Uncertainty of outcome hypothesis in professional football: A scoping review

Hipótesis de la incertidumbre en el resultado en el fútbol profesional: Una revisión de alcance

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I dedicate this work to those who, through their support, patience and affection, accompanied me in this process.

To my parents, Martha and Antonio and my sister Paula who have always accompanied me on my way.

To my friends: Natalia, Jonatán, Lina, Camilo, Jhon, and Julian, that chosen family that brightens life and fills it with hope.

Success is not final, failure is not fatal: It is the courage to continue that counts.

Winston Churchill

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Resumen

Este artículo revisa los estudios empíricos que pusieron a prueba la hipótesis de la incertidumbre en el resultado propuesta por Rottenberg (1956) en los asistentes al fútbol profesional europeo. En primer lugar, se revisan los aspectos teóricos de la hipótesis de incertidumbre en el resultado, las medidas de incertidumbre de resultados de partidos y campeonatos, y sus precedentes en el fútbol europeo. Además, se examinan ocho artículos empíricos seleccionados mediante el modelo de revisión del alcance y se comparan en función de las variables y los resultados compartidos. Este trabajo analiza las investigaciones realizadas en diferentes ligas del fútbol inglés, la Bundesliga alemana, la liga española, la Serie A (liga italiana) y las ligas suiza y austriaca. El análisis de esta selección concluyó que la mayoría de los estudios rechazan la hipótesis de la incertidumbre de los resultados de los partidos y aceptan la incertidumbre de los resultados del campeonato. Sin embargo, no representa una conclusión generalizable debido al tamaño de la muestra.

Palabras clave: Asistencia; Demanda; Incertidumbre del resultado; Fútbol.

Abstract

This paper reviews empirical studies that tested the Outcome Uncertainty proposed by Rottenberg (1956) on the European professional football attendees. First, it reviews the theoretical aspects of the Outcome Uncertainty Hypothesis, match and championship outcome uncertainty measures, and its precedents in European football. In addition, they examine eight empirical articles selected using the scoping review model and compare them in function of shared variables and outcomes. This paper analyses research conducted in different leagues of English football, German Bundesliga, Spanish league, Serie A (Italian league), and Swiss and Austrian leagues. The analysis of this selection concluded that most studies reject the hypothesis of uncertainty of match outcomes and accept the uncertainty of championship outcomes. However, it does not represent a generalisable conclusion due to the sample size.

Keywords: Attendance; Demand; Uncertainty of Outcome; Football; Soccer.

Contents

Abstract **VII**

List of Figures **IX**

List of Tables **X**

List of abbreviations **XI**

1 Introduction **1**

1.1 Goal of the thesis 2

1.2 Structure of the work 2

2 Literature review **4**

2.1 Analysis of the competitive balance (ACB Literature) 5

2.2 Uncertainty of Outcome Hypothesis (UOH Literature) 6

2.2.1 The uncertainty measure for match outcome 7

2.2.2 The uncertainty measure for championship outcome . . 9

2.3 UOH in European Football 10

3 Method **12**

3.1 Research question identification 13

3.2 Relevant studies identification 14

3.3 Study selection 15

3.4 Data charting 17

3.5 Collating and summarising 18

4 Results **19**

4.1 Sample characteristics 19

4.2 Research markets 20

4.3 Uncertainty of outcome-match 21

4.4 Uncertainty of outcome-seasonal 23

4.5 Methodological issues 23

5 Summary & Conclusion **25**

5.1 Summary 25

5.2 Review of goal attainment of the thesis 26

5.3 Conclusion 26

References **28**

Appendix **34**

List of Figures

1 Flow chart of study inclusion process 37

2 keyword co-occurrence clustering view. 38

List of Tables

1 Database search string 34

2 Selected documents 35

3 Summary of the key characteristics of the reviewed studies . . 36

List of abbreviations

ACB	Analysis of competitive balance
CI	Competitive intensity
CB	Competitive balance
FIFA	Fédération Internationale de Football Association
GOU	Game outcome uncertainty
OU	Outcome uncertainty
UEFA	Union des Associations Européennes de Football
UOH	Uncertainty of Outcome Hypothesis

1 Introduction

The uncertainty of outcome hypothesis (UOH) pioneered by Rottenberg (1956) has become one of the most debated topics within the literature on sports demand (Schreyer et al., 2017). It hypothesised that the demand for sports events is influenced by the gap between the qualities of the teams, or in the author's words, "the 'tighter' the competition, the larger the attendance" (Rottenberg, 1956, n. 21). In this respect, Neale (1964) observed that the intensity of the competition and variations in the standings attract spectators' interest and influence attendance and audience, representing the main source of income for sports events.

To differentiate UOH research, the concept has been divided into three time horizons: a short-term perspective that emphasises the uncertainty of the outcome of a match. The medium-term perspective refers to the uncertainty of a season outcome, which has two variants. In the first one, individuals value the identity of the eventual championship winner being uncertain. In the second, fans value their team's success, as they are drawn to the prospect of it winning the championship. Finally, uncertainty in the long-term outcome refers to the existence or absence of a dominant team in the league for several seasons (Cairns et al., 1986).

The UOH is related to the concept of competitive balance (CB), proposed by Rottenberg (1956). Which refers to the degree to which competitors are relatively balanced in resources and talent. Balance, which in turn leads to more uncertainty, as the outcome of a match or season between equal competitors is more uncertain than a competition between unequal competitors. Moreover, fans derive utility from the uncertainty of match outcomes and prefer more balanced leagues; greater CB generates higher attendance. Accordingly, UOH has been frequently employed to justify the use of restrictive competition rules, such as maximum salaries for players, salary caps for

teams, and talent allocation schemes (Forrest et al., 2005).

Nevertheless, mixed results from different research projects show that after decades of empirical research, the importance of outcome uncertainty for the demand for sports events has not been clarified (Pawlowski, 2013; Schreyer & Ansari, 2021).

