Which Employee Characteristics Move Stock Prices?

Evidence from the Boston Celtics

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Abstract

I use data from the Boston Celtics, which traded on the New York Stock Exchange from 1986 to 1998, to investigate the employee characteristics that move stock prices. Investors positively value top-level training when firms seek to hire inexperienced employees. For all added employees, most of whom are experienced, investors respond positively to expected complementarities with existing workers but do not respond to salary. Investors positively value the removal of an older, highly-paid worker but negatively value the removal of a long-tenured worker. These results suggest that a firm's employee base affects its value.

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Zingales (2000) argues that a firm's employee base is potentially a valuable asset. Recent research supports this view. A firm's employee base affects M&A decisions (Ouimet and Zarutskie 2013), industry growth (Ouimet and Zarutskie 2014), a worker's own-productivity (Kim and Ouimet 2014), and productivity spillovers (Gould and Winter 2009; Kahane, Longley, and Simmons 2013; Bartel, Beaulieu, Phibbs, and Stone 2014; Arcidiacono, Kinsler, and Price 2016).

Merz and Yashiv (2007) suggest that the market value of firms reflects personnel decisions, which include changing the employee base. Still, an important question remains: "What employee characteristics do investors value?" Addressing this question is important because, if managers maximize shareholder value, they will strategically acquire and delete employees such that the firm's stock price is maximized. To do so, managers will need to understand the employee characteristics that move stock prices. The purpose of this paper is to document those characteristics.

To conduct this study, I use a hand-collected data set of the characteristics of acquired and deleted employees of the National Basketball Association's (NBA) Boston Celtics. Kahn (2000) argues that the sports industry is a suitable environment for testing labor-related issues because that industry provides data that are not available for employees in traditional firms. These data include, but are not limited to, age, education, years of experience, tenure with an organization, productivity, and salary. I include these variables in this analysis. Also, since the Boston Celtics Limited Partnership traded on the New York Stock Exchange (NYSE) from 1986 to 1998, I am able to measure the impact of employee characteristics on the team's partnership units. Consistent with Brown and Hartzell (2001), I refer to the partnership units as shares of stock.

By using this extensive data set, this paper provides a richer set of conclusions than Chemmanur, Ertrugrul, and Krishnan (CEK 2012) regarding the employee characteristics that matter to investors. In assessing the market's reaction to the departure of investment bankers from one bank and their arrival at another bank, the only banker characteristic that CEK (2012) control for is whether the banker has a MBA. By contrast, this paper documents several employee characteristics that move stock prices, thus providing greater insight into the market's reaction to employee-level changes. Also, this study uses a dataset of inexperienced as well as experienced employees, whereas CEK (2012) use only experienced employees. Thus, this study documents the characteristics that investors value in both groups of employees.

The data set used in this study begins with the population of 428 player-related transactions of the Boston Celtics over the trading period. These transactions include, but are not limited to, players acquired from other teams, players traded to other teams, players drafted in the NBA Draft, and players whom the Celtics waive. The relatively small population is not an issue because some studies (e.g., Warner, 1977) provide useful results with small samples or populations.

Although the NBA is often considered a collection of superstars, the results of this study are generalizable to traditional firms. Rosen (1981) makes it clear that a superstar effect, defined as the situation in which a few people earn large sums of money and enjoy the most success in their fields, is not limited to the sports industry. He argues that a superstar effect is common in several professions, including textbook sales, journal article citations, shoemaking, and, possibly, academic research production. Also, consistent with this line of thought, Malmendier and Tate (2009) find that a superstar

effect exists among CEOs across several industries. In addition, a superstar effect is found in the investment banking industry. CEK (2012) find that superstar investment bankers are associated with improved acquisition performance and higher stock prices, and these superstars earn the highest salaries in the industry.

Therefore, since a superstar effect exists in the traditional business world just as in sports, the results of this study apply to traditional firms. For that reason, the directional movements found in this study are expected to also exist for traditional firms. However, the dollar magnitudes of changes in value may not apply since typical employees in traditional firms do not earn the salaries of NBA players. Still, the dollar magnitudes found in the study constitute upper or lower bounds on the impact of changes in the characteristics of labor on firm value.

Also, the existence of a salary cap in the NBA during all or part of the period of this study does not reduce the validity of the results. The reason is that a salary range exists for most if not all employee-level positions. For instance, a corporation might pay up to a certain amount for an entry-level analyst or division manager, regardless of his/her skill set. Thus, the existence of a salary cap in the NBA is merely consistent with the practice of most organizations.

OLS regression analysis provides insight into the labor characteristics that are associated with changes in the next-day return. The dependent variable is the post-event-day return, where an event is broadly defined as the acquiring or deleting of a player. The independent variables of interest are labor characteristics that are hypothesized to affect the post-event-day return. Labor characteristics used in this study include, but are not limited to, height, age, education, tenure, and salary.

OLS regression indicates that inexperienced employees with a high-quality education, as proxied by a top basketball education, are associated with higher next-day returns. I find that a one-percentage-point increase in inexperienced employees with top-quality training is associated with an increase in next-day returns of between 2.5 and 2.9 percentage points. This finding corresponds to an increase of between $2.8 million and $3.3 million in the market value of the team's equity. This result suggests that the market values top-level training as a credible signal (Spence 1973) when a firm hires inexperienced or entry-level employees. This result is also consistent with the view that well-educated new hires are expected to add value (Ouimet and Zarutskie 2014).

Regarding all employee additions (i.e., inexperienced plus experienced hires), investors do not respond to salary but do appear to value expected complementarities between the acquired worker and the set of existing employees. Those complementarities are associated with a 0.4-percentage-point increase in the next-day return. This result corresponds to an increase of $453,600 in the market value of equity and is consistent with the importance of complementarities among labor (Gould and Winter 2009; Bartel, Beaulieu, Phibbs, and Stone 2014; Arcidiacono, Kinsler, and Price 2016).

Regarding employee deletions, the next-day return increases when older, highly-paid players are deleted. While this result conflicts with the view that pay reflects skill (Lazear 1979), suggesting that market value should decline when older workers are deleted, this result is consistent with the implication of Ouimet and Zarutskie (2014) that younger employees are associated with new technologies that are likely to add value. From a physiological viewpoint, critical to sports, this finding is also consistent with a negative relationship between ability and age (Beckett, Brock, Lemke et al. 1996). OLS

regression reveals that a unit increase in the interaction of the natural logarithm of age and a greater-than-average salary is associated with a 0.11-percentage-point increase in the next-day return, amounting to a $12.5-million increase in equity value.

However, investors punish the firm when it deletes workers of increasingly-longer tenure. A one-year increase in the tenure of a deleted worker reduces the next-day return by as much as 0.4 percentage points and the market value of equity by approximately $450,000. This result is consistent with the idea that a player's complementarities with his colleagues increase in his tenure (Bartel, Beaulieu, Phibbs, and Stone 2014). This result is also consistent with the importance of complementarities among workers (Gould and Winter 2009; Bartel, Beaulieu, Phibbs, and Stone 2014).

Regarding net employee additions (i.e., the simultaneous adding of a player and deleting of another player), the difference in the salaries of added and deleted employees positively affects next-day returns. A net reduction in payroll of approximately every $900,000 is associated with a percentage-point increase in next-day returns.

Endogeneity is an issue in this analysis because management chooses whether to pursue acquiring or deleting a player. To address endogeneity, I segment the data set into labor transactions that occur during the season versus the off-season. During the season, management will be spurred to engage in labor transactions due to various events (e.g., player injury) because of the need to remain competitive during the season and preserve its reputation capital. The results of this paper are robust to this test and counterfactual analysis and suggest that a firm's employee base is valuable (Zingales 2000).

By documenting the market's reaction to changes at the labor level, this paper adds to the recent literature on the effect of labor on the firm (e.g., Chemmanur, Cheng,

and Zhang, 2013; Donangelo, 2014; Kim and Ouimet, 2014; Ouimet and Zarutskie, 2014). Also, this paper contributes to the literature on the use of sports data to examine market-related phenomena (e.g., Brown and Hartzell, 2001; Edmans, Garcia, and Norli, 2007; Bernile and Lyandres, 2011; Akhigbe, Newman, and Whyte 2016). In addition, this paper complements the literature on the market's reaction to top management changes (e.g., Cohen and Wang, 2013; Cornelli, Kominek, and Ljungqvist, 2013; Falato, Kadyrzhanova, and Lel, 2014).

