



Bachelor Thesis Strategy Economics

# **Strategic behavior and shirking as a result of contract related incentive effects in the NBA**

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## **Abstract**

This paper investigates contract related incentive effects that occur in the labor market of the National Basketball Association. Specifically, strategic behavior and shirking. To test for these phenomena, an individual fixed effects regression is carried out to estimate the impact of these contract related incentive effects on the performance of players. Evidence is found for strategic behavior in the final year of an expiring contract. Players perform better in the last year of such a contract because they are rewarded with a better contract in the near future because of their better performance. Weak evidence of shirking is found. A percentual increase in the wages in the first year after signing a multi-year contract has a performance decrease as a result. On average, player performance increased in the first year after signing a multi-year contract. Career concerns and the selection effect dominate shirking incentives.

# Table of Contents

- 1. Introduction and research question ..... 4
- 2. Literature Review ..... 6
  - 2.1 *Ex ante strategic behavior and ex post shirking in baseball* ..... 6
  - 2.2 *Ex ante strategic behavior and ex post shirking in the NBA* ..... 7
  - 2.3 *Hypotheses* ..... 9
- 3. Data and research methodology ..... 9
  - 3.1 *Dataset* ..... 9
  - 3.2 *Variables* ..... 10
  - 3.3 *The Method* ..... 13
  - 3.4 *Potential issues* ..... 14
- 4. Results ..... 15
  - 4.1 *Fixed effects regression* ..... 15
  - 4.2 *Hypotheses* ..... 16
- 5. Conclusions ..... 17
- 6. Limitations and future research ..... 18
  - 6.1 *Internal validity* ..... 18
  - 6.2 *External validity and future research* ..... 18
- 7. Bibliography ..... 19
- 8. Appendix ..... 21

## **1. Introduction and research question**

In world sports, the National Basketball Association (NBA) is the highest paying sports league on average and the average pay level is only expected to increase. (Globalsportssalaries, 2019). This height of the average wages and the expected growth thereof make the labor market of the NBA an interesting sector to study contract related incentive effects.

Alchian and Demsetz (1972) were one of the first to discuss the implications of team production for the compensation of its members. Because the marginal productivity of individual members is either too costly to observe or not possible to observe at all, creating a compensation structure in which individuals are incentivized to work efficiently poses a problem. Holmstrom (1982) expands upon this research and discusses the free riding problem that is specific to moral hazards in a team setting.

The most basic form of the principal-agent problem is characterized by three conditions as described by Stiglitz (1989). The first condition is that the principal and the agent enter into a contract. The principal promises to pay the agent for a certain task. The agent chooses a level of effort to perform that task. The second condition is that the utility of the principal is dependent on the level of effort chosen by the agent. However, an increase of effort by the agent is at the expense of the agent's utility. The final condition is that there is imperfect information concerning the actions of the agent because the agent's effort can neither be observed nor be easily deduced by examining other observable variables.

When these conditions are met, an agent has an incentive to strategically vary the level of effort over the course of the contract.

In academic literature, the solution to principal-agent problems is often sought in monitoring by the principal (Alchian & Demsetz, 1972; Conlon & Parks, 1988) or in group and individual incentives in the contract (Holmstrom 1982). However, specific characteristics of the NBA make it difficult to implement these solutions.

Monitoring in team sports is difficult as the distinction between the degree of effort a player provides and the degree of ability a player possesses is not easy to make. Additionally, the various positions and roles make it difficult to determine the contribution of a player's effort to the team's overall performance (Mason & Slack, 2005).

Group or individual incentive based contracts are not the norm in the NBA. In fact, the majority of NBA contracts is fully guaranteed. Teams are required to pay all of the agreed upon compensation over the term of the contract, even if a player is cut from the team (Brandt, 2019). The contract environment of the NBA is shaped this way because incentive based contracts are detrimental to both teams and players.

With the introduction of incentive based contracts, players would have to receive a risk premium to compensate for the risk they bear. The expected value of an incentive based contract would have to exceed the value of a fully guaranteed contract for a player to consider accepting this contract. This means that teams would have to spend more on wages with incentive based contracts compared to fully guaranteed contracts.

