2nd and 1: What *Should* be the Most Valuable Play in Football

ABSTRACT

Embedded in the game of football is the ability to 'reset the chains' by moving the ball 10 yards or more in four attempts. This option to reset the chains creates a very valuable opportunity for teams to ramp up or down the risk of their play calls based on their distance from the first down marker and how many downs they have left. Analyzing data over the past six years of all play calls in the NFL highlights that on the whole NFL teams are not making use of this embedded option, and are actually playing more conservatively at points where they should be increasing the risk of their play call, namely when facing 2nd and short opportunities. This finding is confirmed by detailing that offensive teams which deviate from this trend and actually increase the range of play calling when facing 2nd and short, score marginally more points, especially when at positions on the field where the value of this option is greatest.

I. INTRODUCTION

Football is structured as a game where the offense's objective is to move the ball ten yards at a time in a set number of downs.[1] This option to "reset the chains" creates a very valuable opportunity for teams to ramp up/down the risk of their play calling, depending on how close they are to the first down marker. And yet, analyzing over 250,000+ plays over the past 6 years, it appears that NFL coaches are not utilizing one of the most valuable options in football - the option to increase the risk and diversity in play calling when faced with 2nd and short.

Play calling, and the optimal level of risk in play calling, is not static as any offensive team moves through their downs. When faced with 3rd and 10 any offensive coordinator will optimally select a much different type of play to run than when faced with 3rd and 1. And, analyzing the play calling of all offensive teams since 2013 (259,288 plays in total), shows that the prevailing wisdom among coaches and offensive coordinators is that "the fewer the number of yards to go, the more risk-averse we must be in the play we run".

This simple heuristic of play calling could hold as a valid strategy for *most* down/yard-to-go combinations, but certainly falls apart when considering one very valuable position on the field – when a team has 2+ downs to go a very short distance. Consider, for example, a team with a strong offense, facing a 2nd and 1 on their opponent's 40 yard line. They are down 7 and it's the fourth quarter, so they know that they will be going for it should it come to a 4th down. When faced with this situation the average play call in the data set will be to take the risk-averse move of running the ball in the hopes of picking up 2 to 3 yards to secure the first down.

Yet, this play neglects to take advantage of an ideal situation for an offensive coordinator to get creative and ramp up the risk. It is actually quite intuitive: you know you have two more plays after your 2nd down where you can play risk-averse football to pick up the first down. All you have done by rushing the ball is pick up the first down and reset the chains to another 10 yards to go, while staying at nearly on the same position the field. You have squandered a very valuable opportunity to have two extra plays *at no expense* to your offense.

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[1] This is very difference from a game that is structured to have the offense move the full 100 yards in a set number of plays. In this structure, the proceeding analysis would not hold.

This paper examines how the risk of play calling changes over different positions on the field and over different down and yards to go positions. I conjecture that if offensive coordinators understand the value of this embedded option to 'reset the downs' that they would treat 2nd and short as an opportunity to ramp up the risk of play calling. Examining play calling over the past six years, I find no evidence of this. In fact, offensive coordinators appear to be playing more conservatively on 2nd and short than even 3rd and short, which doesn't match any rational intuition at all.

Next, I posit that the value of 2nd and short should be greatest the stronger the rush offense of the team (weaker the defense), since the offensive team can induce that they will have a higher likelihood of picking up the 1st down should it come to 3rd and short. The value should also be greatest when the ball is between the midfield and the opponent's 30, since this is the part of the field where the offense is most likely to utilize all four downs. And, yet this does not unfold in the data – coaches seem to call equally risk-averse plays over all these situations.

Following this, to demonstrate that offensive coordinators are not utilize this embedded option properly, I investigate the marginal points that a team may score based on their play calling on 2nd and short. Offensive coordinators who call a more diverse set of play calls on 2nd and short score marginally more points on a given drive as compared to those that choose risk-averse play calls. This especially holds considering positions on the field where this embedded option has the great value - between midfield and the opponent's 30 yard line. In fact, in this area of the field, offensive coordinators that choose more aggressive formations on 2nd and short can expect to score 0.60 extra marginal points on a given drive.

