

Honors Option

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Econ 447

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Introduction

If you listen to enough talking heads on sports TV, radio, or podcasts, you are bound to hear many different mantras about the best way to build a championship winning team in the NFL. Some of these are building around a quarterback on a rookie contract, spending a lot of money on the defensive side of the ball, or that games are won in the trenches, meaning heavy spending on the offensive and defensive lines. Teams have won Super Bowls in recent years in a variety of ways such as with a young QB in Russell Wilson and the Seahawks, by building a formidable defense with the Broncos, or by Bill Belichick and Tom Brady making a deal with the devil. Winning the Super Bowl is the ultimate goal of every team in the NFL, and the best way for a team to set themselves up for a Super Bowl is to win as many games in the regular season as possible. Teams maximize their wins by figuring out the best possible way to allocate money to players according to the salary cap. Given that there is a near infinite number of ways that a team could allocate their money under the salary cap, the question of how to optimally allocate this money is one of the guiding questions of teams in the NFL. This paper explores whether any of the mantras mentioned earlier hold true when comparing positional spending and wins, and if an optimal allocation can be computed based on data from past seasons.

Data

The data presented in this paper is based on salary cap spending by each team between 2013-2018 gathered from Over The Cap [1]. The spending is broken down by overall spending on the

following position groups; Quarterback, Running Back, Wide Receiver, Tight End, Offensive Line, Offense (combined), Defensive Line, Line Backer, Safety, Cornerback, and Defense (combined). The code and the cap data used for analysis can be found on GitHub [2].

Impact of a Quarterback

In the modern passing-friendly NFL, the QB position is widely considered to be the most important position on any team. As a result, a better QB should help a team win more games, thus the more valuable, and therefore higher paid the quarterback will be. When looking at the combined QB spending by each team vs their wins that year (Figure 1), we can see a slightly positive trend between QB spending and wins. This means that to an extent there is at least a small benefit to paying your quarterback more money.

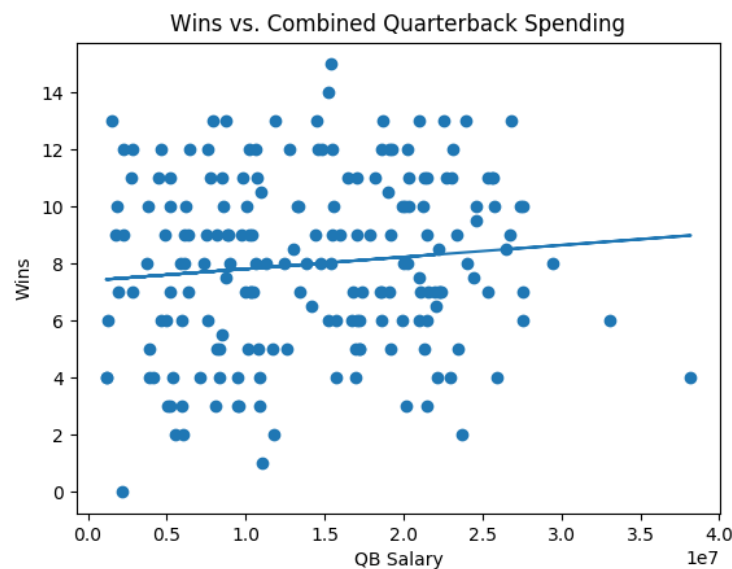


Figure 1: Wins vs. Total Quarterback spending/team

Paying your quarterback more money, usually indicates that they are a better player, however many of good quarterbacks on rookie contracts tend to be undervalued since they can potentially perform at veteran level, like Mahomes or Wentz in past years, while still being