Although the distribution of risk averse, risk neutral and risk seeking players in the NBA is not known, fully guaranteed contracts provide players with more security than incentive based contracts. On top of that, the NBA can be described as an uncertain environment for players. Firstly, NBA players experience a high rate of game-related injuries (Drakos et al., 2010). Secondly, players are not always in control of their own future team because teams can trade players without consulting the players involved. Although no-trade clauses exist, they are extremely uncommon in the NBA. (Hoopsrumors, 2023) Lastly, a coach and his staff decide how many minutes each player plays. Thus, present and future playing time is uncertain and not in control of the player.

The disadvantages of incentive based contracts have been discussed. Teams are forced to pay higher average wages compared to fully guaranteed contracts and players have less security in an uncertain working environment. Although these disadvantages argue for the fully guaranteed contracts that are common in the NBA, the disadvantages of fully guaranteed contracts should not be ignored. This paper investigates the negative side effects that are specific to the principal-agent problem and fully guaranteed contracts: shirking and strategic behavior. The main research question of this paper is therefore:

*Is there evidence for strategic behavior in the final year of a contract and for shirking behavior after signing a multi-year guaranteed contract by NBA players?*

The rest of this paper is organized as follows: in section II the relevant literature and models on the topic of strategic behavior and shirking in sports are discussed. This will lead to two

hypotheses at the end of section II. Section III will consist of a description of the dataset, the definitions of the variables along with the descriptive statistics, an explanation of the method and potential issues. Section IV contains the results and the key findings. The conclusion of this research is given in section V and section VI highlights the limitations and opportunities for future research.

## 2. Literature Review

### 2.1 Ex ante strategic behavior and ex post shirking in baseball

Maxcy et al. (2002) analyze Major League Baseball players' availability and performance during contract negotiations and after signing a contract. The hypothesis is that during contract negotiations, players are incentivized to be available and to perform better for their team in order to get a more lucrative deal. This is called ex ante strategic behavior. After signing a contract, this incentive disappears and the costs of putting in more effort are not compensated by the opportunity of a more lucrative contract in the near future. This is hypothesized to lead to a decrease in availability and performance and is called ex post shirking. To test for ex ante and ex post shirking the following Ordinary Least Squares base equation is used:

$$(1) \Delta P_{i,t} = \alpha_0 + \beta_1 \text{Ante}_{i,t} + \beta_2 \text{Post}_{i,t} + \beta_3 \text{Age}_{i,t} + \beta_4 \text{Age}_{i,t}^2 + \beta_5 \text{Pos}_{i,t} + \varepsilon_{i,t}$$

The deviated performance of player  $i$  in season  $t$  is used as the dependant variable. It deviates the performance in season  $t$  by subtracting the average of the performance of periods  $t-1$ ,  $t-2$  and  $t-3$ . This is done to control for the large differences between players with regards to intrinsic ability. Because the age-productivity relationship is concave in baseball, Age and Age<sup>2</sup> variables control for the variability in performance caused by aging. A position variable is added to control for the position of players. Some positions are more important than others in baseball, while some positions ask for bigger physical demands.

Maxcy et al. criticise the existing literature on strategic behavior and shirking in sports because mechanisms built into contracts to target shirking behavior are ignored. Only the declining performance of some players is used as evidence of strategic behavior and shirking. That is why a comparison is introduced between players that are at a point where strategic behavior is likely

and players who are not at such a point. The dummy variable  $Ante_{i,t}$  equals 1 if a player is in the last year of any contract. The dummy variable  $Post_{i,t}$  equals 1 if a player is in the first year of a multi-year contract. This research did not find evidence for strategic behavior or shirking in baseball.

## 2.2 Ex ante strategic behavior and ex post shirking in the NBA

Stiroh (2007) investigates ex ante strategic behavior and ex post shirking behavior in the NBA in the 1980s and 1990s. To test for ex ante and ex post shirking the following Weighted Least Squares model is estimated:

$$(2) P_{i,t} = \beta_1 Ante_{i,t} + \beta_2 Post_{i,t} + \beta_3 NAGE_{i,t} + \alpha_i + \alpha_p + \alpha_t + \alpha_j + \varepsilon_{i,t}$$

