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Does experience matter for team leaders? Evidence from the American football league

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Abstract

Experience is commonly thought to improve performance and decision making. However, evidence regarding this matter is not clear. In this paper We study the impact of previous experience on proficiency in decision making by analyzing how it affects decisions made by American football coaches regarding what plays to execute. Decisions are analyzed on two different outcomes: how they improve the expected points in a given possession, and how they improve the probability of winning a game. This can be seen as a short-term vs. long-term distinction. We find that, while experience has no impact on decision making with regard to probability of winning a game, it has a negative impact on decisions regarding expected points in a given possession. We also document the existence of heterogeneity in these results regarding type of game (regular season or playoffs), and type of optimal play to be chosen.

Keywords: experience, decision making, American football.

JEL codes: D70, J50, M12

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1 Introduction

When looking for candidates for a position of responsibility, like managers, or any position for that matter, one thing companies look for is previous experience regarding tasks that the position will require the hired candidate to carry out. Companies do this in the belief that the experienced workers will perform better (Rynes et al., 1997). Experience can have benefits on performance through things such as knowledge and skill gained in previous jobs.

However, there are some cases where companies may prefer to have lower experienced workers than higher experienced ones because of differences in other attributes, like in the case of early retirements (Hutchens, 1999). Experience has drawbacks such as habits, routines and other behaviors that, for example, affect the employee's ability to adapt to new ways of doing things or new surroundings, and therefore affect performance negatively (Dokko et al., 2009).

The literature on whether or not this relation exist, and what sign it takes, is mixed. Several papers find negative effects of previous CEO experience on performance of a company when it hires its new CEO, both for CEOs with firm specific (i.d., same industry or similar sized companies) experience (Hamori & Koyuncu, 2015) and more generalist experience (Li & Patel, 2019). Also, the same effect is found on more general jobs like Dokko et al. (2009). On the other hand, there are also studies that find positive effects of experience and performance: McDaniel et al. (1988), studying private organizations across the united states and covering over 80 different occupational groups, or Quińones et al. (1995).

This paper sheds some light on whether experience matters, by analyzing how previous head coach experience relates to heach coach proficiency in decision making in American football (NFL). The decision I will focus on is the choice of type of play to execute taken before each play: pass or run (further explained in section 2). To evaluate decision making, coaches decisions will be compared to the decision that would have been optimal in a given situation, based on the expected outcomes of the different options (section 3.1 provides a full explanation on this). This paper will study decisions analyzing two things: if decisions improve expected points in a given possession, and if decisions improve win probability in the game.

This an ideal setting to this matter because the decisions studied can be clearly diagnosed, and finding the expected outcome of all options in a given situation is also easy. Also, American

football provides a situation where stakes are really high. There are high economic incentives that make every play and every decision have a big potential impact, so we should expect coaches to act at their best.

Of course, this is far from the only decision that American football coaches are responsible for, as they take part in many personnel, training, scouting and team building decision. It could happen that the effect of experience on decision making is different for different decisions. However, the play choice decision is easy to identify and evaluate, and can have major impact on the success of a team. Also, the decision I focus on in this paper are instantaneous, with at maximum 25 seconds to decide, so we would expect that with such little time, experience plays a bigger role in knowing what to do, as compared to other decisions in which more analysis and assistance by other coaches can provide help.

While in the studies mentioned above the metrics used to determine performance are the actual results, to determine whether coaches made the right decision I will not use the results of the plays, but the expected results of their choice of play based on past results. I believe this helps isolate the effect of the coach's experience since it ignores what happens once the play starts, which the coach does not have control over. Although, to a certain degree, he does have an impact on what happens during a play given that, as mentioned previously, a head coach also makes decisions in team building and training.

This paper finds that, while experience has no impact on decision making with regard to probability of winning a game, it has a negative impact on decisions regarding expected points in a given possession. These effects vary across things such as type of game (i.e., regulars season or playoffs), and which play option was the optimal one at each situation.

