

# MLB Performance post-mortem

A quick look into payroll inequality relationship to performance  
from the year 2015 to 2024

# Goals of this study

The overall **goal** of this study is to identify whether a team's **total payroll** and **payroll inequality** plays a role in a MLB team's league **success**, with a focused case study on the **Los Angeles Angels** from the year **2015 to 2024**.

This work as somewhat inspired a [NYTimes article](#) and my friend who is an Angels fan.

# Defining “Team Performance”

The metrics I used to evaluate the MLB team performance

1. **Win Percentage:** How many games did you win? Using Percentage to normalize the number of games (2020).  
→ Wins/(Wins + Loses) \* 100.
2. **Division Win, League Win, and World Series win:** Season and Post-Season success and the ultimate goal of how the public evaluate success  
→ Binary metric of whether or not a team won in their division, their league or the world series.

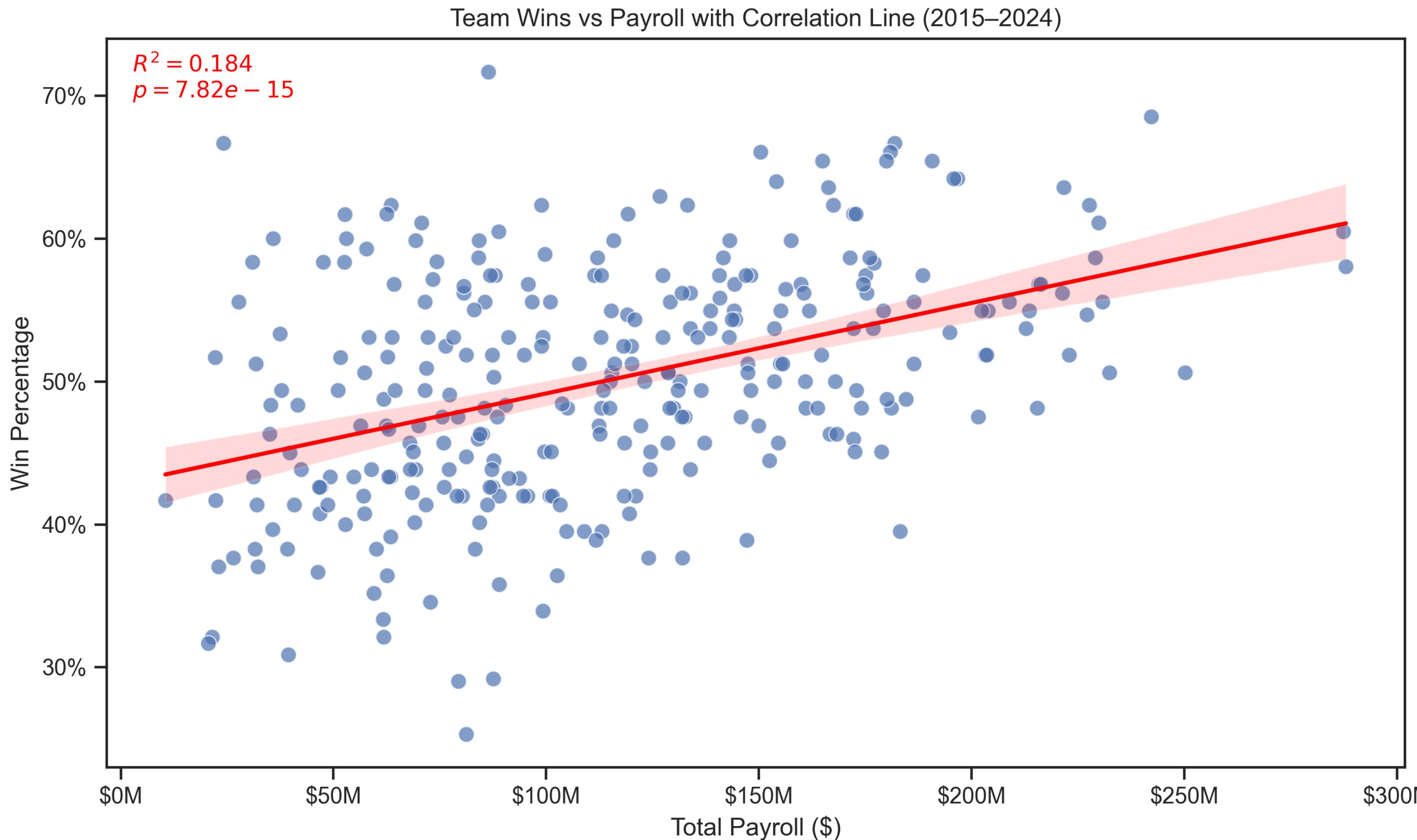
# Dataset Source

1. **Lahman Baseball Database**: a rich dataset includes statistics dating all the way back to 1871.
2. **Spotrac MLB Player Salaries 2011-2024**: a dataset including the salaries of all active players. For this project, we used Christopher Treasure's compliment of the dataset, uploading on Kaggle.

\*Note: Year is define as the end the season (e.g. 2022 data is from the end of 2022 season).

# Team's Total Payroll Impact on Winning

Spending more money does have an impact to winning, but it is small



A **small, but meaningful correlation** between Wins percentage and Total Payroll. This mean that spending **more money** into a team's payroll could help a MLB team win but is **not to the key attribute**.

# The GINI coefficient

A measurement for Inequality

**GINI** is statistical measure of inequality, ranging from **0 (perfect equality)** to **1 (perfect inequality)**, that quantifies the dispersion of income or wealth within a population.

0: Perfect equality (e.g. [1, 1, 1, 1])

