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An Analysis of Major League Soccer: Competitive Balance and Wage Dispersion

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AN ANALYSIS OF MAJOR LEAGUE SOCCER: COMPETITIVE BALANCE AND WAGE DISPERSION

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ABSTRACT

Major League Soccer is in a transitional state which may see it projected into the realm of international relevancy, competing with European soccer. This transition is fueled by contracting renowned superstars from Europe via the designated player (DP) rule. This study examines implications of the DP rule on competitive balance (CB) of the league and wage dispersion among teams. The effect of the rule on CB is inconclusive in the model constructed, but propositions of a more appropriate CB measure are presented for future research. The DP rule has caused higher levels of salary dispersion within the league and this dispersion is found to be negatively related to team performance which is supportive of the wage compression hypothesis.

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Introduction

Why Sports?

Professional sports provide Economists with regulated and controlled experiments. "Thus, sports provide the ultimate avenue for examining business and management practices: owing to data availability, on the one hand, and the high degree of competition in the industry, on the other" (Frick, Prinz and Winkelmann, 2003, p. 473). Performance of players is observable and precisely measured. Payoffs are large, incentivizing players to behave rationally and efficiently, and these players are in the far right tail of the talent distribution. Research in the Sporting industry can be used to support Economic theory. An analysis of penalty kicks gave support to the Nash mixed-strategy equilibria, when laboratory experiments had failed to do so (Chiappori, Levitt and Groseclose 2002).

Why MLS?

MLS is unique in comparison to other Professional sporting leagues because of its top-down managerial structure. MLS is a single entity sporting league, meaning player contracts and all teams are owned by the league. There are shareholders within the organization and some of these shareholders are appointed as investor-operators, acting as team "owners". The single entity structure acts as a cost control and hedges against risks. Today, there are 19 investor-operators for 20 teams with most of the operators being companies such as Hunts Sports and AEG.

MLS has begun slowly hiring superstars from European soccer leagues in order to increase revenues and fan interest via the designated player rule. This rule is unique in

the sporting industry. The salary cap rule in MLS makes it similar to the structural makeup of other American sporting leagues, but the designated player rule allows the league to merge its structure with that of a non-restricted wage system in European soccer leagues. The lack of wage restrictions in European soccer causes high wage bills and low profit margins. European football clubs like Real Madrid, Barcelona, and Manchester United (top three valued sporting clubs in the world) have some of the highest revenues and valuations, but lag behind American clubs in profits.

MLS is trying to find a happy medium between the structural makeup of American leagues and European soccer leagues with the hopes of competing with the NBA, NFL, MLB, and international soccer leagues. The uniqueness of the designated player rule and single entity structure makes MLS an enticing field of research for Sports Economists.

A Brief History of Major League Soccer

In 1994 the United States hosted, arguably, the most important sporting event in the world, the World Cup. The anticipation of the event lead to an increased interest in the sport, and the US decided it would implement a league which fell under the standards of FIFA. The league would be called Major League Soccer, and began its first season in 1996. The 1994 World Cup was a massive success, with an average attendance of 69,000, which is a record for highest average attendance during a World Cup. (Fifa World Cup competition records 2013) This feat is amazing considering countries-Brazil, Germany, and France- which have hosted the World Cup since 1994.

Alan Rotherberg was the president of the U.S. Soccer Federation at the time of the 1994 World Cup and was backed by FIFA to an extent that FIFA threatened to take away the World Cup from the US if Alan was not the president. After the World Cup, Alan began devising a plan for a professional soccer league in the US. He hired Mark Abbot and together they began devising a business plan for the league. (Dure 2010, 3) Once the league was approved they acquired an office in Los Angeles. Ivan Gazidis, was hired by Mark Abbot and describes the state of the office when he arrived:

> So I arrived in this place that had no windows and asked to be shown to my office, and there was no office. Mark was in a fire closet, literally. There was a banner that said Major League Soccer; nobody knew what that was. I had a desk in the corridor of the main thoroughfare. I didn't have a telephone or a computer, and that's how I started. (Dure 2010, 10)

The league began with 10 teams divided up into two conferences. The first match was held in San Jose, California between the San Jose Clash and D.C. United and was broadcasted on ESPN with 31,000 fans in attendance. The first season had great attendance numbers which would decline the following year. MLS lost an estimated $250 million in its first five years (Eligon 2005). The league's first of many expansions came in 1998 with the additions of the Miami Fusion and the Chicago Fire.

The United States advanced to the quarterfinals in the 2002 World Cup which sparked a renewed interest in the sport. The league began to pursue financial stability in the form of soccer specific stadiums. There were six stadiums built between 2003 and 2008. In 2005, the league expanded once more with the additions of Real Salt Lake and

Chivas USA. The league would proceed to slowly expand with the addition of 8 more teams between 2007 and 2015.

One of the major turning points for MLS was when the Designated Player (DP) rule was introduced. The DP rule allowed teams to bring in star players which required high salaries without counting against the salary cap. Teams were only allowed one DP, and could trade their DP roster spot to another team, allowing for a maximum of two DP's per team. The rule changed in 2010 when it allowed teams to have two DP's, but teams could not trade any of these roster spots to other teams. David Beckham was the first major player to which this rule applied and sparked an influx of stars such as Thierry Henry and Juan Pablo Angel. David Beckham began playing for the LA Galaxy in 2007 and changed the outlook of MLS. Beckham wasn't only a great soccer player, but an international celebrity. We now see an increase in superstar additions with the recent signings of Kaka, David Villa, and Frank Lampard. There were 5 DP's in 2007 and 27 DP's for the 2014 season. One interesting aspect of the DP rule is how the salary of DP's are paid. The league pays the amount which the DP counts towards the salary cap and the team pays the amount of the salary above this level.

Demand for Soccer in the US

The DP rule is a tool for increasing the demand for MLS and sustaining steady growth. The research of this paper does not directly analyze demand curves for MLS, but understanding the steps involved in increasing demand is important. The first step in growing MLS and having a sustainable future lies in increasing the demand for the sport of soccer. The sport is at a crutch compared to the NFL, MLB, NBA, and NHL. The

sport is often ridiculed by Americans for being boring and for low scoring games. Americans must appreciate the sport and the tactics which fuel its competitiveness. The best way for Americans to better understand the sport is to participate in it. Soccer participation by kids entering their athletic years, around the age of 6, is usually pretty high, but these kids generally move on to other sports like football, basketball, or baseball. What about these kids that leave soccer after their younger years and participate in other American sports? How will they become interested in the tactics and beauty of soccer?