There have also being some studies about experience and decision making in sports. Vergeer and Lyle (2009) studies how gymnastics coaches with different level of experience deal with injuries, and found significant differences in how the treat such problems, such as that more experienced coaches tend to be more cautious regarding injuries. Woods et al. (2015) studied how different people related to American football (i.d., coaches, players, referees) that present different levels of experience in refereeing judged plays and reacted to different possible fouls, and found that referees were much less likely to call a foul on any given play than those with less or no experience.

2 Background

American football is the most watched sport in the United States: in the 2021 season the average TV audience during the regular season was 17.1 million per game. For comparison, the 2021 NBA finals drew an average of 9.9 millions viewers per game. The 2022 Superbowl was watched by 100 million people in the United States alone. Also, the National Football League is the sports league with the highest revenue in the world, with $15.26 billion in 2019 (next closest is the Major League Baseball with just over $9 billion). Therefore, the stakes in every game and in every play are very high, since there is a lot to gain and a lot to loose in each of them.

The main goal in American is to advance the ball towards the other teams "end-zone" in order to score points and outscore the opponent. The basic structure of a football game is that teams have interchanging possessions for trying to score. Possession changes either when one team scores or the defensive team "takes the ball away". To advance the ball, in each possession teams have sets of 4 tries ("downs" from now on) in order to get 10 yards. If they succeed, they get a new set of downs to get the next 10 yards and keep advancing towards the end-zone. If they do not, the ball goes to the other team. [1]

To advance the ball teams have two basic options to choose from: run or pass. This is precisely the decision I will focus on. Passing and rushing plays differ in the following way: on passing plays the coaches decide what players to line up and where, but once the play starts it is the passer's choice who to pass it to (in many cases there is more than 2 potential receivers). In running plays however, the player who will take the ball and run is chosen by the coach, and on-field players have little power over it. Passing plays have higher expected result than rushing play in terms of yards advanced and other performance metrics (like expected points added or win probability added, both explained in the following section), but also have higher risks as metrics show higher variance in passing plays. Both passing and rushing plays have a wide variety of variations but for simplicity I will only focus on the pass vs. run distinction.

[1] Teams can make different plays in their fourth try to give the other team the ball as far away from their own end-zone as possible, but this is not relevant for the analysis conducted here. However, it involves decisions that can have big influence in the outcome of games.

3 Empirical framework

3.1 Data and summary statistics

The analysis will be conducted using NFL play-by-play data from 10 seasons (2011 to 2020). The data was collected through different sources: play-by-play data, was obtained through the R package "nflreadr" (Ho & Carl, 2022), coaches experience as well as stadium attendance were extracted from the pro-football-reference website (pfref.com). [2]

The dataset contains data from 337034 plays across 2672 games (2560 from the regular season and 112 form the playoffs), 32 teams and 81 different coaches. For every play, it has descriptive data of the play, as well as the players involved in it and the situation around the play (e.g., down and distance for a first down, time in the game, result, different metrics to measure the success and efficiency of the play, etc...).

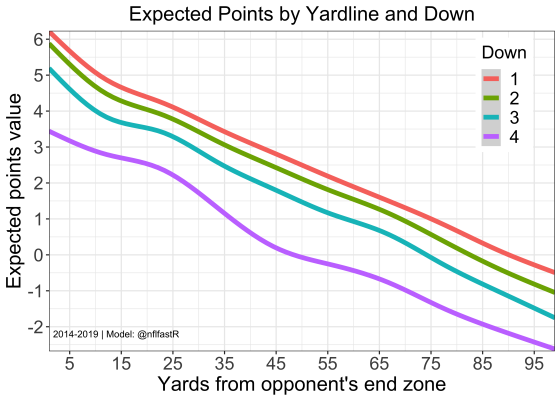
Outcome variables. To measure whether the decision made on any given play was the right one or not, as mentioned in the introduction, I will compare the expected outcome of the different options available to the coach (pass and run). I will measure the expected outcome in two different ways: the first is using *expected points added* (EPA), and the second using *win probability added* (WPA). The reason for this is that while a type of play may benefit the expected points scored in a given possession, it may decrease the win probability in the game and viceversa, although both are highly correlated (r=0.77). Some coaches may be "short-sighted" and only focus on optimizing results in each possession (EPA), and not on the whole game (WPA). The difference between them can be seen as a short-term vs. long-term (still within a game) distinction.

