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National Hockey League guaranteed contracts

A principal agent problem impacting on performance

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Abstract

Purpose – This paper aims to investigate, through the lens of the principal–agent problem, the relationship between payment of National Hockey League (NHL) salaries and player performance during the period of 2005-2011 and explore the inherent issues within the NHL player compensation and incentive structure.

Design/methodology/approach – The research adopts a pragmatic philosophy with deductive reasoning. This paper focuses on the NHL season 2005-2011 and undertake analysis of historical player contracts and performance data of 670 players across 29 clubs to undertake liner regression analysis.

Findings – This paper quantifies potential inefficiencies of NHL league contracts and defines the parameters of the principal–agent problem. It is identifies that player performance generally increases with salary, is higher in the first year of a contract and despite decreasing over the life of the contract, will usually peak again in the final year of the contract.

Research limitations/implications – The research is based around figures from 2005-2011 and secondary statistical data. The study captures quantitative data but does not allow for an exploration of the qualitative perspective to the problem.

Practical implications – Entry-level or first contracts are good for all teams and players because they provide incentive to perform and a reduction of risk to the team should a player not perform to expectations. The same can be said for players at the other end of the spectrum. Although not typically used much, performance bonuses for players over the age of 35 allow clubs to "take a chance" on a player and the player can benefit by reaching attainable bonuses. These findings therefore provide contributions to the practicing managers and coaches of NHL teams who can consider the results to help shape their approach to management of players and the planning of teams and succession planning for talent.

Originality/value – The paper presents a comprehensive and current perspective of the principal–agent problem in NHL and extends the work of Purcell (2009) and Gannon (2009) in understanding player performance enhancement.

Keywords National hockey league, Guaranteed contracts, Pay to performance problem, Principal agent problem

Paper type Research paper

1. Introduction

The increasing wages paid to players in the National Hockey League (NHL) and the prevalence of longer duration contracts has attracted a great deal of scrutiny in recent

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years, particularly in terms of the efficiencies of the league compensation structure. With tougher economic conditions and the addition of a league-wide team salary cap, league budgets can no longer absorb overpaid players that underperform. As such, there is a potential principal–agent problem in the way NHL contracts are drafted. This paper explores the inherent issues within the NHL player compensation and incentive structure and highlights where the principal–agent problem occurs. To do this, we examine the NHL contract signing process, investigate the relationship between contract and performance data from 2005-2011 and model player performance. From this, we quantify potential inefficiencies of NHL league contracts and define the parameters of the principal–agent problem.

2. Background: the context of the paper

To understand the nature of the principal–agent problem in NHL, it is necessary to understand the context of the problem. This is split into three elements, the value of the NHL as a sport and business, the background to how the NHL has developed and, finally, how contracts and salaries are arrived at and determined.

The NHL is considered to be the premier ice hockey league in the world (Wong, 2009). It is an unincorporated not-for-profit organization that has evolved and operated over the past 20 years with 30 franchise teams across the USA and Canada. However, the NHL competes for market share in North American professional sports, and currently trails the NFL, Major League Baseball (MLB) and the National Basketball Association (NBA).

Although the NHL lags behind the NFL in revenue, the sport of hockey in North America has made impressive gains in recent years. However, such gains have been on the back of a troublesome past. Declining popularity of the sport led to labor disputes that nearly ended the business in 2004, and the "player lockout"[1], which lasted the length of the 2004-2005 season was the first time in professional sports that a complete season had to be cancelled due to contract conflicts (Reece and Brandt, 2008).

The league environment at the time of the lockout saw many owners losing money due to the lack of parity among teams. The leading cause of the financial turmoil was associated with rapid league-wide expansion (Andrew, 2003) which affected profitability and popularity, and increased player salaries (Table I) (Bancker, 2011). The league expanded rapidly in the early 1990s into new southern markets and relocated teams that were financially deficient. This made it difficult to attract quality players. Despite expansion drafts allowing new teams to take players from existing teams, there remained a disparity in income and quality. Established teams protected their best players and kept a competitive advantage. Furthermore, new teams were forced to pay franchise fees to existing members upon entering the league. This allowed existing teams to spend more and attract better players.

The business model and revenue structure of the NHL is such that it relies primarily on gate fees to drive its bottom line. The Edmonton Oilers, the NHL's smallest market team, had $49 million of their $87 million in revenues come from gate receipts in 2009-2010 (Forbes, 2010). In contrast, the NFL's smallest market, the Jacksonville Jaguars, had $38 million of their $220 million in revenues come from gate fees during the same year (Forbes, 2010). The majority of the Jaguars revenue came from a league-wide television contract, of which each team was entitled to its share. The NHL has struggled to get media deals of this magnitude and thus relies on gate receipts. As such, lower gate

2000-2001		2003-2004	
Team	Total payroll ($)	Team	Total payroll ($)
New York Rangers	56,887,037	Detroit Red Wings	77,856,109
Detroit Red Wings	55,107,500	New York Rangers	76,488,716
Colorado Avalanche	51,692,500	Dallas Stars	68,578,885
Dallas Stars	50,050,000	Philadelphia Flyers	68,175,247
St. Louis Blues	47,092,500	Colorado Avalanche	63,382,458
San Jose Sharks	42,070,000	Toronto Maple Leafs	62,458,140
Washington Capitals	41,275,000	St. Louis Blues	61,675,000
Toronto Maple Leafs	41,003,187	Los Angeles Kings	53,833,800
Philadelphia Flyers	40,932,500	Anaheim Ducks	53,296,750
New Jersey Devils	39,151,118	Washington Capitals	50,895,750
Buffalo Sabres	38,690,416	New Jersey Devils	48,931,658
Phoenix Coyotes	34,626,833	Boston Bruins	46,569,000
Los Angeles Kings	34,557,500	Vancouver Canucks	42,074,500
Pittsburgh Penguins	33,677,333	New York Islanders	40,865,500
Carolina Hurrican es	32,473,250	Ottawa Senators	39,590,000
Florida Panthers	32,450,000	Phoenix Coyotes	39,249,750
Boston Bruins	31,875,576	Montreal Canadiens	38,857,000
Chicago Blackhawks	29,700,000	Calgary Flames	36,402,575
Ottawa Senators	29,086,250	Carolina Hurricanes	35,908,738
Anaheim Ducks	28,430,000	San Jose Sharks	34,455,000
Calgary Flames	26,542,500	Tampa Bay Lightning	34,065,379
Montreal Canadiens	26,529,200	Columbus Blue Jackets	34,000,000
Edmonton Oilers	25,050,000	Edmonton Oilers	33,375,000
Vancouver Canucks	24,703,750	Buffalo Sabres	32,954,250
New York Islanders	23,354,760	Chicago Blackhawks	30,867,502
Nashville Predators	18,437,500	Winnipeg Jets	28,547,500
Columbus Blue Jackets	18,287,400	Minnesota Wild	27,200,500
Tampa Bay Lightning	17,989,000	Florida Panthers	26,127,500
Phoenix Coyotes	17,818,175	Pittsburgh Penguins	23,400,000
Minnesota Wild	11,737,500	Nashville Predators	21,932,500

Table I.
Gap in team payrolls 2000-2001 vs 2003-2004

Source: USA Today Online: available at: http://content.usatoday.com/sportsdata/hockey/nhl/salaries/team/2000

attendance meant NHL expansion teams spent very little money on players during their initial years in the league and thus lost their competitiveness. From 2001 to 2004, the payroll gap widened, as wealthier teams began purchasing talent. It was during this period that the sport and business suffered as league games results become quite predictable.

Such an environment created a business philosophy based on spending the most money to buy success (Eitzen and Sage, 1997). This resulted in a 233 per cent rise in salary payments over an 11-year period.

