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Do Football Transfers Actually Improve Performance?

Examining the Effect of Football Transfers on Player and Club Performance in Europe, the United States, and China

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Presented to the Department of Applied Mathematics in Partial Fulfillment Of the Requirements for a Bachelor of Arts Degree with Honors

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1 Introduction

In August 2017, Paris Saint-Germain (PSG) completed the signing of Neymar, one of the world's greatest footballers, from Barcelona. The reported transfer fee of €222 million shattered the previous football transfer record of €105 million that Manchester United paid Juventus just one year prior for the rights to French midfielder Paul Pogba. Although most football fans and analysts agreed that, at the time, Neymar was easily the third best footballer in the world, behind only Lionel Messi and Cristiano Ronaldo, Neymar's transfer fee still left many awestruck. PSG club President Nasser Al-Khelaifi stated that he expected ticket revenues, championship revenues, and sponsorship opportunities to more than cover the costs the club had paid for Neymar, generating perhaps a healthy return overall (Blumberg, 2017). Others, including Marc Ganis, co-founder of business sports firm Sportscorp, were more skeptical, claiming that the transfer and PSG's plans to recuperate the costs and generate a positive return did not "make economic sense" (Blumberg, 2017). Besides concerns regarding the club's financial returns, individuals more entrenched within the football world worried about the record-breaking transfer's effect on the transfer market as a whole. World-renowned football manager, Jose Mourinho, who at the time was managing Manchester United, spoke about Neymar's transfer shortly after rumors of the record-breaking fee emerged in the summer of 2017:

"You are going to have more players [sell] for 100 million, more players for 80 million and more players for 60 million. And I think that's the problem because Neymar is one of the best players in the world....I think the problem is not Neymar. I think the problem is the consequences of the Neymar [transfer]" (Critchley, 2017)

The consequences to which Mourinho was referring have played out to a significant extent since Neymar's transfer. According to Transfermarkt, 16 of the 20 most expensive transfers of all time have occurred since PSG completed the transfer for Neymar. Each of these transfers cost at least €80 million, but no transfer has eclipsed Neymar's in terms of fees paid. The closest in terms

of fees were the transfers for Kylian Mbappe (PSG) and Philippe Coutinho (Barcelona), each of which cost a staggering €145 million. For the sake of perspective, the then world record transfer of Cristiano Ronaldo, one of the top-2 footballers in the world, to Real Madrid in 2009 was €90 million (€104 million, CPI-adjusted), which in today's football world appears relatively cheap for a player of his quality.

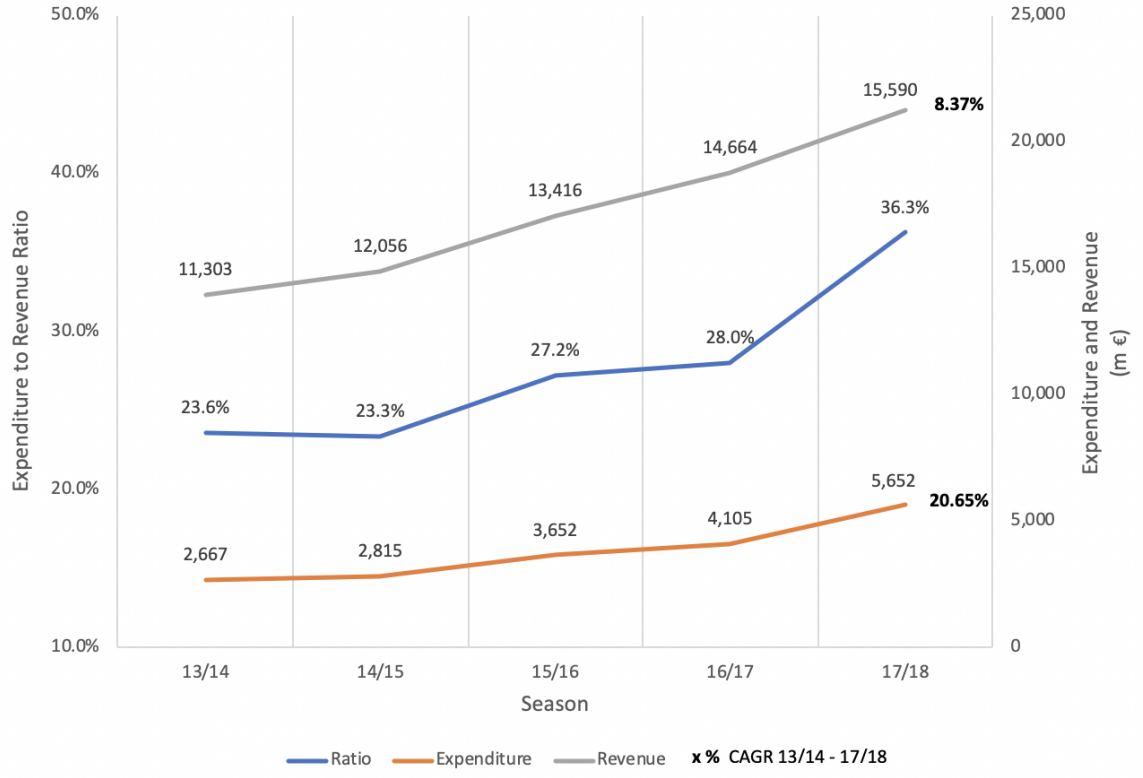
Neymar's record transfer fee, in addition to the trend of expensive transfers following his move, raises questions regarding the economics of the football transfer market. The transfer market is designed to offer clubs the opportunity to find and sign, by means of a transfer fee, players they believe will enable them to perform better and ideally compete at a higher level. From the club's perspective, players can be regarded as valuable assets that contribute to a team's success on and off the pitch. Better match performance often, if not always, translates into better financial success for a club. The direct relationship between individual player performance and club competitive success has been examined in research, but the connection to financial well-being and decision-making has not been thoroughly covered. Thus, the current state of the transfer market, particularly how expensive average transfers have become relative to the past, warrants further analysis and discussion.

Football club revenues have grown considerably in the last decade, and the increase in revenue has potentially contributed significantly to the increase in transfer expenditure. Typical sources of revenue include competition winnings, as well as ticket sales, broadcasting contracts, and sponsorship deals. Given the increase in media and streaming technologies, broadcasting revenues have soared for the top 5 European leagues, according to Deloitte Football Finance (Jones et al, 2019). As leagues become more popular, they are able to sign more lucrative contracts with broadcasting companies, and ultimately, they distribute the money tied to these deals across all their constituent clubs. Football's growing popularity worldwide, in addition to the expansion of streaming technologies, has driven broadcasting revenues up for most European clubs. This trend is apparent in both domestic and international competition. European competitions, such as the UEFA Champions League (UCL) and Europa League (UEL) tournaments, for example, consist of several sources of monetary rewards: participation (qualification), performance (money for each win or draw), market

pool (TV income distribution based on club's league and prior year performance), knockout stage results (money for making it to a specific stage in elimination rounds), champion (bonus for winning tournament) (SporTek, 2019). According to Statisa, the UEFA Champions League consistently awards the most prize money out of all sports events worldwide, and the Europa League awards the fifth most; the prize money pool itself has also increased over the last decade to a record high of €1.3 billion (UCL) and €237 million (UEL) in 2019 (Gough, 2019). Furthermore, participating in these tournaments gives clubs more international exposure and publicity, even if they do not make it far in the tournaments, potentially helping increase their merchandise and sponsorship sales.

Despite these tailwinds, rising revenues alone do not explain the increase in transfer expenditure. As is suggested by Figure 1, there may be other key factors at play.

Figure 1: 'Big 5' European league clubs' transfer expenditure to revenue ratio (2013/14 - 2017/18)



In the top 5 European leagues (Bundesliga, English Premier League, La Liga, Ligue 1, Serie A), both revenue and transfer expenditure increased steadily from the 2013/14 - 2017/18 season. Transfer expenditure rose significantly more on a CAGR basis (compounded annual growth rate, representing the annualized return), and as a result, the percentage of revenue spent on transfers increased by more than 50%. This trend suggests that some aspect (or aspects) of the football transfer market - or the players within it - has (have) changed, pushing clubs to allocate more revenue to transfer expenditure than before. One aspect is the huge growth of football club revenues worldwide due to the sport's increasing popularity and the resulting increase in broadcasting revenues for both domestic and international competition. As mentioned earlier, however, this explanation alone does not address the increase in transfer expenditure, which has grown much more quickly than revenue has.

A second aspect of the football world that has artificially increased transfer fees is the impact of powerful agents. Each year Forbes ranks the world's sports agents based on influence and wealth, and in the last few years, football agents like Jonathan Barnett (Gareth Bale), Jorge Mendes (Cristiano Ronaldo), and Mino Raiola (Paul Pogba) have overtaken their counterparts in sports traditionally known for strong agents, such as Major League Baseball and the National Football League (Belzer, 2017). These individuals take a significant portion of transfer fees for themselves as compensation for facilitating transfers. As a result, transfer fees may have risen, in part, due to the growing influence of football agents.

A third reason for the rise in transfer expenditure is increased funding for many clubs in Europe. In the past decade, several billionaires have entered the football space, the most conspicuous of whom are Roman Abramovich of Chelsea and Sheikh Mansour of Manchester City. The presence of such wealthy individuals has made it easier for clubs to spend exorbitant amounts of money without as much concern for generating significant, or any, financial return. Having a seemingly endless source of funding makes risk-taking easier to justify but, ultimately, can cause clubs to overspend on players. In fact, Reuters reported that Manchester City was the first club to spend €1 billion on assembling their squad through transfer and wage expenditure. This trend in football could also explain why the transfer market has ballooned in recent years.

A fourth potential explanation for the increase in transfer expenditure is that performance in the football world is purely relative. Firms in most traditional economic settings compete on absolute and relative measures. In sports, however, teams compete solely for the top position in leagues, tournaments, etc. As a result, if spending more in the transfer market does indeed translate into better performance, increased spending on the parts of a few teams can significantly inflate transfer pricing across the market. For instance, PSG's world record transfer for Neymar, if one assumes the €222 million fee captures his true value, will force other clubs to try to spend just as much, if not more, to continue competing with PSG and give themselves the best chance to beat them. At the end of the day, PSG's competitors care only about finishing ahead of PSG, as opposed to achieving any specific absolute performance goal, creating a snowball effect whereby more clubs across Europe will engage in spending sprees.

In an effort to clarify the relationship between transfer expenditure and performance outcomes, it is worth recognizing the similarities between the returns on transfer spending in football and the returns on lobbying in politics. Examining the returns on lobbying in the energy sector, Kang (2015) finds that the effects of lobbying expenditure on the probability certain policy is enacted is very low. However, Kang finds that the average return on lobbying in this context is roughly 130%. The policies that lobbying efforts typically address have such large financial implications that even small changes in the probability of those policies being enacted can "lead to large private returns" (Kang 2015, p. 270). In football, clubs may be comfortable spending large amounts of money on transfers even if doing so only marginally improves their performance because even slight improvements can lead to higher finishes in domestic leagues and international tournaments, ultimately bringing in more performance, merchandise, and broadcasting revenue. The lobbying context does not directly mirror the importance of relative performance that pervades sports like football, but it does illustrate how even small changes to the status quo—the probability of policy enactment in the lobbying context and club and player performance in the football context—can significantly impact financial return.

To understand the expansion of the football transfer market in greater detail, I will explore the goals of football clubs and how transfers contribute to their ability to achieve those goals. The

football transfer market can be thought of as an exchange-based market whereby firms—the clubs—trade valuable assets—the players—with the goal of optimizing club performance and competitive success. The nature of this trading is such that when players transfer from one club to another, the receiving club (one that receives the player) pays an agreed upon transfer fee to the sending club. The goal of transfers, ultimately, is twofold: ideally, clubs would like to both improve their competitive performance and generate positive financial return from that transfer. Much research has shown that many clubs, particularly the best-performing ones, focus more so on competitive success than financial gain. As Szymanski explains in *Money and Soccer*, many clubs are owned by huge fans of theirs, and so, they care more about winning trophies and the popularity that comes with owning a winning football club than generating a significant return on their investment, at least in the short term.

Given these motivations, the question still remains about whether increased transfer spending, like that which the football world has witnessed in the past decade, necessarily translates into better competitive performance for clubs on average. Very little research has been dedicated to understanding the economics behind transfer expenditure and the performance return on such investments. From a club's perspective, the return on investment may not be solely determined in financial terms, but rather, in performance terms as well. With each transfer decision, a club takes a risk by spending a specific amount of money on a player with the hope that its investment will pay off in the form of trophies both domestically and internationally. Thus, it is reasonable to assume that clubs perform their own analyses on and gauge market values of players before committing to executing transfers. Indeed, the analytics capabilities of some clubs, like those of Liverpool, the winner of UCL 2019, have been covered in depth by the media (Schoenfeld, 2019). Nearly all of these analysis metrics, however, constitute private information, as clubs do not share the tools they believe can give them a competitive edge over their rivals. As a result, most research on football has been based on publicly available data regarding revenues and transfer expenditure.

This thesis aims to utilize publicly available data to examine the predictive effect of player transfers on performance at the club and player levels. If the transfer market is operating efficiently, the transfer fees clubs are paying should, on average, match the return on performance they expect

by acquiring those players. To perform this analysis, I consider both transfer dummy variables, indicating whether a transfer has joined a given club in a particular season, and transfer spending data, consolidating purchases and sales into a net transfer expenditure measure for each club. Based on the purpose of the transfer market, I expect that, on average, higher spending results in greater improvements in club performance.

In the first section of this thesis, I will provide an overview of the European transfer market and how it has changed over time. I will also present a brief description of the United States' Major League Soccer and China's Chinese Super League and how these two leagues differ from European leagues. Although they are more limited, data from both of these leagues are included in my analysis. In the second section, I will explore the literature surrounding football economics and performance modeling at player and club levels. Then, in the third section, I will highlight motivations for exploring the effects of transfers on performance given data on the transfer market and performance outcomes for clubs domestically and internationally. In the fourth section, I will explain my data sources, as well as any cleaning efforts required prior to analysis. In the fifth section, I will walk through data specification, my initial ("sanity check") analysis, and my final results. Finally, I discuss the results and their broader implications for the literature, as well as limitations of my analysis.

2 European Football and the Transfer Market

2.1 Football

Globally, football is recognized as the world's most popular sport. The shift toward live streaming and digitization has enabled tremendous growth in the global football market. The European market, in particular, leads the pack, generating a record €28.4bn in revenue during the 2017-2018 season (Jones et al, 2019). Within UEFA (Union of European Football Association), the top 5 leagues by revenue–and global recognition–are the English Premier League, La Liga, Bundesliga, Serie A, and Ligue 1, the top-tier leagues in England, Spain, Germany, Italy, and France respectively. Deloitte estimates that these leagues alone bring in over 50% of Europe's total football revenue

(Jones et al, 2019).

Given increased viewership and broadcasting revenues, the competition between clubs to finish at the top of their respective leagues has become more intense than ever before. Within domestic leagues, clubs earn more prize money and broadcasting revenue if they finish higher, bringing in the most revenue should they win the domestic title. Within Europe, top clubs from each league are granted entry into Europe-wide competitions, the UEFA Champions League (first tier) and the Europa League (second tier). Participation in these competitions awards clubs greater broadcasting revenue and global attention, leading to increased club-level revenues, such as merchandise sales. In 2018, an estimated 380 million people watched the Champions League final (Goble, 2019). As a result, there are strong incentives for clubs to ensure they sign the highest performing players to achieve not only domestic, but also international success.