< 0.2: very low inequality

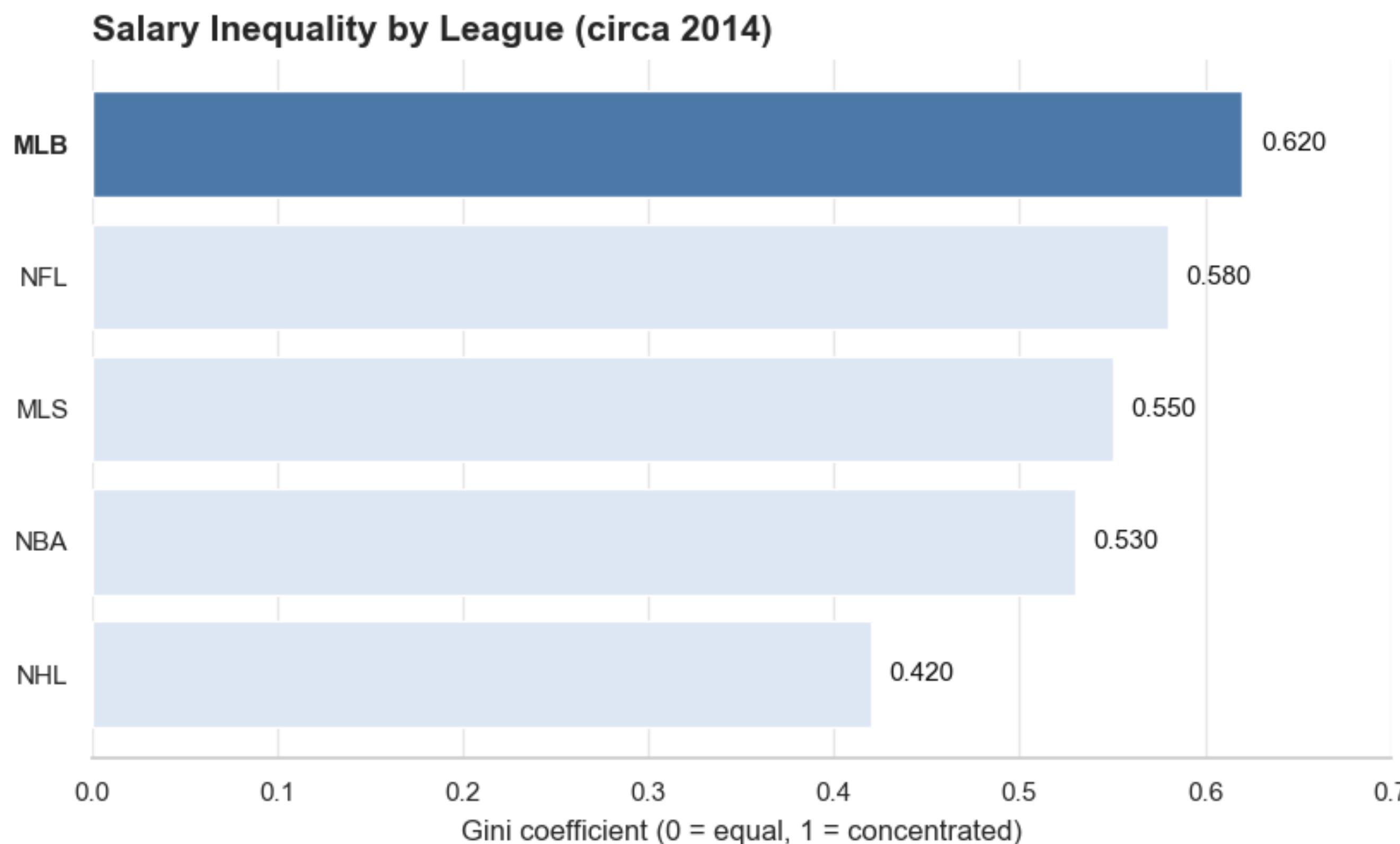
0.2 - 0.5: relative inequality

> 0.5: Severe inequality

1: Perfect inequality (e.g. [0, 0, 0, 4])

# GINI across major sport leagues (US)

MLB's GINI is higher than other major US sport league.



What makes MLB teams vulnerable to a high GINI coefficient?

Like the NBA, MLB has **no hard salary cap** or **salary floor**. Like the NFL, it also have some **highly specialized and necessary roles** (e.g. Pitchers), while having a **large roster** (40-man Roster). Additionally, there are several MLB teams that have the spending capability to attract multiple star players. To compete with those wealthy teams, some low-spending teams will have to sacrifice Salary equality to **attract such star players**, as star players are a big driver to local ticket sales and broadcasting features.

# GINI growth in the past years (NYY)

Salary Inequality has been steadily increasing in the Yankees

## New York Yankees Salaries — 1988 vs 2011

Dollars are nominal except where noted; 1988 (2011\$) is 1988 salaries adjusted to 2011 dollars.

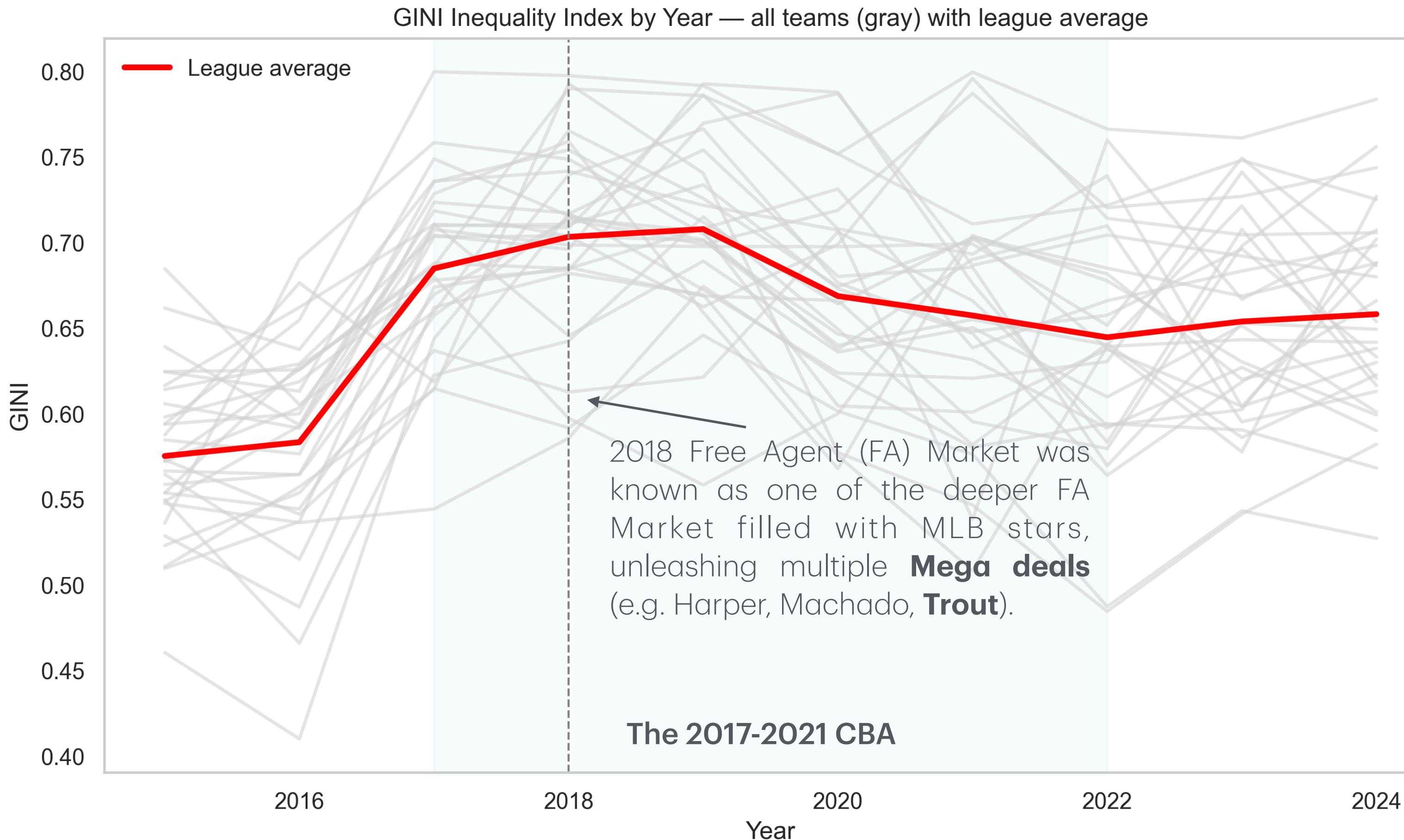
Metric	1988	1988 Salary with 2011 Dollar Conversion	2011
<b>Mean</b>	\$700,400.00	\$1,323,000.00	\$6,756,300.00
<b>Median</b>	\$480,000.00	\$906,700.00	\$2,100,000.00
<b>High</b>	\$2,000,000.00	\$3,778,000.00	\$32,000,000.00
<b>Low</b>	\$67,000.00	\$126,560.00	\$414,000.00
<b>Ratio High/Low</b>	29.9	29.9	77.3
<b>Gini Coefficient</b>	0.459		0.636
<b>Top 10% share</b>	28.5%		39.2%
<b>Top 20% share</b>	49.7%		61.9%
<b>Top 50% share</b>	80.1%		93.9%

10.7% Increase to the  
Top 10% Payroll Share  
over 13 years.