Both this variables are found in the original play-by-play dataset. The EPA of a play is the difference in the expected points in a possession after and before the play, and the expected points of a possession are calculated taking into account things such as down and distance, field position, time and timeouts remaining (see figure 1 as an example). The WPA of a play is essentially the same, but using win probability instead of expected points and using some other parameters such as score and initial odds (Baldwin, 2021).

Having the EPA and WPA of every play I calculated the average of both passing and rushing

[2]The pref.com website contains historical data and statistics for players, coaches, teams and games in American football.

Figure 1: Expected points by yard-line and down



Source: nflfastr.com

Note: This figure shows how expected points of a play varies as the field position (yard-line) in which it takes place changes: the closer to the opponent's end-zone, the higher the expected points. Also, it shows how expected points changes depending on which down (try) the team is at the moment: the earlier the try, the higher expected points.

plays for different situations. In the case of EPA, the situations are every down and distance to a first down combination (e.g., 1st and 10, 2nd and 10, 1st and 5, etc...). For WPA, the situations are every down, distance and WP (rounded to nearest whole %) combination (e.g., 1st and 10 when a team has 55% chance of winning, 3rd and 5 when win probability is 95%, etc...). The difference between the expected value of a pass and the expected value of a run is what determines what play should be chosen in any situation.

From here, the variable that determines how good a coach's decision was, called *Degree* can be computed (for both EPA and WPA). For every situation [3]:

$$Degree = \begin{cases} \mid E(\text{pass}) - E(\text{run}) \mid & \text{if play chosen} = \text{right play} \\ - \mid E(\text{pass}) - E(\text{run}) \mid & \text{if play chosen} \neq \text{right play} \end{cases}$$

Degree was calculated in such way so that when it is positive the decision made was the right one, when negative it was the wrong one, and the magnitude reflects how clear a decision was. A high magnitude positive value reflects that the right decision was made when this decision was easier, while a high magnitude negative value reflects that the wrong decision was made when it was an easy decision. Values closer to 0 reflect decisions where the right choice is not as clear.

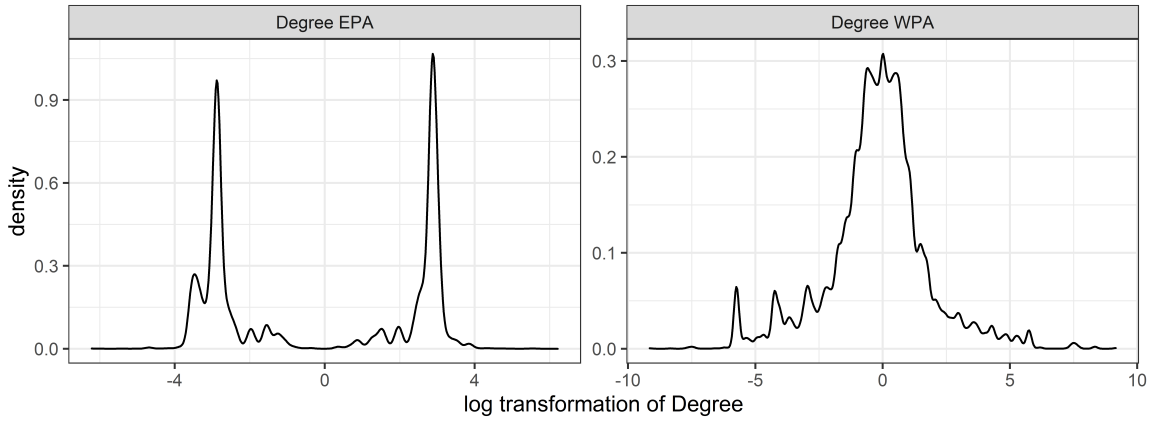
[3] This being $E(\text{pass}) - E(\text{run})$ was chosen arbitrarily, $E(\text{run}) - E(\text{pass})$ yields the same result after taking absolute values.