1.1 Goal of the thesis

To better understand the reasons for the divergences in outcomes, their implications and point out possible future research lines. The thesis aims to conduct a scoping review of a sample of academic papers, which have analysed measures of match outcome uncertainty and uncertainty of championship outcome, particularly in professional football.

For this sport, stadium attendance, while representing its main source of revenue, stadium attendance is also part of the attractiveness of the audiovisual product on offer. Moreover, as one of the most popular sports worldwide, it has extensive empirical research.

1.2 Structure of the work

The thesis is divided into five sections. First, there is an introductory chapter, where the aim of the thesis is explained. Chapter 2 is a literature review of the concepts related to the outcome uncertainty hypothesis, in which the concepts of competitive balance, measures of match outcome uncertainty, measures of championship outcome uncertainty and an introduction to developments in outcome uncertainty in football are discussed. Chapter 3 will develop a scoping review, which starts by formulating a research question,

identifies and selects relevant studies to answer the question, and then graphs and summarises the review's main findings. Chapter 4 presents the results obtained from reviewing the documents obtained through the scoping review. Finally, Chapter 5 will be the summary, conclusion and review of the achievement of the thesis objective.

2 Literature review

From his seminal work on the labour market of American baseball players, Rottenberg (1956) argues that fans would be more interested in a sporting competition the more uncertain its outcome is expected to be. From which he derives the hypothesis that a close difference in their quality of play maximises the welfare of those attending the sporting event and that this is why teams need each other to build a joint product (the league), or in the author's words, "that a more or less equal distribution of talent is necessary if there is to be the uncertainty of outcome; and that uncertainty of outcome is necessary if the consumer is going to be willing to pay admission to the game" (Rottenberg, 1956, p. 246).

In this respect, Neale (1964) observed that the intensity of competition in arousing spectator interest represents one of the main sources of revenue in professional sports. This makes it unfeasible for a single team to dominate the league, since eliminating or absorbing its opponents would also eliminate its ability to compete. The author uses the term Louis-Schmelling paradox to refer to the hypothesis of uncertainty of outcomes.

> "... consider the position of the heavyweight champion ... He wants to earn more money, to maximize his profits. What does he need in order to do so? Obviously a contender, and the stronger the contender the bigger the profits from fighting him ... since doubt about the competition is what arouses interest" (Neale, 1964, pp. 1-2).

Although researchers have tried for decades to demystify the relationship between CB and fans' interest, it was only in the early part of the century that Fort and Maxcy (2003) adopted a systematic approach to assessing the

relationship. Through two lines of research: Analysis of Competitive Balance (ACB) and the test of the Uncertainty of Outcomes Hypothesis (UOH).

2.1 Analysis of the competitive balance (ACB Literature)

The ACB literature is defined as the ex-post relationships of how closely matched teams are in a match, division or league. The focus is on what has happened to the competitive balance over time or due to business practices (Fort & Maxcy, 2003).

The main objective of this set of papers is to assess whether market regulations such as salary caps (limits on player salaries), budget caps (limits on team spending), luxury taxes (which impose charges for spending more than a set limit), revenue sharing (redistribution of revenues from more successful markets to the less successful ones) can play a critical role in ensuring the desired level of competitive balance or uncertainty of outcomes within a league (Sanderson & Siegfried, 2003). While other studies focus on the effect of labour market interventions, such as constraints on freedom of agency (which do not allow the best players to sign in the largest markets) (Sanderson & Siegfried, 2003).

Such factors often influence both the competitive balance and the uncertainty of outcomes. Because when a league lacks competitive balance, due to the dominance of a few teams, matches are likely to suffer from a lack of uncertainty of outcome in individual competitions. Thus, factors that lead to uncertainty of outcome will generally also lead to a lack of competitive balance.

2.2 Uncertainty of Outcome Hypothesis (UOH Literature)

The UOH literature focuses on empirical testing of the relationship between competitive balance and sports demand, which reflects expectations of how close fans expect certain matches to be. Since when fans anticipate a low probability of a home win, there is low uncertainty about the game and stadium attendance suffers. However, as the ex-ante probability of a home win increases, attendance increases until a maximum is reached. Further increases in the probability of a home win reduce match uncertainty and stadium attendance (Pawlowski & Nalbantis, 2019). Peel and Thomas (1992) and Forrest and Simmons (2002) agree that the demand for match tickets peaks at the point where the probability of the home team winning is approximately twice that of the away team, that is, a probability of around 0.66.

Coates, Humphreys and Zhou (2014) argue that the existence of UOH critically depends on the marginal utility of wins and losses. UOH arises when the marginal utility generated by an unexpected win exceeds or equals the marginal utility generated by an unexpected loss.

Most studies testing UOH have focused on the relevance of match uncertainty (Pawlowski & Nalbantis, 2019). However, the evidence for a positive effect of match uncertainty on demand is relatively weak or even contradictory (e.g. Borland & MacDonald, 2003; Pawlowski, 2013). This has motivated further research leading to the concepts of reference-dependent preferences and loss aversion (Coates et al., 2014), the concept of competitive intensity (Scelles et al., 2013), as well as subjective assessments of the competitive balance (Pawlowski, 2013).

Regarding UOH, Cairns et al. (1986) suggest the existence of three types of

the uncertainty of outcome with respect to the temporal horizon:

- Match uncertainty (short-term uncertainty), implies higher attendance if either team has an equal chance of winning.
- Seasonal uncertainty (medium-term uncertainty). The emphasis is on the uncertainty of the season's outcome. In this case, the uncertainty is twofold: the fact that there are multiple teams in the title or relegation battle or the possibility that the team being followed could win the championship. The greater the uncertainty about the outcome of the season, the higher the consumer's utility is expected to be.
- Championship uncertainty (long-term uncertainty). In this case, uncertainty is defined as the lack of dominance of one team or a small group of teams in a competition. Suppose a team manages to win the championship on multiple consecutive occasions. In that case, as has been the case in the Bundesliga, dominated from the 2012-13 season to date by Bayern Munich or in the Spanish LaLiga, historically dominated by Barcelona and Real Madrid, it is assumed that fans may lose interest in the matches and thus reduce attendance (Cairns et al., 1986).