Source: AEI (Carpe Diem), Mark J. Perry, "Significant Increases in Income Inequality for MLB" (2011).

# GINI over in the modern MLB

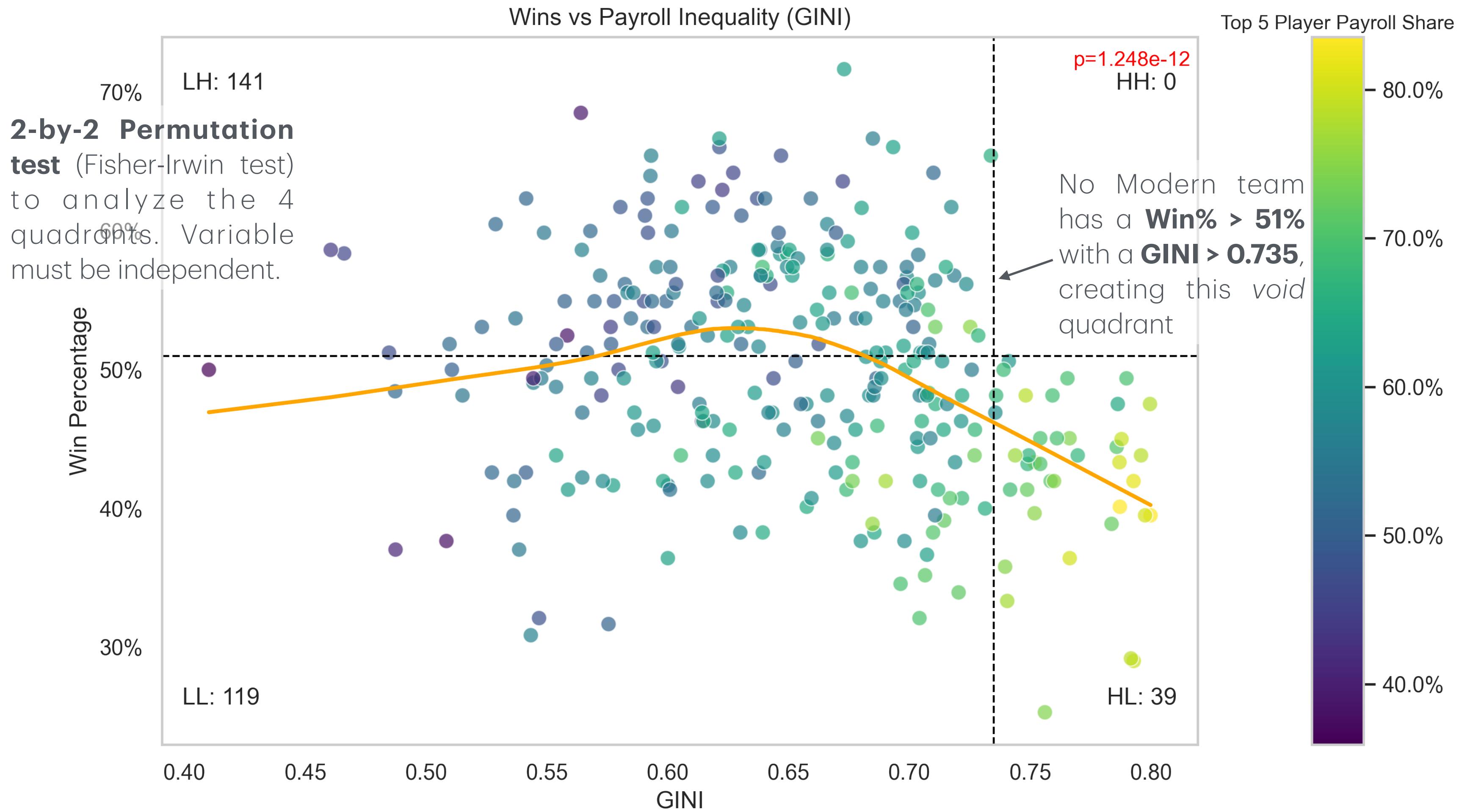
Salary Inequality is at an all-time high in the MLB



The **2017-2021 CBA** had several impacts to the GINI spike. One of these changes was a **tighter Competitive Balance Tax (CBT)**, which penalized repeated luxury tax offenders. This incentivized teams to have **more cheaper contracts** and **focus resources on a few big stars**. The 2022-26 CBA addressed these issue a little bit through minimal salary increase, pay raises for top young prospects and the new Cohen tax may have compressed the line, cause it to **start to plateau**. However, the GINI remains ever high in the modern MLB.