The dependent variable  $P_{i,t}$  refers to the performance of player  $i$  in year  $t$ . The performance measures that are used by Stiroh are a composite rating, points scored, total rebounds, assists, blocked shots, shots attempted, free throws attempted and minutes played. The independent dummy variables  $Ante_{i,t}$  and  $Post_{i,t}$  denote final year of a expiring contract and the year after the final year of a expiring contract. The normalized age of a player ( $NAGE_{i,t}$ ) is controlled for, obtained by subtracting out the average age of all players. The individual fixed effects that account for unobserved individual ability are captured by  $\alpha_i$ . Dummy variables for position ( $\alpha_p$ ), team ( $\alpha_j$ ) and year ( $\alpha_t$ ) control for differences regarding performance between positions, between the quality of management of teams and between years. Position dummy variables are needed along with the individual fixed effects because there is a trend toward positionless basketball. There is an increase in multifaceted players who are able to play multiple roles in the team compared to players that fit the mold of a traditional position (Bruin Sports Analytics, 2021). This means that it is possible to ask players to switch positions from one season to another based on the types of teammates around them and the system the coach wants to use.

Individual performance is found to improve significantly in the final year of an expiring contract and decrease following such a year. This is evidence for strategic behavior by players in the NBA. In this research, contract related incentive effects that occur because of multi-year guaranteed contracts are not investigated, only the effects of an expiring contract. Furthermore, the performance metrics used are outdated, this is an area this paper improves upon.

Berri and Krautmann (2006) investigate the incentive effects of guaranteed pay by looking at ex post shirking by NBA players. The following regression model is estimated:

$$(3) \quad \Delta P = \beta_0 + \beta_1 D2 + \beta_2 D12 + \beta_3 \Delta GP + \beta_4 CEXP + \beta_5 CWPCT + \beta_6 \Delta TMWNS + \beta_7 \Delta ROSTER + \theta_1 SIGNED + \varepsilon$$

The dependent variable of this model is the change in productivity of a player ( $\Delta PROD$ ) in year  $t$  compared to year  $t-1$ . Berri and Krautmann use two different productivity measures in their research. The first is a productivity measure developed and used by the NBA and by the media to evaluate players. The second is developed by Berri (2022) and is more extensive than the NBA's measure. It is designed to capture the marginal productivity of basketball players, making it applicable to economic analyses.

The dummy variables  $D2$  and  $D12$  control for variability of a player's productivity over the course of their career due to experience. Past research on basketball player productivity has indicated that player productivity is relatively stable across a player's career. However, there is a spike upwards in a player's first two years and a steady decline after a player's 12th year in the league.

The change in games played variable ( $\Delta GP$ ) measures the change in games played in the current year compared to the previous year. It is included as a proxy for injuries as injuries are expected to reduce productivity.

Manager quality enters the model through variables that capture the coach's experience ( $CEXP$ ) and the lifetime winning percentage of the coach ( $CWPCT$ ).

The change in the number of team wins ( $\Delta TMWNS$ ) is added to take teammate quality into account. In basketball, improved team quality leads to a decrease in player productivity. Shot attempts, rebounding opportunities and steals are finite. As the quality of a player's team improves, the competition for shot attempts, rebounding opportunities and steals increases, leading to diminishing returns regarding player productivity.

While an increased quality of the team can hinder a player's productivity, team chemistry is expected to raise player productivity levels. By controlling for roster turnover ( $\Delta ROSTER$ ), this concept is captured in the model.



The treatment variable (SIGNED) indicates whether a player has just signed a long-term contract. By adding an interaction effect between the dummy variable SIGNED and the length of the contract and an interaction effect between SIGNED and the salary the player will receive, the effects of these different aspects of signing a long-term contracts can be untangled.

When the NBA's measure for productivity was used, weak evidence of ex post shirking was found. When Berri's measure for productivity was used, no evidence of ex post shirking was found. These results emphasize the influence that the measure of productivity has on the outcome in this type of research as well as the caution with which the conclusions should be drawn. Although the model is extensive, time invariant individual fixed effects are not included and ex ante strategic behavior is not touched upon. This paper will research both ex ante strategic behavior and ex post shirking using a fixed effects model.

### **2.3 Hypotheses**

The research question was whether there is evidence for strategic behavior in the final year of a contract and for shirking behavior after signing a multi-year guaranteed contract. Based on the literature discussed in the previous part of Section II the corresponding hypotheses are formulated:

- *Hypothesis 1: Player performance increases in the final year of a contract*
  
- *Hypothesis 2: Player performance decreases in the first year after signing a multi-year guaranteed contract.*

## **3. Data and research methodology**

### **3.1 Dataset**

The data that is used for this research is a combination of data from two databases. The contract and performance data is retrieved from Rodney Fort's sports business data. The relevant contract data contains information about the salary of a player on a team in a certain year and the year that contract ends. The relevant performance data consists only of a player's WP.