Video games allow kids and adults to compete in different sports without having to incur the costs of participating in recreational or competitive soccer leagues. FIFA is the leading soccer video game across the world and individuals competing in a virtual world of soccer can provide interest for watching soccer. The emergence of FIFA, the video game, could arguably play a major part in getting Americans to appreciate the sport. Kurt Badenhausen of Forbes Magazine shares the same view, he writes:

> A 2012 ESPN Sports Poll found that soccer was the second most popular sport for those ages 12-24. FIFA video games were cited as a driving factor for the sport's popularity among the younger generation in the study. The age group overlaps nicely with FIFA's core audience which is 16-32, according to Nick Channon, a senior producer of the game at EA. These are the people that are fueling the interest in the sport and the nucleus of World Cup viewing parties. A

recent survey of Americans by the Pew Research Center found that 24% of those 18-29 had a strong interest in the World Cup (Badenhausen 2014).

Figure 1

Year	North American Sales (Millions of Units)	% increase
FIFA 14	2.61	5.24%
FIFA 13	2.48	24.62%
FIFA 12	1.99	4.74%
FIFA 11	1.9	0.00%
FIFA 10	1.9	-2.06%
FIFA 09	1.94	-0.51%
FIFA 08	1.95	26.62%
FIFA 07	1.54	4.05%
FIFA 06	1.48	

Figure 1 shows a substantial growth in the demand for FIFA from 2006-2014 (Game Database: FIFA n.d.).

One might assume that as long as the demand for FIFA is on the rise, then the demand for watching soccer will be on the rise, but there still lies an issue in how this will effect MLS. When people play FIFA, they are generally not picking MLS teams because the superstars of the sport play mostly in European leagues. Gamers choose to play with top clubs in Europe such as Manchester United, Chelsea, Barcelona, Real Madrid, etc. FIFA creates an interest in European soccer more so than MLS. This is where the DP rule comes into play and hence, lies its importance concerning the league's growth. By slowly increasing the number of superstars in the league, fans at the margin will begin watching MLS more. The DP rule allows a slow and steady induction of

superstars. League shareholders want the induction to be slow and steady because they want to avoid imitating the collapse of the National American Soccer League (NASL) in 1985.

The NASL began in 1968 and saw a large increase in demand during the mid-1970's. The league began acquiring superstars at a high rate, one being Pele, arguably the best soccer player of all time. The NASL experienced financial troubles due to over-expansion and economic recession. There was a sharp decrease in demand for the NASL and the revenues could not support the high wage bills. The NASL suspended operations just before the 1985 season.

The DP rule puts a restriction on the number of superstars which each team may possess and this allows a slow and steady induction of superstars. The DP rule is a tool placing MLS on a path to international relevance. The research conducted in this paper is focused on understanding how the DP rule may affect important aspects of Major League Soccer, specifically competitive balance and team performance.

Previous Research on Competitive Balance

Competitive Balance (CB) is an important issue concerning sports. It is important to obtain the best measure for CB and know what other variables have an effect on it. When a league experiences higher levels of CB, then there is more uncertainty of the outcome of matches and championship titles. When there is more uncertainty, fans become more interested and attend/view games more often. This positive effect on demand will cause an increase in revenues for a given sporting league. There has been

no research conducted on CB for Major League Soccer, but studies of CB in other sporting leagues have been done.

Simon Rottenberg(1956) was the first to address and measure competitive balance. Rottenberg addressed the reserve clause in Major League Baseball, a rule which prohibited baseball players' free movement in the labor market. The reserve clause caused monopsony rents on players because they could not negotiate with other teams in the league concerning their contract. Once a player is drafted by a team, the team has complete control over the player and the player can transfer only with permission of its current team. The rule was defended by representatives of the league because it maintained parity by not enabling richer clubs to attract the best talent with high salaries.

Rottenberg attacks this claim of parity caused by the reserve clause. He uses a between-season competitive balance measure by analyzing pennants won from 1920-1951. The New York Yankees won the American League Pennant 18 times. In the National League, the St. Louis Cardinals won 9 times, the New York Giants won 8 times, and the Philadelphia Phillies and Boston Braves each earned 1 title. Rottenberg concludes that the reserve clause is not a vehicle for maintaining parity. The wealthier teams were able to put their resources into farm teams and offering high prices for players under contract. All the while, players have no rule over their future or the salaries. The reserve clause was removed in 1976.

Craig Depken (1999) addresses whether the removal of the reserve clause in 1976 had an effect on CB in Major League Baseball. He uses an adjusted Herfindahl-Hirschman Index (HHI). His findings suggest the removal of the reserve clause

statistically decreased parity in the American League, while there is no statistically significant effect in the National League.

Ross Booth (2005) analyzed competitive balance (CB) for three Australian Sports Leagues: the Australian Football League, the National Basketball League, and the National Rugby League. He addresses whether the introduction of a salary cap and a player draft improves CB. Booth uses a within-season CB measure: the actual standard deviation/idealized standard deviation (ASD/ISD) ratio and a between-season measure: the distribution of premierships (championships). CB is measured for the 1970-2004 seasons with emphasis on the 1985 additions of a salary cap and player draft. All three leagues experienced a decrease in CB, suggesting the rules worsened parity, but the leagues saw expansions into large markets post 1985, which he believes negatively affected CB. Booth is not convinced that salary cap and player draft rules negatively affect CB due to the simultaneous effect of expansion. Booth does not use regression analysis but merely analyzes the measures over time. His study would be more complete and the partial effects of salary caps, player drafts, and league expansion would be more discernible if regression analysis was used.

Andrew Larsen (2006) addresses the impact of free agency and the salary cap on CB in the National Football League. Larsen adopts Depken's HHI measure to analyze CB over the 1970-2002 seasons. Larsen uses a regression model with the HHI measure as the dependent variable. Larsen's findings suggests free agency and salary caps improve CB, while an increase in schedule length and the number of playoff spots

decreases CB. Teams building new stadiums also decreased CB. All these variables were found significant at the 10% level.