For the analysis, I will use a log transformation of *Degree*, but since this variable has negative values, a simple log(*Degree*) is not possible. bacause of this, the following log transformation was used:

$$log(Degree) = \begin{cases} log(Degree \times 100) & \text{if } Degree > 0 \\ -log(\mid Degree \mid \times 100) & \text{if } Degree \leq 0 \end{cases}$$

Figure 2 shows the distribution of the log transformation of *Degree*.

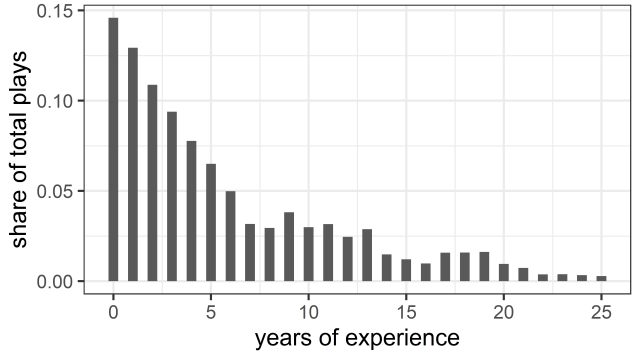
Figure 2: Distribution of log transformation of variable Degree



Note: This figure shows the distribution of the log transformation of the variable *Degree*, both when using expected points (EPA) and win probability (WPA). In the x-axis, values to the right indicate a good decision when it was a clear decision, values to the left indicate a bad decision when decisions were clear, and values closer to to the middle indicate decisions where the right choice was not as clear (i.e., tougher decisions). While it is not normally distributed, it is centered around 0, and shows symmetry. The figure to the left, that corresponds to degree when using expected points, is bi-modal.

Main variable of interest. Experience is measured as the previous experience as a head coach that a coach has. Previous experience as assistant coach, which many coaches have, is not taken into account. There is a total of 81 different coaches in the data, with an average experience of 5.75 years. 19 of the 81 coaches coached 2 different teams during the 10 seasons covered by this study, and 1 coached in 3 teams. The average tenure as a head coach in a team in the seasons covered is 3.14 years (actual tenure is longer since some coaches were already in their teams previous to the first season included). Figure 3 shows the the share of all plays that belong to the different levels in coach experience.

Figure 3: Distribution of coach's experience



Note: This graph shows the distribution of previous head coach's experience as the share of the total plays that correspond to coaches with the different levels in experience. Coach's experience is not normally distributed as the frequency for lower experience is higher than that of higher experienced coaches, and it presents a descending trend in the number of observation as experience increases.

Additional variables. In this empirical analysis I also control fore other factors that might influence the variable *Degree*. First, I control for attendance at the stadium during each game. Several studies find an impact of stadium attendance on performance (Ferraresi and Gucciardi (2021), Cross and Uhrig (2020)). So it makes sense to wonder if it also has an effect on coaches performance.

I also control for whether a team is playing home or away. Home field advantage is a well known occurrence in sports where the home team tends to win more than the away team (Legaz-Arrese et al., 2013). Since it affects team performance, it may also affect how coaches preform.

Other controls include Season (2011-2020) as there could be league-wide trends that are making coaches make better or worse decisions in general, a dummy that indicates whether a game belongs to the regular season or to the playoffs, a dummy that indicates which was the right play to choose: pass or run as coaches may be better at diagnosing when to pass against when to run and viceversa, and the coach responsible for the decision (81 different coaches).

Table 1 contains the summary statistics of the variables.

