IS IT THE TEACHER OR THE STUDENTS? UNDERSTANDING THE ROLE OF A TEAM MANAGER

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The authors thank Eva Marikova Leeds for her many helpful comments and suggestions.

Abstract

Because, it is difficult to separate managers' contributions from the abilities of the workers they supervise, firms may mistakenly attribute the contributions of the workers to the managers who oversee them. With its extensive performance data, the National Basketball Association provides a natural setting to measure a manager's contribution (here the head coach) to the performance of his team. While we find that some highly regarded coaches deserve their accolades, several successful coaches appear to owe their success to having highly talented players. In addition, some coaches with mediocre records have made significant contributions to the performance of their players.

"He can take his'n and beat your'n, and then he can take your'n and beat his'n"[i]

I. The Role of Managers

The reputation of corporate managers goes through periodic upswings and downturns. As noted by Ira Horowitz (1994b), Adam Smith argued that managers play an inconsequential role in the performance of a firm. Specifically, Smith separated the role of the entrepreneur from that of the manager. Entrepreneurs, in Smith's view, provide both the fundamental ideas and the capital the organization requires for success. Beneath the entrepreneur is a group of subordinates that oversees daily operations. From Smith's perspective, this group of subordinates does not differ in any significant degree from organization to organization. In essence, the managers of daily operations are little more than "principal clerks" [Smith (1976): pp. 54-55]. This view of managers has persisted in the neoclassical model of the firm in which "top managers are homogeneous … inputs into the production process." [Bertrand and Schoar, 2003, p. 1173]

The neoclassical theory of the firm effectively assumes away any role for managers with its emphasis on a static equilibrium. Managers are assumed to ensure that the firm behaves in a technically and economically efficient manner. That is, they derive maximal output from a given set of inputs and minimize the cost of a given level of output. For a given set of inputs, a given technology, and given prices, all managers behave in exactly the same manner.

In contrast to economists, the popular press currently regards corporate managers, particularly CEOs with an almost cult-like devotion. A search of Amazon.com's website showed almost 4,000 entries for Jack Welch, of which about twenty-five were either books by him or books whose title mentioned him.[ii] These works almost uniformly praised Welch for his leadership of GE.

The contrast between economic theory and popular wisdom reveals a theoretical flaw that economists have only recently begun to address. By focusing on equilibrium, the neoclassical model overlooks the key role of managers: to seek out and exploit disequilibria. The most successful managers take advantage of market inefficiencies (as Michael Millken did with junk bonds) or find

previously undiscovered niches (as Steven Jobs has done repeatedly at Apple Computer). Only recently have economists attempted to quantify the contributions of individual managers to the firms they head. These studies generally find that managers have a strong impact on firm policy and profitability. However, their findings are typically the result of a broad series of interactions between the CEOs, their "managerial teams," and firms as a whole. As a result, the studies can only indirectly infer the contribution of the manager.

As in other fields of economics, sports provide an avenue for exploring a broader issue. Because sports generate reams of statistics, they provide a way of measuring individual contributions in team settings that are otherwise almost impossible to isolate.[iii] The earliest studies focused on the performance of individual players as if they operated in a vacuum. More recent studies have followed Idson and Kahane (2000) and looked at how an individual player's performance is affected by the performance of the players around him. We take this literature one step further by using team and individual performance to isolate the performance of a professional basketball team's head coach.

We perform the analysis using a data set that we have compiled that measures the performance of individual players in the National Basketball Association (NBA) from the 1992-1993 season through the 2003-2004 season. We use the mobility of players and coaches over this period to isolate the contribution of coaches to determine whether coaches improve the teams they oversee. This paper contributes to the existing literature on managers and CEOs by suggesting a specific channel through which good managers improve team – and hence corporate – performance. We also show that some managers who have reputations for good management skills may simply be the beneficiaries of good teams that surround them. This finding suggests that recent empirical studies of CEOs may also be subject to the failure to isolate the behavior of managers.

In the next section, we show how managers in professional sports behave like managers in corporations in their attempts to exploit inefficiencies and discover niches. We then look at the careers of two NBA coaches. One coach – Phil Jackson – is generally acclaimed as the leading coach of his generation. The other – Tim Floyd – has been far less successful. In the third section, we

develop our model of managerial performance. The model builds on the work of Berri, Schmidt, and Brook (2006) in that it shows how much a player contributes to his team's wins. As noted above, it controls for the performance of a player's teammates. By looking at how this performance metric changes when a player switches from one coach to another, we measure how much a coach improves or worsens the performance of the players on his team. We present the estimates and evaluate the performance of a selection of NBA coaches using this model in section four. Section five contains a conclusion.

