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Final bachelor thesis

**INFLUENCE OF INTELLECTUAL CAPITAL INVESTMENT ON THE PLAYING
AND FINANCIAL PERFORMANCE OF FOOTBALL CLUBS IN THE ENGLISH
PREMIERE LEAGUE**

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INTRODUCTION

Football has gone through a tremendous transformation within the last 25 years, which has a significant impact on the game's DNA today. Contemporary football clubs have taken a huge commercial step towards becoming multi-billion-dollar enterprises. They are no longer there to simply play football. Their main job now is to entertain and enlarge their fan base, which directly translates into generous revenue streams from broadcasting, merchandise, match-day entry tickets, and sponsorship contracts. The special focus on emerging stakeholders such as financial institutions, investors and sponsors has further enhanced the raising ambiguity regarding the key ambitions of a club's performance. Historically speaking, owners of football clubs have mainly focused on playing performance and good on-field results. This was the case within European markets with long traditions in football, such as England and Germany.

Nevertheless, the industry's continuously increasing value has pushed decision makers in football clubs of introducing profit-maximization and efficiency concepts, which used to be a typical trait for American sport managers.

If we think of football as a business, we will immediately come across multiple operational peculiarities, accounting specifics, and 'purely football' nuances, such as player adjustment periods. All these make a simple comparison with any other business not so simple, if not-impossible. An easy way to spot the huge difference between football clubs and any other enterprise is to look at intellectual capital (IC). Given that contemporary football clubs should be looked at as business units as much as sporting organizations, surprisingly few efforts were made to investigate the impact of intellectual capital investment on the performance of football teams. Scholars and practitioners would commonly separate on- and off-field performances, and focus their research to these distinctive assessments. On the one hand, relationship between characteristics of players and results in direct head-to-head matches is analyzed (F. Carmichael, 2000), significant technical aspects impacting a club's playing performance are defined (Oberstone, 2009), manager dismissals' impact on playing results is investigated (M. Paola, 2012). On the other hand, the impact of playing performance on financial results is investigated (Kuypers, 2000), also the relationship between on-field and financial results has been investigated (C. Barros, 2004), and so on. Nevertheless, there are hardly any attempts of assessing the relationship between intellectual capital investment on playing and financial performance of football teams. Research especially concentrated on the English Premier league is also quite limited. The notion of playing performance itself is under-researched, usually taken as a whole, instead being separated into parts.

The goal of this research is to determine the influence of intellectual capital (IC) investment on the playing and financial performance of football clubs in the English Premier League. There are three main objectives, which this paper will focus on. Firstly, to determine the relationship between IC investment and both domestic and international playing performances. A unique contribution of this paper is assessing those relationships separately, after which conducting a comparative analysis. Secondly, to identify the optimal level of investment in IC, determine a frontier value of “overinvestment in IC” or “underinvestment in IC”, also taking into account domestic and international playing performance separately. Finally, to determine whether capital invested in new players improves the financial performance of EPL teams. In order to identify the relationship between IC investment and playing performance of clubs in the EPL, a quantitative panel data analysis was conducted. Additionally, qualitative analysis of primary and secondary sources, along with a review of relevant literature are also included in this research. Furthermore, ‘score boards’ were introduced throughout the research process, to assist with providing a more accurate playing performance measurement. Our statistical analysis aimed at proving non-linear relationships between IC investment and playing performance (both domestic and international performances being separately measured and researched). As a proxy for IC investment we will use the amount of invested capital for purchasing new players at the end of the season. There are several reasons why we consider this amount of capital being the best proxy for EPL teams, which are further discussed in the Chapter 2.

This research might prove useful for decision makers (owners, board members), and managers working in the football sector, because it will investigate relevant industry issues, which have been under-researched so far. To address those issues, the following research questions were raised:

- Are IC investments impacting domestic, and international playing performance differently?
- Is there an optimal level of IC investment for teams striving to be competitive in the EPL?
- What is the minimal initial investment in players, if a team wants be competitive internationally?
- Does IC investment impact the profitability of EPL teams?
- Does buying new players always lead to better playing performance?

The paper is structured in the following way. Firstly, attention is drawn to aspects of football industry specifics, followed by relevant concepts of intellectual capital (IC) in the context of the football industry. Secondly, academic works dedicated to intellectual capital in football clubs are

illustrated and the results of their research are examined. Further on, methodology and data description are introduced, fully explaining the process of sample selection criteria, identification of variables, primary and secondary data collection resources, along with hypotheses statements. This study investigates the relationship between intellectual capital and the playing and financial performance of English football clubs for the period of 2009-2019. The choice of football clubs as a research object can be justified by the fact that intellectual capital (mostly in the form of human capital) can be intuitively viewed as the driver of football clubs' success, both in on-field results and financial performance. Next, empirical research is presented and the results are overviewed. As a result, findings are interpreted in the context of the paper's research objectives, managerial applications are suggested based on the obtained results, limitations are underlined, and further research topics of future academic discussion are suggested. Finally, a conclusion is presented, summarizing all results of this paper, links with relevant literature, managerial recommendations, and future discussion suggestions.

CHAPTER I: LITERATURE REVIEW

Football industry specifics

If we consider football business systems, there are divided into two dimensions, which Grundy (2004) identifies as horizontal and vertical. Horizontal includes structures such as leagues, federations and associations, which conceptually represent football teams joined into incorporative structures. Vertical one would imply clubs' participating in regional, continental or global football structures. According to Szymanski and Kuypers (2000), the football industry is mainly concentrated on horizontal-level interactions, as those represent the natural DNA of the sport-different football clubs competing, each of which is aspires to achieve higher sporting results. As it is the case in most sports, football clubs represent entities, which are incorporated in the aggregation of other entities so-called leagues. From their end, leagues are independent business units. They are mostly accountable for conducting national championships (Rossi, 2003). The best known domestic first division leagues in the world are the English Premier-League, Italian Seria A, Spanish La Liga, German Bundesliga, and French Ligue 1, which constitute 68% of the European football market value worth €25,5 billion in 2017 (Deloitte, 2018). Regional and national federations are the next step of structural stages within the football business ladder. While national leagues tend to fulfill a controlling function towards football teams, national federations are mostly viewed as authorities with disciplinary functions for both leagues and clubs. Although, there is also a connectional link between those three parties (clubs, national leagues and national federations), which are all associated with the Union of European Football Associations (UEFA).

This organizational body mainly has administrative and controlling functions for the parties mentioned above. UEFA's best football clubs compete in the UEFA Champions League, which is considered the most prestigious tournament in European football. Teams finishing close to the top positions in their respective domestic leagues are given the chance to compete in UEFA Europa League, which is considered as the second best European cup.

Football has come through a stage of commercialization, evolving from simple sporting events into an entertainment industry with various groups of stakeholders highly concerned with the outcome of each game. As noted by Senaux (2008) while at first clubs were non-profit organizations with pure sporting objectives, they have now become commercial firms and football has become a lucrative industry. However, it appears this new 'identity' has not simply replaced but co-exists with the initial one. Additionally to the commercial side of the industry, football clubs also have a social function (Sugden, 2002). The overlap of all these dimensions- sporting, social and economic- puts football clubs in a position to deal with a handful of diverse actors. This peculiarity of football drives the need for professional management of football teams, as they can be considered commercial entities whereas, the structure of value adding factors is quite different compared to such of traditional enterprises (Yasar N. , 2015). Given that, the key elements of any sport organization are human-intensive (owners, players, managers, scouts etc.) and traditional accounting techniques are rather obsolete in evaluating those valuable factors. In this sense, intellectual capital is far more crucial in the football industry than pure financial capital. Thus, football isn't all about revenues, it is an actual social phenomenon. The immense interest in European football is resulting in fierce competition for obtaining broadcasting rights, and constant growth of TV viewers and impressive stadium audience numbers. The Champions league final in 2016 had over 360 million televiewers, while 13.4 million viewers visited the matches throughout season 2015/16. It is traditionally the case that participating clubs in European tournaments also have the largest number of viewers (Dima, 2015). Most loyal supporters are in Germany, Great Britain and Spain, where the average league match attendance exceeds 40,000 people.

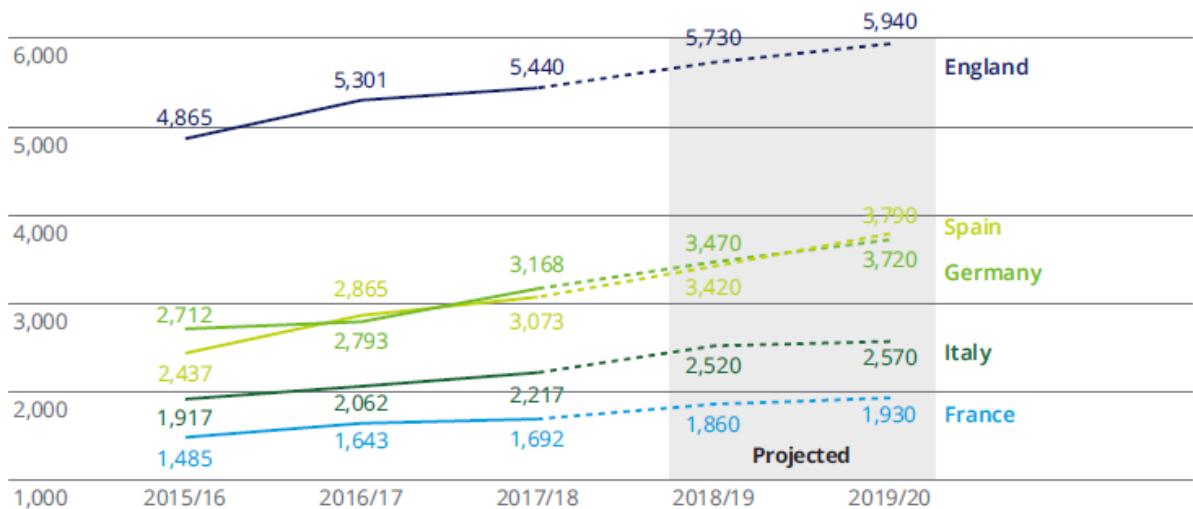
Europe's five top football leagues increased their collective revenue by €1.3 billion (9%) in 2016/17, this is primarily due to bigger revenue from broadcasting rights and is depicted of Figure 1 below.

The key role of the Premier League is to organize the football competition between England's top 20 clubs that make up the league. In terms of revenue, the EPL is currently the largest domestic football league in the world (see figure 2). Thus, the English Premier league was chosen as main focus for this research, because it is the most popular domestic football league in the world, having the highest average revenue per club in Europe that amount being €265 million. Moreover, EPL

teams are also the biggest spenders on the international transfer market for football players and also have the highest rate of stadium utilization at 96% (Deloitte, 2018).

The EPL has also changed immensely throughout the last decade. To watch a football game of Arsenal versus Liverpool in 2020 is a very different experience compared to watching the same two clubs 10 years ago. Arsenal’s total market value back in 2010 was \$300 million, while Liverpool’s was \$250 million. Only a decade after however, those market values have reached \$1.083 and \$1.336 billion dollars, correspondingly (Statista, 2019). Each EPL match is broadcasted to millions of fans around world, thousands of which travel the country to follow their team. The overwhelming popularity of English football and constantly growing interest to EPL teams help to generate a wide range of revenue streams, including tickets, merchandise, broadcast, and sponsorships. The sale of broadcasting rights in particular, is traditionally one of the most significant revenue streams for the Premier League and its participants. A comprehensive representation of the cost structure of the English Premier league can be found in the Appendix, figure 1.1.

