{,}800*10^3$	79,507	$553{,}000*10^3$
CFgoRate	Career goals scored by forward p.g.	0.170	0.182	0	0.548
CMgoRate	Career goals scored by midfielder p.g.	0.071	0.103	0	0.440
CDgoRate	Career goals scored by defender p.g.	0.004	0.020	0	0.151
CFassRate	Career assists by forward p.g.	0.070	0.097	0	0.480
CMassRate	Career assists by midfielder p.g.	0.055	0.078	0	0.322
CDassRate	Career assists by defender p.g.	0.004	0.020	0	0.172

Notes: N=172, p.g. p.s. = per game per season

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