Player characteristics are retrieved from the basketball-reference database. The relevant player characteristics are age, position and experience.

The players that data is collected on are players that have played in the NBA at least two seasons in the period 2000-01 to 2007-08. That means that players with only one observation during this period are not included in this research. This is done because at least two seasons are needed in order to calculate the dummy variables that are used in the regression.

After combining the data from the two databases, removing players that had either missing data on contract information or WP and checking for changed names or spelling errors, the dataset consisted of 672 players and 3105 player-season observations. That means that the average player in the dataset has been in the NBA a little under five seasons.

### **3.2 Variables**

#### **Wins Produced**

Wins Produced is a composite performance metric developed and refined by Berri (2022). It is designed to capture the marginal productivity of basketball players, making it applicable to economic analyses. Because Wins Produced is a composite performance metric, it takes multiple basketball statistics into account. The basketball statistics that are taken into account are three pointers made, two pointers made, free throws made, missed field goals, missed free throws, offensive rebounds, defensive rebounds, turnovers, steals, free throws made by opponent, blocks and assists. Additionally, because basketball is a team sport, some defensive team variables are taken into account. These include opponent's three point field goals made, opponent's two point field goals made, opponent's turnovers, team turnovers and team rebounds. Using NBA data from every player from 1987-88 to 2019-20, a regression is carried out to determine the impact on team wins of every beforementioned statistic. Some statistics have a positive impact on team wins, such as three pointers made, free throws made and steals. Other statistics have a negative impact on team wins, missed field goals, turnovers and free throws made by opponent. A player's Wins Produced for a season is calculated by multiplying the statistics recorded by that player in a season with the impact that the corresponding statistics have on team wins.

### **Ex ante dummy**

The ex ante dummy is determined by comparing the year a player's contract ends with the season the performance data was recorded. If it is the final year of a player's contract in which the performance data is collected, the dummy variable takes on the value 1, it takes the value 0 in all other cases.

### **Ex post dummy**

The ex post dummy variable takes the ex ante dummy and the year a player's contract ends into account. If the ex ante dummy equaled 1 the year before and a player signs a new contract which ends in two or more years, the ex post dummy equals 1. If a player extends their current contract with two or more years, the dummy equals 1. It takes on the value 0 in all other cases.

### **Age**

A player's age on the first of February of each season is used to control for a player's age. Other ways of adding age into the model were considered, such as creating dummy variables for age groups but were found not to improve the significance and the robustness of the results.

### **Position**

In basketball, traditionally there are 5 positions: point guard, shooting guard, small forward, power forward and center. The position a player plays will enter the model in the form of a dummy variable that indicates which position out of those five a player played most that season. As mentioned in the literature review, players that fit into only one of the five traditional positions are less and less prevalent and the number of players who can play multiple positions out of the traditional five is increasing. Players that switch positions over the course of their career have become more common. Position switches during a player's career are therefore not captured by the individual fixed effects that will be included in the model and are captured by categorical position controls.

### **Experience**

In this research, experience is defined as the total number of NBA minutes a player has played during his career up to and including the current season. Experience is defined this

way to untangle the effects of age and experience. If the number of seasons of NBA experience was used, age and experience effects would be perfectly correlated and therefore would not capture the intended effects.

## Salary

The salary data that will be used in the regression is salary per player per season. Because the salary data is skewed to the right, the salary data is logarithmically transformed. Evidence can be found in the appendix.

In Table 1 the mean, the standard deviation and the minimum and maximum of every variable is displayed. The difference between the mean of the ex ante dummy and the ex post dummy is important to note. In this dataset, the number of players in their last year of a contract is higher than the number of players who signed a multi-year contract or extension.