2.2 Transfer Market History and Trends

Unlike some other sports, 'trades' in football are most often one-way exchanges involving a player and an agreed upon amount of money called a transfer fee. Each region has its own rules regarding transfers, and UEFA's transfer regulations have experienced some significant changes in the last few decades.

In 1995, the landmark Bosman case permanently changed the nature of the European transfer market. During the case, the European Court of Justice (ECJ) ruled in favor of the freedom of movement of players throughout the continent (Lembo, 2011). The basis for the ruling rested on the laws of the European Union, specifically those regarding workers' rights to free movement. This ruling also opened the door to foreign player recruitment, and it prevented clubs from charging their players for leaving at the end of their contracts (Lembo, 2011).

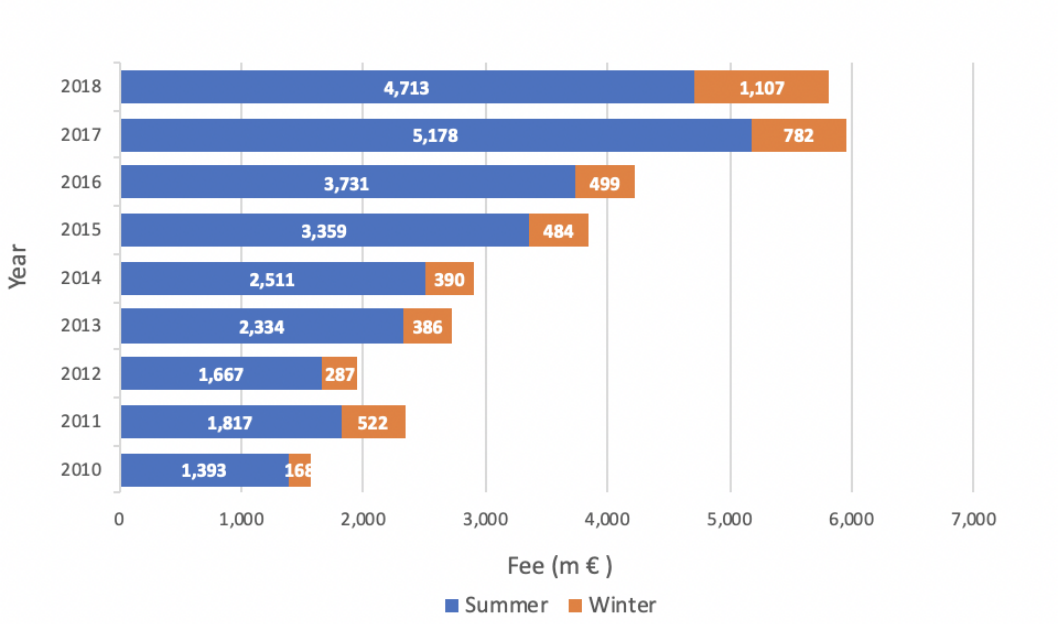
An obvious pitfall with which UEFA has dealt throughout the 21st century is the Bosman case's effect on income inequality between European clubs. Following the ruling, richer clubs were positioned to be able to pay not only higher wages to sign free agents (players whose contracts have expired), but also higher transfer fees to acquire star players. To address this issue, UEFA rolled out Financial Fair Play (FFP) regulations, which force clubs to show that they are not egregiously

overspending (UEFA, 2015). The goal of this program has been to prevent clubs from taking too severe financial risks for the sake of achieving domestic and international success (UEFA, 2015). Another goal, and perhaps the one advertised the most by UEFA in lieu of the Bosman ruling, was to address income inequality between clubs.

However, many have argued that FFP regulations have actually enabled the richest clubs to consolidate their power. For example, they have acquired sponsorships and overseas funding from very rich investors (Bailey, 2017). As a result, by the books, rich clubs can justify their exorbitant spending in the transfer market, allowing them to outbid smaller, less wealthy clubs and to acquire the highest-performing players.

The influx of outside funding highlights a trend in transfer and wage expenditure that people are questioning worldwide. CIES Football Observatory posts updates regarding transfer expenditure in Europe every year (Poli et al., 2018). The following figure summarizes CIES data from 2010 - 2018:

Figure 2: Transfer Fee Investments of Big-5 League Clubs (m €)



As Figure 2 shows, transfer spending has risen dramatically since 2010. Most spending occurs in EPL clubs. Deloitte reports that the growth in broadcasting revenue has bolstered European club spending across the board and that there is no clear sign that this trend is slowing down, despite the marginally lower amount of transfer investment observed in 2018 relative to 2017 (Jones et al, 2019). Given how many people watch the top 5 European leagues in addition to continental UEFA competitions, entertainment companies will continue vying for the rights to broadcast their matches, driving the price of these contracts up and, ultimately, increasing the broadcasting revenues for all these clubs as well.

At an individual player level, transfer fees have reached all-time highs. In fact, 16 of the top 20 transfers of all time (in terms of reported fee amount), have occurred in the last 5 seasons (Transfermarkt). The trend in fees differs across positions (for example, defenders and goalies may generally transfer for lower fees than forwards or midfielders), but each positional transfer record has been broken in recent years. Additionally, clubs generally pay higher wages to players they acquire for higher transfer fees, a trend Deloitte shows holds true in Europe's top 5 leagues and abroad (Jones et al., 2019).

At this point, some football analysts and reporters have begun questioning whether these increased transfer fees are actually warranted. This thesis will explore this question in part by examining how player transfers can impact performance at the player and club levels.

2.3 Non-European Leagues Overview

2.3.1 Major Soccer League

The Major League Soccer (MLS) was founded in 1996, and it represents the top professional soccer league in the United States. Since its inception, the league has expanded numerous times and currently has 26 teams split into Eastern and Western conferences with more projected to join in the near future. As the US men's and women's national soccer teams have performed better in international competition in the last two decades, national interest for soccer has risen, and the MLS has grown almost concurrently (Decurtins, 2017). A few years ago, the MLS proclaimed

that it would be one of the world's top soccer leagues by as early as 2022 from both sporting and economic perspectives (Decurtins, 2017). However, the American league's fundamental structure differs significantly from those of major leagues around the world like those in Europe.

First, the transfer system and league structure are unique. Players in the MLS are distributed to teams by the league, and unlike players in Europe, they do not have the right to choose where to play (Decurtins, 2017). Though players brought a case against this structure in the 1990s, the US Supreme Court struck down their appeal and deemed the MLS a single entity, thereby legitimizing a structure in which the league itself acts as not only the parent company to all of its teams but also the employer for the players themselves (Decurtins, 2017). As a result, the MLS is the sole economic actor in the league, giving it significant strategic and operational latitude (Decurtins, 2017). This structure effectively precludes individual teams from leveraging revenue generation opportunities unilaterally, as the league utilizes its own redistribution mechanisms in every aspect of the sport. Questions remain as to whether the MLS transfer and league structure, meant to provide stability through the league's tremendous growth in the 1990s and 2000s, is still viable given the increasing heterogeneity in team ownership throughout the league (Decurtins, 2017). It is important to note that for international transfers, the MLS follows FIFA guidelines, which reflect the structure found in European football leagues that allows players to move freely and is based on the Bosman ruling (Decurtins, 2017).

Second, the MLS has implemented a salary cap for every team and its players. This policy was originally meant to maintain financial, and thus competitive, balance across the league (Decurtins, 2017). In 2007, the MLS introduced the Designated Player Rule, whereby each team was allowed to sign up to 3 players whose salaries violated the salary cap, as a way to enable teams to bring in high-profile players and increase the talent level of the league overall (Decurtins, 2017). In this structure, the league mandates that no player receive more than $\frac{1}{8}$ of the salary cap, which roughly totals $4 million; a regular player's salary thus comes out to roughly $480,000 per year at most (Decurtins, 2017). In this structure, the league itself pays regular players' salaries, but the clubs pay the bulk of Designated Players' compensation, which is typically greater than $480,000 per year (Decurtins, 2017). For instance, Brazilian star Kaka joined Orlando City in 2016, reportedly

earning an annual salary of $7 million, of which the MLS paid $480,000 (the max regular salary portion of his compensation) and Orlando City paid over $6.5 million (Decurtins, 2017). The reality of the situation, as a result, is that Designated Players earn, on average, many times more than their teammates, most of whom receive much less than the $480,000 salary cap limit (Decurtins, 2017).

Third, whereas domestic football leagues in Europe consist of several tiers of clubs, the MLS is the top tier of football in the United States. Additionally, teams in the MLS are divided equally between two conference, the East and the West. Currently, at the end of the regular season, the top 7 teams from each conference enter the playoffs, and the top team from each gets a 1st-round bye. The playoffs are divided into Eastern and Western conference brackets, and the winner of each bracket competes for the league championship in the playoffs final. Thus, the playoff format in the MLS mirrors that of other American sports leagues more so than it does the European football system.

2.3.2 Chinese Super League

The Chinese Super League (CSL) has also expanded significantly since the 1990s, but it has followed a different course. The league first began in the 1990s, and the top tier league is modeled directly after the English Premier League (Qian et al., 2017). However, throughout its first decade and a half, the league suffered from rampant match rigging and administrative corruption, curtailing its growth (Qian et al., 2017). Then, in the late 2000s, the government began cracking down on CSL officials and encouraged both domestic and foreign investment, stabilizing the league and giving it a real chance to grow (Qian et al., 2017). While these amounts seem small relative to global transfer records, the number of expensive transfers completed by CSL clubs in recent years is unprecedented in the football world.

Since these government efforts, CSL clubs have spent tremendous amounts of money to develop their global brands mainly through the international transfer market. The past decade has seen multiple Chinese football clubs finalize "big-ticket signings and broadcast deals [and smash] transfer fee records...making global headlines" (Qian et al., 2017). In fact, 19 of the CSL's top 25 transfers

of all time, in terms of fees, have occurred since 2016 with fees ranging between $16 and $60 million (Transfermarkt).

While the CSL has captured headlines by spending exorbitant amounts on players from all over the world, Chinese football development has lagged behind. The national team has consistently performed poorly in international competition, and as a result, the number of youths playing the game and participating in training academies has remained low since 2000 (Qian et al., 2017). This issue can, in part, be attributed to the lack of star Chinese players at the national level (Qian et al., 2017). So, although clubs have been improving the sport's popularity in China by bringing in high-quality players through expensive transfers, they have not been able to increase the pool of talented youths in China itself and are working to address that issue (Qian et al., 2017).

Given its clubs' tremendous spending, the CSL recently enacted salary cap restrictions for the upcoming 2020 season (Price, 2020). This policy, unlike others the CSL has implemented in the past, contradicts financial policies in European football and aligns more closely with MLS policies. The CSL is attempting to make the league fairer from both financial and competitive standpoints (Price, 2020). Perhaps more importantly, though, the CSL claims that this salary cap will incentivize Chinese football clubs to develop talent organically and grow China's youth football programs, ultimately improving the national team's quality and increasing the sport's popularity throughout the country even further (Price, 2020). Given that the CSL has not had a salary cap in the past, it is unclear as to whether this decision will incentivize foreign players who were signed in the recent transfer spending spree to leave the CSL and play elsewhere (Price, 2020). Also, salaries are paid directly by the clubs themselves because the CSL is not a single entity like the MLS.

The CSL's current structure generally mirrors that of European football leagues, but its enactment of a salary cap suggests it may be moving toward a system more like that of the MLS, at least in terms of financial fairness.

3 Literature Review

3.1 Club Expenditure

Much economic research has been dedicated to understanding how sports markets function in relation to traditional business markets and settings. In 1956, Simon Rottenberg examined the U.S. baseball player's market, which he argued operated like a monopsony. The existence of a 'reserve' clause ensured that the team a player signed with had exclusive rights to his professional services in the baseball (Rottenberg, 1956). Major League Baseball justified this clause as a policy that prevented talent from concentrating in the hands of a few teams. Rottenberg argued, however, that a free agent system would not decrease competition because sports teams produce 'sport' together and do not benefit as greatly from consolidating all of a league's talent as businesses do in a traditional competitive market setting (Rottenberg, 1956). Rottenberg is credited with producing one of the earliest academic analyses of professional sports.

In 1969, Peter Sloane analyzed English football through an academic lens and argued that although they operate like teams in any other sport, similar to the way the way Rottenberg described, football clubs are not profit maximizers. Instead, they are utility maximizers, focused on team performance more so than anything else, especially given that they often operate at a loss (Sloane, 1969). So, a free agent setting, such as that which Rottenberg suggests, would result in clubs spending a lot of money in an attempt to attract the top players in every position until they meet some budget constraint.

Sloane's analysis applied mainly to English football, but in recent decades, more expansive research has been published regarding football club operations throughout and outside Europe. In *Soccer and Money*, Stefan Szymanski discusses Sloane's analysis and presents data supporting it; he also extends his findings to clubs outside of Europe. First, he argues that club owners tend to be fans of the club, meaning they are emotionally invested in the club's performance and success domestically and internationally (Szymanski, 2015). For many European clubs, that connection translates into extraordinary spending on top talent in the form of transfers and wages in order to secure the best chance of winning. In fact, Szymanski shows a very strong correlation between

wage expenditure and competitive success. Second, Szymanski argues that clubs understand the majority of their revenue relies on fan interest through ticket and merchandise sales (Szymanski, 2015). As a result, buying the most exciting players, such as Neymar and Paul Pogba, can increase fan interest and excitement about the club, ultimately boosting club revenues. Thus, there are significant incentives for European football clubs, and football clubs worldwide, to spend a lot of money on their players if possible, regardless of red line profits, for the sake of competitive success and popularity.

3.2 Football Market Dynamics and Club Priorities

Rossi et al. (2013) explain that in the past couple decades the world of European football has become like other powerful global industries because of the amount of money it generates, its media attention, and its popular support worldwide (Rossi et al., 2013). However, the authors accept that football is a unique phenomenon because the clubs involved embrace a variety of "sport, social and economic dimensions" (Rossi et al., 2013). Each team also focuses on distinct goals, which can be thought of as the competitive advantage each attempts to solidify, including, but not limited to, "distinction in major competitions (national and international championships), acquisition and loyalty of supporters, making profits and owners' visibility" (Rossi et al., 2013). While identifying the various goals of soccer clubs is relatively straightforward, researchers have not always agreed upon which economic models best describe their operations. For instance, profit maximization models were frequently challenged through the 1990s because many researchers, including Cairnes et al (1986), Sloane (1971), and Dabscheck (1975), argued against reducing the complex series of objectives football clubs appeared to have to just profit maximization (Rossi et al., 2013).

