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Entry into exit: Insolvency in English professional football

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Abstract: This paper uses a unique database of financial accounts for English football clubs between 1974 and 2010 to examine the process by which firms fail, which in this context means entering insolvency proceedings. From the data it is possible to estimate shocks to demand and productivity and to show that failing firms typically experience a series of negative shocks. This is consistent with the standard IO theory models of exit.

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1. Introduction

The reason that firms fail is an important question in management, business and economics. The standard economic view since (at least) the work of Jovanovic (1982) and Hopenhayn (1992) is that the forces underlying firm failure and the decision to exit from a competitive industry are driven by random shocks. Empirical studies of bankruptcy and exit have focused on the characteristics of firms that fail and the effect on industry returns, innovation and product market competition. However, due to lack of data most previous studies have not modeled the competitive process among *all* the firms within an industry to identify the causes of failure of *some* of them. The contribution of this paper is to use market and financial data from a specific industry to model the process of competition and identify the "shocks" which affect firms; empirical estimates are derived and it is shown that these do indeed increase the probability of failure.

The industry is English professional football. It consists of around 100 competitors whose performance is measured weekly through the process of league competition. Outcomes are measured with perfect accuracy (teams win, lose or draw). Team revenues and investments (primarily in players) are a matter of public record. Failure is commonplace, and firms enter administration (the UK equivalent of Chapter XI) at officially recorded dates.

In the paper the competitive process is modeled based on the relationship between (a) team performance (in terms of league position) and wage expenditures (mostly devoted to hiring playing talent) and (b) club revenues and team performance. This paper shows that failure can be identified with idiosyncratic shocks both to productivity (the wage-performance relationship) and to demand (the performance revenue-relationship). A shock in this sense is measured as the difference between the fitted values for each of these relationships and the realized values. The probability of failure increases significantly when firms experience a series of negative shocks.

The paper also has relevance to policy debates within the football industry. In recent years concerns about financial failure have led to increased pressure for regulation of budgets, culminating in the Financial Fair Play rules introduced by the European governing body (UEFA) in 2009.

The next section reviews the relevant literature. There follows a description of the organization of English football, the insolvency process in England and a simple model of insolvency. Section 4 describes the data and the regression results, section 5 concludes.

2. Literature

The causes of business failure are of longstanding interest. In the 1980s economists started to develop optimizing models which could account for the observed patterns of exit from an industry- e.g. Jovanovic (1982), Hopenhayn (1992), Ericson and Pakes (1995). These models rely on the notion of idiosyncratic shocks which affect the firm's perception of its true productivity. In this world, exit is rational once perceived productivity falls below some threshold value.

Estimation of structural models is challenging, but an early example is Olley and Pakes (1996) on telecommunications equipment and recent industry studies include Dunne et al (2013) (dentists and chiropractors) and Collard-Wexler (2013) (ready-mix concrete). This paper is related to this literature in that it estimates a structural model of competition using data on almost all firms in an industry to identify shocks that cause some firms to fail.

There is also a large literature on the estimation of exit probabilities using reduced form models with both multi-industry datasets, e.g. Dunne et al (1988), Disney et al (2003), Honjo and Harada (2006), Esteve-Pérez et al (2010), Fackler et al (2013) Lee and Mukoyama (2015), and industry specific datasets, e.g. Airlines (Joskow et al (1994)) and grocery retailing (Hosken et al (2016)). The main findings are that the probability of exit tends to decrease with firm size and that the relationship between firm age and turnover is often U-shaped, with both very young and very old firms at higher risk than middle-aged firms. In general these studies are based on large scale industrial surveys, and while it is possible to group firms into broad industry categories (e.g. using the Standard Industrial Classification), in most cases it is not possible to identify all of the direct competitors among failing and non-failing firms.

As Schary (1991) pointed out, exit can occur for many different reasons, including merger, voluntary liquidation and bankruptcy. In this paper "exit" takes the form of entry into the legal process of administration. Administration is a legal process in the UK which allows insolvent firms to reach an accommodation with creditors while allowing the business to survive. As a result, the shareholders typically see the value of the shares reduced to zero and new investors take control of the business (the process is explained in more detail in the next section). Hence while the business survives, the shareholders exit.

There have been numerous studies of the causes of bankruptcy, e.g. Cuthbertson and Hudson (1996), Kovenock and Phillips (1997), Donker et al (2009), El Kalak and Hudson (2016).[1] This research shows that bankruptcy is more likely when profitability is low and leverage is high. There is a long literature stretching back to Altman (1968) which uses accounting measures to

[1] There is also a literature on the ex post consequences of bankruptcy, e.g. Borenstein and Rose (2003), Ciliberto and Schenone (2012).

predict bankruptcies. Altman based his analysis on five well known accounting ratios –working capital/total assets, retained earnings/total assets, earnings before interest and taxes/total assets, sales/total assets and market value of equity/book value of total liabilities. The weight to attach to each of these ratios is derived by matching insolvent businesses with a sample of businesses with similar characteristics (e.g. size and industry). Such models have been widely used by practitioners to assess bankruptcy probabilities. In more recent times logit models have been developed (e.g. Ohlson (1980), Jones and Hensher (2004)).[2] For the industry studied in this paper financial statements are available for almost of the businesses that compete in the market. Rather than rely only on balance sheet data (assets and liabilities) to predict failure, the approach in this paper is to identify idiosyncratic shocks arising from the competitive process to explain the deterioration of the balance sheet as a business approaches insolvency.

The causes of bankruptcy have also been widely researched in the strategic management literature. This research tends to focus on case studies and generates more qualitative conclusions. For example Ooghe and De Prijcker (2007) develop a fourfold classification of bankruptcies- start-ups, (over)-ambitious growth, dazzled growth (extreme optimism and unrealistic perceptions) and apathetic management. Trahms et al (2013) review the literature on firm decline and turnaround focusing on managerial cognition, strategic leadership and stakeholder management. These are clearly more difficult concepts to quantify, but nonetheless can reasonably be considered likely to have an impact on outcomes. In the football industry it is commonplace to blame failure on poor leadership and especially over-ambitious growth plans and unrealistic perceptions. The influence of these factors is assessed below.

[2] One problem with these approaches is that the accounting variables are often not very informative, while the businesses themselves are heterogeneous, even within industry groups, and so predictive performance is not strong (see e.g. Ohlson pp124-130 and Peat and Jones (2012)). More recently attention has focused on whether information contained in share prices might not be a better predictor of insolvency, given that under the efficient market hypothesis the share price should contain all relevant information. Hillegeist et al (2004) show that an option pricing model can improve on the best alternative ratio-based indicator, but while the difference is statistically significant it does not appear large in absolute terms.

3. Insolvency in Professional football

(a) Context

Insolvency, meaning that the value of assets owned by a business is insufficient to cover its liabilities,[3] is a chronic problem in the world of professional Association football (soccer), the world's most popular sport. According to UEFA, 56% of European clubs participating at the highest level of national competition were loss-making in 2010 and 36% reported negative net equity (UEFA (2012a)). Since 2013-14 the eligibility of a club to play in international UEFA competitions has been assessed in relation to minimum financial criteria, including a determination that it is a going concern, has no overdue payables and no negative equity (these regulations are known as Financial Fair Play (FFP, UEFA (2012b)). UEFA reported that 56% of clubs failed to meet at least one of these criteria in 2010. Nor is this a recent phenomenon; financial crises in football are frequent and well documented.[4]

This paper examines cases of insolvency in English professional football from the early 1980s, when the first cases of the modern era arose, until 2010.[5] During this period the finances of clubs were unregulated and insolvency proceedings were commonplace in the lower divisions of English football: between 1982 and 2010 there were 67 cases of legal insolvency proceedings

[3] This "balance sheet definition" of insolvency should be distinguished from technical insolvency where the value of assets exceeds liabilities but in the short term the business does not have cash available to meet debt repayments. Technical insolvency can usually be dealt with by negotiation.

