Evolution of Offense in the NFL from 1970 to 2023

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Data Visualization

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**Abstract**

This project investigates the evolution of offensive strategies in the NFL from 1970 to 2023, with a focus on the hypothesis that the sport has increasingly emphasized offense, leading to higher game scores and more dynamic gameplay. Utilizing comprehensive data sets from Pro-Football-Reference, this study analyzes trends in points scored, passing yards, rushing yards, and other relevant offensive metrics across five decades. It also looks at the offensive aspects of the most dominant teams in the league over the decades. The analysis extends to Super Bowl performances, examining whether trends observed during regular seasons mirror those in championship games. By exploring this data through various visualization techniques, including time series analysis and scatter plots, the project aims to offer new insights into how offensive play has shaped the dynamics of the game and its outcomes. This report presents a detailed discussion of the findings, supported by interactive dashboards that allow for an in-depth exploration of the data, thereby contributing to a deeper understanding of the strategic evolution of offenses within the NFL.

**Introduction**

The offensive strategies in the NFL have shaped how the game has been played, with every so often the creation of a revolutionary offensive strategy like the shotgun offensive formation which changed the passing game in the NFL forever. The evolution of these strategies reflects not only changes in player skills and coaching philosophies but also adaptations to the evolving rules of the game. This project focuses on the period from 1970 to 2023, a span that begins with a pivotal moment in NFL history—the merger between the National Football League and the American Football League. This merger marked the beginning of the modern NFL, transforming it into a 26-team league and setting the stage for the expansion and popularity that the league has today.

The choice of this time frame is strategic, allowing us to analyze the development of offensive strategies in what can be considered the contemporary era of football. This period encompasses significant changes in the game, including technological advancements, shifts in playing styles, and modifications in league regulations, all of which have influenced how offenses are orchestrated. By examining these changes, this project aims to gain insights into how and why the nature of offensive play has evolved and the impact this evolution has had on game outcomes.

To conduct my analysis, this project utilizes two comprehensive datasets: the first dataset includes detailed offensive statistics from every Super Bowl game played during this period, sourced from a Kaggle dataset specifically compiled for this purpose. The second dataset aggregates historical offensive statistics for every NFL team from 1970 to 2023, meticulously compiled from historical stat pages from Pro-Football-Reference.com. This dataset required significant editing and standardization, including the addition of labels for season years and detailed game outcome statistics of wins, losses, and ties. These enhancements allow a robust analysis of trends and patterns over more than five decades of football.

Through the study, the project seeks to explore how offensive strategies have shaped the competitive landscape of the NFL and how these strategies correlate with team performance and season outcomes. By dissecting these relationships, the analysis provides a comprehensive overview of the strategic evolution in NFL offenses and contributes to a deeper understanding of their pivotal role in shaping the game of football.

**Background**

The NFL's history is marked by significant strategic and structural changes that have profoundly influenced the league's offensive dynamics and player performance. One of the most critical changes was the extension of the season from 14 games in 1978 to 16 games, and eventually to 17 games in 2021, with ongoing discussions about moving to an 18-game season. These expansions have allowed for greater offensive outputs and have extended players' opportunities to accrue statistics over a season. Another defining moment was the 1982 player strike, which resulted in a substantial reduction of the season, skipping weeks 3-10. This not only disrupted the season but also had long-lasting effects on team strategies and player performances during that year.

The evolution of offensive strategies in the NFL has been equally dramatic. Historically, the league featured a more balanced approach between the run and pass, but over the decades, there has been a significant shift towards a more pass-oriented game. This shift is due in part to the enhanced capabilities of players, particularly quarterbacks, whose skills in making long, accurate throws have become a central aspect of the modern NFL. The introduction of the shotgun passing formation in 2003 marks a pivotal development in offensive strategies. Initially used sparingly, its effectiveness has led to its widespread adoption, significantly altering how teams approach their offensive play-calling.

The NFL's environment encourages adaptation and innovation, as seen in the quick adoption of successful strategies by multiple teams. The "K-Gun" formation introduced by the 1990 Buffalo Bills is an excellent example of this, leading to the widespread use of no-huddle offenses across the league. The leagues’ quick changes in adoption of new offensive strategies is a testament to the league's competitive spirit and its constant evolution in pursuit of a competitive edge. As this project explores, the NFL's ongoing strategic advancements and responses to unique events shapes the contemporary offensive playbook and defines the modern era of professional football.