Figure 1. ‘Big five’ European league clubs’ revenue- 2015/16 to 2019/20 (€m)

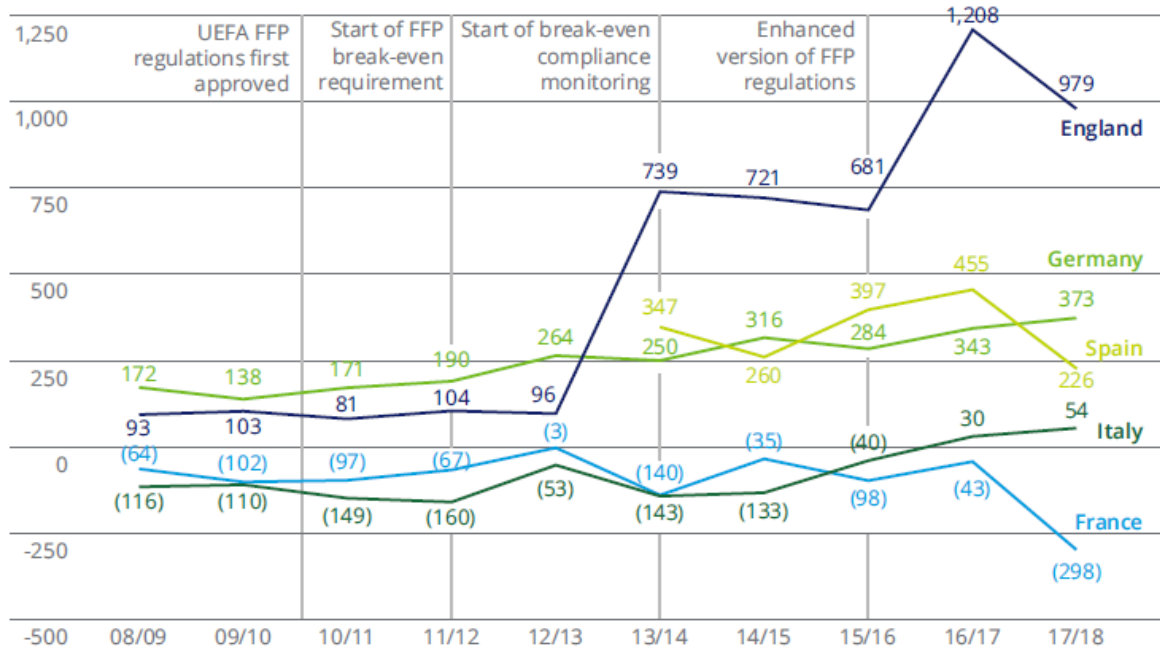


Source: (Deloitte, 2018)

It is important to note that the increasing commercialization of the football industry and its transition to becoming more and more business-like has not remained unnoticed by management scholars. Adcroft and Teckman (2009) point out two main reasons for the constantly increasing interest to football management. Football, with its full unpredictability, endless rivalries and constant aspiration for winning, could be viewed as a metaphor of the existing business environment and investigated from this perspective. Additionally, specific nuances of the football

industry might be favorable for testing out alternative business ideas and techniques, while their effect might be examined in nearly ‘laboratory’ conditions of simplified playing tournaments. All in all, it is precisely the multidimensionality of both football and business that results in the growing amount of football management related literature.

Figure 2. ‘Big five’ European league clubs’ profitability- 2008/09 to 2017/18(€m)



Source: (Deloitte, 2018)

To sum up, the key specifics of the football industry include the structure of its business systems, rapid commercialization of the sector and transition of football clubs from being pure sport organizations to business enterprises, the heavy human-intensive nature of football and the crucial role of human capital in value creation, along with the wide social reach of the game.

Intellectual capital in football

Intellectual capital can be defined as intangible assets which are not reported explicitly on a firm’s financial statements. However, it has a relationship between employees, ideas, and information, thereby positively impacting firm performance (Edvinsson, 1997). It is a common notion that an enterprise prepares a balance sheet for mainly reporting purposes instead to provide information regarding the actual value of the company. Furthermore, the relationship between financial figures and the real value of companies has weakened over the last decade and conventional accounting systems fall flat to comprehensively display value- adding intangible assets in enterprises (Cañibano, 2000). Therefore, the representative power of contemporary accounting data has been diminishing (Lev, 1999). In the current business world, companies

include not only the economic value of resources for product manufacturing, but also their intellectual capital represented as intangible assets (Chen M. C., 2005). According to Powell (2003), intellectual capital has a crucial role in value creation for companies. It is also referred to as one of the crucial factors of production within a knowledge-based economy, and evaluating corporate performance may not be representative using solely conventional accounting techniques anymore. In this sense, it is necessary to uncover new approaches, which are taking into account the role of intellectual capital as well (Berzkalne, 2014). Nadeem, Gan, and Nguyen (2017) discovered that intellectual capital efficiency is has a significantly positive relationship with return on assets and return on equity in human-intensive industries.

According to Edvinsson and Malone (1997), intellectual capital has three main components, namely human capital, structural capital, and relational capital. Existing research investigating IC in the football industry suggests that of those three parts, human capital plays the biggest role and adds most value (Yasar N. I., 2015). Edvinsson and Malone (1997), define human capital as the core assets in intellectual capital such as individual skills, knowledge, talent, and experience. It mainly represents the human ability to solve the company's issue and how efficiently a firm uses human resources to gain new knowledge and boost innovation. In the sports industry, each component of intellectual capital has high values of intangible assets in the enterprise. When it comes to a football club in particular, talented players, the main source of human capital in this industry, are the key drivers of their team's performance and value. Successful management strategies of football clubs using key structural capital, are mainly centered around ensuring more efficient usage of human resources. Fan loyalty, one basic type of relational capital, is greatly affected by on-field performance of players as is the establishment of a strong brand.

Professional football is a fruitful industry for IC research for several main reasons. To start with, the business nature of the industry is "highly intellectual" or personnel-intensive. Secondly, this fast paced and socially influential sector is unique in recognizing investments in human capital from accounting perspective, as suggested by IC theorists (Pulic, 2008). Finally, professional football tends to be a relatively under-researched field by IC scholars.

Even though the football industry seems to be amongst the most heavily-dependent on human and structural capital ones, there is a certain gap in investigating this relationship. There are empirical studies conducted in wide range of knowledge-intensive industries such as financial (Appuhami, 2007), insurance (Alipour, 2012), banking (Cabrita, 2006), pharma (Sharabati, 2010), high-tech (Shiu, 2006), and hospitality (Zeglat, 2014). However, there appear to be very limited number of empirical studies regarding the impact of IC on performance within professional football clubs (Mnzava, 2013; Dimitropoulos & Koumanakos, 2015).

As a way to measure intellectual capital within the football industry, there are several approaches used in existing research papers. For example, Gürel, Dagli Ekmekci, and Küçük Kaplan (2012), applied the VAIC method, and found that intellectual capital of Turkish football clubs has high efficiency levels especially when it comes to human capital efficiency. Ricci, Scafarto, Celenza, and Gilvari (2015) have also investigated the effect of intellectual capital efficiency (ICE) on twelve football firms in Italy's top football division. Another study by Yasar, Isik and Calisir (2015) investigated the influence of intellectual capital of football teams in Turkey on their profitability and efficiency. They discovered a positive relationship between those teams' profitability and the HCE (human capital efficiency) of VAIC. However, these studies are focused mainly on determining which part of a club's intellectual capital adds the most value to those teams, and investigate IC efficiency from this standpoint. This is also the case in most existing studies about intellectual capital in football. Most scholars have decided to concentrate on the three parts of IC (human capital, social capital and structural capital) separately and further assess their effectiveness. The current paper fills this research gap by using the findings obtained by existing relevant literature, which discovered that human capital adds the highest amount of value in the football industry and focus on the relationship of investments in human capital and a club's performance.

The importance of economics in football, being the world's most popular sport with more than 3,5 billion fans globally (Sourav, 2020) has increased in recent years both from the point of financial performance and its effect on other businesses (mass media, retail, advertising, etc.). Economic results in football, however, depend mainly on a team's playing performance. Sport results depend on professional skills, talent and knowledge of all the team, starting from sportsmen and finishing with football clubs' managers and owners. All the people involved in a club's activity form its human capital that affects at the integrated intellectual capital. As highlighted by existing literature, human capital is the main asset of football clubs, but also the major type of investments. That is why human capital assessment is so important for football clubs and football industry as a whole. Thus, we try to reveal the relationship between the intellectual capital and financial performance in this area. Dobson and Goddard (2001) found a positive relationship between financial performance levels, measured by the quantity of gained revenue and playing results. Such results could be due to the fact that when the number of wins and trophies of a team are growing, its potential to generate revenue grows. In other words, when a club performs successfully, it is bound to attract more fans, players, and sponsors, and therefore generates bigger revenues. However, prior studies mostly focused on analyzing of the relationship of clubs' financial performance with their intellectual capital. This may be due to the fact that most European football

clubs are obliged to published their financial statements, which are publically available, providing opportunities for investigation. Despite the fact that contemporary football clubs should be considered as business units, and not as sporting organizations solely, oddly enough very few efforts were made to determine the impact of IC investments on performance of football clubs. Scholars and practitioners usually approach this topic via distinguishing on- and off-field performances, and further devote their studies to those assessments separately.

Results of prior relevant studies

Guseva and Rogova (2015) conducted analysis based on the fixed effects panel model, with a sample of 144 UEFA teams. The study revealed that bigger investments in IC result in higher profitability, higher demand for a club's shares and, ultimately, to growth in market value. Additionally, the study outlined that amongst the three components of the IC - structural, human and social capital, - only human and social capitals have a significant impact on the team's market capitalization and financial performance. Human capital in the football industry mainly suggests the capabilities of players, as well as the expertise of the coaching staff and owners, who together deliver sporting success to the club, which later becomes a financial gain.

Non-linear relationship between IC and business performance was investigated by Huang and Liu (2005). They analysed data of 1000 Taiwanese firms and tried to determine the influence of $(R\&D/Sales)$ and $(R\&D/Sales)^2$ on performance indicators. As a conclusion, they have found significant non-linear impact on firm performance. Another paper exploring non-linear influence of IC on business performance by Fredriksson and Wikberg (2015), who analysed the impact of R&D spending (averaged across 2008-2014) on performance of 209 international public producers of industrial equipment. They discovered a positive non-linear impact of R&D (proxy for IC in their paper) on firms' performance. Non-linear relationship testing between IC and playing and financial performance of football clubs has not been used in research on intellectual capital. Additionally, a rare paper by Shareef and Davey (2005) discovered a positive relationship between IC investments and playing performance of European football clubs.

Summary

Football has come through a stage of commercialization, evolving from simple sporting events into an entertainment industry. It is a fruitful industry for IC research for several main reasons. To start with, the business nature of the industry is "highly intellectual" or personnel-intensive. Secondly, this fast paced and socially influential sector is unique in recognizing investments in human capital from accounting perspective, as suggested by IC theorists (Pulic, 2008). The key specifics of the football industry include the structure of its business systems, rapid commercialization of the sector and transition of football clubs from being pure sport organizations

to business enterprises, the heavy human-intensive nature of football and the crucial role of human capital in value creation, along with the wide social reach of the game.

As a way to measure intellectual capital within the football industry, there are several approaches used in existing research papers. Most existing researchers have focused either on investigating HCE (human capital efficiency) as an element of the VAIC method and its relationship football teams' profitability (F. Ricci, 2015; Gürel, 2012; D. Guseva, 2015) or focused on analyzing of the relationship of clubs' financial performance with their intellectual capital (Dimitropoulos P. E., 2015; Shareef, 2005). The current paper is using findings obtained by existing relevant literature, which discovered that human capital adds the highest amount of value in the football industry and focuses on the relationship of investments in human capital and a club's playing and financial performance.

CHAPTER II: METHODOLOGY

Research focus

The goal of this research is to determine the influence of intellectual capital (IC) investment on the playing and financial performance of football clubs in the English Premier League. There are three main objectives, which this paper will focus on. Firstly, to determine the relationship between IC investment and both domestic and international playing performances. A unique contribution of this paper is assessing those relationships separately, after which conducting a comparative analysis. Secondly, to identify the optimal level of investment in IC, determine a frontier value of "overinvestment in IC" or "underinvestment in IC", also taking into account domestic and international playing performance separately. Finally, to determine whether capital invested in new players improves the financial performance of EPL teams.

As a proxy for IC investment we will use the amount of invested capital for purchasing new players at the end of the season. There are several reasons why we consider this amount of capital being the best proxy for EPL teams. Human resource capital represents only one of the three parts of IC's structure (Onge, 2000). In football, however, having the best players means literally everything. Without talented footballers (human capital), a club's investment in building a bigger stadium (structural capital) will not be a sensible decision- bad performance pushes fans spending their money on something else than match tickets. Continuously poor playing performance ultimately leads to fan base unrest, possible turbulence in the club's management which results in a negative effect on a club's image (social capital). Other scholars have also pointed out that human

capital has a particularly big impact on business performance in the football industry (Bridgewater, 2010). Thus, this we will test three hypotheses in order to address our research objectives.

Hypotheses

H1: Ceteris paribus, the more capital invested in players, the better a club's domestic performance, and this impact is non-linear.

H2: Ceteris paribus, the more capital invested in players, the better a club's international performance, and this impact is non-linear and has a reversed u-shape.

Non-linear relationship between IC and business performance were investigated by Huang and Liu (2005). They analyzed data of 1000 Taiwanese firms and tried to determine the influence of (R&D/Sales) and (R&D/Sales)² on performance indicators. As a conclusion, they have found significant non-linear impact on firm performance. Non-linear relationship between capital invested in players and on-field performance has not been investigated in general for the football industry. Based on papers from other industries (Cabrita, 2006; Appuhami, 2007; Alipour, 2012), along with the results of the survey which we conducted, testing non-linear relationship between IC and performance, we decided to apply a similar approach to football teams in the EPL.