[4] See e.g. the symposium in the Journal of Sports Economics on the Financial Crisis in Europe, Lago et al. (2006), Szymanski and Smith (1997) and Jennett and Sloane (1985). A UK government report in 1968 revealed substantial losses among professional football clubs and commented "Ominously, clubs were in financial debt in inverse ratio to their likely capacity, in terms of playing success, to pay it off" (Department of Education and Science, p41). "If these clubs continue to incur losses at the present rate or at an increased rate, one must ask who will take responsibility for the accumulated deficits in, say, a decade's time, or even less? Is it possible for them to remain in existence or will there be increasing insolvency?" Ibid, p45.

[5] For a history of insolvency in football, both in England and elsewhere see Szymanski (2015), chapters 1 and 8.

among English clubs participating in the second, third and fourth tiers of English football.[6] Thirteen clubs experienced insolvency more than once over this period.

Insolvency does not mean liquidation. All of the professional football clubs that became insolvent in our database still survive. Either new investors acquired the club and injected capital, or, in a small number of cases, the business was liquidated but the club was resurrected and the new legal entity took over the stadium. While insolvency does not mean liquidation of the football club, it does typically entail turnover of the management and ownership team. The next section explains how the interaction of English insolvency laws with the organization and culture of football have brought this situation about.

Since 2010 a number of regulatory controls have been introduced. As well as UEFA's FFP, the English leagues have adopted financial regulations: the top tier (the Premier League) adopted Short Term Cost Control measures in 2013, the second tier (The Championship) adopted Profit and Sustainability rules in 2012 (since merged with Premier League rules) and in 2011 the third and fourth tiers (League One and League Two) introduced sanctions for failure to comply with their Salary Cost Management Protocol).[7]

The impact of these measures, notably FFP, on competition has been widely debated; for a positive view see Franck (2014), for a more jaundiced view see Szymanski (2014). While there is some theoretical analysis (e.g. Madden (2015) and Sass (2016)) as yet little empirical work has appeared. Peeters and Szymanski (2014) generate some predictions about the impact on wages using simulations based on the same database as used in this paper. Dimitropoulos (2016) finds

[6] Within this hierarchical structure the tiers are generally known as divisions, and the words will be used interchangeably here, but some care is required since the names of the divisions have changed over time. Hence the top division is now known as the Premier League but was formerly called the First Division; the Football League Championship (the second tier) was formerly known as the Second Division, and for a short while as the Football League Division One; the third tier has been called the Third Division, the Second Division, and is now Football League One; the fourth tier was known as the Fourth Division, then the Third Division, and now Football League Two. To avoid confusion I shall simply refer to each of these as the first, second, third and fourth tier/division.

[7] For more details on the current regulatory structure see http://www.financialfairplay.co.uk/.

some evidence that indebted clubs are less likely to choose high quality auditors following the introduction of FFP in order, he argues, to avoid sanctions. Scelles et al (2016) examined the pattern insolvency in French football over the period 1970 to 2014, although without financial accounting data, and found that clubs entered insolvency with roughly the same frequency, at the same levels, and for similar reasons as in England.

(b) Insolvency law and English football

Insolvency law[8] is complex and country specific. In English law a creditor can apply to a court to have the company wound up and its assets sold to repay creditors, usually under the temporary management of a professional insolvency practitioner (see e.g. Finch (2009), chapters 1 and 2). The purpose of the law is to protect creditors when a business is continuing to trade and incur liabilities while there is no realistic prospect of repayment. By the early 1980s it was widely perceived that the law gave undue power to certain creditors and too frequently provoked the winding up of companies that were in fact, given a reasonable settlement with creditors, capable of surviving as (profitable) going concerns (Cork (1982)). The Insolvency Act of 1986 significantly altered the law and extended a process known as "administration", whereby a company could place itself under the management of an insolvency practitioner whose job is to reach an agreement with creditors so that the business can survive (thus the legislation is akin to Chapter XI in US bankruptcy law).

By the end of the 1990s there was a consensus that the 1986 Act was still failing to ensure that viable companies could be rescued from liquidation (see e.g. Review Group (2000)). In particular it was argued that it continued to be difficult for a company to negotiate a write-off with its creditors. Thus the 2002 Enterprise Act created greater incentives for negotiation and placed more power in the hands of company directors to reach a voluntary arrangement.

[8] Under English law insolvency relates to corporations, bankruptcy to individuals.

Most of the insolvencies of English football clubs have involved either administration or a "company voluntary arrangement".[9] Whatever the perceived failings of insolvency law in the wider economy, football clubs have survived. Although there are 67 recorded cases of formal insolvency proceedings in the population between 1982 and 2010, 84[10] of the clubs that participated in the four divisions in 1982 also did so in 2010, while all but two of the remaining clubs were relegated to play in fifth tier.[11] Even when the limited liability company that owned the football club has been liquidated, the football club has been taken over by a new limited liability company. But in most cases the company itself survives, having reaching a deal with its creditors.

This unusual phenomenon arises from three special features of the industry. First, when a football club's performance on the field deteriorates it loses support, but there is always a small number of diehards prepared to stand by the club, and thus at almost any level of play it can generate some income. Second, a club can always adjust its wage bill to its current status. While competition for talent is intense, there is also a large supply of players, and at the lower levels individuals are willing to play for almost nothing (usually in the hope of gaining recognition and playing at a higher level). Third, the principal asset of any club is usually its stadium. In an unrestricted market the value would reside almost entirely in the land which could profitably be converted to commercial or residential uses[12]. However, local planning authorities seldom permit this to happen since they value the sense of community that a football club creates. Hence the only viable use of the assets of an insolvent football club is to continue operating as a football club.

While the club survives, insolvency is often a signal that principal owners of the club have decided to exit. In many cases exit is forced, since the club requires an injection of capital that

[9] See also Beech et al (2010) for a description of insolvency in English football.

[10] One team, formerly Wimbledon, relocated to Milton Keynes and was renamed MK Dons.

[11] Newport County and Halifax Town were closed down before being (almost immediately) reformed by fans, and made to start at the bottom of the competitive pyramid. Aldershot were forced to resign from the league in 1992 without completing their fixtures, but were later reformed. Maidstone United, whose insolvency occurred after they had resigned from the fourth tier, were reformed with a longer lag.

[12] many stadia in England, having been built over a century ago, are located in prime sites in cities that have grown significantly.

the existing owners are unable to finance. In other cases owners simply tire of owning the club. While clubs are, in themselves, often not profitable, owners can obtain indirect financial benefits (e.g. because of the opportunity to promote related businesses) or simply enjoy the consumption benefits and celebrity status associated with control of a significant community asset.[13]

Since the change in the law in 2002 the football authorities have become concerned that club owners are using the insolvency laws to write-off debt and obtain a competitive advantage. With the help of a friendly administrator a club can pressure creditors to agree to write-off most of what they are owed, allowing the club to emerge from administration as a more competitive entity. Since 2005 the football authorities have applied a sporting penalty for entering administration in the form of a deduction of points in the season following the start insolvency proceedings.

Given these peculiar features, it might be wondered how clubs obtain access to credit in the first place. Insolvencies have become relatively frequent but the sums of money involved are relatively small. In 2009/10 the total revenue across the four divisions totaled £2.5 billion, but the average turnover of clubs in the second tier was only £19 million, £9 million in the third tier and £3 million in the fourth. Clubs frequently obtain overdrafts from a local bank, and in most years clubs are able to service these loans. The largest creditor is usually the tax authority (owed payroll taxes and VAT). Since by law these taxes are paid in arrears, the tax authority cannot avoid becoming a creditor. In most cases it is the tax authority that starts insolvency proceedings.

(c) Insolvency in the context of the market

[13] See Zimbalist (2003) for a discussion of ownership motives in the context of football and also American professional sport.

Since 1958 English professional football clubs have been organized into four hierarchical divisions consisting of 92 clubs in total, connected through the system of promotion and relegation on sporting merit. The divisions are of roughly equal size[14] and once relegations are included around 120 clubs that have participated in the professional leagues since 1958.

