**Assessing the Accuracy of Hart Trophy Voting**

**Introduction**

The Hart Memorial Trophy is perhaps the NHL’s most prestigious annual award. It was the first individual post-season award devised by the league, and save for the 2005 lockout, has been continuously up for grabs since 1924. The NHL describes the winner as “the player judged to be the most valuable to his team”: in other words, the MVP. Select members of the Professional Hockey Writers’ Association (PHWA) submit ballots each year to collectively determine a winner. The present-day format permits these journalists to each present a top-five list, from which a points system is applied to generate vote totals. From 1982 to 1996, journalists presented a top-three list, and from the award’s inception until 1981, voters submitted only their top option. In general, the player who records the highest vote total, wins the Hart.

This means that the Hart is not an objective award, like the Art Ross, which is given to the player who records the most points each year. Its voting process is therefore susceptible to bias. Since 1967-1968, when the NHL expanded to 12 teams, the Hart has only been awarded to a defenseman or a goaltender four times each. Incredibly, Chris Pronger has been only defenseman to win the award since Bobby Orr recorded a three-peat from 1970-1972. Centers are responsible for 33 of Hart Trophy wins since 1968, or more than 62%.

Additionally, the Hart has not been awarded to a player whose team missed the playoffs since the expansion to 12 teams. One must go all the way back to 1959 to find a player who won the Hart on a non-playoff team, when the New York Rangers’ Andy Bathgate picked up the award. It is certainly possible that players who are considered most valuable will often take their teams to the playoffs, but this is not necessary. Accordingly, it is reasonable to think that an MVP has appeared on a non-playoff team since then.

One of two explanations could suffice for these phenomena: (1) centers may have consistently been more valuable to their respective teams than players at other positions and players who are considered most valuable tend to take their teams to the playoffs, or (2) the PHWA is biased, implicitly or otherwise, against defensemen and goaltenders, and players who are rostered on weak teams, in their voting.

While the Athletic covered this issue in a 2020 article, there is a lack of research within this aspect of the Hart Trophy. Even with the consensus that (2) is true, this has not directly been quantified. Thus, while considering a more objective measure of a player’s value to their team, Point Share Percentage, a player’s position, and their team’s regular season success, this report will address how well the PHWA has applied the definition of MVP to their Hart Trophy voting.

**Data Collection**

All data used in the analysis were scraped from Hockey-reference.com. The data collection process followed these steps:

* For each season in 1968 to 2021, excluding 2005:
  + For each player who played during that season:
    - Record their team, position, number of games played, total point shares, and unique ID
    - Attach new variable to each player that represents the total number of points shares accumulated by their team, or, if they were traded mid-season, proportional values from each team they played for
    - Attach another variable that is the regular season points percentage recorded by their team, with similar adjustments made for players who were traded
    - Compute the Point Share Percentage, or the player’s individual point shares divided by their team’s, with similar adjustments for players who were traded
  + Scrape the Hart voting results, and keep only players who received at least one vote by matching player IDs
  + Append resulting data to overall data frame

Brett Hull’s 1995 observation was removed from the dataset because he did receive any Hart votes but appeared in the final register for some reason. Sebastian Aho’s position was adjustment from “F” to “C”, as his primary position is center, and he would have been the only player listed at the forward position.

All variables were removed from the final data frame except for Team Points %, Point Share %, Position, actual Vote Percentage, and Voting System to prepare for regression.

**Descriptive Statistics**

A useful metric that emerges from the voting process is percentage of total votes attained. For example, if a player is listed as MVP by every writer surveyed, like Connor McDavid was in 2021, their Vote% is 100%. Since this value is standardized by the total number of votes cast, it is a more useful metric to compare players across seasons and eras. The following shows that the vast majority of players who receive Hart votes in a season are only named on a handful of ballots. What is also worth mentioning is that no player is guaranteed to receive 100% of the vote in any given year: Alex Ovechkin took home the Hart in 2013 while receiving only 60.89% of the maximum votes, the lowest percentage recorded by a winner since 1982, the first year tiered votes were introduced. If voting is considered across the three systems, a similar trend holds with regards to the overall histogram. Indeed, it has only been exaggerated with the most recent iteration of the voting system, since more players are named and are therefore more likely to receive a smaller vote share. The spread has also increased over time, as the tiered presentation of votes makes it possible for several players in a year to receive vote percentages in excess of 50%.