1. Approach and Data

1.1 Approach

To investigate the potential relationship involving changes in the labor base and stock prices, I use OLS regression. The dependent variable is the BOS post-event-day return, defined as the BOS return on the trading day following the event under analysis. The post-event-day return is an appropriate dependent variable because the vast majority if not all of the Celtics' player-related transactions are likely to have occurred when the market is closed. Thus, information pertinent to those events is likely to be impounded into prices the next trading day, consistent with Brown and Hartzell (2001).

1.2 Data Overview

The data used in this study come from the population of 428 events related to players associated with the NBA's Boston Celtics from December 4, 1986, to March 31, 1998, according to basketball-reference.com and realgm.com. During that time period, the Boston Celtics traded on the NYSE. The population includes 25 drafted players and 403 players for whom other dynamics (e.g., traded, acquired, retired, waived) are involved. Data on the players whom the Celtics draft come from the NBA's website

(nba.com), insidehoops.com, draftexpress.com, statsheet.com, thedraftreview.com, basketball-reference.com, and realgm.com. Data on the Boston Celtics' stock prices are from CRSP. Data on the dates of the annual NBA Draft come from statsheet.com. Data on the Celtics' player transactions come from basketball-reference.com and realgm.com.

To measure the human capital of labor, I use the independent variables that are discussed later in this paper. The data include, but are not limited to, height, years of experience, and performance statistics. For draftees with only U.S. experience, other first-time NBA players, and for players with gaps in years between leaving NCAA basketball and joining the NBA, I use average data for those players' college careers. For players whom the Celtics acquire with prior NBA experience, I use the latest year of performance data available prior to being acquired by the Celtics. Still, some players acquired from other NBA teams do not have performance data during their time with those teams, while other acquired players end their NCAA career in a given year but do not play their first NBA game the next season, meaning that no data exist regarding their time between the NCAA and the NBA. In both sets of cases, I use data from their college careers (i.e., the last time they played and, therefore, the latest data available).

1.3 Non-Salary Measures of Labor Quality

The independent variables in this study control for labor and coaching quality. These controls are important because human capital is shown to be associated with future success (Judge, Cable, Boudreau, and Bretz 1995). If the objective of the Boston Celtics is to maximize shareholder value per finance theory (Bodie, Kane, and Marcus 2013), management will consider human capital when dealing with labor-related issues, consistent with the potentially high value of a firm's employee base (Zingales 2000).

I use several measures of labor quality. For regressions that use only data from the NBA Draft, I use percentages or averages of the independent variables because teams often select multiple players in the Draft. I also use percentages or averages in those cases where the Boston Celtics acquire or trade more than one player at the same time.

One measure of labor quality is McDonald's H.S. All-American. This variable equals one if a player is a McDonald's High-School All-American and zero otherwise. I collect data on McDonald's High-School All-Americans primarily from mcdonaldsallamerican.com and basketball-reference.com. Including this variable is important because it credibly signals quality, consistent with Spence (1973). Each year, only 24 high-school boys and 24 high-school girls are selected as McDonald's High-School All-Americans. Membership on a McDonald's team is thus a credible signal of labor quality at the high-school level and of readiness to play at the major college level, as evidenced by their success at that level.

Although McDonald's High-School All-Americans make up a small percentage of college players, whether freshmen or veterans, McDonald's All-Americans make up large percentages of various NBA Drafts. On average, 46 percent of lottery picks (typically, the first 13 or 14 players selected) in the NBA Drafts from 2010 to 2016 were McDonald's All-Americans. During four of those seven NBA Drafts, McDonald's All-Americans comprised at least 50 percent of the lottery picks, with a peak of 64 percent during the 2015 Draft. McDonald's All-American status is also an indicator of immediate readiness for the NBA Draft. Since 1995, when McDonald's All-American Kevin Garnett went straight from high school to the NBA, 100 percent of the players who have done the same were McDonald's High-School All-Americans.

A second measure of labor quality for inexperienced new hires is Lottery Pick. A NBA lottery pick is a player who is drafted by a team that participates in the NBA Draft Lottery. Typically, a team participates in the Lottery because it had a low winning percentage during the previous season. Since teams typically draft players based on talent needed, and since many teams often have similar needs, being drafted as a Lottery pick is a credible signal of labor quality and of readiness for the NBA. Lottery Pick equals one if a player is selected in the lottery of the NBA Draft and zero otherwise.

A third measure of labor quality is Played in Big Six Conference. Played in Big Six Conference equals one if a player played in a Big Six Conference and zero otherwise. In this analysis, a Big Six conference is one of the six major NCAA men's basketball conferences – the Atlantic Coast, Big East, Big Ten, Big Eight (now Big 12), Pacific 10 (now Pacific 12), and Southeastern conferences. The Big Six conferences are widely considered prestigious and are able to recruit players selectively. Thus, playing in a Big Six conference is a credible measure of labor quality and proxies for a top-level basketball education. This variable is consistent with Celerier and Vallee (2015), who measure the quality of finance professionals based on attending elite French schools that are able to recruit selectively based on performance on a French national exam.

A fourth measure of labor quality is NCAA Tournament Experience, which equals one if a player played in a post-season NCAA Men's Basketball Tournament, commonly known as "March Madness," and zero otherwise. This measure credibly conveys labor quality because the NCAA Tournament is a winner-take-all tournament played on a highly-visible stage. Many coaches and general managers in the NBA thus believe that performing well in the NCAA Tournament suggests that a player has a

foundation to perform in the NBA. Also, since playing in front of a broad audience is likely to reduce investors' information asymmetry regarding a player, this variable captures investor recognition (Merton 1987) and information advantage (Brennan and Cao 1997; Huberman 1998). A fifth measure of labor quality is Years of College Playing Experience, defined as the numbers of years of college playing experience.

I also control for Height, which is also a measure of player quality. Berri et al. (2005) find that tall players exist in shorter supply, score more points, and are more productive than short players. This finding suggests that tall players tend to be more successful than short players. This finding is also a microcosm of the general work environment, as height is found to be positively related to career success (Judge and Cable 2004) and income (Norton and Olds 2001; Judge and Cable 2004). I do not include income measures in the regressions for inexperienced or new hires (i.e., for draftees) because, at the time of the NBA Draft, the Boston Celtics and a player's agent have not finalized a player's salary.

During Season equals one if a player-related transaction occurs during the season and zero otherwise. This variable is important because it captures whether investor attention (Hirshleifer and Teoh 2003) differs for off-season versus during-season events. I also include Ln(Age), the natural log of a player's age. Controlling for age is important because one strand of literature finds that age is negatively related to job performance (Rhodes 2004). However, another strand of research (Schmidt et al. 1986; McDaniel et al. 1988) suggests that age is positively correlated with job performance. Schmidt et al. (1986) and McDaniel et al. (1988) specifically find that experience is positively related to

performance. Clearly, as a person gains more experience, he necessarily becomes older, suggesting that age and performance are positively related.

Years of Pro Playing Experience contains the number of years that a player has played professionally, whether in the NBA or other professional league. Including this variable is consistent with the idea of learning by doing (Arrow 1962; Levitt, List, and Syverson 2013), as skill improves with experience. Consistent with this notion, I also include Years of Playing with Boston Celtics. This variable also captures familiarity, as investors will suffer from less information asymmetry about a player the longer he plays with the team (Brennan and Cao 1997). Along similar lines, I include Player Won Championship with Boston Celtics, which equals one if a player was on a Boston Celtics championship team and zero otherwise.

1.4 Salary Measures of Labor Quality

Data on the Boston Celtics' player payroll for the 1985-1986, 1986-1987, 1987-1988, 1988-1989, 1991-1992, 1992-1993, and 1993-1994 seasons are from Fort and Quick (1995). Data for all other seasons (except for 1989-1990, for which no data are available) are from Patricia Bender's website at www.eskimo.com/~pbender. As a certification of the quality of Bender's data, noted sports economist Rodney Fort posts Bender's data on his website at https://sites.google.com/site/rodswebpages/codes.

Data on individual player salaries come from basketball-reference.com. Player Salary is the salary of a player when he is added to or removed from the Celtics. Team Average Salary is the average salary of all team members at the time of a player transaction. Player Salary Is Greater than Average equals one if a player's salary exceeds the team's mean salary and zero otherwise.

The handling of salary in the regressions deserves mention. I do not use the natural logarithm of salary data, as Player Salary and Team Average Salary are recorded in actual units (US$). The reason is that this paper is testing competing hypothesis regarding the addition or deletion of a player with an above- or below-average salary. Since the natural logarithmic function is monotonic-increasing, using the natural logarithm of these salary measures would be assuming a positive relationship between Player Salary and next-day returns and between Team Average Salary and next-day returns. By using the actual dollar amounts of salary variables, I am able to observe the relationship that the data dictate.