The markets in which the clubs operate, for players and for supporters, are highly competitive. In the player market there are large numbers of buyers and sellers and player capabilities are well known. The search for talent is a vigorous, global process and the top players move relatively freely across national borders. Clubs generate revenues from game day (ticket sales, food and beverage, etc), TV revenues, merchandising and sponsorship. While local fan loyalty can be passionate, team performance is a significant determinant of revenues. Most broadcast revenue is generated at the highest tier (which also tends to make the highest tier the most financially stable), and attendance is significantly affected by the tier in which a team plays.

The intensity of competition is greatly enhanced by the system of promotion and relegation, [15] through which a number of the worst performing teams in a given tier are automatically sent down to play in the next lower tier at the end of the season, to be replaced by the best performing teams in the lower tier. Between 1974 and 2010 a team promoted from the second tier to the top tier enjoyed on average a 24% increase in attendance, while a relegated team saw attendance drop by 16%.[16] Merchandising and sponsorship revenues are highly correlated with the level of fan interest in a club. Thus while each division contains only 20 or so clubs, the

[14] There have been a number of minor reorganizations over the years- the top division currently consists of 20 clubs and the three lower divisions 24 each. Currently, each season there are three promotions/relegations to/from the top two divisions (The FA Premier League and the Football League Championship), four relegations/promotions from/to the third division (The Football League One) and two relegations from the fourth level (Football League Two) to the fifth level.

[15] This system is almost universal in the football world, but unknown in the professional major leagues of North America

[16] Promotion from 3rd to second raised attendance by 17% on average, and from 4th to third by 6%. Relegation from 2nd to 3rd tier reduced attendance by 12% on average and from 3rd to 4th by 3%.

threat of relegation hangs over an underperforming club during the season. The intensity of competition affects teams at all levels despite the fact that some clubs have enjoyed fairly consistent success. All but three clubs between 1974 and 2010 have spent time in at least two divisions (and so have been promoted or relegated at least once) and 21 clubs spent time in all four divisions.[17]

(d) Modeling insolvency in English football

Most panel data studies of firm failure/exit adopt a reduced form approach where the likelihood of failure is attributed to plausible exogenous variables. In this paper a structural model of competition is developed to identify deviations, labeled shocks, from expected performance which then contribute to the likelihood of failure. The process can be simply described. Clubs spend resources, primarily in the form of player wages, in the pursuit of sporting success (supply) which then generate revenues through ticket sales, merchandising and broadcast income (demand). Given that there exists a large and relatively transparent market for playing talent and a reliable relationship between success and fan interest, it is possible to model these relationships with a good degree of precision (and the participating clubs can be assumed to have a good understanding of these relationships). However, there can be negative productivity shocks to the wage-performance relationship or negative demand shocks to the performance-revenue relationship.

It is natural to associate random shocks with good and bad luck. According to the well-known "uncertainty of outcome hypothesis" advanced by Rottenberg (1956), some randomness is essential to sporting competition in order for it to be attractive to viewers. Because football is a low scoring game, outcomes are especially susceptible to random events.[18] Obvious sources of

[17] The three clubs are Arsenal, Everton and Liverpool. Everton finished one place above relegation on three occasions in the data.

[18] For example, in basketball there are typically between 50 and 100 scoring events in a game; if scoring opportunities are proportional to ability then it is very unlikely that a team of significantly less able players will win. By contrast most football matches are decided by a single goal and teams may have only a handful of scoring

bad fortune in the wage-performance relationship are injuries or loss of form by star players. An example of a negative shock to the performance-revenue relationship was the unexpected collapse of the ITV Digital broadcast contract[19] in March 2002, involving a loss equivalent to about 10-20% of annual income for the clubs affected. Within one year 12 clubs entered insolvency proceedings. This shock affected many clubs simultaneously, but negative shocks to demand can occur which are idiosyncratic; for example, a local economic downturn can reduce demand for attendance at home games of a particular club.

Shocks in this sense will have financial implications that will appear in the short term as financial losses (or lower than expected profits), which then undermine the balance sheet by leading to increased borrowing or short term sale of assets. A series of negative shocks could thus stretch the balance sheet to the point where the value of assets is no longer sufficient to cover liabilities and the club is required to declare itself insolvent.

The simple model of Szymanski and Smith (1997) can be adapted to focus on the issue of insolvency.[20] That paper estimated two relationships, now well established in the football finance literature. Firstly, because the market for players is highly competitive league performance is highly correlated with player wage spending (see e.g. Hall et al (2002), Simmons

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opportunities in a game, making the game more susceptible to chance. For a good discussion of this issue see Groot (2008).

[19] Properly speaking, what was unexpected was that the Football League, which signed the contract on behalf of the clubs, had failed to ensure that the wealthy parent companies of ITV Digital had signed the guarantees which they had agreed to provide, rendering the guarantees unenforceable (see Szymanski (2015), pp78-80 for details).

[20] Two papers have used data to analyse financial distress of football clubs. Barajas and Rodriguez (2010) used accounting data to test for the probability of insolvency for Spanish football clubs. They found that accounting measures similar to those used in the mainstream literature had no significant effect (although they questioned the reliability of the accounting data), while presence in the top division significantly reduced the probability of insolvency. Leach (2006), who uses a similar methodology to the one that will be adopted here, looked at the same population of football clubs over eleven seasons between 1990 and 2001. She estimated the relationships (1)' and (2)' below in error correction form and then used the residuals from these equations to explain (a) company credit ratings and (b) financial distress, in the form of adverse comments by the auditors in the company report and accounts. She found that negative residuals (meaning either a worse than expected league position conditional on wage expenditure, or lower than expected revenues conditional on league position) had a statistically significant adverse effect on credit ratings and raised the probability of adverse audit opinions.

and Forrest (2002, 2004), Torgler and Schmidt (2007), Carmichael et al (2010)). Hence we can write

(1) $P_i = a + b \frac{w_i}{\sum_i w} + \varepsilon_i, \quad a,b > 0$

Where P_i is league rank, which runs from 1 to 92 in the case of English professional football, w are wages and $\frac{w_i}{\sum_i w}$ is the Tullock contest success function – money buys talent and talent produces success[21] (for an analysis of contest theory and sports leagues see Szymanski (2003)) and ε_i is a random productivity shock.

The second relationship is between club revenues and league position- more successful clubs generate larger revenues, which is, ceteris paribus, equivalent to saying that demand is increasing in the quality of the home team (see e.g. Dobson and Goddard (2011), Buraimo et al (2007), Cox (2012)). [22] This can be written as

(2) $R(P_i) = c + dP_i + \eta_i, \quad c, d > 0$

Where η_i is a random demand shock. Profit is simply (2)-(1):

(3) $\pi_i = R(P_i) - w_i$

Ever since the work of Sloane (1971) it has been a widespread view among academics that football clubs in Europe are not profit maximisers (unlike North American sports franchises),

[21] In addition to wages, clubs often pay a transfer fee to acquire a player from another club, theoretically as a compensation for contractual services foregone. In most cases this does not amount to a substantial sum of money, but in a small number of cases it can amount to tens of millions of pounds. The transfer fee for each player is not identified, and hence a plausible amortization schedule cannot be derived. However, Szymanski (2013) based on research relating to reported Premier League transfer fees of players between 1992 and 2010, found that wages and transfer fees of players currently on a team roster, adjusted for aggregate transfer fee inflation, had a correlation coefficient with club wage bills of around +0.87.

[22] Clubs typically play around 40 games per season in league competition (half of them at their home ground). In addition they play some revenue generating games in domestic knock-out cup competitions and in international competitions such as the Champions League. These sources of revenue are included in the financial statements used in the estimating model applied in the next section, while the league performance of the team tends to be highly correlated with success in those other competitions.

but rather win maximisers (Késenne (1996)), so that all available income is spent on playing talent. "Available" here may also entail a soft budget constraint (see Andreff (2007) and Storm (2012)). Thus the objective of the owner can be written as

(4) Max $\Omega_i = \alpha\pi_i + (1 - \alpha) P_i$ subject to $\pi_i \geq k$

where k may be negative if the club faces a soft budget constraint. Assuming that the expectations of the random shocks are zero, then the symmetric Nash equilibrium when $\alpha = 1$ is

(5) $w = bd(n-1)/n^2$

where n is the number of clubs and expected profits are

(6) $\pi_i = ad + c + bd/n^2 + d\varepsilon_i + \eta_i$

For large n this expected profit is positive and equal to $ad + c > 0$.