While the cancellation of the 2004-2005 season was detrimental to stakeholders, the lockout proved to be beneficial to the league as a business because there was time to review league operations and plan for the future. The owners and players agreed to terms on a new CBA (2005)[2]. The major change was the decision to institute a salary

cap for each team. The salary cap (or Cap Hit) is a league-wide regulatory tool based on the contract amount divided by the length of the contract, and is used to control how much a team can spend on its players. It was put in place to ensure that clubs could maintain a viable business as well as help level out the playing field (Rosner and Shropshire, 2011).

The cap for the 2011-2012 season was set at $64.3 million (the timeline of this research). As the cap continues to rise so does the salary floor ($48.3 million); this forces teams in smaller markets to generate more revenues to meet spending (Table II).

The cap numbers are strict and there is no room for error. Having a cap provides added challenges for general managers and team owners. They now must allocate money more carefully in the hope of fielding a competitive team without overspending. The cap floor provides equal challenges for teams in smaller markets, as some find it difficult to spend until the minimum is "hit".

In recent years, teams have manipulated the cap by offering players long contracts with high values up front (present value of cash) and declining values as the player ages. What this does is create a lower average against the salary cap (or cap hit) and is a deciding factor for a player choosing one team over another. A particular problem arises, in that all NHL contracts are guaranteed and non-negotiable once signed. This forms the basis of our potential principal–agent problem.

In some cases, general managers have been found to be taking on extra years to a player contract at league minimum salary to bring down the "Cap Hit". Some declining contracts result in the player being well above the average age of typical retirement, and with considerably less salary. For example, Ilya Kovalchuk signed one of the most publicized deals the NHL history at the age of 27. Kovalchuk originally signed a 17-year contract worth $102 million. However, the NHL commissioner voided the contract based on the structure of the deal. Consequently, Kovalchuk signed a 15-year contract worth a total of $100 million a few weeks later. The payout per year and cap hit are demonstrated in Table III.

While the cap hit only appears marginally larger with the second contract ($660,000), it is significant enough to act as a deciding factor in signing another star player away from the free agency market. With a contract of this length, it is highly unlikely that Kovalchuk will ever complete all years of the first contract and potentially not even the second. So the NHL responded by making a case that, under the current CBA, the first contract structure was unjust. This does not change the fact that several other contracts were structured this way before Kovalchuk's deal.

Season	Salary cap ($ million)	Salary floor ($ million)
2005-2006	39	21.5
2006-2007	44	28
2007-2008	50.3	34.3
2008-2009	56.7	40.7
2009-2010	56.9	40.9
2010-2011	59.3	43.3
2011-2012	64.3	48.3

Source: The NHL League Office: available at: www.nhl.com/ice/news.htm?id=431786

Table II.
Salary cap and floor from 2005-2012

Table III.
Ilya Kovalchuk's contracts

Age	27	28	29	39	31	32	33	34	35	36	37	38	39	40	41	42	43	Cap hit
1	$6	$6	$11.5	$11.5	$11.5	$11.5	$11.5	$10.5	$8.5	$6.5	$3.5	$0.75	$0.55	$0.55	$0.55	$0.55	$0.55	$6
2	$6	$6	$11	$11.3	$11.3	$11.6	$11.8	$10	$7	$4	$1	$1	$1	$3	$4	–	–	$6.66

Source: Cap Geek: available at: http://capgeek.com/players/display.php?id=339

Under the current market condition created by the salary cap, this style of contract brings forth an important parallel issue, in that the longer a contract, the higher the risk to the team that a player becomes undesirable. If Kovalchuk's team is no longer satisfied with his performance or effort level, it will be very difficult in a salary-capped league to find him a new team. Certain contracts become unmovable and force a team to buyout the unwanted contract for a significant price. The term buyout refers to the option teams have where they pay the player a portion of the remaining salary. The benefit to the team is that only a portion of his contract counts against the salary cap over an extended period.

In tough economic conditions, it is presumable that most owners would disagree with wasting of capital, so it makes the contract process much more important. Consequently, there are few penalties for players underperforming. Guaranteed contracts provide security for the players but are risky for the owners. This raises the question as to what incentive a player has to perform, if he is guaranteed to receive compensation throughout the duration of his contract, even if the team and manager are trying to "squeeze" value out of their new signing (David, 2006). The asymmetry of information available to both players and managers creates an incentive problem (Holmstrom, 1979). Currently, there are no performance bonuses for players unless they are in their first contract (usually draft picks) or 35 years of age and older. As a result, many players can be paid in excess of their current performance, wasting precious cap space. This can be seen as a principal–agent problem related to the environment in which they operate that is common throughout the workplace and not just in professional sports (Scully, 1994). Guaranteed contracts with no incentive structures create discrepancies between managers and players. In other words, management's expectations of performance might not match the efforts put forth by the player or team (DeMatteo *et al.*, 1998), indeed, as Alchian and Demsetz (1972) would assert "Every team member would prefer a team in which no-one, not even himself, shirked" (p. 790). This is the issue we seek to explore.

3. Literature review

3.1 Principal–agent problem

Principal–agent problems ultimately exist in jobs that have some form of hidden actions, what Sannikov (2008) claims as "output being a diffusion process with drift determined by the agents unobserved effort". McEachern (2009, p. 322) defines the principal–agent relationship as:

> […] a relationship in which one party, known as the principal, contracts with another party, known as the agent, in the expectation that the agent will act on behalf of the principal.

The problem arises when the goals of an agent are mismatched with those of the principal. The examples used by McEachern (2009) are that of the services of mechanics, lawyers and stockbrokers, all of which contain some form of hidden or behind the scenes actions. Actions become difficult to assess, as employers are often behind closed doors, leading to differing objectives by the agent. This is not the case in professional sports because the contracts are readily available and the product can be watched. This makes the outputs transparent but often multifaceted and inseparable from the team (DeMatteo *et al.*, 1998).

However, Abdalla (2008) argues that the principal–agent problem is when the interests of agents are not aligned exactly with those of the principals. The principal–agent problem, therefore, is thought to arise in NHL in situations where players sign multi-year contracts which are guaranteed. The principals, however, can only monitor elements of the agent's actions resulting in the advancement of the agent's interests at the expense of the principal. In the NHL, this definition is apparent as personal habits or training throughout the summer is difficult for clubs to monitor, making performance measures incomplete and problematic (Feltham and Xie, 1994).

Abdalla (2008) continues by listing how the employer can respond to the agency problem. One remedy proposed ties employee compensation to the performance of the firm, an issue Haubrich (1994, p. 258) highlights as "pay does not depend enough on performance". This could work in NHL but may evoke emotions as to who actually helped the team's performance (Atkinson *et al.*, 1988; DeMatteo *et al.*, 1998; Idson and Kahane, 2000). The dangers in creating incentive plans to solve principal–agent problem is that they create perverse incentives. Abdalla (2008), therefore, proposes another form of compensation that is more direct, performance-based pay, either year-end bonus or piece-rate. The year-end bonus is something that most businesses are familiar with and is a way for a firm to share extra profits at the end of a business year. Piece-rate pay can be described as being paid by the number of units produced. These are both potential compensation systems, however, across the NHL, teams have different revenue streams and players may be inclined to sign with clubs where there is the greatest potential to earn additional income using their "monopsony power" (Richardson, 2000).

Something the NHL does not do is re-negotiate contracts during the term. Abdalla (2008) goes on to further suggest other proposals to align the incentives of workers with employers and that is to pay "seniority" wages. A worker is paid a rate lower than their marginal productivity upon being hired but see their wages rise as they demonstrate value to the company. This type of incentive could work well in the professional sports setting and more evenly distribute risk between management and players and, by using enforceable contracts, Atkinson *et al.* (1988) would claim that "the problem of an agents outputs being affected by the output of others could be diminished [with enforceable contracts]". Although as alluded to before, with the current reduction in the free agency market (the age of 27), it becomes difficult to retain a players services in such a competitive market. This was evidenced in baseball by Scully (1974) and subsequently by Richardson (2000) in exploring the NHL in the 1993-1994 season.