**Table 1**

*Descriptive statistics for all the variables in the panel dataset.*

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Wins Produced	2.986	3.909	-5.289	22.876
Ex Ante	0.309	0.462	0	1
Ex Post	0.184	0.387	0	1
Age	26.973	4.385	18	42
Position	3.129	1.433	1	5
Length of contract	2.567	1.490	1	7
Salary	\$4,014,843	\$4,098,813	\$20,000	\$27,696,43
Log salary	14.700	1.057	9.903	17.137

Number of observations = 3105

*Note.* While the total number of observations for every variable is 3105, these observations stem from 672 different players. Dummy variables to control for seasons and teams are not included.

### 3.3 The Method

The method that is used in this research is a combination of three models used to investigate shirking and strategic behavior in sports (Maxcy 2002; Stiroh 2007; Berri and Krautman 2006) as discussed in the literature review. The following fixed effects regression equation will be used as a base:

$$(4) \quad WP_{i,t} = \beta_0 + \beta_1 ANTE_{i,t} + \beta_2 POST_{i,t} + \beta_3 AGE_{i,t} + \beta_4 EXP_{i,t} + \alpha_p + \alpha_t + \alpha_s + \varepsilon_{i,t}$$

The dependent variable  $WP_{i,t}$  denotes the Wins Produced of player  $i$  in season  $t$ ,  $ANTE_{i,t}$  is a dummy variable that indicates if a player is in their last season of their current contract. The coefficient of the  $ANTE_{i,t}$  variable is expected to be positive since the first hypothesis states that performance is expected to increase in the last year of a player's contract. The  $POST_{i,t}$  is a dummy variable that indicates if player  $i$  is in their first season after signing a new multi-year contract or extension. The coefficient of the  $POST_{i,t}$  dummy variable is expected to be negative. The second hypothesis states that performance is expected to decrease in the first season after signing a multi-year guaranteed contract, which would result in a negative  $POST_{i,t}$  coefficient. The  $AGE_{i,t}$  variable is added to control for the variability in performance caused by differences in age. The variable  $EXP_{i,t}$  indicates how many NBA minutes player  $i$  has played up to and including season  $t$ . Experience is expected to increase the performance of players, the coefficient of the experience variable is therefore expected to be positive. The  $\alpha$ 's denote fixed effects that control for unobserved differences between individuals, position played, teams and the season in which the statistics are recorded.

To further investigate the components that play a part in the effect of the  $POST_{i,t}$  dummy, interaction effects will be added to the base regression. The interactions that will be added are between the  $POST_{i,t}$  dummy and the length of the multi-year contract (Post x Length) and between the  $POST_{i,t}$  dummy and the logarithm of the salary in that first year (Post x Salary). These interactions tell more about the different effects that either a longer period of guaranteed money or a higher salary may have on player performance.

### **3.4 Potential issues**

Stiroh (2007) identifies two effects that make the expected post-contract decline in performance difficult to estimate: the selection effect and career concerns.

The selection effect occurs because teams want to select and reward high-ability players, not the players who temporarily exert more effort. It is difficult for teams to observe intrinsic ability and effort separately since only player performance is observed. If teams are successful in making the distinction between effort and ability, even if it is only partly, player performance will not vary as much due to contract related incentive effects. Therefore, the selection effect neutralizes the expected post-contract decline in performance.

Career concerns are also expected to mitigate the expected post-contract decline in performance. If players have concerns about their future career, there is an additional incentive to put in effort. This could be the case for younger players who signed their first multi-year contract, for players who are injury prone and for players who do not have alternatives after their basketball career. Even after signing a multi-year guaranteed contract, it might be worth the effort for those players to maintain a reputation of a high quality worker in order to be considered for multi-year contracts in the future. Stiglitz (1975) acknowledges this critical function that compensation structures have; they facilitate the differentiation and the screening of workers of different abilities. After receiving a multi-year guaranteed contract, the opportunity costs of shirking include the salary that is not received in the next contract as a result of shirking behavior. The security that multi-year contracts are expected to provide players with is therefore offset by career concerns.

Both these effects bias the post-contract dummy upwards, the expected negative effects on performance caused by contract related incentive effects are diminished by the selection effect and career concerns.