# GINI association with Win Percentage

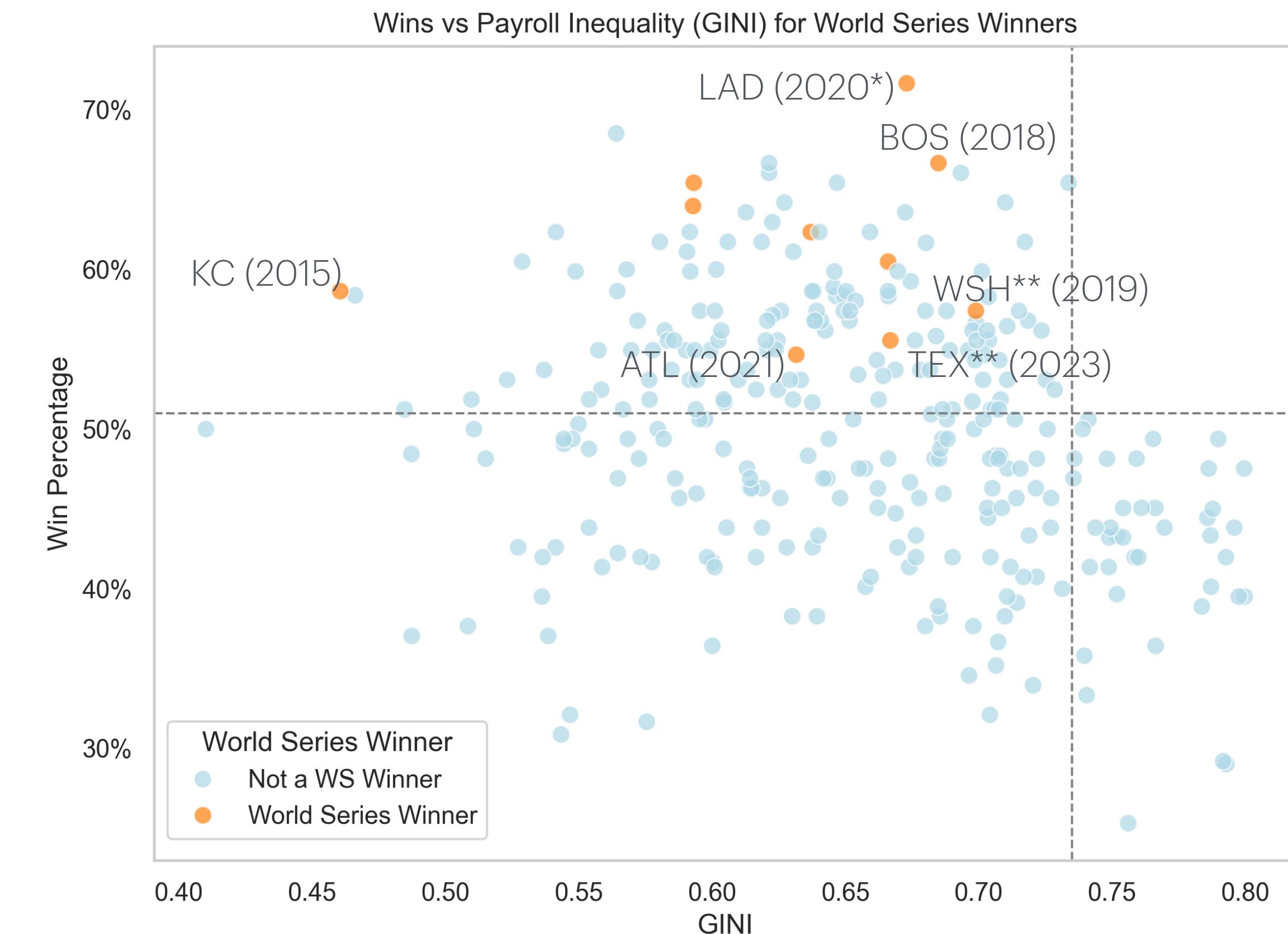
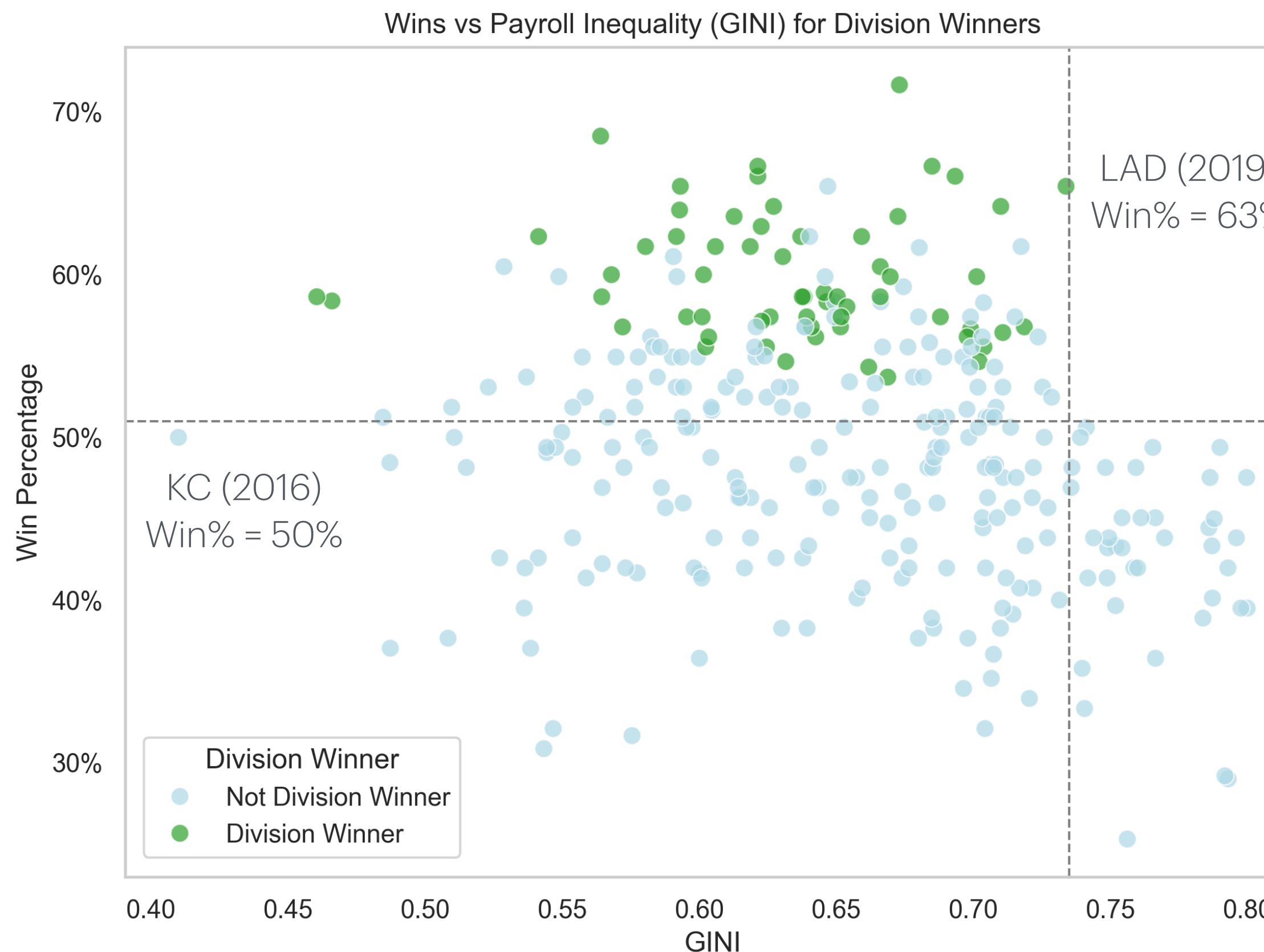
There is an upper threshold ( $\text{GINI} > 0.735$ ) where teams start struggling



This scatterplot is showing each team-year's Win percentage to GINI while tracking the top 5 player payroll share by color. The smooth fit curve peaks around **0.638**, which would be indicative of the **optimal GINI for a high winning percentage**. Though the sample size is small, the current GINI is plateauing slightly above this optimal GINI (previous slide, \*high deviation).

# GINI for Successful MLB teams

Teams had success regardless of GINI as long as its below 0.735



Kansas City in 2016 was able to maintain a **50% win percentage** while having a relatively **lowest GINI (0.41)** in the past 10 years. No team won a world series with a GINI above 0.7 ( $\text{GINI}_{\text{WSH(2019)}}=0.699$ ). The 2019 Dodgers came close with their franchise record breaking year and easy division win at a high GINI (0.734).

\*COVID-19 Total Game Shortage

\*\*Wild Card team who won the World Series (Not Division Winner)