While describing Italian football at great length, Rossi et al. (2013) analyze the market using Porter's Five Forces. First, the authors argue that the high financial and talent barriers to entry make it difficult for new entrants to survive (Rossi et al., 2013). Today, the Italian league is not looking to expand dramatically, as is the case for most, if not all, European football leagues, so one could argue this aspect of Porter's is moot. Second, the authors suggest that substitute products, consisting of all other professional sports, do not threaten the football market given the levels of

loyalty and support in its fan base (Rossi et al., 2013). It is fair to assume, as the authors do, that football draws a unique appeal from its fan base that other sports cannot replicate. Third, the authors discuss the nature of supporters as customers in the football 'industry.' Rossi et al. (2013) argue that these customers' relation to the clubs, the 'firms,' is a "social phenomenon" whereby they have little power in the market relative to customers in other, more traditional markets (Rossi et al., 2013). They describe football customers as weak buyers because they are so loyal that they are not likely to "punish" clubs for not performing well, with such punishment characterized by the decision not to attend or watch as many matches as they normally do. Fourth, the authors discuss three main categories of suppliers in the football industry. Sponsors and technical managers provide funding to clubs and maintain its utilities, such as stadiums, merchandise sales, marketing, etc. (Rossi et al., 2013). These groups, while vital to a club's longevity and long-term success, have very little power relative to football players, who provide the skills and talent necessary for the club to perform at a high level and increase its popularity (Rossi et al., 2013). Since the Bosman ruling, players have had relatively strong bargaining power in the European football market and have been able to control where they would like to play, putting the clubs in a more desperate situation when compared with the relationship between clubs and players prior to the ruling (Rossi et al., 2013). Finally, and perhaps most importantly, competition within football is characterized by intense rivalry between clubs at the national and international level (Rossi et al., 2013). Competition exists in the transfer market as well, since clubs compete to sign the best players by highlighting their unique strengths and advantages over their rivals (Rossi et al., 2013).

Rossi et al. (2013) also categorize Italian clubs to reflect their different goals. The first category the authors describe is "sports winners-performance losers," teams that focus on national and international competition rather than financial performance (Rossi et al., 2013). While these clubs tend to aim for operating balance, they prioritize winning with the knowledge that their wealthy owners will compensate for any financial losses they incur (Rossi et al., 2013). These clubs also tend to achieve the greatest success in competition because they can afford to spend money on the best-performing players. The second category is "combined sports-performance," describing teams with moderate competitive success and a consistently balanced budget (Rossi et al., 2013).

The third category is "performance winners," describing clubs that prioritize a balanced budget (Rossi et al., 2013). These clubs tend to have significant player turnover, often cycling through players developed in their youth academies or young players they have bought whom they then sell at a significant premium in the transfer market (Rossi et al., 2013). The last category is "survivors," describing clubs that focus solely on achieving profits or minimizing losses (Rossi et al., 2013). These clubs care more about cost-benefit analysis than about domestic and international performance often because they do not have the funding available to spend exorbitant amounts of money in the transfer market.

Given the dynamics of the football market and divergent interests of football clubs outlined above, it is important to address how clubs balance their financial and sporting performance. Minin et al. (2014) discuss the concept of strategic agility in the context of Italian football club Udinese to address this issue. Strategic utility is defined as "firm-level ability to continuously adjust and adapt decisions to the changing circumstances of the external environment and thus nurture value creation" (Minin et al., 2014). In recent history, Udinese has balanced financial and sporting performance through strong investments and fast turnaround of the players they develop (Minin et al., 2014). The authors argue that the club's ability to sustain this business model has made it "strategically agile" (Minin et al., 2014).

As global viewership has increased, the goal of balancing financial and sporting performance has become more important. In order to secure strong and consistent broadcasting revenue, clubs need to perform well to earn a significant share of their league's broadcasting revenues and, more importantly, a share of European competitions' revenues. As mentioned before, top performing clubs in European leagues are invited to participate in the Europe-wide competitions, the UEFA Champions League or Europa League, offering clubs opportunities outside their domestic competition to earn significant broadcasting revenue and gain more global exposure. There is an important caveat to this structure, however. Pawlowski et al. (2010) build a model that analyzes football competitiveness in European competitions, and they find that a change in European competition payout structure that occurred at the turn of the century has created somewhat of a vicious cycle whereby the top clubs, which perform decently in their league (to secure a spot in European compe-

tition) or in Europe, or both, will consistently play in European competition, reducing competitive balance both in these competitions and in domestic leagues as well (Pawlowski et al, 2010). The broadcasting share of money awarded to each team that plays in the UCL or Europa League offers a select handful of clubs across Europe a significant financial advantage, which ultimately translates into a sporting advantage if funds are invested wisely in the transfer market, thus creating a vicious competitive imbalance cycle (Pawlowski et al., 2010).

This background contextualizes the findings of Minin et al. (2014), who offer an insightful case study into a club that has not had tremendous success in qualifying for European competitions, let alone winning such competitions. Udinese, which competes in one of the top 5 leagues in Europe, Serie A, "has turned into a factory of talents," focusing on youth development and long-term sustainability, rather than short-term sporting success (Minin et al., 2014). Three main capabilities have been vital to the club's success. First, resource fluidity requires that the entire club provides a nurturing, supportive environment for its players so that they can develop their talents without worrying about being dropped from the team for poor short-term performance, a common occurrence in top performing clubs throughout Europe (Minin et al., 2014). Second, strategic sensitivity reflects the club's scouting network, ability to collect information regarding scouted players, and ability to attract players, particularly young ones with loads of potential (Minin et al., 2014). Third, the leadership must be unified in its goal of developing such a talent factory and must not pressure the club's players to focus on short-term performances (Minin et al., 2014). This last point generally reflects the need for a unified top-down club culture. Overall, though, this characterization does not describe top-performing clubs throughout Europe that are known to spend a lot of money, as they have the funding to do so, and to perform well in domestic and European competition consistently.

3.3 Financial Fair Play

As mentioned earlier, UEFA, the governing body of European football, implemented Financial Fair Play (FFP) regulations in 2011-2012. UEFA outlined several goals of this program, including, but not limited to, encouraging responsible spending for the sake of long-term sustainability and re-

quiring clubs to use only their own revenue as their source for transfer spending. The President of UEFA made the following comments regarding FFP shortly after its first season of implementation:

"Many people are coming into the game to make business, to make popularity ... some actually love football, but remember UEFA are there to protect [the clubs], not kill them. I just want clubs to spend money they have, not what they don't have." (Guardian article)

The aforementioned goals of FFP appear to focus on club efficiency and deleveraging, but many football supporters believe that the real motivation behind FFP is fairness. Obviously, fans would be upset if some owners could enable their clubs to win simply based on their own ability to provide endless funding to fuel exorbitant spending in the transfer market (Szymanski, 2014). The goals of FFP policies, though, imply a focus on efficiency and no significant consideration of fairness. Indeed, Szymanski (2014) argues that FFP regulations, as they are written, do not clearly address efficiency or fairness, questioning UEFA's motivations for this policy as well as its efficacy.

3.3.1 Efficiency

Certainly, in recent decades, many high-profile clubs have operated at a loss, a point Szymanski (2014) highlights. Additionally, FFP rules apply only to clubs with expenses of €5 million or greater (Szymanski, 2014). Thus, the policy is generally geared toward top-tier European clubs who earn the highest share of broadcasting revenues and who pay the highest wage bills on average. Szymanski (2014) questions why losses incurred by these clubs implies the existence of inefficiency within the European football market (Szymanski, 2014). Traditional economic reasoning would explain that losses in the market indicate "the value of what [the clubs] produce is lower than the value of the inputs required, suggesting that there is overproduction" (Szymanski, 2014). Many European clubs, however, are backed by owners who are willing to continue pouring in money to more than compensate for financial losses (Szymanski, 2014). The owners of these clubs are not acting as profit-maximizing managers, but rather, they simply love the sport and desire to see their clubs be competitive from a sporting perspective, illustrating potential motivations behind their

willingness to overinvest (Szymanski, 2014).

To solidify this argument, Szymanski (2014) discusses the idea of relative ranking. For football clubs and their supporters, absolute performance is not very relevant. Rather, everyone involved cares more about their club's performance *relative* to that of other clubs or their competitors (Szymanski, 2014). While this concept by itself is not very insightful, its implications in the context of understanding inefficiencies in football are very useful. If relative performance is all that matters to a club and its fans from a sporting perspective, then these clubs should be able to scale back their spending and investment proportionally without affecting their ability to compete (Szymanski 2014). However, increased investment in football, Szymanski (2014) argues, has expanded global interest in the sport and enabled more people from around the world, such as Chelsea and Manchester City's billionaire owners from Russia and the UAE, to get involved (Szymanski, 2014). For example, high levels of investment "provoked a global search for talent which in turn generally requires increased participation in the sport, and increased supply of facilities such as training grounds or stadiums," ultimately enhancing the sport's popularity to a great extent (Szymanski, 2014).

3.3.2 Fairness

While not directly mentioned in FFP guidelines, then President of UEFA Michael Platini made it clear that UEFA's regulations were aimed at wealthy club owners who believed they could achieve sporting success by means of their own wallets. Szymanski (2014) clarifies, though, that football clubs generate revenue through nontraditional means because they have focused on generating revenue from a wide variety of sources, not just the commonly recognized ones like broadcasting or ticketing: "In the past, football clubs have run lotteries, organised social clubs, gone into manufacturing businesses, and much else besides. Indeed, many of Europe's biggest clubs today are multi-sport enterprises with opportunities for cross subsidy" (Szymanski, 2014). Thus, FFP's requirement that football clubs spend no more than their own revenue is not fully clear, as the definition of a club's 'own revenue' is not well-defined.

Perhaps more importantly, UEFA's own regulations have, if anything, made the playing field of European football more unfair and unequal. Currently, broadcasting revenues are not generally

shared equally among all the participant clubs, who jointly create the experience generating these revenues (Szymanski, 2014). As Szymanski points out, 10 teams alone have accounted for "50% of the money distributed by UEFA's European competitions" (Szymanski, 2014). Thus, the notion that FFP addresses unfair funding advantages that tilt the football playing field is questionable at best given UEFA's own policies engender such unfairness as well.

3.3.3 Performance

Madden (2015) presents a model that incorporates dual owner objectives for football clubs, profit and win maximization, in order to examine the potential effects of FFP on performance and club quality (Madden 2015). Owners of high-profile clubs like those FFP targets are motivated by "pure consumption" and interest in the sport (Madden, 2015). FFP regulations attempt to prevent such wealthy owners from singlehandedly injecting so much money into a club that it can initiate a major spending spree in the transfer market and on wages in order to secure the best players to contribute to team performance (Madden, 2015). The regulations themselves, as Madden notes, do not prevent owners from investing in long-term needs of the club, such as youth development, but they do prevent owners from spending exorbitantly to sign the next big transfer (Madden, 2015). The model Madden (2015) designs predicts a "Pareto disimprovement for all fans of the league as well as a fall in owner utilities and player wages" (Madden, 2015). Thus, FFP's unintended negative consequences may also be in question.

3.4 Transfer Market Dynamics

Fürész (2018) explores trends in transfer expenditures through network analysis. After examining aggregated club transfer data, such as number of bought/sold players and value of transfers completed, Fürész concludes that top clubs (like Manchester City and Real Madrid) are able and willing to sign high-priced players because of "immediate sport successes and marketing" superiority, whereas lower level clubs transfers offer the "best [form of] investment" for future profitability. This paper highlights the various goals and motivations different clubs maintain as a result of their past successes and financial backing. Clubs like Manchester City and Real Madrid have tremendous

history and financial support, whereas smaller clubs do not have the same track record or backing, creating inherent differences between how clubs can participate in the European transfer market.

Matesanz et al (2018) uses a dynamic network approach to examine the relationship between transfer activity and performance of European clubs over time. The authors find that transfer spending is a significant factor in European and domestic performance, particularly for top clubs. They point out heterogeneity between clubs and leagues in their data, but they explain that this finding, generally speaking, exists for top clubs throughout UEFA. However, their analysis does not delve into specific transfer characteristics, which is what my thesis wishes to explore.

3.5 Player Performance

Some economists have attempted to build models to analyze the performance of football players. The goal of this research is to build predictive models that use input statistics like passes completed, tackles won, etc. to predict a player's performance relative to his peers. Casals and Martinez (2013) perform such an analysis for basketball, and *Moneyball* examines the usage of data analysis by the Oakland Athletics in Major League Baseball (Lewis, 2013). However, generally speaking, football managers have not yet widely adopted performance models as quickly as coaches in other sports. Nonetheless, many researchers have continued building predictive models.

Nasiri et al. (2018) develop a decision support method meant to guide a football club in their player selection during transfer windows. The authors utilize several player statistics and characteristics to present a multi-criteria model that optimizes for performance return based on financial constraints. The model outputs the optimal decision(s) for a club to make, including keeping, selling, and borrowing/buying players. This field is still relatively young, as researchers continue producing models that they hope will better predict player and club performance, potentially helping clubs make more data-driven decisions during transfer windows.

All in all, though, not much research has been conducted on the impact of transfers on player performance. Dobson and Gerrard (1999) show that key player and club statistics account for the majority of the variation in transfer fees, and as mentioned above, much research has been devoted to performance models. However, this thesis aims to connect the two topics by examining the effect

of transfers and transfer spending on player and club level performance.

4 Motivations

4.1 Rise in Transfer Spending

Transfer expenditure is assumed to be correlated strongly with team performance because the positive relationship between spending on player wages and performance is well documented. However, European transfer spending has increased across the board, and very little research has examined the effects of this trend on player and club performance. Canes (1974) discusses how one club's spending on high quality players compels its competitors to spend significant amounts of money in order to 'catch up' and stay competitive (Canes, 1974). Thus, one can see that the European transfer market creates somewhat of a rat race in domestic and international competition based on each club's funding and spending capability.

Table 1 below shows aggregate revenues for Serie A (Italy), Ligue 1 (France), English Premier League (England), La Liga (Spain), and Bundesliga (Germany) from the 2013/14 season to the 2017/18 season. As is shown, each league's revenue has increased modestly during this time period. As mentioned previously, these increases can be attributed to football's growing popularity worldwide as well as more lucrative broadcasting deals and revenue generation.

Table 2 shows aggregate transfer expenditure within each of the top 5 European leagues. As is shown, each league's transfer expenditure has risen significantly over the 4-year period. Part of the explanation for this increase in spending could be the effects of wealthy owners entering some, if not all, of these leagues and pouring money into their budgets so that they can buy the best players in Europe. Regardless of the causes of increased spending at the club level, the ultimate network effect Cane describes results in increased spending by all clubs in a given league as a way to keep up with the clubs that spend the most in the transfer market. This cycle of spending could offer one reason for the increase in transfer expenditure in the top 5 European leagues.

Figure 3 consolidates the data from Tables 1 and 2 into a ratio of transfer expenditure to revenue. This ratio has trended upward for each of the top 5 European leagues over the last few

years, a finding that further supports the theory that the European transfer market reflects rat races for success in European football. Something important to note, however, is that while aggregate transfer expenditure has been increasing at a faster pace than aggregate revenue has, the distribution of growth is not even across the top 5 leagues. Italy, for instance, has experienced very little change in its expenditure to revenue ratio, whereas England has seen a significant increase. Part of the reasoning behind this observation is the greater worldwide popularity of English football and, as a result, greater broadcasting revenue for English clubs. Thus, while research tends to examine the top 5 European leagues in aggregate, looking at data on a league-by-league basis may also provide interesting results.

Nonetheless, the data below reflect that transfer expenditure has increased across the top-5 European leagues, even as a percentage of the member clubs' growing revenues. In fact, some researchers, such as Dietl et al. (2008) have built models studying the trends of over-investment in European football because transfer expenditure has been increasing significantly over the past several years. The findings of this research, as well as the data below, support the notion that relative performance is key to European football clubs, and the battle to spend more than one's competitors is as important as the battle for success in both domestic and international competition.

