Chapter Eight Notes

Modeling the Impact of Coaches on the Performance of Individual Players

From the book: p. 203. (footnote 5) *The investigation of coaches reported is taken from Berri, M. Leeds, E. Leeds, and Mondello (2009). The study considered player data from 1977-78 to 2007-08 (such data can be found at Basketball-Reference.com). Additional details can be found in the published article and at [stumblingonwins.com.](stumblingonwins.com)*

This model was originally published in Berri, David J., Michael Leeds, Eva Marikova Leeds, and Michael Mondello (2009).”The Role of Managers in Team Performance.” **International Journal of Sport Finance**, 4, n2; (May): 75-93.

The above article reports the estimated model as follows:

$$ADJP48_{it} = \beta' X_{it} + \gamma' Y_{it} + \sum_{j=1}^{62} \delta_{ijt} (DCOACH_{ijt} * DNC_{it}) + \sum_{j=1}^{62} \theta_{ijt} (DCOACH_{ijt-1} * DNC_{it}) + \eta_{it}$$

Where

ADJP48 = Adjusted Productivity per 48 minutes (see Calculating Wins Produced)

X_{it} = A vector of individual-specific variables

Y_{it} = A vector of team-specific variables and lingering coaching effects

$DCOACH_{ijt}$ = 1 if player i played for coach j in year t (= 0 otherwise) where j spans the 62 coaches in our data set

DNC_{it} = 1 if player i played for a different coach in year t than in year t-1 (= 0 otherwise)

For details on specific variable employed, estimation technique, etc… see tables and notes below.

Estimated Coefficient for Non-Coaching Independent Variables

Independent Variable	Coefficient	Standard Error	z-statistic
AdjP48, lagged*	0.1588*	0.0355	4.4700
Age	0.0465*	0.0064	7.2700
Age Squared	-0.0010*	0.0001	-8.3800
Games Past Two Seasons	0.0006	0.0001	8.1800
Dummy Variable, Center	0.0070	0.0113	0.6200
Dummy Variable, Power Forward	-0.0004	0.0099	-0.0400
Dummy Variable, Small Forward	-0.0143***	0.0084	-1.7000
Dummy Variable, Shooting Guard	-0.0179*	0.0069	-2.5800
Productivity of Teammates (TMWP48)	-0.2996*	0.0449	-6.6800
Roster Stability	0.0080	0.0069	1.1600
Dummy Variable, New Team	-0.0025	0.0025	-0.9900
Dummy Variable, New Coach	-0.0033	0.0035	-0.9300

* Significant at 1% level ** Significant at 5% level *** Significant at 10% level

Estimated Coefficient for Coaching Independent Variables

Impact of Moving To Coach…	Coefficient	Standard Error	z-statistic	p-value
Rick Adelman	0.003	0.012	0.290	0.770
Stan Albeck	0.026**	0.011	2.240	0.025
Bernie Bickerstaff	-0.001	0.012	-0.120	0.907
Allan Bristow	-0.008	0.015	-0.520	0.602
Hubie Brown	0.012	0.014	0.820	0.413
Larry Brown	0.017***	0.009	1.880	0.060
P.J. Carlesimo	0.008	0.014	0.570	0.569
Rick Carlisle	0.015	0.013	1.110	0.265
Don Casey	0.014	0.016	0.880	0.377
Don Chaney	-0.003	0.015	-0.200	0.838
Maurice Cheeks	-0.002	0.014	-0.130	0.895
Doug Collins	0.009	0.015	0.630	0.526
Dave Cowens	-0.005	0.018	-0.280	0.779
Chuck Daly	0.012	0.018	0.650	0.519
Mike Dunleavy	0.019	0.012	1.540	0.124
Bill Fitch	0.014	0.011	1.320	0.185
Cotton Fitzsimmons	0.042*	0.013	3.170	0.002
Tim Floyd	-0.005	0.019	-0.280	0.780
Chris Ford	0.020***	0.011	1.860	0.063
Mike Fratello	0.022**	0.011	1.970	0.049
Alvin Gentry	0.029	0.025	1.150	0.250
Matt Guokas	-0.046*	0.014	-3.210	0.001
Del Harris	0.013	0.011	1.270	0.205
Bob Hill	0.013	0.015	0.840	0.399
Brian Hill	0.000	0.014	0.000	0.997
Dan Issel	0.003	0.024	0.130	0.898