In the context of the present scoping review, the focus is on the uncertainty of match and seasonal outcomes. A brief discussion of these dimensions and how studies measure them is presented below.

2.2.1 The uncertainty measure for match outcome

Match outcome uncertainty is the idea that spectators prefer close contests and are more likely to attend the next match if the teams perform similarly.

Game uncertainty is often measured using the first and second-order terms of the home win probabilities derived from betting odds (Peel & Thomas, 1988). This is to check whether there is an inverted U relationship between the home win probability and the demand. In other words, they test whether attendance is maximised when both the home and away teams have equal chances of winning.

In particular, these "objective" home win probabilities are correlated with fans' perceived home win probabilities (Pawlowski et al., 2018). As Buraimo and Simmons (2008) show, if a betting market is efficient, fixed odds incorporate relevant public and private information about the probabilities of a match outcome that are not easily observable by other means, such as injuries, suspensions, players' loss of form, and even prospective information such as whether a given player returns after a suspension.

Another popular index to measure the uncertainty of the game is the Theil index (1967), which uses the probabilities of home win, away win and draw. This index increases with increasing uncertainty of the match outcome reaching its highest value when all three probabilities are equal and its lowest value when the probabilities are primarily located in one of the outcomes. Pawlowski and Nalbantis (2015) state that previous studies suggest a negative correlation of the Theil score with demand, which may suggest that home fans prefer to watch a match with the certainty that their team will be the winner, so they include it in their estimate as a dummy variable that reflects that the home team is the favourite.

The other measure commonly used is the absolute difference between the home and away team win probabilities (Buraimo and Simmons, 2015); this hypothesises a negative linear relationship with demand, meaning that attendance should increase the smaller the degree of variation between the home and away team probabilities. However, the main disadvantage of this model

is that, unlike the Theil index, it does not explicitly consider the probability of a draw.

Recently Ely et al. (2015) introduced a framework in which an audience derives utility from anticipated changes in beliefs (suspense) and actual changes in beliefs (surprise). Concepts that, although related to uncertainty, go further by including two dimensions of enjoyment. In this sense, greater suspense is generated if the variance of beliefs in the next period is greater (what is currently happening versus what is expected to happen next). Conversely, greater surprise occurs when the current belief deviates from previous beliefs. Consequently, a match between teams with an equal chance of winning is expected to generate more suspense than one with a clear favourite. In turn, a match with a clear favourite may generate great surprise if the favourite is defeated (Pawlowski & Nalbantis, 2019).

2.2.2 The uncertainty measure for championship outcome

In the context of the medium-term dimension of OU, the focus is on uncertainty about the seasonal outcome. which is often measured by using league points and rankings to represent the closeness of sub-competitions, such as the race for the championship title, the fight to secure a playoff spot, the continental club competitions or the fight to avoid relegation. According to Budzinski and Pawlowski (2017), seasonal uncertainty seems to be more relevant for fans than the short- or long-term dimension of OU, as it aggregates fans' perceptions of league-wide (in)balance.

Among the first works to include measures of championship uncertainty is Jennett (1984), who focused on match relevance by measuring the ex-ante championship importance of each match for the two contenders by using ex-post information about the number of matches they have to win to be cham-

pions in the given season. Related to this is the measure of championship uncertainty, introduced by Janssens and Késenne (1987) and slightly modified by Pawlowski and Anders (2012) and Pawlowski and Nalbantis (2015), to measure the uncertainty of UEFA Champions League qualification. Like Jennett's measure, this measure uses ex-post information to represent ex-ante probabilities. It is based on the points needed to become champions (or to qualify for the UEFA Champions League), the points collected so far, the maximum number of points that can be achieved during the season, as well as the maximum number of points that can be achieved during the rest of the season.

Other similar measures developed to capture medium-term OU include playoff uncertainty, on which Krautmann et al. (2011) used a playoff measure that takes into account the distribution of all playoff teams in contention; The decisiveness of a match by Geenens (2014) which is measured at the tournament level, such as the FIFA World Cup, by considering the playing strength of both contenders in a match and the temporal position of this game in the tournament; The league standings by Neale (1964) which is based on three components: (i) the variance of the total daily changes in the rank order, (ii) the cumulative changes in the rank order, as well as (iii) the standard deviation of the winning percentages in a given league on each matchday of a given season. Finally, the intensity of competition proposed by Scelles et al. (2013) focuses on the points needed to achieve different sporting objectives for the club closest to a specific sporting prize (Pawlowski et al., 2018).

2.3 UOH in European Football

Among the main empirical developments on UOH on the European football, Peel and Thomas (1988), who in their study of English football during the 1986-1987 season, was among the first to use win probabilities derived from

betting odds as a measure of ex-ante game uncertainty, which has become the most widely used method when testing UOH in football in European countries. As betting odds are often subject to bias due to bookmakers' profits, Forrest and Simmons (2002) corrected this bias in a study of the same leagues during the 1997-1998 season. Czarnitzki and Stadtmann (2002), in their study of the German Bundesliga in the 1996-1997 season, acknowledged the problem of not being able to observe the real demand for stadium attendance due to limited stadium capacity. Benz et al. (2009) advanced the literature by recognising differences in consumer behaviour and used a method that allows the impact of outcome uncertainty to vary across the full range of stadium attendance.

The importance of sports broadcasting and the current availability of broadcast audience data has led to the second group of studies focusing on the impact of UOH on TV demand. Buraimo (2008) modelled match attendances and television audiences using data from the second tier of the English Football League and found that while televised matches reduced stadium attendances, higher stadium attendances positively impacted the size of television audiences. Forrest, Simmons and Buraimo (2005) modelled both the choice of televised matches and the audience size each Premier League match attracted between 1993 and 2002. Buraimo and Simmons (2009) consider total audiences (stadium and television) in the Spanish first division between 2003 and 2007. These studies are in favour of UOH for television audiences. In contrast, the evidence on television audiences for Premier League football is less clear. Forrest et al. (2005) showed that TV audiences prefer more uncertain match outcomes, but Buraimo (2008) and Buraimo and Simmons (2015) showed that there is no significant impact to support this result.