3.2 Incentives in organisations

Gibbons (1998) explored four new strands in agency theory that help expand views about incentives in organizations. However, it is difficult to relate the NHL to one agency theory in particular, as the business of professional hockey is unique. Gibbons (1998) demonstrates how the literature on incentives in organizations has made important contributions, which resulted in new areas of focus beyond the classic trade-off between insurance and incentives. Gibbons (1998) describes the agent as being risk-averse which is the key idea in the classic model. It looks at the two extreme cases of receiving no bonus contracts and contracts which the agent benefits from the total output. The efficient incentive rate is somewhere in between the two extremes depending on many factors led by the amount of risk or a person's risk appetite. Therefore, they typically cannot be used to create ideal incentives. As such, subjective incentives become

important. Gibbons (1998, p. 123) indicates that subjective assessments can be significant where workers have career concerns, concluding that "career-concern models show that subjective assessments matter when future compensation depends on current performance".

Skill acquisition concentrates on how a firm must evaluate a worker's potential contribution to future firm value, rather than what the worker has contributed to date. Such skill acquisition, relates closely to NHL contracts and the NHL arbitration process, with the shift from realized performance to potential performance being the challenge faced by most NHL managers and representing the separation between player and management. While firms use the promotion rules based on subjective performance assessments. This raises the issue of how to price a subjective assessment, which is considerably more complex to quantify in professional hockey. Indeed, as Idson and Kahane (2000) highlight "team attributes have both direct effects on an individual's pay, and indirect effects through altering the rates at which individual player productive characteristics are valued".

Similarly, Milne (2007) maintains that reward and recognition programs increase motivation, performance and interest within an organization. He goes one step further and asserts that team-based incentives can be more problematic, but if used correctly, it can result in positive outcomes (Milne, 2007). A view already expressed by Alchian and Demsetz in (1972, p. 790), who claimed "[…] the team is better, with team spirit and loyalty, because of the reduced shirking". Therefore, ideas behind reward- and recognition-type incentives create a specific culture, promoting loyalty and fostering teamwork.

3.3 The principal–agent problem in sports

While the former has established the theoretical underpinning of the principal–agent problem and related key concepts to the NHL, it is useful to understand what work has been undertaken already in the field of agency theory in sport, and where available, in ice hockey.

The main research undertaken by sport management scholars focusing on the sport of ice hockey is the work of Mason and Slack (2001a, 2001b, 2003). Here, the researchers have highlighted a variety of issues from agent certification programmes to opportunism by players' agents within ice hockey. In a broader discussion of agency theory in sport, the same authors put forward the subject as an alternative theoretical basis for future research in sport management (Mason and Slack, 2005; Faulkner, 1974). Having first addressed agency theory in ice hockey, their work has done much to outline the relevance of this approach for research in professional sport as the increased commercialization and commodification of the industry has led to a greater focus on the business practices of sport organizations.

Lambrinos and Ashman's (2007) study uses statistics in an attempt to determine if arbitrated contracts differ from negotiated contracts. Seven factors are focused on to help determine both negotiated and arbitrated contracts: overall performance, games played, league and team tenure, contribution to team performance in previous season, comparable to similar caliber player and salary to similar caliber player (Lambrinos and Ashman, 2007). Their results shed light on what type of player might benefit from going into arbitration and which player might avoid these procedures. This highlights the inefficiency from one contract to the next. The example used is of Bobby Holik, who was

awarded a salary of $3.5 million from an arbitrator in 2001-2002 only to receive a salary of $7.0 million plus a significant signing bonus in free agency the next year (Lambrinos and Ashman, 2007). The study brings up an interesting issue by claiming that the marginal revenue product is not likely to be so different from one season to the next and that someone was not measuring the marginal revenue product correctly (Lambrinos and Ashman, 2007), a problem highlighted by other prominent researchers such as Feltham and Xie (1994), Scully (1974) and Richardson (2000).

Purcell (2009) examined the principal–agent problem within professional sports and specifically with long-term contracts. The lack of perfect information (Holmstrom, 1979) between managers and players, as well as the guaranteed income a long-term contract provides, was predicted to present players with incentive to alter effort (resulting increased or decreased performance), particularly during the first year of a long-term contract. The results of a regression analysis indicate that a player's performance levels decline during the first year; however, the study did not suggest any increase in performance in the final year (Purcell, 2009). The regression used in Purcell's study used data from four major sports leagues in the USA (MLB, NBA, NFL and NHL), and separated each sport by position and statistics associated with that position. While it is problematic in that the study only used one player position for the NHL representation (in this case that of the goalkeeper), it does highlight a distinct principal–agent problem. Indeed, research by Maxcy *et al.* (2002) suggests that "the principal–agent problem predicts that long-term contracts can create inefficient pay and performance, unless mechanisms exist within the contract to prevent these". This contention is similar to Gannon (2009), who explored NHL player production during contract years. Gannon (2009) hypothesizes that players will perform better the year their contract expires and worse the first year into a contract due a decrease in incentive. The study applied nine independent variables believed to explain the dependent variable points per game. This study extended the work of Purcell (2009) by also evaluating forwards, not just goalkeepers, and using a data set of 416 players from one season. The findings indicated that of the nine independent variables five were found significant. According to his research, salary and nationality were found to positively affect points per game whereas year in league, first year and age negatively affected this performance measure. The last year of contract was found to be statistically insignificant. However, Gannon (2009) did refer to the work of Krautmann (1990) who, in examining baseball performance over a period of time, found "shirking" existed. An issue also highlighted by Alchian and Demsetz (1972) and Scully (1994). According to Krautmann (1990), there was no evidence of players adjusting their effort level in hopes of signing a bigger contract. This may be what prompted the President and CEO of the Boston Red Sox, Larry Lucchino to claim that it is widely believed across front offices that shirking does exist. Lucchino (cited in Gannon, 2009) claimed that it depended on the mentality of the player and that some are more financially motivated than others.

The next section of our paper focuses on the principal–agent problem, where we extend the study of the NHL context to represent 670 players of all positions over a six-season period, making our study considerably more comprehensive than those previously undertaken.

4. The research hypotheses

Based on the previous discussion, it can be seen that there may be evidence of "shirking" in a number of forms and studies. While Gannon's work (2009) indicated no statistical significance of "shirking" in the first year of a contract, in practice and from other studies (Alchian and Demsetz, 1972; Scully, 1994; Purcell, 2009), there is clearly a case to be explored.

The hypotheses for our work are therefore founded on the concept of "shirking" and on the nature of contracts offered to NHL players. While we recognize that financial incentives are important (Franke, 2000), we also take into account the "sports" nature of the context of the research and the need for players to gain "promotion" to increase their desirability, fame and transfer prospects. In this respect, promotion is seen as an increase in a player's time on the ice, or a player playing with a prominent scorer and increasing the potential visibility and performance of their contribution to the team e.g. points scoring. While this measure is subjective, it could be a driver for improving performance in the later years of a contract as the player seeks to renew of move "up" their contract value.

These contentions form the basis of our hypotheses as we extend the work of Purcell (2009) in terms of sample players and potions, and explore contractual components of the player–performance dilemma in which we see a principal–agent problem.

We have four hypotheses to test:

H1. As a player gets paid more and has a longer contract, the more his performance diminishes.

H2. The type of contract correlates to performance level.

H3. The number of years of a contract correlates to a decrease in performance level.

H4. A player's performance increases in the last year of a contract and decreases in the first year of signing.

5. Research design

The research adopts a pragmatic philosophy with deductive reasoning. A case study is built around the NHL and uses an analysis of historical player contracts and performance data found through various online sources (e.g. nhlpa.com, tsn.ca and capgeek.com) and potential correlations between the data. The performance variables are shown in Table IV.