For $0 < \alpha < 1$

(7) $w = (n-1)/n^2 (\alpha bd + 1 - \alpha)/\alpha$

so that $\partial w/\partial\alpha < 0$. Thus as α decreases (the owner places a greater emphasis on winning)

- wage spending increases, even though in the symmetric equilibrium the expected league position is constant and equal to 1/n
- The profits of the firm are driven down and may no longer be positive
- Even if profits are above zero in expectation, a random shock (i.e. negative realizations of ε_i or η_i) may be sufficient to generate short term economic losses.

From (6) it is clear that profitability is driven by random shocks to demand (η_i) and to productivity (ε_i) which can push profits below the budget constraint threshold k. at this point insolvency and exit may occur.

4. Data, regression model and results

(a) Descriptive statistics

English football clubs are limited liability companies (most have been so since the early 20th century). Under English law all limited liability companies have to publish annual accounts available for public inspection. Moreover, the date on which a limited company enters insolvency proceedings is also a matter of public record. The data used in this paper covers the four professional divisions of English league football over 37 seasons from 1973/74 to 2009/10.

In each season this amounts to a total of 92 clubs, but due to promotion and relegation from the fourth tier the database includes 109 clubs. Two thirds of the teams were present in all 37 seasons, and only 12 clubs were present for fewer than 10 seasons. Given that the league position is known for every team, the data represents the entire population (3404 club seasons) rather than a sample. The financial information was obtained from Companies House.[23] Data for revenues, aggregate club wage spending, pre-tax profits and balance sheet data on assets and liabilities can be extracted from the accounts. The data includes a full set of accounting information for 87% of the 3404 club seasons, plus abbreviated accounts[24] for a further 8%, leaving only 5% of club years for which there is no accounting information.

Figure 1 shows the trend in real (inflation adjusted) average club income by division from 1974 to 2010. The aggregate revenues of clubs in the top division have grown at 9.3% per year on average for 37 years, a 24-fold increase in real terms. This is an extraordinary rate of growth over such an extended period of time. While real growth rates have been less spectacular in the lower divisions, they have still been well in excess of the average real growth rates recorded by the UK economy over the period. At the aggregate divisional level revenue growth rates are not volatile and while negative in some years, in percentage terms declines are generally small.

Figure 1 here

[23] financial information can be downloaded from this website https://www.gov.uk/government/organisations/companies-house and all records back to around 2000 are now freely available. Earlier data can be obtained for a small charge; data from 1974 to around 2000 is supplied on a CD-rom and prior to 1974 they provide paper copies.

[24] Companies whose annual revenue falls below a certain threshold are not required to provide a full set of accounts.

Despite this rapid rate of growth, clubs have rarely managed to generate significant profits, as shown in figure 2. In each division total reported profits are seldom above zero. Given that profitability data is available for only 85% of the population and that financial accounts are often not available during insolvency, figure 2 probably overstates the average level of profitability. While some individual clubs may have sustained profits over some years, on average few do better than breakeven, and many do substantially worse.

Figure 2 here

The proximate cause of this financial weakness is evident in Figure 3. In the 1970s average team wage spending as a percentage of revenue was less than 50% in the top tier and 70% in the fourth tier. Despite the astonishing increases in revenues, the percentage of revenues devoted to wages has increased in all the divisions, particularly in the last decade and a half. From this perspective, the increase in insolvencies is perhaps not so surprising.

Figure 3 here.

The estimation in this paper will focus on the 48 cases where clubs became insolvent for the first time. There are thirteen clubs that experienced insolvency more than once but the accounting records for these repeat offenders are patchy rendering inference problematic. Figure 4 shows the average league position of the 48 clubs that entered insolvency proceedings (for the first time) since 1982, from 10 years before the event to 6 years after the event. League rank is treated as if continuous across divisions, so that top of the Premier League is 1, bottom of the Premier League is 20, top the Football League Championship is 21, and so on down to 92. The average rank for insolvent clubs lies between rank 45 (which is the highest rank of the third tier and rank 68, which is the lowest rank of the third tier).

The chart shows that in the five years prior to insolvency league rank declines from an average of 47 to 63 (16 places, a drop which almost inevitably entails relegation), while in the five years before that the average league rank is stable between 47 and 49.

Figure 4 here

Figure 4 also shows that by around six years after the insolvency event average league rank has risen by eleven places from the post insolvency trough, reaching the same position as two years before insolvency.

Table 1 further illustrates the pattern of decline into insolvency. Panel (a) shows the percentage of the previous ten seasons that insolvent clubs had spent in each of the divisions. There were no clubs in the top tier at the date of their first insolvency.[25] The clubs that went into insolvency while in the second tier had on average spent 48% of the previous ten seasons in the same tier, 47% in the top tier and only 5% of their time in the third tier. A similar pattern emerges for teams that became insolvent while in the third or the fourth tier. Clubs that became insolvent had spent more of the previous decade in higher tiers than lower ones, suggesting that insolvency was associated with a trend of declining league performance.

Table 1 here

For comparison, panel (b) shows the how all of the clubs in each division in 2010 were spread across the divisions in the previous decade. In the second tier teams had spent more time in the lower tiers than the top tier, while in the third tier they had spent approximately the same amount of time in higher and lower tiers. In the fourth tier teams had spent more time in higher tiers, but to a lesser degree than was the case for insolvent clubs.

(b) Regression analysis

This evidence suggests that insolvency is primarily a consequence of relative decline. However, to make this more specific a regression model is helpful. The approach adopted here is to estimate the wage-performance relationship (analogous to (1)) and the revenue – performance relationship (analogous to (2)) at the first stage and then at the second stage use the estimated residuals to infer the likelihood of insolvency.

[25] Portsmouth, the only team to enter insolvency while in the Premier League (in 2010), had already been through an administration process in 1999 while in the second tier..

Stage 1: estimation of the wage-performance and revenue-performance relationships

The measure of performance based on league position (as discussed above) is transformed to the negative of the log odds of league rank, lnp = (-ln(P/(93-P)) where P is the rank of the team in the league hierarchy (from 1 to 92).[26] The measure of team revenue is the log of club revenue in a given season relative to the sum of league revenues in the season (lnrelrev), which eliminates the inflationary trend evident in figure 1. Nonetheless, Fisher panel unit root tests strongly rejected that these variables have unit roots, and therefore an error correction framework was adopted, following Leach (2006). Thus the empirical counterpart to equation (1) is defined as:

(1') $\Delta lnp_{it} = \beta_i + \beta t + \beta 1 lnpit_{-1} + \beta_2 \Delta lnp_{it-1} + \beta_3 lnrelw_{it} + \beta_4 \Delta lnrelw_{it-1}$ + *promotion/relegation dummies + division/tier dummies + wage/tier interactions* + ε_{it}

In addition to the inclusion of relative wage spending (from the financial accounts), as suggested by (1), the estimating equation (1') includes lagged position, dummies for promotion and relegation (given the large adjustments involved in divisional movements), divisional dummies and the interaction of these dummies with wage spending, allowing for different wage-performance sensitivities in different tiers. Club and year fixed effects are also included. The empirical counterpart of equation (2) is defined as:

(2') $\Delta lnrelrev_{it} = \gamma_i + \gamma_t + \gamma_1 lnrelrev_{it-1} + \gamma_2 \Delta lnrelrev_{it-1} + \gamma_3 lnp_{it} + \gamma_4 \Delta lnp_{it-1}$ + *promotion/relegation dummies + top 5 dummies + division/tier dummies + revenue/tier interactions* + η_{it}

As well as including the impact of league performance (lnp) on revenues as suggested by equation (2), the estimating equation (2') includes promotion and relegation dummies, a dummy for teams in the top 5 (awarding access to lucrative European competitions), divisional

[26] Szymanski and Smith (1997) found that the log odds formulation worked well in estimation and this formulation has subsequently been adopted by other researchers (e.g. Buraimo et al (2007)).

dummies and interactions between revenues and tier, allowing that the sensitivity of revenues to performance may differ by tier. Club and year fixed effects are also included.