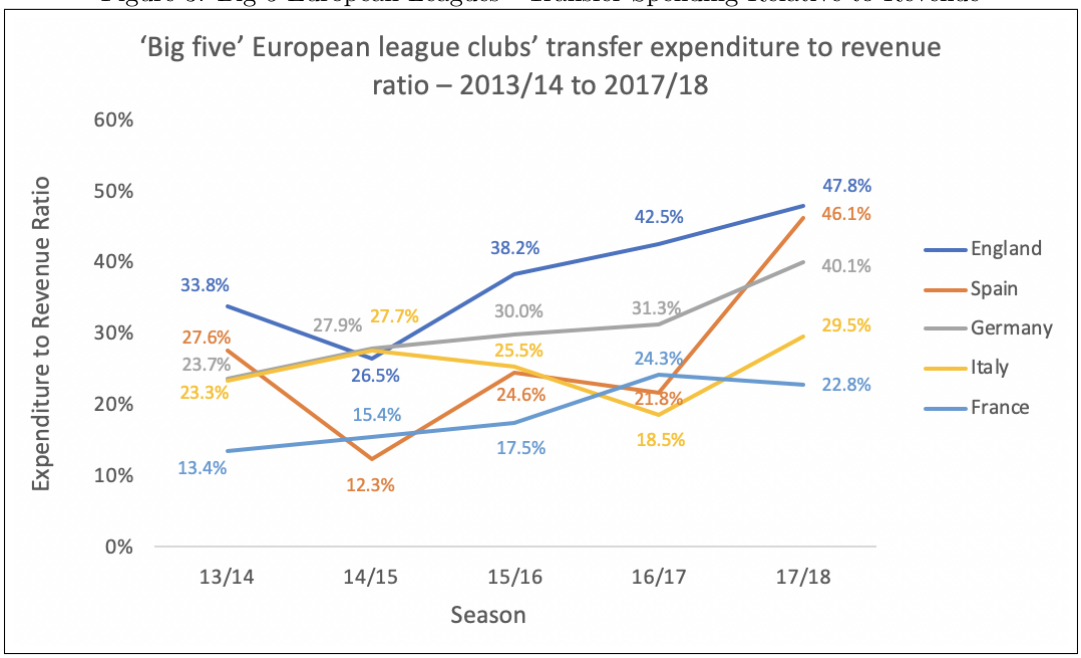
Table 1: 'Big five' European league clubs' revenue, 2013/14-2017/18 (€m)

Year	**Italy**	**France**	**England**	**Spain**	**Germany**
13/14	1700	1498	3897	1933	2275
14/15	1790	1418	4403	2053	2392
15/16	1917	1485	4865	2437	2712
16/17	2062	1643	5301	2865	2793
17/18	2217	1692	5440	3073	3168
4 Year CAGR	6.86%	3.09%	8.70%	12.29%	8.63%

Table 2: 'Big five' European league clubs' transfer expenditure, 2013/14-2017/18 (€m)

Year	Italy	France	England	Spain	Germany
13/14	574	414	924	450	305
14/15	474	174	1230	568	368
15/16	733	365	1460	620	474
16/17	877	358	1660	531	680
17/18	1060	780	2180	907	724
4 Year CAGR	16.57%	17.21%	23.92%	19.19%	24.08%

Figure 3: Big-5 European Leagues - Transfer Spending Relative to Revenue



(Source: Jones et al., Deloitte Football Finance 2019)

Not much research has attempted to find a link between increased spending and improved performance, though. If, in fact, transfer expenditure reflects a rat race of sorts in European football, then perhaps at some point such spending will become too exorbitant and will fail to provide a sufficient performance return on the transfer investments these clubs are making. Of course, there is no set ROI threshold to which all clubs adhere when considering their transfer expenditure. The wealthier clubs, typically backed by rich owners like those of Chelsea and Manchester City,

have more margin for error in this regard because if they spend too much on a given player and do not realize sufficient return, their owners can step in and compensate the clubs for any losses. Smaller clubs, on the other hand, may not have as much room for error, suggesting two potential implications.

First, I may see performance returns on spending peak at levels much lower than those indicated by the top 10 or 20 percent of all transfer fees, suggesting that the highest fees do not result in sufficient return.

Second, given their relative size, smaller clubs may prove to achieve greater performance return levels, even though their average spending and number of transfers will be lower than those of richer clubs, because they have less room for error. If one of these smaller clubs spends a lot of money on a player who does not perform as well as expected, it ultimately takes a loss on that investment because of its poor performance, indicating a poor ROI. For such a club to stay afloat and consistently remain in the top division, however, it probably shows some strong strategic capabilities just like the clubs Minin et al. (2014) describes. This result would also imply that transfer expenditure results in positive performance return up to a certain fee level.

4.2 Performance Trends associated with Transfers

To get a sense for performance trends following top transfers, I examined how clubs involved in transfers prior to the 2019-2020 season performed before and after the transfer(s) occurred. This basic analysis does not incorporate robust controls of any sort, but it is meant to provide an understanding of the types of performance results that matter to clubs, such as success in league and European competitions. Most importantly, though, this analysis will illustrate whether clubs have performed much better after spending more money on transfers. Later on, I will present the results of more robust analysis that includes additional controls at the club and league levels.

To gauge performance in my initial analysis, I build out a custom scoring system to capture the relative performance of all clubs in the analysis, describing explicitly how many "points" would be awarded for each result. In league performance, 1st place gets 20 points, 2nd gets 19 and so on; beyond 10th, a club gets 0 points. In European competition, there are two categories because there

are two competitions, the Champions League (UCL) and the Europa League (UEL). For the UCL, 1st place gets 20 points, runner-up gets 18, a semifinal finish gets 16 points and so on; if it qualifies for but does not make it past the group stage, the club gets 10 points. For the UEL, the scoring system is different because teams that qualify for the UEL finish lower in their domestic leagues relative to those that qualify for the UCL. Thus, for the UEL, 1st place gets 10 points, runner-up gets 9, a semifinal finish gets 8 points and so on; if it qualifies for but does not make it past the group stage, the club gets 0 points. Setting up the scoring system this way also accounts for UCL group stage teams who enter the Europa League knockout stages after failing to advance into the UCL knockout stages because the point totals for winning the UEL and making the UCL group stage are identical.

In this basic analysis, I examine 130 transfers involving European destination clubs, and I collect performance results from UEFA. The graphs below highlight the relationship between transfer fee and the destination club's performance. To capture performance changes, I calculated percentage change in performance rating relative to averages of 2 and 3 years of club performance. Figure 4, shown below, illustrates the percent chance in performance rating for clubs relative to their average performance over 2 years prior to the transfer joining the club. The variance of the performance change is concentrated around 0% between 20 and 60 million euros with a few key outliers, each of which represents greater than average, positive performance return. Examples of these transfers include Everton's transfer for Morgan Schneiderlin in 2016 and Wolfsburg's transfer for André Schürrle in 2014. Also, an interesting note is that Manchester United's world record signing of Paul Pogba in 2016 did not result in significant positive return for the club.

Figure 4

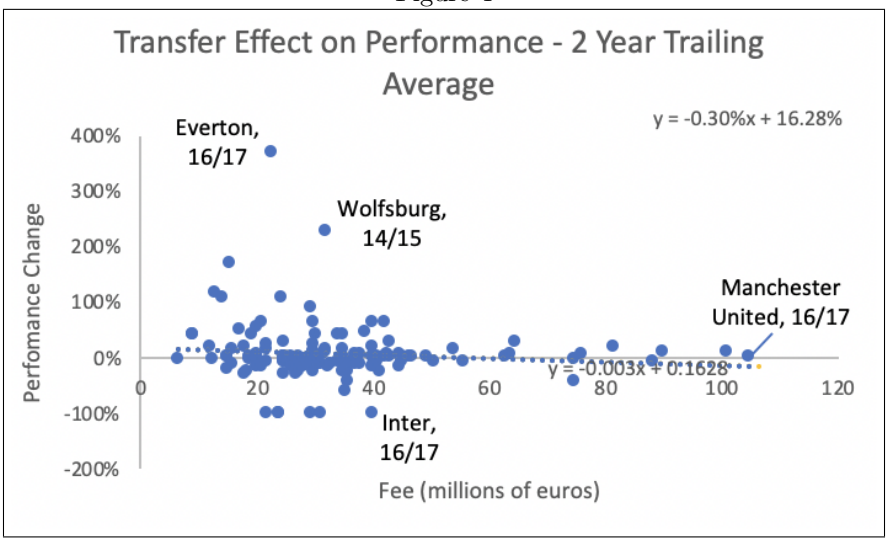


Figure 4, however, may still present biased results because it uses only 2 years of average performance. Thus, to make this basic analysis more robust and avoid one-time club performance outliers, I examine the same performance effects based on 3 years of average performance. The graph below illustrates these results.

Figure 5

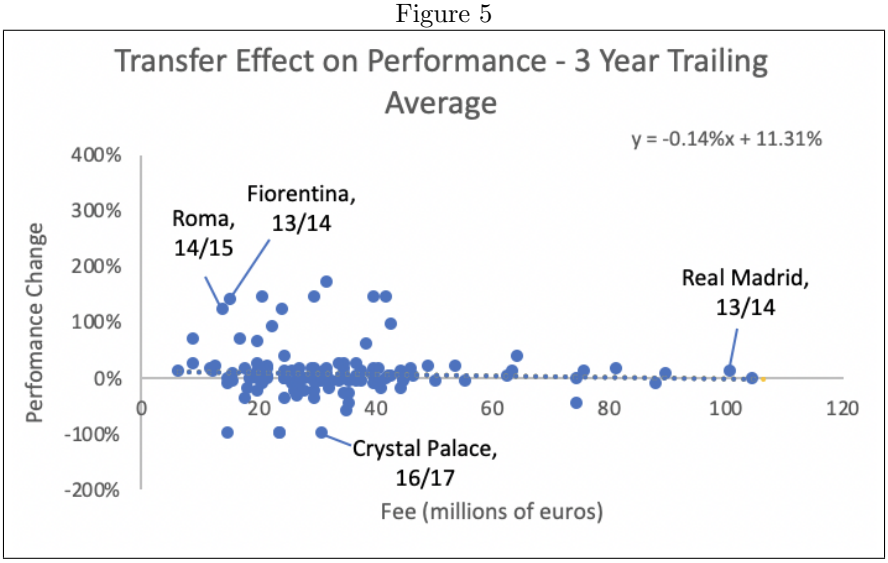


Figure 5 shows similar results to that of the prior graph. The performance returns are consoli-

dated around 0% with several outliers between 100 and 150% for transfer fees between 20 and 60 million euros. A couple of these outliers are noted on the graph, such as Fiorentina's signing of Mario Gomez in 2013.

Figures 4 and 5 do not capture the ability for a transfer to impact his club's performance over the course of several years, though. Thus, I examine the same relative performance changes highlighted in Figures 6 and 7 with the new outcome utilizing average club performance over 2 years with the transfer playing on the club's squad. These graphs are shown below.

Figure 6

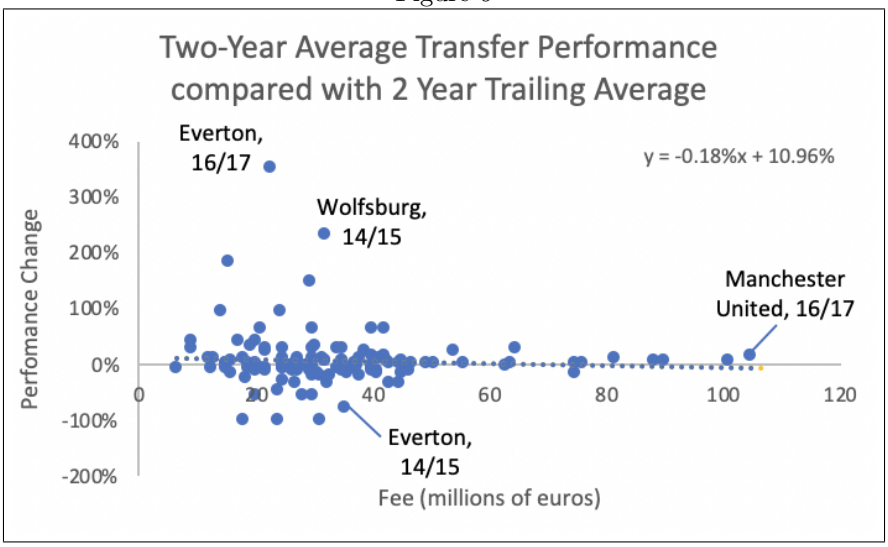
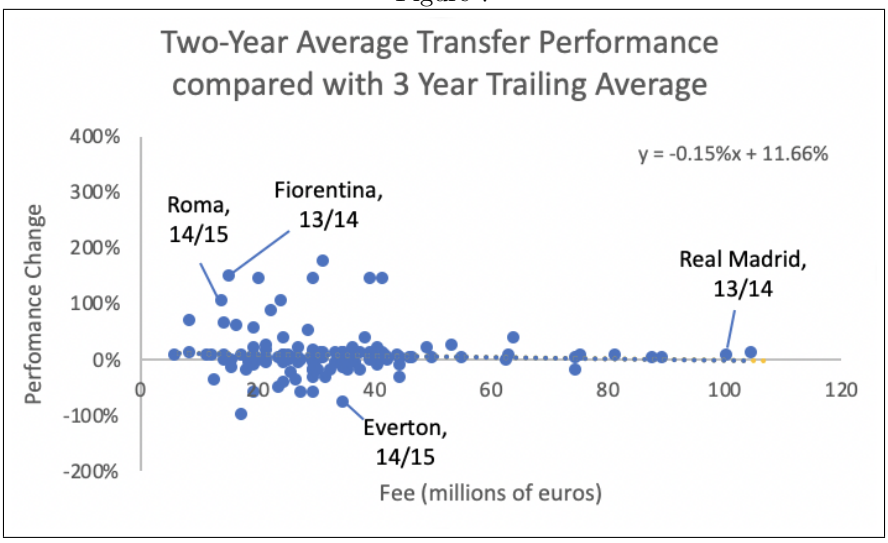


Figure 7



As is shown, the variance in performance is concentrated around 0% and between 20 and 60 million euros. The results do not differ much from the initial graphs.

Note that the dotted orange line in each graph above represents the regression line for the plotted data. Additionally, the regression equations are included in terms of percentage data. For each graph, the dependent mean, the y-intercept, is above 10%. Overall, the most expensive transfers show very little to no performance change for the club (clustered around x axis, representing 0% change). There a are a few potential reasons. First, clubs may be spending a lot of money on transfers without real concern for the monetary cost because of seemingly endless funding. Second, clubs may be forced to spend a lot of money to acquire certain players whom several clubs are bidding for; these bidding wars could boost the transfer fees for such players. Finally, and perhaps most likely, successful clubs, which are likely to have the funding necessary to buy players for extremely high transfer fees, consistently perform well in their league and European competitions; as a result, there is not much room for their performance to improve year to year, as they already consistently achieve great results. Thus, given their financial backing, they can afford to spend exorbitant amounts of money on players without worrying about an immediate performance return.