Name	Club	Salary	Position
Age	Games played (GP)	Goals (G)	Assists (A)
Points (P)	Points per game (P/G)	Penalty minutes per game (PIM/G)	Plus minus (PM)
Time on ice per game (TOI/G)	Short handed time on ice per game (shTOI/G)	Power play time on ice per game (ppTOI/G)	Hits per game (Hits/G)
Blocked shots per game (Blks/G)	Days on roster (DOR)	Year of contract signed in the time period	Contract length in years

Table IV. Performance variables

5.1 The use of statistics in professional hockey

The successful manipulation of existing data in baseball opened the way for debate in hockey, as well as basketball. Mason and Foster's (2007) research examined implementing "Moneyball's" (Lewis, 2003) theories in the NHL. Lewis (2003) showed how a resource-constrained team in MLB used statistical analysis to inform its management decisions through focusing on quantifying player performance. However, unlike baseball, Gietschier (2005) notes that there is no single statistic to develop a useful formula. Thorne (2005) furthers this point, claiming hockey has a "ton of numbers and statistics" yet no "well-established system that tracks to give feedback on what player brings you the best results". Ken Holland, a well-respected NHL general manager, admits that they are trying to find the "best bang for their buck" and believes that statistics can help. He furthers his statement by recognizing that hockey will never be a statistics-driven sport like baseball because the games are separated by team effort more than individual efforts (Dater, 2006).

Despite the former, statistical analyses has been becoming more popular in the professional hockey industry, making sources of data available (Addona and Yates, 2010; Tarter *et al.*, 2009). However, there has yet to emerge a well-established and proven way of using such data to help teams manage their players (Thorne, 2005), not to mention as a foundation for researchers. The next section therefore explains the process used for this paper.

5.2 Regression model adopted

To understand the model adopted for the research, the starting point is to clarify the perspective taken for the principal–agent model forming the basis of the analysis. In this paper, various models were considered from profit signaling, peasant and landlord, employment relationships, gift exchange and contract monitoring. From these, the latter, contract monitoring was seen as the closest fit for NHL player performance modeling and allowed for the capture of salary to effort and concepts of shirking, linked to contracts offered. As such, contract monitoring forms the basis of the principal–agent model adopted where the player is the principal and the team is the agent. Using this model, the dependent variables for our study were identified as "points" and "points per game", while the independent variables were as listedas follows:

- Games played (GP);
- Age (age);
- Term of contract (contract term);
- Whether it was first year of contract (first.year);
- Whether it was last year of contract (last.year);
- Fraction of contract completed (i.e. contract.year/contract.term) (contract.fraction);
- Salary (on logarithmic scale) (log.salary);
- Salary squared (on logarithmic scale) (log.salary^2);
- Year; and
- Club. [Variables found not to be significant (in addition to above): Position (wing vs center); Whether contract was one-year deal; Age^2]

The regression model used is a simple linear group regression and in this research, relates to points scored related to all contracts, multi-year contracts and points per game and all contracts (Section 6). The quantitative data are analyzed using these regression models which account for variation of performance between players, and tries to model points (or points per game) as a function of games/minutes played, age, year, contract length, log scale salary and whether the player is in the first or last year of the contract. The regression is linear regression with an extra random effect term to see if there is a relationship between the data variables. The covariance is used to tell if variables move together and determines if variables are related or not. Statistical significance is tested via *t*-test and probability values are presented to ensure the relationships are not due to chance.

Section 6 presents the findings and discusses the three regression models.

5.3 Characteristics of the sample

The sample was composed of 670 NHL players in forward positions from 29 clubs, playing during the period 2005-2011 seasons. A database was constructed per season and player performance, position, salary, contract and profile were recorded. An extract of the database is shown as Appendix. Confidence level of the data recorded is high, as no estimations were made and all figures used were sourced from the same raw data. Year-on-year figures are seen as comparable and, while not adjusted for inflation, do allow for in year comparison and across year correlation or regression.

6. Results

The findings explore secondary data relating to player contracts and performance and a pragmatic realism perspective to the principal–agent problem.

6.1 Player contract and performance correlation

Measuring the relationship between performance and features of a player's contract, while adjusting for confounding variables such as games played, club and year, four multiple linear regression models were created. These models used points and points per game as a response (dependent) variable and were tested for significant effect using *t*-tests and *p*-values.

Figure 1 explores points and points per game versus salary on the log scale.

It is evident from Figure 1 that there is a clear increasing trend between points scored and salary level. This is not terribly surprising, as better-producing players get paid more. The curve (B) is from the result of a parabola to the points, while curve (A) is the outcome of modeling coefficients along with average values of the other variables (see above). The curve (B) suggests that after approximately $5 million, there is no longer an increasing performance trend. This finding may have interesting connotations for setting of salary levels.

Figure 2 explores points scored by contract year, including the last year of the previous contract (marked "last"). The findings are very revealing. For 5-, 4-, 3- and 2-year contracts entirely contained in the sampling period (2006-2011), it indicates points relative to the first year of the contract, broken down by player. Each colored line is a player, and, for a given contract year, the plot is that year's points minus year 1 points. Everything is still a point difference relative to the first year of the contract (marked "1" on the x-axis).

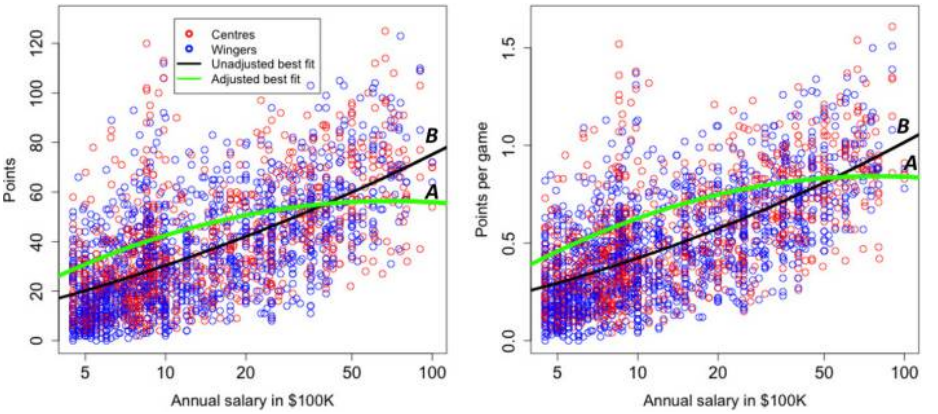

Figure 1.
Points vs salary and points per game vs salary

For this figure, contracts that were entirely contained within the study period were included – i.e. first year was 2006 or higher and last year was 2011 or lower.

The initial impression may be that players perform better in their final year, compared to the first year (*H1*). If that is correct, then one would see the last point (furthest right) often above 0. However, this does not consistently occur, indicating a tailing off of performance and potential "slacking" or "shirking" (Gannon, 2009).

Of course, there are many variable, such as age, that could account for that but it is worth noting.

To explore this more fully, in addition to the standard multiple linear regression model, the study allowed for a "random player effect" in the model. This means that it allowed for the fact that players have a baseline performance or ability level which varies from player to player. A player's own performance across the six years of study tended to vary less than the performance between players. The model assumes that each player's baseline performance, as a deviation from the average performance of all players, is a normal random variable. The model gives estimates of these values for each player. Each model is presented next.

6.2 Model summaries

When modeling the performance of players across points scored and points scored per game, with all contracts and multi-year contracts, Tables V-VIII are formed.

Each model presents the regression results, highlighting the degrees of freedom (df) as the number of variables free to vary during the computation of the statistical relationships. *t*-statistic and *p*-value indicate the statistical significance of the relationship between the independent and dependent variables and the likelihood of the variable groups being different or similar. The *t*-statistic indicates the relationship of the foci (in the tables, the foci is points scored or points per game) against the variables. Where the result is positive, the factor variable relates to the foci. The *p*-value determines the probability of "chance". In this case, where *p*-value is greater than 0.05, there is not any statistical significance and a null hypothesis can be accepted. With the *p*-value, 0.000 is not the absolute zero but a rounding up of figures to three decimal places.