Distribution of Points

In soccer, success isn't measured simply by winning or losing, draws are allowed and are an important part of the game. There is a point system in soccer with three points being awarded to the winning team and 0 points for the losing team. If there is a draw (tie), then both teams are awarded 1 point. Teams are then ranked based on point totals instead of win totals. The point system is a concept which most Americans don't understand due to the fact American sports are based off of winning or losing, barring the extremely rare cases of a tie in the NFL[1]. Analyzing the distribution of the points for a given season can allow for an understanding of levels of competitive balance within the league. Points obtained by each team can be found in Wikipedia entries for each MLS season.

Measuring Competitive Balance with the Herfindahl-Hirschman Index

In order to measure competitive balance Depken (1999) and Larsen (2006) use a form of the Herfindahl-Hirschman Index (*HHI*) for MLB and the NFL. Before Depken, the most common way to measure within-season CB was using the standard deviation of wins. Standard deviation of wins and *HHI* are related, in a non-linear way, which will be

[1] Ties are very much frowned upon by Americans and MLS tried to accommodate their customers and viewing population by having a penalty shootout at the end of games in which the score was level. The team which wins the penalty shootout would receive 1 point with the loser receiving 0. This shootout rule was abandoned in 2000 and MLS conformed to the rest of the soccer world by allowing both teams to receive a point in the case of a draw.

explained in this section. Depken claims that *HHI* allows us to control for exogenous factors that influence the competitive nature of MLB.

The HHI is a measure used in industry to understand the concentration of market shares. It is calculated as follows:

$$HHI = \sum_{i=1}^{n} (MS_i^2)$$

Where MS_i equals the market share of each firm with *n* number of firms in the industry. The HHI is used to evaluate mergers and stands as a measure of competition. The squaring of each company's market share gives more weight to large companies. The index has a lower bound of 0, the case with many companies all having small market shares. The upper bound of the index is 1, as would be the case with one company in the industry which holds a monopoly. Therefore, a larger HHI is represented by a decrease in competition and vice versa.

In order to use the HHI as a measure of parity within sports leagues, Depken (1999) and Larsen (2006) allow the market shares to be represented by a team's wins divided by total wins by all teams within the league for that year. In the case for soccer we can't use wins because of the point system aforementioned. Therefore, the HHI used for this paper is as follows:

$$HHI = \sum_{i=1}^{n} (p_i / \sum_{i=1}^{n} p_i)\text{^}2$$

where p_i equals the points accumulated for the given season by each team with *n* teams. Depken and Larsen note that the lower bound of the HHI is 1/n, a case of perfect parity.

Sports leagues may expand or contract which will in turn affect this lower bound. If the number of teams increase then 1/n decreases, therefore comparing HHI levels across different seasons can be deceiving. If the HHI is the same value for two separate seasons, but there are a different number of teams within the league for both seasons, then the seasons weren't equally competitive. In order to account for this change in the lower bound both authors use an adjusted HHI,

$$dHHI = HHI - 1/n\,.$$

Therefore, competitive balance is measured by the deviation of HHI from the best case scenario in any given time period. Depken shows how dHHI and the standard deviations of wins are related, and that in fact it is not linear. His derived equation is as follows:

$$\sigma_w^2 = \frac{G^2 N}{4}\left(HHI - \frac{1}{n}\right).$$

Standard deviation of wins (σ_w) is positively related to dHHI, number of games played, and number of teams in the league. It is possible for the dHHI to be effected by exogenous factors other than just the number of teams and games played, which isn't the case for the standard deviation of wins. Depken controls for factors such as integration of African American players, the expansion of new teams, and free agency.

Owen, Ryan, and Weatherston (2007) modify and critique Depken's HHI measure in order to account for changes in the upper bound. When *n* changes, then not only is the lower bound of HHI affected, but the upper bound as well. "This occurs because teams cannot win games in which they do not play, so that, unlike the case of firms' market shares, the upper bound for HHI and dHHI are less than unity" (Owen, Ryan, and Weatherston (2007) p. 291) . Therefore, we must consider the upper bound, or the most

unequal distribution of wins. The most unequal distribution of wins is considered to be the situation where Team 1 wins all its games, Team 2 wins all its games except for against Team 1, Team 3 wins all its games except for against Teams 1 and 2, and so forth down to the last team which wins none of its games. Even with draws being a possibility in soccer, this situation would still be the worst case scenario of balance. Experiencing zero draws would mean that none of the teams performed equally on a given day. Owen, Ryan and Weatherston (2007) derive the upper bounds for HHI and dHHI as follows:

$$HHI_{ub} = 2(2n-1)/[3n(n-1)]$$

and

$$dHHI_{ub} = (n+1)/[3n(n-1)]\,.$$

The effect of expansion on these upper bounds can be seen by differentiating each term with respect to *n*.

$$\frac{\partial HHI_{ub}}{\partial n} = -\frac{2(2n^2-2n+1)}{[3n^2(n-1)^2]} < 0 \; if \; n \geq 2$$

$$\frac{\partial dHHI_{ub}}{\partial n} = -\frac{n^2+2n-1}{[3n^2(n-1)^2]} < 0 \; if \; n \geq 2$$

An increase in *n* causes a decrease in both upper bounds. In order to account for this a normalized HHI measure must be constructed.

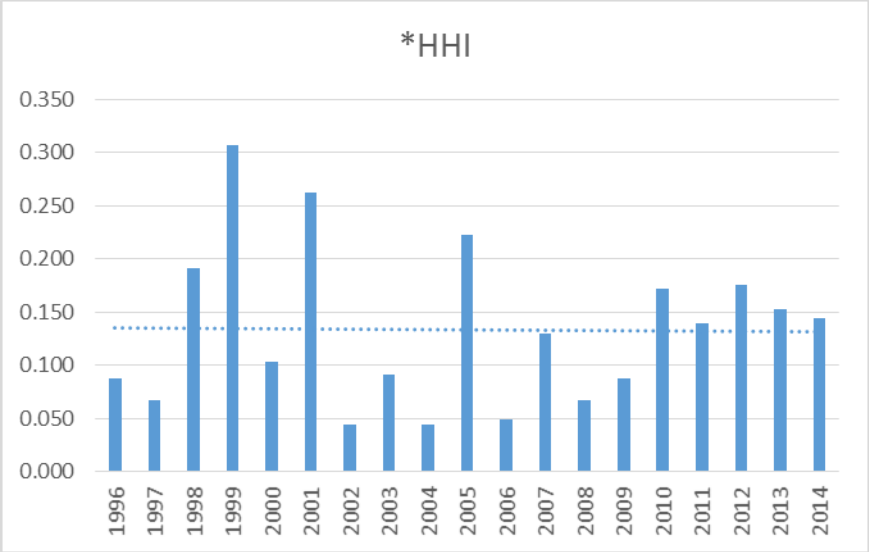
A normalized HHI measure allows us to compare competitive balance across time and across leagues. The equation is as follows:

$$HHI^* = \frac{HHI - HHI_{lb}}{HHI_{ub} - HHI_{lb}} = dHHI/dHHI_{ub}$$

This normalized measure lies in the interval [0,1], where 0 represents perfect parity and 1 represents the highest level of competitive imbalance. This measure will be used to analyze competitive balance in Major League Soccer for this paper, and in turn analyze what affects this measure. Major League Soccer has only been in play for 19 seasons and during that time we have seen the league slowly increase from 10 teams to 19, therefore the adjusted HHI is very much beneficial to this study.

The normalized HHI spanning from the 1996 season to the most recent 2014 season is shown in Figure 2, with the average HHI represented by the dotted line. The league experienced consistently low levels of HHI between 2002 and 2009, with 2005 as the exception. The league experienced a lot of variation in competitive balance during the first half of its existence with extremely high levels in 1998, 1999, and 2001. Beginning in 2007, the year which the designated player rule was implemented, the change in HHI from year to year begins to be less volatile. Beginning in 2010, the volatility of HHI is very low, but the HHI levels are above average for the remaining seasons.

Figure 2



MLS experienced some changes in structure during the offseason leading up to the 2010 season. For one, the players went on strike when negotiating a new collective bargaining agreement (the first collective bargaining agreement was established in 2004 along with MLS Players Union). Teams were now allowed to have two designated players instead of one, and a luxury tax of $250,000 could be paid in order to acquire a third. There were 13 designated players in the league by the end of the 2010 season, compared to 6 at the beginning of the 2009 season.

Regression Analysis of HHI

The Model

An Ordinary Least Squares regression will be used to find relationships between competitive balance and the explanatory variables. The model is as follows:

$$HHI = \beta_0 + \beta_1 DESIGNATEDPLAYER + \beta_2 EXPANSION + \beta_3 NEWSTADIUMS + \beta_4 GAMESPLAYED + \varepsilon$$

The summary statistics of the variables are pictured below in Figure 3. DESIGNATED PLAYER represents the number of DP's during a given season. Seasons 1996-2006 take on a value of zero because the rule wasn't established until 2007. I expect this variable to have a positive effect on the adjusted HHI i.e. decrease CB.

EXPANSION represents the number of teams added to the league in a given year. The minimum value of -2 represents the 2002 season when the Miami Fusion F.C. and the Tampa Bay Mutiny ceased operations. If the expansion draft is effective, then this variable should have a negative coefficient, meaning an increase in CB.

NEWSTADIUMS represents the number of soccer-specific stadiums built within the last 3 seasons. A soccer-specific stadium allows teams to better accommodate their fans experience and may generate more revenues. There is a 2 season lag on the variable because it takes time to acquire the new revenues and put them to good use. Therefore, I expect NEWSTADIUMS to have a negative effect on CB.

GAMESPLAYED is the difference between the schedule length for the given season and the previous season. The minimum value of -6 represents the 2001 season when teams only played 26 matches. The 9/11 attack on the World Trade Centers caused the league to suspend the regular season early. There is an increased probability of injuries and squad rotation when teams play more games for a given season. Therefore, I expect this GAMESPLAYED to positively affect CB. HHI's minimum value represents the 2004 season, meaning highest level of CB, and its maximum value represents the 1999 season.

Figure 3

Variable	Obs.	Mean	Std. Dev.	Min	Max
HHI	19	0.1337	0.07465	0.04397	0.30641
EXPANSION	19	0.4737	0.9643	-2	2
DESIGNATED	19	8.368	12.148	0	27
NEWSTADIUMS	19	2.211	1.903	0	6
GAMESPLAYED	19	-0.7368	2.13	-6	2

Results from the regression are shown in Figure 4. None of the variables have a statistically significant effect. Therefore, the signs of the coefficients should be taken lightly. EXPANSION's effect is the strongest with a p-value of .101 being nearly significant at the 10% level. The positive coefficient suggests that expanding the league may lead to lower levels of CB. The sign of DESIGNATEDPLAYER is as expected, but has a t-statistic of 1.03. NEWSTADIUMS may positively affect CB, which is the opposite of what was hypothesized. GAMESPLAYED may positively affect CB as expected, but has the lowest t-statistic of .79.

Figure 4

HHI model

	coefficient	t-statistic
EXPANSION	0.0423	1.76
DESIGNATED	0.0028	1.03
NEWSTADIUMS	-0.0165	-1
GAMESPLAYED	-0.009	-0.79
CONS	0.12	3.9
R-squared	0.19	

Due to the ineffectiveness of the model, a comparison of HHI levels between MLS and another league may provide some insight. Figure 5 compares summary

statistics between the Premier League and MLS. The average HHI level for the Premier League is almost double for that of MLS, but MLS has a higher SD. The Premier League is considered one of the more competitive European soccer leagues because of the strength of teams from top to bottom. MLS has better CB on average in comparison to the Premier League, which suggests that the league has put rules into place which maintain parity better than European soccer.

Figure 5

MLS		Average	SD	Min	Max	Obs.
1996-2014	HHI*	0.13371	0.07465	0.04397	0.30641	19
Premier League						
1996-2014	HHI*	0.25434	0.06878	0.14436	0.37141	19

Suggestions for future research on CB for MLS

The model constructed for CB in MLS is not reliable because of high p-values and a low F-statistic. The number of observations, 19, is an issue of concern. MLS has only experienced 19 seasons, so a within-season measure of CB may be ineffective. A within-game measure may be more efficient. Using gambling data for matches, one could obtain the odds for a given soccer match in MLS. The odds are a representation of the probability of one team winning or losing. A higher value of odds suggests a lower chance of winning. Low odds values for MLS matches would suggest better parity. This would capture the uncertainty of outcome for a given match from a fans perspective best.