1.4.1 Salary and Lower Stock Prices

One set of literature suggests that differences in pay will reduce cohesiveness and impair team production. With respect to wage levels, Adams (1965) suggests that workers who believe that they are underpaid will not exert optimal effort. With respect to relative wages, or wage equity, Lazear (1989) and Levine (1991) imply that wage dispersion leads to rebellion on the part of lesser-paid employees, eroding the team's relational bonds and reducing production. Consistent with Adams (1965), Akerlof (1982) finds that employees exert the level of effort that they believe is commensurate with what they receive from their employers. This finding suggests that employees will exert more effort when they believe they are fairly compensated.

Closely related to the literature on the relationship between an employee's wage and team production is the literature on employee motivation. Frey (1993a, 1993b) argues that intrinsic motivation is costly to develop and sustain and is increased or decreased by rewards or sanctions (e.g., restrictions on financial compensation) related to

on-the-job production. Thus, Frey (1993a, 1993b) implies that, if employees believe that salaries are unfair, that belief is likely to curtail their intrinsic motivation (Leete, 2000). Frey (1993, 1993b) also argues that employees develop and use only the level of intrinsic motivation required to succeed in a task, consistent with Akerlof (1982).

Smith and Tyler (1997) find that fairness affects employees' pride in an organization. They define pride as the status of an organization or team and respect as an employee's position on a team or in an organization. As Leete (2000) argues, employees' perceptions of the fairness of salaries are likely to affect their pride and respect, thus further linking employee compensation and motivation.

The aforementioned papers imply that, if the Boston Celtics acquire an employee at a high salary (defined in this paper as higher than the team's average), team production will suffer due to less team cohesion and lower intrinsic motivation among lower-paid employees. As a result, the share price will fall. This hypothesis is stated below.

Hypothesis: Acquiring a highly-paid employee is associated with a lower stock price.

These papers also imply that, if the team acquires a highly-paid employee while trading a lower-paid employee, the net positive difference in pay will be associated with lower team production and a lower share price. This hypothesis is stated below.

Hypothesis: Acquiring a highly-paid employee while trading a lower-paid employee is associated with a lower stock price.

1.4.2 Salary and Higher Stock Prices

Lazear (1991) argues that disparities in wages do not necessarily imply lower team production. He argues that the sum total of status on the team is constant, meaning that the loss of status of lesser-paid employees equals the gain in status of highly-paid

employees. He argues that this situation will lead to gains in efficiency arising from competition among workers to win tournaments (here, for a larger contract to be drawn from fixed funds), consistent with Lazear and Rosen (1981). In addition, Lazear and Rosen (1981) argue that those gains to team production will dominate any losses due to salary differentiation.

These papers imply that, if the Boston Celtics acquire a highly-paid employee, team production will increase. Greater production should in turn lead to a higher share price. Underlying this view is the assumption that pay is positively correlated with talent. This assumption makes sense because, although the NBA is a monopsony, management will need to out-bid other teams for top players. Thus, even in the NBA, pay is likely to be somewhat correlated with talent, which is necessary to become a superstar (Franck and Nuesch 2012). This hypothesis is stated below.

Hypothesis: Acquiring a highly-paid employee is associated with a higher stock price.

The papers in this subsection also imply that, if the Boston Celtics acquire a highly-paid employee while trading a lower-paid employee, the net positive difference in pay will be associated with greater team production and, ultimately, a higher share price. This hypothesis is stated below.

Hypothesis: Acquiring a highly-paid employee while trading a lower-paid employee is associated with a higher stock price.

1.5 Player Age and Stock Prices

The literature makes mixed predictions about the effect of the age of workers on stock prices. Ouimet and Zarutskie (2014) find that employees (typically younger) with current skills are positively associated with the creation of new firms in an industry. This

relationship suggests that the industry in question is, or is expected to be, profitable. If not, informed investors and venture capitalists would not fund the growth of that industry. Also, due to the importance of product differentiation, the new firms will not produce goods and services that are identical to those of existing firms, suggesting that younger employees are associated with new technologies that are expected to add value. This situation implies that young workers are associated with higher stock prices. This hypothesis is stated below.

Hypothesis: Acquiring younger workers is associated with higher stock prices.

Bloomfield and Michaely (2004) find that investment professionals expect high-growth firms, which tend to be young as well as attractive to young workers (Ouimet and Zarutskie 2014), to be riskier than value firms. Absent the lure of high returns, which are often earned from investing at a discount, the greater risk in these young firms will make risk-averse financiers reluctant to provide key financing. As a result, many young firms are likely to fail (Cressy 2006).

The internet bubble period of 1999-2000 illustrates this notion. During that period, first-day-closing returns from initial public offerings (IPO) of technology firms averaged 65 percent, as technology firms comprised 72 percent of new issues (Ritter and Welch, 2002). These technology firms were typically young and, as Ouimet and Zarutskie (2014) find, attractive to young workers. These firms were also risky in two ways. First, 79 percent of the firms had negative earnings (Ritter and Welch, 2002). Second, investors suffered from high information asymmetry with respect to the young technology firms. Thus, to entice investment in these young, risky firms, IPO

underpricing spiked during the internet bubble period (Ritter, 1984; Lowry, Officer, and Schwert, 2010). Ultimately, the internet bubble burst.

These papers suggests that lower stock prices are associated with young workers. This hypothesis is stated below.

Hypothesis: Acquiring younger workers is associated with lower stock prices.

1.6 Fixed Effects

I control for existing player and coach fixed effects. Controlling for these fixed effects is important because a player is not added to or deleted from the Celtics in a vacuum. For instance, when a player is drafted, he is drafted into an existing team consisting of players and coaches with their own human capital. Thus, investors are reasonably expected to consider the existing players and coaches when valuing the addition or deletion of a player to the team.

The player fixed effects that are controlled for in the regressions include Percentage of Returning Players. As the name suggests, this variable is defined as the percentage of players at time t who were on the team at time t-1. Height, which is discussed earlier, can also be considered a player fixed effect because it measures the average height of existing players. The coach fixed effects that are controlled for in the regressions include Same Head Coach and Percentage of Returning Coaches. Same Head Coach is a dummy variable that equals one if the head coach at time t is the same from time t-1 and zero otherwise. Percentage of Returning Coaches is the percentage of coaches (i.e., the head coach and assistants) at time t who were on the coaching staff at time t-1. Percentage of Returning Coaches does not include the trainer.

2. Descriptive Measures

[Insert Table 1 about here]

Table 1 provides summary financial measures. Franchise values come from noted sports economist Rodney Fort's website and stock price data are from CRSP. For the years for which the Boston Celtics' franchise value is available, the average value is $136.25 million. The team's value reaches a high of $180 million after the 1990-1991 NBA season and falls to a low of $91 million two seasons later. The average stock price during a full season, which constitutes the regular season and the playoffs, is $18.42. The Boston Celtics' stock price falls to its lowest season-long average of $12.70 during the 1987-1988 season but reaches its highest season-long average of $23.59 during the 1996-1997 season. The average market value of equity, computed as the product of the average stock price over a full season and the average number of shares outstanding over a full season, is $113.4 million. The average market value of equity falls to a low of $81.7 million during the 1987-1988 season and reaches a high of $135.8 million during the 1994-1995 season.

[Insert Table 2 about here]

Table 2 summarizes the population of 168 player-related events that occur during all NBA seasons for which the Boston Celtics traded on the NYSE. Of those 168 events, 77 pertain to player additions while 91 refer to player deletions. The 77 player additions do not count drafted players because the NBA Draft occurs during the off-season.

A player deletion is defined as any situation in which a player is not firmly on the team. Thus, player deletions do not simply include traded players, waived players, players who retire, players who die, or players whose contract is voided. If I restricted

player deletions to only those situations, I would have 11 observations that occur during the season and 20 observations that occur during the off-season (shown in Table 3). As a result, a total of 31 observations, a quantity barely sufficient in theory to generate meaningful statistical interference, would be used. Instead, to facilitate meaningful statistical inference by using a much larger data set, player deletions are defined as stated above throughout this paper.

The maximum number of players acquired in a season was 11 during the 1996-1997 season, while the minimum number of acquisitions was three, which occurred during the 1987-1988 season. 91 player deletions occurred, decomposed as follows. 11 players were traded to other teams, while 56 players became free agents. According to insidehoops.com, a free agent is a player whose contract has expired, meaning that he is no longer employed. At the point of contract expiration, the player needs a new contract, with either the former team (in this case, the Boston Celtics) or another team, to be able to play in the NBA. Although it is possible for the Celtics to re-acquire a player who became a free agent, double-counting is not an issue because, upon the Celtics' re-acquiring that player, he is counted under Acq.