3.2 Regression model

To study the relationship between experience and decision making, I estimate the following regression model, in which the unit of observation is a play i, in game g, in team t led by coach c in

Table 1: Summary statistics

	Mean	SD	Min	Max	N
Degree (epa)	-.0180442	.2135467	-5.010223	5.010223	337034
Degree (wpa)	-.0010069	.0175587	-.3980382	.532401	337034
coach experience	5.756663	5.744069	0	25	337034
attendance	61674.08	21157.02	0	95952	337034
season	2015.492	2.873846	2011	2020	337034
home	1.500596	.5000004	1	2	337034
regular season	1.957547	.2016199	1	2	337034
right choice (epa)	1.225149	.4176813	1	2	337034
right choice (wpa)	1.32964	.4700832	1	2	337034

Note: This table contains summary statistics for the variables that will be used in the analysis. The variable right choice is a dummy variable that takes the value 2 when the right play was to run, and the value 1 when it was to pass. Variable home takes the value 2 for the home team and 1 for the away team. The variable regular season takes the value 2 for a game in the regular season and 1 for a game in the playoffs. Column (1) captures the mean; column (2) captures the standard deviation, while colums (3) and (4) the minimum and maximum values. Finally, column (5) displays the number of observations.

season s:

$$log(Degree_{i,g,t,c,s}) = \alpha_0 + \alpha_1 CoachExp_{t,c,s} + \alpha_2 Home_{g,t,c,s} + \alpha_3 X_{g,t,c,s} + \lambda_g + \lambda_c + \lambda_s + \varepsilon_{i,g,t,c,s}$$

where $Degree_{i,g,t,s}$ indicates how good or bad a coach's decision is for each play, $CoachExp_{t,s}$ is the head coach previous experience, $Home_{g,t,s}$ is a dummy variable that denotes whether the play was done by the home team or not, $X_{i,g,t,s}$ represents other control variables, and $F_{i,g,t,s}$ are fixed effects. $\varepsilon_{i,g,t,s}$ is clustered by season.

The fixed effects included are *coach* and *right choice*. For different variations of the model, different variables such as *game* or *season* are also included as fixed effects.

In this regression model, our coefficient of interest is α_1.

4 Empirical results

4.1 Main empirical results

Table 2 shows the estimates for the regression model specified in section 3.2.

Table 2: Impact of coach experience on decision making

	Degree EPA			Degree WPA		
	(1)	(2)	(3)	(4)	(5)	(6)
Coach experience	-0.041***	-0.038***	-0.037***	0.017*	0.008	0.007
	(0.011)	(0.010)	(0.010)	(0.009)	(0.006)	(0.006)
Home	-0.008	-0.008	-0.008	0.002	0.001	0.000
	(0.015)	(0.015)	(0.015)	(0.005)	(0.006)	(0.006)
log(attendance)			0.004**			-0.002*
			(0.001)			(0.001)
Regular season			-0.073***			0.069***
			(0.017)			(0.018)
Observations	337034	337034	337034	337034	337034	337034
R^2	0.0838	0.0742	0.0742	0.0158	0.0008	0.0009
Coach FE	Yes	Yes	Yes	Yes	Yes	Yes
Right choice FE	Yes	Yes	Yes	Yes	Yes	Yes
Game FE	Yes			Yes		
Season FE		Yes	Yes		Yes	Yes

Standard errors, clustered at the season level, in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Columns (1), (2) and (3) are estimations for degree as measured with expected points (as mentioned in 3.1, this can be seen as a "short-term" decision). In column (1) the variable home is added as a control, and this column accounts for coach, right choice and game fixed effects (the first 2 are accounted for in all model specifications). It shows a negative, and significant at the 1% level, impact of 4.1% for a year increase in experience. Home has no significant effect on *Degree*.

Column (2) differs from column (1) in that it does not have game fixed effects, but it does have season fixed effects. Results are very similar to those in column (1), a negative impact of experience on Degree of 3.8% per extra year of experience.

Column (3) adds two more controls, for attendance and regular season (dummy), and keeps the same fixed effects as column (2) did: coach, right choice and season. Again, the effect is negative,

significant at the 1% levels, and very similar in magnitude to those in column (1) and (2): a one year increase in experience leads to a decrease in Degree of 3.7%. Home still has no impact. Attendance does have a positive and significant effect: a 1% increase in attendance increases Degree by 0.4%. Regular season has a negative impact on Degree, as Degree is 7.3% lower on average if a play belongs to the regular season instead of the playoffs.