## 4. Results

### 4.1 Fixed effects regression

**Table 2**

*Different fixed effects models with Wins Produced as the dependent variable*

	(1) No Team controls	(2) No Season controls	(3) All controls	(4) Interaction Length	(5) Interaction Salary
Ante	.269** (.134)	.253* (.132)	.301** (.137)	.314* (.179)	.474*** (.136)
Post	.438*** (.128)	.357*** (.124)	.437*** (.129)	.305 (.331)	.748 (1.922)
Age	-.213*** (.026)	-.512*** (.066)	-.241*** (.052)	-.239*** (.052)	-.261*** (.051)
Experience	0*** (0)	0*** (0)	0*** (0)	0*** (0)	0*** (0)
Post x Length				.046 (.077)	
Post x Log salary					-.020** (.065)
Constant	6.977*** (.678)	12.972*** (1.553)	6.829*** (1.332)	6.754*** (1.345)	1.395 (1.709)
Observations	3105	3105	3105	3105	3105
R-squared	.04	.059	.062	.062	.07
Season controls	YES	NO	YES	YES	YES
Team controls	NO	YES	YES	YES	YES
Position controls	YES	YES	YES	YES	YES

*Note.* Robust standard errors are in parentheses. \*\*\* p<.01, \*\* p<.05, \* p<.1

The results of the fixed regression can be seen in Table 2. In column (1) position and team controls are added to the model, in column (2) position and season controls are added. Column (3) includes position, team, and season controls. This is the column where the results regarding the coefficients of the treatment variables Ante and Post will come from. In column (4) the interaction term between the Post dummy and contract length is included in the model of the third column. Column (5) adds the interaction between the Post dummy and the logarithm of salary to the full model.

Looking at the first row of Table 2, the coefficients of the treatment variable Ante are positive and significant. In column (3), the Ante coefficient is significant at the .05 level. Player performance improves on average in the final year of a contract. This is supporting evidence for the first hypothesis which assumes that player performance increases in the final year of a contract.

The second row of Table 2 shows positive, significant coefficients for the treatment variable Post. In the full model in column (3) the coefficient is significant at the 0.01 level. The positive, significant coefficients imply that player performance increases in the first season after signing a multi-year guaranteed contract or extension. These results are not in line with the second hypothesis which assumes that player performance decreases in the first year after signing a multi-year guaranteed contract.

Furthermore, while player performance increases on average in the year following the signing of a multi-year guaranteed contract, this does not mean that shirking due to contract-related incentive effects does not exist. The added interactions separate the different components that play a part in ex post shirking. The interaction of Post and contract length in column (4) is not significant. The interaction between the Post dummy and the logarithm of salary in column (5) is significant at the 0.05 level and negative. The sign and significance of this interaction imply that a percentual increase in wealth comes with a negative impact on player performance in the first season after signing a multi-year contract.

## 4.2 Hypotheses

The hypotheses that were formulated based on the literature review at the end of section II were:

- *Hypothesis 1: Player performance increases in the final year of a contract*
  
- *Hypothesis 2: Player performance decreases in the first year after signing a multi-year guaranteed contract.*

For the first hypothesis, the sign and significance of the Ante dummy variable are of interest. The coefficient of the Ante dummy variable was positive and significant at the .05 level. These results were expected as the positive, significant coefficient suggest that player



performance increases temporarily because of higher levels of effort in order to sign a more lucrative contract after their current contract expires. Therefore, the first hypothesis can be accepted.

For the second hypothesis, the sign and significance of the Post dummy variable as well as the coefficients of the interaction effects are of importance. The sign of the Post dummy variable was positive and significant at the .01 level. Player performance improves in the first year after signing a multi-year contract. The selection effect and career concerns dominate shirking incentives. The interaction effect that combines the Post dummy variable with the height of the salary is negative and significant. This suggests that on average, player performance decreases in the first year after signing a multi-year contract with a percentual increase in salary. The results regarding the second hypothesis are ambiguous. Therefore, the second hypothesis cannot be accepted.

## **5. Conclusions**

The main goal of this paper was to investigate whether there is evidence of strategic behavior in the final year of a contract and of shirking in the first season after signing a multi-year guaranteed contract. Based on the results, the conclusion is that there is evidence for strategic behavior in the final year of the contract as player performance increases on average in the year that a contract expires. For shirking, the conclusion is more complicated. Player performance increases on average in the first season after signing a multi-year contract. This is the opposite result of what shirking entails. The reason for this increase is the selection effect and career concerns. Evidence for shirking in the first season after signing a multi-year contract is only visible when an interaction effect is added to model that combines the dummy variable that indicates a player is in the first season after signing a multi-year contract with the height of the salary. Then, the value of a new contract has a negative impact on player performance in the first season after signing a multi-year contract.