3 Method

This study applies a scoping review technique based on the methodological framework presented by Arksey and O'Malley (2005) to review the academic literature that has analysed measures of uncertainty of match results and uncertainty of championship results in European football. The main objective is to understand better the reasons for divergences in results and their implications.

Scoping reviews are a way of synthesising knowledge in a given area, especially in emerging and complex research fields, allowing to clarify complex concepts and refine future research (Levac et al., 2010). They are particularly popular in medical or health sciences, while their implementation in fields such as economics and sports management is relatively rare (e.g., Schreyer & Ansari, 2021).

Among the purposes of a scoping review are to examine the extent, scope and nature of research in a specific discipline or research area, determine the feasibility and relevance of further reviews, summarise and disseminate research findings and identify gaps in the existing literature, and thereby succeed in evaluating policy formulation, research and practice (Arksey & O'Malley, 2005). According to Tricco et al. (2016).

> "Aim to map rapidly the key concepts underpinning a research area and the main sources and types of evidence available, and can be undertaken as stand-alone projects in their own right, especially where an area is complex or has not been reviewed comprehensively before" (p. 2).

Scoping studies differ from systematic reviews and literature reviews in that they do not seek to assess the quality of the studies included in the review

and in that the scoping process requires an analytical reinterpretation of the literature (Levac et al., 2010). Instead, definitions of scoping studies often relate to the concept of 'mapping', which refers to the process of synthesising a body of evidence to provide broad and deep coverage of a research area (Levac et al., 2010).

In this thesis, a scoping review approach is taken for the following reasons. Scoping reviews allow for examining existing literature and incorporating the results of multiple methods and study designs, generating an overview of current key issues (Davis et al., 2009). Peters et al. (2015) indicated that a scoping review could be adopted, especially when the research area is diverse or has not been reviewed expansively. In addition, scoping reviews are convenient in identifying, locating and synthesising existing knowledge, providing answers to broad questions (Sucharew and Macaluso 2019).

Although there are multiple methodologies for conducting scoping reviews, the methodological structure proposed by Arksey and O'Malley (2005) was adopted for this document as it is widely accepted within the academic community. Arksey and O'Malley's (2005) protocol follows the following five stages: 1. identifying the research question; 2. identifying relevant studies; 3. study selection; 4. charting the data; 5. collating, summarising and reporting the results.

3.1 Research question identification

The initial stage of the methodological structure of the scoping review presented by Arksey and O'Malley (2005) is to generate the research question to be answered, as it directs how search plans are designed. The present scoping review attempts to answer the following question: What are the trends with respect to the validity of the outcome uncertainty hypothesis presented in the

academic literature assessing attendance in European professional football?

3.2 Relevant studies identification

In order to be as inclusive as possible in identifying studies on the Uncertainty of outcome hypothesis in European professional football on 20 December 2021, a search was conducted in the bibliographic databases Web of Science (WoS) and Scopus. Web of Science database owned by Thomson Reuters has more than 155 million records in more than 34,000 journals covering multiple disciplines of knowledge (Clarivate, 2022). Scopus is a database owned by Elsevier with more than 84 million records in more than 27,000 journals (Elsevier, 2022). Together, these databases provide a broad overview of the world's research output, ensuring repeatability, consistency, reliability and limiting source bias.

The search string is mainly derived from the previous reading of papers on determinants of sport event attendance and uncertainty of outcome (e.g., Borland & Macdonald, 2003; Downward et al., 2009; Pawlowski & Nalbantis, 2019). In the electronic databases the search string included words related to uncertainty of outcome hypothesis and football e.g., outcome uncertainty, uncertainty of outcome, game uncertainty, game outcome uncertainty, uncertainty of game outcome, uncertainty of outcome hypothesis, uncertainty-of-outcome hypothesis, football and soccer, which were combined using the Boolean operators OR and AND.

Initially, this resulted in a total of 258 documents: 148 in WoS and 110 in Scopus. Results were compiled in a Microsoft Excel spreadsheet, where, by means of an existing function, 84 duplicates were removed. Because a relatively broad search string had been chosen, the remaining 174 articles were systematically reviewed for titles, abstract and author keywords, where

these existed, leading to the elimination of obviously unrelated literature.

This process led to the elimination from the database, particularly of papers that focused on sports other than football, despite the search string including the words football and soccer. Two main reasons can explain their presence: firstly, because most of the documents published in the United States use the word football to refer to what is known outside the United States as American football; secondly, the presence of the word "football" in those papers whose object of study was other sports, responds to the fact that in their summaries football is mentioned as the most studied sport in the field of sport economics and particularly in the literature on uncertainty of outcomes. After the elimination of these papers, the database was reduced to 61 manuscripts, is to say 113 papers were excluded.

3.3 Study selection

The search strategy yielded several inadequate studies for the review. This is because breadth was prioritised over depth during the early stages. The article inclusion and exclusion criteria for this scoping review are intended to allow for a quality comparison. Only research articles that serve as a primary source of analytical evidence are included in the exercise. Thus excluding publications without empirical contribution, in the form of systematic review articles, review articles, meta-analysis articles and conference papers (e.g. Schreyer & Däuper, 2018; Borland & Macdonald, 2003). Nor are articles published in languages other than English analysed due to the expense of trying to translate them (e.g., Guironnet, 2018)). A limitation which, although for practical reasons, Arksey and O'Malley (2005) make it clear that it can lead to relevant studies being overlooked.

Given that survey data is often criticised for lacking explanatory power for

actual behaviour, studies based on qualitative interviews or using survey data that model various dependent variables were not considered (e.g., Arrondel & Duhautois, 2019). Studies that measure fan interest based on ticket numbers (attendance) are used, as this is considered the standard measure of fan behaviour as reviewed by Borland & MacDonald (2003). Studies using betting market data to measure fan expectations are considered given their effectiveness in aggregating information, and authors such as (Sauer, 1998) suggest that betting market data better captures fan expectations of uncertainty compared to other performance-based indicators of OU, such as rating differentials.