Other interesting aspects of this data include the outliers highlighted on the figures themselves. The big-name clubs like Manchester United and Real Madrid spent the most in this collection of

transfers (latest transfer is prior to 2017-2018 season), but the performance return in each case is near 0%. Smaller clubs, on the other hand, such as Roma, Fiorentina, Wolfsburg, and Everton have experienced more variable performance returns, but their transfer fees have been between 20 and 60 million euros. These outliers suggest that performance return on transfers costing up to 50-60 million euros are fairly variable, although the majority show a positive return on average, whereas return on very expensive (greater than 60 million euros) transfers has been minimal, close to 0%. There could be multiple reasons explaining this phenomenon. Thus, the more interesting takeaway is that there does not seem to be a clear correlation between spending and performance return for football clubs in Europe, further strengthening our basis to question the performance returns of expensive transfers in general.

A glaring issue with this analysis is its downward bias of the performance return of transfers bought by consistently successful clubs. For instance, clubs that have won domestic or European cups multiple times in a row appear to experience minimal changes in performance, when in reality, being able to win major trophies repeatedly is a significant accomplishment. To account for this, I altered the scoring system slightly by adding in bonus points for clubs that won the league or European competition 2 straight years (+10 points) and 3 straight years (+20 points). Figures 8-11 highlight the results after I made this change.

Figure 8

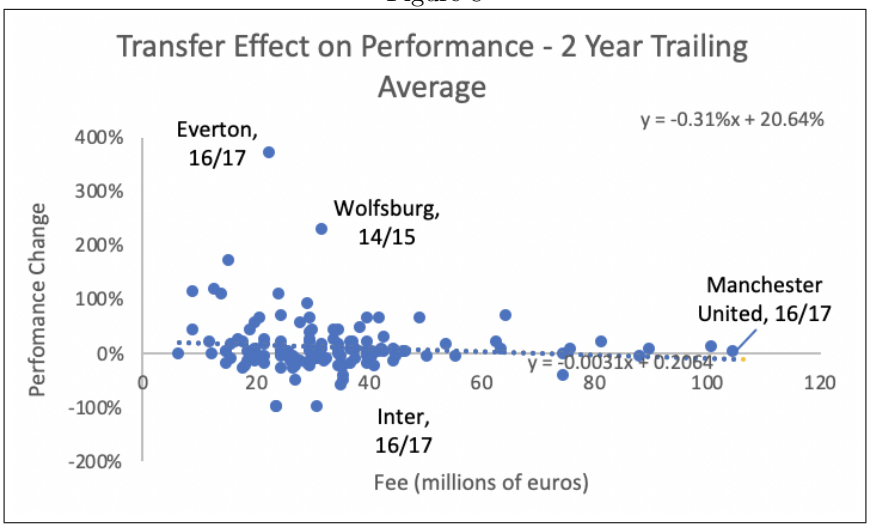


Figure 9

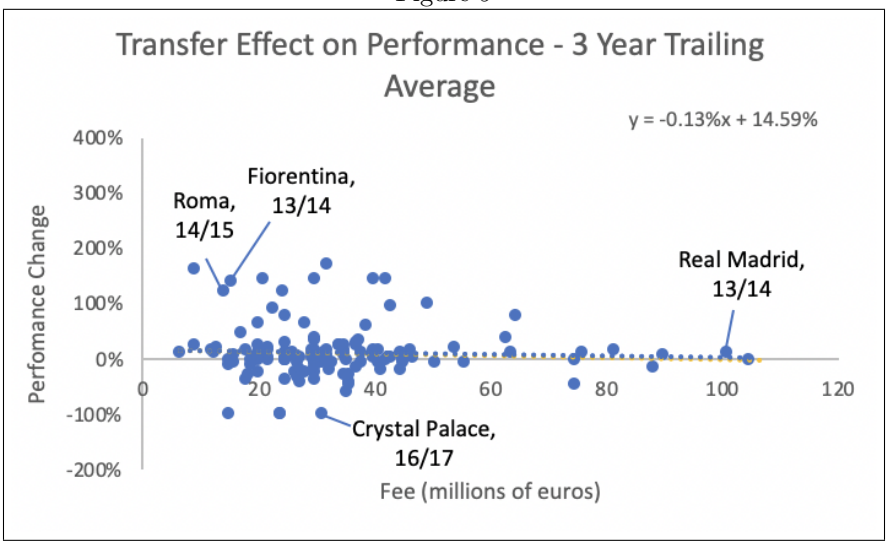


Figure 10

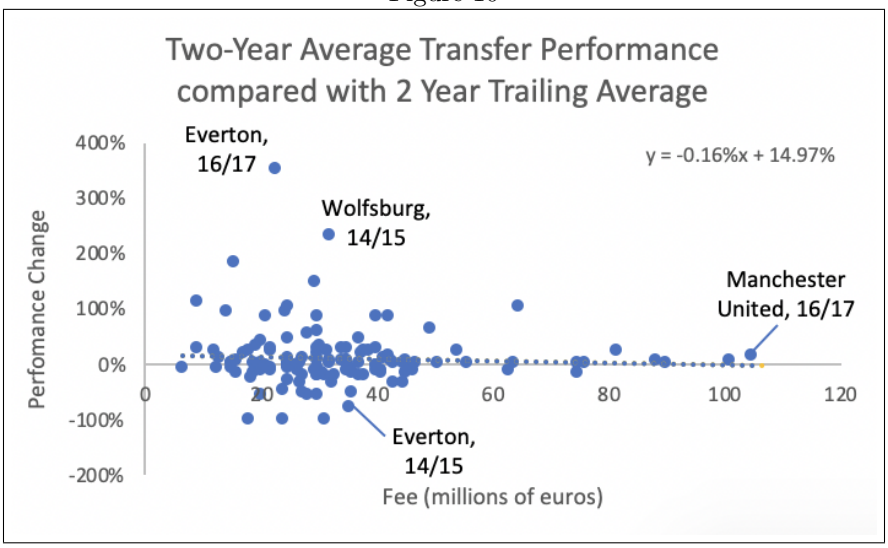
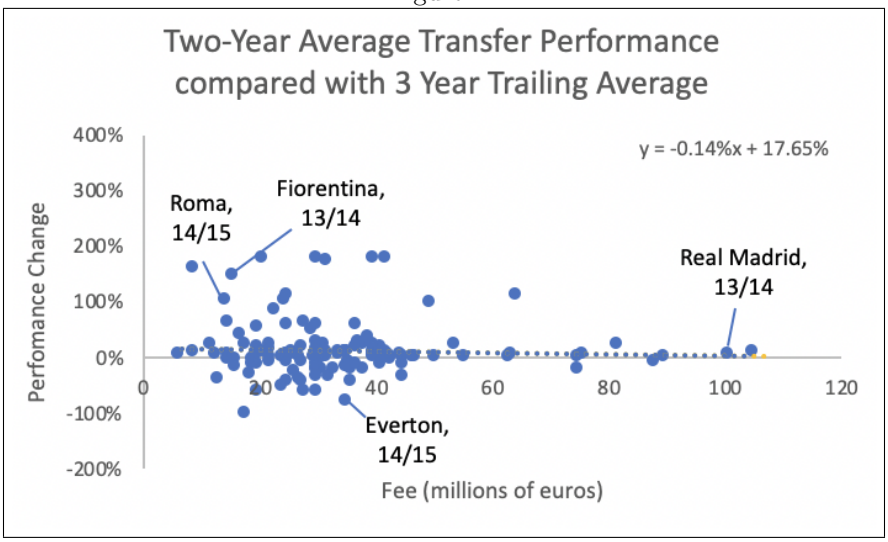


Figure 11



As is shown above, the outliers mentioned previously do not change significantly, and overall, the variance in performance return again is concentrated around 0% and between 20 and 60 million euros. The regression lines have a slightly higher dependent mean (y-intercept), but the results look fairly similar to those of the previous graphs.

This basic analysis suggests that either transfer expenditure alone does not explain performance

return or that there are factors other than performance return that drive clubs to spend larger amounts of money on transfers. Regardless of the true factors at play, this basic analysis provides sufficient motivation for studying the effects of transfer expenditure on performance and seeing whether football clubs have been receiving "a performance bang for their buck" through the transfer market.

5 Data Sources

5.1 Transfers and Net Spending

The source I used for transfer information is *transfermarkt.com*, a German website that mass collects football transfer data. This website tracks several data points for every transfer in football leagues around the world, including the top 5 European leagues, MLS, and CSL. Some of the key data from this source, such as transfer fees and wages, is not publicly known, so the site collects this information by crowd-sourcing news articles and reports about this information. Regarding the source's validity, many researchers have utilized Transfermarkt's data before, including researchers at the Centre for Economic Performance. It represents a credible source of publicly available data regarding transfers and some player statistics.

For each player transfer on Transfermarkt, I collected the following information: name, position, pos (abbreviated position), season (1st season played by transfer on destination club), destination club, destination country, and transfer fee (millions of €). The players are the top 5 European leagues, MLS and CSL, and the transfers range from the 2009-2010 season to present day. I ignore the 2019/2020 data, however, as the full season was not been completed at the time of writing. The transfer fees range from €1.7 - 222M. From Transfermarkt, I also pulled income and expenditure levels for each club in my analysis. I then calculated relative spending levels based on available data regarding aggregate league spending and income. These spending levels include all transfer activity, including low fee transfers and loans.

To collect this data, I utilized the Python package *BeautifulSoup* to web scrape Transfermarkt's website.

5.2 Player/Club Ratings

I use WhoScored.com for performance ratings in my analysis. The website utilizes data from Opta, a sports analytics company that collects live, in-game statistics for every player and club it covers. WhoScored inputs this data into its proprietary algorithm that uses over 200 raw factor statistics in order to calculate player and team ratings. The ratings themselves begin at 6.0 as a baseline and differ based on performance of a player and club in a given season.

For player and club ratings, I have manually collected data in the top 5 European leagues from the 2009-2010 season to present day; Chinese Super League from 2016 to present day; and MLS from 2017 to present day (present day referring to ratings so far in the ongoing 2019-2020 season). For each player in a given season, I have collected the following information: name, club, age, position (same format as pos from Transfermarkt), minutes played, and performance rating.

For each club in a given season, I have manually collected the following information: club name, performance rating, number of red cards, number of yellow cards, possession percentage, pass success rate, aerial headers won, number of manager changes in a given season, and average minutes played at each position. Much of this club-level data provide controls for my analysis.

WhoScored does not allow public web scraping, so I manually pulled all the data I needed.

5.3 Consolidation

In order to match transfers to players and clubs in my data, I standardized club names. For example, I changed 'Bayern' to 'Bayern Munich,' as Transfermarkt's club names sometimes differed over time from colloquial to official names. Other than these changes, I did not manipulate the data from either of the transfer or player/club rating sources. I left player names as they appeared on these sites.

Additionally, the information about predictors in my analysis is constructed so that each piece of data is used to predict the change in a club or player's performance over the course of a year. For instance, if club A spends a net amount of €100 million over the 2015/16 season, I examine the impact that spending has on the club's performance change from the 2015/16 season to the

2016/17 season. This way, the effects I am capturing accurately reflect the duration of a season.

5.4 Position Classification

I categorize the positional data from Transfermarkt and WhoScored into FOR (forward), DEF (defender), MID (midfielder), and GK (goalkeeper). Since there are a variety of position titles on both sources, I spent some time determining what types of positions were on each source to determine the best way to classify. I categorized the positions from Transfermarkt the following way:

Classification	**Relevant Position(s)**
FOR	Centre-forward, Left winger, Right winger, Second striker
DEF	Centre-back, Right-back, Left-back
GK	Goalkeeper
MID	All else, including defensive, attacking, unspecified midfielders

I categorized the positions from WhoScored the following way:

Classification	**Relevant Position(s)**
FOR	Forward or 'FW'
DEF	Defender or 'D('
GK	'GK'
MID	Midfielder, 'MD', or other

Given how different teams have different formations that assign various positions to their players, I determined the above was the positional categorization of players for my analysis.

5.5 GitHub

All of my final data, in addition to my web scraping code for Transfermarkt and data from section 4, are available on my GitHub account under the username *adilbhatia98*. The repository is private, so please email *abhatia98@gmail.com* if you would like access.

6 Specifications and Analysis

My initial analysis examines the predictive effect of a club executing a player transfer on player and club performance. As such, the outcome variable in both settings reflects a change in rating at the player or club level between the season prior to a given transfer and the season after (first season in which transferred player officially plays for the club). To standardize the ratings, the outcome I examine is percentage change in performance rating. The goal of this thesis, as mentioned before, includes examining the effect of a player transfer on the performance of a given player or club, seeing if these transfers affect different positions differently, and determining whether characteristics of the transfer, such as position, or of the club, such as number of manager changes in a given season, play a significant role. Note that in each player performance regressions below, I cluster the standard errors at the club level because I am accounting for individual clubs over several seasons. Also, since my outcome variable is change in performance rating, each player in my data plays for the same team across the seasons being considered; I set up the data in this way to ensure more control in my analysis.

6.1 WhoScored Team Rating

To begin, I show that WhoScored's team rating can be explained, for the most part, by positional player ratings. In order to sanity check WhoScored's team ratings, I expect positional mean ratings to have the most significant impact on a club's rating and that other variables will have minimal, if any, impact.

$$ClubRating_{cls} = \beta_1\delta_l + \beta_2\lambda_s + \beta_3 FORRating_{cs} + \beta_4 DEFRating_{cs} + \beta_5 MIDRating_{cs} + \beta_6 GKRating_{cs} + \vec{\beta}\vec{X}_{cs} + u_{cls}$$

In this regression, the outcome variable is club $c's$ performance rating in league l and season s. I include both league and season fixed effects, captured by δ_l and λ_s. The main explanatory variables being examined are $FORRating_{cs}$, $DEFRating_{cs}$, $MIDRating_{cs}$, and $GKRating_{cs}$, which capture

the average player rating at each position (FOR, DEF, MID, or GK) in the club in a given season. I also include a vector of controls, $\vec{X}_{cs}$, that includes the following: club yellow cards, club red cards, club possession percentage, club pass success rate, club aerial headers won, and average minutes played by each position (FOR, DEF, MID, or GK).

The results from the WhoScored Club Rating regression are shown in Table 3. The only variables with meaningful impact on the rating outcome are the mean ratings of a club's positions. Each of these is statistically significant at the 99.9% level. Defender mean rating has the strongest predictive effect, holding the other variables constant (0.402 coefficient). The R^2 of this regression is approximately 0.846, suggesting that these factors alone explain most of the variation in team rating. Therefore, it appears that WhoScored's rating system matches what I expected. It is important to note that WhoScored itself mentions it uses several (almost 200) statistics to calculate performance ratings, so it is likely that they are using other factors to calculate player and club ratings. However, showing that the positional ratings, which consist of player rating averages, largely explain club ratings is helpful as it shows this data is reliably constructed.

Table 3: WhoScored Club Ratings

	(1) Club Performance Rating β/SE
FOR rating average	0.221***
	(0.02)
MID rating average	0.250***
	(0.03)
DEF rating average	0.402***
	(0.02)
GK rating average	0.053***
	(0.01)
Yellow cards	0.000
	(0.00)
Red cards	-0.001
	(0.00)
Possession percentage	0.004**
	(0.00)
Pass success rate	0.001
	(0.00)
Aerial headers won	-0.000
	(0.00)
Observations	442
Adjusted R^2	0.846

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
*League and Season fixed effects are not reported above.
*Average minutes played by each position not reported above.