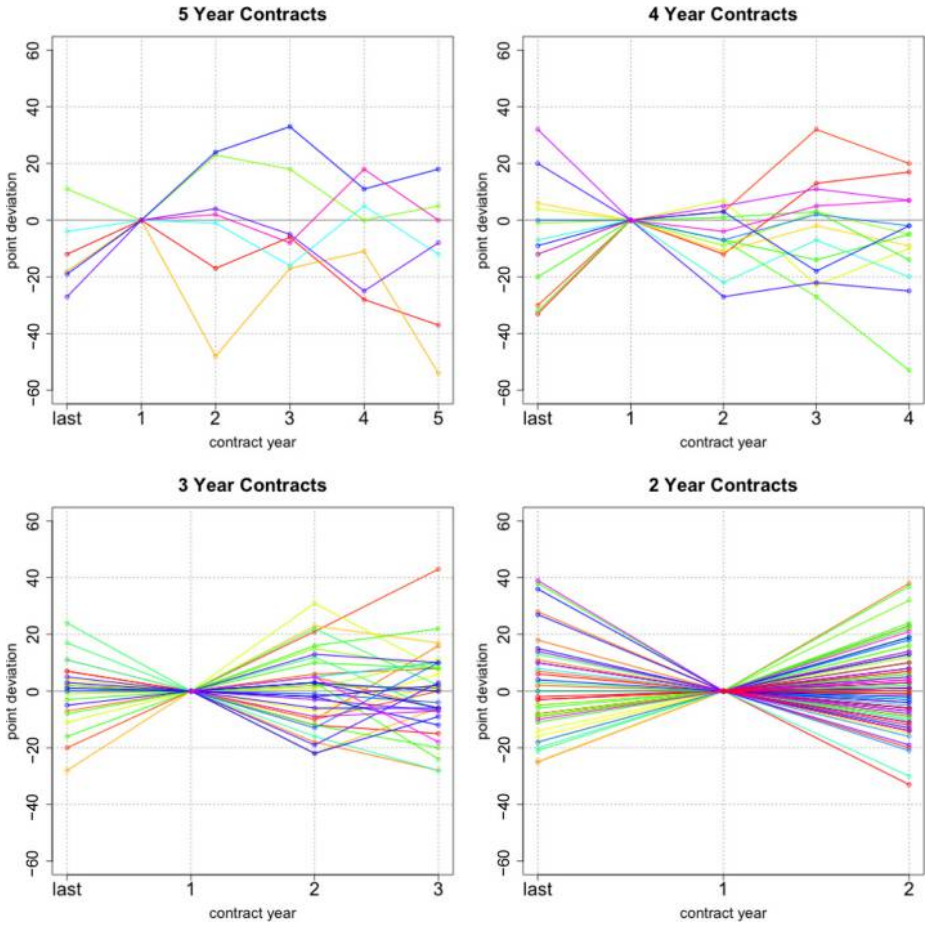

Figure 2.
Points by contract year 5-, 4-, 3-, 2-years

Table V indicates positive relationship in foci to variables across games played, contract term, first year of contract salary and games played in the contract year. This would seem to indicate that the performance of players does increase with salary in particular in situations where longer contracts are offered. As may be expected points scored increases with the more games played but age has little impact, as well as a *p*-value leading to caution in interpretation of the result.

Table VI indicates similar results to Table V with particular notable results of *p*-value of 0.929 for age and a greater emphasis on salary to points scored. Others results are much in line with the all contracts findings.

Table VII focuses on points per game for all contracts. From the results, the contract terms, salary and games played per contract year have significant impacts. As with the previous results, age has no impact and term of contract seems not to influence the points per game (in this context). However, the year of contract does seem to have some relationship to points per game, depending on first or last year of the contract.

Variable	No. of coefficients	Value	SD	df	*t*-statistic	*p*-value
(Intercept)	1	−893.593	126.251	980	−7.078	0.000
GP	1	0.408	0.059	980	6.894	0.000
Age	1	0.172	0.244	980	0.703	0.482
Contract.term	1	9.656	1.687	980	5.724	0.000
First.year	1	4.494	1.082	980	4.153	0.000
Last.year	1	4.377	1.628	980	2.688	0.007
Contract.fraction	1	13.220	4.339	980	−3.047	0.002
Contract.year	1	6.830	2.034	980	−3.357	0.001
Log.salary	1	116.297	17.705	980	6.569	0.000
Log.salary^2	1	−3.691	0.619	980	−5.967	0.000
Age × contract.term	1	−0.318	0.062	980	−5.146	0.000
GP × contract.year	1	0.129	0.027	980	4.826	0.000
Club	29	Not shown				
Year	5	Not shown				
Club: year	145	Not shown				

Table V.
Model 1. Points, including all contracts

Variable	No. of coefficients	Value	SD	df	*t*-statistic	*p*-value
(Intercept)	1	−1,094.078	138.257	773	−7.913	0.000
GP	1	0.426	0.072	773	5.924	0.000
Age	1	−0.028	0.316	773	−0.090	0.929
Contract.term	1	10.072	2.101	773	4.795	0.000
First.year	1	5.179	1.420	773	3.646	0.000
Last.year	1	4.778	1.753	773	2.726	0.007
Contract.fraction	1	−14.114	6.007	773	−2.350	0.019
Contract.year	1	−5.910	2.330	773	−2.536	0.011
Log.salary	1	142.803	19.431	773	7.349	0.000
Log.salary^2	1	−4.560	0.678	773	−6.724	0.000
Age × contract.term	1	−0.337	0.078	773	−4.299	0.000
GP × contract.year	1	0.124	0.030	773	4.111	0.000
Club	29	Not shown				
Year	5	Not shown				
Club: year	145	Not shown				

Table VI.
Model 2. Points, only multi-year contracts

Table VIII reinforces the results from Table VII. This seems to indicate that performance relationships between all contracts and multi-year only contracts provide the same results but that the multi-year contracts are less pronounced when linked to the type of contract but salary has a bigger impact on performance. These results are discussed more fully in Section 7.

Figure 3 presents the models using all the data (including one-year deals). The normal distributions illustrated, imply the model assumptions are acceptable.

6.3 Model Predictions

The Model Predictions below were created using the median Games Played (GP) for the data set, which is 76 GP. The examples are good illustrations of the general trend and

Variable	No. of coefficients	Value	SD	df	*t*-statistic	*p*-value
(Intercept)	1	−12.033	1.685	981	−7.142	0.000
Age	1	0.002	0.003	981	0.717	0.473
Contract.term	1	0.119	0.023	981	5.268	0.000
First.year	1	0.056	0.014	981	3.906	0.000
Last.year	1	0.062	0.022	981	2.888	0.004
Contract.fraction	1	−0.198	0.057	981	−3.445	0.001
Contract.year	1	−0.040	0.016	981	−2.523	0.012
Log.salary	1	1.619	0.236	981	6.862	0.000
Log.salary^2	1	−0.051	0.008	981	−6.241	0.000
Age × contract.term	1	−0.004	0.001	981	−4.795	0.000
GP × contract.year	1	0.001	0.000	981	5.920	0.000
Club	29	Not shown				
Year	5	Not shown				
Club: year	145	Not shown				

Table VII.
Model 3. Points per game, including all contracts

Variable	No. of coefficients	Value	SD	df	*t*-statistic	*p*-value
(Intercept)	1	−14.584	1.815	774	−8.036	0.000
Age	1	−0.001	0.004	774	−0.267	0.789
Contract.term	1	0.119	0.028	774	4.308	0.000
First.year	1	0.065	0.019	774	3.512	0.000
Last.year	1	0.070	0.023	774	3.080	0.002
Contract.fraction	1	−0.214	0.078	774	−2.728	0.007
Contract.year	1	−0.033	0.017	774	−1.905	0.057
Log.salary	1	1.963	0.255	774	7.703	0.000
Log.salary^2	1	−0.063	0.009	774	−7.053	0.000
Age × contract.term	1	−0.004	0.001	774	−3.855	0.000
GP × contract.year	1	0.001	0.000	774	5.821	0.000
Club	29	Not shown				
Year	5	Not shown				
Club: year	145	Not shown				

Table VIII.
Model 4. Points per game, only multi-year contracts

effect sizes. However, they are not ideal because the results appear sensitive to the GP value and the values of other variables.