Columns (4), (5), and (6) follow the same structure as columns (1), (2) and (3) respectively, but for decisions measured with win probability rather than with expected points. Column 4 shows a positive effect of experience on Degree, but smaller in magnitude and less significant than those obtained in columns (1) through (3).

Column (5) shows no effect for either experience or home, as does column (6). Column (6) shows that attendance has a negative effect on Degree of WPA. Also, regular season has a positive impact on Degree as a play belonging to the regular season instead of the playoffs increases degreewpa by 6.9%.

Overall, when degree is measured with expected points, experience has a negative effect, but when it is measured with win probability, there is no clear effect of experience. This means that newer coaches, despite being better at making decisions in order to score in a possession, are equal at making decisions in order to increase win probability. This difference could be due to the fact that although newer coaches are better, they are also "short-sighted", and this balances out for the long-term decisions.

4.2 Heterogeneous effects

For briefness, the models specifications used in the following heterogeneity analysis will be those corresponding to columns (1), (3), (4) and (6) from Table 2.

4.2.1 Regular season and Playoffs

As seen before, whether a game is a regular season or playoffs game has an impact on how well coaches call plays. Because of this, there may also be differences in the effect of experience for both situations.

In Table 3 can be seen that the impact of experience is significantly different for both periods,

Table 3: Impact of coach experience on decision making: heterogeneity by type of game

	Playoffs (EPA)		Regular season (EPA)		Playoffs (WPA)		Regular season (WPA)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Coach experience	0.710**	0.661***	-0.046***	-0.043***	-0.311*	-0.304***	0.019*	0.010
	(0.289)	(0.119)	(0.011)	(0.010)	(0.149)	(0.053)	(0.009)	(0.006)
Home	0.011	-0.024	-0.008	-0.007	0.080	0.079**	-0.002	-0.003
	(0.051)	(0.060)	(0.015)	(0.015)	(0.047)	(0.034)	(0.005)	(0.006)
log(attendance)		-0.006		0.004**		0.043***		-0.003**
		(0.007)		(0.001)		(0.004)		(0.001)
Observations	14308	14308	322726	322726	14308	14308	322726	322726
R^2	0.0942	0.0839	0.0837	0.0740	0.0258	0.0071	0.0155	0.0009
Coach FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Right choice FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Game FE	Yes		Yes		Yes		Yes	
Season FE		Yes		Yes		Yes		Yes

Standard errors, clustered at the season level, in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

specially when decisions are measured with expected points.

For expected points, the impact of experience on Degree during the playoffs is positive, significant at the 1% level: an increase of 1 year in experience increases Degree in the playoffs by 6.6% to 7.1%. But during the regular season the effect is negative. More experienced coaches make better decisions during the playoffs, but less experience ones make better decisions during the regular season.

For win probability, the impact is also different but it is opposite: during the playoffs the effect is negative and significant while during the regular season there is no clear effect as column (7) reports a significant positive effect but column (8) does not.

There is still no effect of playing at home on Degree, except for the playoffs when decisions are measured with win probability where playing at home has a positive effect of 7.9% (see column (6)).

4.2.2 Optimal option: pass and run

The decision analyzed is whether to pass or run. Coaches with different level of experience could be better or worse at diagnosing when to choose pass or when to choose run, meaning that the im-

pact of experience may be different for different situations. Table 4 shows the regression estimates when pass or run was the right play to choose.

Table 4: Impact of coach experience on decision making: heterogeneity by optimal option