II. The Economist's View of Management and Coaching

Perhaps because of the long-standing view that entrepreneurs, and not managers, matter, the economic and financial literature has only recently begun to quantify the performance of individual managers. Some studies, such as Chevalier and Ellison (1999) and Bertrand and Schoar (2003) essentially construct matched-panel data sets that allow them to track managers as they move from firm to firm. They claim that using such data sets allows them to separate the performance of managers from the organizations they head. Unfortunately, a manager's decision to move is often endogenously made. For example, a change in CEOs could be the result of internal conflict within the organization that adversely affected the company's performance under the former CEO and whose resolution boosts the company under the new CEO. The performance of the firm could thus reflect the underlying conflict that led to the change in CEOs rather than the behavior of the CEOs themselves.

Moreover, when managers move from one firm to another, they often bring a coterie of assistants with them. The fact that the company effectively hires both the CEO and his "team" again leads to an identification question: does the firm owe changes in performance to the manager or to the team s/he heads?

Other studies, such as Johnson et al. (1985) and Bennedsen, Perez-Gonzalez, and Wolfenzon (2006) base their analyses on a truly exogenous form of separation: the unexpected

deaths of CEOs. Such data sets, though, have proven to be very small or geographically specific. Moreover, Johnson et al. base their framework on the existence of firm-specific human capital. That is, managers are valuable because they have obtained specific skills that could be learned by anyone and not because they bring any inherent talents to the firm.

Two books by Michael Lewis show how managerial initiative can lead to improved performance in professional sports. In *Moneyball* (2003), Lewis shows how Billy Bean, the general manager of the Oakland Athletics baseball team, exploited inefficiency in the evaluation of potential major league players. As was the case for Michael Millken and junk bonds, Billy Bean recognized that players with specific skills had been undervalued by the market. According to Lewis, this realization has allowed the Athletics to compete with teams that have much higher payrolls.

In *The Blind Side* (2006), Lewis describes the niche that football coach Bill Walsh first uncovered with the Cincinnati Bengals and later perfected with the San Francisco 49ers. Like Steven Jobs, Walsh developed a new product that revolutionized his field. Walsh created the "West Coast Offense," in which teams rely heavily on quarterbacks who can respond to what they see on the field and complete short passes to a variety of receivers. The West Coast Offense transformed the Bengals and then the 49ers from mediocre teams to dominant offensive machines and greatly enhanced the careers of key players on each team.

A. A Tale of Two Coaches

While Michael Lewis's case studies are highly suggestive, they do not prove that coaches and managers in professional sports systematically affect their teams' performances. A look at two coaches reveals the difficulty involved in evaluating coaching performance. Phil Jackson became head coach of the Chicago Bulls of the National Basketball Association (NBA) in 1988. Over the next nine seasons the Bulls won 74% of their regular season contests and six NBA titles. Jackson retired after winning his sixth title with the Bulls in 1998. His retirement, though, lasted only one

season. In 1999, he became the head coach of the Los Angeles Lakers. Again, Jackson's team won three consecutive titles.

During his first fourteen seasons of coaching, Jackson compiled a record unmatched in the history of the NBA. He is the only coach with a career winning percentage greater than .700, and only Red Auerbach coached teams to as many championships. Jackson was also well-rewarded. According to an Associated Press report, when Jackson agreed to return as head coach of the Lakers in 2005, his new contract made him the highest-paid coach in NBA history.[iv]

Whether one considers winning percentage, championships, or salary paid to be the appropriate measure of productivity, Jackson appears to be the best coach in NBA history. However, Jackson had considerable talent at his disposal. In seven of Jackson's first nine seasons with the Bulls, the incomparable Michael Jordan played with the team. In the 147 games Jordan did not play with the Bulls in 1993-94 and 1994-95, Chicago won only 60.5% of its games.[v]

With the Lakers, Jackson was again blessed with extraordinarily talented players, particularly Shaquille O'Neal, one of the best centers in NBA history, and Kobe Bryant, one of the best guards. When Shaquille O'Neal was traded to the Miami Heat, the Lakers' performance declined significantly. Although the initial decline took place during a year-long retirement that Jackson took after O'Neal departed, even when Jackson returned the Lakers failed to win at their previous pace. Again, it is not easy to separate Jackson's ability as a coach from the talents of his players.

Phil Jackson's career record stands in stark contrast to that of Tim Floyd, Jackson's successor in Chicago. Floyd has enjoyed considerable success as a coach at the collegiate level, winning close to two-thirds of his games with three colleges. In the NBA, however, Floyd has had little success. His record with the Bulls before being dismissed part-way through the 2001-2002 season was a dismal 49-190. Under his leadership, the formerly indomitable Bulls managed to win barely 20 percent of their games.

While Tim Floyd had far less success with the Bulls than Phil Jackson, he also had far fewer weapons at his disposal. When Jackson left, so did almost half the members of the 1997-98

championship team, including such star players as Dennis Rodman, Scottie Pippen, and Michael Jordan. At least a portion of Tim Floyd's lack of success with the Bulls can be attributed to a much shallower pool of talent. Some support for the claim that Floyd was a victim of circumstance comes from his record in 2003-04 with the New Orleans Hornets. The Hornets won half their games and advanced to the second round of the playoffs, something that none of Floyd's teams in Chicago came close to doing.