# Finding so far

Recapping Payroll and Salary Inequality to Team Performance relationship

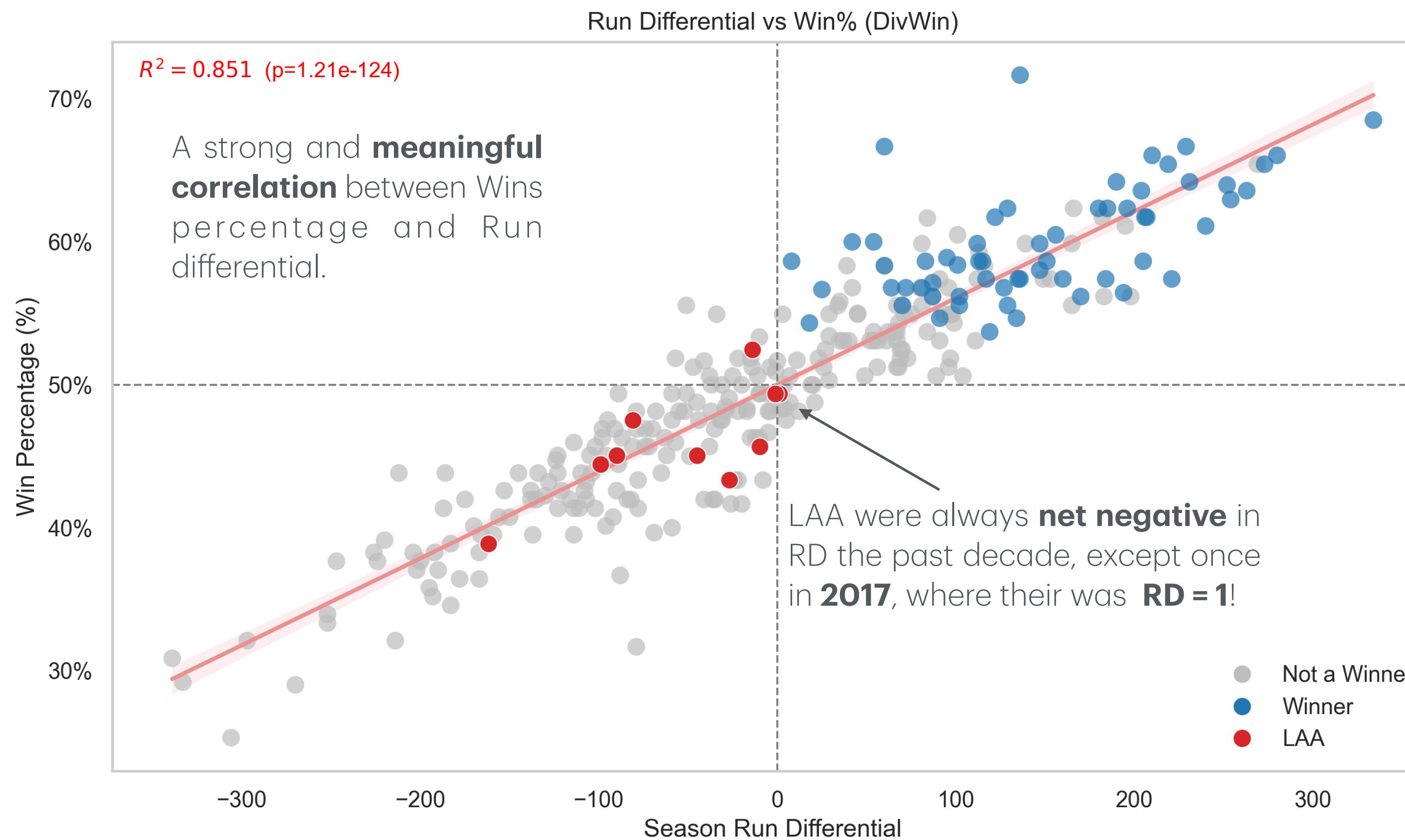
1. A higher payroll has a small impact to win percentage.
2. Passing a certain threshold in salary inequality (GINI) will lead to low team performance.
3. Modern MLB's salary inequality is at its highest!

# Payroll, GINI and Trout

A case study in the Los Angeles Angels' Team Performance,  
Payroll and Salary Inequality

# LAA is not a high performing team

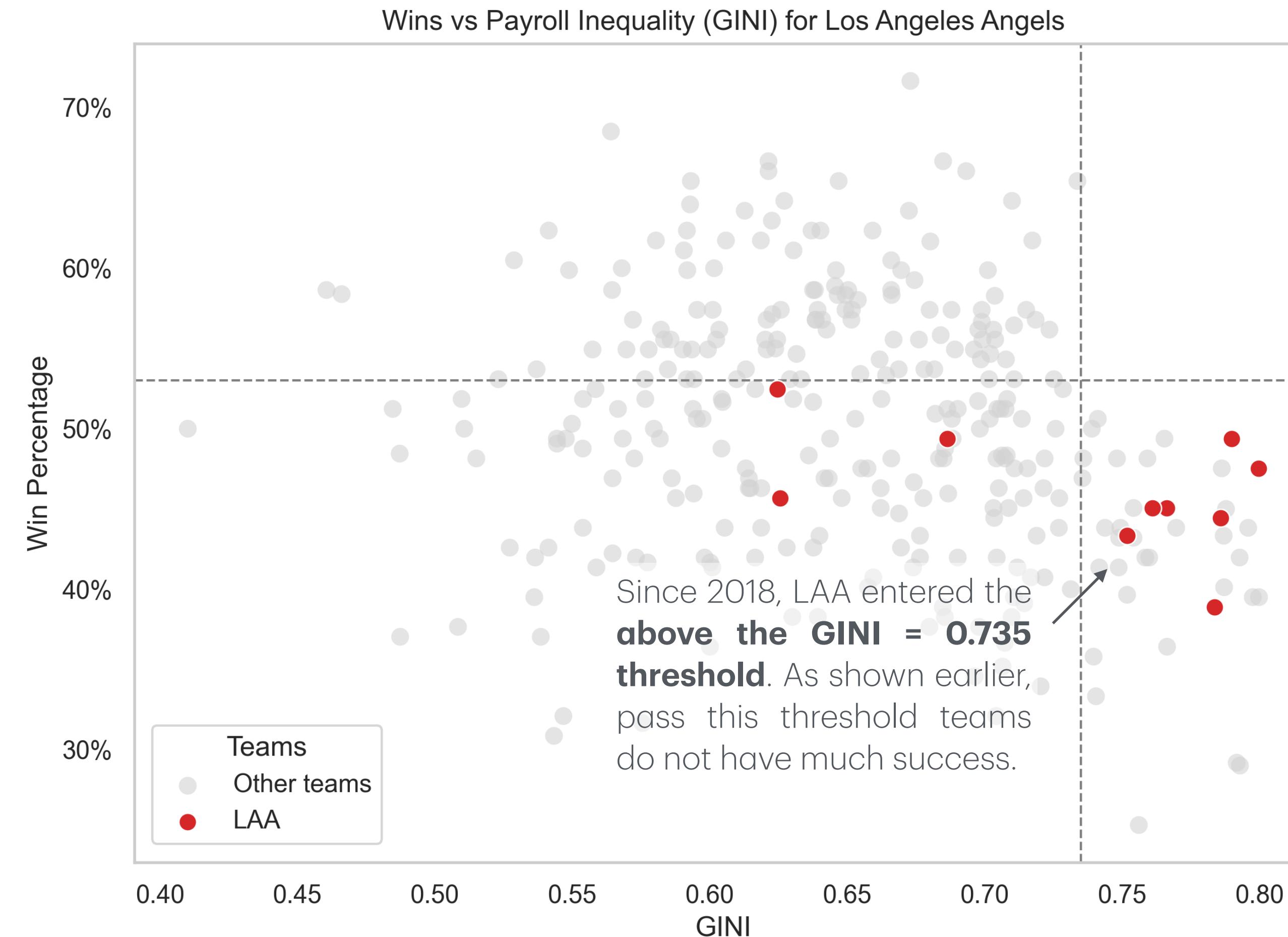
Run Differential (RD) is the number one (and obvious) factor for team success



**RD** is calculated by subtracting **how many run your team allowed** from **how many run your team gain**. The reason why these have a such a high and obvious correlation is because they are **not independent variables**. You need runs to score and you need to outscore to win. This is similar to how point differential in the NFL and field goal percentage in NBA are the strongest indicators for a Team's performance.