	Pass (EPA)		Run (EPA)		Pass (WPA)		Run (WPA)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Coach experience	-0.056**	-0.059***	0.018	0.044*	0.029	0.022	-0.013	-0.028*
	(0.020)	(0.017)	(0.032)	(0.023)	(0.017)	(0.012)	(0.022)	(0.015)
Home	-0.041*	-0.040*	0.104***	0.103***	0.056***	0.057**	-0.123***	-0.111***
	(0.021)	(0.021)	(0.023)	(0.023)	(0.016)	(0.019)	(0.036)	(0.031)
log(attendance)		0.004*		0.005***		-0.001		-0.004*
		(0.002)		(0.001)		(0.002)		(0.002)
Regular season		-0.106***		0.040		0.138***		-0.066
		(0.029)		(0.044)		(0.027)		(0.041)
Observations	261151	261151	75883	75883	225934	225934	111100	111100
R^2	0.0215	0.0046	0.0493	0.0087	0.0392	0.0041	0.0363	0.0052
Coach FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Game FE	Yes		Yes		Yes		Yes	
Season FE		Yes		Yes		Yes		Yes

Standard errors, clustered at the season level, in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

When measuring decisions with expected points, experience has a negative impact in should-pass plays, but in should-run plays there effect is unclear, as in column (3) it is not significant, and in column (4) it is. This means that newer coaches are better at knowing where to pass than more experienced ones, and both are similar at knowing when to run.

When measured with win probability, there are no significant differences between both situations. Only in column (8) there is a significant negative impact of experience on Degree.

This is similar to the main results. Less experienced coaches are better at knowing when to pass to increase expected points, but there are no major difference in knowing when to run, both to increase expected points and win probability. It seems that the main results are driven by the effects of should-pass plays, especially for degree of EPA.

The effect of attendance is in line with what was found in Table 2: positive for Degree of EPA, and negative for degree of WPA, although in column (6) it is not significant. Similarly for regular season, the effects are different for Degree of EPA and Degree of WPA, but this seems to be driven

by should-pass plays (columns (2) and (6)), since in should-run plays (see columns (4) and (8)) the effect is non-significant.

The effect of home, which was non-significant across all model specifications in the main results, is significant for all columns in Table 4, but the sign of the effect are very different, and there is no clear takeaway from them.

5 Conclusion

Experience has a negative impact on decision making when decisions are measured with expected points, but when measured with win probability there are no clear effects. However, these effects vary depending on if a game belongs to the regular season or the playoffs: experience has a positive impact during the playoffs and negative during the regular season when decisions are measured with expected points. The impact also varies depending on whether the right options was to pass or run: the negative impact on decision makings when measured with expected points seems to be driven by the negative impact on plays where the right option was to pass.

6 Bibliography

Rynes, S. L., Orlitzky, M. O., & Bretz Jr, R. D. (1997). Experienced hiring versus college recruiting: Practices and emerging trends. *Personnel Psychology*, *50*(2), 309–339.

Hutchens, R. (1999). Social security benefits and employer behavior: Evaluating social security early retirement benefits as a form of unemployment insurance. *International Economic Review*, *40*(3), 659–678.

Dokko, G., Wilk, S. L., & Rothbard, N. P. (2009). Unpacking prior experience: How career history affects job performance. *Organization Science*, *20*(1), 51–68.

Hamori, M., & Koyuncu, B. (2015). Experience matters? the impact of prior ceo experience on firm performance. *Human Resource Management*, *54*(1), 23–44.

Li, M., & Patel, P. C. (2019). Jack of all, master of all? ceo generalist experience and firm performance. *The Leadership Quarterly*, *30*(3), 320–334.

McDaniel, M. A., Schmidt, F. L., & Hunter, J. E. (1988). Job experience correlates of job performance. *Journal of applied psychology*, *73*(2), 327.

Quińones, M. A., Ford, J. K., & Teachout, M. S. (1995). The relationship between work experience and job performance: A conceptual and meta-analytic review. *Personnel psychology*, *48*(4), 887–910.

Vergeer, I., & Lyle, J. (2009). Coaching experience: Examining its role in coaches' decision making. *International journal of sport and exercise psychology*, *7*(4), 431–449.

Woods, A. J., Kranjec, A., Lehet, M., & Chatterjee, A. (2015). Expertise and decision-making in american football. *Frontiers in psychology*, *6*, 994.

Ho, T., & Carl, S. (2022). *Nflreadr: Download 'nflverse' data* ["https://nflreadr.nflverse.com", "https://github.com/nflverse/nflreadr"].