The main purpose of the regressions is to estimate the errors, which are interpreted as shocks. A negative residual from equation (1') implies that the club achieved a lower league position than it might have expected at the start of the season given the amount it was willing to spend on player wages. Given a lower than expected league position, this would in turn imply that the club generated a lower level of revenue than it would have expected at the start of the season. A negative residual from (2') implies that a club generated lower revenues than it might reasonably have expected given its league position. In both cases a negative residual implies financial stress. Over time, if these residuals are truly random, then they produce some better than expected years, some worse than expected years, and in the long run these effects will cancel out. However, in the short term a sequence of negative shocks could put significant pressure on the balance sheet of the club and hence precipitate insolvency.

Tables 2 and 3 report the OLS estimates of (1') and (2'). Standard errors are clustered around each club. Table 2 reports three variants of the estimating equation (1'), the first including position variables, the second adding relative wages and the third adding club and year effects.[27] The residuals from (1') for the next stage are taken from the third variant. Table 3 reports three variants of the estimating equation (2'); the second version allows for league rank to interact differently with revenues in different divisions, while the third includes club and year effects. The residuals from (2') for the next stage are taken from the third variant.

Tables 2 and 3 here

If the relationships in Tables 2 and 3 can be interpreted as causal then the implied long run elasticity of league position (lnp) to relative wage spending is around 0.8 and the elasticity of revenues to league position is around 0.5. Both of these estimates are significant at the 1% level and in line with the theory. These estimates could be biased due to problems of omitted

[27] The wage/tier interaction terms were dropped from (1') as these were not highly significant.

variables[28] or reverse causality, an issue addressed in this context by Hall et al (2002) and Simmons and Walker (2010). However, since we are using (1') and (2') to obtain best linear unbiased predictors of position and revenue in order to estimate the shocks to be employed in stage 2 of the analysis, we do not need to assume the exogeneity of the right hand side variables. The prediction is conservative in that the estimate of expected rank, for example, from (1') will pick up not only the effect of relative wages, but the effect of any omitted variable correlated with relative wages. Thus the residual only measures elements orthogonal to the included regressors, as is appropriate for the unexpected component.

Stage 2: Using the residuals from (1') and (2') to infer the probability of insolvency

The main focus of interest here is the residuals from (1') and (2'). Figure 5 is a plot of the kernel densities from (1') and (2'). While both plots appear normal, both fail a skewness-kurtosis test for normality; this appears to be because of some large outliers (fat tails). To check the robustness of the results, (1') and (2') were re-estimated using least absolute deviations (LAD) which does not require the assumption of normality, and these regression results are available on request from the author. The estimated coefficients from the regressions are very similar and results are not changed significantly.

Figure 5 here

The residuals from (1') and (2') are now used as regressors in a probit regression for the probability of entering insolvency proceedings. As well as the residuals, the regression includes divisional dummies, balance sheet ratios (the ratio of total liabilities to total assets and the ratio of net debt to revenues) and a dummy for the year 2002 (the ITV Digital collapse discussed in footnote 20 above which was a common shock to Football League clubs). The results are reported in Table 4.

Table 4 here

[28] A Ramsey Reset test rejected the hypothesis of omitted variables in equation (1') but not in (2').

It is not surprising to find that the divisional dummies are highly significant given the absence in the data of any club from the Premier League entering insolvency.[29] While competition is intense in all of the league tiers, the top tier benefits from significantly higher revenues and is hence less prone to insolvency. Likewise, the significance of the 2002 dummy is unsurprising given the number of clubs that became insolvent following the ITV Digital collapse. The ratio of liabilities to assets on the balance sheet is also highly significant, while the net debt to revenue ratio is positively correlated with the insolvency probability but is not consistently significant.

It was argued above that the cumulative effect of negative shocks may increase the likelihood of insolvency. Thus column 1 of Table 4 reports the coefficients for the sum of residuals from time t and t -1 for (1') and (2') respectively, column 2 reports the coefficients for the sum of residuals from time t to t-2, column 3 reports the coefficients for the sum of residuals from time t to t-3 and column 4 reports the coefficients for the sum of residuals from time t to t-4. The table also reports the joint significance of the residuals from (1') and (2').

All of the residuals have the correct sign – the larger the cumulative negative shocks the higher the probability of insolvency. In all four columns the shocks from the investment-performance regression (1') are all statistically significant at conventional levels. Shocks from the revenue – performance regression (2') are not generally significant despite being of similar magnitude to the shocks from (1'). However, all the residuals are jointly significant. Column 2, which uses current and two lags of the residuals has the highest pseudo-R^2, the largest values of the coefficients on the residuals and the highest level of joint significance.[30]

A further mechanism by which the residuals from (1') and (2') may trigger insolvency is explored in the next two tables. It was shown in Table 4 that insolvency is more likely when the ratio of liabilities to assets increases. One way for this to happen is as follows. If a team

[29] Portsmouth entered insolvency in 2010 while the Premier League but financial account for this season were not available and so they are not in the data

[30] One problem with using longer lags is that there is considerable attrition in the data- 16% of observations are lost in moving from column 1 to column 4 of Table 4. In the version based on estimation of (1') and (2') using LAD (not reported here but available on request from the author) only the residuals in columns 1 and 2 are jointly significant.

underperforms on the field (1') or fails to generate as much revenue as expected from performance (2') then there may be a tendency for the ratio of wages to turnover to rise. This in turn will increase the likelihood that the team will have to borrow, causing the balance sheet to deteriorate. However, if the club perceives this simply to be a consequence of a negative shock, it may attempt to maintain a high level of spending in the (rational) expectation that performance will improve. A further negative shock will cause a further deterioration in finances. Repeating this process a number of times will weaken the balance sheet and so increase the probability of insolvency.

Table 5 reports the relationship between the wage/turnover ratio and the residuals from (1') and (2'), using the same presentation as in Table 4. The divisional dummies are highly significant, meaning that the wage turnover ratio tends to be larger in lower divisions (this was illustrated by figure 4). Table 5 also shows that negative residuals have a positive impact on the wage/turnover ratio. These residuals are highly significant for all cumulative lag lengths, suggesting that negative shocks have a tendency to increase financial pressure on a club.

Table 5 here

Table 6 examines the relationship between the wage/turnover ratio (which comes from the profit and loss account) and two balance sheet ratios- total liabilities/total assets and net debt/revenue. It appears that there is a fairly predictable relationship: a higher wage/turnover ratio leads to a statistically significant deterioration in the balance sheet.

Table 6 here

To conclude the empirical section, a set of regressions (not reported here but available on request) were estimated to identify any negative impacts on performance post insolvency. As the evidence of figure 4 might lead one to expect, there is no evidence that an insolvency event has any long lasting effect, in the sense that the post-insolvency clubs face the same trade-offs as other clubs as identified in (1') and (2'), while the relationship between the profit and loss account and the balance sheet also seems unimpaired. One is left with the impression that negative shocks provoke insolvency, which leads to a company restructuring and a writing-off

of debts, which returns the club to its former good health, albeit typically under new ownership and control.

The results of this paper show that:

(i) There exists a relatively stable and predictable relationship between (a) player investment and team performance (Table 2) and (b) team performance and revenue (Table 3).

(ii) In the run up to entering insolvency, clubs on average experience a sharp decline in league performance over a five year period, following a period of relative stability (Figure 1).

(iii) Insolvency is a common event in the lower divisions where revenue generation is much lower than in the top division; only one club ever became insolvent while playing in the top division (Table 1)

(iv) The probability of becoming insolvent increases the greater the negative residuals from the estimated relationships described in (i), and in particular when these negative residuals are realized in successive seasons (Table 4)

(v) A series of negative residuals tends to be associated with a rising wage/revenue ratio, which is likely to stress the balance sheet (Tables 5 and 6).