**Data Visualization**

This project utilizes the analytical visualization tools of Tableau to highlight the evolution of offensive strategies in the NFL from 1970 to 2023. The collected data, derived from the meticulous aggregation of Pro-Football-Reference statistics, encompasses a wide range of offensive metrics including offensive statistics that has been broken up into different aspects – passing, rushing, and penalties, as well as overall team metrics including wins, losses, and ties. The idea of breaking up the offensive metrics into the categories of passing and rushing is to be able to create visualizations that describe the offensive environment of teams each year.

Looking at teams over the years it seems that for some like the Pittsburg Steelers their offensive strategy seems to work no matter what, as they have the most wins in the NFL as of right now and have performed in the top half of all teams in each decade for the last five decades. In other cases, it seems as though the offense only works at specific times and when looking into what could have been a factor in this, it turns out that it can just come down to the players on the team at that point in time. For example the Colts were one of the top two teams for the decade of the 2000s, and in all other decades they were either average or below average in wins and passing yards. This change in the decade of the 2000s could be attributed to the presence of hall of fame quarterback Peyton Manning. The presence of Peyton Manning on the Colts greatly affected the offense of the team. The Colts went being the seventh worst team in terms of passing, and wins, in the 1990s to the number one team in the 2000s. Their performance from the addition of Peyton Manning gave them almost double the amount of passing touchdowns, from 170 for the 90s to 322 in the 2000s, an increase of almost doubled in wins, from 67 in the 90s to 115 in the 2000s, and passing yards increased by almost 11,000 extra yards across the 2000s. After Peyton left after the 2010 season the Colts in the 2010s fell to 267 passing touchdowns, lost a little over four thousand passing yards, and won forty fewer games. This idea of a single player or a couple players being the biggest factor in the offensive capabilities of a team is further exemplified and supported by the New England Patriots. The Patriots were one of the most dominant teams for two decades, the 2000s and the 2010s they were either number one or number two for both decades. This idea is supported from the future hall of famer and one of the best quarterbacks to every play the game, Tom Brady, was a part of the Patriots for both decades, earning the most Superbowl wins by a player or quarterback. Under the leadership of Tom Brady, the Patriots saw a decade over decade increase in their offense, with wins in the 90s going from 65, to 112 in the 2000s, and 125 in the 2010s. While their rushing offense stayed stagnant and saw almost no increase, their passing offense greatly increased with passing touchdowns going from 197 in the 90s, to 271 in the 2000s, and then to 323 in the 2010s, and their passing yards saw an increase of almost 10,000 from the 90s through the 2010s. From these two examples it seems that there are a couple different factors that play a role in affecting offense in the NFL.

Since the extension to a 16-game season in 1978 and further to 17 games in 2021, there has been a noticeable increase in offensive production, with passing and rushing statistics growing significantly. Total yards across the league have increased by about 80,000 since 1970. And directly after the switch to a 16-game season in 1978, the NFL saw an increase of about 10,000 total yards and an increase of over 100 total touchdowns in across the league the two years following the schedule change. The statistical shift towards passing is evident, with the highest passing yards increasing from around 2,900 in 1970 to 4,600 by 2023. The adoption rate of the shotgun formation is a testament to this strategic shift; with teams using it for an average of 40 percent of their plays, and teams like the Detroit Lions employing it in up to almost 65 percent of their offensive plays. When looking at the NFL overall in the period if 1970-2023 we can look at some general linear increase in the offenses across the league by analyzing season averages. The offense in the NFL is nothing like what it is statistically today, looking at the beginning of this data in 1970 the league saw on average 850 plays per team, teams averaged a total of around 4,000 offensive yards, and an average of 4.62 yards per play. Since then, the NFL has seen an increase of 36% for average offensive yards per team now at 5637, a 26% increase in the average number of plays which is now at 1,073, and almost 14% increase to 5.253 average yards per play. While these numbers might not seem very impressive over this big of a period. Most of this came from the change in schedule length, which skyrocketed these statistics drastically in a two- or three-year period and has been gradually increasing year over year since. These stats not only reflect the changes in gameplay but also underscore the strategic adaptations that teams have made over the decades.