Previous Research on Wage Dispersion and MLS

Wage Dispersion

Two conflicting hypotheses on wage dispersion's effect on an organization's (team) performance exist. The hierarchical pay hypothesis infers that team performance increases along with wage dispersion. The hierarchical pay system provides incentives for better individual performance through high wages being paid to higher talent levels (Bloom, 1999). Then there exists the wage compression hypothesis, which predicts that wage dispersion and team performance are inversely related to each other. High wage differentials may cause low-wage workers' dissatisfaction to reflect in their productivity, thereby reducing an organization's (team) performance (Akerlof and Yellen, 1990).

The wage compression hypothesis mostly dominates the research for wage dispersion in sporting leagues. Depken (2000) found there to be a negative relationship between wage dispersion and team performance in Major League Baseball. A team fixed effects model is used with an adjusted HHI measure representing wage dispersion. San and Jane (2008) apply Depken's model to a small baseball league in Taiwan and also find a negative relationship. Mondello and Maxcy (2009) study wage dispersion in the NFL and find a conflict of objectives. Salary dispersion is negatively related to team performance, but positively related to a team revenue production function. Meaning, a hierarchical pay system is optimal when maximizing revenues, but a wage compression system should be used when optimizing team performance. Frick, Prinz, and Winkelmann (2000) find support for the hierarchical pay system in the NBA, while their model for the NFL and MLB support the wage compression hypothesis.

Franck and Nuesch (2011) use data from the first German soccer league to analyze wage dispersion, and find there to be a quadratic U-shaped relation between dispersion and team performance. Implying that German teams should either have high levels of wage dispersion or extremely low, but to be in the middle is detrimental to team performance. Sonntag and Sommers (2014) wrote a two page note in the International Atlantic Economics Society journal which briefly analyzed salary dispersion in MLS. The data used comes from the 2011 and 2012 seasons. Sonntag and Sommers find winning percentage to be negatively affected by salary dispersion and positively affected by average salary. The variables were found to be statistically significant for both seasons. The findings suggest that there is a trade-off when spending lavishly on designated players.

Relevant Research on MLS

Lawson, Sheehan, and Stephenson (2008) conducted research which analyzes variables that have a significant effect on attendance in MLS. Games involving David Beckham for the 2007 season saw a significant increase in attendance. Even games where Beckham was on the bench, attendance increased significantly. This externality is coined the term "Beckham Effect". The "Beckham Effect" is analogous to previous research on the NBA with superstars such as Michael Jordan and Larry Bird. Lawson, Sheehan and Stephenson's use the model to predict the additional revenue supplied by Beckham to the LA Galaxy via ticket sales. They found that Beckham generated approximately twice as much revenue compared to his annual salary.

Kuethe and Motamed (2010) analyzed how being a superstar effects wages within MLS. The structure of MLS allows for two easy routes to determine whether a player is of superstar status: the DP rule and the All-Star Game. Studies of the "superstar effect" in European football has used the number of Google hits to determine the whether players are considered superstars (Lehmann and Schulze, 2005; Franck and Nuesch, 2006). Kuethe and Motamed us an OLS regression model and the results suggest a 928% wage premium for designated players. A quantile regression is also constructed with results suggesting different performance elasticities for different quantiles. Meaning, non-superstars receive less compensation than superstars when both experience an equal increase in performance. This may stifle performance incentives for players at the lower end of the wage bill.

The relationship between wage and age in Kuethe and Motamed's model is the opposite of that found in most sporting leagues. Lucifora and Simmons (2003) found there to be a concave relationship between wages and age in Italian soccer, but MLS exhibits a convex relationship. The strategy of MLS' DP rule explains this contrasting relationship. Older superstars whom are past their prime come to MLS in order to maximize their earning potential on the cusps of retirement.

Player Salaries in Major League Soccer

Introduction

In April 2003, the Major League Soccer Players Union was formed and acts as the exclusive collective bargaining representative for all players in MLS. Each team in the

league has a player representative which is elected by the team. Collective Bargaining Agreements were agreed upon by the Union and MLS in 2004, 2010, and 2015. The Union has an archive of player salaries beginning in the 2007 season. This salary data is extremely beneficial for Economists and the availability is somewhat unique. In European soccer leagues player salary information isn't always easily obtained, and player Unions do not exist.

Wage dispersion among players in MLS is an area of controversy. The Player's Union went on strike just before the start of the 2015 season, arguing that non-superstar players deserve more pay. If lower income players feel that they should be making more money while Designated Players are making a substantially higher amount, then how does this affect team performance? Soccer players must be in sync with each other in order to execute the passing and defending necessary to compete on the highest level. Attackers and midfielders must know where their teammates will be and trust their teammates when executing no look passes, quick one-two passes, through balls, etc. Defenders need to hold a tight line in order to prevent an opposing attacker from receiving a dangerous through ball.

Granted, there are moments of individual brilliance in soccer. An attacker may "knife" through the opposing team starting at the 40 yard mark and then have only the Goalkeeper to beat, but these moments are outliers. Attacking play should be sustained through effective team work in order to be successful throughout an entire season. If some of the players on the squad resent the salary received by their teammates then the mental cohesiveness among the squad may be affected. The introduction and growth of

the Designated Player Rule is causing high variation in salaries. We want to understand how this dispersion is affecting team performance.

Data

The data used for this section originates from the MLS Players Union website, spanning the 2007-2014 seasons (Player Salary Information n.d.). Listed below in Figure 6 are the year to year descriptive statistics of the guaranteed compensation salaries. All salary numbers are adjusted for inflation with 2007 as the base year. Guaranteed compensation salaries include a player's base salary, all signing bonuses and guaranteed bonuses annualized over the term of the contract. "The value also includes any annual marketing bonus to be received in the current year and any agent's fees annualized over the term of the contract but does not include performance bonuses" (Kuethe and Motamed 2010, 569). The salary cap for each year is also shown because it has a direct effect on the average salaries. Salary cap numbers were found on Wikipedia under "The Designated Player Rule" entry.