Taken together, this evidence suggests that insolvency has more to do with a crisis of performance than lack of discipline or irrationality. In any one season a team may underperform for reasons that are not predictable, and this creates a financial stress. Repeated negative shocks intensify the stress, and this can lead to insolvency.

5. Discussion and Conclusions

The process by which firms exit from markets has been a subject of great interest in the literature. In the standard model of the theoretical literature random shocks (to demand and/or productivity) can push firms over the edge. These shocks emerge from a competitive

process among all the firms in an industry, even though only some fail. This paper uses a unique dataset comprising of almost all the firms of an industry to identify the shocks to demand and productivity which drive some firms into insolvency.

These results are of more than merely theoretical interest. There is a perception that insolvency in football is driven by excessive profligacy, clubs living beyond their means, a kind of irrational exuberance. This view has been endorsed by the European governing body, UEFA, which in 2009 introduced a form of financial regulation for clubs, called Financial Fair Play (FFP). The pre-amble to FFP Regulations claims that they will, inter alia, "introduce more discipline and rationality in club football finances" (UEFA (2012b), p2). On this view, clubs behave irresponsibly by spending beyond their means, generating excessive debt in the pursuit of success, leading ultimately to insolvency.

The results of this paper suggest a different story. Clubs exist in a hyper-competitive environment due to the incentives of the promotion and relegation system. In a competitive environment firms generate negligible profits and are always close to insolvency. A sequence of negative shocks can drive a club over the edge, no matter how rational or disciplined the owners.

It can be argued that many clubs suffer slumps in performance and not all become insolvent – there may be management failures involved in failing to adjust to declining performance, even indiscipline and irrationality. However, adjustment strategies to negative shocks are difficult to implement. The intense competitive pressures in professional league football means that any cut in wage expenditure in order to reduce costs is likely to lead to a deterioration in league performance which can in turn lead to relegation and a further collapse in revenue (for example, in 5% of relegations in the data the club was relegated by two divisions in successive seasons).

The regulatory measures adopted by UEFA and by the English leagues (see section 3(a) above) are intended to reduce the incidence of insolvency. In their 2016 Annual Review of Football Finance, the accountants Deloitte reported that no English league clubs had entered insolvency proceedings since 2013. Whether this trend continues and whether it can be attributed to regulation remains an important topic for future research.