H3: Ceteris paribus, the more capital invested in players, the better a club's financial performance

Most of researches reflect positive (significant or insignificant) effect of intellectual capital on financial performance of companies (Chen., 2005) (Vishnu, 2014). In the context of the football industry (D. Guseva, 2015) discovered that the bigger IC investments ultimately lead to higher profitability rates and growth of the demand for the club's shares and, consequently, the growth of the market value. Their research investigated 144 international football clubs, so we expect a similar impact in the context of English football teams playing in the EPL.

Managerial problem and research questions

The idea behind this research was triggered by an existing managerial problem, which many English teams face season after season. Some club owners implement profit-maximization techniques and try to maintain positive player trade balances. The same owners, along with the club's fans, however, are often not satisfied with the playing performance resulting from this strategy, as they constantly want to see strong team results, and demand the manager of the club to deliver them. This results in constant pressure on the manager, demanding results without increase in budget for new players, and average tenure of 1 year among managers in the EPL (J. K. Wilson, 2019). For example, Arsenal FC faced this very situation in season 2018/2019. Arsenal's supporters were furious with Stan Kroenke's (owner of the club) cost-minimization strategy and urged the board to 'Sign some defenders, spend some money!' (Wilmot, 2019). By the

end of the season Arsenal's manager Unai Emery was replaced after only one season in the club, while the budget for transfers remained unchanged. The other side of the coin is no different. There are EPL teams which spend a great deal of money on new players, yet without achieving desired results (in Chapter 3 we will explain why to achieve desired results, the goal should be set and measured correctly). This again leads to the same outcome- fans demand even more capital to be spent on player selection, managers are often replaced with (presumably) 'more competent' successors, and owners did not change neither budgets nor strategies. A great example of such situation is Manchester United's spending under Jose Mourinho, who spent approximately £362 million during his tenure. Regardless of these overwhelming investments, the club continued to stagnate, and Mourinho was eventually replaced. Currently, Manchester United fans demand the club to spend more money on players, in an attempt to improve the club's rather mediocre performance since 2016. This 'spiral' effect is summarized on Figure 3 below.

This vicious cycle has deeper impact and does not only affect English teams. In this scenario, teams' constant demand for spending more on players, is bound to face the simple reality of supply- football talent is limited. Thus, such a "big spender" tendency will eventually become a prerequisite for 'high football inflation'. If a player was worth £20 million in 2010, his price current price be around £100 million and more. Scholars investigating inflation levels in football, have discovered that amounts at stake on the football players' transfer market have strongly increased over the last decade. If we consider Europe's top 5 football leagues (England's EPL, Germany's Bundesliga, Spain's La Liga, Italy's Serie A, France's Ligue 1), the investments in transfer indemnities have grown from €1.5 billion in 2010 to the colossal €6.6 billion in 2019, which represents a +340% growth (P. Raffaele, 2019). The market for football players is international, meaning that clubs are directly competing for talents with competitive clubs of all sizes, nationalities and budgets. Teams from the English Premier league are traditionally the biggest spenders on player trading market (Deloitte, 2018), which means that they 'push' other clubs to spend as much (or more) to acquire a desired player and stay competitive. This is the deeper effect we mentioned earlier- with time, the accumulative reach of such overspendings goes far beyond any domestic league, and ultimately affects the football industry overall. This leads us to yet another dilemma of contemporary football clubs- to be competitive domestically, or internationally? Or both? For the sake of giving some clarity on this question we have conducted a survey amongst managers, currently working in one of the twelve English football clubs from our sample. According to our survey, out of all 87 respondents only 4 think their teams have equal ambitions both domestically, and internationally. This result gave some ground for investigating the two separately. Furthermore, this insight was the first step towards considering this research

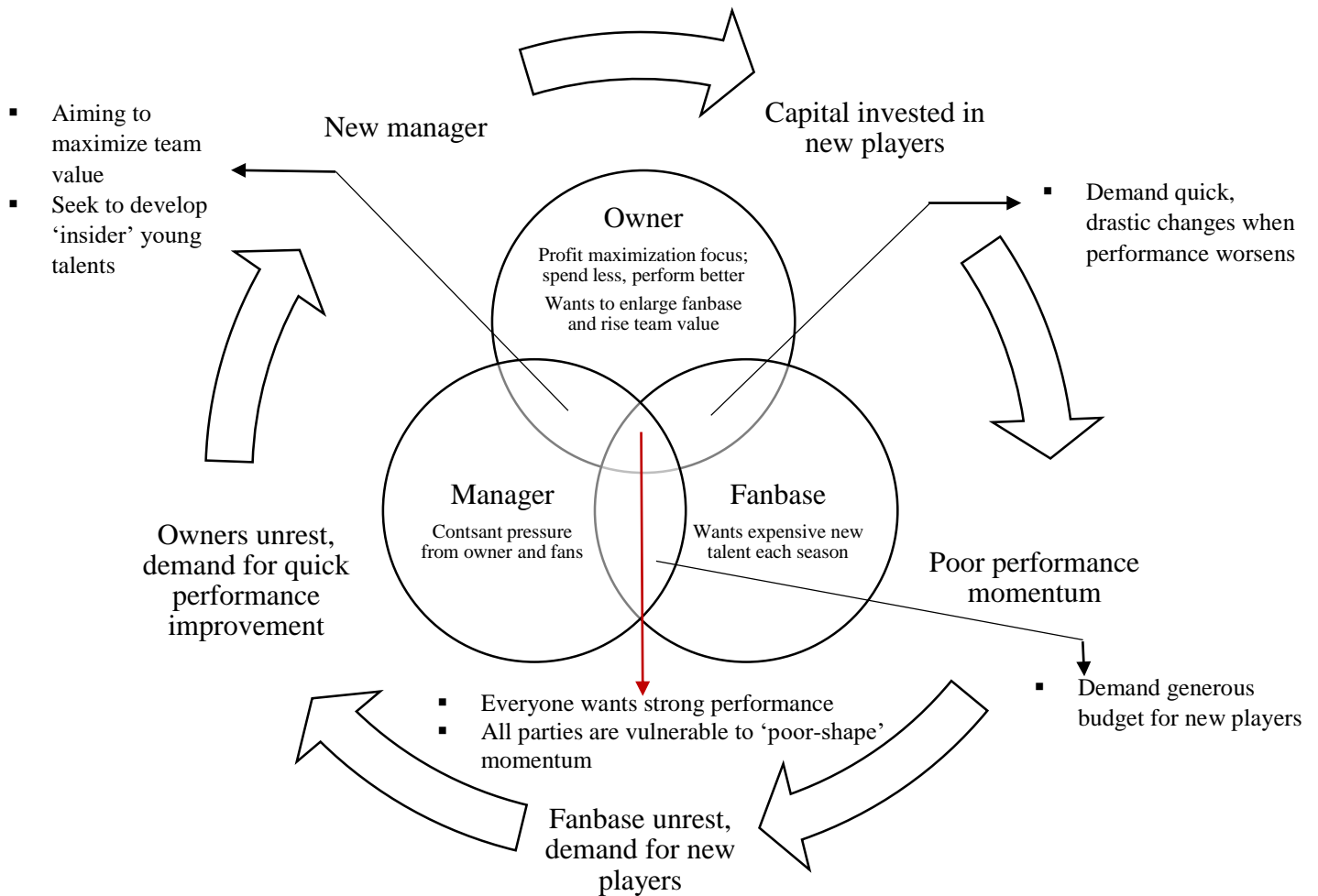
approach, as by far, such a separation of football performance is not present in any related literature. This research direction was eventually supported by some surprising preliminary results we have obtained analyzing playing performance, only measured by the score of points each team had in the English premier league for the last ten seasons. The initial logic we followed was that ‘the more a football team spends on players- the better the performance’, which we tested using panel data analysis. The results, however, were oddly enough showing the exact opposite of this assumption. As it turned out, the results clearly showed a significant relationship the other way around, meaning ‘the better the performance- the more money are spent on new players’. This was the main twist moment throughout the research process, which proved to be crucial and made us take a step back and look at the problem from a wider angle. After analyzing our survey results, preliminary results, and existing literature, we decided there was enough ground to split playing performance in two part- international and domestic.

However, the notion behind this separation is quite intuitive, frankly speaking. International tournaments, just like the global player market we mentioned earlier, are extremely competitive. If a team aims at winning the Champions League or Europa League for example, this means this team would directly compete with the best teams *globally*. And a crucial nuance- the wealthiest, too. Thus, the international tournament stage in football is simply beyond most clubs’ financial and playing quality scope.

This research might prove useful primarily for decision makers of football clubs, but also for managers, because it will investigate relevant industry issues, which have been under-researched so far. To address those issues, the following research questions were raised:

- Are IC investments impacting domestic, and international playing performance differently?
- Is there an optimal level of IC investment for teams striving to be competitive in the EPL?
- What is the minimal initial investment in players, if a team wants be competitive internationally?
- Does IC investment impact the profitability of EPL teams?
- Does buying new players always lead to better playing performance?

Figure 3. Visual representation of managerial problem



Source: Own representation

Research gap

Currently there is no research focused on investigating non-linear relationship between intellectual capital investment and performance in the football industry. Moreover, playing performance hasn't been analyzed in terms of domestic and international performance separately. Most scholars have decided to concentrate on the three parts of IC (human capital, social capital and structural capital) separately and further assess their effectiveness. The current paper fills this research gap by using the findings obtained by existing relevant literature, which discovered that human capital adds the highest amount of value in the football industry and focus on the relationship of investments in human capital and a club's performance. Also, research devoted to the role of intellectual capital investment in the context of the English Premier league is also very limited.

Research design

Dependent variables

The dependent variables are indicators of a team's performance and we can split them into two categories: playing performance indicators and financial performance indicators.

We will divide playing performance into two categories: *domestic* and *international* performance. This is a crucial distinction to make and understand. The main reasoning behind it is the very nature of football clubs in the English Premier league. Each team greatly differs from the rest not only when it comes to budget size for purchasing new players. Different teams have totally different playing KPIs, too. For example, teams such as West Ham, Sunderland and Stoke City, are mainly focused on their domestic performance, while teams such as Arsenal, Manchester City, Chelsea and Liverpool, have ambitions to make a step further their domestic league and to perform supreme internationally (T.Gibbons, 2016). Even though each club invests a certain amount of capital in their main playing squad each season, these investments have varying purposes both *team-over-team* and *year-over-year*. Therefore, it makes sense to assume that invested capital in player selection has a different relationship with domestic performance, and with international performance of those clubs.

To measure domestic and international playing performance separately, we have developed and used *score assigning boards*. To understand the logic behind those two score boards, however, we have to define what exactly is referred to as 'domestic performance' and 'international performance' and why the two differ so greatly in the English football reality. Table 1 below shows which tournaments are included on the domestic English level, and those on the international level, summarizing each tournament's key characteristics, benefits and overall significance in the football world. As we can see clearly from the table below, each tournament greatly differs from the rest in terms of scope, audience size, prize budget size, and overall significance. This is why for this research we separate the performance into two and investigate the influence of capital invested in new players separately, which then we can compare. Such approach has not been used before, probably due the fact that this topic is very under-researched. The score boards are shown on tables 2 and 3 below. The full score assigning table for all twelve clubs in the past ten seasons is also available in the Appendix, Table 1.2.

Every score takes into account the benefits, which each team will enjoy after reaching a certain stage of a tournament. For example, winning the FA cup or the EFL, gives the winners the right to qualify for UEFA Europa league, same privilege goes for being 5th in the EPL table, thus, any of those achievements would give a team 2 points. This is still within the domestic score, however, because the EFL, FA cup and EPL are still a domestic- level tournament, even though they provide

teams with opportunities for appearance on the international football stage. Runners-up are always considered, as we assume that in football, reaching the final is a more reliable performance indicator, since during a final match there are always situations that may potentially disrupt the quality of the game (poor referee decisions, fan vandalism, fatal injury of key players, etc.). Thus, runners-up are also assigned with points as reaching a final is recognized as a performance achievement alone. The first 4 places in the EPL give clubs the right to qualify to Champion's League, which is the most prestigious football tournament, thus those bring higher scores.