subject to the rookie wage scale. Other quarterbacks like Brandon Weeden and Johnny Manziel were 1st round picks on relatively high paying rookie contracts that never lived up to their draft expectations. Looking at spending by teams with quarterbacks on rookie contracts there is a slight positive trend between wins and spending as seen in Figure 2. The teams included in Figure 2 are teams that had rookie quarterbacks start 3 or more games for the team, this was found using passing data and individual contract data from 2013-2018 [3, 4]. This trend may be due to the fact that better quarterbacks are drafted in the 1st round of the draft, and the value of a rookie contract is dependent on draft position. It also could indicate that teams would be better off drafting a quarterback in the 1st round vs waiting to find a serviceable one in later rounds. An interesting point to note in Figure 2 is that the far-right outlier near 40 million is the 2018 San Francisco 49ers who had the 2nd highest paid quarterback in the league in Jimmy Garoppolo get injured and missed 13 games. In his stead CJ Beathard and Nick Mullens only won 4 games but a lot of the 49ers cap was wasted due to injury. Without him included, the slope of the trendline gets nearly 6 times steeper, and gets more positive as well. Some of the other points on the right

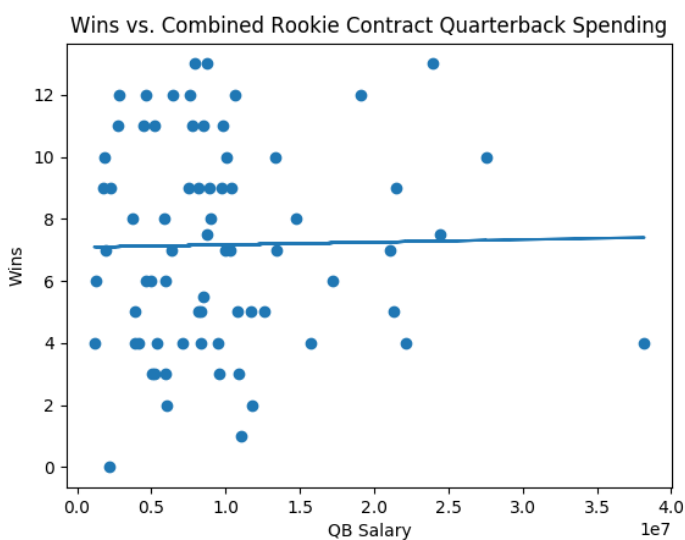


Figure 2: Comparing wins and spending for teams with QBs on rookie contracts

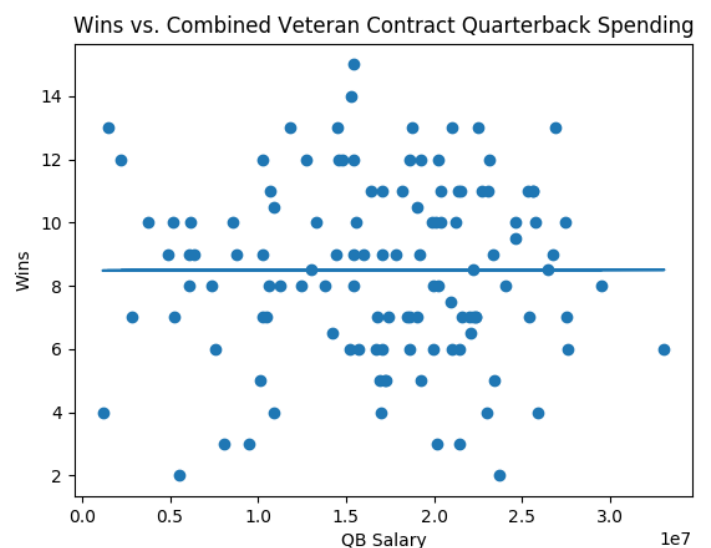


Figure 3: Comparing wins and spending for teams with QBs on veteran contracts

further away from the main group include the 2018 Ravens with an injured/aging Flacco that got beat out by a rookie, but still managed to get the Ravens to 10 wins.

On the other hand, in Figure 3, we can see that when looking at wins vs. spending for veteran quarterbacks, it shows almost no correlation. So no matter how much you pay your quarterback, you aren't necessarily immune from having a bad season, and this can easily be seen in the NFL where teams like the Chargers or Saints have had mediocre or bad seasons over the years with expensive Hall of Fame caliber quarterbacks at the helm, whereas the 2017 Vikings had a great season with relatively cheap Case Keenum at quarterback. One interesting comparison between rookie contract quarterbacks and veterans, is that teams with veterans on average had more wins with 8.49 vs. 7.16 for rookie contract quarterbacks. If a quarterback needy team is looking to make a decision whether to invest in a rookie quarterback or sign a free agent veteran, the veteran will get likely more wins, but the rookie especially if picked early on will be a better value to leave more room to spend money elsewhere. However, based on these results, the benefit of having a rookie contract quarterbacks does not seem to be that substantial in helping a team win more games.