6.2 Transfer Effects on Player and Club Rating

Next, I run regressions of percentage changes in player and club rating on multiple variables, and the results are reported in Tables 4 and 5. I examine the impact of transfer characteristics on player and club performance, as well as the purchase of a transfer by a given club in a given season (a dummy = 1 if a transfer occurs, 0 otherwise). The variables corresponding to transfer fee information reflect the most expensive fee a club paid in a given season. So, if a club purchases several transfers in a given season, these characteristics apply only to the most expensive transfer. Using data on players and clubs throughout Europe, MLS, and CSL, I construct rating delta variables that capture the percent change in performance for a given player or club from one season to the next. Some data

points from the original collection were automatically dropped as this construction requires usable data in the prior and current seasons, which is not available for every player or club in every season (2009-2018). For example, if a club is promoted to the top tier league in their country, it has no club level rating for the season prior to joining the top tier. Also, the data begins in season 2009-2010, so the first delta variables begin in 2010-2011 (season 10).

In the first regression, I examine the effect of the transfer dummy on the percentage change in performance of players in the club that signed the transfer. The regression is as follows:

$$\%\Delta PlayRating_{icls} = \beta_0\alpha_c + \beta_1\delta_l + \beta_2\lambda_s + \beta_3 NumTransfers_{cs-1} + \beta_4 Top20Fee_{cs-1} + \beta_4 Fee_{cs-1} + \vec{\beta}\vec{X}_{ics-1} + u_{icls}$$

In this regression, the outcome variable is the percent change in performance rating of player i from season $(s-1)$ to s on club c in league l. I include club, league, and season fixed effects, captured by α_c, δ_l, and λ_s. The main explanatory variables are $NumTransfers$, the number of transfers that were bought by club c in season $s-1$; $Top20Fee$, an indicator variable equal to 1 if the most expensive transfer fee club c paid in season $(s-1)$ was in the top 20 percent of fees for players in that position; and Fee, the highest transfer fee paid by the club in season $(s-1)$. I also include a vector of controls, $\vec{X}_{ics-1}$, consisting of the following: club yellow cards, club red cards, club possession percentage, club pass success rate, club aerial headers won, whether the most expensive transfer plays the same position as the player being examined (1=Yes), number of manager changes, minutes played, age of the player, and dummies for what position the transfer plays (FOR, DEF, MID, or GK). I also include percent change in club rating (season $s-1$ to s) as an additional control. Note that I do not include $TransferxFee$ because $TransferFee$ will be 0 for clubs that did not sign any transfers.

The results for this regression are listed in Table 4. For this analysis, I hypothesized that more expensive transfers should result in an increase in player rating on average if transfer fees accurately measure how much a player being brought in could improve the performance of the players around him (and the club as a whole). Surprisingly, the initial analysis shows a statistically significant

(90% level) negative relationship between *Fee in top 20 percent for position? (1 = Yes)* and change in player performance, suggesting that paying a fee that is in the top 20 percent of transfer fees ever paid for that player's position results in a 0.064 decrease in player rating on average. However, it is important to note that the magnitude of this effect falls and that the effect itself becomes statistically insignificant when additional controls are added.

The most significant variables are player age, minutes played, and percent change in club rating. The effect of each of these variables is statistically significant at the 99.9% level. A unit increase in player age results in a 0.177 point decrease in player performance on average. A unit increase in minutes played results in a 0.238 point increase in player performance on average. A unit increase in percent change in club rating results in a 0.176 point increase in player performance on average. These characteristics describe a given player's age and playing time, as well as changes to the overall team's performance ratings, so I expected them to have the most significant effect on changes in player rating. I find that these variables do indeed mute the effect, if any, of the main explanatory variables like *Fee in top 20 percent for position? (1 = Yes)*.

Interestingly, when a club's number of manager changes increases, player performance rating does not change significantly. This contradicts my hypothesis that cycling through more managers in a given season implies a lack of consistency at the club, thereby negatively impacting club performance overall. Also, the effect of a club's prior rank is not statistically significant, suggesting that past club success does not contribute much to changes in player performance. However, both of these variables have a statistically significant negative effect (95% and 99.9% levels respectively) on player rating when change in club rating is not added to the regression. This is important to note because the change in club rating variable directly captures changes in player rating (as explained by the regression in Table 3), explaining why it has a significant effect on the outcome. Looking at the regression(s) without this variable can show us meaningful results in this context. Regression 3, specifically, highlights these results.

Finally, the effect of the Fee variable is not statistically significant, suggesting that the highest transfer fee a club pays in a given season does not affect player performance rating.

In the next regression, I examine the effect of the transfer dummy on the percentage change in

performance of the club that signed the transfer. The regression is as follows:

$$\%\Delta ClubRating_{cls} = \beta_0\alpha_c + \beta_1\delta_l + \beta_2\lambda_s + \beta_3 NumTransfers_{cs-1} + \beta_4 Top20Fee_{cs-1} + \beta_4 Fee + \vec{\beta}\vec{X}_{cs-1} + u_{cls}$$

In this regression, the outcome variable is the percent change in club $c's$ performance rating in league l from season $(s-1)$ to s. I include club, league, and season fixed effects, captured by α_c, δ_l, and λ_s. The main explanatory variables are $NumTransfers$, the number of transfers that were bought by club c in season $s-1$; $Top20Fee$, an indicator variable equal to 1 if the most expensive transfer fee club c paid in season $(s-1)$ was in the top 20 percent of fees for players in that position; and Fee, the highest transfer fee paid by the club in season $(s-1)$. I also include a vector of controls, $\vec{X}_{cs-1}$, consisting of the following: club yellow cards, club red cards, club possession percentage, club pass success rate, club aerial headers won, and number of manager changes. Note that I do not include $TransferxFee$ because $TransferFee$ will be 0 for clubs that did not sign any transfers.

The results for this regression are listed in Table 5. For this analysis, I hypothesized that more expensive transfers would result in an increase in club rating on average if transfer fees accurately measure how much a player transfer could improve a given club. Indeed, there is statistically significant (95% level) relationship between *Fee in top 20 percent for position? (1 = Yes)* and percent change in club rating. When a club completes a transfer for a fee in the top 20 percent for that position, club rating decreases by 0.348 points on average. In fact, adding more controls, as shown in Table 5, increases the magnitude of this effect.

The results also show a statistically significant (95% level) negative relationship between number of manager changes and change in club performance. When a club's number of manager changes increases, its performance rating falls 0.157 points on average. This aligns with my hypothesis that cycling through more managers in a given season implies a lack of consistency at the club, thereby negatively impacting its performance overall. Additionally, a club's prior rank positively affects its change in performance rating by 0.336 points on average (99.9% significance), which suggests that

a club's past success does indeed impact its future performance.

Interestingly, when a club's most expensive transfer is a defender, club performance increases 0.156 points on average, and this effect is statistically significant at the 95% level. Also, the number of completed transfers and transfer fee variables do not have statistically significant effects.

Table 4: Transfer Dummy Effect on % Change in Player Performance

	(1)	(2)	(3)	(4)	(5)
Transfer x Fee	0.032	0.025	0.028	0.029	0.013
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Fee in top 20 percent for position? (1 = Yes)	-0.064*	-0.052	-0.035	-0.038	-0.013
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
FOR transfer? (1 = Yes)	0.031	0.025	0.015	-0.005	0.018
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DEF transfer? (1 = Yes)	0.017	0.012	0.001	0.01	-0.006
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)
MID transfer? (1 = Yes)	0.005	-0.001	-0.001	-0.011	-0.003
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GK transfer? (1 = Yes)	0.004	0.001	0.004	0.012	0.007
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Transfer plays same position? (1 = Yes)	-0.010	-0.010	-0.012	-0.017	-0.012
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Player age		-0.160***	-0.177***	-0.093***	-0.177***
		(0.00)	(0.00)	(0.00)	(0.00)
FOR player? (1 = Yes)		-0.045**	0.001	-0.002	-0.002
		(0.00)	(0.00)	(0.00)	(0.00)
DEF player? (1 = Yes)		-0.032	-0.004	-0.026	-0.007
		(0.00)	(0.00)	(0.00)	(0.00)
MID player? (1 = Yes)		-0.045*	0.006	0.034	0.003
		(0.00)	(0.00)	(0.00)	(0.00)
Number of manager changes		-0.044***	-0.032*	0.014	0.001
		(0.00)	(0.00)	(0.00)	(0.00)
Prior club rank (negative log)		-0.062***	-0.108***	0.009	0.015
		(0.00)	(0.00)	(0.00)	(0.00)
Yellow cards		-0.030	-0.042	-0.016	-0.020
		(0.00)	(0.00)	(0.00)	(0.00)
Red cards		-0.036**	-0.043**	-0.084***	-0.020
		(0.00)	(0.00)	(0.00)	(0.00)
Minutes played			0.239***	0.254***	0.238***
			(0.00)	(0.00)	(0.00)
Percent change in team rating				0.199***	0.176***
				(0.06)	(0.04)
League Fixed Effects	Yes	Yes	Yes	Yes	Yes
Season Fixed Effects	Yes	Yes	Yes	Yes	Yes
Club Fixed Effects			Yes		Yes
Observations	12298	12298	12298	12298	12298
Adjusted R^2	0.007	0.037	0.092	0.111	0.111

Standardized beta coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

*Aerial headers won, pass success, possession, average minutes by position not reported

Table 5: Transfer Dummy Effect on % Change in Club Performance

	(1)	(2)	(3)	(4)	(5)
Total number of transfers bought	-0.010	0.119	-0.041	-0.057	-0.034
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Completed top 20th percentile transfer? (1 = Yes)		-0.158	-0.287*	-0.258*	-0.348*
		(0.00)	(0.00)	(0.00)	(0.01)
Transfer fee (m euros)			0.113	0.101	0.053
			(0.00)	(0.00)	(0.00)
FOR transfer? (1 = Yes)			0.124	0.083	0.156
			(0.01)	(0.00)	(0.01)
DEF transfer? (1 = Yes)			0.159*	0.157*	0.156*
			(0.01)	(0.01)	(0.01)
MID transfer? (1 = Yes)			0.104	0.068	0.113
			(0.00)	(0.00)	(0.01)
GK transfer? (1 = Yes)			0.062	0.047	0.074
			(0.01)	(0.01)	(0.01)
Yellow cards				-0.076	-0.053
				(0.00)	(0.00)
Red cards				-0.071	-0.082
				(0.00)	(0.00)
Possession percentage				-0.204*	-0.178
				(0.00)	(0.00)
Pass success rate				0.291*	0.494*
				(0.00)	(0.00)
Aerial headers won				0.089	0.203
				(0.00)	(0.00)
Number of manager changes				-0.198***	-0.157*
				(0.00)	(0.00)
Prior club rank (negative log)				0.213***	0.336***
				(0.00)	(0.00)
FOR average minutes played				0.025	0.094
				(0.00)	(0.00)
DEF average minutes played				0.146**	0.165*
				(0.00)	(0.00)
MID average minutes played				0.040	0.026
				(0.00)	(0.00)
GK average minutes played				-0.029	-0.004
				(0.00)	(0.00)
League Fixed Effects	Yes	Yes	Yes	Yes	Yes
Season Fixed Effects	Yes	Yes	Yes	Yes	Yes
Club Fixed Effects					Yes
Observations	442	442	442	442	442
Adjusted R^2	0.069	0.074	0.082	0.165	0.059

Standardized beta coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6.3 Transfer Spending

The method presented in section 6.2 has important limitations. First, many clubs, particularly those in Europe, execute several transfers in a given season, so using a dummy variable measuring whether each one has bought a transfer may not accurately capture the extent of clubs' transfer activity. The prior analysis accounted for transfer details relating to only the top transfer brought into a club, if any transfer had been completed. Second, the transfer data in the prior analysis does not consider all types of player movement, such as low cost transfers (under €1.3 million) or loans, which involve clubs transferring or receiving a player for only a short period of time (typically 1 year but can range from 6 months to 2 years). These deals are perhaps the most common, but the general media and most research tend to ignore them and focus on high fee transfers.

In the following analysis, I examine net transfer spending relative to league spending for each club in my data. The variable I incorporate includes various types of transfers, including low cost deals and loans.

In the first regression, I examine the effect of a club's net transfer spending (transfer expenditure minus transfer income) relative to net transfer spending across its entire league in a given season on the percentage change in performance of the club's players from that season to the next. The regression is as follows:

$$\%\Delta PlayRating_{icls} = \beta_0\alpha_c + \beta_1\delta_l + \beta_2\lambda_s + \beta_3 RelNetSpend_{ics-1} + \vec{\beta}\vec{X}_{ics-1} + u_{icls}$$

In this regression, the outcome variable is the percent change in performance rating of player i from season $(s-1)$ to s on club c in league l. I include club, league and season fixed effects, captured by α_c, δ_l, and λ_s. The main explanatory variables are $RelNetSpend$, club $c's$ net spending relative to that of league l, reported as a percentage, and $Top20Fee$, an indicator variable equal to 1 if the most expensive transfer fee club c paid in season $(s-1)$ was in the top 20 percent of fees for players in that position. I also include a vector of controls, $\vec{X}_{ics-1}$, consisting of the following: club yellow cards, club red cards, club possession percentage, club pass success rate, club aerial headers won, number of manager changes, prior league rank (reported as negative log), minutes played, age

of the player, and dummies for what position the transfer plays (FOR, DEF, MID, or GK). I also include percent change in club rating (season $s-1$ to s) as an additional control.

The results for this regression are reported in Table 6. As is shown, the effect of relative net transfer spend is not statistically significant, and its magnitude is very low, near 0.

The most significant results exist for player minutes, player age, and change in club performance rating. The effect of each of these variables is statistically significant at the 99.9% level. A unit increase in player age results in a 0.177 point decrease in player performance on average. A unit increase in minutes played results in a 0.238 point increase in player performance on average. A unit increase in percent change in club rating results in a 0.177 point increase in player performance on average. Similar to Table 4 in the transfer dummy analysis, these characteristics describe a given player's age and playing time, as well as changes to the overall club's performance, so I expected them to have the most significant effect on changes in player rating. Like in Table 4's regression, I find that these variables do indeed mute the effect, if any, of the main explanatory variable relative net transfer spend.

Interestingly, when a club's number of manager changes increases, player performance rating does not change significantly. This contradicts my hypothesis that having more managers in a given season implies a lack of consistency at the club, thereby negatively impacting club performance. Also, the effect of a club's prior rank is not statistically significant, suggesting that past club success does not contribute much to changes in player performance. However, both of these variables have a statistically significant negative effect (95% and 99.9% respectively) on player rating when change in club rating is not added to the regression. This is important to note because the change in club rating variable directly captures changes in player rating, explaining why it has a significant effect on the outcome. Looking at the regression(s) without this variable can show us meaningful results in this context. Regression 3, specifically, highlights these results.

In the next regression, I examine the effect of a club's relative net transfer spending in a given season on the percentage change in club performance from that season to the next. The regression

is as follows:

$$\%\Delta ClubRating_{cls} = \beta_0\alpha_c + \beta_1\delta_l + \beta_2\lambda_s + \beta_3 RelNetSpend_{cs-1} + \beta_4 Top20Fee_{cs-1}\vec{\beta}\vec{X}_{cs-1} + u_{cls}$$

In this regression, the outcome variable is the percent change in performance rating of club c from season $(s-1)$ to s in league l. I include club, league, and season fixed effects, captured by α_c, δ_l, and λ_s. The main explanatory variables are $RelNetSpend$, club $c's$ net spending relative to that of league l, reported as a fraction, and $Top20Fee$, an indicator variable equal to 1 if the most expensive transfer fee club c paid in season $(s-1)$ was in the top 20 percent of fees for players in that position. I also include a vector of controls, $\vec{X}_{cs-1}$, consisting of the following: club yellow cards, club red cards, club possession percentage, club pass success rate, club aerial headers won, number of manager changes, and prior league rank (reported as negative log).