In addition, studies exploring proxy indicators of attendance, such as willingness to pay (e.g., Nalbantis et al., 2017) and studies examining alternative indicators of demand, such as television audience (e.g., Buraimo & Simmons, 2015), were excluded.

As suggested by Pham et al. (2014), during the first stage, study titles and abstracts are evaluated to avoid wasting resources searching for articles that do not meet the inclusion criteria. A form is created for the evaluation of titles, keywords and abstracts. In cases where the assessment of titles, keywords and abstracts is insufficient. The introduction and conclusion are also evaluated. When the review of the introduction and conclusion is insufficient, it is necessary to review the articles in their entirety to determine their inclusion in the review.

Following the screening process, the citations that are deemed appropriate are acquired for complete text analysis. A template is designed to collect the main characteristics of the articles, including author(s), year of publication, number of male authors, number of female authors, title, journal, number of citations in Google scholar and the average number of citations per year.

The characteristics of each article are extracted from the full text. After

reading the complete studies, the decision is made to include a paper in the review. It should be noted that although 14 articles met the selection criteria due to time resource constraints, eight research articles were nominated for the review: Buraimo and Simmons (2008), Czarnitzki and Stadtmann (2002), Martins and Cró (2018); Pawlowski and Anders (2012), Pawlowski and Nalbantis (2015), Peel and Thomas (1988, 1992) and Serrano et al. (2015).

3.4 Data charting

This stage involves "charting" the main information obtained from the primary research articles reviewed using Microsoft Excel to facilitate comparative analysis. Ritchie and Spencer (1994) indicated that "charting" refers to a method of interpreting and synthesising qualitative data by examining, plotting and organising the material about its main aspects. This review adopts the "descriptive-analytic" technique, which involves applying the same analysis structure to all the selected articles and collecting information from all of them (see Arksey and O'Malley 2005). The data plotted in this study are presented in a "Summary of the key characteristics of the reviewed studies" (see Table 3). The following 9 data are recorded in this chart:

- Study
- League(s)
- Period(s)
- Dependent variable
- OU Proxies
- Findings

- UOH Measure
- Estimation methods
- UOH Support

3.5 Collating and summarising

This phase involves collating, summarising and reporting the results. Sucharew and Macaluso (2019) argue that the scoping review results usually focus on the range of content found, while the quantitative review is usually limited to a count of the number of sources recording a particular issue. This scoping review presents an overview of the reviewed material. Following the review of the selected studies, an account of the findings is provided, i.e. conclusions and discussions supported by the literature.

The study process from identification to final inclusion was as follows (Figure 1). The initial search (conducted on 20 December 2021) yielded 258 hypothetically suitable studies: 110 in WoS and 148 in Scopus. As the search string was relatively broad, after the relevance check and elimination of duplicates, 197 articles were eliminated. Consequently, 14 articles met the selection criteria, of which 8 were included in the scoping review.

4 Results

4.1 Sample characteristics

Table 2 shows the general information of the papers selected for the review; the database contains eight articles, all of them published between August 1988 (Peel & Thomas (1988)) and May 2018 (Martins & Cró (2018)). With the participation of 15 authors.

These eight manuscripts generated a total of 1160 citations in Google scholar, where the work of Czarnitzki and Stadtmann (2002), Peel and Thomas (1992) and Peel and Thomas (1988) has the highest number of citations with 276, 270 and 260 respectively. Although these numbers are influenced by the fact that they are the oldest, when assessing the number of citations per year, the work of Czarnitzki and Stadtmann (2002) moves into the second position with 14 citations per year, surpassed only by Pawlowski and Anders (2012), who were cited an average of 19 times per year. The fact that these papers considerably exceed the average number of citations per year of the selected documents, which is nine citations per year, evidences the existence of a group of papers that are recognised and cited much more frequently than others.

The absence of women co-authors is notable, as they represent just 13% of the authors present in the database. Only the papers by Martins and Cró (2018) and Serrano et al. (2015) have a female co-author. Although these two papers only occupy the fifth and seventh place in the ranking of citations per year, the fact that they are the most recently published among those present in the database provides evidence of a growing female contribution to the field.

The articles belonging to the sample were published in six journals: Applied

Economics (1 article), Applied Economics/Letters (2), Empirical Economics (2), Scottish Journal of Political Economy (1), International Journal of Sport Finance (1) and Journal of Sports Economics (1), these last two journals focusing on the publication of research related to sports economics. The average number of pages per article was 11, which is affected by the two manuscripts published in Applied Economics/Letters, a journal that publishes short articles. Since excluding them, the average becomes 13 pages.

4.2 Research markets

As can be seen in table 3, the papers in the sample were especially interested in football spectator demand in the UK market (3 articles), followed by Germany (2), Switzerland and Austria (1) and Portugal (1). Additionally, Serrano et al. (2015) analyse aggregate data for the four main European football leagues (Bundesliga, Spanish league, Premier League and Italian Serie A). In addition to being the market with the most significant number of related studies, English football is the one with the most extensive treatment as, besides the evaluation of the English Premier League by Buraimo and Simmons (2008), the works by Peel and Thomas (1988,1992) study its predecessor, the English Championship, as well as English League One and English League Two. The papers by Buraimo and Simmons (2008), Czarnitzki and Stadtmann (2002), Pawlowski and Nalbantis (2015), Peel and Thomas (1988,1992) and Serrano et al. (2015) make it evident how research on OU in European football focuses on this four main leagues. It makes particularly valuable the articles by Pawlowski and Nalbantis (2015) and Martins and Cró (2018), which, by evaluating the minor leagues, make it possible to contrast the results of these with those of the major championships. However, throughout the scoping review, it became evident that there is a scarcity of articles assessing the importance of OU in lower-level competitions, youth football and

the women's leagues.