In total, the results highlight lacking use of this embedded option across all tests and the value of diverse play calling on 2nd and short should an offensive coordinator deviate from this trend. This paper proceeds as follows. Section II highlights the data construction, Section III demonstrates the empirical analysis and optimality of wide-ranging play calls on 2nd and short. Section IV concludes the paper.

II. DATA CONSTRUCTION

The data used in this investigation is initially pulled from NFLsavant. NFLsavant pulls publicly-available NFL play-by-play data and compiles it into an easy usable format.

The play-by-play data spans the 2013 to 2018 seasons (through the full 2018 in its entirety). Each season includes all plays and includes the following variables for each play: game date, exact time in the quarter when play started, team on offense, team on defense, down, yard line, left to go, where the play was run from (yard line and position), a description of the play, result of the play, offensive formation, whether the play was a rush or pass, pass and run type, whether it resulted in a sack/interception/incomplete/interception, whether the play was challenged, and whether there was a penalty (with yards noted too).

In the second half of the paper, data on each football team's offensive and defensive strength are needed. For this, ESPN data over the 2012 to 2018 season are used to check total yards gained and total yards given up by the defense (partitioned by rush/pass). This is used to rank teams by their respective rush defense, pass defense, rush offense and pass offense (using the top 10 and bottom 10 in a given past year to denote good and bad categories).

III. EMPIRICAL ANALYSIS

In the proceeding section I detail the empirical analysis. First, below I detailed all the summary stats associated with the data. All play and play calls below only include those run on 1st, 2nd, and 3rd downs. This amounts to 195,746 plays over the 2013 to 2018 seasons. Below details the yards, rush attempts and percent of big gains (10+ yard plays) as a whole and partitioned by the down the offense is facing.

The summary stats highlight that the variability of yards attained are highest on 3rd down play calls. The highest percent of rushing attempts occur on 1st down and the lowest percent of rushing attempts are on 3rd down.

Summary Statistics:

Panel A: Summary Statistics	Mean	Std Dev	25th Percentile	Median	75th Percentile
Play Stats					
Yards	5.48	9.096	0	3	8
Rush Attempted	38.1%	0.48	0	0	1
Ten Plus Yard Gain	20.5%	0.40	0	0	0

Panel B: Play Selection	Yards	STD of Yards	Rush%	Ten Yards Plus %
Play Selection by Down				
1st Down	5.46	8.87	47.1	19.2
2nd Down	5.45	8.76	38.6	20.2
3rd Down	5.53	10.09	18.3	23.6

Play Selection by Down:

Next, the table below examines the type of play calling and outcome of playing calling given the position of the offense relative to the number of downs and yards left. 'Long' denotes any play run where the offense had greater than 8 yards to go; 'Mid' denotes any play run where the offense had between 8 and 3 yards to go; and 'Short' denotes any play run where the offense had just 1 or 2 yards left to go. Detailed below are the average yards per play, the standard deviation of yards (a proxy for the degree of variability in play calling), percent of plays where there was a rush attempt, and the percent of plays where there was a 10-yard or great pick up.

The results highlight that 2nd and short has the most risk-averse play calling of all positions. 2nd and short has the highest percentage of rushing attempts, lowest average yards per play and the lowest standard deviation of yards per play. This even holds when comparing 2nd and short to 3rd and short – offenses pick up 0.15 fewer yards as compared to 3rd and short, and a whopping 11.30% greater chance of rushing.