In addition, 23 players' contracts were placed on waivers (CPW), meaning that other teams in the NBA had a chance to sign the player away from the Boston Celtics. As with a player's becoming a free agent, it is possible for the Celtics to re-sign a player whose contract was placed on waivers. No double-counting occurs in this case because, upon a player's re-signing, he is counted under Acq. Although some players fall in the CPW category, the Celtics did not formally waive any players during the trading period.

However, the team renounced the free-agent exception rights of one player during the 1990-1991 season.

[Insert Table 3 about here]

Table 3 summarizes the 260 player-related events that occur during the off-seasons when the Boston Celtics' stock trades on the NYSE. In all, 118 additions and 142 deletions occur across all off-seasons.

Regarding player additions, the Boston Celtics select 25 players in the NBA Draft in each off-season, and the number of players drafted ranges from a minimum of one to a maximum of seven after the 1986-1987 season. The team acquires 91 players, with a maximum of 16 players acquired after the 1996-1997 season. One player is retained in an expansion draft (RED). An expansion draft occurs when the NBA adds a new team, which, of course, will need players. Instead of requiring the expansion team to field a team wholly of inexperienced rookies via the NBA Draft, the league allows the expansion team to draft experienced players from existing NBA teams. As such, all NBA teams are required to make certain players available for the expansion draft. If the expansion team does not draft a player, he remains with his current team (i.e., is retained in an expansion draft). Also, the Celtics exercise the team's option to extend a contract (TOEC) to one player after the 1995-1996 season.

Regarding player deletions, 14 players are traded across the off-seasons. The team waives two players. The Boston Celtics place the contracts of 23 players on waivers (CPW). 70 players become free agents (FA), with the maximum number, 13, occurring after the 1996-1997 season.

21 players become free agents whose exception rights are renounced (FAERR). This term is explained based on information from the NBA's website (nba.com). After a player plays three years for a NBA team (here, the Boston Celtics) without becoming a free agent or being waived, he becomes a qualifying veteran free agent. This situation is more commonly known as earning "Bird rights," named after former Celtics superstar Larry Bird. This situation means that the player can exercise his option to remain with the Boston Celtics. If a player chooses to exercise the option, he is eligible to receive a raise of 10.5% of the salary from his rookie year. Even if the team exceeds the limit that the NBA allows for salaries (i.e., the salary cap), the team is not penalized. However, the team has the option to grant or deny the player's requested contract extension, choosing in 21 cases to renounce those players' free-agent exception rights.

As the next column shows, four players become free agents whose rights are renounced (denoted FARR). Unlike players under FAERR, players under FARR do not have Bird rights. Three players are lost in an expansion draft (LED). Two players retire, and the team voids the contract of one player. One player passes away (PA), while another player receives a qualifying offer (RQO) to become a restricted free agent.

The RQO situation is explained as follows, based on information from nba.com. A restricted free agent is a free agent who, although he signs an offer sheet from another team, will be retained by his current team (here, the Celtics) if Boston matches the terms in the offer sheet. In this situation, the player's current team is said to have the right of first refusal. A qualifying offer to a player is a one-year contract with a value that equals the maximum of (1) 125 percent of the player's previous salary or (2) the player's minimum salary plus $175,000. If the player accepts the qualifying offer, he receives a

one-year contract, plays the upcoming season as a restricted free agent, and becomes an unrestricted free agent at the end of the upcoming season. As an unrestricted free agent, the player will be able to sign with any team he chooses, and his current team will not have the right of first refusal.

3. General Note about Results

In the sections that follow, I present the results of the main analysis and additional tests. In doing so, I discuss percentage-point changes in the team's next-day returns as well as dollar-value changes in the team's market value of equity (MVE). In almost all cases, percentage-point changes in next-day returns are computed as a regression coefficient multiplied by 100. Also, in almost all cases, I compute changes in MVE as a regression coefficient multiplied by the team's average market value of equity ($113.4 million, shown in Table 1) over the period that the team traded on the NYSE. If the MVE computation is not a straightforward multiplication, I show the computation.

For instance, a coefficient of 0.007 for Average Height implies that an increase of one percentage point is associated with an increase in next-day returns of 0.7 (= 0.007 x 100) percentage points. This result would correspond to a MVE increase of $793,800 (= 0.007 x $113.4 million).

4. The Market's Reaction to Inexperienced New Hires

[Insert Table 4 about here]

Table 4 presents the results of OLS regression analysis that seeks to explain stock returns on the day after inexperienced employees are hired. To proxy for such an environment, I use the NBA Draft. The NBA Draft is a setting where the market knows that an inexperienced or entry-level employee will be hired. During the Draft, the Boston

Celtics select players with no previous NBA experience. As stated earlier, the dependent variable in all regressions in this paper is the post-event-day return, defined as the BOS return on the next trading day. The next trading day's return is the appropriate dependent variable because the Draft occurs when the market is closed.

I use the population of 25 players whom the Boston Celtics draft during the time that the team trades on the NYSE. Since the Celtics draft the players across 11 different NBA Draft instances, meaning that the team drafts multiple players in some years, 11 observations are used in the regressions. The small population is not an issue because some studies (e.g., Warner, 1977) provide useful results with small populations. When multiple players are drafted, I use average values of the independent variables. Team and coach fixed effects, which are controlled for in Model (2), are % Returning Players and % Returning Members of Coaching Staff, respectively.

The main point of Table 4 is that the market's valuation of various labor characteristics varies in direction and in significance. % Who Played in Big Six Conference is positively related to post-Draft-day returns. Model (1) indicates that a percentage-point increase in this variable is associated with an increase of 2.8 percentage points in the next-day return. This result corresponds to an increase of $3.2 million in the team's market value of equity. This positive relationship implies that investors value top-level training when inexperienced workers are hired. Since Big Six teams are known for selectively recruiting players and investing heavily in player development, playing in a Big Six Conference is a proxy for receiving a top-quality basketball education. This result is consistent with the idea that well-educated new hires are expected to add value (Ouimet and Zarutskie 2014).

Average Height is associated with lower stock prices. Model (1) shows that a percentage-point increase in this variable is associated with a 0.4-percentage-point drop in the next-day return, or slightly more than a $450,000 reduction in the market value of equity. At first thought, investors might be expected to cheer the drafting of tall players because Berri et al. (2005) find that tall players exist in short supply and are more productive than short players. However, investors realize that the newly-drafted tall players are inexperienced relative to the NBA and will need on-the-job training to improve their skills. As a result, the stock price falls. This explanation is consistent with the notion of learning by doing (Arrow 1962; Levitt, List, and Syverson 2013).

Points per Game is associated with higher next-day returns. This result makes sense because players who scored consistently in college are expected to complement the scoring ability of the players who are already on the team. This explanation is consistent with research that shows that complementarities among labor are positively related to team success (Gould and Winter 2009; Bartel, Beaulieu, Phibbs, and Stone 2014; Arcidiacono, Kinsler, and Price 2016).

Field-Goal Shooting Percentage is negatively related to next-day returns. This result makes sense because NBA teams typically have a designated player(s) who score most of the points by taking most of the shots. If an inexperienced player shoots sparsely, he cannot get into a shooting rhythm. As a result, his shooting percentage will suffer. In addition, if his effort is reduced because he shoots poorly, complementarities among labor will suffer, leading to lower returns and lower equity value. This explanation is consistent with research that shows that complementarities among labor are positively related to team success (Gould and Winter 2009; Bartel, Beaulieu, Phibbs,

and Stone 2014; Arcidiacono, Kinsler, and Price 2016). Model (3) shows that a percentage-point increase in Field-Goal Shooting Percentage is associated with a decrease of 0.2 percentage points in the next-day return, amounting to a decrease in equity value of just over $225,000.

Although not shown, I find no evidence that the salaries of inexperienced hires affect stock prices. The lack of significance holds whether the employee's salary is above or below the team's average salary. An explanation is that a rookie pay scale existed in the NBA during the sample period. Thus, investors, knowing that a rookie's salary was capped, were not surprised when the salary was announced.

Also, although not shown, I find a positive coefficient of Total Rebounds per Game. That coefficient is significant at the 14 percent level, close to the 10-percent threshold for meaningfully marginal significance. Since rebounding complements the team's shooters by giving them additional opportunities to score, the results for Total Rebounds per Game lend credence to the importance of complementarities among labor (Gould and Winter 2009; Bartel, Beaulieu, Phibbs, and Stone 2014; Arcidiacono, Kinsler, and Price 2016).

5. The Market's Reaction to All Labor Additions

[Insert Table 5 about here]

Table 5 shows the results of OLS regressions that seek to explain the market's reaction to all labor additions, whether of inexperienced or seasoned hires. Consistent with Table 2, labor additions that occur during the season include only Acquisitions (Acq). Consistent with Table 3, labor additions that occur during the off-season include

Acq, drafted players (Draft), players retained in an expansion draft (RED), and players for whom the team exercises its option to extend a contract (TOEC).