Baldwin, B. (2021). Open source football: Nflfastr ep, wp, cp xyac, and xpass models. https://mrcaseb.github.io/open-source-football/posts/2020-09-28-nflfastr-ep-wp-and-cp-models/

Ferraresi, M., & Gucciardi, G. (2021). Who chokes on a penalty kick? social environment and individual performance during covid-19 times. *Economics Letters*, *203*, 109868.

Cross, J., & Uhrig, R. (2020). Do fans impact sports outcomes? a covid-19 natural experiment. *A COVID-19 Natural Experiment (October 5, 2020)*.

Legaz-Arrese, A., Moliner-Urdiales, D., & Munguia-Izquierdo, D. (2013). Home advantage and sports performance: Evidence, causes and psychological implications. *Universitas Psychologica*, *12*(3), 933–943.

Appendix A: testing for non-linear effects

One might also be concerned that the effect of experience is non-linear. An extra year at the beggining of a career may be more valuable that when a coach already has 10 or more years of experience., or maybe the other way around. Because of this, in this appendix you can find the results for the regression testing whether this non-linear effects exist or not.

Table A.1: Impact of coach experience on decision making: non-linear effects

	Degree EPA			Degree WPA		
	(1)	(2)	(3)	(4)	(5)	(6)
Coach experience	-0.0429**	-0.0308*	-0.0299*	0.0241**	0.0062	0.0056
	(0.016)	(0.014)	(0.014)	(0.009)	(0.008)	(0.008)
Coach experience ^2	0.0001	-0.0002	-0.0002	-0.0003**	0.0001	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Home	-0.0084	-0.0076	-0.0075	0.0021	0.0005	0.0005
	(0.015)	(0.015)	(0.015)	(0.005)	(0.006)	(0.006)
log(attendance)			0.0040**			-0.0018*
			(0.001)			(0.001)
Regular season			-0.0726***			0.0687***
			(0.017)			(0.018)
Observations	337034	337034	337034	337034	337034	337034
R^2	0.0838	0.0742	0.0742	0.0158	0.0008	0.0009
Coach FE	Yes	Yes	Yes	Yes	Yes	Yes
Right choice FE	Yes	Yes	Yes	Yes	Yes	Yes
Game FE	Yes			Yes		
Season FE		Yes	Yes		Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Columns in table A.1 follow the same same structure of model specifications as table 2 in section 4, but with the added control of experience squared.

Overall, the squared term is insignificant. Only in column (4) the effect of experience squared on Degree of WPA is negative. The estimated linear impact is consistent with the ones from table 2, as are the effects of attendance, Home and regular season.

Appendix B: additional robustness check

Decisions are evaluated at different situations, as explained in section 3.1. One of the components of every situation is what try or "down" the team is in (from 1st to 4th down). There may be differences is how coaches act in different downs, and experience can have an impact on this.

Table B.1 shows the estimation for the regression model with the down of each play as an added fixed effect. This results do not differ from those in section 2

Table B.1: Impact of coach experience on decision making: including Down fixed effects

	Degree EPA			Degree WPA		
	(1)	(2)	(3)	(4)	(5)	(6)
coach experience	-0.041***	-0.037***	-0.036***	0.016	0.007	0.007
	(0.011)	(0.010)	(0.010)	(0.009)	(0.006)	(0.006)
home	-0.007	-0.006	-0.006	0.007	0.005	0.005
	(0.015)	(0.015)	(0.015)	(0.005)	(0.006)	(0.006)
log(attendance)			0.004**			-0.002
			(0.001)			(0.001)
regular season			-0.067***			0.072***
			(0.017)			(0.017)
Observations	337034	337034	337034	337034	337034	337034
R^2	0.1003	0.0907	0.0907	0.0199	0.0052	0.0053
Coach FE	Yes	Yes	Yes	Yes	Yes	Yes
Right choice FE	Yes	Yes	Yes	Yes	Yes	Yes
Game FE	Yes			Yes		
Season FE		Yes	Yes		Yes	Yes
Down FE	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors, clustered at the season level, in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$