	Average Yards per Play	Standard Deviation of Yards	% Rushing	Ten Plus Yard Play (%)
1st and 10	5.46	8.87	47.06%	19.19%
2nd and Long	5.83	9.04	30.42%	22.94%
2nd and Mid	5.35	8.59	42.11%	18.92%
2nd and Short	4.10	7.30	62.49%	13.06%
3rd and Long	6.10	10.62	10.89%	28.85%
3rd and Mid	5.61	10.31	11.05%	23.55%
3rd and Short	4.26	8.23	51.19%	14.20%

Difference between a Given Down-Distance and 2nd and Short:

For further robustness, I compare the play calling on 2nd and short to all other down-distance combinations. The difference between the two samples is denoted below. All *p*-values follow from Satterthwaite t-tests of significance (assumes unequal distributions between the two samples) and are denoted below the difference in Columns 1, 3, and 4. In Column 2 a *F*-statistic is noted for the difference in the standard deviation in yards per play.

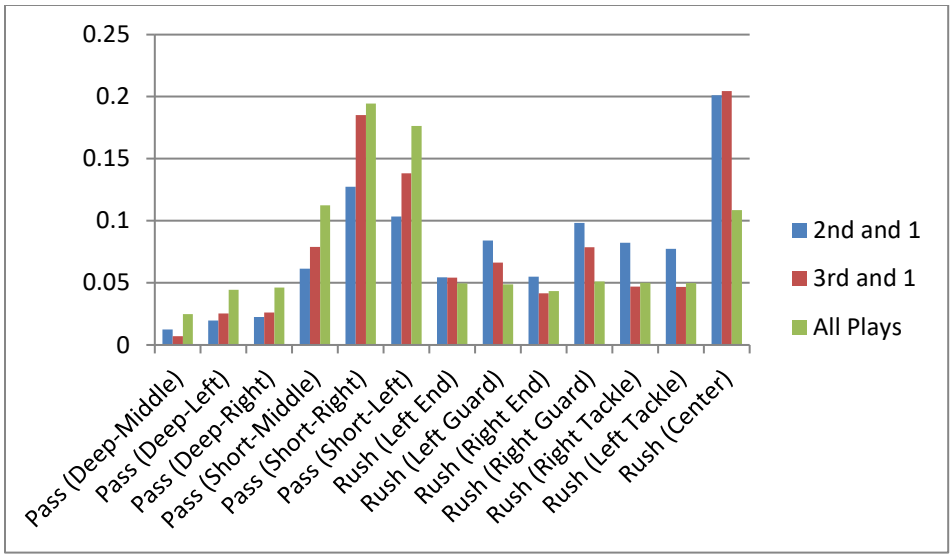
	Difference in Average Yards	*F*-Value (Pr>F)	Difference in % Rushing	Difference in Ten Plus Yard Play (%)
1st and 10	1.35*** (<.0001)	1.48*** (<.0001)	-15.44%*** (<.0001)	6.13%*** (<.0001)
2nd and Long	1.73*** (<.0001)	1.53*** (<.0001)	-32.06%*** (<.0001)	9.88%*** (<.0001)
2nd and Mid	1.25*** (<.0001)	1.38*** (<.0001)	-20.38%*** (<.0001)	5.86%*** (<.0001)
3rd and Long	2.01*** (<.0001)	1.71*** (<.0001)	-51.59%*** (<.0001)	15.79%*** (<.0001)
3rd and Mid	1.51*** (<.0001)	1.35*** (<.0001)	-51.44%*** (<.0001)	10.49%*** (<.0001)
3rd and Short	0.15* (<.10)	1.20*** (<.0001)	-11.30%*** (<.0001)	1.14%** (<.05)

For instance the difference in the average yards gained on 1st and 10 v 2nd and short is denoted in the upper left-hand box (5.46 v 4.10, which equates to 1.35). The t-stat for this difference amounts to 14.11, which yields a p-value at the <.0001 level.