Figures 2 and 3. Score boards for generating international and domestic performance

International performance score				
<i>Champions League</i>			<i>Europa League</i>	
Semifinalist	2 points		Semifinalist	1 point
Finalist	4 points		Finalist	2 points
Winner	6 points		Winner	3 points

Domestic performance score					
<i>EFL</i>		<i>FA Cup</i>		<i>EPL</i>	
Winner	2	Winner	2	Winner	6
Runner-up	1	Runner-up	1	Runner-up	5
				3rd place	4
				4th place	3
				5th place	2

Source: Own representation

Table 1. Key football tournaments on domestic and international level: summary

Domestic tournaments			International tournaments	
English Premier League (EPL)	Football Association Cup (FA Cup)	English Football League Cup (EFL Cup)	UEFA Champions League	UEFA Europa League

<ul style="list-style-type: none"> • The most-watched domestic league in the world, broadcast in 212 and a TV audience of 4.7 billion people • The richest league in the world, generates 72% more revenue than its nearest competitor, the Bundesliga • Total value of participating teams as of April 2020 is €9.71 billion (Transfermarkt Ltd., 2020) • Immensely competitive 	<ul style="list-style-type: none"> • The oldest national football competition in the world • More than 700 participants • 30 million pounds distributed to participants as prize money • Winner wins £3.6 million 	<ul style="list-style-type: none"> • Considered as less prestigious than FA Cup • 72 participants from England and Wales • League Cup winners receive £100,000 prize money 	<ul style="list-style-type: none"> • World's most prestigious football tournament (James McNicholas, 2013) • €1.41 billion paid in total participating clubs in 2017 (UEFA, 2018) • International prestige for participants • Playing experience with the best football teams in the world • Media coverage worldwide • Winners receive over €80 million in prize money • Clubs playing in the UCL have bigger leverage over talented players • Let best players 'shine' in front for potential international buyers, bigger leverage over a player's price 	<ul style="list-style-type: none"> • World's second most prestigious football tournament (James McNicholas, 2013) • Participants earned €428.2 million in total in 2017. • International stage for talents • International media coverage • It's stature is less than the UCL and more than a country's national league.
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As a financial measure we will use Return on Assets (ROA), which equals operating income divided by total assets. We consider this measure being the most appropriate financial metric, because it captures the foundations of business performance in a holistic way, taking into account both income statement figures and the assets needed to actually run a business. Other metrics such as return on equity (ROE) or earnings per share (EPS) are sensitive to financial engineering, especially when it comes to debt leverage, which can be misleading regarding the actual business picture at a certain period. ROA is also less sensitive to so called 'short-term gaming' that can occur on income statements since many assets, such as property, plant, and equipment (PPE),

and intangibles, require strategic long-term asset decisions that are more difficult to tamper within a short term frame. This approach had been used by other researchers in the insurance industry (Alipour, 2012), banking (Appuhami, 2007) and Brazilian football league (C. Barros, 2004). As an accounting measure, we will use EBITDA margin since it is related to FCFF (and thus to club's value), while not being as volatile as FCFF itself, and is less subject to peculiarities in football accounting rules than EBIT margin. Similar approach has been used by (Cabrita, 2006), who examined the influence of IC on the Portuguese banking industry. We will also use the squares, and logarithms of our chosen indicators. This is due to the fact that all indicators we are analysing are presented in substantially distinctive scale formats (some numbers are very large, while others are quite small), which can result in disruption of our statistical results. Logarithmic formats help in bringing different scale formats closer and thus, making them more easily comparable. Squares are used for capturing the shape of the relationship between dependent and independent variables in question.

Independent variables

As an independent variable, we use the capital invested in players' registration rights in the end of each season, its square, and logarithms. We consider that capital invested in players' registration rights, as investment in intellectual capital, is the best proxy of IC itself in case of football clubs since the main driver of their performance is each team's players and their ability to demonstrate exquisite football skills. This argument is also supported by the survey we have conducted, where 89% of respondents consider main squad's performance to be the key driver for a team's intangible asset value. Furthermore, there are existing research papers supporting the notion that services provided by football players are a team's most valuable source of value creation (Morrow, 1996), and that human capital valuation is very prominent in the football sector through the proposal of transfer fees (Mate-Kole, 2014).

Control variables

One of the control variables we selected followed the example of similar research papers from the IT industry (Cheng Jen Huang, 2005) is size in the form of $\ln(\text{Turnover})$. In relation to football clubs, previous studies (Dimitropoulos P. T., 2012) outline that the size of the firm has a positive impact on its profitability, because it translates to economies of scale, the club increases control over foreign investors. Moreover, large and well-known a football clubs have better chances to attract highly desired football players, and the quality of games significantly increases the recognition and financial performance (sponsorship deals, match attendance fees, merchandise sales, etc.) of clubs. All variables are summarized on Table 4 below.

Table 4. Summary of variables used throughout this study

Variables	Independent	Dependent	Control
What does it represent	Investment in IC	1. Domestic playing performance 2. International playing performance 3 and 4. Financial performance	Size of a club
Selected proxy	Capital invested in players each season	1. Domestic performance score 2. International performance score 3. Return on assets 4. EBITDA margin	Turnover
Way of measurement	(capital); log(capital); capital ² ,	1 and 2. Using total scores obtained from our ranking tables at the end of each season 3. Operating income/ total assets 4. EBITDA/Revenue	(turnover); log(turnover)
Label	CAP; LCAP; CAP2	1-DS; 2-IS; 3- ROA; 4- EBITDA	TURN; LTURN
Information sources	EPL website, official annual report of EPL teams	EPL website, ORBIS Bureau van Dijk database, official annual report of EPL teams	Annual report of EPL teams, ORBIS Bureau van Dijk database
Prior research using similar measurement approach	(Morrow, 1996), (Mate-Kole, 2014)	(Alipour, 2012) (Appuhami, 2007) (C. Barros, 2004) (Cabrita, 2006)	(Cheng Jen Huang, 2005) (Dimitropoulos P. T., 2012)

Research models and hypothesis testing

To test our hypotheses, we use the following models:

$$\text{Domestic performance}_{it} = \beta \cdot \log \text{Capital}_{it} + \alpha + \text{uit} + \varepsilon_{it}$$

$$\text{International performance}_{it} = \beta \cdot \text{Capital}_{it} + \alpha + \text{uit} + \varepsilon_{it}$$

$$\text{Profitability performance}_{it} = \beta_0 + \beta_1 \text{Capital}_{it} + \varepsilon_{it}$$

We conduct the following tests:

H1,2₀: IC investment does not have an effect on a teams' domestic/international performance

$$H1_0: \beta_1 = \beta_2 = \dots = \beta_n = 0$$

H1,2₁: The effect of IC investment on a team's domestic/international performance is linear

$$H1_{1_1}: \begin{cases} \beta_1^2 + \beta_2^2 + \dots + \beta_n^2 > 0 \\ \beta_8 = \beta_9 = \dots = \beta_n = 0 \end{cases}$$

H1,2₂: The effect of IC on a team's domestic/international performance is non-linear

$$H1_{2_2}: \beta_8^2 + \beta_9^2 + \dots + \beta_n^2 > 0$$

H3₀: IC investment does not have a linear effect on a teams' financial performance

$$H1_{0_0}: \beta_1 = \beta_2 = \dots = \beta_n = 0$$

H3₁: The effect of IC investment on a team's financial performance is linear

$$H1_{1_1}: \beta_1 = \beta_2 = \dots = \beta_n \neq 0$$

To make sure our results are of statistical quality the following tests were conducted:

- On normality of errors
- On heteroscedasticity
- On autocorrelation

Panel data analysis deals with repeated measures on individuals i over time t . It was chosen as a statistical because panel data has the property to 'catch' variable effects from one period of time and take into account their residual effect on future periods. In football, when a club buys a new player, this player (if not sold immediately after the end of the season) impacts his team not only for a single season, but for the next 2, 3 and so forth. Panel data analysis is also suitable for smaller samples, in our case 12 EPL teams, allowing to analyze them and still obtain statistically reliable results (Greene, 2001). This approach has been used for analyzing other knowledge- intensive industries such as high-tech, and pharmaceuticals (Appuhami, 2007) as regard to IC investment.

To identify whether to use Fixed effects model or Random effects model, we performed the Hausman test, which showed that the Random effects model is more suitable for our data. No autocorrelation was identified. Heteroscedasticity was identified, as well as normality of errors. All tests are available in the Appendix.

Sampling procedure

To be considered suitable for this research, English teams had to fulfill a particular criterion. Namely, this criterion being to have participated in the English Premier league at least eight times for the past ten seasons. The reasoning behind this screening procedure is connected with the research method chosen, which in our case is panel data analysis. One of this method's peculiarities is its sensitivity to missing sample points, and in case of such final results are not considered reliable (Gruyter, 1996). This is why to avoid such large number of missing values, due to non-participation in the EPL during a particular season, only analyzing teams which participated at

least eight times last ten seasons will give us a better quality panel data analysis. There is another point supporting this selection criterion, which is a purely football rather than academic one. In the end of each season, the clubs ranked at the last three places in the table are relegated, meaning that next season they will not participate in the EPL, but in the lower championship division instead. We have to bare in mind that the English Premier league is known for being the most competitive domestic league in the world (R. Penn, 2019), which is why many players cannot adapt to the heavy physical intensity required and prefer to play in the Spanish La Liga or Italy’s Lega Serie A. Thus, teams which participated at least 80% of the time during the last ten years can also be considered as clubs with a traditional stable performance in the EPL.

After the sampling procedure, there were twelve English clubs found suitable for this research, they are presented on Table 5 below.

Table 5. Participating teams throughout this research

1. Arsenal		7. Liverpool	
2. Chelsea		8. Stoke City	
3. West Ham United		9. Sunderland	
4. Manchester United		10. Everton	
5. Newcastle United		11. West Bromich Albion	
6. Manchester City		12. Tottenham Hotspur	

Data collection

To support this research primary data was collected in the form of survey, the full results of which are available in the Appendix. The survey has 87 respondents, all of them managers who are currently working in the football clubs we are investigating in this paper. This survey aimed at collecting valuable insights from people close to the day-to-day operations in the English football industry. Having survey participants working at various departments (from accounting to young talent scouting), gave solid ground for obtaining results which take into account different sides of the business and thus, are less prone to being biased. The key findings are summarized in Table 6 below and the full survey is available in the Appendix on Figure X.

All secondary financial data was acquired from ORBIS Bureau van Dijk database, except for the capital invested in new players each season. The latter was retrieved from a publicly available (The Guardian Finance, 2009-2019). All secondary information used for constructing playing

performance rankings was also retrieved from publicly available sources and mainly from the official websites of the English premier league and The Union of European Football Associations (UEFA).

Summary

Our research is testing three hypotheses, first two of which devoted to investigating the relationship between IC investment and playing performance of football teams, and the third refers IC investment and its impact on financial performance. As an independent variable, we use the capital invested in players' registration rights in the end of each season, its square, and logarithms. This is considered as the best proxy of IC itself in case of football clubs based on our survey results, where 89% of respondents consider main squad's performance to be the key driver for a team's

Table 6. Survey highlights

Respondents' departments	Business development	Finance	Marketing	HR	Sales	Other
%	35%	25%	14%	11%	6%	7%
Key insights	81% think playing performance is the most relevant performance indicator for EPL teams					
	83% think investment in new players is the best proxy for intellectual capital investment in their club					
	89% consider main squad's performance to be the key driver for their team's intangible asset value					
	Only 4% think their team's key priority in terms of playing performance includes BOTH domestic and international performance.					

value, and is also supported by results of existing papers (Mate-Kole, 2014; Morrow, 1996).

As dependent variables we used scores for domestic and international performance for testing the first two hypotheses, and EBITDA margin and ROA to test the third one. The performance scores were assigned with the help of special scoreboards, the values of which are based of concrete criteria, which is explained in depth throughout the chapter. The full information which was used to form the scoreboard is also available in the Appendix.

Twelve English football clubs were chosen to participate in this research, as they fulfilled the sampling criteria set in the beginning, namely to have participated in the EPL at least eight from

the last ten seasons. This selection rule is justified with ensuring better statistical quality of our results, since the method of analysis is panel data analysis which is sensitive to missing sample values. A second reason for this criteria more rather from a football standpoint- the EPL is the most competitive domestic league in the world and teams that manage to play in the EPL can be considered very stable, and ‘true representatives’ of the English Premier league performance level.

Panel data analysis deals with repeated measures on individuals i over time t . It was chosen as a statistical because panel data has the property to ‘catch’ variable effects from one period of time and take into account their residual effect on future periods. In football, when a club buys a new player, this player (if not sold immediately after the end of the season) impacts his team not only for a single season, but for the next 2, 3 and so forth. Panel data analysis is also suitable for smaller samples, in our case 12 EPL teams, allowing to analyze them and still obtain statistically reliable results (Greene, 2001). This approach has been used for analyzing other knowledge- intensive industries such as high-tech, and pharmaceuticals (Appuhami, 2007) as regard to IC investment.