The most novel result of Table 5 is that % Returning Players is positively related to next-day returns. All models show that a one-percentage-point increase in % Returning Players is associated with a 0.4-percentage-point increase in the next-day return, amounting to an increase in equity value of slightly over $450,000. This result suggests that, when the Celtics acquire a player, investors consider the existing players with whom the acquired player will play. This situation further suggests that investors realize that complementarities among labor are valuable (Gould and Winter 2009; Bartel, Beaulieu, Phibbs, and Stone 2014) and thus consider whether those complementarities will be positively or negatively affected. The positive price response indicates that, on average, investors expect complementarities among labor to improve.

Table 5 shows that, in contrast to Table 4, Height is positively related to the next-day return on the Boston Celtics' stock price. This result makes sense because, in the full sample of additions, experienced acquisitions make up the bulk of the observations. All models show that an extra inch of height of an added employee is associated with approximately a 1.2-percentage-point increase in the next-day return, corresponding to an increase in equity value of $1.4 million. The positive relationship between Height and returns is consistent with the findings that (1) tall players are more productive and are likely to be more successful than short players (Berri et al. 2005) and (2) height is positively related to career success (Judge and Cable 2004).

Consistent with the findings in Table 4 for inexperienced new hires, Table 5 shows that Field-Goal Shooting Percentage is negatively related to next-day returns. The magnitude of the impact is also similar to that found in Table 4.

% Who Played in Big Six Conference does not explain next-day returns. This result contrasts with Table 4, which shows that this variable is positively related to next-day returns. The key difference is that Table 4 considers only inexperienced new hires while Table 5 considers all acquired players, most of whom are experienced hires. Taken together, Tables 4 and 5 suggest two important points. The first point is that, based on Table 4, experience at a prior level is important at the point of hire at a new level, consistent with the signaling argument in Spence (1973). The second point is that, based on Table 5, experience at a prior level does not affect prices when an employee moves laterally. This result is consistent with CEK (2012), who find that the stock prices of investment banks rise when they acquire experienced investment bankers from their rivals (i.e., when the experienced bankers move laterally). By similar logic, % McDonald's High-School All-Americans does not significantly explain next-day returns associated with player acquisitions in general.

Although not shown, as with the case of inexperienced hires, I find no evidence that salary affects stock prices when experienced employees are hired. The lack of significance holds whether the employee's salary is above or below the team's average salary. Also, interactions of salary with age as well as salary with years of experience do not explain next-day returns. One explanation is that investors know that (1) experienced players will be paid more than inexperienced players and (2) superstars are paid more

than the average player (Rosen 1981; Franck and Nuesch 2012). Thus, investors realize that team management needs to pay for performance, consistent with Lazear (1979).

6. The Market's Reaction to Labor Deletions

[Insert Table 6 about here]

Table 6 shows the results of OLS regressions that seek to explain the market's reaction to labor deletions. Consistent with Table 2, labor deletions that occur during the season include traded players (Trade), players who become free agents (FA), players whose contracts are placed on waivers (CPW), and players whose free-agent exception rights are renounced (FAERR). Consistent with Table 3, labor deletions that occur during the off-season include Trade, players whom the Celtics waive (Waive), CPW, FA, FAERR, players whose free-agent rights are renounced (FARR), players whom the Celtics lose in an expansion draft (LED), players who retire (Retire), players whose contracts the Celtics void (Void), players who pass away (PA), and players who receive a qualifying offer (RQO) to become a restricted free agent.

Across all models, the salary variables typically explain the Boston Celtics' next-day returns. Most importantly, the coefficient of Player Salary Is Greater than Average x Ln(Age) in Model (3) is positive and significant. The coefficient suggests that the next-day return is increasing in the interaction of a large player salary and player age. Model (3) indicates that the next-day return and the market value of equity increase by 0.11 percentage points and $12.5 million, respectively, when an older, highly-paid player is deleted. This finding contrasts with Lazear (1979), who suggests that the market should punish the deleting of a highly-paid employee, whom Lazear (1979) suggests must also be highly-skilled if pay reflects performance. However, this finding is consistent with the

view that younger workers are associated with higher stock prices (Ouimet and Zarutskie 2014) because the effect of removing older workers is that the team will become younger.

The positive coefficient of the interaction term Player Salary Is Greater than Average x Ln(Age) is also consistent with the view that workers' abilities (Rhodes 2004), including their physical abilities (Beckett, Brock, Lemke et al. 1996), decline with age. Since the NBA is a professional sports league, which requires physical ability to succeed, the finding of a negative relationship between physical ability and age is clearly relevant. Some of the NBA's greatest players underscore this finding. For instance, Charles Barkley, a member of the NBA Hall of Fame, periodically reminds viewers during NBA television broadcasts that "Father Time is undefeated."

Player Salary is positively related to next-day return. If pay reflects performance (Lazear 1979), players with greater talent will receive higher salaries. Thus, investors likely view the removal of players with increasingly higher salaries as a signal that those players did not meet expectations. As a result, the market cheers those players' removal from the team. To quantify the effect of Player Salary on the next-day return, Model (2) indicates that a one-dollar increase in the salary of a deleted player is associated with an increase of 8.159×10^{-7} percentage points in the next-day return. Equivalently, for each \$1,225,640 (= \$1 / 8.159×10^{-7})) of salary (here, payroll reduction) associated with the deletion of an employee, next-day returns increase by one percentage point.

The coefficient of Ln(Age) is generally positive and significant, suggesting that the removal of older players is associated with a higher stock price. The coefficient of 0.021 on Ln(Age) in Model (2) implies that the next-day return increases by 2.1 percentage points, or \$2.4 million in equity value, as Ln(Age) increases by one unit.

Years of Playing with Boston Celtics is negatively associated with next-day return. Model (2) indicates that the next-day return falls by 0.4 percentage points, for a loss of over $450,000 in equity value, when a player with an extra year of tenure with the Celtics is deleted. An explanation for this result is that investors realize that a player who has a long tenure with the team is likely to have developed complementarities with his teammates. When such a player is deleted, investors, who realize the value of complementarities among workers (Gould and Winter 2009), believe that the team's complementarities will become weaker, consistent with Bartel, Beaulieu, Phibbs, and Stone (2014). Also, if complementarities among workers are lower, investors will believe that fewer productivity spillovers will exist (Arcidiacono, Kinsler, and Price 2016). This line of thought also explains the positive association between % Returning Players and next-day returns because an increasing percentage of returning players means that more players with established complementarities remain on the team.

7. The Market's Reaction to Net Labor Additions

[Insert Table 7 about here]

Table 7 shows the results of OLS regressions that seek to explain the market's reaction to net labor additions. A net labor addition occurs when, on the same date, a player is added while another player is deleted. In cases where multiple players are added or deleted, I average the labor characteristics of the added or deleted players. The purpose of this phase of analysis is to measure the market's reaction to net changes in labor characteristics. Accordingly, the continuous independent variables described above are measured in differences that equal the variable's value for the added player minus that

of the deleted player. In some cases where multiple players are added or deleted, salary data may not exist for all players. In those cases, I use only the available salary data.

Some special cases deserve mention. On October 16, 1987, the Celtics acquired one future draft pick and traded two players. I exclude this record because the team did not know who would be drafted in the future, which also means that the team did not know that player's labor characteristics. A similar situation occurred on October 5, 1989, when the Celtics acquired John Bagley and traded two future draft picks. I omit this record for similar reasons. Also, on June 23, 1988, Dennis Johnson was retained in the Expansion Draft while Fred Roberts was lost in that Draft and Sylvester Gray was traded. I include this record because, although the team never technically lost Johnson, the market is likely to have responded to the Celtics' retaining him in the Expansion Draft.

The main point of Table 7 is that Difference in Player Salary is positively associated with next-day returns. Recall that all difference variables are computed as the value for an added player minus the corresponding value for a deleted player. Thus, negative values of Difference in Player Salary indicate that the salary of an acquired player is less than that of a deleted player. This result implies that, if a net trade leads to a lower (higher) payroll, next-day returns rise (fall). Stated differently, acquiring a highly-paid employee while removing a lower-paid employee is associated with lower returns, consistent with Lazear (1989), Levine (1991), and Leete (2000).

To quantify this relationship, Model (2) shows that the coefficient of Difference in Player Salary is -1.108×10^{-8}. This result implies that a net trade that results in a payroll reduction of one dollar is associated with higher returns of 1.108×10^{-6} percentage points.