The contrasting stories of Phil Jackson and Tim Floyd exemplify the fundamental problem facing those interested in studying the role of management in the success of an organization: how can one separate the performance of management from the performance of the workers. As our title notes, is it the teacher or the students who ultimately determine the success of a team?

B. Previous Economic Studies of Sports Coaches and Managers

Economists have produced numerous studies of the role of coaches in professional sports. Notable papers examining the role of baseball managers include Ruggiero, et al. (1997), Horowitz (1997, 1994a, 1994b), Kahn (1993), Scully (1994) and Porter and Scully (1982). Fizel and D'Itri (1996) and Clement and McCormick (1989) have examined college basketball coaches. Hadley, et al. (2000) studied coaching in the NFL.

Much of this research was inspired by the seminal work of Scully (1974). Scully posited that wins were a function of a vector of player skills and a vector of other inputs including managers, coaches, and capital. To capture these factors, Scully devised a production function that included player statistics as well as factors designed to capture elements of the second vector. This basic approach to the team production function has inspired inquiries into managerial efficiency, which typically examines the relationship between wins and player's statistics to assesses managerial ability [see Horowitz (1997, 1994a, 1994b), Kahn (1993), Scully (1994)].

An alternative approach was recently offered by Dawson, Dobson & Gerrard (2000a, 2000b) and Lee and Berri (forthcoming). These papers examine the relationship between wins and a

measure of playing talent taken before the beginning of the season. Unlike this study, they view the coach's job as allocating a fixed amount of talent, not as improving the players' performance.

III. Coaching and Player Performance

The studies cited above employ the team as the unit of analysis. We depart from this literature by focusing on the impact coaches have upon the productivity of individual players. We begin our study with Table I, which reports the lifetime coaching records (as of the end of the 2005-06 season) of the 19 coaches investigated in this study. Table I includes all coaches to whom at least 20 players in our data set (described below) switched from a different coach. The records run the gamut from outstanding – Phil Jackson has won over 70 percent of his games – to mediocre – Mike Dunleavy has won almost exactly half of his games – to dreadful – Tim Floyd won less than 30 percent of his games in the NBA. Our goal is to separate the contribution these coaches made to their teams' performance from the contributions of their players.

A. Measuring player productivity

To reach this goal, we require a measure of player performance. Numerous studies of Major League Baseball have used performance metrics such as slugging percentage or OPS[vi] to measure a player's productivity. The virtue of these metrics is that each is a simple and a fairly accurate measure of performance.

For our study of basketball we turn to a measure with characteristics similar to OPS and slugging percentage. As noted in Berri, Schmdt, and Brook (2006), productivity in the NBA can be captured both simply and accurately with Win Score[vii], which is calculated as follows for player *i* in year *t*:

(1) $$WIN\ SCORE_{it} = PTS_{it} + TREB_{it} + STL_{it} + 1/2*BLK_{it} + 1/2*AST_{it} - TO_{it} - FGA_{it} - 1/2*FTA_{it} - 1/2*PF_{it}$$

Where *PTS* = Points scored, *TREB* = Total Rebounds, *STL* = Steals, *BLK* = Blocked Shots, *AST* = Assists, *TO* = Turnovers

FGA = Field Goal Attempts *FTA* = Free Throw Attempts
PF = Personal Fouls

As noted in much of the work using this model, a player can increase his production by simply playing more minutes. Therefore, to accurately assess productivity one should evaluate a player on a per-minute basis, as reported in equation (2).

(2) $Wins\ Score\ per\ minute\ (WSMIN_{it}) = Win\ Score_{it} / Minutes\ Played_{it}$

We now use this performance measure to evaluate how coaching affects production. We then examined how the productivity of these players changed from season to season based on data we collected from the 1992-93 season through the 2003-04 campaign. To be included in the sample for a given year, the player had to play at least 20 games and average at least 12 minutes per contest. These restrictions yielded a sample of 2,836 players. We refer to each data point in this sample as a "player observation". Because we often have data from the same player in multiple seasons, a single player frequently has several player observations.

B. A Simple Evaluation of Coaching

Our objective is to see how coaching impacts productivity. One simple way to do this is to ask whether a player's performance changes with different coaches. Table II shows how often players improved when they began playing for one of the 19 coaches we examine. The evidence reported in Table II suggests that, over the time period we examine, Flip Saunders was the top coach. Of the 27 players who came to Saunders, 19 (70 percent) improved. In contrast, only 48 percent of Don Nelson's player observations improved.

From Table II we might conclude that Nelson – a coach voted in 1996 as one of the top ten coaches in NBA history -- is not one of the better coaches in the NBA. Of course, there is a fundamental problem with this very simple approach. A variety of factors beyond coaching can impact a player's productivity from season to season. To assess coaching accurately, our analysis

must account for these factors. Hence, we turn to a more sophisticated empirical model of player performance.