# LAA GINI coefficient since 2015

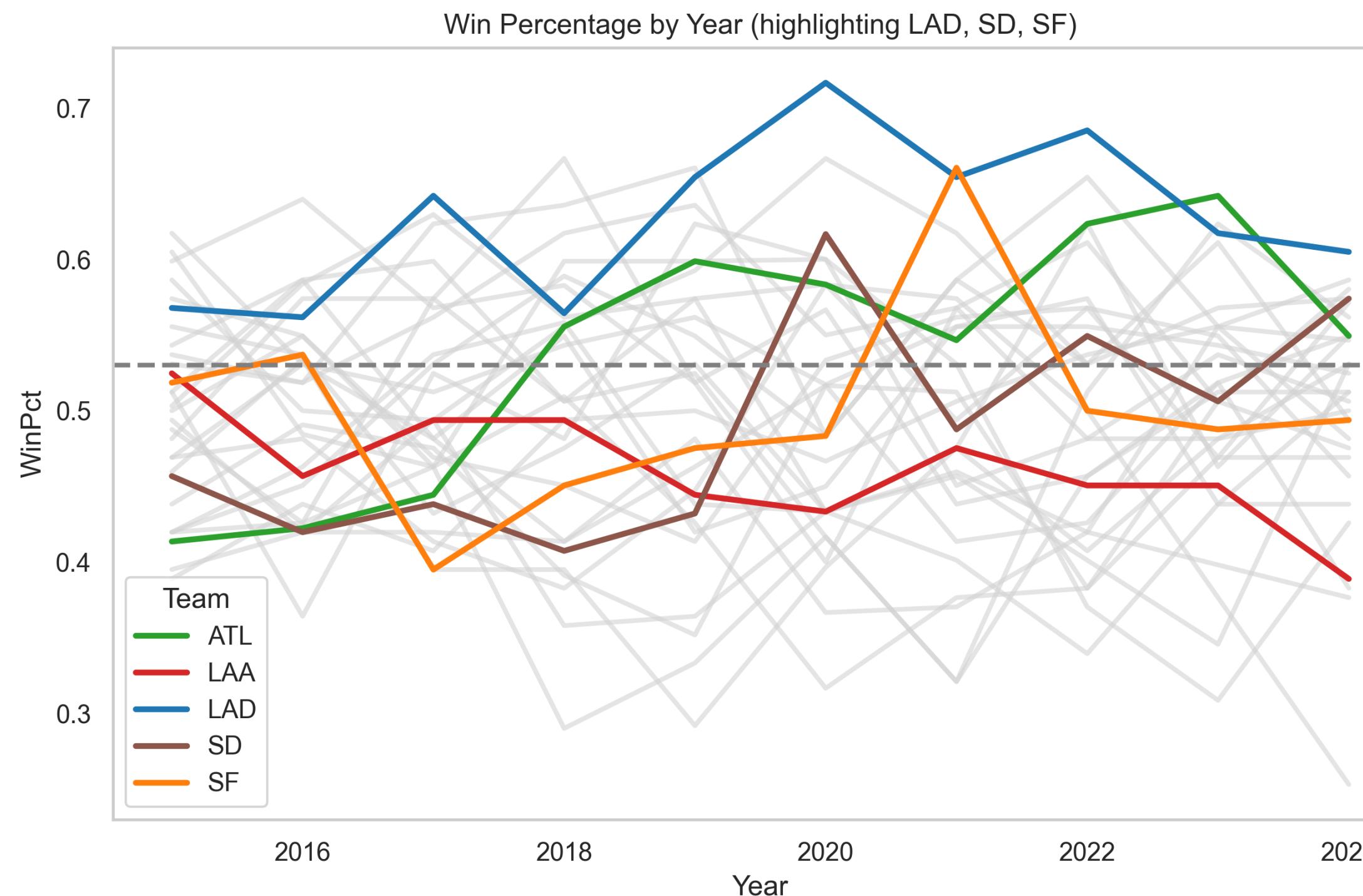
LAA has low Win% despite having high than league average GINI



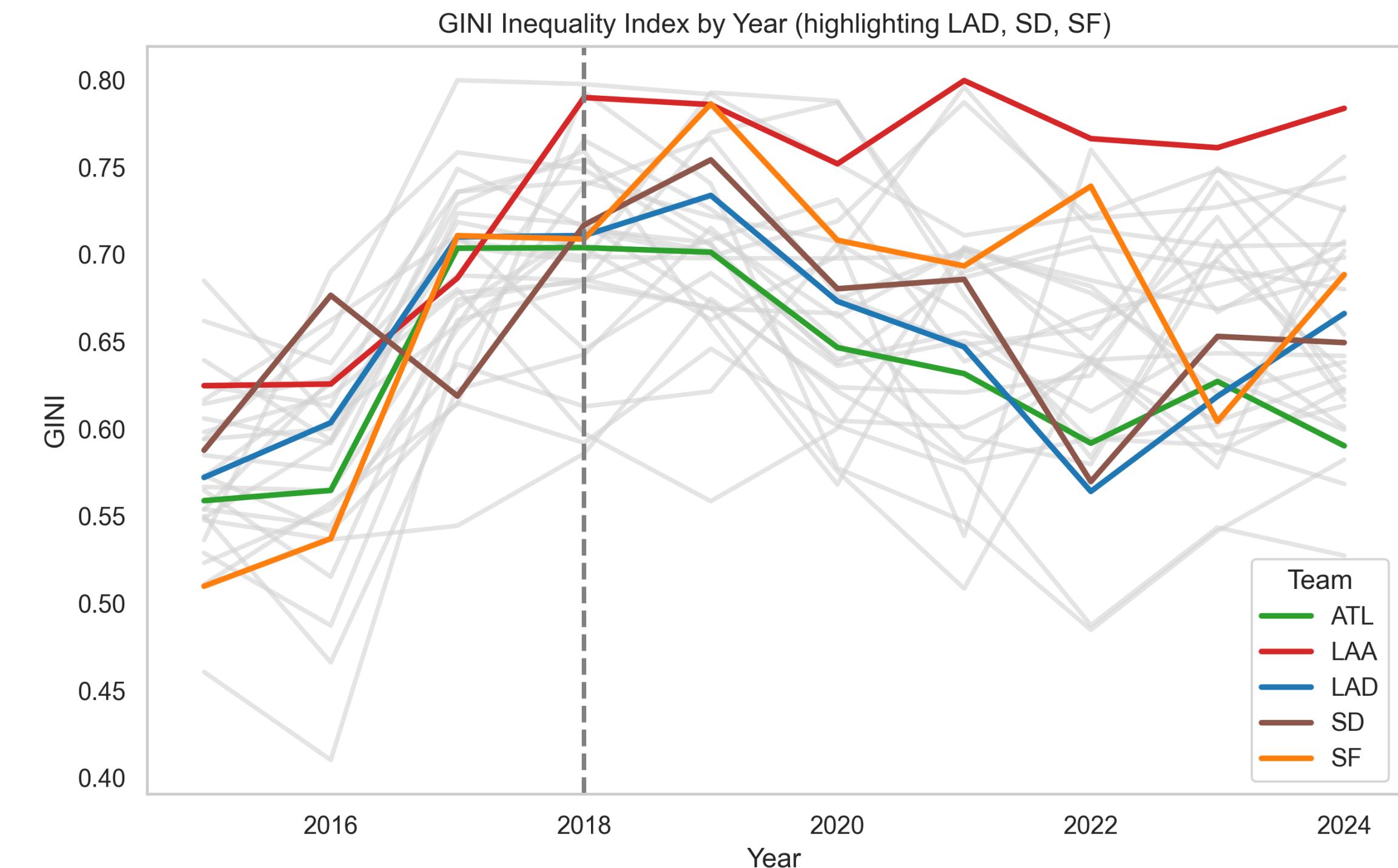
# CA teams' performance over the year

LAA's Win Percentage and GINI are in an inverse relationship

Since 2018, LAA is not only the highest GINI in California, but one of the **highest GINI** throughout the league!