Phil Jackson	0.045*	0.013	3.550	0.000
K.C. Jones	-0.005	0.015	-0.360	0.720
Eddie Jordan	0.017	0.015	1.080	0.282
George Karl	0.018	0.011	1.600	0.109
Kevin Loughery	0.026*	0.010	2.520	0.012
Sidney Lowe	-0.003	0.014	-0.250	0.800
John Lucas	-0.006	0.021	-0.280	0.783
Jim Lynam	0.004	0.015	0.290	0.774
John MacLeod	0.012	0.018	0.680	0.499
Nate McMillan	0.018	0.024	0.770	0.443
Doug Moe	0.015	0.016	0.910	0.362
Dick Motta	0.005	0.020	0.250	0.799
Eric Musselman	-0.012	0.017	-0.680	0.494
Don Nelson	0.030*	0.012	2.580	0.010
Tom Nissalke	0.000	0.011	0.010	0.994
Jim O'Brien	0.032*	0.013	2.510	0.012
Rick Pitino	0.027***	0.016	1.700	0.089
Gregg Popovich	0.042*	0.016	2.610	0.009
Jack Ramsay	-0.007	0.015	-0.510	0.611
Pat Riley	0.001	0.009	0.150	0.878
Doc Rivers	-0.006	0.018	-0.330	0.740
Flip Saunders	0.028*	0.011	2.700	0.007
Mike Schuler	0.020	0.021	0.940	0.346
Byron Scott	-0.007	0.014	-0.520	0.601
Gene Shue	0.030*	0.011	2.650	0.008
Paul Silas	0.002	0.013	0.130	0.897
Scott Skiles	0.014	0.022	0.640	0.520
Jerry Sloan	0.000	0.012	-0.010	0.991
Isiah Thomas	0.028**	0.014	2.000	0.045
Rudy Tomjanovich	-0.006	0.019	-0.320	0.751
Wes Unseld	0.003	0.016	0.200	0.842
Jeff Van Gundy	-0.002	0.011	-0.150	0.882
Bob Weiss	0.006	0.019	0.300	0.762
Paul Westhead	0.005	0.013	0.380	0.707
Paul Westphal	-0.017	0.020	-0.870	0.383
Lenny Wilkens	0.001	0.010	0.070	0.945

* Significant at 1% level ** Significant at 5% level *** Significant at 10% level

Second Year with Coach...	Coefficient	Standard Error	z-statistic	p-value
Rick Adelman	-0.006	0.015	-0.400	0.686
Larry Brown	0.008	0.010	0.770	0.440
Chuck Daly	0.007	0.017	0.430	0.668
Mike Dunleavy	0.005	0.014	0.360	0.722
Bill Fitch	-0.017	0.014	-1.220	0.222
Cotton Fitzsimmons	0.021	0.015	1.420	0.157
Del Harris	0.025	0.016	1.600	0.111
Bob Hill	-0.046*	0.014	-3.350	0.001
Phil Jackson	0.026**	0.012	2.120	0.034
George Karl	0.003	0.013	0.240	0.812
Kevin Loughery	0.010	0.017	0.550	0.583
Doug Moe	0.014	0.013	1.100	0.273
Don Nelson	0.028***	0.014	1.950	0.052
Gregg Popovich	0.031*	0.012	2.650	0.008
Pat Riley	-0.004	0.010	-0.380	0.703
Flip Saunders	0.013	0.012	1.150	0.248
Jerry Sloan	-0.014	0.014	-1.010	0.311
Rudy Tomjanovich	-0.017	0.016	-1.080	0.282
Jeff Van Gundy	-0.002	0.013	-0.130	0.894
Lenny Wilkens	-0.014	0.011	-1.320	0.187

* Significant at 1% level ** Significant at 5% level *** Significant at 10% level

Third Year with Coach...	Coefficient	Standard Error	z-statistic	p-value
Bill Fitch	0.009	0.013	0.650	0.515
Del Harris	-0.006	0.016	-0.410	0.684
Phil Jackson	0.055*	0.011	4.840	0.000
George Karl	0.006	0.018	0.320	0.749
Pat Riley	-0.007	0.014	-0.520	0.603

* Significant at 1% level ** Significant at 5% level *** Significant at 10% level

Impact of Moving away from Coach...	Coefficient	Standard Error	z-statistic	p-value
Rick Adelman	-0.007	0.018	-0.380	0.707
Stan Albeck	-0.019	0.014	-1.350	0.177
Bernie Bickerstaff	-0.033*	0.012	-2.630	0.009
Allan Bristow	-0.008	0.014	-0.570	0.567
Hubie Brown	-0.014	0.011	-1.320	0.186
Larry Brown	-0.025**	0.011	-2.220	0.027
P.J. Carlesimo	0.010	0.013	0.830	0.406
Rick Carlisle	0.011	0.013	0.800	0.423
Don Casey	-0.001	0.022	-0.030	0.976
Don Chaney	-0.013	0.013	-1.010	0.311
Maurice Cheeks	-0.006	0.009	-0.630	0.527
Doug Collins	-0.034*	0.012	-2.830	0.005
Dave Cowens	-0.003	0.023	-0.120	0.903