The data collection process included both primary and secondary sources. Our primary source of information represents a survey, conducted among 87 managers currently working in the English football industry. The secondary sources of data used throughout the paper were the official EPL website, ORBIS Bureau van Dijk database, official annual report of EPL teams, along with relevant literature.

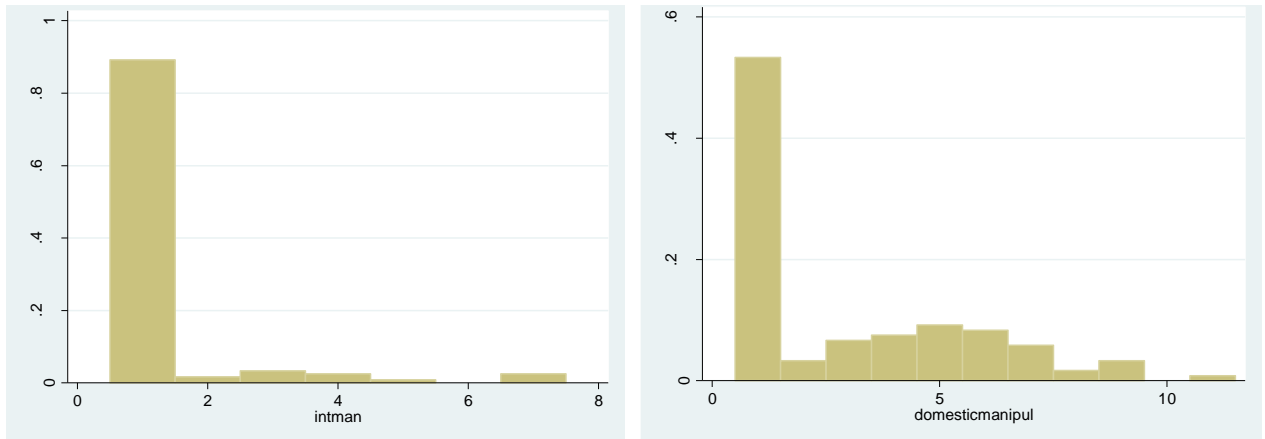
CHAPTER III: RESULTS AND DISCUSSION

Empirical results

An interesting moment in our statistical analysis, was taking into consideration a very interesting concept, called *data censoring*. There is a variety of existing statistical research where the dependent variable is so called *censored*. Examples of such variables can be number of hours worked, the number of suicide attempts, the number of arrests after release from prison, or purchases of durable goods, (Greene, 2001). If we are analyzing a dependent variable which is censored (being zero in the examples above) for a significant part of the observations, parameter estimates obtained by conventional regression methods are biased. Such consistent estimates can be analyzed using the so-called “Tobit” model, which is characterized as being a censored regression model, which can be used with panel data. Our case is a good example of working with censored dependent variables. Because our playing performance estimates were obtained with the help of score ranking boards, we can see that a significant part of the observations have a value of

one. This can be observed for both domestic, and international performances, on Figures 4 and 5 below.

We have obtained results, supporting our first two hypotheses implying the presence of a non-linear relationship between IC investment and both domestic and international playing Figures 4 and 5. Distributional plots of international performance (left) and domestic performance (right) indicators.



performances. From the sign of ‘*a*’ in our quadratic equation, we can immediately tell the shape of the function. From the coefficients presented in the statistical output, we can clearly see that the two function are different. While domestic performance’s function is concave ($a = -0.15, a < 0$), the function for international performance is convex ($a = 0.00002, a > 0$).

Thus, we can accept our two hypotheses that IC investment have a non-linear relationship between both domestic and international performances. Based on the coefficients obtained, we can build a graphs and visually observe the relationship which IC investment has domestically, and internationally, and compare the two. As for our third hypothesis, however, we did not obtain any results, suggesting that investments in new players as a proxy for IC investment had an impact over the EBITDA margin and ROA of clubs, and results we obtained were insignificant. All original tables with statistical output are also available in the Appendix The obtained statistical results are summarized on tables 9 below.

Table 9. Tobit regression model coefficients summary

Tobit panel regression model	Variables tested	Unstandardized Coefficients		Standardized Coefficients	P > z	Sig.	Result
		z	Std. error	beta			
H1 DS	LCAP	1.29	0.4695	0.607	0.036	1.527	<i>Accept</i>
	LCAP2	-1.87	0.779	-0.1456	0.042	0.007	
	LTURN	3.3	0.4535	1.498	0.001	2.38	

H2 <i>IS</i>	CAP	-1.38	0.0046	-0.0064	0.057	0.027	Accept
	CAP2	1.24	0.00001	0.000019	0.015	0.0003	
	LTURN	3.26	0.235	0.7546	0.001	0.3008	
H3 <i>EBIT;</i> <i>ROA</i>	LCAP	-0.51; 0.84	0.929; 3.292	-1.6850; 777	0.609; 0.403	2.321; -0.254	<i>Reject</i>
	LTURN	0.82; 3.84	2.878; 3.57	13.719; 2.35	0.114; 0.000	10.511; -0.418	

The most crucial insight we were able to prove statistically throughout this analysis, however, was not only the existence of non-linear relationship mentioned above. As we can see on the figures 6 and 7 below, the functions for domestic performance and IC investment, and international performance and IC investment differ tremendously in terms of budget size. Domestic performance and capital have a reversed U shape, having a convex function. This would suggest that there is an ‘optimal point of IC investment’ (the function’s critical maximum point), which in our case is equal to £7,6 million. This value, however, is not representative. It can be interpreted as representing the ‘best value for money’ so to speak, which is subject to many factors beyond the scope of this research. What we should actually consider is the frontier point, which in our case equals to £58.85 million (Figure 6). This value can be interpreted as the maximum investment in new players, which would significantly improve playing performance domestically. According to our analysis, investments in player far beyond this amount will not be optimal for a team, if their main focus is to be competitive in England.

If we see the obtained results for the relationship between international playing performance and investment in new players, we see their function is concave. This would allow us to calculate the critical minimum point, which is marked on Figure 7 below. This frontier value equals £350 million and can be interpreted as the minimum ‘useful’ capital invested in players, for teams who focus on international performance. In this sense, having ambitions of being internationally competitive (in tournaments such as Champion’s league and Europa League), a team should be able to insure a budget somewhat close to this critical value.

Figure 6. Visual representation of the influence of IC investment on domestic playing performance

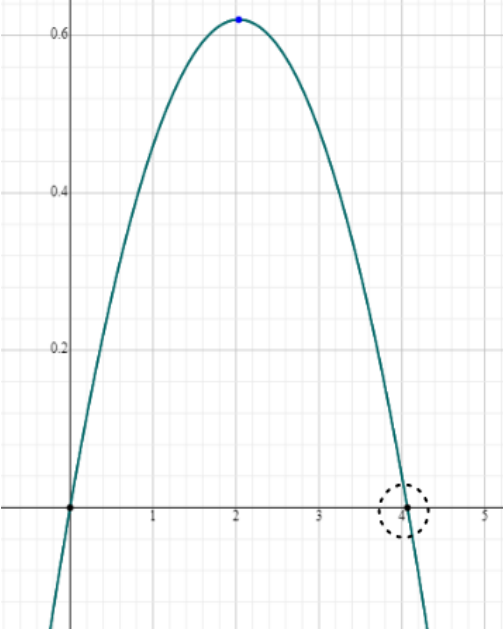
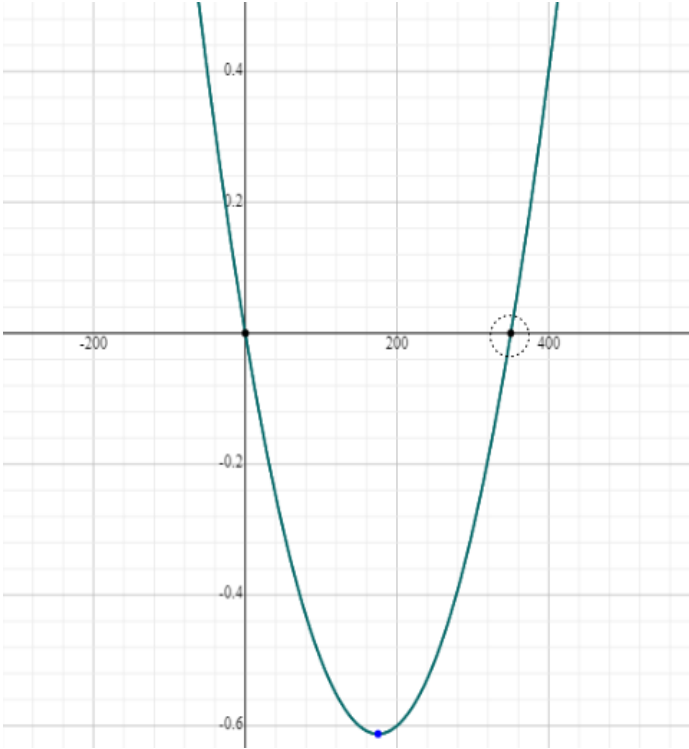


Figure 7. Visual representation of the influence of IC investment on international playing performance



Managerial contributions

Going back to our managerial problem represented in Chapter 2, the obtained results in this research could be useful in breaking the vicious cycle at one particular stage of the problem. The results are particularly useful for board members and owners of football clubs, who are in charge of appointing new managers, agreeing upon a budget for the upcoming season, and set a club's strategy in terms of performance. The crucial moment in our managerial problem was the fact that owners of clubs often replace managers after a short period of time, doing so in a pursuit of better results. A key finding of this paper is that it proved that domestic and international performance behave very differently in terms of investments in new players, and the two scenarios require substantially different player selection budgets. This insight can be used by the key decision makers within a club in choosing a strategic course of action for the team. Firstly, decision makers should decide whether they want their team to prioritize competing domestically over internationally or vice versa. This is a long-term strategic course of the team, covering the following two to three seasons (depending on a club's current financial and performance state). After deciding upon that, using the results presented in the beginning of Chapter 3, the decision makers should validate whether or not the planned budget for the upcoming season (or seasons, in case the budget is voted beforehand for a longer period of time) corresponds to their choice of performance strategy. The first scenario is the following- if available capital for investment in new players is somewhat close to the critical values presented in the result section above, then the chosen strategy is feasible. Therefore, it will be implemented by the manager, as his purchases will coincide with the agreed strategy. For example, let's say Manchester City's owner decides that his team's top priority is to win the Champions League next season (international performance). The board sets the transfer budget for next season, which is £270 million. They also analyze that for the past three seasons the team has spent £190 million each season. In this situation, considering that player transfers have an accumulative effect (which cannot be quantified and it is listed as a limitation of our research), Manchester City has grounds to pursue such international strategy, as available budget (taking into account capital spent in the last three seasons) is rather close to critical value we have obtained for international performance. After validating that strategy matches available funds, the next important step is to tailor relevant KPIs for assessing the team's performance. Coming back to the example of Manchester City, when the main goal is international successes, then KPIs should also be internationally-oriented. A peculiarity of football is that managers often 'save' their players' strengths for some kick-offs at the expense of others. This is very intuitive, as football players have limited amount of physical endurance and need an occasional break. This suggests that according to a club's strategy, the manager would keep his

best players fresh for some games (in our example games in the Champions League) and give a chance to other players instead. This may result in worse scores in the kick-offs played without the top players and might seem as weaker performance. This is why performance KPIs should match the strategy of the club. If Manchester City wins the Champions League, but finishes at fourth position in the EPL table, without winning any other English tournament, this should be considered as great performance because it directly corresponds to the initial plan of the club. Even if some parties (fan fractions, media, or other) criticize Manchester City's manager for performing too poorly in England for the club's usual standards, this is not the case according to the team's initial goals. By setting this direction in the very beginning, the owner now has representative KPIs to assess if the manager performs well. Without this foundation step, the owners of the club might have interpreted Manchester City's manager's results as unsatisfactory and could have replaced him. A real example of such situation took place in the England during season 2011/2012 with Roman Abramovich's Chelsea. The club managed to win the prestigious final of the Champions League, and also finished third in the EPL table. Nevertheless, Chelsea's manager at the time André Villas-Boas was sacked after only 9 months on the job. The official statement given by the club was that "Unfortunately, the results and performances of the team have not been good enough in the EPL" (BBC, 2012). As you might see, the decision makers in Chelsea at that time did not separate domestic and international ambitions. As a 'universal cure', the team considered changing the manager to be the best decision. However, the Chelsea finished third again in the EPL table, but could not win the Champions League next season.