Focusing on One Side of the Ball

While quarterbacks are often thought to be the most important part, there are 21 other players on the field at any time so it stands to reason that just investing at quarterback isn't the best way to build a good team. Some teams have found success in focusing heavily on one side of the ball be it Offense or Defense, and relying on a mediocre to bad effort on the other side of the ball. The 2018 Chiefs, the 2015 Saints, and the Packers for the past few years are teams that come to mind with good to great offenses that had historically bad defenses, but curiously

various levels of success. On the other side of the ball, the 2015 Broncos dragged Peyton Manning to a championship on the back of a phenomenal defense.

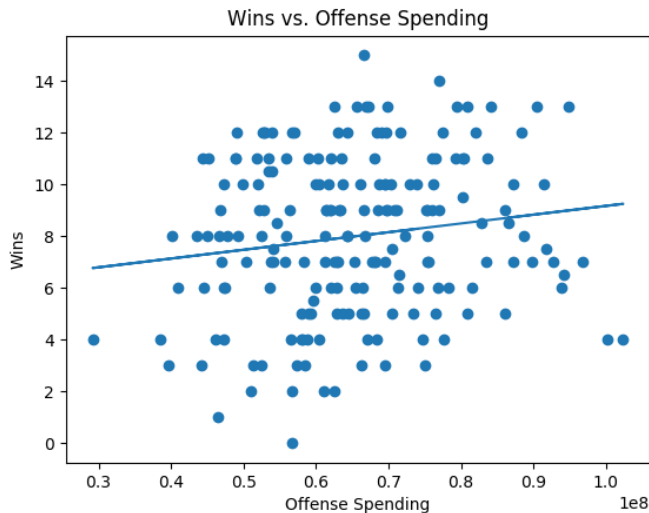


Figure 5: Comparing wins and overall offensive spending for teams

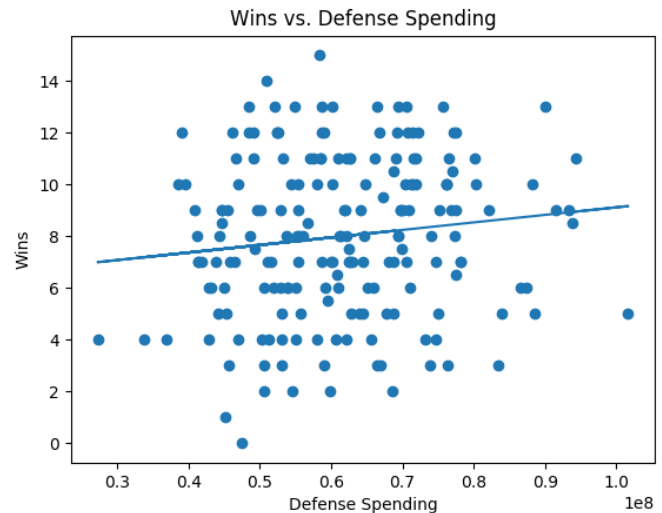


Figure 6: Comparing wins and overall defensive spending for teams

As seen in Figures 4 and 5, increased spending in both offense and defense have a positive trend and correlate to slightly higher wins. The trendline for the offense is about 15% steeper than that for defense, which seems to indicate a that a slight advantage is to be had with a more offense heavy focus. The shift in the rules to favor passing offenses over defense may be one of the reasons that we can see a slight benefit to investing in offense over defense. In general, we can also see that the average offense amount is about 4 million higher at \$65 million compared to \$61 million for defense. So while Defense may win a championship, it is not clearly not the only way to win a championship. As the rules keep changing to favor offensive, we will most likely see the disparity in offensive vs. defensive spending increase.