Chuck Daly	-0.008	0.012	-0.650	0.519
Mike Dunleavy	0.009	0.023	0.380	0.702
Bill Fitch	-0.001	0.011	-0.050	0.961
Cotton Fitzsimmons	-0.018	0.013	-1.460	0.143
Tim Floyd	-0.002	0.017	-0.140	0.892
Chris Ford	0.025***	0.015	1.710	0.087
Mike Fratello	0.006	0.010	0.620	0.536
Alvin Gentry	0.008	0.018	0.450	0.656
Matt Guokas	-0.012	0.009	-1.270	0.203
Del Harris	-0.003	0.013	-0.200	0.841
Bob Hill	-0.010	0.014	-0.670	0.502
Brian Hill	0.004	0.014	0.280	0.780
Dan Issel	0.010	0.015	0.660	0.508
Phil Jackson	-0.031**	0.015	-2.070	0.038
K.C. Jones	0.012	0.012	1.010	0.312
Eddie Jordan	-0.010	0.023	-0.430	0.669
George Karl	-0.006	0.011	-0.520	0.603
Kevin Loughery	0.009	0.017	0.530	0.598
Sidney Lowe	-0.010	0.013	-0.760	0.445
John Lucas	-0.026	0.020	-1.290	0.198
Jim Lynam	0.007	0.015	0.470	0.637
John MacLeod	-0.003	0.011	-0.270	0.786
Nate McMillan	-0.006	0.017	-0.360	0.717
Doug Moe	-0.025***	0.013	-1.940	0.053
Dick Motta	-0.019	0.012	-1.530	0.125
Eric Musselman	-0.007	0.018	-0.390	0.700
Don Nelson	-0.023*	0.009	-2.480	0.013
Tom Nissalke	0.006	0.020	0.280	0.783
Jim O'Brien	-0.008	0.016	-0.500	0.616
Rick Pitino	-0.023**	0.011	-2.120	0.034
Gregg Popovich	0.002	0.022	0.080	0.939
Jack Ramsay	-0.026**	0.013	-2.060	0.039
Pat Riley	-0.005	0.012	-0.390	0.694
Doc Rivers	-0.004	0.014	-0.320	0.752
Flip Saunders	-0.007	0.014	-0.510	0.608
Mike Schuler	-0.012	0.015	-0.820	0.414
Byron Scott	-0.001	0.012	-0.060	0.952
Gene Shue	0.007	0.011	0.590	0.555
Paul Silas	-0.007	0.008	-0.800	0.425
Scott Skiles	-0.018	0.015	-1.180	0.239
Jerry Sloan	0.021	0.014	1.480	0.138
Isiah Thomas	0.036*	0.014	2.570	0.010
Rudy Tomjanovich	0.000	0.013	-0.010	0.990
Wes Unseld	0.013	0.011	1.160	0.246
Jeff Van Gundy	0.015	0.013	1.160	0.245
Bob Weiss	-0.015	0.017	-0.850	0.398
Paul Westhead	-0.028	0.014	-1.940	0.052
Paul Westphal	-0.022	0.012	-1.800	0.071
Lenny Wilkens	0.006	0.009	0.640	0.523

* Significant at 1% level ** Significant at 5% level *** Significant at 10% level