Equivalently, a net addition that results in a payroll reduction of $902,527 (=0.01 x $1 / $1.108x10^{-8}$)) is associated with a one-percentage-point increase in next-day returns.

Difference in Years of Pro Playing Experience is negatively related to next-day returns. A one-year increase in this variable is associated with a 0.3-percentage-point decline in the next-day return, or a decrease in equity value of slightly over $340,000. However, Difference in Points per Game is positively related to next-day returns, suggesting that investors value a net acquisition that improves productivity. Model (2) shows that a percentage-point increase in this variable is associated with a 0.3-percentage-point increase in the next-day return, corresponding to an increase in equity value of over $340,000. Although not shown, interactions of differences in salary with differences in years of experience do not explain next-day returns.

8. Robustness Test

[Insert Table 8 about here]

Table 8 shows the results of robustness tests of gross labor additions and deletions against the prevailing economic state at the time of a labor transaction. I define a gross labor addition or deletion, respectively, as the standalone acquisition or removal of a player (i.e., without considering a related removal or acquisition of another player). To control for the economy, I include year dummy variables, which capture all observed and unobserved economic factors in a respective year. I do not conduct a similar robustness test for net labor additions and deletions because of econometric issues. The two regression models shown in Table 7 include only 14 and 11 observations, respectively. Since the Boston Celtics traded for 13 years on the NYSE, adding 13 year dummy

variables would result in a situation wherein the number of independent variables exceeds the number of observations, allowing for multiple OLS solutions.

Table 8 shows that the interaction term Player Salary Is Greater than Average x Ln(Age) is robust to the economy for deletions. Also, the main-effects variables Player Salary, Player Salary Is Greater than Average, and Years with Boston Celtics are robust to the economy for deletions. For additions, Height and Field-Goal Shooting Percentage are robust to the economy. The results of this robustness test are consistent with the main results shown earlier for gross labor additions and deletions.

9. Endogeneity Test and Counterfactual Analysis

[Insert Table 9 about here]

Table 9 shows the results of a counterfactual and endogeneity test. These tests are necessary to promote the validity of the main result discussed earlier in this paper – namely, that a relationship exists between changes in labor and next-day returns. A counterfactual statement is that, if no such relationship existed, it would not matter whether an analysis is conducted on a subgroup of labor trades during the season versus during the off-season. However, if a firm's labor base is a valuable asset (Zingales 2000), changes in labor should explain returns, regardless of when the changes occur. Thus, I segment the data set into subgroups based on whether a labor transaction occurred during the season or during the off-season. In both subgroups, the sum of additions and deletions exceeds the total because of the need to remove controls for the economy in the "All" regressions due to multi-collinearity.

It is important to note that segmenting the data set in this manner is different from including the During Season dummy variable in earlier regressions. Including the During

Season dummy variable in the regressions merely tests whether the intercept differs for events that occur during the season versus the off-season. Segmenting the data set based on in-season versus off-season and running regressions on each subgroup allows for the examination of labor characteristics that explain next-day returns in each subgroup.

Segmenting the data set into subgroups based on in- versus off-season is also a useful test to mitigate endogeneity. Endogeneity exists because management can choose whether to acquire or trade a player. However, various events (e.g., injury to existing players) that occur during a season mitigate endogeneity because managers will need to quickly acquire or trade a player to maintain a competitive team to keep their jobs and preserve their reputation capital. Likewise, the need to assemble a competitive team during the off-season mitigates endogeneity for the same reason.

Table 9 shows results that negate the counterfactual, as several labor characteristics significantly explain next-day returns during the season as well as during the off-season. Ln(Age) explains labor transactions during the season while Years with Boston Celtics and Player Won Championship with Boston Celtics explain labor transactions during the off-season. Also, Player Salary, which reflects a player's skill (Lazear 1979), explains labor transactions both during the season and the off-season. Since labor characteristics explain next-day returns in both subsets of the data, I can conclude that the counterfactual is rebutted, lending support to the view that labor characteristics affect next-day returns.

10. Conclusion

I use data from the NBA's Boston Celtics, which traded on the NYSE from 1986 to 1998, to examine the effect of changes in labor base on stock prices of monopsonistic

firms. The market positively values the acquisition of inexperienced employees with top-level training. For all employee acquisitions, most of which involve experienced employees, prices respond positively to expected complementarities with existing players but do not respond to salary. Regarding employee deletions, prices rise when an older worker is removed but fall when that worker has a longer tenure with the team or a large salary. Regarding net employee trades, a net increase (decrease) in payroll is associated with lower (higher) next-day returns. Taken together, these results suggest that changes in labor affect firm value, lending credence to Zingales' (2000) assertion that a firm's employee base has value potential.

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Table 1
Summary financials

Summary financials on the NBA's Boston Celtics are shown for each full season, which includes the regular season and the playoffs associated. Franchise Value is the team's value from the website of sports economist Rodney Fort of the University of Michigan. Avg. Stock Price is the average stock price during the specified full season. Avg. Shares Outstanding is the average number of shares outstanding over the course of a full season. Avg. Mkt. Value of Equity is the product of the average stock price and the average number of outstanding shares, both for a given full season.

Season	Franchise Value ($ Mil.)	Avg. Stock Price ($)	Avg. Shares Outstanding (Millions)	Avg. Mkt. Value of Equity ($ Millions)
1986-87	N/A	14.86	6.435	$95.6
1987-88	N/A	12.70	6.435	81.7
1988-89	N/A	13.86	6.435	89.2
1989-90	N/A	17.39	6.435	111.9
1990-91	180	16.58	6.435	106.7
1991-92	110	19.59	6.435	126.0
1992-93	91	17.36	6.435	111.7
1993-94	117	19.78	6.404	126.7
1994-95	127	21.22	6.400	135.8
1995-96	134	22.79	5.641	128.6
1996-97	155	23.59	5.614	132.0
1997-98	176	20.90	5.346	111.8
Population Period	136.25	18.42	6.206	113.4

Table 2
Labor-related events during NBA season

Population parameters for the 168 events pertaining to players associated with the NBA's Boston Celtics from December 4, 1986, to March 31, 1998, are shown by season. 77 events involve player additions while 91 involve player deletions. Each column contains data on a specific aspect of player-related dynamics. Trade is the number of players traded. Acq is the number of players acquired via trade. Waive is the number of players waived. FA is the number of players who become free agents. CPW is the number of players whose contract is placed on waivers. FAERR is the number of players whose free-agent exception rights are renounced by the Boston Celtics.

	Additions (N = 77)	Deletions (N = 91)			
Season	Acq	Trade	FA	CPW	FAERR
1986-87	5	0	3	1	0
1987-88	3	1	3	3	0
1988-89	9	2	3	0	0
1989-90	4	0	2	2	0
1990-91	6	0	5	2	1
1991-92	8	1	11	4	0
1992-93	9	1	7	5	0
1993-94	5	0	3	0	0
1994-95	6	1	5	1	0
1995-96	7	1	4	2	0
1996-97	11	0	10	3	0
1997-98	4	4	0	0	0
All	77	11	56	23	1

Table 3
Labor-related events during the off-season

Population parameters for the 260 events pertaining to players associated with the NBA's Boston Celtics from December 4, 1986, to March 31, 1998, are shown for the off-season immediately following a given season. Of the 183 events, 118 involve player additions while 142 involve player deletions. Draft is the number of players drafted. Trade is the number of players traded. Acq is the number of players acquired via any method other than the Draft. Waive is the number of players waived. FA is the number of players who become free agents. CPW is the number of players whose contract is placed on waivers. FAERR is the number of players whose free-agent exception rights are renounced. FARR is the number of players whose free-agent rights are renounced. LED is the number of players whom the Boston Celtics lose to an expansion team in an expansion draft. RED is the number of players retained in an expansion draft. Retire is the number of players who retire from the Boston Celtics. TOEC is the number of players for whom the Boston Celtics exercise their team option to extend a contract. Void is the number of players whose contracts are voided. PA is the number of players who pass away. RQO is the number of players who receive a qualifying offer to become a restricted free agent.