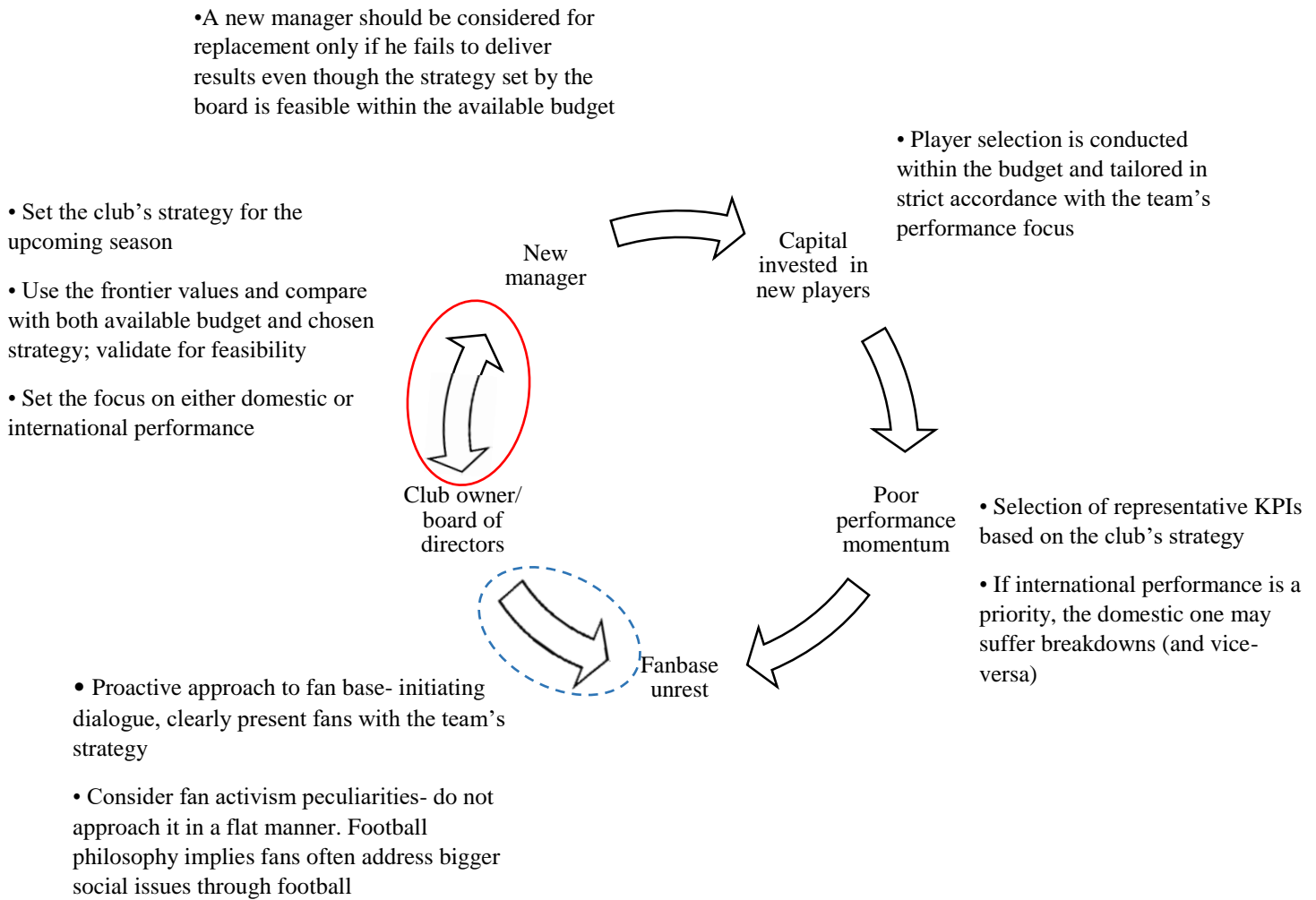
Now let's return to the second possible scenario, namely when the chosen strategy does not match a club's available budget. In this case, the owner has two choices- either to change the strategy or change the budget. Let's illustrate this situation with an example. Let's say that Sunderland's owner decides he wants his team to compete internationally starting from next season, but his board voted a transfer budget of £50 million for Sunderland's manager to spend. In this case the owner might need to reconsider his view, as there is a big discrepancy between his vision for the team and available budget. Our results showed a minimum value for new players enabling a team to be internationally competitive at £350 million. Although this value is subject to limitations and lacks absolute concreteness, the difference between the two numbers is obviously huge. In this scenario, the owner should understand that if he appoints a manager and gives him this amount of capital to work with, Sunderland would most likely not see major performance improvements on the international football stage. Even if another manager is appointed, then another after him, such performance ambitions are not feasible for any manager.

Simple getting a new one every season won't give much different results if the budget stays the same.

Another way of looking at the possible managerial implications of our results may also include a philosophy of budget allocation of EPL teams. Let's consider the following example. Everton's owner wants the team to be competitive internationally, but after reviewing the budget (£100 million) finds out it is insufficient for realizing this goal. The club cannot afford to increase the budget and therefore, decides to focus on domestic performance. However, comparing the available funds to our suggested value of £56 million, being the maximum 'useful' amount of capital spent for new players, Everton's owner will find himself into an interesting situation. The club is apparently ready to spend more than necessary to be competitive in England, but not enough do the same internationally. In this sense, 'excess' capital can be allocated elsewhere, rather being spent only on players. Examples of sensible options might be investing in the club's youth academy, improving Everton's marketing, enlarging their merchandise range, attracting celebrities to promote Everton's image, increase the salaries of staff/players/manager to boost their motivation, and so on. Such approach would be more efficient and can be used to enhance Everton's international ambitions in the long run.

To sum up, the results of this research are aimed towards decision makers in football clubs, who are responsible of appointing new managers, setting a budget for new players, and decide upon performance strategies. Firstly, understanding the difference in required budgets by owners of EPL teams would allow them to choose strategies for their clubs more comprehensively. Secondly, using the suggested values for international and domestic performance budgets will be help decision makers in validating their strategies, ensuring feasibility. Finally, decisions makers can tailor specific KPIs, matching the club's performance strategy, allowing them to have a clearer measure of a manager's performance. On Figure 8 below you can see a scheme, which visually shows how the results of this study would help solving the initially stated managerial problem. Our results target a particular step of the vicious cycle (circled in red) and provides suggestions how to introduce improvements during this stage. Further on we will briefly discuss the notion of fan activism, which we find being a fruitful topic for future research papers (circled in blue) and could also help in solving the presented managerial problem.

Figure 8. Visual representation of the managerial implications of the study



Limitations and future research

Despite high statistical significance of the results obtained and their substantial contribution to the enhance eliminating the existing research gap, there are several limitations of the present research and they should be taken into consideration for further academic studies.

The research limitation of this paper was focused on football teams in the English Premier league, which was justified mainly by the overall reputation of the league, it's economic indicators, and convenience in terms of data collection due to the United Kingdom's reporting system. Nevertheless, wider geographical coverage could be of academic and practical interest. As much as EPL football clubs are amongst the wealthiest, best in terms of playing performance and well-known for detailed on-field performance analysis, considering other leagues such as La Liga, the Bundesliga, and Serie A, might contribute to a more comprehensive, in-depth comparative analysis of IC investment in the sector, and could also reveal different relationships between IC investment and performance.

The assumption that human capital plays the biggest role in the football industry is supported by previous studies. However, most papers suggest that other parts of intellectual capital (social and structural) also have an impact on a team's performance. Another limitation to consider is the lack of existing concrete measure of human capital. Although our choice for choosing capital spent on new players as a proxy for IC investment was supported by our survey among football managers, there is still an inevitable ambiguity of this indicators' definition, which might have a significant influence on overall results of this research, as well as the lack of previous research using the method of scoreboard performance assignment, and division of domestic and international performances.

Moreover, there are numerous industry-specific peculiarities, which impact a team's performance but cannot be 'captured' and quantified. Examples of such are new players' adjustment periods, manager's personal relationship with players, talent accumulation form season to season, a team's tendency to perform poorly as a guest, referee mistakes, quality of a team's medical staff, length of recovery periods, and many more. Therefore, a way to measure those effects access could enrich the model and bring more thorough results.

An interesting topic for future research could be connected to the Factors which drive football fans to act, or the notion of 'fan activism'. The critical focus of football fans on different topics is driven by the overarching philosophy of football. This philosophy frames the discontent of fans by universalistic claims (Numerato, 2018). Therefore, specific issues in football are often depicted and interpreted as broader existing societal problems. In other words, football's philosophy takes this sport way beyond the playing field. In this sense, any potential issue (efforts to preserve the color or logo of a club, protest against a ruled penalty, increase in price of seasonal membership cards, etc.) can be potentially addressed as a socially or politically important topic. Numerato (2018) outlines two main reasons why alternative philosophies of football are generally misinterpreted. The first aspect to consider is the highly heterogeneous nature of football fans critical mass, which encompasses numerous clusters of different fans who are mainly focused towards only one particular issue. Secondly, football decision makers, mass media and sponsors, tend to interpret fans' claims as if they represent a single homogeneous voice, based on particularistic rather than universalistic claims. As a result, football authorities (club owners, managers, members of the board, independent football associations), mass media and sponsors tend to perceive football fans' actions, ideas, and claims with very limited consideration of the alternative essence of football's philosophy. Coming back to our research, a key figure in the managerial problem presented in Chapter 2 is the fan base. As was already mentioned, fan activism in England is often related to movements demanding increased capital spending on new players

each season. However, taking into account the peculiarities of football philosophy, these claims are likely to be connected with bigger social issues. For example, there is a wide-spread frustration with the overall commercialization of football, and football clubs' becoming lucrative sources of income to only a handful of people. Owners of football teams are often accused of spending too little on players, but not necessarily in absolute terms. Fans are rather frustrated with the ratio of profit taken away to profit invested back in the club. Arsenal is a very good example of such scenario. The team managed to qualify in nineteen successive UEFA Champions League seasons (1998–99 to 2016–17), an English football record, which is only surpassed by Real Madrid. However, since Stan Kroenke became the key holder of Arsenal's shares in 2007, many fans noticed significant lack of investments. Along with that it seemed that Arsenal's ambitions were narrow and simply the qualification to Champions League (bringing huge financial gains) was good enough for the board. Newspapers all over England started posting fan fractions demanding Arsenal to spend more money on players. While this was the main focus of mass media to cover, other fractions alarmed that the fact Arsenal was just a money making machine for its owners is the beginning of the end for football in general. Other fan movements addressed the issue from a political perspective, demanding for higher degree of democracy in football and more rights for football fans associations. In this sense, fans' demand for spending should not be approached in absolute, narrow terms. Instead, football clubs' decision makers should take into account football's initial philosophy and initiate a dialogue with fans.

Summary

Based on the obtained results, we have accepted hypothesis one and two. Furthermore, the results, implied presence of a non-linear relationship between IC investment and both domestic and international playing performances, thus confirming our academic suspicions provoked by survey results, and studies of IC investment in other industries. Our results clearly showed that domestic and international playing performance greatly differ in terms of required budget for new players. A threshold value obtained with the help of obtained coefficients were £58.85 million for domestic performance. This value can be interpreted as the maximum investment in new players, which would significantly improve playing performance domestically. According to our analysis, investments in player far beyond this amount will not be optimal for a team, if their main focus is to be competitive in England. If we consider international performance, this frontier value is £350 million and can be interpreted as the minimum 'useful' capital invested in players, for teams who focus on international performance. In this sense, having ambitions of being internationally competitive (in tournaments such as Champion's league and Europa League), a team should be able to insure a budget somewhat close to this critical value.

As for the third hypothesis, our results showed no significant evidence between financial performance and investment in new players for EPL clubs. This result contradicts with some previous papers investigating IC investment impact on financial performance (D. Guseva, 2015) (Dimitropoulos P. T., 2012). However, those previous researches investigated bigger samples, including a mixture of all types of international football teams. In this sense, our result may be interpreted as being the case of EPL in particular- as we mentioned those clubs are the biggest spenders on the international football transfer market, as well that the EPL is the most competitive domestic league in the world. Thus, spending the ‘usual’ amount of capital in new players for EPL teams may simply be too high to bring substantial financial profitability compared to Spanish or Italian domestic leagues, or for example.

To sum up, the results of this research are aimed towards decision makers in football clubs, who are responsible of appointing new managers, setting a budget for new players, and decide upon performance strategies. Firstly, understanding the difference in required budgets by owners of EPL teams would allow them to choose strategies for their clubs more comprehensively. Secondly, using the suggested values for international and domestic performance budgets will help decision makers in validating their strategies, ensuring feasibility. Finally, decision makers can tailor specific KPIs, matching the club’s performance strategy, allowing them to have a clearer measure of a manager’s performance.