The results for this regression are reported in Table 7. The results show that relative net transfer spend is not statistically significant. However, the effects of executing a transfer in the top 20th percentile of fees for that position and prior season rank are significant (95% and 99% significance levels respectively), resulting in a 0.301 unit decrease and 0.337 unit increase in club performance rating respectively. While net spending does not seem to be significant on average, spending at the high end, as indicated by the variable Completed top 20th percentile transfer? (1 = Yes), has a significant negative effect. Additionally, if a club has performed well in the prior season, its club-level performance will increase on average. There are a variety of factors that could explain this, such as the club's better players performing very well or young players trained in the club's academy developing and positively contributing to club performance. This result is consistent with the transfer dummy analysis in Table 5 as well.

Interestingly, when a club's most expensive transfer is a defender, club performance increases 0.157 points on average, and this effect is statistically significant at the 95% level.

Table 6: Transfer Expenditure Effect on % Change in Player Performance

	(1)	(2)	(3)	(4)	(5)
Club net spend as percent of league net spend	-0.002	-0.009	-0.002	0.007	-0.008
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Fee in top 20 percent for position? (1 = Yes)	-0.047	-0.038	-0.024	-0.025	-0.006
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
FOR transfer? (1 = Yes)	0.039	0.031	0.021	0.003	0.021
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DEF transfer? (1 = Yes)	0.021	0.017	0.003	0.012	-0.003
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
MID transfer? (1 = Yes)	0.010	0.002	0.002	-0.007	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Transfer plays same position? (1 = Yes)	-0.010	-0.010	-0.012	-0.017	-0.013
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Player age		-0.160***	-0.177***	-0.092***	-0.177***
		(0.00)	(0.00)	(0.00)	(0.00)
FOR player? (1 = Yes)		-0.045**	0.001	-0.002	-0.002
		(0.00)	(0.00)	(0.00)	(0.00)
DEF player? (1 = Yes)		-0.032	-0.004	-0.025	-0.007
		(0.00)	(0.00)	(0.00)	(0.00)
MID player? (1 = Yes)		-0.045*	0.006	-0.033	0.003
		(0.00)	(0.00)	(0.00)	(0.00)
Number of manager changes		-0.045***	-0.033*	0.015	0.000
		(0.00)	(0.00)	(0.00)	(0.00)
Prior club rank (negative log)		-0.061***	-0.109***	0.009	0.014
		(0.00)	(0.00)	(0.00)	(0.00)
Yellow cards		-0.031	-0.042	-0.019	-0.020
		(0.00)	(0.00)	(0.00)	(0.00)
Red cards		-0.036**	-0.043**	-0.084***	-0.020
		(0.00)	(0.00)	(0.00)	(0.00)
Minutes played			0.239***	0.254***	0.238***
			(0.00)	(0.00)	(0.00)
Percent change in team rating				0.201***	0.177***
				(0.06)	(0.03)
League Fixed Effects	Yes	Yes	Yes	Yes	Yes
Season Fixed Effects	Yes	Yes	Yes	Yes	Yes
Club Fixed Effects			Yes		Yes
Observations	12298	12298	12298	12298	12298
Adjusted R^2	0.007	0.037	0.092	0.111	0.111

Standardized beta coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

*Aerial headers won, pass success, possession, average minutes by position not reported

Table 7: Transfer Expenditure Effect on % Change in Club Performance

	(1)	(2)	(3)	(4)	(5)
Club net spend as percent of league net spend	-0.002	0.005	0.000	0.014	0.017
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Completed top 20th percentile transfer? (1 = Yes)		-0.062	-0.241*	-0.234*	-0.301*
		(0.00)	(0.00)	(0.00)	(0.01)
FOR transfer? (1 = Yes)			0.136	0.038	0.129
			(0.00)	(0.00)	(0.01)
DEF transfer? (1 = Yes)			0.159**	0.142**	0.157*
			(0.01)	(0.01)	(0.01)
MID transfer? (1 = Yes)			0.106	0.038	0.102
			(0.00)	(0.00)	(0.01)
GK transfer? (1 = Yes)			0.067	0.037	0.071
			(0.01)	(0.01)	(0.01)
Yellow cards				-0.048	-0.025
				(0.00)	(0.00)
Red cards				-0.065	-0.055
				(0.00)	(0.00)
Possession percentage				-0.270*	-0.233
				(0.00)	(0.00)
Pass success rate				0.240*	0.473*
				(0.00)	(0.00)
Aerial headers won				0.055	0.195
				(0.00)	(0.00)
Number of manager changes				-0.159**	-0.080
				(0.00)	(0.00)
Prior club rank (negative log)				0.216**	0.337**
				(0.00)	(0.00)
FOR average minutes played				0.011	0.074
				(0.00)	(0.00)
DEF average minutes played				0.148**	0.153*
				(0.00)	(0.00)
MID average minutes played				0.021	0.012
				(0.00)	(0.00)
GK average minutes played				-0.039	-0.009
				(0.00)	(0.00)
League Fixed Effects	Yes	Yes	Yes	Yes	Yes
Season Fixed Effects	Yes	Yes	Yes	Yes	Yes
Club Fixed Effects					Yes
Observations	442	442	442	442	442
Adjusted R^2	0.069	0.070	0.080	0.181	0.089

Standardized beta coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6.4 Average Transfer Spending

The finding that net spending is not significant in either the basic transfer or transfer expenditure regressions at the player and club levels, with the exception of a top 20th percentile fee's negative effect on club performance, is interesting, but one shortcoming is the prior analysis' failure to capture longer-term effects of spending. Football clubs often spend in the transfer market to build a squad full of potential for future performance after a few years of development. Thus, I can make the analysis more robust by including variables that measure average relative net spending over multiple seasons to examine the effect on performance at the player and club levels.

The results of these regressions are reported in Tables 8 and 9. In the player performance regression (Table 8), the results are not much different from the prior analysis (Table 6). The effects of relative net transfer spend, as well as average relative net spend over 2 and 3 years, are statistically insignificant. The magnitude for each of the variables with statistically significant effects—player age, minutes played, and percent change in club rating—is different from its corresponding magnitude in Table 6. Thus, average relative net transfer spend over multiple years does not significantly affect changes in player performance, and these other variables remain significant.

The prior club rank variable has a statistically significant negative effect on player rating (99.9% confidence) when change in club rating is not added to the regression; the magnitude of the effect is near 0, though. Also, unlike before, the number of manager changes variable is not significant in any regression.

In the club performance regression (Table 9), the results are much different from the prior analysis (Table 7). The effects of relative net transfer spend, as well as average relative net spend over 2 and 3 years, are statistically insignificant. Additionally, the effects that were statistically significant in the prior analysis (Table 7) are no longer significant. Only the effect of yellow cards is significant, resulting in a 0.621 point decrease in club performance when a given club earns an additional yellow card in a given season. The reasoning behind this result is unclear, but the results suggest that average relative net transfer spend over multiple years does not significantly affect changes in club performance. I will note, though, that this regression contains very few data points

(¡ 100) given the lack of available club data to construct the average relative spending variables, potentially explaining the high magnitude effect of yellow cards. Thus, the results in this table in particular should be taken lightly.

Table 8: Average Transfer Expenditure Effect on % Change in Player Performance

	(1)	(2)	(3)	(4)	(5)
Club net spend as percent of league net spend	0.010	0.010	0.006	0.007	0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2-year average club net transfer expenditure	-0.036	-0.014	-0.019	-0.012	-0.016
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3-year average club net transfer expenditure	0.093	0.064	0.066	0.051	0.067
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Fee in top 20 percent for position? (1 = Yes)	-0.068	-0.042	-0.020	-0.038	-0.042
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
Transfer plays same position? (1 = Yes)	-0.030	-0.030	-0.030	-0.019	-0.024
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Player age		-0.122***	-0.099***	-0.093***	-0.097***
		(0.00)	(0.00)	(0.00)	(0.00)
FOR player? (1 = Yes)		-0.060	0.003	-0.002	0.002
		(0.00)	(0.00)	(0.00)	(0.00)
DEF player? (1 = Yes)		-0.088**	-0.021	-0.025	-0.022
		(0.00)	(0.00)	(0.00)	(0.00)
MID player? (1 = Yes)		-0.106***	-0.030	-0.032	-0.032
		(0.00)	(0.00)	(0.00)	(0.00)
Number of manager changes		-0.037	-0.035	0.015	0.004
		(0.00)	(0.00)	(0.00)	(0.00)
Prior club rank (negative log)		-0.111***	-0.001***	0.003	0.003
		(0.00)	(0.00)	(0.01)	(0.01)
Yellow cards		0.009	0.012	0.013	0.028
		(0.00)	(0.00)	(0.00)	(0.00)
Red cards		-0.112***	-0.145***	-0.082***	-0.116***
		(0.00)	(0.00)	(0.00)	(0.00)
Minutes played			0.256***	0.254***	0.258***
			(0.00)	(0.00)	(0.00)
Percent change in team rating				0.199***	0.199***
				(0.07)	(0.07)
League Fixed Effects	Yes	Yes	Yes	Yes	Yes
Season Fixed Effects	Yes	Yes	Yes	Yes	Yes
Club Fixed Effects			Yes		Yes
Observations	2924	2924	2924	2924	2924
Adjusted R^2	0.011	0.039	0.101	0.122	0.122

Standardized beta coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

*Aerial headers won, pass success, possession, average minutes by position not reported

*Position of transfer not reported

Table 9: Average Transfer Expenditure Effect on % Change in Club Performance

	(1)	(2)	(3)	(4)	(5)
Club net spend as percent of league net spend	0.180	0.188	0.196	0.236	0.306
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2-year average club net transfer expenditure	0.123	0.142	0.076	-0.429	-0.766
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3-year average club net transfer expenditure	0.007	0.056	0.104	0.459	0.277
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Completed top 20th percentile transfer? (1 = Yes)		-0.104	-0.680	-0.682	-0.105
		(0.00)	(0.01)	(0.01)	(0.01)
FOR transfer? (1 = Yes)			0.384	0.370	0.574
			(0.01)	(0.01)	(0.02)
DEF transfer? (1 = Yes)			0.370	0.334	0.369
			(0.01)	(0.01)	(0.02)
MID transfer? (1 = Yes)			0.452	0.330	0.293
			(0.01)	(0.01)	(0.02)
GK transfer? (1 = Yes)			0.059	-0.036	0.201
			(0.01)	(0.01)	(0.02)
Yellow cards				-0.182	-0.621*
				(0.00)	(0.00)
Red cards				-0.107	0.038
				(0.00)	(0.00)
Possession percentage				-0.479	0.047
				(0.00)	(0.00)
Pass success rate				0.632	0.876
				(0.00)	(0.00)
Aerial headers won				0.292	0.513
				(0.00)	(0.00)
Number of manager changes				-0.306*	-0.431
				(0.00)	(0.00)
Prior club rank (negative log)				0.117	-0.127
				(0.01)	(0.02)
FOR average minutes played				0.137	0.195
				(0.00)	(0.00)
DEF average minutes played				0.085	0.013
				(0.00)	(0.00)
MID average minutes played				-0.021	0.127
				(0.00)	(0.00)
GK average minutes played				-0.111	-0.343
				(0.00)	(0.00)
League Fixed Effects	Yes	Yes	Yes	Yes	Yes
Season Fixed Effects	Yes	Yes	Yes	Yes	Yes
Club Fixed Effects					Yes
Observations	96	96	96	96	96
Adjusted R^2	-0.030	-0.036	-0.029	0.114	0.288

Standardized beta coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6.5 Regressions Using Segmented Data

6.5.1 Minutes Played

Across my player data set, there are several players who consistently receive limited play time. As such, I perform the analysis from 6.3 on two segments of players: those who play less than 1,630 minutes and those who play at least 1,630 minutes in a season. This threshold of playing time represents the median of minutes played in my player data (see Table 12, Appendix) and roughly translates into 18-19 full games, each of which is about 90 minutes long. The results for this segmented regression are reported in Table 10.

As Table 10 shows, the effects of minutes played, player age, and percent change in club rating are statistically significant at the 99.9% level, similar to my previous analyses, for both groups of players. On average, a unit increase in minutes played results in a 0.154 point increase for players playing less than 1,630 minutes and a 0.094 increase in player performance for players playing at least 1,630 minutes respectively. On average, a unit increase in player age results in a 0.186 point decrease for players playing less than 1,630 minutes and a 0.181 decrease in player performance for players playing at least 1,630 minutes respectively. On average, a unit increase in percent change in club rating results in a 0.099 point increase for players playing less than 1,630 minutes and a 0.306 increase in player performance for players playing at least 1,630 minutes respectively. These results align with my hypothesis, as explained in my previous analysis, but the changes in magnitude are interesting. The percent change in club rating has a greater effect on player performance for the group of players who play at least 1,630 min, whereas the effects of the other two variables are weaker (in terms of magnitude) for this group. This makes sense since team rating more directly relates to the ratings of players who play more frequently than to those of players who play less frequently.

The effect of prior club rank is also significant (95% level) for both groups. Interestingly, on average, a unit increase in prior club rank results in a 0.063 point increase for players playing less than 1,630 minutes and a 0.060 decrease in player performance for players playing at least 1,630 minutes respectively. This result could suggest that clubs performing well in their league have

more resources to develop younger players, who may not play as many minutes but will eventually overtake and replace the older players who may, at the time, play more minutes than them.

The effect of the player's position is also statistically significant at the 99.9% level for both groups of players. These variables indicate the effect of being a FOR, DEF, MID, or GK (dropped because of collinearity) on performance. These results suggest an underlying issue regarding first-team players and everyone else in a club. The variables negatively impact performance of players who do not play many minutes—the substitutes and second-team players who are more easily replaceable than the starters and first-team. These variables positively impact the performance of first-team players perhaps because being a starter forces players to improve their performance in order to secure their starting roles. This would be the case for every position.

Finally, relative net spending has a statistically significant (95%) effect on player performance for players who play at least 1,630 minutes. A unit increase in a given club's relative net spend results in a 0.029 unit decrease in player performance on average. This effect is statistically insignificant for players playing under 1,630 minutes. These results suggest that greater club spending negatively impacts starters—players who play more minutes on average—more so than it does other players, or all players more generally. This makes sense because clubs typically spend money on players they expect to enter the starting lineup, potentially hurting the performance rating of the club's current starters.