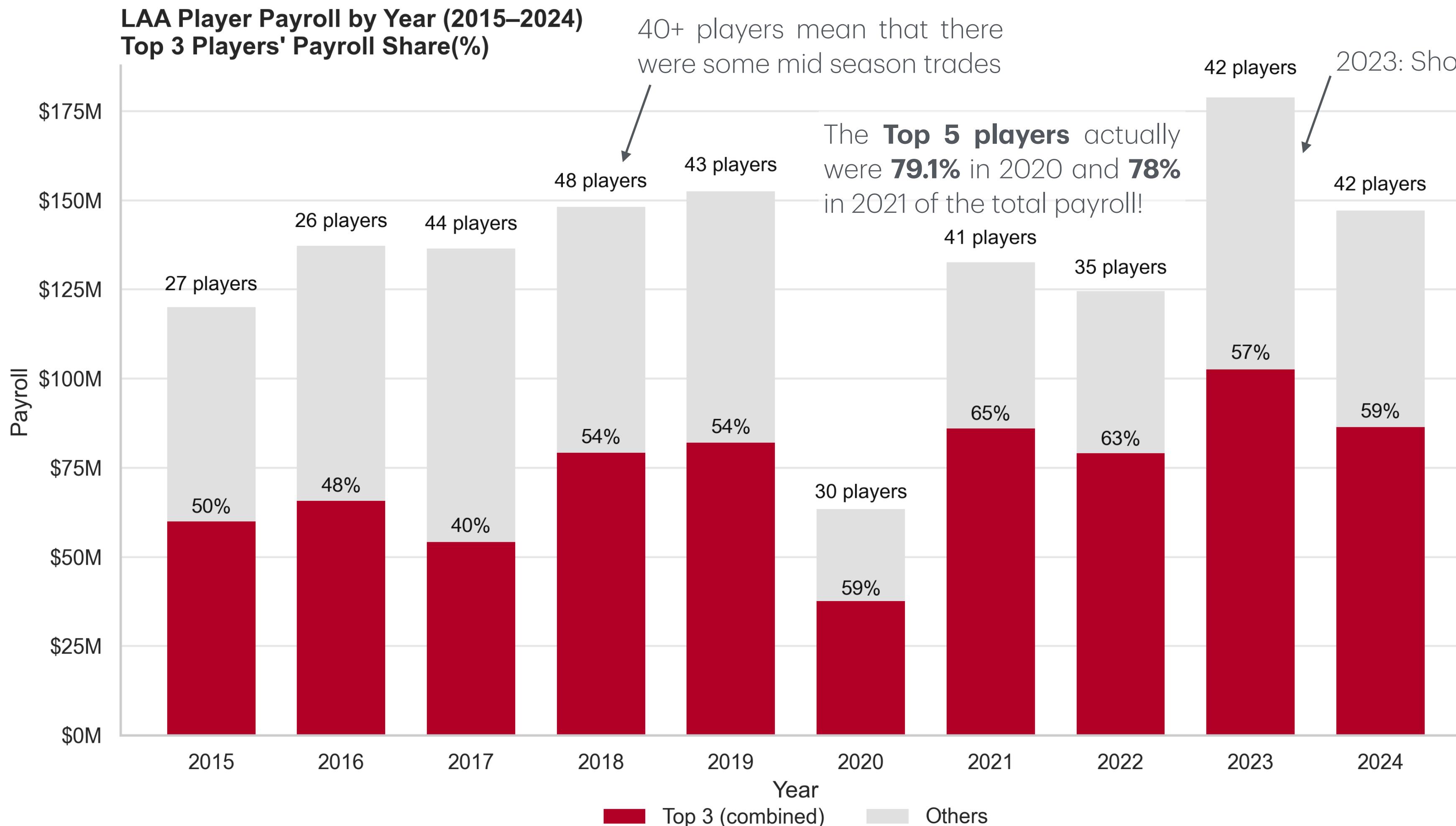


LAA has been slowly **trending downwards** in team performance, year after year.



# LAA's year to year Total Payroll changes

An increase in Salary Inequality, but total payroll changes remain somewhat static