One of the limitations of this paper is the narrow geographical focus, as we analyzed only football teams in the English Premier league. Also, even though the assumption that human capital plays the biggest role in the football industry is supported by previous studies, there are some scholars suggesting other parts of intellectual capital (social and structural) also have a significant impact on a team’s performance. Another limitation to consider is the lack of existing concrete measure of human capital, as well as lack of previous research using the method of scoreboard performance assignment, and division of domestic and international performances. Moreover, there are numerous industry-specific peculiarities, which impact a team’s performance but cannot be ‘captured’ and quantified. Examples of such are new players’ adjustment periods, manager’s personal relationship with players, talent accumulation from season to season, a team’s tendency to perform poorly as a guest, referee mistakes, quality of a team’s medical staff, length of recovery periods, and many more.

With the help of our panel data regression analysis, we were also able to find the optimal values of IC investment for domestic and international performances separately. This was a result of confirming non-linearity in our hypothesis one and two, thus referring to research questions two and three. A limitation regarding this is that such an approach has not been applied yet by

researchers in the football industry, and certainly not in regards to intellectual capital in football. Thus our results could be used as a ground for further research papers, being bettered and polished.

Another suggested topic for future research could be connected to the factors which drive football fans to act, or the notion of ‘fan activism’. The critical focus of football fans on different topics is driven by the overarching philosophy of football. This philosophy frames the discontent of fans by universalistic claims (Numerato, 2018).

CONCLUSION

Football has come through a stage of commercialization, evolving from simple sporting events into an entertainment industry. It represents a fruitful industry for IC research for several main reasons. To start with, the business nature of football is “highly intellectual” or personnel-intensive. Secondly, this fast paced and socially influential sector is unique in recognizing investments in human capital from accounting perspective, as suggested by IC theorists. Thus, key specifics of the football industry include the structure of its business systems, rapid commercialization of the sector and transition of football clubs from being pure sport organizations to business enterprises, the heavy human-intensive nature of football and the crucial role of human capital in value creation, along with the wide social reach of the game.

As a way to measure intellectual capital within the football industry, there are several approaches used in existing research literature. Most prior researchers have focused either on investigating HCE (human capital efficiency) as an element of the VAIC method and its relationship football teams’ profitability, or focused on analyzing of the relationship of clubs’ financial performance with their intellectual capital. The current paper is using findings obtained by existing relevant literature, which discovered that human capital adds the highest amount of value in the football industry and focuses on the relationship of investments in human capital and a club’s playing and financial performance.

Going back to the research questions mentioned in the beginning of the paper, key results obtained throughout this research, the review of relevant literature sources, as well as with the assistance of a survey among 87 football managers, could be used to shed light on them and suggest answers. Firstly, we have discovered a that domestic playing performance and international playing performance have different relationship with IC investment in regards of capital efficiency and budgeting. Our panel data regression model aimed at the investigation of relationship between investment in new players (IC proxy) and domestic, and international playing performance separately, and resulted into the conclusion that indeed they have different connection to IC

investment. We were also able to find the optimal values of IC investment for domestic and international performances. This was a result of confirming non-linearity in our hypothesis one and two, thus referring to research questions two and three. Even though, such approach has not been applied yet in literature for the football industry, and certainly not in regards to intellectual capital in football, our results could be used as a ground for further research papers, being bettered and more sophisticated statistical models could be constructed.

An interesting result we obtained was the rejection of our third hypothesis, meaning that we could not statistically prove a significant relationship between IC investment and financial performance of EPL football clubs. This result contradicts with some previous papers investigating IC investment impact on financial performance in the football industry (D. Guseva, 2015) (Dimitropoulos P. T., 2012). However, those studies investigated larger, more heterogeneous samples, including a mixture of all types of international football teams. In this sense, our result may be interpreted as being the case of EPL in particular- as we mentioned those clubs are the wealthiest, the biggest spenders on the international football transfer market, as well that the EPL is the most competitive domestic league in the world. Thus, spending the 'usual' amount of capital in new players for EPL teams may simply be too high to bring substantial financial profitability compared to Spanish or Italian domestic leagues, or for example.

If we elaborate on whether buying new players is always leading to better playing performance, based on prior studies and our results, the answer is that it depends. The separation of playing performance into two parts (domestic and international) is crucial in answering this question, setting representative KPIs, and measuring the playing performance in a sound manner. In this sense, defining playing performance into either domestic or international, is the first step of this process.

The managerial implications of this research are addressing decision makers in football clubs, who are responsible of appointing new managers, setting a budget for new players, and decide upon performance strategies. Firstly, understanding the difference in required budgets by owners of EPL teams would allow them to choose strategies for their clubs more comprehensively. Secondly, using the suggested values for international and domestic performance budgets will help decision makers in validating their strategies, ensuring feasibility. Finally, decisions makers can tailor specific KPIs, matching the club's performance strategy, allowing them to have a clearer measure of a manager's performance.

Results presented in this paper significantly contribute to the defined research gap elimination, and provide several possibilities for further research. Firstly, there is very limited existing research focused on investigating non-linear relationship between intellectual capital investment and

performance in the football industry, and especially devoted to the role of intellectual capital investment in the context of the English Premier league. Secondly, playing performance hasn't been analyzed in terms of domestic and international performance separately in the context of relationship with IC investment. Thirdly, if given an access to data on currently immeasurable indicators, researchers could investigate impact IC investment on playing and financial performance, taking into account other parts of intellectual capital, such as social capital. Finally, conducting a similar analysis of other domestic football league teams could give ground for a deeper comparative analysis.

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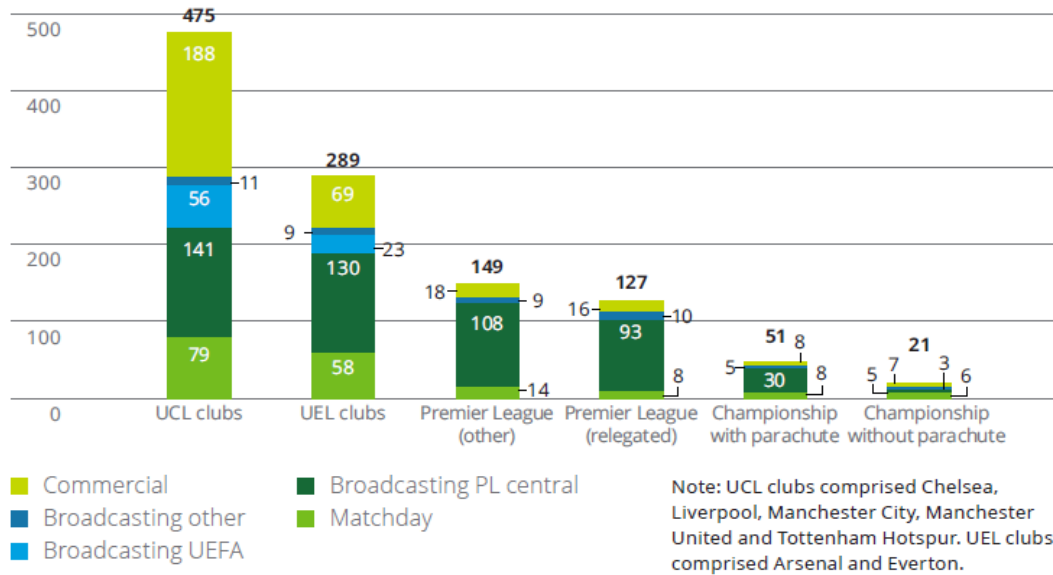
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APPENDIX

Figure 1.1. Premier League and Championship clubs' average revenues –



Source: (Deloitte, 2018)

Figure 1.1.1 'Big five' European league clubs revenue- 2015/16 to 2019/20 (€m)

Chart 7: Premier League clubs' revenues 2015/16-2019/20 (€m)

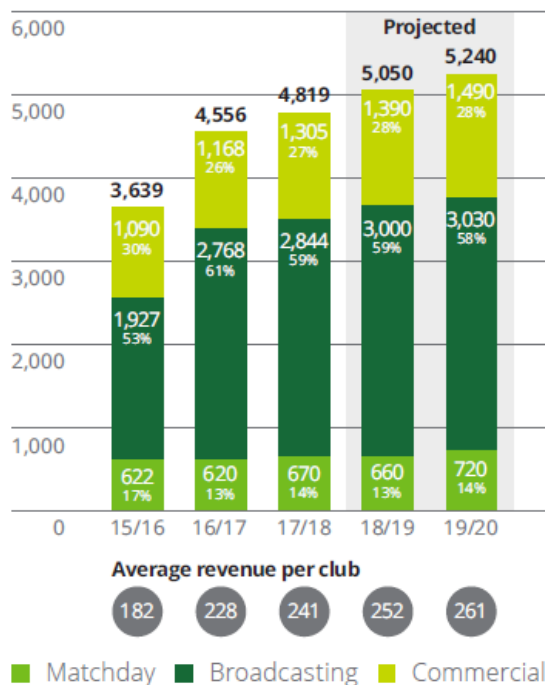


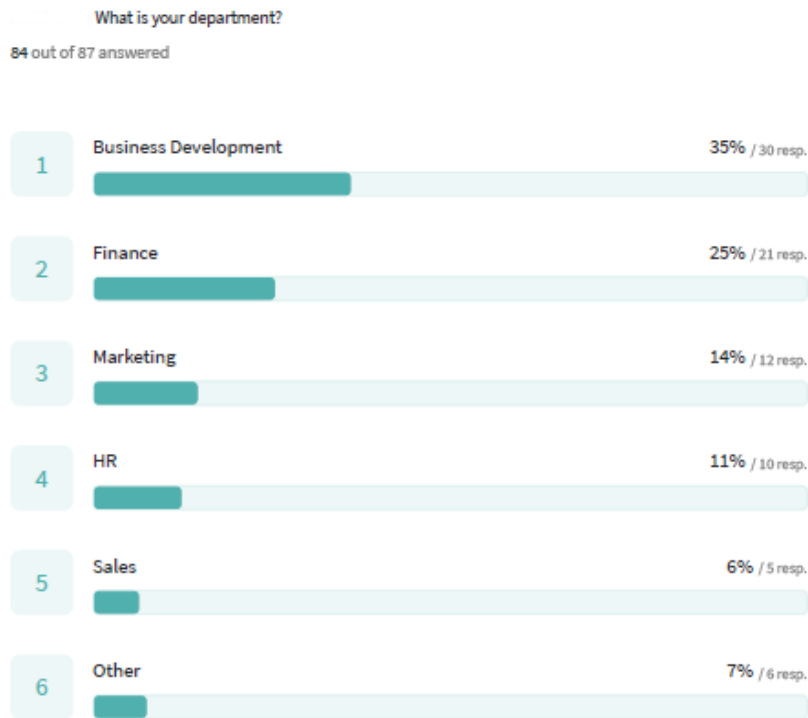
Figure 1.2. Scoreboard scores: full score assessment

	tid	year	EFL	FA	EPL	CHAMP	EUROPA	domestic	interna
ARS	6	2010			4	0		4	0
ARS	6	2011	1		3	0		4	0
ARS	6	2012			4	0		4	0
ARS	6	2013			3	0		3	0
ARS	6	2014		2	3	0		5	0
ARS	6	2015		2	4	0		6	0
ARS	6	2016			5	0		5	0
ARS	6	2017		2	2	0		4	0
ARS	6	2018	1		0	0	1	1	1
ARS	6	2019			2	0	2	2	2
CHEL	5	2010		2	6	0		8	0
CHEL	5	2011			5	0		5	0
CHEL	5	2012		2	0	6		2	6
CHEL	5	2013			4	0		4	0
CHEL	5	2014			4	2		4	2
CHEL	5	2015	2		6	0		8	0
CHEL	5	2016			0	0		0	0
CHEL	5	2017		1	6	0		7	0
CHEL	5	2018		2	2	0	3	4	3
CHEL	5	2019	1		4	0	3	5	3
EVERTON	7	2010			0	0		0	0
EVERTON	7	2011			0	0		0	0
EVERTON	7	2012			0	0		0	0
EVERTON	7	2013			0	0		0	0
EVERTON	7	2014			2	0		2	0
EVERTON	7	2015			0	0		0	0
EVERTON	7	2016			0	0		0	0
EVERTON	7	2017			0	0		0	0
EVERTON	7	2018			0	0		0	0
EVERTON	7	2019			0	0		0	0
LIV	3	2010			0	0	1	0	1
LIV	3	2011			0	0		0	0
LIV	3	2012	2	1	0	0		3	0
LIV	3	2013			0	0		0	0
LIV	3	2014			5	0		5	0
LIV	3	2015			0	0		0	0
LIV	3	2016	1		0	0	2	1	2
LIV	3	2017			3	0		3	0
LIV	3	2018			3	4		3	4
LIV	3	2019			5	6		5	6
CITY	2	2010			2	0		2	0
CITY	2	2011		2	4	0		6	0
CITY	2	2012			6	0		6	0
CITY	2	2013		1	5	0		6	0
CITY	2	2014	2		6	0		8	0
CITY	2	2015			5	0		5	0
CITY	2	2016	2		3	2		5	2
CITY	2	2017			4	0		4	0
CITY	2	2018	2		6	0		8	0
CITY	2	2019	2	2	6	0		10	0