Some of the notable events that the NFL has seen are the player strikes of 1982 and 1987. The players in the NFL went on strike in 1982 for almost two months in the middle of the season which resulted in the loss of seven weeks of games, leading to a season of only 9 games and all-time lows for almost all stats in the league. The league saw a loss of almost 50% in the statistics of total plays, total touchdowns, and total offensive yards, dropping from 30,000 to 16,000 for plays, 1,000 to 500 for total touchdowns, and 150,000 to 80,000 for total yards in the season. While this strike didn’t have any long-term effects on the league in terms of offensive output as the following season the totals went back up to normal of around 30,000, 1,000, and 150,000 respectively, it did have implications and lasting effects on player morale. As in 1987 there was another player strike which lasted for 24 days, unlike before the NFL decided to continue the season with replacements players from the Canadian Football League and the recently dissolved United States Football League. Oddly enough, the analysis shows that even though there were three weeks of games that were played at a lower level of play with players that didn’t even belong to the NFL, the offenses for the year didn’t suffer all that much, only going down by 1,300 total plays, 15 total touchdowns, and 8,000 total yards.

When looking at the comparison of regular season vs Super Bowl trends, it showed that the overall trends in the offensive playstyles in the regular seasons aren’t further mirrored by the trends in Super Bowl games. While looking at just the statistics of total passing and total rushing yards for the regular season, it shows that when using linear regression trend lines both factors have gone up year after year and have seen a dramatic increase overall. For perspective the league started with a total passing and rushing yardage of 59,000 and 49,000 respectively and increased to 120,000 and 61,000 respectively. When looking at the linear regression trend lines of the passing and rushing yardage shown in the year over year change for the offense of the Super Bowl, there is a linear increase in passing yard in the Superbowl and a decrease of rushing yards. When looking at the visualization it seems as though there could be a slightly inverse relationship between these two statistics, as when passing goes up rushing goes down and vice versa. Overall there is a change positively for passing yards as the previous low for yards was 192 yards in 1972 and a high of almost 900 yards in 2017, and a negative change in rushing as shown from the previous highest rushing yards being 370 in 1987 and some of the more recent lows being 91 in 2008 and 122 in 2021. It seems that from the inverse relationship seen in the Super Bowl games that there is a correlation with regular season passing trends, but not with the rushing trends.

**Conclusion**

This study's comprehensive investigation into the NFL's offensive strategies from 1970 to 2023 has confirmed a significant shift toward more dynamic, offense heavy playstyles, supporting the hypothesis that the sport has increasingly emphasized more offense in gameplay. During the regular season, the analysis reveals a positive relationship between passing and rushing offenses from 1970 -2023, indicating how offense has become a bigger highlight of the game as there is more and more offense happing each year, offenses are getting better and better in the regular season.

However, Super Bowl analyses present a contrasting scenario. Unlike the regular season, Super Bowl data shows a clear inverse relationship between passing and rushing. As passing plays have become more dominant in these high-stakes games, rushing has seen a continual and linear decline. This shift suggests that while the regular season accommodates a diversified strategy, the Super Bowl favors a pass-heavy approach, underscoring the adaptability required under different competitive conditions.

Throughout this exploration, conducted through Tableau's visual analytics, we've uncovered not only the overarching trends but also intricate patterns and the impact of key historical events like the 1982 player strike and regular season expansions. These elements underscore the necessity of contextual understanding when interpreting the complex and diverse offensive strategies across the league, as demonstrated by varying team dynamics like those of the Pittsburgh Steelers and others.

The insights from this project extend beyond the statistical data; they provide a framework for anticipating future trends and strategic planning in both regular and postseason NFL games. As the league continues to evolve, these findings will guide future strategies, ensuring teams can adapt to the demands of NFL gameplay effectively.

In conclusion, this study has not only affirmed that the NFL has become more offense-forward but also offered a nuanced view of how strategic evolution drives this change, shaping the NFL's legacy. The insights gained from over five decades of football will be invaluable in informing future developments and innovations within this ever-evolving sport.