	Additions (N = 118)				Deletions (N = 142)										
Off-Season After …	Draft	Acq	RED	TOEC	Trade	Waive	CPW	FA	FAERR	FARR	LED	Retire	Void	PA	RQO
1986-87	7	11	0	0	3	0	5	3	0	0	0	0	0	0	0
1987-88	2	9	1	0	1	0	2	8	3	0	1	0	0	0	0
1988-89	2	7	0	0	2	0	1	9	0	0	1	0	0	0	1
1989-90	1	5	0	0	0	1	0	4	4	0	0	1	0	0	0
1990-91	1	7	0	0	0	0	3	4	2	0	0	0	0	0	0
1991-92	2	6	0	0	0	0	2	4	0	0	0	1	0	0	0
1992-93	1	7	0	0	0	0	2	5	0	0	0	0	0	1	0
1993-94	2	9	0	0	1	1	0	9	0	4	0	0	0	0	0
1994-95	2	6	0	0	0	0	2	5	2	0	1	0	0	0	0
1995-96	2	8	0	1	1	0	3	6	1	0	0	0	0	0	0
1996-97	3	16	0	0	6	0	3	13	9	0	0	0	1	0	0
All	25	91	1	1	14	2	23	70	21	4	3	2	1	1	1

Table 4
The market's reaction to inexperienced new hires

This table shows OLS regressions that explain next-day returns associated with players whom the Boston Celtics acquire in the NBA Draft, which proxies for an environment wherein inexperienced new workers are hired. % Who Played in Big Six Conference is the percentage of players who played in a major (Big Six) conference, which proxies for a top-level basketball education. % Lottery Picks is the percentage of drafted players who were lottery picks. Average Height is the average height of players drafted. % McDonald's H.S. All-American is the percentage of drafted players who were McDonald's High-School All-American basketball players. Average Years of College Playing Experience is the average number of years of college playing experience for drafted players. Points per Game is straightforward. Field-Goal Shooting Percentage is the combined two- and three-point shooting percentage of drafted players. % Returning Players and % Returning Members of the Coaching Staff are, respectively, the percentage of players or members of the coaching staff who were on the team during the immediately prior season and return to the team the following season.

Dependent Variable:	Next-Day Return			
	(1)	(2)	(3)	(4)
Intercept	0.267	0.283*	0.296***	0.288*
	(0.131)	(0.127)	(0.049)	(0.114)
% Who Played in Big Six Conference	0.028**	0.025*	0.029***	0.028**
	(0.008)	(0.010)	(0.003)	(0.007)
Average Height	-0.004**	-0.005**	-0.003***	-0.004**
	(0.002)	(0.001)	(0.001)	(0.001)
Points per Game	0.006**	0.005**	0.005***	0.005**
	(0.002)	(0.002)	(0.001)	(0.002)
% McDonald's High-School All-Americans	-0.013			
	(0.014)			
Average Years of College Playing Experience		0.005		
		(0.005)		
Field-Goal Shooting Percentage			-0.002***	
			(0.0005)	
% Lottery Picks				-0.018
				(0.013)
% Returning Players	-0.0002	-0.0005	0.0001	-0.0003
	(0.0004)	(0.0005)	(0.0001)	(0.0003)

% Returning Members of Coaching Staff	0.00003 (0.0001)	0.0001 (0.0001)	-0.0001 (0.0001)	0.0001 (0.0001)
N	11	11	11	11
R^2	0.891	0.891	0.983	0.911

Table 5
The market's reaction to labor additions

This table shows the results of OLS regressions of next-day returns on labor additions. Height is the height of a traded player. Field-Goal Shooting Percentage is a player's combined two- and three-point field-goal shooting percentage. Points per Game, Total Rebounds per Game, and Assists per Game are straightforward. Years of Pro Playing Experience is a player's number of seasons of professional basketball experience. Ln(Age) is the natural log of a player's age. Years with Boston Celtics is the number of years that a player has played with the Boston Celtics. % Who Played in Big Six Conference is the percentage of players who played in a major (Big Six) conference, which proxies for a top-level basketball education. % McDonald's H.S. All-American is the percentage of players who were McDonald's High-School All-American basketball players. During Season equals one if a player was added to the Celtics during a season and zero otherwise. % Returning Players is the percentage of players who played for the Celtics during the immediately prior season and return to the team the following season. Head Coach Change equals one if the team has a new head coach and zero otherwise. % Returning Members of Coaching Staff is the percentage of members of the coaching staff who coached for the Celtics during the immediately prior season and return to the team the following season.

Dependent Variable:	Next-Day Return		
	(1)	(2)	(3)
Intercept	-1.038*	-1.154*	-1.107**
	(0.524)	(0.606)	(0.528)
Height	0.012*	0.012**	0.013**
	(0.006)	(0.006)	(0.006)
Field-Goal Shooting Percentage	-0.002*	-0.002*	-0.002*
	(0.001)	(0.001)	(0.001)
Points per Game	0.010	0.009	0.009
	(0.006)	(0.006)	(0.007)
Total Rebounds per Game	-0.010	-0.010	-0.008
	(0.015)	(0.015)	(0.016)
Assists per Game	0.002	0.005	0.007
	(0.014)	(0.014)	(0.014)
Years of Pro Playing Experience	0.003		
	(0.004)		

Ln(Age)		0.025	
		(0.123)	
Years with Boston Celtics			-0.002
			(0.009)
% Who Played in	0.054	0.055	0.054
Big Six Conference	(0.035)	(0.035)	(0.035)
% McDonald's High-School	-0.045	-0.043	-0.047
All-Americans	(0.046)	(0.047)	(0.047)
During Season	-0.018	-0.016	-0.012
	(0.036)	(0.037)	(0.036)
% Returning Players	0.004**	0.004**	0.004**
	(0.002)	(0.002)	(0.002)
% Returning Members	-0.001	-0.001	-0.001
of Coaching Staff	(0.001)	(0.001)	(0.001)
N	126	125	126
R^2	0.144	0.141	0.141

Table 6
The market's reaction to labor deletions

This table shows the results of OLS regressions of next-day returns on labor deletions. Player Salary is the salary of a player when he is added to or removed from the Celtics. Player Salary Is Greater than Average equals one if a player's salary exceeds the team's mean salary and zero otherwise. Team Average Salary is the average salary of all team members at the time of a player transaction. During Season equals one if a player was added to the Celtics during a season and zero otherwise. Points per Game, Total Rebounds per Game, and Assists per Game are straightforward. Ln(Age) is the natural log of a player's age. Years with Boston Celtics is the number of seasons that a player has played with the team. Player Won Championship with Boston Celtics equals one if a player was on a Celtics team that won a NBA title and zero otherwise. % Returning Players is the percentage of players who played for the Celtics during the immediately prior season and return to the team the following season. Head Coach Change equals one if the team has a new head coach and zero otherwise. % Returning Members of Coaching Staff is the percentage of members of the coaching staff who coached for the Celtics during the immediately prior season and return to the team the following season. Player Salary is Greater than Average x Ln(Age) is the product of Player Salary is Greater than Average and Ln(Age).

Dependent Variable:	Next-Day Return		
	(1)	(2)	(3)
Intercept	-0.098**	-0.102**	-0.089*
	(0.045)	(0.046)	(0.050)
Player Salary	$6.333x10^{-9}$*	$8.159x10^{-9}$**	
	($3.300x10^{-9}$)	($3.38x10^{-9}$)	
Player Salary Is Greater than Average			-0.377*
			(0.207)
Team Average Salary		$-1.458x10^{-9}$	$-1.499x10^{-9}$
		($5.093x10^{-9}$)	($5.282x10^{-9}$)
Ln(Age)	0.021*	0.021*	0.021
	(0.012)	(0.012)	(0.013)
Player's Salary Is Greater than Average x Ln(Age)			0.110*
			(0.061)
During Season	0.001	0.002	0.003
	(0.003)	(0.003)	(0.003)

Points per Game	0.0004	0.0002	0.001
	(0.0007)	(0.0007)	(0.001)
Total Rebounds	-0.002	-0.002	-0.001
Per Game	(0.001)	(0.001)	(0.001)
Assists per Game	0.0002	0.0008	0.000004
	(0.001)	(0.001)	(0.001)
Years with	-0.003*	-0.004**	-0.001
Boston Celtics	(0.002)	(0.002)	(0.001)
Player Won Champ.	0.008	0.005	-0.003
with Boston Celtics	(0.009)	(0.009)	(0.009)
% Returning Players	0.0002	0.0005	0.0002
	(0.0002)	(0.0002)	(0.0002)
Head Coach Change	0.020	0.017	0.015
	(0.012)	(0.012)	(0.013)
% Returning Members	0.0001	0.0001	0.0001
of Coaching Staff	(0.0002)	(0.0002)	(0.0002)
N	90	85	85
R^2	0.171	0.230	0.200

Table 7
The market's reaction to net labor additions

This table shows the results of OLS regressions of next-day returns on net labor additions, defined as the simultaneous acquiring of a player and deleting of another player. All differences in the continuous variables shown below are computed as the value for an acquired player minus the corresponding value for a deleted player. Field-Goal Shooting Percentage is a player's combined two- and three-point field-goal shooting percentage. Points per Game is straightforward. Years of Pro Playing Experience is a player's number of seasons of professional basketball experience. Years with Boston Celtics is the number of years that a player has played with the Boston Celtics. Player Salary is the salary of a player when he is added to or removed from the Celtics.