UNITED	1	2010	2		5	0		7	0
UNITED	1	2011			6	6		6	6
UNITED	1	2012			5	0		5	0
UNITED	1	2013			6	0		6	0
UNITED	1	2014			0	0		0	0
UNITED	1	2015			3	0		3	0
UNITED	1	2016		2	2	0		4	0
UNITED	1	2017	2		0	0	3	2	3
UNITED	1	2018		1	5	0		6	0
UNITED	1	2019			0	0		0	0
NEWCAS	9	2010			0	0		0	0
NEWCAS	9	2011			0	0		0	0
NEWCAS	9	2012			2	0		2	0
NEWCAS	9	2013			0	0		0	0
NEWCAS	9	2014			0	0		0	0
NEWCAS	9	2015			0	0		0	0
NEWCAS	9	2016			0	0		0	0
NEWCAS	9	2017			0	0		0	0
NEWCAS	9	2018			0	0		0	0
NEWCAS	9	2019			0	0		0	0
STOKE	11	2010			0	0		0	0
STOKE	11	2011		1	0	0		1	0
STOKE	11	2012			0	0		0	0
STOKE	11	2013			0	0		0	0
STOKE	11	2014			0	0		0	0
STOKE	11	2015			0	0		0	0
STOKE	11	2016			0	0		0	0
STOKE	11	2017			0	0		0	0
STOKE	11	2018			0	0		0	0
STOKE	11	2019			0	0		0	0
SUNDER	12	2010			0	0		0	0
SUNDER	12	2011			0	0		0	0
SUNDER	12	2012			0	0		0	0
SUNDER	12	2013			0	0		0	0
SUNDER	12	2014	1		0	0		1	0
SUNDER	12	2015			0	0		0	0
SUNDER	12	2016			0	0		0	0
SUNDER	12	2017			0	0		0	0
SUNDER	12	2018			0	0		0	0
SUNDER	12	2019			0	0		0	0
TOT	4	2010			3	0		3	0
TOT	4	2011			2	0		2	0
TOT	4	2012			3	0		3	0
TOT	4	2013			2	0		2	0
TOT	4	2014			0	0		0	0
TOT	4	2015	1		2	0		3	0
TOT	4	2016			4	0		4	0
TOT	4	2017			5	0		5	0
TOT	4	2018			4	0		4	0
TOT	4	2019			3	4		3	0

WESTBR	10	2010			0	0		0	0
WESTBR	10	2011			0	0		0	0
WESTBR	10	2012			0	0		0	0
WESTBR	10	2013			0	0		0	0
WESTBR	10	2014			0	0		0	0
WESTBR	10	2015			0	0		0	0
WESTBR	10	2016			0	0		0	0
WESTBR	10	2017			0	0		0	0
WESTBR	10	2018			0	0		0	0
WESTBR	10	2019			0	0		0	0
WESTHA	8	2010			0	0		0	0
WESTHA	8	2011			0	0		0	0
WESTHA	8	2012			0	0		0	0
WESTHA	8	2013			0	0		0	0
WESTHA	8	2014			0	0		0	0
WESTHA	8	2015			0	0		0	0
WESTHA	8	2016			0	0		0	0
WESTHA	8	2017			0	0		0	0
WESTHA	8	2018			0	0		0	0
WESTHA	8	2019			0	0		0	0

Figure 1.3. Full survey content



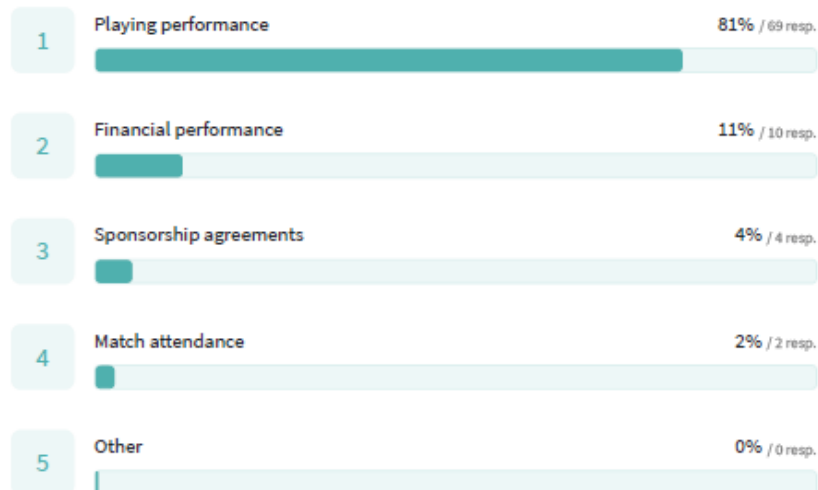
Just a few more! What's the key driver for your team's intangible asset value in your view?

85 out of 87 answered



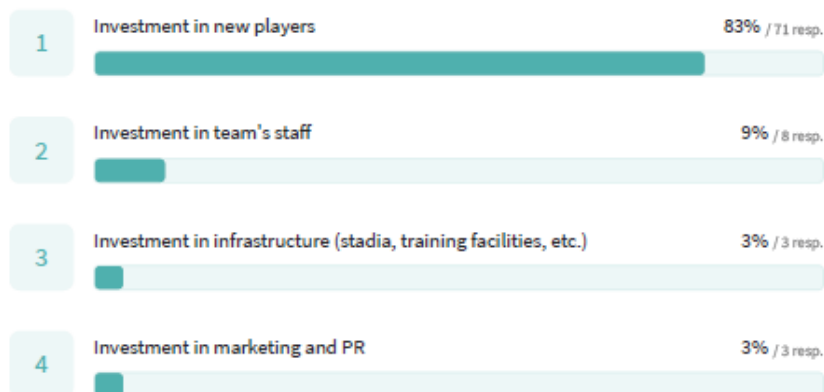
What is the most relevant performance indicator for EPL teams in your view?

85 out of 87 answered



What is the best proxy for Intellectual capital investment in your club?

85 out of 87 answered



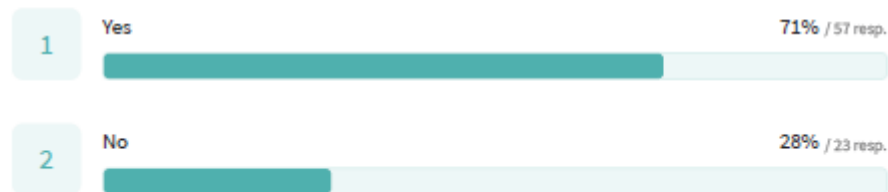
What is your team's key priority in terms of playing performance?

87 out of 87 answered



Do you think investing in intellectual capital improves your team's playing performance?

80 out of 87 answered



Do you think investing in intellectual capital improves your team's financial performance?

86 out of 87 answered



Table 1.4 Statistical output.

	capital	intman	domest~1	ebitda	turnover	oprev	roa
capital	1.0000						
intman	0.1671	1.0000					
domesticma~1	0.4237	0.1917	1.0000				
ebitda	0.0528	0.1071	0.1236	1.0000			
turnover	0.6225	0.3306	0.6834	0.3808	1.0000		
oprev	0.5649	0.2872	0.6475	0.3016	0.7425	1.0000	
roa	0.0896	0.1397	0.0492	0.7067	0.2972	0.3079	1.0000


```

Random-effects tobit regression      Number of obs   =    120
Group variable: tid                 Number of groups =    12

Random effects u_i ~ Gaussian       Obs per group:  min =    10
                                       avg   =    10.0
                                       max   =    10

Integration method: mvaghermite     Integration points =    12

Log likelihood = -231.26001          Wald chi2(3)    =    12.76
                                       Prob > chi2     =    0.0052

```

dom0	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
lcap	.6076306	.4695094	1.29	0.036	-.3125909	1.527852
lcap2	-.1456906	.0779322	-1.87	0.042	-.2984348	.0070536
lturn	1.498818	.4535696	3.30	0.001	.6098375	2.387798
_cons	-6.152139	2.619667	-2.35	0.019	-11.28659	-1.017687
/sigma_u	1.659523	.4186364	3.96	0.000	.8390113	2.480036
/sigma_e	1.456986	.1008335	14.45	0.000	1.259356	1.654616
rho	.5647151	.1321599			.3102896	.7941481

```

Observation summary:      0 left-censored observations
                          120 uncensored observations
                          0 right-censored observations

```

```

Random-effects tobit regression      Number of obs   =    120
Group variable: tid                 Number of groups =    12

Random effects u_i ~ Gaussian       Obs per group:  min =    10
                                       avg   =    10.0
                                       max   =    10

Integration method: mvaghermite     Integration points =    12

Log likelihood = -176.9722          Wald chi2(4)    =    14.34
                                       Prob > chi2     =    0.0063

```

int0	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
capital	-.0064223	.0046499	-1.38	0.057	-.0155359	.0026912
cap2	.0000197	.0000159	1.24	0.015	-.0000115	.0000509
lturn	.7546501	.231554	3.26	0.001	.3008126	1.208488
dvout	-.5057166	.3348787	-1.51	0.131	-1.162067	.1506336
_cons	-3.436079	1.156503	-2.97	0.003	-5.702785	-1.169374
/sigma_u	.2283187	.1502894	1.52	0.129	-.0662431	.5228806
/sigma_e	1.036716	.0707391	14.66	0.000	.8980701	1.175362
rho	.0462587	.0597536			.0019218	.3178195

```

Observation summary:      0 left-censored observations
                          120 uncensored observations
                          0 right-censored observations

```

```

Random-effects tobit regression      Number of obs   =   120
Group variable: tid                 Number of groups =   12

Random effects u_i ~ Gaussian       Obs per group:  min =   10
                                      avg =   10.0
                                      max =   10

Integration method: mvaghermite     Integration points =   12

Log likelihood = -449.65141          Wald chi2(3)    =   133.45
                                      Prob > chi2     =   0.0000

```

roa	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
lcap	.7771372	.9291583	0.84	0.403	-1.04398	2.598254
lturn	2.350639	2.878213	0.82	0.414	-3.290555	7.991833
ebitda	.5776891	.0657893	8.78	0.000	.4487445	.7066337
_cons	-23.85895	14.3312	-1.66	0.096	-51.94758	4.22968
/sigma_u	6.333768	1.601043	3.96	0.000	3.195781	9.471756
/sigma_e	9.418919	.6417224	14.68	0.000	8.161166	10.67667
rho	.3113855	.1141585			.130313	.5560884

```

Observation summary:      0 left-censored observations
                          120 uncensored observations
                          0 right-censored observations

```

```

Random-effects tobit regression      Number of obs   =   120
Group variable: tid                 Number of groups =   12

Random effects u_i ~ Gaussian       Obs per group:  min =   10
                                      avg =   10.0
                                      max =   10

Integration method: mvaghermite     Integration points =   12

Log likelihood = -459.98693          Wald chi2(4)    =   160.57
                                      Prob > chi2     =   0.0000

```

ebitda	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
lcap	-1.685125	3.292621	-0.51	0.609	-8.138544	4.768293
lcap2	-.1072822	.5463378	-0.20	0.844	-1.178085	.9635202
lturn	13.71929	3.570153	3.84	0.000	6.721922	20.71667
roa	.6855394	.0787858	8.70	0.000	.5311221	.8399567
_cons	-55.02178	20.33019	-2.71	0.007	-94.86822	-15.17534
/sigma_u	6.865888	2.189551	3.14	0.002	2.574446	11.15733
/sigma_e	10.27112	.7218304	14.23	0.000	8.856358	11.68588
rho	.3088414	.1451909			.0955939	.6212628

```

Observation summary:      0 left-censored observations
                          120 uncensored observations
                          0 right-censored observations

```

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fixed	(B) random		
lcap	.7771372	.7771372	0	0
lturn	2.350639	2.350639	0	0
ebitda	.5776891	.5776891	0	0

b = consistent under Ho and Ha; obtained from xttobit
 B = inconsistent under Ha, efficient under Ho; obtained from xttobit

Test: Ho: difference in coefficients not systematic

$$\begin{aligned} \text{chi2}(0) &= (b-B)' [(V_b-V_B)^{-1}] (b-B) \\ &= 0.00 \end{aligned}$$