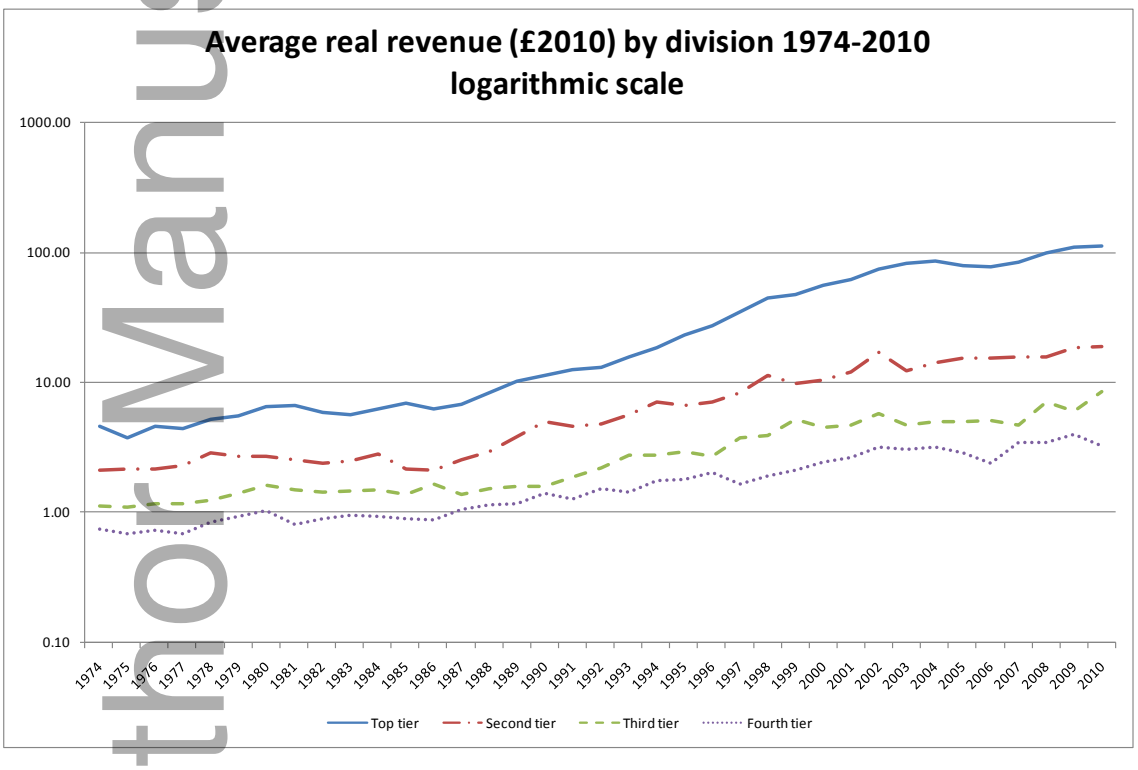


Figure 1: Average real revenue growth by division

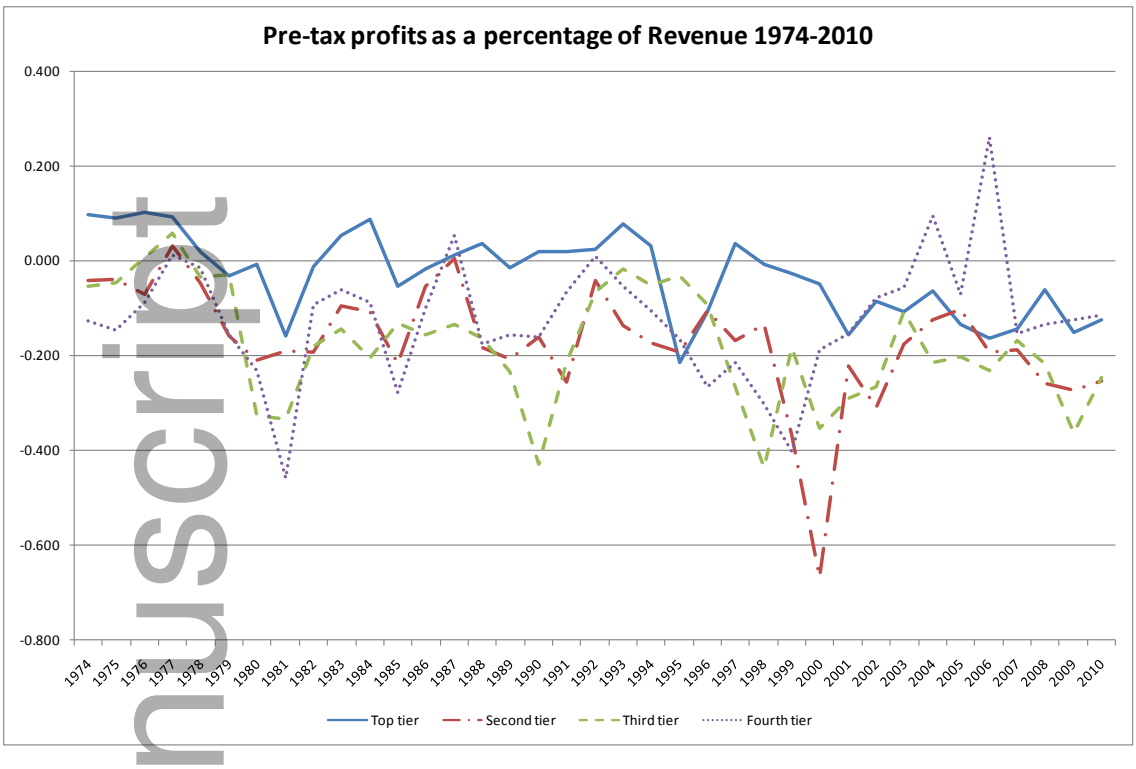


Figure 2: Profitability

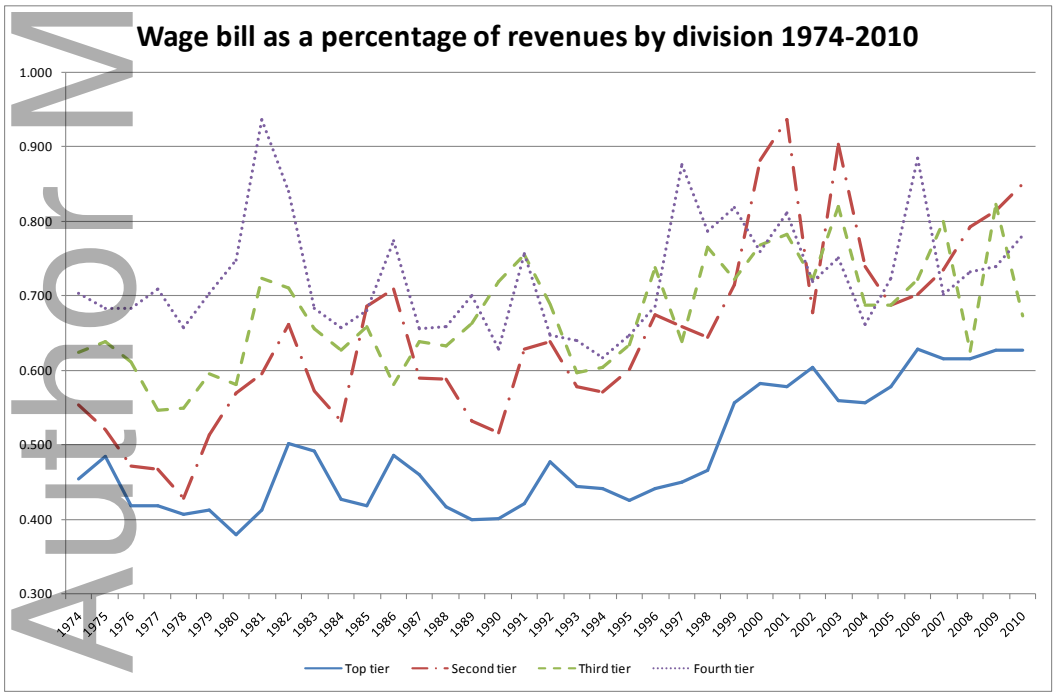


Figure 3: Wage bill as a percentage of revenue by division

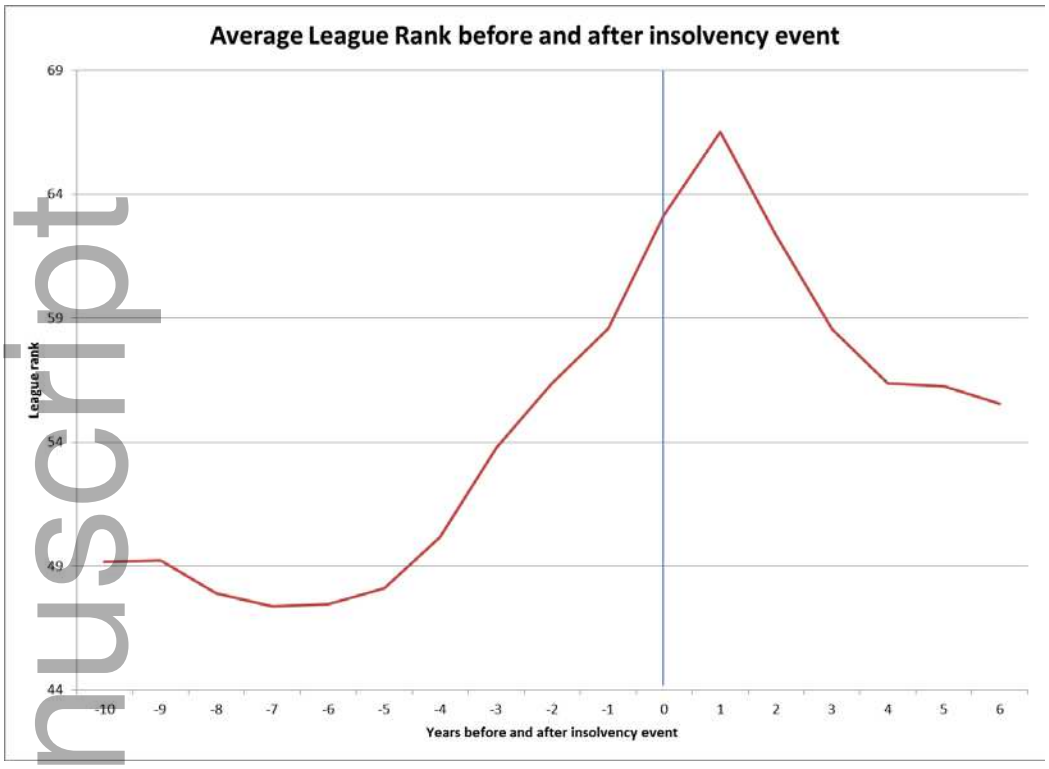
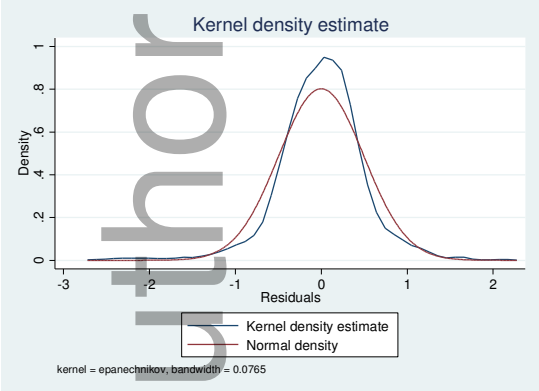
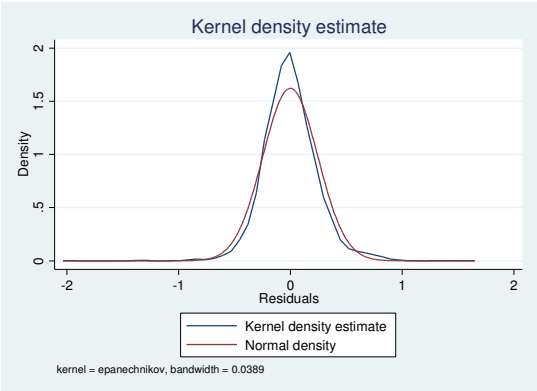


Figure 4: Average League Rank before and after insolvency

Note: number of observations from t-10 to 0 ranges from 48 to 45 and falls to 38 by t+6.





(a) position – wage regression (1') (b) revenue - position regression (2')

Figure 5: Kernel density estimates of the residuals from (1') and (2')

Table 1: Movement of teams between divisions

Panel (a) 10 year history of teams before year of entering insolvency

	fraction of club years in division over previous decade					
division at date of insolvency	**1**	**2**	**3**	**4**	**lower**	**n**
1	0%	0%	0%	0%	0%	0
2	47%	48%	5%	0%	0%	120
3	10%	30%	33%	24%	4%	210
4	0%	5%	32%	59%	5%	150

Panel (b) 10 year history of all clubs in the four divisions in 2010

	fraction of club years in division over previous decade					
Division in 2010	**1**	**2**	**3**	**4**	**lower**	**n**
1	68%	26%	5%	3%	0%	200
2	18%	49%	23%	8%	2%	240
3	8%	20%	43%	23%	6%	240
4	1%	8%	23%	46%	23%	240

Table 2: League rank and wage spending (dependent variable is Δlnp)