4.3 Uncertainty of outcome-match

As for the results of the selected studies that take short-term OU into account, they mostly reject UOH (Peel & Thomas, 1988, 1992; Buraimo & Simmons, 2008; Pawlowski & Anders, 2012; Martins & Cró, 2018) or do not find a connection between the uncertainty of the match outcome in attendance figures (Czarnitzki & Stadtmann, 2002; Pawlowski, & Nalbantis, 2015) while a few give only partial support to UOH (Serrano et al., 2015)

These papers can be divided into two groups; the first comprises studies that consider the level of outcome uncertainty as to the independent variable, measuring it through the Theil index, which considers the draw and the probability of victory of both the home and away teams.

To this first group belong the works of Buraimo and Simmons (2008), Pawlowski and Anders (2012), Pawlowski and Nalbantis (2015) Serrano et al. (2015), and Martins and Cró (2018). Of which only Serrano et al. (2015) find a positive relationship between OU and attendance, which is restricted to cases where stadiums have a large spectator attendance representing approximately 10% of the matches; meanwhile, Buraimo and Simmons (2008), Pawlowski and Anders (2012) and Martins and Cró (2018) find that an increase in OU decreases the level of attendance, results that contradict the UOH. This suggests that most spectators would prefer to watch the home team play against an inferior team (Buraimo & Simmons, 2008; Martins & Cró, 2018) or a match against a big team with a strong brand (Pawlowski & Anders, 2012); while Pawlowski and Nalbantis (2015) do not find a significant correlation.

From this group of authors, Pawlowski and Anders (2012) and Martins and

Cró (2018) present contradictory results about the dummy variable that measures whether the probability of the home team winning is higher than that of the away team (FAVORITE). While Pawlowski and Anders (2012) find no significant evidence of spectators' preference for the home team to play against an inferior opponent, Martins and Cró (2018) find evidence favours this hypothesis.

In the second group are those studies that investigate the OU of a match through the probability of victory of the home team. This methodology makes it possible to identify the exact point at which the home team victory probability curve changes its trend. Since the Theil index only allows detecting an increase or decrease in uncertainty, variations that may respond to a higher probability of victory of both the home and away team.

Papers using this methodology include Peel and Thomas (1988), Peel and Thomas (1992), Czarnitzki and Stadtmann (2002) and Buraimo and Simmons (2008). Peel and Thomas (1988) find a significantly positive relationship between attendance and home team win probability, a finding that rejects the UOH; Peel and Thomas (1992) and Buraimo and Simmons (2008) who in turn, use the squared term of home team win probability as a measure of uncertainty, find a U-shaped relationship, rather than the inverted U predicted by the UOH. This suggests that most spectators prefer to attend matches with a very high or low probability of a home win. The attractiveness of a low win probability outcome for home supporters possibly resides in a "David versus Goliath" effect, whereby home supporters want to be present on the very rare occasions when David beats Goliath (Buraimo & Simmons, 2008); in the work of Czarnitzki and Stadtmann (2002), although the U-shaped relationship is also present, in this case, the correlation is not significant.

4.4 Uncertainty of outcome-seasonal

Only half of the papers in the sample examined the impact of medium-term OU on stadium attendance (Czarnitzki & Stadtmann, 2002; Pawlowski & Anders, 2012; Pawlowski & Nalbantis, 2015; Martins & Cró, 2018). Except for Czarnitzki and Stadtmann's (2002) research, the papers coincide in finding a significant positive effect when one of the contending teams still has a possibility to compete for the championship, for Martins and Cró (2018) such effect is significant only for the case of the home team; while for the sub-competitions, the empirical results are mixed. For example, in the research of Martins and Cró (2018) it is noted that the possibility of qualifying for the Champions League (UEFA) has an apparent relevance for consumers exclusively in the case of the home team, while Pawlowski and Anders (2012) only find a weak significance for the case of the away team.

4.5 Methodological issues

Despite early criticisms by Forrest et al. (2005), only a few of the documents in the sample (e.g. Peel & Thomas, 1992; Pawlowski & Nalbantis, 2015) discuss the limitations that may emerge from the use of aggregate data for both season ticket holders and individual match ticket buyers. However, none of them present disaggregated attendance data. Pawlowski and Nalbantis (2015) attribute this to the lack of disaggregated data for European football.

It would therefore be useful for future research to use a similar approach to that developed in the papers selected through the scoping review, to analyse disaggregated data on the season ticket holders of the different football teams, or if the limitations to access information on this specific group persist, increase the discussion on the problems derived from this limitation.

Except for Serrano et al. (2015), all authors in the sample discussed the problems derived from the limited stadium capacity, while Peel and Thomas (1992) do not see this as an urgent issue in their target market and consequently do not consider the use of estimates that allow for a censored distribution to be justified. While the authors who observe cases where the dependent variable is censored make use of the Tobit model, either primarily as in Czarnitzki and Stadtmann (2002), Buraimo and Simmons (2008), Pawlowski and Anders (2012), Pawlowski and Nalbantis (2015) or as an additional robustness check, as in Martins and Cró (2018).

Finally, the fact that divergent results are presented even when the same authors are involved, as in the case of Pawlowski and Anders (2012) and Pawlowski and Nalbantis (2015) or when different authors evaluate the same league, as in the case of Czarnitzki and Stadtmann (2002) and Pawlowski and Anders (2012) makes evident the need for future research projects that evaluate under-explored markets, such as lower leagues, youth football and women's football. To evidence patterns in the influence of OU on European football attendance in this way, reach conclusions about the validity of the UOH. Since although the sample of documents used for the present thesis evidences some common results, the limited sample size does not make these results generalisable.

5 Summary & Conclusion

5.1 Summary

This thesis reviews a sample of empirical studies that tested UOH proposed by Rottenberg (1956) in European professional football, which suggests the existence of a hypothetical positive effect of OU on demand for attendance to sporting events and, in this case, European professional football.