The following predictions based on models are as follows:

(1) *Prediction 1*: Two players with same ability, team, year, age and 76 GP in two-year contracts, in years 1/2 of contract: player in Year 2 is expected to produce 3.75 fewer points than player in Year 1.

(2) *Prediction 2*: Three players with same ability, team, year, age and 76 GP in three-year contracts, in Years 1/2/3 of contract:

- Player in Year 2 is expected to produce 5.93 fewer points than player in Year 1.
- Player in Year 3 is expected to produce 2.98 fewer points than player in Year 1.

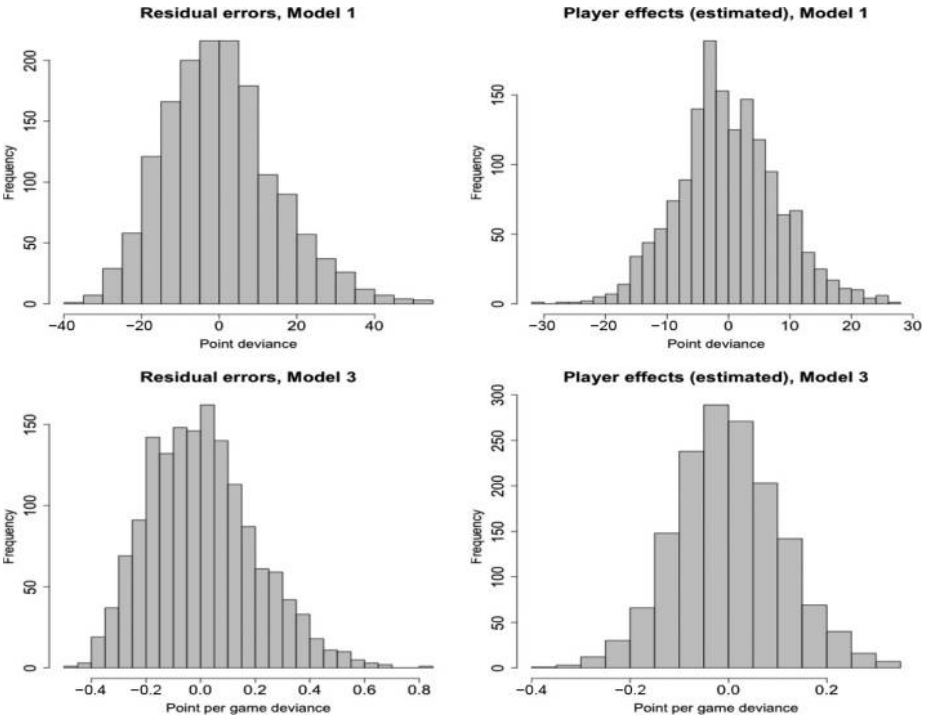

Figure 3.
Diagnostic histograms

(3) *Prediction 3:* Four players with same ability, team, year, age and 76 GP in four-year contracts, in Years 1/2/3/4 of contract:

- Player in Year 2 is expected to produce 4.83 fewer points than player in Year 1.
- Player in Year 3 is expected to produce 5.16 fewer points than player in Year 1.
- Player in Year 4 is expected to produce 1.11 fewer points than player in Year 1.

In summary, there is not much evidence of added incentive in the sense that players do not suddenly "turn it on" in the last year of a contract compared to the first year. The models indicate that the first year of contract provides a degree of performance which gradually decreases once contracts have been obtained. The performance then improves on previous years into the final year of a contract but still not to the level of a first year contract. This is the essence of the principal–agent problem and an issue for Managers in the NHL.

7. Discussion

Based on the findings, there is a clear principal-agent problem in NHL. The research has not sought to attribute blame but rather to explore what may cause such a problem. Such causes can be seen to lie in what we articulated as our hypotheses.

According to the empirical findings, those of most import are as follows:

- Performance generally increases with salary, but this relationship flattens out at high salaries (at around $5 million) (*H2*: true).
- Performance is generally higher in the first year of a contract, adjusting for the fact that performance decreases with age (*H4*: false).
- Baseline performance is higher for players with longer contracts; however, this effect diminishes later in the contract (*H1*: true).
- A player's production is expected to decrease slightly over the life of a contract (both total years and fraction years) (*H3*: true).
- There is a slight up-tick in production in the final year of a contract, but it does not usually offset the decline over contract term/fraction (*H4*: true).

According to the empirical study, performance generally increases with salary, but the relationship flattens out at high salaries (at around $5 million). A relationship can be drawn between paying a free agent to "keep them on the books" and influence the overall transfer market. In this sense, the player neither makes the team better nor would the player become a better player should he receive an extra income. So the question becomes: *for the money the team was going to pay for him, what could you get if you were to replace the player via trade or simply spending dollars elsewhere?* This particular case would suggest that the signing process is more efficient; however, the fact remains that many players do receive contracts in excess of $5 million and underachieve. This area requires further research involving interviews with NHL managers and key stakeholders. As such, it is out with the scope of this initial paper.

Considering the motivating factors found from the empirical study to experiences within the league, performance is generally higher in the first year of a contract; adjusting for the fact that performance sometimes decreases with age. This can be attributed to higher levels of confidence, security and dealing with less pressure. This is significant because it contradicts Purcell's (2009) study that examines the principal–agent problem within professional sport long-term contracts. Purcell (2009) found that performance levels declined among players in the first year, but noticed a slight increase in final year performance. Purcell (2009) says players would reduce effort because of the lack of incentives.

The correlation of game statistics also reveal that there is a slight "up-tick" in production in the final year of a contract, but it does not usually offset the decline over contract term. For a player in the final year of his deal, this can be a great motivator. In essence, players may compete harder and play at a higher level to secure a new contract. As such, a contract year creates an incentive for players to begin the season in their best physical and mental state and to maximize effort to perform to "have a big year" and to capitalize on the market. However, this is a highly individualized issue and one which aligns to professionalism and sportsmanship, thus it depends on human nature. Krautmann (1990, 1993) and Gannon (2009) found that in baseball players, there was no evidence of players adjusting their effort level in hopes of signing a big contract. We expect a similar situation occurs in NHL, indeed Luchino (cited in Gannon, 2009) of the Boston Red Sox front office claimed that "it depends on the mentality of the player [effort and performance] and some are more financially motivated than others".

The following three perspectives taken from the empirical analysis show that as a player gets paid more, and for longer periods of time, then he is more susceptible to performance decline:

- Baseline performance is higher for players with longer contracts; however, this effect diminishes later in the contract.
- For older players (roughly 30+), the correlation between point production and contract term reverses.
- A player's production is expected to decrease slightly over the life of a contract (both total years and fraction of years).

The previous statements set *H1* as true. It becomes apparent that incentives across all levels could work to eliminate the problem. However, Prendergast (1999) contradicts this view by suggesting that the addition of incentives to performance can lead to dysfunctional responses, where workers focus solely on the one performance that will return the most reward. Futterman and Clegg's (2011) article in the *Wall Street Journal* brings this research full circle. The article asserts that professional sports teams are looking for that extra motive, in this case, statistics, to warrant signing a player to these high-dollar amounts.

The fans' lack of satisfaction with a player's pay to performance ratio is pervasive, and provides evidence supporting the existence of a principal–agent problem. It does not take an economist or a hockey expert to determine that there are a few players who are not "carrying their weight". However, these views are regarded as subjective, and are difficult to concretely establish given their often changing nature.

There are many contracts where a player's pay exceeds his performance after every season. The problem is that players are unpredictable, and their performance tends to fluctuate year to year based on a multitude of variables. Historical performance is not a solid indicator of future performance, although there are the cases every year in which a player's performance far exceeds that of his current pay.