## **6. Limitations and future research**

### **6.1 Internal validity**

Some limitations of this research have already been discussed in the potential issues chapter in section III. These limitations consist of effects that complicate the identification of ex post shirking: the selection effect and career concerns. These effects have an upward bias of the Post coefficient as a result. Consequently, the internal validity of this research is affected. One of the two treatment effects of interest, ex post shirking, is difficult to isolate due to effects that are not added into the model.

The structure of the data is also a concern. The scope of this study is the period 2000-01 to 2007-08. Every player that has played at least two seasons in the NBA in that period is included in the dataset. Some players started their career before the 2000-01 NBA season and some players carry on playing after the 2007-08 NBA season. The careers of those players are cut short. As a result, the data of most players that are in the data does not span over the players full career. The effect that this has on the results is impossible to approximate. To give an example of this limitation, consider the career of a player who has played in the NBA before the 2000-01 NBA season. If that player signed a multi-year guaranteed contract at the end of the 1999-00 season, the Post dummy variable will not equal 1 in 2000-01, it will wrongly equal 0. Ensuring that players full careers are available in the data will therefore improve the internal validity of this research as well as the reliability of the results. This limitation applies to both the treatment variables of interest. However, the implication is larger for the Post dummy variable than it is for the Ante dummy variable. As illustrated, it is possible that the Post dummy equals 0 when it should equal 1. This problem can not occur with the Ante dummy variable as it does not use information about the previous season for its calculation.

### **6.2 External validity and future research**

The limitations regarding the internal validity have been discussed. The external validity of this research is low. The results can be generalized for other team sports in which monitoring of effort is not possible and guaranteed contracts are common. Most of those sports are played in the United States and include baseball, ice hockey and american football.

Future research into strategic behavior can investigate whether strategic behavior starts closer to year a contract ends. The incentive to put in more effort may start a season before a player enters the last year of his current deal. Furthermore, the exact moment during a season when a contract expires and when a new contract is signed could be introduced to heighten the chance of identifying strategic behavior and shirking. Something that has not been done yet.

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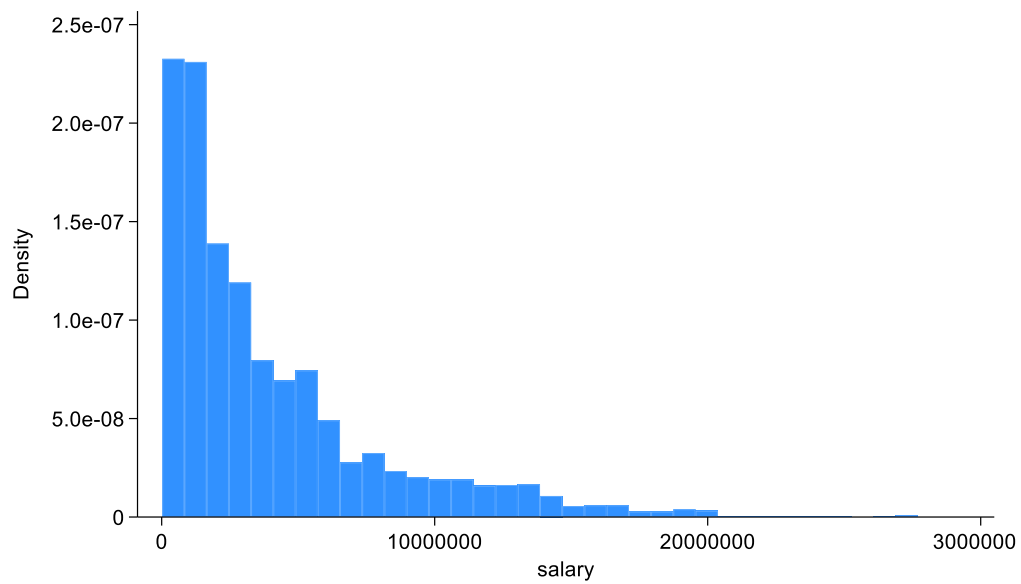
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## 8. Appendix

**Figure 1**

*Histogram of the skewed distribution of salary data*



**Figure 2**

*Histogram of the logarithmic transformed salary data*