As noted above all differences are significant at 1% level for differences between playing calling on 2nd and short and those on other down-yard combinations (aside from 3rd and short). Most important is the comparison to 3rd and short. First, the F-value for the difference in standard deviations of yards gained is significant at the .0001 level, which indicates that play variability in 3rd and short is greater than 2nd and short. Next, we see that on 2nd and short offenses choose to run the ball 11.30% more of the time than on 3rd and short, significant at the .0001 level. Finally, 3rd and short is associated 1.14% greater chance in a ten-plus yard gain, significant at the .05 level (t-stat of 1.97). Altogether, these results suggest a greater degree of play variety and overall risk taking on 3rd and short as compared to 2nd and short.

Specific Play Selection by Down:

The conservative play calling noted about for 2nd and short situations even holds when investigating the selection of rush v. pass attempts. Not only do teams disproportionately rush the ball on 2nd and short, they also show a lack of creativity (or risk taking) when they choose to actually throw the ball. On passing attempts on 2nd and short, teams tend to disproportionately (as compared to all other downs) throw short and to the side-lines (not risking down field passes or those in the middle). This is noted below in the frequency chart below. T-statistics for the differences between 2nd and short (denoted in blue) and 'All plays' (denoted in green below) are significant at the .001 level for 12 of the 13 different rush/pass combinations below (single exception is the rush left end guard statistic).



Play Selection Across Different Positions on the Field:

Next to examine how offensive coordinator are making use of this option to reset the chains based on when it may have more value, I examine the use of 2nd and short over different positions on the field.

I conjecture that offensive coordinators should take most advantage of a 2nd and short position when they are in a position on the field where they are most likely to go for it on 4th down (aside from a field goal attempt). The value of this option to amp up the risk and variability of your play calling on 2nd and short should be most valuable when you understand that you have two more plays to run should you not make the down. Most likely, this corresponds to being between midfield and the opponent's 30-yard line.

The table below denotes these results. Again, it appears that coaches are playing no differently in this area of the field than any other. Here, coaches are gaining only 4.8 yards per play on 2nd and short (less than or equal to the yards per play on their own side of the field), and are rushing the ball with the same frequency as well. And, bafflingly, teams are still playing more conservatively than their 3rd and short counterparts across all measures of play selection and volatility of yards per play (significant at the 0.001 level using *F*-statistic). These data points are highlighted below.

		All Plays	Only 2nd and Short	Only 3rd and Short
0 to 10 yard line				
	Yards	5.48	7.25	3.50
	STD (Yards)	9.20	6.84	4.51
	% Rushing	46.23%	75.00%	50.00%
10 to 20 yard line				
	Yards	5.86	5.10	5.52
	STD (Yards)	9.71	7.43	10.51
	% Rushing	37.23%	62.33%	46.81%
20 to 30 yard line				
	Yards	5.98	5.12	5.40
	STD (Yards)	9.98	8.54	10.03
	% Rushing	37.43%	59.97%	48.29%
30 to 40 yard line				
	Yards	5.95	5.01	5.38
	STD (Yards)	9.79	7.71	9.58
	% Rushing	36.97%	65.28%	48.66%
40 to 50 yard line				
	Yards	6.05	5.47	4.75
	STD (Yards)	9.70	8.79	8.88
	% Rushing	36.89%	62.62%	52.54%

		All Plays	Only 2nd and Short	Only 3rd and Short
50 to 40 yard line				
	Yards	5.93	4.83	4.87
	STD (Yards)	9.27	7.94	8.64
	% Rushing	36.86%	58.97%	50.42%
40 to 30 yard line				
	Yards	5.52	4.72	4.25
	STD (Yards)	8.63	6.68	7.57
	% Rushing	37.60%	65.05%	53.85%
30 to 20 yard line				

	Yards	5.17	4.32	4.49
	STD (Yards)	7.84	6.64	6.75
	% Rushing	38.51%	65.19%	56.20%
20 to 10 yard line				
	Yards	4.12	3.75	3.42
	STD (Yards)	6.45	4.74	5.31
	% Rushing	38.45%	67.23%	54.75%
10 to end zone				
	Yards	1.96	0.83	1.32
	STD (Yards)	4.74	3.36	4.47
	% Rushing	44.98%	61.51%	49.05%

In the above table, it is important to also note that the difference between 2nd and short and 3rd and short Rushing results for the yellow highlighted areas are significant. The difference between rushing attempts for 2nd and short v 3rd and short amounts to 11.2% for the 40 to 30 yard line, and 8.55% for the 50 to 40 yard line, both significant at the .001 level.