B. A Simple Model of Player Performance

Our analysis of player productivity begins with a simple model of the determinants of performance. We employ a modified version of an equation estimated in both Berri and Krautmann (2006) and Berri, Schmidt, and Brook (2006). In each of these works the dependent variable is per-minute player productivity, which we measure with WSMIN. WSMIN, in turn, is a function of past performance and observable characteristics of player *i*.

(3) $$WSMIN_{it} = f(WSMIN_{it-1}, EXP_{it}, GP_{it}, MGM_{it}, POS_{it})$$

Where
EXP_{it} = Experience of player *i* in year *t*.
GP_{it} = Games played by player *i* in year *t*.
MGM_{it} = Minutes per game played by player *i* in year *t*.
POS_{it} = Player *i's* primary position in year *t*.

The first argument of this production function is player performance in the previous season $WSMIN_{t-1}$. This measure captures the player's level of human capital at the end of the previous season. Over the course of the season and during the off-season, players engage in on-the-job training that adds to their human capital. We take experience (EXP) as a proxy for this investment in human capital. Games played capture the impact of injuries, which reduce player performance. We also expect that, cet. par. increasing minutes played should improve performance. We base this expectation on the observation that, all else equal, the marginal product of full-time workers exceeds that of part-time workers (see Leeds, 1990). Of course, games and minutes played could also reflect the coach's opinion regarding a player's productivity. Because beliefs are based on past performance, our including the lagged value of WSMIN captures this effect. Finally, because some positions might be inherently more productive than others, we must account for a player's primary position.[viii]

C. An Empirical Model of Player Performance

We build our model using a simple linear version of Equation (3) as our starting point

$$WSMIN_{it} = \beta_0 + \beta_1 WSMIN_{it-1} + \beta_2 EXP_{it} + \beta_3 EXP_{it}^2 + \beta_4 GP_{it} + \beta_5 MGM + \beta_6 DC_{it} + \beta_7 DPF_{it} + \beta_8 DSF_{it} + \beta_9 SG_{it} + \varepsilon_{it} \quad (4a)$$

In Equation (4a), we again model current performance as a function of lagged performance and experience. We include the squared value of experience to account for possible diminishing or increasing returns to investment in human capital. This is followed by the games played, minutes per game, and position. We model position with a series of dummy variables designed to capture whether player *i's* primary position in year *t* was center (DC_{it}), power forward (DPF_{it}), small forward (DSF_{it}), or shooting guard (DSG_{it}). The default category here was point guard.

If every player stayed with the same team throughout his career and if every coach had a lifetime contract, it would be impossible to separate player performance from coaching performance. Fortunately (for us), players frequently change teams through trades or free agency, and coaches are regularly hired and fired (72 percent of all NBA teams changed coaches between the 1998-99 – the mid-year in our sample -- and 2003-04 seasons, several of them more than once).

NBA teams' propensity to change coaches allows us to identify the impact of a coach on player performance. Coaching changes, however, also result when players change teams. Any change in performance might thus reflect both the new coach and the new set of teammates. In addition, adapting to a new coach or to new teammates might negatively affect a player's performance in his first season with a new team. We capture the impact of such changes on player performance by adding three variables to Equation (4a).

$$WSMIN_{it} = \beta' X_{it} + \gamma_1 TMWINS_{it} + \gamma_2 RSTAB_{it} + \gamma_3 DNC_{it} + \mu_{it} \quad (4b)$$

The first term in Equation (4b) is a vector containing all the explanatory variables in Equation (4a). The next two terms capture the impact of player *i's* teammates. Berri and Krautmann (2006) show that a basketball player's performance is affected by the players around him. In particular, player performance is subject to diminishing returns. As player *i's* teammates produce more, we expect his productivity to decline. To account for this factor, we include the number of wins (*TMWINS*) created by a player's teammates.[ix]

The second added variable accounts for roster stability. Following the work of Berri and Jewell (2004) and Berri and Krautman (2006) we measure this as the difference in the number of returning player minutes on a player's team (RSTAB).[x] *A priori*, more stable rosters (i.e., a decline in this factor) should cause a player's performance to improve as he becomes more comfortable with his teammates the longer they play together.

Finally, all the results are conditional on the team's coach. Because we account for the impact of specific coaches below, *DNC* picks up the impact of switching to a generic coach. While individual coaches might positively affect a player's performance – indeed, testing for such an effect is the point of this paper - we expect the disruption caused by the change itself to have a negative impact on player performance.

To capture the impact of playing for the coaches in Table I, we supplement Equation (4b) with a series of interaction variables that indicate whether player *i* shifted to or away from coach *j*.

$$WSMIN_{it} = \beta' X_{it} + \gamma' Y_{it} + \sum_{j=1}^{19} \delta_{ijt} (DCOACH_{ijt} * DNC_{it}) + \sum_{j=1}^{19} \theta_{ijt} (DCOACH_{ijt-1} * DNC_{it}) + \eta_{it} \quad (4c)$$

The first two terms on the right-hand side capture the effects in Equations (4a) and (4b). The third term interacts a coaching change (DNC_{it}) with playing for one of the 19 coaches in Table I. Thus, if player *i* played for a new coach in year *t* and that coach was one of the 19 in Table I, then his

productivity increased (decreased) by $\gamma_3 + \delta_{ijt}$, where γ_3 is the generic effect of playing for a new coach and δ_j is the impact that coach *j* has above and beyond a generic coach.