This thesis did a literature review that includes the concepts such as competitive balance, outcome uncertainty hypothesis and its variants for the short and medium-term, and some milestones in the evaluation of this hypothesis in European professional football. Furthermore, following the five-stage model proposed by Arksey and O'Malley (2005) for conducting scoping reviews, the characteristics and conclusions of eight academic articles that evaluate the UOH in English football, the German Bundesliga, the Spanish league, the Serie A (Italian league) and the Swiss and Austrian leagues were analysed. They show that most studies reject the hypothesis of the uncertainty of match outcomes and accept the uncertainty of championship results. What could be interpreted as saying that those attending football matches, who are mostly fans of the home team, would prefer to see their team play against an inferior team and win than to see the home team lose or draw.

However, the existence of some contradictory results and the limited sample size make the findings not generalisable. For this reason, future research should evaluate under-explored markets, lower leagues, youth football and women's football, as well as disaggregated data, in particular on subscribers of the different football teams. This is in order to arrive at more conclusive results.

5.2 Review of goal attainment of the thesis

This thesis describes the main indicators used to measure OU in the short and medium-term. It performed a scoping review of papers assessing the hypothetical relationship between match and league OU with attendance at European football matches. It also compared the different approaches to OU derived from betting odds, its results and the interpretations given by the different authors. Thus, the author believes that while the results discard the UOH, the use of additional methodologies and the evaluation of other markets will contribute not only to confirming these results but also to clarifying the influence of the different factors that the authors have been suggesting to explain the results of the empirical developments.

5.3 Conclusion

This thesis examines a selection of empirical studies using the scoping review model, which have analysed OUH, particularly measures of match OU and championship OU, and their hypothesised relationship with the decision to attend a match in major European football leagues, including the English football league, the German Bundesliga, the Spanish league, the Serie A (Italian league) and the Swiss and Austrian leagues. It is concluded that most of the papers present in the review reject the OU measures of the match and therefore deny the UOH and accept the OU measures of the league. The results could be interpreted to mean that football match attendees, who are mostly fans of the home team, would prefer to see their team play against an inferior team and win than to see the home team lose or draw. However, contradictory results and the limited sample size mean that the results obtained are not generalisable. For this reason, there is a need for future research to evaluate both under-explored markets, such as the lower leagues,

youth football and women's football, and disaggregated data, particularly on the season ticket holders of the different football teams.

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Appendix

Table 1: Database search string

Database search string	
WoS	(("outcome uncertainty" OR "uncertainty of outcome" OR "game uncertainty" OR "game outcome uncertainty" OR "uncertainty of game outcome" OR "uncertainty of game outcome" OR "uncertainty of outcome hypothesis" OR "uncertainty-of-outcome hypothesis") AND ("football" OR "soccer"))
Scopus	TITLE-ABS-KEY (("outcome uncertainty" OR "uncertainty of outcome" OR "game uncertainty" OR "game outcome uncertainty" OR "uncertainty of game outcome" OR "uncertainty of game outcome" OR "uncertainty of outcome hypothesis" OR "uncertainty-of-outcome hypothesis") AND ("football" OR "soccer"))

Table 2: Selected documents

#	Author	Male authors	Female Authors	Short title	Journal	Citations	Citations/ Year
1	Peel and Thomas (1988)	2		Outcome uncertainty and the demand for football	SJPE	260	8
2	Peel and Thomas (1992)	2		The demand for football	EE	270	9
3	Czarnitzki and Stadtmann (2002)	2		Uncertainty of outcome versus reputation	EE	276	14
4	Buraimo and Simmons (2008)	2		Do sports fans really value uncertainty of outcome?	IJSF	10	1
5	Pawlowski and Anders (2012)	2		Stadium attendance in German professional football	AEL	193	19
6	Pawlowski and Nalbantis (2015)	2		Competition format, championship uncertainty and stadium attendance in European football	AE	74	11
7	Serrano et al. (2015)	3	1	Expected quality in European football attendance	AEL	37	5
8	Martins and Cró (2018)	1	1	The demand for football in Portugal	JSE	40	8

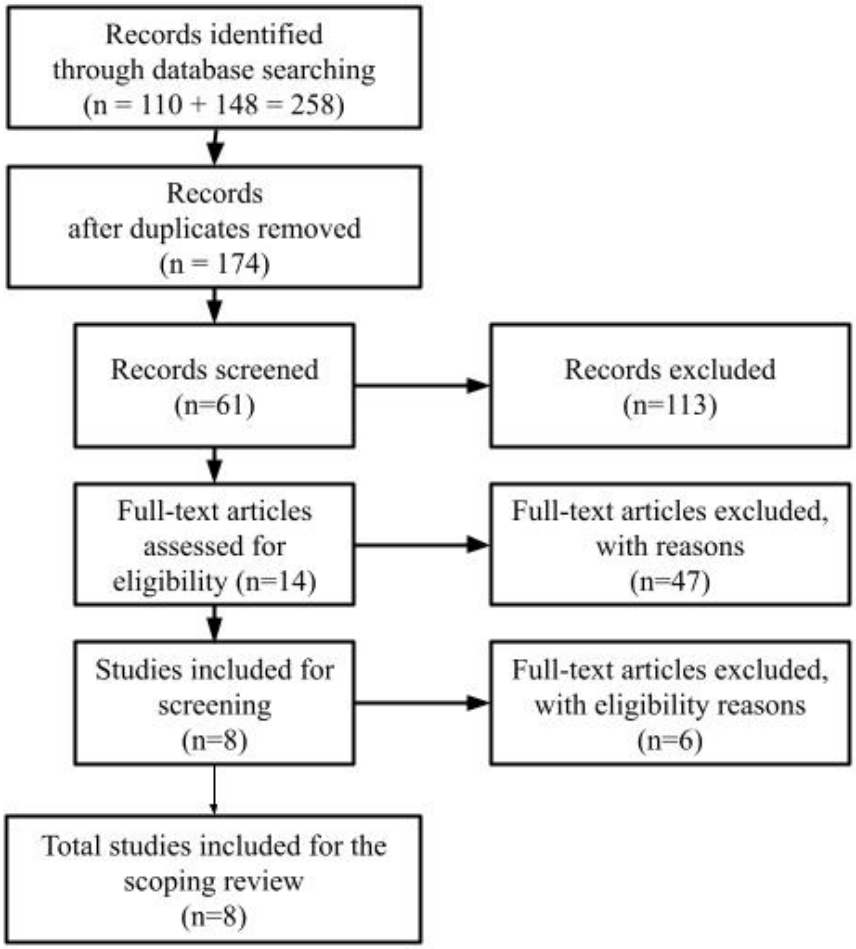
Nota = All numbers are rounded. AE = Applied Economics; AEL = Applied Economics/Letters; EE = Empirical Economics; GER = German Economic Review; IJSF = International Journal of Sport Finance; JSE = Journal of Sports Economics; SJPE = Scottish Journal of Political Economy.