8. Conclusions

Our paper has explored the inherent issues within the NHL player compensation and incentive structure and highlighted where the principal–agent problem occurs. We examine the NHL contract-signing process, investigated the relationship between contract and performance data from 2005-2011 and modeled player performance. From this, we quantified potential inefficiencies of NHL league contracts and defined the parameters of the principal–agent problem. Our findings indicated a number of contributions to the field. We see these as relating to practice, policy and theory.

From a practice perspective, it is clear that the principal–agent problem is most relevant in Restricted Free Agent or second contracts as well as long-term contracts which take players well into their 30s. It was evident that entry-level or 1st contracts are good for all teams and players because they provide incentive to perform and a reduction of risk to the team should a player not perform to expectations. The same can be said for players at the other end of the spectrum. Although not typically used much, performance bonuses for players over the age of 35 allows clubs to "take a chance" on a player and the player can benefit by reaching attainable bonuses. These findings, therefore, provide contributions to the practicing managers and coaches of NHL teams

who can consider the results to help shape their approach to management of players and the planning of teams and succession planning for talent.

From a policy perspective, our research has generated interesting findings which can help shape NHL policy. The research revealed three key areas that prove to be problematic to the NHL:

(1) The death of the second contract, which is described by players signing long-term speculative deals upon exiting entry-level contracts.

(2) The increasing percentage of revenues awarded to the player salary cap number.

(3) The reduction of free agency age.

These are the three areas at the root of the inflationary contract trend that when coupled with guaranteed contracts create the principal–agent problem between management and players and need to be addressed.

To address such issues, the CBA should seek to reduce salaries paid to players to ensure balance in the partnership. This also gives teams with smaller revenues a chance to maintain a viable business. Incentivizing players with special attention to the second contract could improve the longevity of performance (and effort). Bonus money could then be completely up to management and the team could realign commitment and balance authority and responsibility within team management. Arguably, these suggestions require radical thinking, but realign the principal with agent and encourage the players to continue to perform throughout the contract term.

With regards to contributions to theory, the first contribution we have made is through the testing of the four hypotheses. Our results indicated that there is a link between players pay and the length of contract and the type of contract players are awarded. This adds to Purcells work by adding additional variables to consider, linked to performance and extending the player positions. The composite result is a more holistic understanding of the principal–agent problem in NHL and potential for further areas of study.

In addition to extending the study of principal–agent issues in NHL, the research also highlighted the increased interest of sport science and need for research and evidence to support understanding of performance in all sports at the highest levels. In this regard, our work has highlighted the potential of athletes prolonging their careers and in the process sustaining high levels of performance at an age where previously they would have been considered too old. Alongside this, it is also the case that, as athletes become bigger and stronger, then in some high-contact sports, the careers of top players may become shorter as the increased physicality takes its toll on the body. These are on-going concerns for those involved with elite physical sport, e.g. NFL, NHL or rugby union, and are likely to become the focus of research across various sports leagues. Our work has reinforced this important area for future study while extending existing work on NHL principal agent issues (Purcell, 2009; Gannon, 2009; Mason and Slack, 2001a,2001b).

In addition, it is recognized that there are a number of issues impacting upon this area and that with something as complex as team performance then a range of factors are important and can impact upon the issues identified in our paper. The approach put forward in *Moneyball* (Lewis, 2003) can be seen to be ever more prominent in the more fluid team games like ice hockey and football and an increased focus on sport science

incorporating ever-more sophisticated notational analysis techniques has resulted in a much clearer quantification of individual player performance. Our future research will explore the views of managers and senior stakeholders in the game relative to the principle–agent issue. We will also explore the issue of trust in principal–agent relationships, as this is an area where the opportunism of some agents can have an impact upon an athlete's performance (Mason and Slack, 2001a) and influence their productivity on the ice.

Notes

1. A result of the 2004 Collective Bargaining Agreement (CBA) not being signed.
2. The CBA is a labor agreement between the board of governors (the NHL owners) and the players, represented by the National Hockey League's Players Association (NHLPA).

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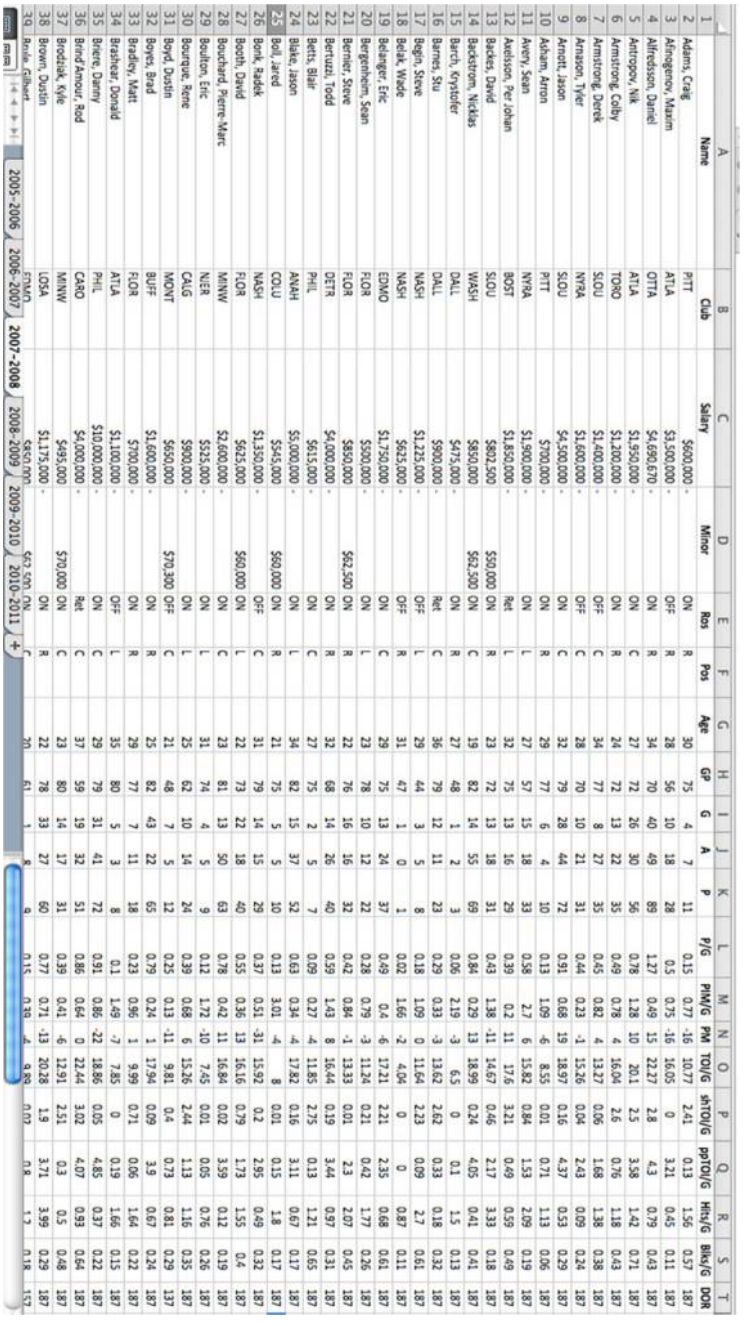
Appendix