Table 10: Transfer Expenditure Effect on % Change in Player Performance - Playing Minutes

	(1) Less than 1,630	(2) More than 1,630
Club net spend as percent of league net spend	0.007	-0.029*
	(0.00)	(0.00)
Fee in top 20 percent for position? (1 = Yes)	-0.007	0.009
	(0.01)	(0.00)
FOR transfer? (1 = Yes)	0.035	-0.001
	(0.01)	(0.00)
DEF transfer? (1 = Yes)	0.007	-0.016
	(0.01)	(0.00)
MID transfer? (1 = Yes)	0.017	-0.028
	(0.01)	(0.00)
GK transfer? (1 = Yes)	0.008	0.013
	(0.01)	(0.00)
Transfer plays same position? (1 = Yes)	-0.019	-0.009
	(0.00)	(0.00)
Player age	-0.186***	-0.181***
	(0.00)	(0.00)
FOR player? (1 = Yes)	-0.112***	0.075***
	(0.00)	(0.00)
DEF player? (1 = Yes)	-0.110***	0.044***
	(0.00)	(0.00)
MID player? (1 = Yes)	-0.117***	0.090***
	(0.00)	(0.00)
Number of manager changes	0.001	-0.011
	(0.00)	(0.00)
Prior club rank (negative log)	0.063*	-0.060*
	(0.00)	(0.00)
Yellow cards	-0.037	-0.000
	(0.00)	(0.00)
Red cards	0.000	-0.053**
	(0.00)	(0.00)
Minutes played	0.154***	0.094***
	(0.00)	(0.00)
Percent change in club rating	0.099***	0.306***
	(0.00)	(0.04)
League Fixed Effects	Yes	Yes
Season Fixed Effects	Yes	Yes
Club Fixed Effects	Yes	Yes
Observations	6149	6149

Standardized beta coefficients; t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

*Aerial headers won, pass success, possession, average minutes by position not reported

6.5.2 Transfer Expenditure and Income

Some clubs in my data earn and spend very little in the transfer market, so below, I examine the results of my previous club performance analysis for the groups of clubs that earn transfer income above 15,360,000 (top 50% transfer income) and clubs that spend more than 16,170,000 (top 50% transfer spending) on transfers. The results for this regression are reported in Table 11.

Interestingly, as in Table 7, when a club's most expensive transfer is a defender, club performance, on average, increases 0.311 and 0.232 points respectively for the two groups shown in the graph, and this effect is statistically significant at the 99% level. There are a few other significant effects shown in the table, such as whether the transfer plays GK, pass success rate, aerial headers won, prior club rank (reported as negative log), and average minutes played by a given club's defenders.

However, the most important significant result is for the variable describing whether the most expensive transfer fee a club pays is in the top 20 percent for the player's position. When a club completes such a transfer, on average, its performance decreases 0.464 and 0.454 points for both groups of clubs shown. For a given club in the top half of transfer income earned, these results suggest it has sold off players in order to pay for one very expensive transfers, who is meant to have a big difference on the club's performance; in the end, though, the club's performance declines on average perhaps because that one transfer did not compensate for all the talent the club sold off to pay for him. For a given club in the top half of transfer spending, the results suggest that enormous spending does not directly lead to improved team performance, but rather, doing so may lead to a decline in performance. One reason could be the additional media attention that comes with spending a lot of money on a big-name transfer; such attention may distract players or staff from focusing on football, and the club's performance could suffer as a result.

Table 11: Transfer Expenditure Effect on % Change in Club Performance - Income and Expend

	(1) Top 50% Income	(2) Top 50% Spending
Club net spend as percent of league net spend	-0.026	0.009
	(0.00)	(0.00)
Completed top 20th percentile transfer? (1 = Yes)	-0.464*	-0.454*
	(0.00)	(0.01)
FOR transfer? (1 = Yes)	0.270	0.242
	(0.01)	(0.01)
DEF transfer? (1 = Yes)	0.311**	0.232**
	(0.01)	(0.01)
MID transfer? (1 = Yes)	0.143	0.171
	(0.01)	(0.01)
GK transfer? (1 = Yes)	0.193*	0.112
	(0.01)	(0.01)
Yellow cards	-0.032	0.060
	(0.00)	(0.00)
Red cards	0.104	-0.035
	(0.00)	(0.00)
Possession percentage	-0.413	-0.415
	(0.00)	(0.00)
Pass success rate	0.668*	0.574
	(0.00)	(0.00)
Aerial headers won	0.396*	0.017
	(0.00)	(0.00)
Number of manager changes	0.056	-0.128
	(0.00)	(0.00)
Prior club rank (negative log)	0.584**	0.338
	(0.01)	(0.01)
FOR average minutes played	0.175	0.063
	(0.00)	(0.00)
DEF average minutes played	0.138	0.263**
	(0.00)	(0.00)
MID average minutes played	0.162	0.055
	(0.00)	(0.00)
GK average minutes played	-0.007	0.076
	(0.00)	(0.00)
League Fixed Effects	Yes	Yes
Season Fixed Effects	Yes	Yes
Club Fixed Effects	Yes	Yes
Observations	221	221

Standardized beta coefficients; t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

7 Discussion

In this thesis, I have attempted to show the complex relationship between football transfers and performance at the player and club levels. My analysis suggests that transfer spending alone does not meaningfully impact player or club performance. Other variables, such as player age, minutes played, and the number of manager changes a club experiences impact these outcomes more significantly. However, paying a transfer fee in the top 20% for a given player's position does have a statistically significant impact on club performance (and a weaker effect on player performance). Contradictory to the original assumption that greater spending leads to better performance, paying such a transfer fee actually results in a decrease in performance, on average.

To better capture transfer activity, I then incorporated net transfer spending, rather than a transfer dummy, into my analysis. Doing so allowed me to capture the effects of low-fee transfers and loans. My analysis suggests similar results regarding the statistically significant effect of paying a transfer fee in the top 20% for a given player's position. Completing such a transfer negatively impacted club performance, on average; the impact on player performance on the other hand, was not significant. This analysis also highlights findings for player age, minutes played, and prior league rank similar to those of the transfer dummy analysis. Most importantly, this analysis suggests that a club's net transfer expenditure, reported as a fraction of the corresponding league's net expenditure, did not significantly impact player or club performance. These results, again, directly contradict the premise that greater spending results in better performance in football.

I then extended this analysis by incorporating average club spending over 2 and 3 years to account for clubs that buy or sell player for the sake of long-term improvement in performance. Though the sample size of clubs in this analysis is small, I find that the results at both the player and club levels were not much different from my initial club spending analysis: a club's relative net transfer expenditure does not significantly impact player or club performance.

Finally, I examined cross-sections of my data to determine if the analyses I had conducted would produce different results based on certain criteria. First, I examined the effects of club net transfer expenditure on players playing less than 1,630 minutes, the 50th percentile for minutes played in

a season, and those playing at least that amount of time. Such criteria effectively divided the data into frequent first-team players and everyone else. The results suggest that a club's relative net spending significantly decreases player performance if the player played at least 1,630 minutes. For the other group, the effect was insignificant. This analysis suggests that increased transfer spending can negatively affect players with more playing time. One reason for this result could be that a transfer's arrival to a club creates competition for established players, ultimately hurting their ability to perform, on average.

Second, I examined the effects of net transfer expenditure on clubs earning in the top 50% of transfer income and those spending in the top 50% of transfer expenditure. Such criteria divided the data into frequent sellers and buyers, with overlap for clubs that are generally very active in the transfer market. The results showed that a club's relative net spending did not significantly impact club performance in either group. However, paying a transfer fee in the top 20% for a given player's position resulted in a significant performance decrease for clubs in both groups, suggesting that greater transfer activity may lead to poorer performance, particularly for clubs spending at the highest levels in the transfer market. One reason for this result could be that greater transfer activity leads to lower team chemistry since the squad is changing quite frequently through a combination of selling several players for the purpose of purchasing a few very expensive players. Another reason could be that a club is simply overspending on transfers and not receiving a sufficient performance return. A third reason, as mentioned in the prior section could be distractions associated with buying super expensive transfers that hurt player and club performance.

The results presented in Section 6, even when statistically significant, appear very low in magnitude, but it is important to remember that the player and club rating scales are 1-10 in my analysis (with 6 being baseline). The summary statistics in Tables 12 and 13 show that there is much greater variation in player rating than club rating, but for both, small changes in rating can be very impactful in relative ranking. Relative performance ratings determine player and club success in football, so even slight changes—positive or negative—in player and club ratings can have a significant impact. Although more research should be conducted to understand the complex dynamics of football transfer spending and its effects on performance, this thesis suggests that greater

transfer spending has no impact on player and club performance at best and has a negative impact, particularly on club performance, at worst. Given the unprecedented level of transfer activity in recent years, this analysis is useful in understanding the nature and value of the current football transfer market to clubs in Europe, the United States, and China.

8 Limitations

The nature of football transfer spending is very complex. Multiple parties are involved in every transfer—owners, managers, scouts, players, agents—and analyzing the impact of each party is difficult to understand. Additionally, the decisions to pay specific transfer fees and wages are private information. Clubs have also built their own proprietary performance models to determine which players to sign in the transfer market. All of this information, while useful to understand the returns on a given transfer, as calculated by clubs paying the fee, is very difficult to obtain. Nonetheless, the performance rating measures I utilize in this thesis capture relative differences between players and clubs, a general framework that should be fairly consistent across all reliable performance models.

Although my data contain several pieces of information that intuitively play a role in both player and club performance, having many more statistics could be useful. As mentioned in the Data Sources section, WhoScored's performance model uses roughly 200 inputs to construct its rating for each player and club. Using all of this data or constructing one's own performance model, as recent research has produced, could be valuable in developing a comprehensive performance ROI for football clubs.

The most difficult part of this analysis, however, is capturing the full return a club generates because of a given transfer. My analysis captures, to an extent, the performance return, solely based on playing statistics and performance ratings. However, data regarding merchandise, broadcasting, ticketing, and sponsorship sales specifically tied to the arrival of one player transfer is incredibly difficult to acquire or even ascertain. One proxy for this type of information could be gauging a given transfer's popularity through a piece of data like the player's number of Instagram followers.

Creative ways to capture popularity or other proxies for financial benefits clubs receive as a result of signing a given transfer are necessary to effectively capture the performance and financial ROI of player transfers.

Another aspect of the analysis that could be improved is distinguishing between summer and winter transfers. While this issue is mitigated in the expenditure analysis to some extent, the transfer dummy analysis does not capture the timing of transfers at all. Ideally, categorizing the type of transfer in this way would indicate how long the transfer has played at the club and had time to make an impact.

Lastly, my regression analysis could be more robust with much more data. The sources that I used enabled me to perform my analysis only on data going back to the 2009/10 season, and for multi-year variables, such as 2- and 3-year average spending, the usable data set shrunk even further. With more data, I would also need to adjust transfer fees for inflation in order to compare them across decades.

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10 Appendix

Table 12: Summary Statistics for Player Data

	mean	sd	p25	p50	p75	min	max
Minutes played	1595.3	984.1	723.0	1630.0	2426.0	1.0	3420.0
Player rating	6.8	0.4	6.5	6.8	7.0	4.7	9.9
Player age	26.7	4.3	23.0	27.0	30.0	16.0	42.0
FOR average minutes played	1214.6	304.7	996.8	1191.0	1405.0	422.3	2972.5
MID average minutes played	1191.9	306.3	985.5	1172.7	1383.7	365.8	2533.3
DEF average minutes played	1498.2	231.4	1331.0	1493.9	1652.5	935.7	2378.1
GK average minutes played	1855.1	726.7	1530.0	1710.0	1710.5	683.2	3420.0
Club net spend (k)	8535.4	34491.0	-6700.0	1850.0	15400.0	-151110.0	226150.0
Club net spend rel. to league	0.1	1.3	-0.1	0.0	0.2	-16.1	23.5
Club transfer income (k)	24856.7	33569.2	3800.0	13200.0	31200.0	0.0	260950.0
Club transfer expenditure (k)	33392.1	44744.5	5700.0	16800.0	41500.0	0.0	374500.0
League net spend (m)	146.6	227.7	23.1	72.8	160.9	-116.4	823.6
Club rating	6.8	0.2	6.7	6.8	6.9	6.5	7.4
Number of manager changes	0.9	1.1	0.0	1.0	1.0	0.0	7.0
Yellow cards	72.1	18.8	59.0	68.0	83.0	34.0	143.0
Red cards	4.1	2.5	2.0	4.0	6.0	0.0	14.0
Possession percentage	50.7	4.5	47.4	50.0	53.4	40.3	67.4
Pass success rate	78.4	4.7	75.3	78.3	81.4	63.4	89.6
Aerial headers won	16.2	4.7	13.0	15.9	18.5	5.3	36.0
Observations	12,298	12,298	12,298	12,298	12,298	12,298	12,298

Table 13: Summary Statistics for Club Data

	mean	sd	p25	p50	p75	min	max
Club rating	6.8	0.2	6.7	6.8	6.9	6.5	7.3
FOR average minutes played	1224.3	307.0	1002.8	1194.2	1412.7	422.3	2972.5
MID average minutes played	1203.7	305.1	1000.3	1187.2	1392.9	365.8	2319.3
DEF average minutes played	1513.2	233.0	1350.1	1514.9	1679.0	935.7	2272.3
GK average minutes played	1893.0	753.4	1530.0	1710.0	1710.5	689.8	3420.0
Club net spend (k)	9861.3	34754.2	-6570.0	1279.0	15400.0	-78900.0	178150.0
Club net spend rel. to league	0.0	1.1	-0.1	0.0	0.1	-16.1	7.1
Club transfer income (k)	25526.9	31918.1	4920.0	15360.0	32400.0	0.0	232500.0
Club transfer expenditure (k)	35388.2	48225.2	5880.0	16170.0	46030.0	0.0	374500.0
League net spend (m)	167.3	290.0	4.2	81.0	203.2	-261.4	1088.7
Number of manager changes	0.8	1.0	0.0	1.0	1.0	0.0	5.0
Yellow cards	72.2	19.0	59.0	68.0	82.0	34.0	143.0
Red cards	4.3	2.5	2.0	4.0	6.0	0.0	14.0
Possession percentage	50.6	4.5	47.4	49.8	53.4	41.0	66.4
Pass success rate	78.2	4.9	75.1	78.2	81.2	63.4	89.6
Aerial headers won	16.0	4.6	12.9	15.8	18.2	5.3	35.3
Observations	442	442	442	442	442	442	442

Table 14: Top 25 Transfers

Rank (by fee)	Player Name	Fee (euros, m)	Season	Destination Club
1	Neymar	222	17	PSG
2	Philippe Coutinho	145	17	FC Barcelona
3	Kylian Mbappe	145	18	PSG
4	Ousmane Dembele	125	17	FC Barcelona
5	Cristiano Ronaldo	117	18	Juventus
6	Paul Pogba	105	16	Manchester United
7	Gareth Bale	101	13	Real Madrid
8	Cristiano Ronaldo*	94	9	Real Madrid
9	Gonzalo Higuain	90	16	Juventus
10	Neymar	88.2	13	FC Barcelona
11	Romelu Lukaku	84.7	17	Manchester United
12	Virgil Van Dijk	84.65	17	Liverpool
13	Luis Suarez	81.72	14	FC Barcelona
14	Kepa	80	18	Chelsea
15	Zinedine Zadane*	77.5	1	Real Madrid
16	Kevin De Bruyne	76	15	Manchester City
17	Angel Di Maria	75	14	Manchester United
18	James Rodriguez	75	14	Real Madrid
19	Thomas Lemar	70	18	Atletico Madrid
20	Zlatan Ibrahimovic*	69.5	9	FC Barcelona
21	Kaka*	67	9	Real Madrid
22	Diego Costa	66	17	Atletico Madrid
23	Alvaro Morata	66	17	Chelsea
24	Aymerica Laporte	65	17	Manchester City
25	Edinson Cavani	64.5	13	PSG

Players with a * next to their names were not included in my data because their transfers occurred outside the date range of my data. Season indicates first year transfer played for new club. No players transferred prior to 2019 season included.