Figure 6

Year	Average	SD	Max	Min	Salary Cap	# of DP's
2007	$113,810.40	$385,422.05	$6,500,000.00	$12,900.00	$2,100,000	5
2008	$112,239.13	$372,922.95	$6,256,015.40	$12,415.78	$2,300,000	6
2009	$130,971.39	$385,219.88	$6,280,800.08	$19,422.17	N/A	7
2010	$164,580.67	$532,641.06	$6,179,294.61	$29,717.65	$2,550,000	13
2011	$146,089.49	$474,665.86	$5,990,783.41	$30,046.08	$2,667,500	22
2012	$150,149.32	$423,477.24	$5,054,151.62	$30,460.29	$2,811,375	21
2013	$148,769.56	$349,694.27	$3,870,106.76	$31,250.00	$2,951,944	19
2014	$181,495.58	$608,843.24	$5,862,687.39	$31,961.47	$3,099,541	27

The average salary for MLS players does not experience an annual increase in all seasons, but has seen an overall increase from $113,810.4 in 2007 to $181,495.58,

adjusted for inflation, in 2014. There was a large spike in average salary during the 2010 season, from $130,971.39 to $164,580.67. The DP rule changed preceding the 2010 season: teams could now sign two designated players as compared to one. Yet, the average salary of the league decreased the following season and hovered around $150,000 until it increased to $181,495.58 in 2014. The 2010 and 2014 World Cup Tournaments may have had an impact on average salaries across the league for the respective seasons. American's interest in soccer peaks during the World Cup which could cause an influx of Designated Players. Also, players who performed well during the Cup may request higher salaries.

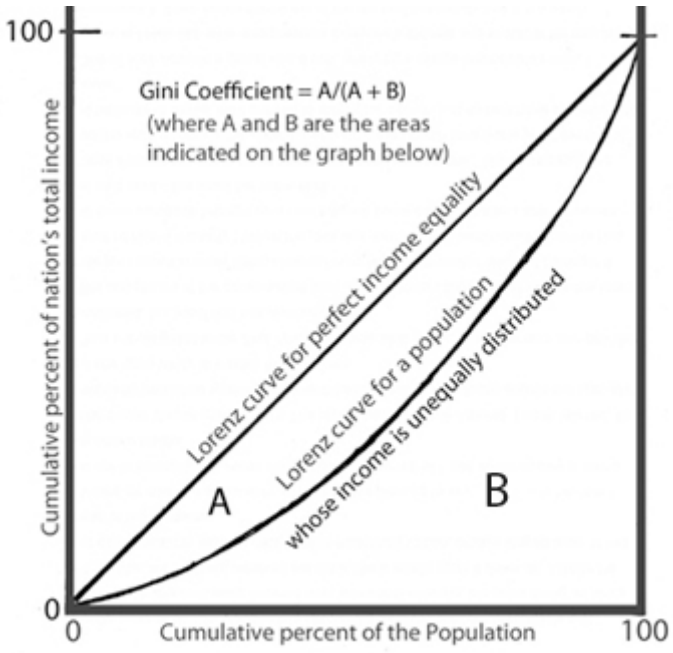
The standard deviation (SD) of salaries from year to year moves in the same direction as the average salary with a correlation coefficient of .82, which is consistent with what is an expected effect of the DP rule. Superstars are brought into the league with substantial higher salaries than the rest of the players, causing the average salary and SD to increase together. The maximum salary from 2007-2011 was David Beckham at $6.5 million (nominal). In 2012 and 2013 Thierry Henry had the highest salary, while in 2014 Clint Dempsey had the highest salary of $6.7 million (nominal). The minimum value for each season represents the minimum salary required by the rules of MLS and agreed upon during Collective Bargaining Agreements between MLS and the Union. The minimum salary has increased or stayed the same every year since 2007. The minimum value of $12,900 for the 2007 season seems low for a professional athlete in a first division league. If MLS soccer players were assumed to work 40 hours per week throughout the year, then that salary is equivalent to $6.20/hour. The MLS season lasts

about 8 months, so if a player only worked during this time span then the minimum salary would be equivalent to $10/hour. All this to say, that a salary of $12,900 for a professional athlete in the same league as David Beckham shows a high level of disparity.

Gini Coefficient

The Gini coefficient is a widely used measure of income inequality in the field of Economics, and is used in previous literature on the subject of Sports Economics (Frank and Nuesch, 2010; Sonntag and Sommers, 2014). To understand the Gini coefficient one must understand the Lorenz curve. Pictured below in Figure 7 is the graphical representation of the Lorenz curve and the Gini coefficient (Linehard 2011).

Figure 7



The Lorenz curve represents the cumulative distribution of income for a given population. If all agents within a given population have an equal share, then the Lorenz

curve will simply be a straight line that is represented by the equation y=x. If income is unequally distributed, then the Lorenz curve will lie below the line of perfect equality. The Gini coefficient is simply the ratio of the area between the line of perfect equality and the Lorenz curve over the area under the perfect line of equality. When looking at the picture above the Gini coefficient is represented as A/(A+B) where A+B= .5. Therefore, a Gini coefficient with a value of 1 represents complete inequality where one person has all of the income, while a value of 0 represents income of the population being perfectly distributed.

Regression Analysis of Wage Dispersion Stage 1

Starting with Sonntag and Sommers (2014) model and building upon it, a more accurate and appropriate model will be constructed for wage dispersion's effect on team performance. Their points percentage variable is coded differently than the standard point system used by MLS and all major Professional soccer leagues. Losses, ties, and wins were coded 0, .5, and 1, respectively. The standard point system has ties receiving 1 point and wins receiving 3 points which places more weight on a win. The differences in the point systems will cause the regression results to differ. The standard point system will be used for construction of the model for this study because it represents the actual system used by MLS. The natural log of average team salary was used as an explanatory variable by Sonntag and Sommers, but using a ratio of average team salary over average league salary for the given year (adjusted for inflation) allows for a better measurement and understanding of salary levels. The model is as follows:

$$POINTS = f(AVERAGERATIO, GINI)$$

The salary of a player is closely remunerated by their ability/talent. Therefore, the AVERAGERATIO reflects the team's total talent in comparison to the rest of the league. Previous studies on wage dispersion (Frank and Nuesch, 2011; Depken, 2000) control for total salary in their models, but average salary is more useful for MLS due to the high variation in the number of players on each team. The maximum number of roster slots is usually 31, but most teams do not fill all these spots.