Table 3: Summary of the key characteristics of the reviewed studies

#	Study	League(s)	Period(s)	Dependent variable	OU Proxies	Findings	UOH Measure	Estimation methods	UOH Support
1	Peel and Thomas (1988)	English football divisions 1-4	1981/1982	Log (total match day attendance)	Short-term OU: (1) Winning probability of home team (WPH)	(1) Significant positive	Betting odds	OLS	No
2	Peel and Thomas (1992)	English football divisions 1-4	1986/1987	Log (total match day attendance)	Short-term OU: (1) Winning probability of home team (WPH)[a]	(1) Significant U-shaped	Betting odds	OLS	No
3	Czarnitzki and Stadtmann (2002)	German Bundesliga	1996/1997-97/98	Total match day attendance	Short-term OU: (1) Winning probability of home team (WPH)[a] Mid-term OU: (2) Home or away team still have the chance to win the championship (UCS)	(1) not significant U-shaped (2) not significant	Betting odds	Tobit	No
4	Buraimo and Simmons (2008)	English Premier League	2000/2001-05/06	Log (total match day attendance)	Short-term OU: (1) Winning probability of home team (WPH)[a] (2) Probability inequality of the three game outcomes (THEIL)	(1) significant U-shaped (2) signigicant negative	Betting odds	Tobit	No
5	Pawlowski and Anders (2012)	German Bundesliga	2005/2006	Log (total match day attendance)	Short-term OU: (1) Probability inequality of the three game outcomes (THEIL) (2) Home team favorite (FAVORITE) Mid-term OU: (3)Home or away team still have the chance to win the championship (UCS) (4) Home or away team still have the chance to qualify for the UEFA Champions League (UCL)	(1) significant negative (2) not significant (3) significant positive (4) not significant home team; weakly significant away team	Betting odds	Tobit	Partial short-term no; mid-term partly yes
6	Pawlowski and Nalbantis (2015)	Swiss and Austrian 1 division leagues	2008/2009-12/13	Log (total match day attendance)	Short-term OU: (1) Probability inequality of the three game outcomes (THEIL) Mid-term OU: (2)Home or away team still have the chance to win the championship (UCS)	(1) not significant (2) significant positive	Betting odds	Tobit	Partial short-term: no; mid-term: yes
7	Serrano et al. (2015)	4 European leagues	2012/2013	Log (total match day attendance)	Short-term OU: (1) Probability inequality of the three game outcomes (THEIL) [a]	(1) partly significant inverse U-shaped (90% quantile)	Betting odds	Quantile regression OLS	No
8	Martins and Cró (2018)	Portuguese First Division	2010/2011-14/15	Log (total match day attendance)	Short-term OU: (1) Probability inequality of the three game outcomes (THEIL) (2) Home team favorite (FAVORITE) Mid-term OU: (3) Home or away team still have the chance to win the championship (UCS) (4) Home or away team still have the chance to qualify for the (UEFA) Champions League (UCL)	(1) significant negative (2) significant positive (3) significant positive home team; not significant away team (4) significant positive home team; not significant away team	Betting odds	Two stage least squares (2SLS) Two stage Tobit	No

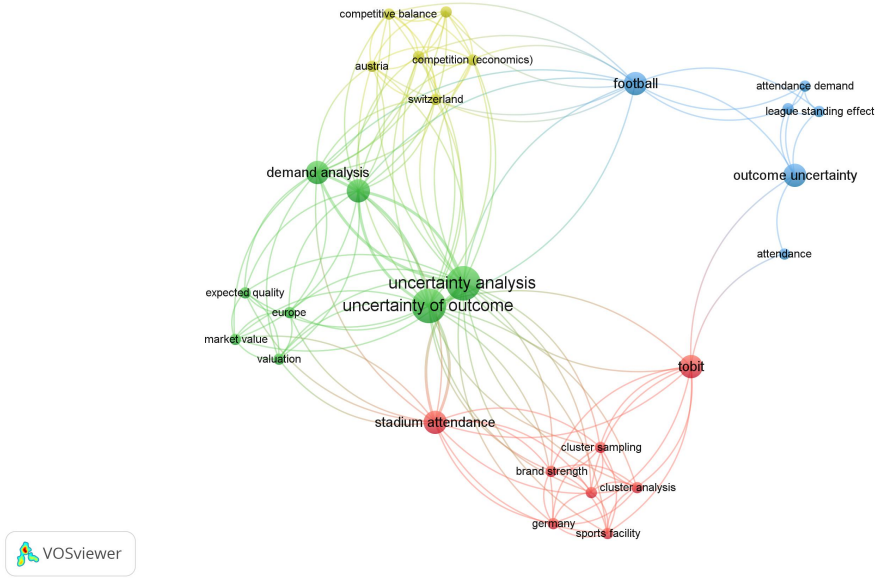
Note: All numbers are rounded.AE = Applied Economics; AE/L = Applied Economics/Letters; Book = Book chapter; EE = Empirical Economics; GER = German Economic Review; IJSF = International Journal of Sport Finance; JSE = Journal of Sports Economics; SJPE = Scottish Journal of Political Economy. [a] Including its square

Figure 1: Flow chart of study inclusion process



Source: adapted from Tricco et. al. (2016)

Figure 2: keyword co-occurrence clustering view.



Note: As can be seen in the figures, the main concepts are uncertainty of outcome y and its variant uncertainty of analysis, to which others very close to it are annexed, such as Stadium attendance, Tobit, outcome uncertainty, football y demand analysis.