If moving to coach *j* improves player *i*'s performance, it is possible that moving away from coach *j* could worsen his performance. This would be the case if the human capital that player *i* gains from coach *j* rapidly depreciates if it is not constantly maintained or is highly specific to coach *j's* "system." To account for this possibility, we added the second sum in Equation (4c). This interacts the indicator variable that designates playing for a new coach with a dummy that shows whether player *i* played for coach *j* in the previous year. The impact of leaving coach *j* is thus $\gamma_3 + \theta_{ijt}$.

The use of interaction variables in Equation (4c) is similar to the use of differences-in-differences. It is not identical, however, because the event (moving from one coach to another) is not fixed in time for all player observations. The samples of players who joined any particular coach are almost all too small to test for self-selection bias that would result if coaches were particularly adept (or poor) at attracting good players. Because players can switch coaches for many exogenous reasons (the most popular of which is team's switching coaches), we do not believe this to be a significant problem.

The descriptive statistics associated with both the dependent and independent variables appear in Table III. The fact that WSMIN and its lagged value are almost identical shows that player productivity does not change dramatically from one year to the next. The relatively high value of experience, games played and minutes per game reflect the restrictions we placed on the sample and the fact that, in order to generate much of the data needed, we could not include rookies (players with less than one full year of experience) in the sample.

IV. **Estimation Results**

The results from OLS estimation of Equation (4c) appear in Table IV. For ease of presentation, we break the results into four parts. Tables IVa and IVb correspond to the variables in Equations (4a) and (4b). The last two parts contain the interaction effects for players who join a

specific coach (Table IVc) and players who leave a specific coach (Table IVd). The first column contains results for the full specification, which used all the possible explanatory variables. The second column contains only variables with a t-statistic that is greater than 1.0.

With the exception of the experience variables, the coefficients of all the variables in Table IVa are statistically significant and of the expected sign. Past performance is the single best predictor of current performance, as seen by the large value and t-statistic of the coefficient for the lagged value of WSMIN. Centers, power forwards, and small forwards are all relatively more productive than point guards, while shooting guards are less productive. The difference, however, is significant only for centers and power forwards. To our surprise, experience enters the productivity equation negatively, while the quadratic term is statistically insignificant.

The coefficients in Table IVb show evidence that both coaching and the performance of teammates impacts a player's productivity. Player performance is negatively affected by both a generic coaching change and turnover among players. As expected, team wins – the productivity of player *i's* teammates – also negatively affects the productivity of player *i*.

Of the 19 coaches for whom we created indicator variables, 8 had a statistically significant impact on the performance of new players. Of these, Phil Jackson had the greatest impact, with a point estimate of a 0.027 increase in WSMIN. Thus, players who joined a Phil Jackson-coached team saw their productivity increase by 0.027 more than players who joined a generic coach. Close behind Jackson were Rick Adelman and Rudy Tomjanovich, who increased the productivity of new players by 0.023.

The next group of coaches, which consisted of Rick Carlisle, Don Nelson, and Flip Saunders, were virtually indistinguishable, increasing the productivity of players by 0.017. Greg Popovich trailed this group only slightly, increasing productivity by 0.016. The differences among these coaches were not statistically significant. It is important to note that from Table II it appeared that Saunders was a much more successful coach than Nelson. When we control for a variety of

factors that impact performance, though, we see that Nelson and Saunders had a similar impact on player performance.

Eleven of the coaches we examined did not significantly impact the performance of individual players. One coach, Tim Floyd, had a statistically significant, negative impact on players who joined his teams, reducing productivity by 0.020. In sum, when we look at a sample of players new to a coach, most coaches are found to be the "principal clerks" described by Adam Smith in 1776.

As noted earlier, one can measure a coach's contribution by looking at players who have left as well as players who have joined a team. The results for the second set of interaction terms, those designed to test the impact of leaving one of the 19 designated coaches, appear in Table IVd. Looking at the second column of Table IVd shows statistically significant results for only four coaches, three of whom did not show statistically significant results in Table IVc. The performance of players leaving teams coached by Jeff van Gundy and Doug Collins – two coaches whose teams have had only middling success in the NBA – declined by 0.022 and 0.021, putting them among the upper tier of coaches in our study. In contrast, despite Pat Riley's outstanding record in the NBA, players who have left his teams improved by 0.012. Once again, Tim Floyd trails the pack. Players who left teams coached by Floyd improved by 0.020.