	Rank only	Rank and wages	Fixed effects

Lnp (t-1)	-0.399***	-0.426***	-0.685***
	(0.0634)	(0.0599)	(0.0469)
Δ Lnp (t-1)	-0.147***	-0.167***	-0.0518
	(0.0421)	(0.0388)	(0.0313)
Promotion (t)	0.426***	0.413***	0.244***
	(0.0643)	(0.0666)	(0.0555)
Promotion (t-1)	0.0337	0.0625	0.0464
	(0.0401)	(0.0393)	(0.0357)
Relegation (t)	-0.462***	-0.462***	-0.255***
	(0.0747)	(0.0721)	(0.0536)
Relegation (t-1)	-0.112***	-0.119***	-0.0617
	(0.0425)	(0.0435)	(0.0379)
Second tier	-0.616***	-0.426***	-0.600***
	(0.0833)	(0.0851)	(0.0730)
Third tier	-1.033***	-0.705***	-1.080***
	(0.148)	(0.152)	(0.119)
Fourth tier	-1.735***	-1.324***	-1.974***
	(0.252)	(0.248)	(0.184)
$\ln(\text{Wage}/\Sigma_{92}\text{wages})$ (t-1)		0.226***	0.224***
		(0.0274)	(0.0462)
$\Delta\ln(\text{Wage}/\Sigma_{92}\text{wages})$ (t)		0.659***	0.670***
		(0.0527)	(0.0573)
Constant	0.870***	1.750***	1.900***
	(0.116)	(0.149)	(0.232)
Observations	3,162	2,609	2,609
R-squared	0.357	0.417	0.491
Number of clubs			98

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Revenue and league rank (dependent variable is $\Delta \ln(Rev/\Sigma_{92}Rev)$ (t))

	Revenue and league rank	Revenue and league rank with rank/tier interactions	Revenue and league rank with fixed effects
$\ln(Rev/\Sigma_{92}Rev)$ (t-1)	-0.145***	-0.148***	-0.270***
	(0.0125)	(0.0119)	(0.0215)
$\Delta\ln(Rev/\Sigma_{92}Rev)$ (t-1)	-0.236***	-0.243***	-0.187***
	(0.0232)	(0.0220)	(0.0231)
Lnp (t-1)	0.119***	0.0367	0.0678
	(0.0158)	(0.0246)	(0.0443)
Δ Lnp (t)	0.120***	0.0782***	0.0848***
	(0.0133)	(0.0223)	(0.0307)
Top 5 rank (t)	-0.109***	-0.0303	-0.0359
	(0.0368)	(0.0389)	(0.0515)
Top 5 rank (t-1)	0.0675**	0.152***	0.146***
	(0.0309)	(0.0436)	(0.0471)
Promotion (t)	0.267***	0.298***	0.279***
	(0.0183)	(0.0248)	(0.0247)
Promotion (t-1)	0.0482**	0.0485**	0.0420**
	(0.0197)	(0.0189)	(0.0187)
Relegation (t)	-0.146***	-0.190***	-0.175***
	(0.0222)	(0.0237)	(0.0234)
Relegation (t-1)	-0.0540***	-0.0612***	-0.0480**
	(0.0199)	(0.0195)	(0.0185)
Second tier	-0.0904***	-0.320***	-0.331***
	(0.0279)	(0.0525)	(0.0814)
Third tier	-0.0769*	-0.0742	-0.0981
	(0.0419)	(0.0558)	(0.0855)
Fourth tier	0.130**	-0.0560	-0.109
	(0.0639)	(0.0616)	(0.0891)
Lnp (t-1) x T2		0.220***	0.209***
		(0.0406)	(0.0526)
Δ Lnp (t) x T2		0.148***	0.131***
		(0.0426)	(0.0450)

Lnp (t-1) x T3		0.411***	0.388***
		(0.0453)	(0.0550)
Δ Lnp (t) x T3		0.246***	0.235***
		(0.0386)	(0.0436)
Lnp (t-1) x T4		0.0614**	0.0296
		(0.0282)	(0.0463)
Δ Lnp (t) x T4		0.00404	-0.00896
		(0.0271)	(0.0341)
Constant	-0.749***	-0.621***	-1.244***
	(0.0620)	(0.0730)	(0.148)
Observations	2,652	2,652	2,652
R-squared	0.294	0.319	0.398
Number of clubs			98

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Dependent variable: Insolvency Event (probit)

	(1)	(2)	(3)	(4)
VARIABLES				
Second tier	3.929***	4.062***	3.879***	3.890***
	(0.342)	(0.355)	(0.355)	(0.390)
Third tier	4.170***	4.324***	4.233***	4.164***
	(0.279)	(0.291)	(0.328)	(0.365)
Fourth tier	4.047***	4.075***	4.013***	4.080***
	(0.299)	(0.269)	(0.290)	(0.331)
2002 dummy	0.938***	0.906***	0.933***	0.944***
	(0.284)	(0.276)	(0.275)	(0.284)
Total liabilities/total assets (t-1)	0.0613***	0.0639***	0.0613***	0.0581***
	(0.0192)	(0.0190)	(0.0189)	(0.0216)
Net debt/revenue (t-1)	0.0723**	0.0549	0.0560	0.0723**
	(0.0354)	(0.0366)	(0.0374)	(0.0341)

Wage-performance residual t: t-1	-0.365***			
	(0.123)			
Performance-revenue residual t:t-1	-0.359			
	(0.259)			
Wage-performance residual t:t-2		-0.411***		
		(0.120)		
Performance-revenue residual t:t-2		-0.474*		
		(0.281)		
Wage-performance residual t:t-3			-0.329***	
			(0.121)	
Performance-revenue residual t:t-3			-0.203	
			(0.277)	
Wage-performance residual t:t-4				-0.269**
				(0.110)
Performance-revenue residual t:t-4				-0.246
				(0.225)
Constant	4.170***	4.324***	4.233***	4.164***
	(0.279)	(0.291)	(0.328)	(0.365)
Observations	2,236	2,113	1,995	1,882
Pseudo- R^2	.164	.194	.186	.192
F-test for joint significance of residuals	11.34***	12.92***	7.49**	6.25**
p-value	.004	.002	.024	.044

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Dependent variable: the Wage-Revenue ratio

VARIABLES	(1)	(2)	(3)	(4)
Second tier	0.182***	0.181***	0.179***	0.177***
	(0.0232)	(0.0245)	(0.0262)	(0.0269)

Third tier	0.221***	0.223***	0.217***	0.213***
	(0.0274)	(0.0282)	(0.0296)	(0.0305)
Fourth tier	0.240***	0.225***	0.220***	0.218***
	(0.0296)	(0.0303)	(0.0324)	(0.0343)
Wage-performance residual t:t-1	-0.0620***			
	(0.00969)			
Performance-revenue residual t:t-1	-0.260***			
	(0.0226)			
Wage-performance residual t:t-2		-0.0502***		
		(0.00963)		
Performance-revenue residual t:t-2		-0.209***		
		(0.0234)		
Wage-performance residual t:t-3			-0.0384***	
			(0.00926)	
Performance-revenue residual t:t-3			-0.176***	
			(0.0230)	
Wage-performance residual t:t-4				-0.0300***
				(0.00913)
Performance-revenue residual t:t-4				-0.145***
				(0.0228)
Constant	0.578***	0.584***	0.592***	0.597***
	(0.0184)	(0.0193)	(0.0207)	(0.0216)
Observations	2,357	2,219	2,087	1,960
R-squared	0.250	0.243	0.232	0.214

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: The wage/revenue ratio and the balance sheet

Dependent variable:	Total liabilities/ total assets	Net debt/revenue
Wage/revenue (t-1)	0.629***	0.447***
	(0.190)	(0.149)
Wage/revenue (t-2)	0.550**	0.359***
	(0.231)	(0.116)
Wage/revenue (t-3)	1.122***	0.466***
	(0.263)	(0.174)
Wage-performance residual t:t-3	-0.0770*	-0.0918***
	(0.0405)	(0.0290)
Performance-revenue residual t:t-3	-0.344***	-0.216***
	(0.130)	(0.0769)
Constant	-0.276	-0.171
	(0.299)	(0.204)
Observations	2,114	2,205
R-squared	0.095	0.096

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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