A negative coefficient estimate on GINI is expected and would imply that while holding average salary constant, large salary dispersion negatively effects performance. A positive coefficient estimate on AVERAGERATIO is expected, suggesting that players' salaries reflect their ability to perform. The results from the OLS regression are shown in Figure 8.

Figure 8

Points Percentage Model

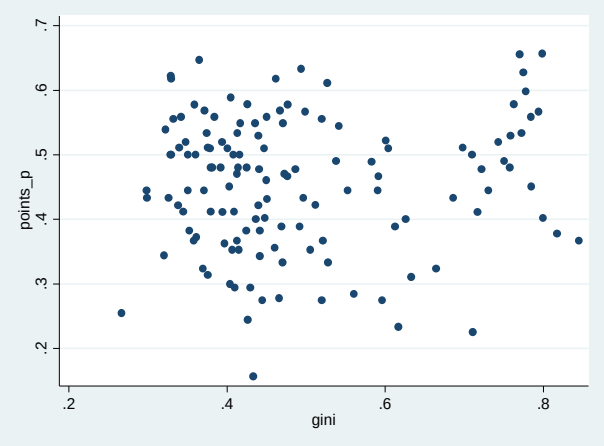
Explanatory Variables	coefficient	t-statistic
GINI	-0.1673	-1.47
AVERAGERATIO	0.0611	2.3
CONS	0.4754	12.73
R-squared	0.0443	

The signs of the estimated coefficients are as expected with AVERAGERATIO being statistically significant. The insignificance of GINI could be attributed to omitted variable bias, which is a concern of any regression model.

A simple scatter plot between the dependent variable and the explanatory variable of interest can show the relation between the two in the simplest way. A two-way scatter

plot is pictured below in Figure 9. The Gini coefficient and points may have a quadratic relationship which is analogous to the case of the first German soccer league (Frank and Nuesch, 2010).

Figure 9



Therefore, a new OLS regression may be of use:

$$POINTS = f(GINI, GINI^2, AVERAGERATIO)$$

The results of this regression are as follows:

Figure 10

Points Percentage Model

Explanatory Variables	coefficient	t-statistic
GINI	-0.5665	-0.9
GINI^2	0.4137	0.65
AVERAGERATIO	0.0442	1.19
CONS	0.5798	3.5
R-squared	0.047	

None of the variables in this regression are significant. Figure 11 shows the same regression, except AVERAGERATIO is dropped. The GINI and its quadratic term are both significant at the 10% level. When comparing the models in figures 8, 10, and 11, it

seems that either GINI^2 or AVERAGERATIO should be included, but not both. Other explanatory variables will be introduced to the model and then a decision will be made on whether to keep the GINI^2 or AVERAGERATIO term. By controlling for other variables which have an effect on team performance we may have a better chance of understanding the relationship between salary dispersion and team performance.

Figure 11

Points Percentage Model

Explanatory Variables	coefficient	t-statistic
GINI	-0.9955	-1.94
GINI^2	0.943	2.06
CONS	0.696	5.21
R-squared	0.037	

Control Variables for Wage Dispersion Model

Coach Experience

A good coach is vital to the performance of a team in any sport. Therefore, controlling for the coaching quality will allow us to better understand the effect of salary dispersion on team performance. Previous coaching experience in MLS will be used as a metric for coaching experience. Overall coaching experience isn't used because there were several internationally successful coaches which came to MLS and performed poorly. Years of coaching the United States Men's National Team (USMNT) and previous MLS teams will represent experience. Bruce Arena coached the USMNT from 1998-2006 and during that period most team members were MLS players, so those years of coaching should be considered valuable experience. Also, any years as an assistant

coach for an MLS team or the USMNT will be counted as experience. Any year in which a coach was fired during the middle of the season and an interim coach was hired, will receive a value of 0.

The summary statistics and frequency table of coaching experience throughout the sample are pictured below in Figure 12. The average is 5.5 years with a standard deviation of 5.2 years. 21% of the observations have a value of 0, meaning no coaching experience or a coach was fired during the season. The value increases from year to year as the coach obtains years of experience. Bruce Arena has 21 years of experience by the end of the sample, the most in the league. He began coaching the LA Galaxy in 2009 with 16 years of experience, and he has been in Los Angeles ever since.

Figure 12

Variable	Obs	Mean	Std. Dev.	Min	Max
COACHEXPERIENCE	133	5.504	5.2	0	21

COACHEXPERIENCE	Freq.	Percent	Cum.
0	28	0.2105	0.2105
1	11	0.0827	0.2932
2	14	0.1053	0.3985
3	8	0.0602	0.4586
4	7	0.0526	0.5113
5	7	0.0526	0.5639
6	7	0.0526	0.6165
7	6	0.0451	0.6617
8	8	0.0602	0.7218
9	9	0.0677	0.7895
10	7	0.0526	0.8421
11	4	0.0301	0.8722
12	3	0.0226	0.8947
13	3	0.0226	0.9173
14	1	0.0075	0.9248
15	2	0.0150	0.9398
16	2	0.0150	0.9549
17	2	0.0150	0.9699
18	1	0.0075	0.9774
19	1	0.0075	0.9850
20	1	0.0075	0.9925
21	1	0.0075	1.0000
	133	1	

Newly added teams

Teams which are new to the league may experience a difficult time being immediately successful in the league, therefore, will be controlled for. The NEWTEAM variable is a dummy variable which takes a value of 1 for a team's first and second year of play in the league. The second year of play was included because it seems reasonable that it may take more than one season for an expansion team to adjust. Even if newly added teams employ some superstars it is extremely difficult to jump into a league and be successful. The Seattle Sounders were the only team which achieved immediate success when joining the league in 2009, while finishing in 4th place. A frequency table of the variable is shown in Figure 13.

Figure 13

NEWTEAM	Freq.	Percent	Cum.
0	119	89.47	89.47
1	14	10.53	100
Total	133	100	

Western Conference vs. Eastern Conference

Major League Soccer is divided into two conferences: Eastern and Western. There have been no assertions, to my knowledge, as to which conference is more or less difficult to compete in than the other. There is undoubtedly a difference between the Eastern and Western conference, but is the difference significant? The model will give some insight to this question.