A. The Impact of Hiring and Firing Coaches on Team Performance

Our analysis has shown that many coaches do not have a statistically significant impact on player performance. A number of coaches, though, do have an impact. Because coaches should ultimately be judged by how their teams perform, it is useful to translate player performance into wins and losses. To do this, we convert the impact coaches have on player productivity – measured here in terms of Win Score per minute – into wins. Such a calculation begins by noting that each element included in Win Score is normalized around the value of a point. From Berri, Schmidt, and

Brook (2006) we see that each point is worth approximately 0.033 wins. Therefore, increasing Win Score by one would result in a 0.033 increase in team wins.

Because we needed to consider prior performance, our sample included only veterans and excluded first-year players (rookies). On average, about 9 percent of a team's minutes are allocated to rookies. If we focus on the 91% of minutes allocated to veterans we see that hiring Phil Jackson increases his teams' veterans' Win Score by about 482, which as noted in Table V, is about 16 wins.

The results from the 2005-06 season are consistent with this finding. In the summer of 2005 the Lakers returned Jackson to the sidelines. In 2004-05, without Jackson on the sideline, the Lakers had won 34 games. The key performers on this team – Kobe Bryant and Lamar Odom – returned to the team in 2005-06. With Jackson on the sideline, both Bryant and Odom increased their productivity, and the team increased its win total to 45. Because Phil Jackson has the largest impact on player and team performance, he is indeed worthy of being the highest paid coach in the league.

As Table V indicates, hiring certain coaches can increase a team's performance substantially. It is also the case the firing a coach can change a team's performance. We found that letting Jeff van Gundy or Doug Collins depart would result 12 fewer wins. In contrast, letting three-time coach of the year Pat Riley depart would lead to about seven additional victories.

The departure of Jeff van Gundy from the Knicks in 2001 illustrates his impact. In the 2000-01 season, the Knicks won 59 percent of their contests. The next season, van Gundy suddenly quit after the team had won 10 of its first 19 games. For the remainder of the season the Knicks won only 33 percent of their contests and every returning player from 2000-01 season who played more than 1,000 minutes saw his per-minute productivity decline. Thus, despite the relatively mediocre performances of the teams they coached, van Gundy and Collins could be considered among the NBA's finest coaches.

V. Concluding Observations

Managers who oversee work done by teams are generally rewarded based on the performance of their teams. An appropriate reward system should therefore pay the manager for his impact on the performance of the team. Unfortunately, it is generally difficult to separate the performance of the manager from the quality of workers whom he supervises.

In professional sports, coaches are frequently evaluated in terms of the wins and losses of the teams under their direction. Such an evaluation, though, ignores the fact that coaches work with different endowments of playing talent. The approach taken here was to ascertain the impact coaches have on the performance of players placed in their charge.

Our story began with Phil Jackson and Tim Floyd. These coaches occupy opposite ends of the win-loss rankings. A simple analysis of changes in player performance revealed that under both Jackson and Floyd players were more likely to regress. Such an approach, though, failed to control for the many factors that impact player performance beyond coaching.

When we employed a fully specified empirical model we found that player performance did systematically decline under Tim Floyd. In contrast, Phil Jackson had the largest positive impact on player productivity. Such a result suggests that Jackson deserves the highest coaching salary in the NBA.

Beyond discovering that Phil Jackson did have a substantial impact on player performance, we also found that many coaches did not have a noticeable impact. The list of coaches that did not have an impact includes many with outstanding career won-loss records. In our sample, Pat Riley ranked third in career winning percentage and Lenny Wilkens holds the record for career wins. But we found no evidence that these coaches, along with eleven others in our sample, systematically caused players new to their coaching to improve. Surprisingly, players leaving Riley were found to actually play better for their new coaches.

In sum, there is evidence that a few coaches are indeed more than "principal clerks." And a couple of coaches appear to cause performance to decline. But the majority of coaches do fit the description Adam Smith offered more than two hundred years ago.

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Table I
NBA Coaches in the Sample

Coach	Career Wins	Career Losses	Winning Percentage	NBA Championships
Phil Jackson	877	353	0.713	9
Greg Popovich	518	252	0.673	3
Pat Riley	1151	589	0.662	5
Paul Westphal	267	159	0.627	0
Rick Adelman	752	481	0.610	0
Rick Carlisle	246	164	0.600	0
George Karl	784	545	0.590	0
Flip Saunders	475	344	0.580	0
Don Nelson	1190	880	0.575	0
Jeff Van Gundy	378	288	0.568	0
Larry Brown	933	713	0.567	1
Rudy Tomjanovich	525	416	0.558	2
Lenny Wilkens	1332	1155	0.537	1
Doug Collins	332	287	0.536	0
Mike Dunleavy	510	524	0.493	0
Brian Hill	258	273	0.486	0
Chris Ford	323	376	0.462	0
John Lucas	174	258	0.403	0
Tim Floyd	90	231	0.280	0

Note: Career records conclude with the 2003-04 season. These records are reported by both the *Sporting News NBA Register* and databaseBasketball.com [http://www.basketballreference.com/index.html