Dependent Variable:	Next-Day Return	
	(1)	(2)
Intercept	-0.003	-0.002
	(0.004)	(0.004)
<u>Difference in</u>:		
Field-Goal Shooting Percentage	-0.0005	-0.0005
	(0.0005)	(0.0004)
Points per Game	0.002	0.003**
	(0.001)	(0.001)
Years of Pro Playing Experience	-0.003*	-0.003*
	(0.001)	(0.001)
Years with Boston Celtics	0.0005	-0.0003
	(0.001)	(0.002)
Player Salary		-1.108×10^{-8}**
		(4.036×10^{-9})
N	14	11
R^2	0.453	0.822

Table 8
Robustness tests of gross labor additions and deletions against the economy

This table shows the results of robustness tests of next-day returns on gross labor additions or deletions against the economic state. Gross labor additions and deletions are defined respectively as the standalone (i.e., without considering other related transactions) acquisition or removal of a player. The economic state is controlled for via the Year Controls. Height is the height of a traded player. Field-Goal Shooting Percentage is a player's combined two- and three-point field-goal shooting percentage. Points per Game, Total Rebounds per Game, and Assists per Game are straightforward. Ln(Age) is the natural log of a player's age. % Who Played in Big Six Conference is the percentage of players who played in a major (Big Six) conference, which proxies for a top-level basketball education. % McDonald's H.S. All-American is the percentage of players who were McDonald's High-School All-American basketball players. During Season equals one if a player was added to the Celtics during a season and zero otherwise. Years with Boston Celtics is the number of years that a player has played with the Boston Celtics. Player Salary is the salary of a player when he is added to or removed from the Celtics. Player Salary Is Greater than Average equals one if a player's salary exceeds the team's average and zero otherwise. Player Won Championship with Boston Celtics equals one if a player was on a Celtics team that won a NBA title and zero otherwise. % Returning Players is the percentage of players who played for the Celtics during the immediately prior season and return to the team the following season. Head Coach Change equals one if the team has a new head coach and zero otherwise. % Returning Members of Coaching Staff is the percentage of members of the coaching staff who coached for the Celtics during the immediately prior season and return to the team the following season. Team Average Salary is the average salary of all team members at the time of a player transaction. Player Salary is Greater than Average x Ln(Age) is the product of Player Salary is Greater than Average and Ln(Age).

Dependent Variable:	Next-Day Return			
	Additions		Deletions	
	(1)	(2)	(3)	(4)
Intercept	-1.051	-0.991	0.009	0.026
	(0.740)	(0.668)	(0.105)	(124)
Height	0.012*	0.012*		
	(0.007)	(0.007)		
Field-Goal Shooting	-0.003*	-0.002*		
Percentage	(0.001)	(0.001)		
Points per Game	0.009	0.009	0.0001	0.0001
	(0.007)	(0.007)	(0.001)	(0.001)

Total Rebounds Per Game	-0.012 (0.016)	-0.012 (0.018)	-0.003* (0.002)	-0.004* (0.002)
Assists per Game	0.005 (0.015)	0.005 (0.016)	0.0001 (0.002)	0.0001 (0.002)
Ln(Age)	0.026 (0.135)		0.016 (0.014)	0.016 (0.014)
% Who Played in Big Six Conference	0.064 (0.040)	0.063 (0.040)		
% McDonald's High-School All-Americans	-0.043 (0.053)	-0.045 (0.053)		
During Season	-0.018 (0.039)	-0.016 (0.039)	0.002 (0.004)	0.002 (0.004)
Years with Boston Celtics		-0.000 (0.010)	-0.004** (0.002)	-0.004** (0.002)
Player Salary			1.361×10^{-8}*** (4.637×10^{-9})	1.370×10^{-8}*** (4.686×10^{-9})
Player Salary Is Greater than Average			-0.448* (0.232)	-0.452* (0.235)
Player Won Champ. with Boston Celtics			0.008 (0.012)	0.008 (0.012)
% Returning Players	0.002 (0.005)	0.002 (0.005)	-0.0002 (0.001)	-0.0003 (0.001)
Head Coach Change			-0.017 (0.035)	-0.023 (0.040)
% Returning Members of Coaching Staff	-0.000 (0.001)	-0.000 (0.001)	-0.0004 (0.001)	-0.001 (0.001)
Team Average Salary				1.895×10^{-8} (7.099×10^{-8})
Player Salary Is Greater than Average x Ln(Age)			0.127* (0.068)	0.128* (0.069)

Economic Controls	Yes	Yes	Yes	Yes
N	125	126	85	85
R^2	0.181	0.181	0.364	0.365

Table 9
Test of counterfactual and endogeneity

This table shows the results of counterfactual analysis and a test of endogeneity. Points per Game, Total Rebounds per Game, and Assists per Game are straightforward. Ln(Age) is the natural log of a player's age. Years with Boston Celtics is the number of years that a player has played with the Boston Celtics. Player Won Championship with Boston Celtics equals one if a player was on a Celtics team that won a NBA title and zero otherwise. % Returning Players is the percentage of players who played for the Celtics during the immediately prior season and return to the team the following season. Head Coach Change equals one if the team has a new head coach and zero otherwise. % Returning Members of Coaching Staff is the percentage of members of the coaching staff who coached for the Celtics during the immediately prior season and return to the team the following season. Player Salary Is Greater than Average equals one if a player's salary exceeds the team's average and zero otherwise. Player Salary is the salary of a player when he is added to or removed from the Celtics. Team Average Salary is the average salary of all team members at the time of a player transaction. In both subgroups, the sum of additions and deletions exceeds the total because of the need to remove controls for the economy in the "All" regressions due to multi-collinearity.

Dependent Variable:	Next-Day Return					
	During Season			During Off-Season		
	All	Additions	Deletions	All	Additions	Deletions
Intercept	-0.019	0.115	0.181	-0.076	-0.019	-0.064
	(0.100)	(0.200)	(0.200)	(0.053)	(0.100)	(0.105)
Points per Game	-0.0003	0.003	0.0005	-0.0002	-0.0002	-0.0003
	(0.002)	(0.004)	(0.002)	(0.001)	(0.001)	(0.001)
Total Rebounds per Game	-0.001	-0.008	-0.008*	0.003*	0.002	-0.001
	(0.003)	(0.005)	(0.005)	(0.001)	(0.002)	(0.003)
Assists per Game	0.001	-0.007	-0.003	0.0001	0.001	0.001
	(0.003)	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)
Ln(Age)	0.036**	0.074*	0.016	0.011	0.020	0.016

	(0.018)	(0.038)	(0.026)	(0.014)	(0.020)	(0.025)
Years with Boston Celtics	-0.001	0.008	-0.002	0.003	0.010***	-0.009*
	(0.003)	(0.005)	(0.004)	(0.002)	(0.003)	(0.004)
Player Won Championship with Boston Celtics	0.012	-0.087	0.981	-0.035**	-0.090***	-0.002
	(0.019)	(0.054)	(0.763)	(0.017)	(0.029)	(0.028)
% Returning Players	-0.001	-0.002**	-0.001	-0.0001	-0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Head Coach Change	-0.029	-0.115	-0.069	0.008	-0.012	-0.003
	(0.044)	(0.083)	(0.055)	(0.015)	(0.001)	(0.028)
% Returning Members of Coaching Staff	-0.001	-0.002	-0.003	0.0005	0.0004	-0.0004
	(0.001)	(0.001)	(0.002)	(0.001)	(0.0003)	(0.001)
Player Salary Is Greater than Average	0.005	0.009	-1.041	0.017*	0.021**	-0.011
	(0.015)	(0.023)	(0.761)	(0.009)	(0.010)	(0.016)
Player Salary	$1.587\text{x}10^{-9}$	$-1.057\text{x}10^{-8}$	$4.350\text{x}10^{-8}$*	$-8.844\text{x}10^{-9}$**	$-1.411\text{x}10^{-8}$***	$1.808\text{x}10^{-8}$**
	($9.865\text{x}10^{-9}$)	($1.148\text{x}10^{-8}$)	($2.244\text{x}10^{-8}$)	($4.054\text{x}10^{-9}$)	($5.162\text{x}10^{-9}$)	($8.546\text{x}10^{-9}$)
Team Average Salary					$-2.930\text{x}10^{-8}$	$-5.762\text{x}10^{-10}$
					($2.241\text{x}10^{-8}$)	($1.695\text{x}10^{-8}$)
Economic Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	67	35	48	94	63	37
R^2	0.208	0.588	0.383	0.173	0.353	0.502