Additional notes on the model

- The metric we employed to measure performance was Adjusted Production per 48 minutes played [AdjP48]. As detailed in the appendix to the book, AdjP48 measures the value of a player's statistical production. This value is then adjusted for team defense and the teammates' production of assists and blocked shots. To get to Wins Produced and WP48, we then adjust for position played. AdjP48 is what you have just prior to making the position adjustment. The position adjustment – as we note -- is not exact. And because we are looking at how player performance changes over time, the position adjustment is not necessary for this study. In other words, position adjustments are needed when you compare a player to a different player. Our study of coaching involves comparing a player's current performance to what the same player did the previous season. So AdjP48 is all we need to employ.
- Additional adjustments were also included in our calculation of AdjP48. As noted, this measure adjusts for team defense and the teammate's production of assists and blocked shots. It also adjusts for the pace a team played at in the course of the season. We also took one more step to adjust for pace. Because teams generally played at a faster pace in the earlier years in our sample, we also adjusted for the average pace in the season the player played. This was done by subtracting the average AdjP48 in a given season from each player's AdjP48. Then the average AdjP48 across all 31 seasons was added. So if you played in a year with an above average pace, your AdjP48 would be lowered. If you played in a slower year your AdjP48 would be raised. We should note that we estimated our model without this adjustment and the story was essentially the same. We also considered WP48, Win Score per minute, and NBA Efficiency per-minute, and again we found the same story on coaches we report in this chapter. In sum, how productivity is measured does not change the result that most coaches do not have a statistically significant impact on player performance.
- To measure the impact of coaching we needed an adequate sample of productivity data from the season before and after the move to the new coach. Consequently, we only considered players who played at least 20 games and 12 minutes per game in both the prior and subsequent seasons. Then with a player sample in hand, we looked for players who got a new coach in the subsequent season. Across the 30 seasons we investigated (due to the data limitations noted in the book, 1977-78 doesn't have a prior season), we have 3,595 observations of a player getting a new coach. The next task involved creating a sample of coaches to investigate. Ultimately we are going to want to see what happens to a player both coming to and leaving a particular coach. So although there were 123 coaches who led a team for at least one entire season in the years we examined, our sample is restricted to a group of 62. To be in this group the coach needed to have at least 15 new players who played enough to qualify as a member of the player sample. In addition, the coach had to have at least 15 qualifying players depart for another coach.
- For each situation (first year with coach, second year with coach, third year with coach, and departing coaching) we constructed a dummy variable that was unique to each coach in our sample. Again we had 62 coaches in our sample to examine with respect to both players coming and leaving a coach. Players and coaches, though, tend to come and go frequently. So our sample for the second and third year only included twenty and five coaches respectively. In other words, given our desire to only consider coaches with at

least 15 players fitting a specific situation, the number of coaches we could look beyond the first year was limited.

- Given all the coaches we examined, as well as the non-coaching variables we considered, we estimated an extensive model comprised of 189 independent variables. This model was then estimated across 973 specific players and 5,211 player season observations. We employed the Arellano-Bond technique to estimate this model. As noted in Berri, Leeds, Leeds, and Mondello (2009): "This method is specifically designed to handle unbalanced panels. Essentially, that means that we use it for panel data in which there are empty cells. In this case, we do not have a "balanced panel" because we do not follow a fixed number of players through the entire set of years. Some players disappear partway through. Others appear partway through (and may not last until the end). As a result, standard panel techniques often don't hold. This is particularly true because people do not disappear from the sample randomly but by some self-selection procedure (e.g., not good enough to make the roster)."
- When we estimate a regression we get a coefficient – or the impact of the independent variable on the dependent variable – and a corresponding standard error. The standard error is important because it tells us how confident we should be in the estimates of our coefficients. As we have noted, for most coaches we were not able to find a statistically significant impact. When we say "we are not able to find a statistically significant impact" we are specifically saying that the standard error is so large that we can't differentiate the estimated coefficient from zero. How large does a standard error have to be for us to reach the conclusion that the coefficient is not different from zero? A standard rule of thumb is that the estimate coefficient has to be twice the size – in absolute terms – of the standard error. This rule of thumb can be explained if we think about confidence intervals. The confidence interval for a coefficient can be found by subtracting and adding two standard errors to a coefficient. For example, Don Nelson has an estimated coefficient of 0.030 and a corresponding standard error of .012. This means that the confidence interval – at the 95% level -- for Nelson's impact ranges from .006 to .054. If we use our rule of thumb, then we find only eleven coaches have a positive impact on performance. We also thought we would weaken our standards somewhat, though, and report the three coaches that we found had an impact at the 10% level of significance. If we weakened our standards even further we would note that we find George Karl and Mike Dunleavy have an impact at the 15% level. At the 20% level we would add the name of Bill Fitch. And at the 30% level we can add Del Harris, Alvin Gentry, Rick Carlisle, and Eddie Jordan. After these names, the coefficient for all other coaches is actually less than the corresponding standard error. In sum, for 41 coaches the corresponding standard error is bigger – in absolute terms -- than the coefficient.
- Although Jackson tops our list of coaches who have a positive impact on a player in the player's first year with the coach, we should note that we cannot say with any confidence that Jackson has a bigger impact than the other coaches on our list. In other words, although we can argue that Jackson's impact – and the other coaches listed – is different from zero; we cannot argue that these coaches are different from each other. Or to put it another way, we really have two groupings. In one group we have fourteen coaches who have an impact that is different from zero. In another grouping we have coaches whose impact is not different from zero.