Table II
Percentage of Improved Players for each Coach

Coach	Player Observations	Number of Improved Players	Percentage of Improved Players
Flip Saunders	27	19	0.70
Phil Jackson	22	15	0.68
Rick Carlisle	20	13	0.65
Rick Adelman	30	19	0.63
Doug Collins	23	14	0.61
Rudy Tomjanovich	25	13	0.52
George Karl	35	18	0.51
John Lucas	30	15	0.50
Chris Ford	23	11	0.48
Don Nelson	23	11	0.48
Greg Popovich	21	10	0.48
Brian Hill	22	10	0.45
Pat Riley	29	12	0.41
Lenny Wilkens	37	14	0.38
Larry Brown	59	22	0.37
Mike Dunleavy	35	13	0.37
Jeff Van Gundy	22	7	0.32
Paul Westphal	20	6	0.30
Tim Floyd	20	5	0.25

Table III
Means of Relevant Variables

Variable	Mean
WSMIN	0.168
Lagged WSMIN	0.173
Experience	6.860
Games Played	66.890
Minutes Played per Game	26.859
Productivity of Teammates	0.002
Roster Stability	0.675
New Coach	0.613
Center	0.209
Power Forward	0.197
Small Forward	0.192
Shooting Guard	0.198

Note: Player data can be found in the *Sporting News NBA Guide* (various years) and the *Sporting News NBA Register* (various years).

Table IVa
Determinants of Player Productivity – Player Characteristics

Variable	*Specification 1*	*Specification 2*
Lagged value of WSMIN	0.658***	0.657***
	(49.58)	(49.94)
Minutes per Game	0.001***	0.001***
	(10.86)	(10.81)
Games Played	0.0005***	0.0005***
	(9.98)	(10.15)
Center	0.032***	0.032***
	(12.10)	(12.26)
Power Forward	0.025***	0.025***
	(9.78)	(9.89)
Small Forward	0.003	0.003
	(1.23)	(1.28)
Shooting Guard	-0.003	-0.003
	(1.46)	(1.48)
Experience	-0.001	-0.0004*
	(1.36)	(1.73)
Experience Squared	0.00005	-
	(0.97)	

* - denotes significance at the 1% level
**- denotes significance at the 5% level
***- denotes significance at the 10% level

Table IVb
Determinants of Player Productivity – Player Movement Variables

Variable	*Specification 1*	*Specification 2*
Teammate Wins Production	-8.542***	-8.833***
	(6.19)	(6.62)
Roster Stability	0.021***	0.021***
	(3.88)	(4.01)
New Coach	-0.008***	-0.008***
	(4.07)	(4.44)

* - denotes significance at the 1% level
**- denotes significance at the 5% level
***- denotes significance at the 10% level

Table IVc
Determinants of Player Productivity – Impact of Moving to a Coach

Variable	*Specification 1*	*Specification 2*
New – Rick Adelman	0.023***	0.023***
	(3.22)	(3.16)
New – Larry Brown	0.008	0.008
	(1.48)	(1.44)
New_ Rick Carlisle	0.017*	0.017**
	(1.89)	(1.89)
New – Doug Collins	0.013	0.013
	(1.58)	(1.61)
New – Mike Dunleavy	0.005	-
	(0.79)	
New – Tim Floyd	-0.021**	-0.020**
	(2.35)	(2.21)
New – Chris Ford	-0.012	-0.012
	(1.49)	(1.46)
New – Brian Hill	0.004	-
	(0.51)	
New – Phil Jackson	0.026***	0.027***
	(3.03)	(3.13)
New – George Karl	0.010	0.010
	(1.38)	(1.54)
New – John Lucas	0.003	-
	(0.41)	
New – Don Nelson	0.0172**	0.017**
	(2.07)	(2.07)
New – Greg Popovich	0.015*	0.016**
	(1.74)	(1.82)
New – Pat Riley	-0.005	
	(0.71)	
New – Flip Saunders	0.017**	0.017**
	(2.23)	(2.20)
New – Rudy Tomjanovich	0.022***	0.023***
	(2.77)	(2.92)
New – Jeff van Gundy	-0.004	
	(0.50)	
New – Paul Westphal	-0.0004	
	(0.04)	
New – Lenny Wilkens	-0.0009	
	(0.14)	

* - denotes significance at the 1% level
**- denotes significance at the 5% level
***- denotes significance at the 10% level