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Name	Club	Salary	Minor	Ros	Pos	Age	GP	G	A	P	P/G	PIM/G	PM	TOI/G	shTOI/G	ppTOI/G	Hits/G	Blks/G	DOR
2	Adams, Craig	PITT	$600,000	-	ON	R	30	75	4	7	11	0.15	0.77	-16	10.77	2.41	0.13	1.56	0.57	187
3	Afinogenov, Maxim	ATLA	$3,500,000	-	OFF	R	28	56	10	18	28	0.5	0.75	-16	16.05	0	3.21	0.45	0.11	187
4	Alfredsson, Daniel	OTTA	$4,680,670	-	ON	R	34	70	40	49	89	1.27	0.49	15	22.27	2.8	4.3	0.79	0.43	187
5	Antropov, Nik	ATLA	$1,950,000	-	ON	C	27	72	26	30	56	0.78	1.28	10	20.1	2.5	3.58	1.42	0.71	187
6	Armstrong, Colby	TORO	$1,200,000	-	ON	R	24	72	13	22	35	0.49	0.78	4	16.04	2.6	0.76	1.18	0.43	187
7	Armstrong, Derek	SLOU	$1,400,000	-	OFF	C	34	77	8	27	35	0.45	0.82	4	13.27	0.05	1.68	1.38	0.38	187
8	Arnason, Tyler	NYRA	$1,600,000	-	OFF	C	28	70	10	21	31	0.44	0.23	-1	15.26	0.04	2.43	0.09	0.24	187
9	Arnott, Jason	SLOU	$4,500,000	-	ON	C	32	79	28	44	72	0.91	0.68	19	18.97	0.16	4.37	0.53	0.29	187
10	Asham, Arron	PITT	$700,000	-	ON	R	29	77	6	4	10	0.13	1.09	-6	8.55	0.01	0.71	1.13	0.06	187
11	Avery, Sean	NYRA	$1,900,000	-	ON	L	27	57	15	18	33	0.58	2.7	6	15.82	0.84	1.53	2.09	0.19	187
12	Axelsson, Per Johan	BOST	$1,850,000	-	Ret	L	32	75	13	16	29	0.39	0.2	11	17.6	3.21	0.49	0.59	0.49	187
13	Backes, David	SLOU	$802,500	$50,000	ON	R	23	72	13	18	31	0.43	1.38	-11	14.67	0.46	2.17	3.33	0.18	187
14	Backstrom, Nicklas	WASH	$850,000	$62,500	ON	C	19	82	14	55	69	0.84	0.29	13	18.99	0.24	4.05	0.41	0.41	187
15	Barch, Krystofer	DALL	$475,000	-	ON	R	27	48	1	2	3	0.06	2.19	-3	6.5	0	0.1	1.5	0.13	187
16	Barnes, Stu	DALL	$900,000	-	Ret	C	36	79	12	11	23	0.29	0.33	-3	13.62	2.62	0.33	0.18	0.32	187
17	Begin, Steve	NASH	$1,225,000	-	OFF	L	29	44	3	5	8	0.18	1.09	0	11.64	2.23	0.09	2.7	0.61	187
18	Belak, Wade	NASH	$625,000	-	OFF	R	31	47	1	0	1	0.02	1.66	-2	4.04	0	0	0.87	0.11	187
19	Belanger, Eric	EDMO	$1,750,000	-	ON	C	29	75	13	24	37	0.49	0.4	-6	17.21	2.21	2.35	0.68	0.61	187
20	Bergenheim, Sean	FLOR	$500,000	-	ON	L	23	78	10	12	22	0.28	0.79	-3	11.24	0.21	0.42	1.77	0.26	187
21	Bernier, Steve	FLOR	$850,000	$62,500	ON	R	22	76	16	16	32	0.42	0.84	-1	13.33	0.01	2.3	2.07	0.45	187
22	Bertuzzi, Todd	DETR	$4,000,000	-	ON	R	32	68	14	26	40	0.59	1.43	8	16.44	0.19	3.44	0.97	0.31	187
23	Betts, Blair	PHIL	$615,000	-	ON	C	27	75	2	5	7	0.09	0.27	-4	11.85	2.75	0.13	1.21	0.65	187
24	Blake, Jason	ANAH	$5,000,000	-	ON	L	34	82	15	37	52	0.63	0.34	-4	17.82	0.16	3.11	0.67	0.17	187
25	Boll, Jared	COLU	$545,000	$60,000	ON	R	21	75	5	5	10	0.13	3.01	-4	8	0.01	0.15	1.8	0.17	187
26	Bonk, Radek	NASH	$1,350,000	-	OFF	C	31	79	14	15	29	0.37	0.51	-31	15.92	0.2	2.95	0.49	0.32	187
27	Booth, David	FLOR	$625,000	$60,000	ON	L	22	73	22	18	40	0.55	0.36	13	16.16	0.79	1.73	1.55	0.4	187
28	Bouchard, Pierre-Marc	MINW	$2,600,000	-	ON	C	23	81	13	50	63	0.78	0.42	11	16.84	0.02	3.59	0.12	0.19	187
29	Boulton, Eric	NJER	$525,000	-	ON	L	31	74	4	5	9	0.12	1.72	-10	7.45	0.01	0.05	0.76	0.26	187
30	Bourque, Rene	CALG	$900,000	-	ON	L	25	62	10	14	24	0.39	0.68	6	15.26	2.44	1.13	1.16	0.35	187
31	Boyd, Dustin	MONT	$650,000	$70,300	OFF	C	21	48	7	5	12	0.25	0.13	-11	9.81	0.4	0.73	0.81	0.29	187
32	Boyes, Brad	BUFF	$1,600,000	-	ON	R	25	82	43	22	65	0.79	0.24	1	17.94	0.09	3.9	0.67	0.24	187
33	Bradley, Matt	FLOR	$700,000	-	ON	R	29	77	7	11	18	0.23	0.96	1	9.99	0.71	0.06	1.64	0.22	187
34	Brashear, Donald	ATLA	$1,100,000	-	OFF	L	35	80	5	3	8	0.1	1.49	-7	7.85	0	0.19	1.66	0.15	187
35	Brere, Danny	PHIL	$10,000,000	-	ON	C	29	79	31	41	72	0.91	0.86	-22	18.86	0.05	4.85	0.37	0.22	187
36	Brind'Amour, Rod	CARO	$4,000,000	-	Ret	C	37	59	19	32	51	0.86	0.64	0	22.44	3.02	4.07	0.93	0.64	187
37	Brodziak, Kyle	MINW	$495,000	$70,000	ON	C	23	80	14	17	31	0.39	0.41	-6	12.91	2.51	0.3	0.5	0.48	187
38	Brown, Dustin	LOSA	$1,175,000	-	ON	R	22	78	33	27	60	0.77	0.71	-13	20.28	1.9	3.71	3.99	0.29	187
39	Brule, Gilbert	EDMO	$850,000	$62,500	ON	F	20	61	1	8	9	0.15	0.38	-4	9.89	0.02	0.8	1.2	0.18	157

Figure A1.
Sample data spread sheet

About the authors

Jon Landry is an alumnus of Glasgow Caledonian University, MBA program. He has played for a number of professional ice hockey teams including Braehead Clan in Scotland, Arizona Sundogs, Bridgeport Sound Tigers, Colorado Eagles and is currently signed with New York Islanders. This research paper build on Jon's original MBA thesis and interesting insights and discussions held with the team. Jon is therefore recognized as lead author.

David Edgar is a Professor of Strategy and Business Transformation and member of the Department of Business Management at Glasgow School for Business and Society. His main areas of research and teaching are in the field of strategic management, ethics and responsible management. He has a specific interest in dynamic capabilities, business uncertainty and complexity and responsible management of talent and innovation. He has worked with a range of organisations on Business Transformation projects in particular relating to e-Business strategies, innovation and knowledge or talent management. David Edgar's interest in innovation relates to innovation as an element of dynamic capabilities and the strategy process. David Edgar is the corresponding author and can be contacted at: d.a.edgar@gcu.ac.uk

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Kevin Grant is Professor of Management (Technology and Innovation) at Kent Business School, University of Kent. His main research interest are in business strategy informed by disruptive technological innovation, business modeling, IT alignment and, finally, on Academic Enterprise (the nexus and Triple Helix between teaching, research, scholarship and consultancy). His primary teaching areas are in strategic information systems, technology-based innovations, the management of innovation, research and consultancy methods. He has published over forty academic articles with the vast majority ranked by the ABS and ARC/ERA. Finally, Professor Grant is a Fellow of the Higher Education Academy, Fellow of the British Computing Society, a Chartered Information Technology Professional (CITP).