In addition, it is important to note that comparing the play calling of 2nd and short in this area of the field where a 4th down attempt is more likely, is equally as conservative or more so than on the offensive's own side of the field. For instance, comparing the play calling of 2nd and 1 in the 30 to 40 yard line area (offense's own side of the field) to that in the 40 to 30 yard line area (defense's side of the field) highlights that on average on the defensive side of the field 0.29 more yard per play are picked up (5.01 v 4.72), significant at the .05 level and that the difference in the standard deviations of playing calling is greater (significant at the .01 level). Altogether, the risk taking and diversity of play calling in the 50 to 30 yard line (where the likelihood of a 4th down attempt is greater) while facing 2nd and short does not appear to be greater than when in the area of the field (offensive side) where the likelihood of a 4th down attempt is less.

Time Trends of 2nd and Short:

Next to examine how play calling on 2nd and short may have changed over time, I highlight the time trends. The table below summarizes how play calling on 2nd and short looks over the past six years. Again, comparing t-stats of the differences across years paints no major

trends or consistent picture that overtime coaches are using the 2nd and short as a greater chance to increase play variability or risk of play calling.

Year	Average Yards per Play	Standard Deviation of Yards	% Rushing	Ten Plus Yard Play (%)
2013	4.03	7.20	64.35%	12.41%
2014	3.89	6.58	62.96%	13.05%
2015	4.31	7.90	61.42%	13.20%
2016	4.01	7.31	62.26%	12.24%
2017	3.95	6.64	62.66%	13.19%
2018	4.41	7.77	61.37%	14.37%

Good Offenses v. Bad Defenses:

Finally, if coaches are to utilize the value of a 2nd and short opportunity, it should be most valuable to a team that has a strong offense and is facing a team with a weak rush defense (since the probability of picking up the 1st down in a 3rd and short is highest in this scenario). To empirically test this, I categorize each team's offense and defense by total yards allowed/gained (partitioned by rush and pass). The top ten teams in the league per year in each respective category (total offense, rush offense, pass offense, total defense, rush defense, pass defense) are labeled 'Good' teams and the bottom ten teams in each respective category make up the 'Bad' teams.

For robustness, I investigate all forms of offensive strength v defensive strength, but only include a few of the most interesting match-ups. The tables below detail the results. Again, the results do not show that good offensive teams facing bad defensive teams are taking this 2nd and short opportunity to try unique and bold play calling. In contrast, we see a greater percentage of rushing attempts on 2nd and short, lower standard deviation of yards per play, and slightly more yards per play (though not significant at the 0.05 level, as compared to all other match-ups). In total, the results highlight that good offensive teams when matched up against bad defensive teams do not appear to be using the optionality of 2nd and short to a greater degree.

Good Off v. Bad Def:

2nd and Short Only	Yards	STD (Yards)	% Rushing
Good Offense/ Bad Defense	4.15	6.87	66.05%
All others	4.03	7.24	62.31%
Difference	0.12 (<.10)	1.21 (<.001)	3.74% (<.01)

Good Rush Off v Bad Rush Def:

2nd and Short Only	Yards	STD (Yards)	% Rushing
Good Offense/ Bad Defense	4.39	7.79	71.70%
All others	4.01	7.13	61.71%
Difference	0.37 (<.01)	1.23 (<.01)	10.00% (<.001)

Good Pass Off v Bad Pass Def

2nd and Short Only	Yards	STD (Yards)	% Rushing
Good Offense/ Bad Defense	3.86	7.01	60.91%
All others	4.06	7.21	62.93%
Difference	-0.20 (<.01)	1.20 (<.001)	-2.02% (<.05)

Optimality of play calls on 2nd and short:

With the lack of creative play calling on 2nd and short established it is important to turn to the issue of the optimality of play calling on 2nd and short. To investigate this issue, I use the points score on a given drive as the dependent variable or outcome variable to measure success of a given play call in a drive.