Table IVd
Determinants of Player Productivity – Impact of Moving From a Coach

Variable	*Specification 1*	*Specification 2*
Old – Rick Adelman	0.007	
	(1.01)	
Old – Larry Brown	-0.0008	
	(0.14)	
Old_ Rick Carlisle	-0.016	-0.015
	(1.28)	(1.28)
Old – Doug Collins	-0.020**	-0.021**
	(2.44)	(2.53)
Old – Mike Dunleavy	0.005	
	(0.73)	
Old – Tim Floyd	0.020**	0.020**
	(2.05)	(2.04)
Old – Chris Ford	0.002	
	(0.28)	
Old – Brian Hill	0.008	
	(0.86)	
Old – Phil Jackson	0.005	
	(0.61)	
Old – George Karl	-0.005	
	(0.82)	
Old – John Lucas	-0.0006	
	(0.07)	
Old – Don Nelson	-0.005	
	(0.59)	
Old – Greg Popovich	0.010	
	(0.082)	
Old – Pat Riley	0.011*	0.012**
	(1.80)	(1.87)
Old – Flip Saunders	-0.008	
	(0.84)	
Old – Rudy Tomjanovich	-0.010	-0.010
	(1.21)	(1.31)
Old – Jeff van Gundy	-0.021*	-0.022*
	(1.86)	(1.90)
Old – Paul Westphal	0.004	
	(0.55)	
Old – Lenny Wilkens	-0.002	
	(0.34)	
Constant	-0.010*	-0.012**
	(1.65)	(2.01)
Number of Observations	2836	2836
Adjusted R-2	0.728	0.729

* - denotes significance at the 1% level
**- denotes significance at the 5% level
***- denotes significance at the 10% level

Table V
The Impact of Hiring and Firing Coaches
Who Have an Impact on Player Performance

Coaches	Coefficient from Specification II	Expected Change in Team Wins
The Impact of Hiring		
Phil Jackson	0.027	16.0
Rudy Tomjanovich	0.023	13.8
Rick Adelman	0.023	13.7
Don Nelson	0.017	10.2
Flip Saunders	0.017	10.1
Rick Carlisle	0.017	10.0
Greg Popovich	0.016	9.5
Tim Floyd	-0.020	-11.6
The Impact of Firing		
Jeff van Gundy	-0.022	-12.9
Doug Collins	-0.021	-12.4
Pat Riley	0.012	7.0
Tim Floyd	0.020	12.0

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[i] Attributed to former NFL coach Bum Phillips when describing the talents of rival coach Don Shula.
[ii] This counts only English-language titles of hardcover books.
[iii] Perhaps the best example of this comes in the area of discrimination, in which Kahn and Sherer's (1988) study of racial discrimination in the National Basketball Association touched off an entire literature.
[iv] Associated Press. "Return of the Zen Master. Lakers rehire Jackson as coach after reconciliation." June 14, 2005. This article was posted at CNNSI.
http://sportsillustrated.cnn.com/2005/basketball/nba/06/14/jackson/index.html
[v] Phil Jackson's coaching record was taken from NBA.com.
[vi] OPS is on-base percentage plus slugging percentage. This was utilized by Zimbalist [1992a, 1992b]. Twelve studies have only utilized slugging percentage to measure performance in baseball. These include Sommers and Quinton [1982], Raimondo [1983], Bruggink and Rose [1990], Hill [1985], Durland and Sommers [1990], Sommers [1993], Krautmann and Oppenheimer [1994], Krautmann [1999], Krautmann, Gustafson, and Hadley [2000], Maxcy, Fort, and Krautmann [2002], Krautmann and Oppenheimer [2002]. Sommers [1993] also employed a player's batting average while Krautmann, Gustafson, and Hadley [2000] added a hitter's runs-batted-in. Slugging percentage has not been the only measure of productivity chosen. Medoff [1976], Hill and Spellman [1983], and MacDonald and Reynolds [1994] measured a hitter's productivity with runs scored. Such a choice ignores the impact a player's hitting has upon the scoring of teammates. Sommers [1990] utilized a player's batting average, or simply hits divided by at-bats.
[vii] Win Score was introduced in *The Wages of Wins* [Berri, Schmidt, and Brook (2006)], although it was based on an earlier version of Berri (2008). The Win Score metric is derived from a linear weights model, developed very much in the spirit of the linear weights model introduced for baseball by John Thorn and Pete Palmer (1984). The Thorn-Palmer work was utilized by Blass (1992). A form of the basketball metrics introduced in *The Wages of Wins* was referenced in Lee and Berri (forthcoming), Berri and Schmidt (2006), Berri and Krautmann (2006), Berri and Eschker (2005), Berri, Brook, Fenn, Frick, and Vicente-Mayoral (2005), and Price and Wolfers (2007). The formula reported in many of these works is slightly different from what was reported in *The Wages of Wins*.
[viii] As noted in Berri, Schmidt, and Brook (2006), Win Score for big men tends to be higher than Win Score for small forwards and shooting guards.
[ix] To calculate the productivity of a player's teammates we measured each player's wins production according to the methodology laid forth in Berri, Schmidt, and Brook (2006). For each player we subtracted the number of wins the player produced from the team's total wins produced. We also subtracted the number of minutes the player played from team minutes. In other words, we calculated the number of wins produced by a player's teammates and the number of minutes these players played. With these two calculations in hand, we then divided the teammate's wins production by the minutes these teammates played. This calculation yielded the per-minute productivity of a player's teammates.
[x] To calculate this factor, one must first note the players who played for the team in both the current and prior season. The minutes of these players were then summed for each season, and this total was then divided by the total number of player minutes in each season. The average of these two numbers was taken, to determine the extent of roster turnover on each player's team.