Regression Analysis of Wage Dispersion Stage 2

Two models will be constructed and compared. Model 1 includes a quadratic GINI term and no AVERAGERATIO term. Model 2 excludes the quadratic GINI term, while including AVERAGERATIO.

(1)

$$Points = \beta_0 + \beta_1 GINI + \beta_2 GINI^2 + \beta_3 COACHEXPERIENCE + \beta_4 NEWTEAM + \beta_5 WEST + \varepsilon$$

(2)

$$Points = \beta_0 + \beta_1 GINI + \beta_2 AVERAGERATIO + \beta_3 COACHEXPERIENCE + \beta_4 NEWTEAM + \beta_5 WEST + \varepsilon$$

The expected sign of the variables have already been discussed. The only variables in which the summary statistics have not been shown are GINI and AVERAGERATIO.

The summary statistics are pictured below in Figure 14. The minimum GINI value belongs to Chivas USA for 2013, while the largest value belongs to LA Galaxy for the 2008 season. The lowest AVERAGERATIO value belongs to Chivas for 2010, while the largest belongs to the NY Red Bulls for 2010.

Figure 14

Variable	Obs.	Mean	Std. Dev.	Min	Max
AVERAGERATIO	133	1.007	0.624	0.511	3.232
GINI	133	0.492	0.146	0.267	0.845

The results of the first regression are shown below:

Figure 15

Model 1

Points_P	Coefficient	t-statistic
GINI	-0.8324	-1.74
GINI^2	0.7313	1.71
COACHEXPERIENCE	0.008	4.86
WESTCOAST	0.0093	0.56
NEWTEAM	-0.045	-1.72
CONS	0.6286	5
R-squared	0.21	

GINI and GINI^2 are significant at the 10% level. The model suggests that higher levels of salary dispersion negatively effects team performance, until a certain cut-off point where increasing dispersion results in better team performance. In order to solve for that cut-off point the following equation must be calculated:

$$\frac{\partial Points}{\partial GINI} = \beta_1 + 2\beta_2 GINI = 0$$

The cut-off point for the model is approximately .57. There are 34 teams in the sample with a Gini larger than .57. These 34 teams would see an increase in team performance by increasing salary dispersion levels, i.e. employing mores superstars.

COACHEXPERIENCE is statistically significant at the 5% level and has a positive sign as expected. NEWTEAM is statistically significant at the 10% level with a negative coefficient estimate. WEST is not significant, but

The results from the second model are as shown in Figure 16:

Figure 16

Model 2

Points_P	Coefficient	t-statistic
GINI	-0.2216	-2.09
AVERAGERATIO	0.0558	2.27
COACHEXPERIENCE	0.0081	4.99
WESTCOAST	0.0103	0.63
NEWTEAM	-0.0435	-1.68
CONS	0.4629	12.97
R-squared	0.2206	

GINI is significant at the 5% level with a negative effect, implying wage dispersion negatively effects team performance. The AVERAGERATIO is significant at the 5% level with a positive effect on team performance. COACHEXPERIENCE, WEST, and NEWTEAM have the same signs in both models and their magnitudes are almost identical. Model 2 states that salary dispersion negatively affects team performance, but by increasing the AVERAGERATIO, the team can counteract the negative effect of dispersion. If GINI increases by one standard deviation then point percentage decreases by .033, but if AVERAGERATIO increases by one SD then point percentage increases

by .035. The tradeoff between the two variables is essentially equal when experiencing a one SD change[2].

Discussion on Salary Dispersion in MLS

Models 1 and 2 tell the same story: teams in the lower tail of the wage disparity distribution (low Gini coefficients) in MLS improve team performance, but signing superstars via the DP rule increases team performance (wins) with the inevitable tradeoff of increasing wage dispersion (losses). Teams cannot have a significantly large average salary without increasing wage dispersion. AVERAGERATIO and GINI^2 from Models 1 and 2, respectively, capture the same information with a positive coefficient estimate. The salary dispersion situation in MLS is different than European soccer leagues because of rules such as the salary cap, maximum salary limitation on non-DP's, and limited number of DP's per team. There are no such wage restrictions in European soccer. Therefore, European teams can have high average salaries while obtaining low levels of salary dispersion.

Model 1 supports both the hierarchal pay hypothesis and wage compression hypothesis, depending on where the team lies relative to the cut-off point mentioned. Model 2 supports the wage compression hypothesis which, intuitively, seems accurate due to the team chemistry involved in gameplay. Model 2 represents the salary dispersion trade-off in MLS more accurately than Model 1. The positive effect of having

[2] GINI coefficients for all non-DP's on a team were calculated and regressed on points percentage and was not found to be statistically significant. DP's share of total salary for teams was calculated and regressed as well and was also found to not have significance.

high average salaries and increasing a team's talent level is important and is better captured by the AVERAGERATIO variable as compared to the GINI^2 variable.

Conclusion

MLS is a sporting league ripe with research opportunity and lacking in previous research. Competitive balance is an area of importance in the sporting industry dating back to 1956 (Rottenberg) and is of major concern for management due to its implications on revenue streams and profits. Understanding variables which have a negative or positive effect on competitive balance is important in obtaining viewers and fans.

This study failed to provide conclusive evidence on the DP rule's effect on CB, but the model constructed suggests the possibility of a negative relation. The within-season measure used restricts the number of observations due to MLS's short existence. A within-game measure is proposed for future researchers, specifically, the distribution of match odds provided by gambling data. This measure can provide a higher number of observations and an interesting view on parity from the fan's perspective.

The DP rule has caused salary dispersion levels to rise. The effect of wage disparity on an organization's performance is a common issue addressed by Economists in industries besides sports. The two contradicting hypothesis, wage compression and hierarchal pay, have been supported in different studies across different industries. The wage compression hypothesis is applicable to wage structure in MLS according to the model 2's results in Figure 16**.** Soccer requires high levels of team chemistry considering the amount of passing and communication needed to be effective as a unit. Teams in

MLS should keep salary disparity levels at a minimum, but should also increase average salaries in order to acquire better talent. Because of the structure of MLS and its DP rule, teams cannot increase average salaries without inevitably increasing wage dispersion. As more DP's are allowed to enter the league and minimum salary requirements increase, wage dispersion levels will begin decreasing. In turn, allowing teams to handle the tradeoff between dispersion and average salaries more effectively.

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