Next, to delineate between teams that are using the optionality of 2nd and short correctly, I need a proxy for 'diversity/range of play calling'. I opt to use the given formation of the offense as an indicator for diverse (risk seeking) v. narrow (risk-averse) play calling. This amounts to labeling diverse (or aggressive) play calls as those that take place when a 'Shotgun' formation is taken prior to the play being executed, and a narrow play call (or risk averse) when the offense is 'Under Center'.

It should be noted that 'Under Center' is highly correlated with the indicator of a rushing attempt so the results below hold in an equivalent fashion should pass v. rush be the partitioning variable. Yet, the ex-ante formation that the offense takes is the preferred measure throughout this section because it is not an outcome of the play, yet a strategy that the offensive coordinator takes prior to the play.

Next, to avoid any issues with haphazard or forced play calling, all plays that are run inside of the final two minutes of either half are eliminated from the analysis below. Further, those that are run within 10 yards of the end zone are eliminated in the following table's analysis since this zone is stunted and doesn't capture the full range of diverse play calling potential.

The table below details the points scored in a given drive by an offensive team conditional on the formation called by the offensive coordinator. 'Shotgun' represents a propensity for a more risk seeking play call (vastly pass attempts), while 'Under Center' represents a propensity for less risk seeking play calls (vastly rushing attempts). All points scored are factored in and include field goals, touchdowns and any points that may come directly off of turnovers (counted against the offensive team).

	2nd and Short	3rd and Short	Difference
Shotgun	3.272	2.662	0.61 (<.01)
Under Center	3.198	2.784	0.414 (<.01)
Difference	0.073 (<.10)	-0.122 (<.05)	0.195 (<.05)

The results highlight that on 2nd and short, unconditional on the position on the field, one can expect to gain 3.272 points in a given drive following a more wide-ranging play call formation (Shotgun). On 2nd and short one can expect to gain 3.198 points following a more narrow play call formation (Under Center). This difference is 0.073 points and is significant at the 10% level.

Also noted in the table is the observation that on 3rd and short the same results do not hold. In general, when facing 3rd and short a more narrow play calling formation (Under Center) will yield 0.122 more points in a given drive, which shows that more risk averse play calling on 3rd and short may be warranted. Also, not directly noted in the above table is the 0.019 probability of a turnover given starting from the Under Center position on 2nd and short v. 0.026 probability of a turnover from the Shotgun formation (0.0068 difference which is not statistically significant at the 10% level).

Next, since the area of the field that the offense is in may dictate play calling and risk taking, I repeat the above analysis yet for all areas of the field. The table below denotes the points score in a given drive following 2nd and short opportunities, partitioned by play calling strategies. Differences in points scored between Shotgun and Under Center positions are noted for each region of the field and *p*-values are denoted below differences.

		Only 2nd and Short	Only 3rd and Short
10 to 20 yard line			
	Shotgun	2.865	1.234
	Under Center	2.994	1.327
	Difference	-0.297 (0.54)	-0.093 (0.75)
20 to 30 yard line			
	Shotgun	2.285	1.955
	Under Center	2.138	1.919
	Difference	0.147 (0.51)	0.035 (0.84)
30 to 40 yard line			

	Shotgun	2.557	1.956
	Under Center	2.441	1.991
	Difference	0.116 (0.49)	-0.034 (0.81)
40 to 50 yard line			
	Shotgun	2.810	2.445
	Under Center	3.111	2.519
	Difference	-0.300 (0.18)	-0.074 (0.71)