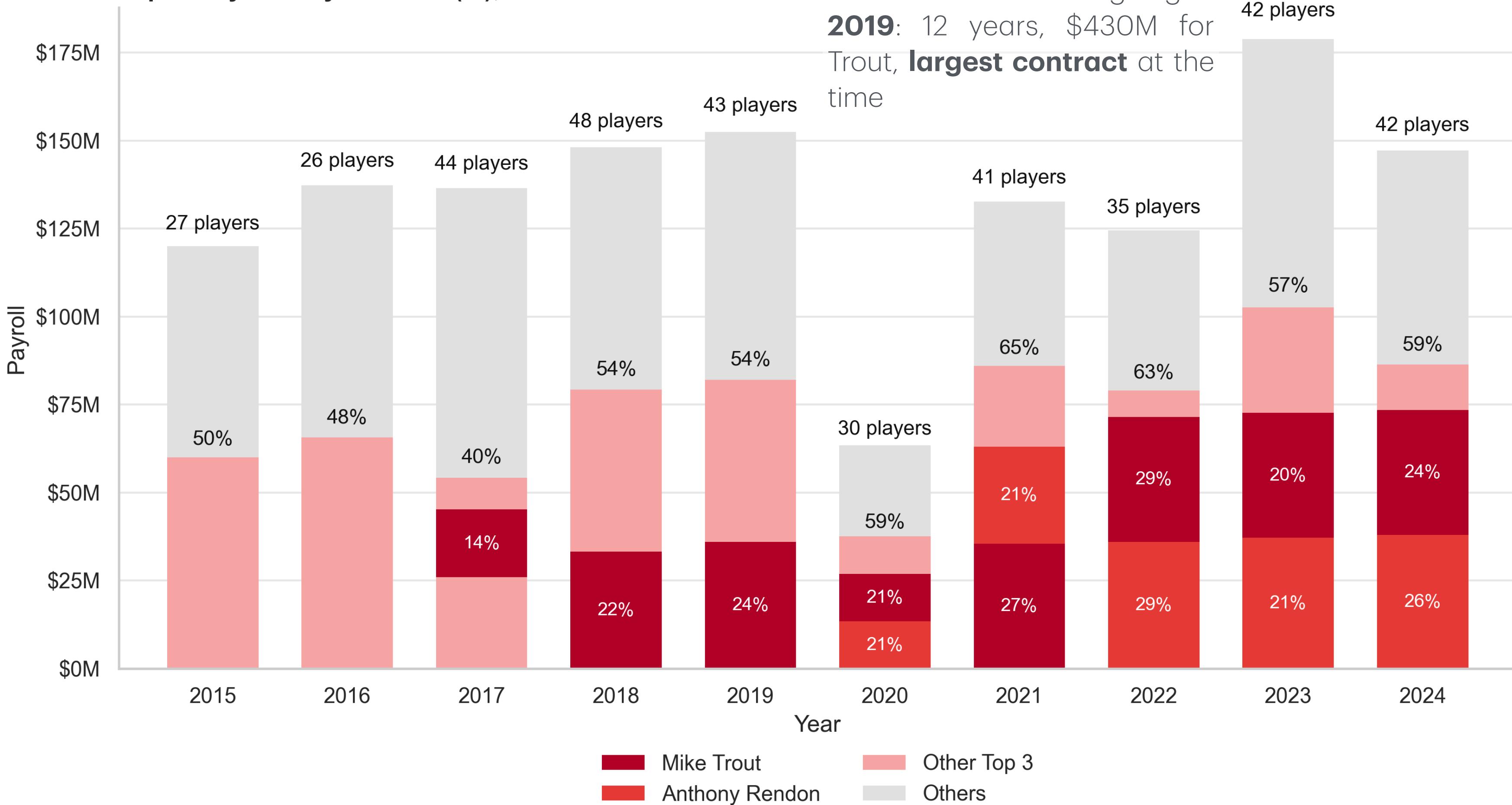


The LAA's Total Payroll changes are **minimal** considering the increase in Top Player Heavy payroll. **In 2018**, the total payroll increased \$11M, despite a ~14% increase in the top 3 players' salary. This usually means that the team explored **several cost-cutting measures** (e.g. Drafting or Trades) to accommodate the expensive contract,

# Trout and Rendon's impact to Payroll

Since 2020, almost half of the team payroll went to Trout and Rendon

**LAA Player Payroll by Year (2015–2024)**  
**Top 3 Players' Payroll Share(%); With Trout & Rendon**



A historic extension signing in **2019**: 12 years, \$430M for Trout, **largest contract** at the time



**Mike Trout**  
-3x AL MVP  
-LAA since 2011  
-One of the **Best Talents** in MLB  
-Injury Prone past 5yrs

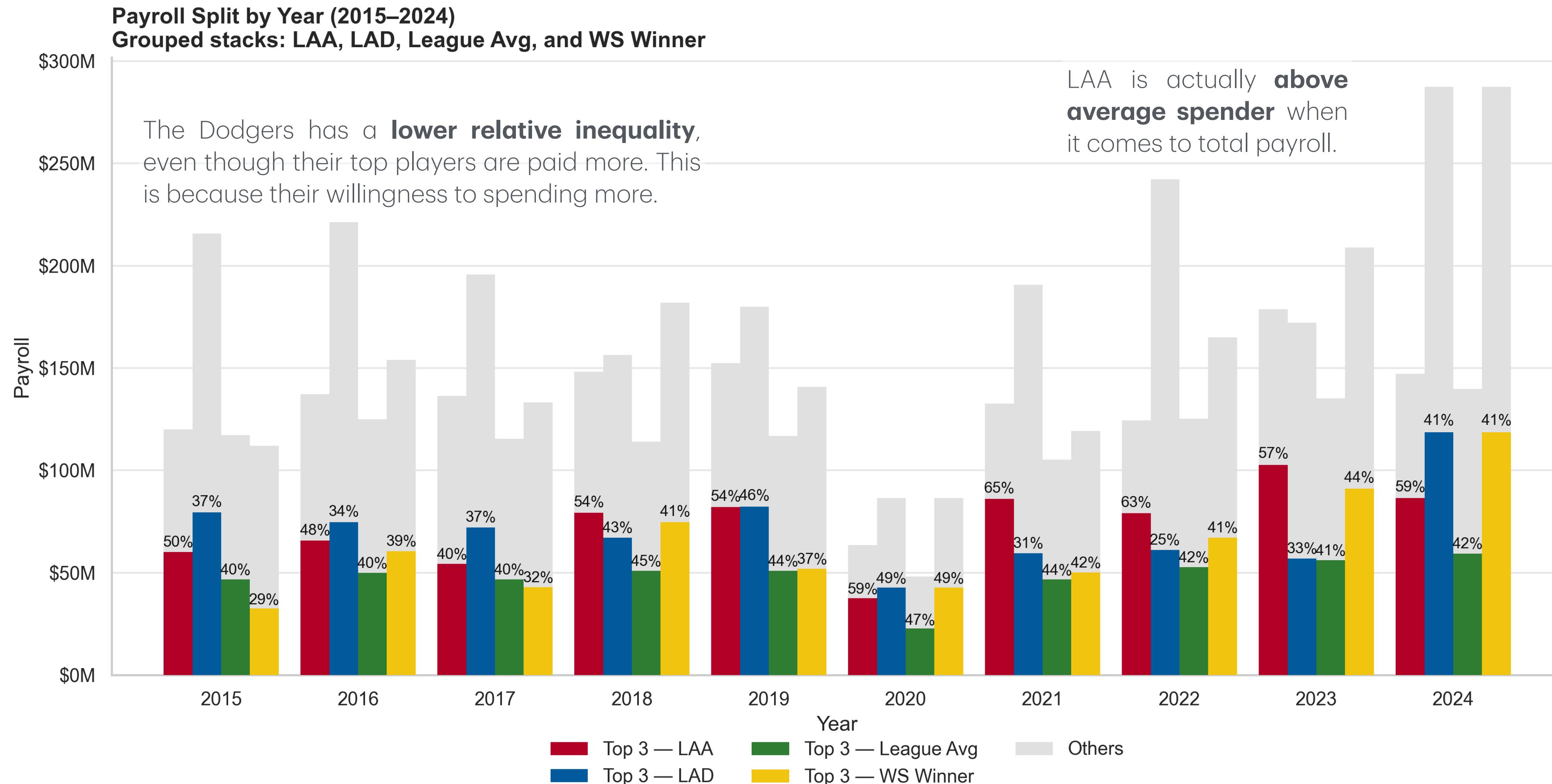


**Anthony Rendon**  
-2019 Champ (WSH)  
-LAA since 2020  
-Amazing WAR,  
second after Trout  
-Injury Prone past 5yrs

Trout and Rendon combined payroll has been **41% - 50%** of the LAA total payroll **since 2020**. Previously with Albert Pujols, LAA preferred investing in just a few star players for long

# LAA Total Payroll compared to others

LAA is an imbalanced team; spends on par to league average



# Salary Inequality impact on the LAA

Is a high GINI the reason for LAA's struggles?

Yes, but not because of the mega-deal contracts they gave out. It is likely due to the spending and management strategy beyond the stars.

Both Trout and Rendon are amazing players with incredible WAR (Win Against Replacement). However, **if the player with such WAR gets injured, how do you find an equivalent replacement?**

# Recommendations for LAA

\*Only using Payroll and Salary Inequality data

In my opinion, the LAA had 3 broad options:

- (1) **Spend more money** to make sure that there are viable replacements — the *Rich Team* method.
- (2) **Even out the spending** so the team was not too reliant on their stars, perhaps in young, cheaper prospects. *If need, invest less in star players (Not recommended—Stars bring value in various ways).*
- (3) **Booster up the staff** and **focus on prevention** to make sure their stars remain healthy.

# Conclusions for this study

Is Total Team Payroll or Salary Inequality related to Team Performance?

Yes, it does play a **small role** in a team performance. However, this relationship is **not a direct causal link**, and there are a lot of other factors play into a team's performance. A strategic spending is key to any organization's success and the MLB is no exception: Balance salaries between the stars, role players and back ups; Booster up player development, injury preventions and management; Understand