Focusing on the Trenches

Much like war, many football analysts claim that games are won or lost in the trenches. At first glance this seems to hold true, since good offenses typically have good offensive lines,

and good defenses are built on the backbone of a good defensive line. When we look at the data in Figures 6 and 7, we can see a mildly positive trend for both offensive line and a near flat trend for the defensive line, although the offensive line slope is about 4 times steeper. Similar to the previous section, this may be a result of offense heavy rule changes and are driving up the value of a good offensive line. One interesting area to note is that the trends for both the offensive and defensive lines tend to vary from year to year jumping between positive and negative. 2018 saw a negative year for defensive lines and a positive year for offensive lines and could be linked to the roughing the passer rule-change this past season, or it could be a correction from 2017 when defensive line and wins had a slightly positive correlation. When looking at both offensive line and defensive line spending combined, there is a very slight positive correlation, but not enough to say that investing in the “trenches” is the ideal strategy.

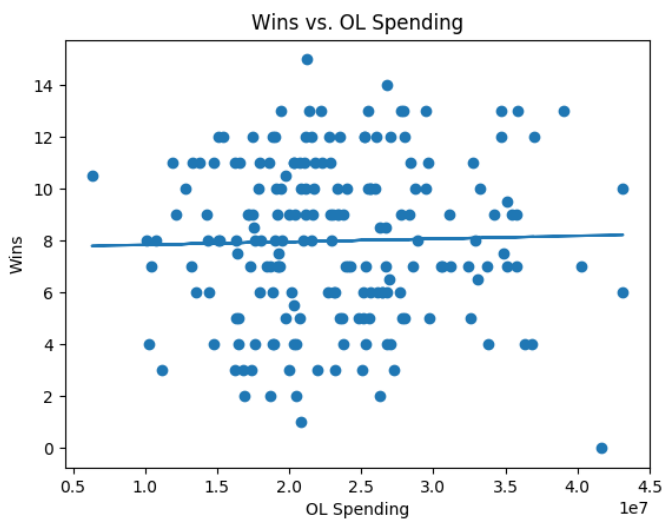


Figure 7: Comparing wins and offensive line spending for teams

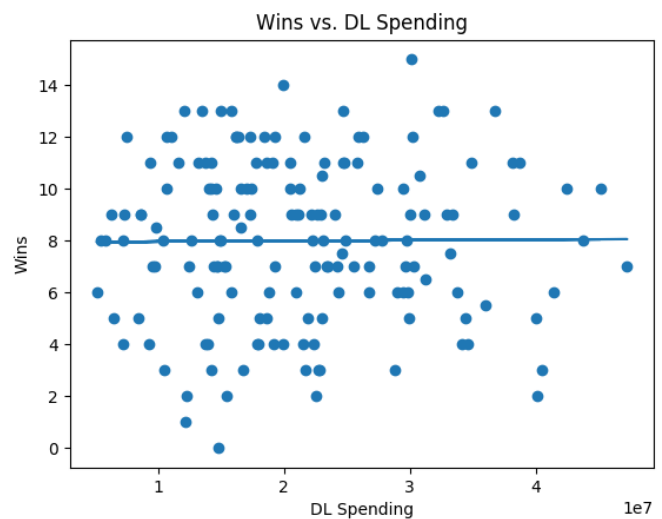


Figure 6: Comparing wins and defensive line spending for teams

Individual Position Groups

Outside of the position groups that we have already looked at, some of the individual position trends are also insightful but individual positions like linebacker or running back are usually not

as impactful on a team's success. The remaining positions to consider are running back, wide receiver, tight end, linebacker, safety, and corner back. All of them have some level of a positive trend, but to varying degrees. Corner back is the flattest of the trends, with it being pretty similar to defensive line. Linebacker, wide receiver, and running back are all mildly positive.

Interestingly, running backs have higher correlation than wide receivers, considering that the league has taken a passing focused slant in recent years. Tight end and safety have fairly positive trends, even more so than quarterback despite not being the flashiest position on their sides of the ball. Maybe Gronk was the true reason for the resurgence of the Patriots dynasty, and it will finally end now that he's gone.

Optimal Allocation

Citations

[1] <https://overthecap.com/positional-spending/>

[2]

[3] <https://www.pro-football-reference.com/>

[4] <https://www.spotrac.com/>