		Only 2nd and Short	Only 3rd and Short
50 to 40 yard line			
	Shotgun	3.644	2.853
	Under Center	3.205	2.579
	Difference	0.439** (<0.05)	0.247 (0.19)
40 to 30 yard line			
	Shotgun	4.414	3.757
	Under Center	3.827	3.217
	Difference	0.587*** (.01)	0.539** (<.02)
30 to 20 yard line			
	Shotgun	4.487	4.309
	Under Center	4.633	4.377
	Difference	-0.146 (0.58)	-0.068 (0.80)
20 to 10 yard line			
	Shotgun	5.060	4.490
	Under Center	5.438	4.979
	Difference	-0.378 (0.15)	-0.489 (.06)
10 to end zone			
	Shotgun	6.065	5.295
	Under Center	6.204	5.394
	Difference	-0.139 (0.38)	-0.099 (0.58)

The results highlight that all of the explanatory power of the value of aggressive formations (Shotgun) on 2nd and short come from one region of the field – between midfield and the 30 yard line. This fits directly with the hypothesis that the value of the option to reset the chains should be greatest when the offensive team is more likely to go for it should they face a 4th down opportunity (i.e. between midfield and the opponent's 30 yard line).

In fact, we see that when an offensive coordinator is between midfield and the 40 yard line facing 2nd and short, and calls a more aggressive formation (Shotgun), they can expect 0.439 more points in that drive as compared to calling a risk averse formation (Under Center), which is significant at the 5% level. Even further, when an offensive is facing 2nd and short and is between the 40 yard line and the 30 yard line, and calls a more aggressive formation (Shotgun), they can expect 0.587 more points in that drive as compared to calling a risk averse formation (Under Center), which is significant at the 1% level.

The results highlight that the full value of aggressive/diverse play calling on 2nd and short seems to come from this region of the field (midfield to 30 yard line). In no other regions of the field do we see a significant difference in points scored based on plays calls following a 2nd and short position.

Next, since there may be other variables at play here that may affect play calling and points scored on a given drive, I repeat the analysis in a multivariate framework. The table below presents the results where the dependent variable is the points scored in a given drive (net points factoring in any direct points that may come against an offense should a turnover occur). Nine regressions are run based on area of the field. In Column (1) all plays are those that are run from the 10 to 20 yard line, Column (2) are those from the 20 to 30 yard line, Column (3) are those from the 30 to 40 yard line, Column (4) are those from the 40 to 50 yard line, Column (5) are those from the 50 to 40 yard line (opponent's), Column (6) are those from the 40 to 30 yard line (opponent's), Column (7) are those from the 30 to 20 yard line (opponent's), Column (8) are those from the 20 to 10 yard line (opponent's), and Column (9) are those from the 10 to end zone.

Panel A presents the results where the down is 2nd and short, while Panel B presents the results for 3rd and short. The variables that are included as controls are an indicator variable for a

strong offense-bad defense matchup, an indicator which captures if the offensive team is currently ahead during the game, and year fixed effects.

Table: Marginal Points Scored on Second and Short by Play Call

This table reports the marginal points scored based on play calls, conditional on down and position on the field. The following regression is estimated: $y_{dt} = \alpha + \beta_1 Shotgun_{dt} + \beta_2 X_{dt} + \eta_t + \varepsilon_{dt}$, where y_{dt} is points scored in a given drive, $Shotgun_{dt}$ indicates the formation that an offense has taken prior to the play, X_{dt} is a vector of controls, and η_t are time fixed effects.
In Column (1) all plays are those that are run from the 10 to 20 yard line, Column (2) are those from the 20 to 30 yard line, Column (3) are those from the 30 to 40 yard line, Column (4) are those from the 40 to 50 yard line, Column (5) are those from the 50 to 40 yard line (opponent's), Column (6) are those from the 40 to 30 yard line (opponent's), Column (7) are those from the 30 to 20 yard line (opponent's), Column (8) are those from the 20 to 10 yard line (opponent's), and Column (9) are those from the 10 to end zone. Additional controls include an indicator variable for a strong offense-bad defense matchup, an indicator which captures if the offensive team is currently ahead during the game, and year fixed effects. Standard errors, denoted in parentheses, are robust to heteroscedasticity and are clustered by director. *, **, and *** indicate differences significant at the 10%, 5%, and 1%, respectively.

Panel A: 2nd and Short	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	1.36***	1.72***	1.87***	2.48***	2.83***	3.02***	4.32***	5.09***	5.83***
	(0.37)	(0.19)	(0.18)	(0.20)	(0.22)	(0.27)	(0.25)	(0.26)	(0.12)
Shotgun	-.014	0.17	0.26	-0.28	0.48**	0.67***	-0.13	-0.35	0.14
	(0.48)	(0.23)	(0.21)	(0.24)	(0.21)	(0.24)	(0.30)	(0.28)	(0.15)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: 3rd and Short	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	1.16***	1.41***	1.44***	2.07***	2.21***	2.30***	3.65***	4.82***	4.89***
	(0.30)	(0.16)	(0.16)	(0.19)	(0.20)	(0.21)	(0.24)	(0.21)	(0.15)
Shotgun	-0.05	0.04	0.01	-0.01	0.33	0.59**	-0.00	-0.48*	-0.07
	(0.30)	(0.18)	(0.18)	(0.20)	(0.24)	(0.25)	(0.25)	(0.25)	(0.17)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The results confirm the univariate findings. Again, the only two significant coefficients on Shotgun are found in Columns (5) and (6) for 2nd and short (Panel A). Across these two positions on the field (midfield to 30 yard line) the marginal points added in a given drive by calling an aggressive play formation on 2nd and short is 0.48 and 0.67 (significant at the 5% and 1%, respectively).

The results are repeated as above yet partitioned once again by offensive and defense match-ups/strengths and similar loadings are found on the coefficients. In these regressions, the same results hold that the significance of the Shotgun indicator only occurs in the midfield to 30 yard line area on 2nd and short, and holds across good offense-bad defense matchups (total, run only, and pass only). In total, the multivariate results confirm that the explanatory power of aggressive play calling on 2nd and short fully is realized in terms of marginal points in only one area of the field (midfield to the opponent's 30 yard line).

IV. CONCLUSION

This paper investigates whether offensive coordinators view the ability to 'reset the chains' in football as a valuable option to get creative with play calling and increase the risk associated plays run. To examine this, I study the play calling on 2nd and short at various positions on the field, given different offensive-defensive match-ups, and over time and observe that across the board there is little evidence that 2nd and short is viewed as a valuable play calling opportunity. In fact, just the opposite is pervasive – 2nd and short is one of the most conservative play calling situations observed in the data over the past six years. The offensive coordinators that deviate from this trend and do call a more wide arrange of play calls on 2nd and short can expect to yield marginally more points on a given drive, especially in the midfield to 30 yard-line region where the marginal points scored amount to a very significant 0.60 per drive.

Across key positions on the field and particular defense/offense match-ups, 2nd and short seems to be a wholly misused and squandered opportunity by offensive coordinators. Instead of viewing this unique situation as one where creative play calling can come into play, on average the down is treated merely as one where the offense opts to play entirely too conservatively with the single goal of picking up the first down by moving the ball just a few yards. This pervasive strategy neglects the beautiful value this particular down offers an offense, which is the freedom of a near costless play- especially if you are a strong offensive team.

Going forward, teams should investigate the value of 2nd and short even further. Although not mentioned in this writeup, there should be many other subtle situations where the value of 2nd and short should also be evident, including when offensive teams are down by more

than three but less than seven in the 4th quarter. Finally, hopefully this work can be extended to challenge how wide receivers and running backs view first down markers. Traditionally, we tell each player to use every ounce of energy to reach the ball out and stretch for that first down marker. While that might be the best strategy in most cases, perhaps teaching them the value of a 2nd and 1 opportunity could make them think twice of straining for that extra yard if they have already picked up nine.