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Select summary statistics are listed below for the continuous predictors and the response, in general. It is worth noting that 75% of players nominated played for teams with at least a 56% points percentage, and also how little separation there is within Point Share Percentage compared to actual vote percentage.

Table

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Here are the characteristics of Voting % within the three different systems:

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confidence](data:image/png;base64,iVBORw0KGgoAAAANSUhEUgAAAcoAAACpCAYAAACri32cAAAACXBIWXMAABJ0AAASdAHeZh94AAAgAElEQVR4AQDigB1/Af////8AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA8vLyAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA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AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA8PDwAGhoaAAtLS0ALS0tAC0tLQAtLS0AgoKCAPj4+AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADPz88AgoKCAPj4+AAAAAAAAAAAAAAAAAC0tLQALS0tAC0tLQCCgoIA+Pj4AAAAAAAAAAAAAAAAAAAAAADf398AZ2dnAN/f3wAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADf398AVFRUAC0tLQCCgoIA+Pj4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAN/f3wBUVFQALS0tAIKCggD4+PgAAAAAAAAAAAAAAAAAmJiYAC0tLQAtLS0AmJiYAAAAAAAAAAAA+Pj4AIKCggAtLS0ALS0tAC0tLQCYmJgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAPDw8ABoaGgALS0tAGhoaADw8PAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAD4+PgAgoKCAM/PzwAAAAAAAAAAAPDw8ABoaGgALS0tAC0tLQCCgoIA+Pj4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAN/f3wBUVFQALS0tAIKCggD4+PgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA39/fAFRUVAAtLS0AgoKCAPj4+AAAAAAAAAAAAAAAAACYmJgALS0tAC0tLQDPz88AAAAAAAAAAADw8PAAaGhoAC0tLQAtLS0AgoKCAPj4+AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA39/fAFRUVAAtLS0AgoKCAPj4+AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADf398AVFRUAC0tLQCCgoIA+Pj4AAAAAAAAAAAAAAAAAAAAAAD4+PgAgoKCAM/PzwAAAAAAAAAAAAAAAAAAAAAAmJiYALS0tAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADf398AVFRUAC0tLQCCgoIA+Pj4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAN/f3wBUVFQALS0tAIKCggD4+PgAAAAAAAAAAADf398AVFRUAC0tLQAtLS0AmJiYAAAAAAAAAAAAAAAAAM/PzwAtLS0ALS0tAGhoaADw8PAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA39/fAFRUVAAtLS0AgoKCAPj4+AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAM/PzwCCgoIA+Pj4AAAAAAAAAAAAAAAAAPj4+ACCgoIAz8/PAAAAAAAAAAAAAAAAALS0tAAtLS0ALS0tAIKCggD4+PgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADf398AVFRUAC0tLQCCgoIA+Pj4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAALS0tAAtLS0ALS0tAC0tLQBoaGgA8PDwAAAAAADf398AVFRUAC0tLQAtLS0AmJiYAAAAAAAAAAAA8PDwAGhoaAAtLS0ALS0tAIKCggD4+PgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA3NzcA7OzsAO/v7wAAAAAAAAAAAAAAAADf398A7OzsACsrKwAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAtLS0AIKCggD4+PgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAACioqIA09PTANPT0wDLy8sAAAAAAKCgoAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAN/f3wBnZ2cA39/fAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAM/PzwBeXl4AAAAAAAAAAAAAAAAAAAAAAM/PzwCgoKAAsrKyANPT0wAWFhYAoKCgAAAAAAAAAAAAAAAAAPj4+ACjo6MA7e3tAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAPj4+ACjo6MAYGBgAMvLywAAAAAAvLy8AAAAAAAAAAAAAAAAAAAAAAAAAAAA+Pj4AKOjowBgYGAAy8vLAAAAAAC8vLwAAAAAAAAAAAC0tLQA6urqAMvLywDDw8MA0NDQALS0tAAAAAAA+Pj4APT09ACysrIA09PTANPT0wBoaGgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAKioqAAwMDAA09PTADAwMACoqKgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAPj4+ACKiooAq6urAAAAAAAAAAAA+Pj4AJKSkgBMTEwA09PTAMvLywAAAAAAoKCgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA+Pj4AKOjowBgYGAAy8vLAAAAAAC8vLwAAAAAAAAAAAAAAAAAAAAAAAAAAAD4+PgAo6OjAGBgYADLy8sAAAAAALy8vAAAAAAAAAAAAM/PzwDQ0NAAw8PDAKKiogCZmZkA8PDwAPj4+ACSkpIATExMANPT0wDLy8sAAAAAAKCgoAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAD4+PgAo6OjAGBgYADLy8sAAAAAALy8vAAAAAAAAAAAAAAAAAAAAAAAAAAAAPj4+ACjo6MAYGBgAMvLywAAAAAAvLy8AAAAAAAAAAAAAAAAAPj4+ACKiooAq6urAAAAAAAAAAAAAAAAAAAAAACYmJgAlZWVAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAPj4+ACjo6MAYGBgAMvLywAAAAAAvLy8AAAAAAAAAAAAAAAAAAAAAAAAAAAA+Pj4AKOjowBgYGAAy8vLAAAAAAC8vLwAAAAAAPDw8ACJiYkAe3t7ANPT0wDDw8MA0NDQALS0tAAAAAAA39/fAIWFhQCioqIA09PTAExMTACSkpIA+Pj4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAD4+PgAo6OjAGBgYADLy8sAAAAAALy8vAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAz8/PAF5eXgAAAAAAAAAAAAAAAAAAAAAA+Pj4AIqKigCrq6sAAAAAAAAAAAAAAAAAz8/PALS0tADDw8MAy8vLAAAAAACgoKAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAPj4+ACjo6MAYGBgAMvLywAAAAAAvLy8AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAOTk5ACHh4cA09PTANPT0wCYmJgAEBAQAPDw8ACJiYkAe3t7ANPT0wDDw8MA0NDQALS0tAD4+PgAkpKSAExMTADT09MAy8vLAAAAAACgoKAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAhISEAFBQUANXV1QAAAAAAAAAAAAAAAADJyckAREREACEhIQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA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uLACEhIQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAMTExAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA4ODgDv7+8AVFRUAC0tLQCCgoIA+Pj4AAAAAAAAAAAAxMTEADIyMgAQEBAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAaGhoACAgIAAAAAAAQEBAADg4OAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABoaGgAICAgAAAAAABAQEAAODg4AAAAAAAAAAABMTEwATU1NADU1NQBkZGQAd3d3ADExMQAAAAAA5eXlAKurqwA1NTUALS0tAGhoaADw8PAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA8PDwAREREAAAAAABEREQAPDw8AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGBgYABgYGAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAPDw8AC0tLQAMjIyAAgICAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABoaGgAICAgAAAAAABAQEAAODg4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGhoaAAgICAAAAAAAEBAQAA4ODgAAAAAAAAAAAAAAAAAbGxsAAAAAAAgICAAWFhYAAAAAAAAAAAAAAAAAAAAAAAAAAADw8PAAtLS0ADIyMgAICAgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGhoaAAgICAAAAAAAEBAQAA4ODgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAaGhoACAgIAAAAAAAQEBAADg4OAAAAAAAAAAAAGBgYABgYGAAAAAAAAAAAAAAAAAAAAAAAEBAQACAgIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAaGhoACAgIAAAAAAAQEBAADg4OAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABoaGgAICAgAAAAAABAQEAAODg4AAAAAAAAAAAAAAAAAAAAAAAAAAADf398AvLy8ADc3NwAAAAAAAAAAAAoKCgBoaGgALS0tAGhoaADw8PAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGhoaAAgICAAAAAAAEBAQAA4ODgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAxMTEAAAAAAAAAAAAAAAAAAAAAAAAAAAAYGBgAGBgYAAAAAAAAAAAAAAAAAAAAAAAAAAAAMTExAHd3dwBkZGQANTU1AE1NTQBMTEwAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAaGhoACAgIAAAAAAAQEBAADg4OAAAAAAAAAAAAAAAAAAAAAAAAAAAA7+/vAN7e3gBOTk4ALS0tAC0tLQDPz88AAAAAAAAAAAAAAAAAAAAAAAAAAADf398AvLy8ADc3NwAAAAAAAAAAAAAAAAAAAAAA8PDwALS0tAAyMjIACAgIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAISEhABQUFADw8PAAAAAAAMnJyQAwMDAAEBAQAPj4+ADOzs4AMjIyAAgICAAQEBAATExMAM7OzgD4+PgAAAAAAAAAAAAAAAAA+Pj4AM7OzgBNTU0ACAgIAAgICABNTU0Azs7OAPj4+AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABeXl4ALS0tAC0tLQA1NTUAAAAAAGBgYAAAAAAA5+fnAOXl5QArKysAAAAAACEhIQCZmZkAISEhAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAPLy8gDExMQApKSkAMvLywAAAAAAoKCgAAAAAADf398A2traAERERAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAACYmJgAs7OzAMvLywCkpKQAo6OjALS0tAAAAAAA5OTkAFVVVQDLy8sA09PTADAwMACSkpIA+Pj4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA+Pj4AJKSkgAaGhoAREREAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAPj4+ACSkpIAGhoaAERERAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAPDw8ACJiYkAREREADExMQAAAAAAAAAAAKqqqgCIiIgA09PTADAwMACSkpIA+Pj4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAtLS0AImJiQCcnJwA09PTAMnJyQCYmJgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA8PDwAAAAAACysrIA09PTAKKiogCFhYUA39/fAAAAAAAAAAAAAAAAAPDw8ACJiYkAREREADExMQAAAAAAAAAAAAAAAAD4+PgAkpKSABoaGgBEREQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAEBAQADAwMADJyckA8PDwANDQ0AA3NzcAAAAAAPj4+ADm5uYAGxsbAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA+Pj4AObm5gBeXl4ALS0tAC0tLQBeXl4A5ubmAPj4+AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAACioqIA09PTANPT0wDT09MAfn5+AAgICAAAAAAA8PDwAAEBAQAREREAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA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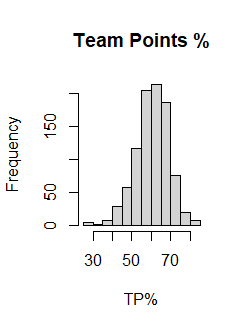
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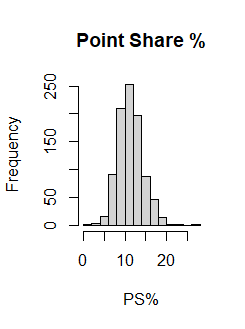
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ArKysACAgIAE1NTQDOzs4A+Pj4AAAAAAAAAAAAAAAAAAAAAADn5+cA5eXlACsrKwAICAgATU1NAM7OzgD4+PgAAAAAAOTk5AAWFhYACAgIABAQEAAwMDAA5OTkAAAAAAAAAAAAAAAAAAAAAADPz88A0NDQAFhYWAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAPDw8ABoaGgA3t7eAElJSQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABAQEAAwMDAAzs7OAPj4+AAAAAAA8PDwANDQ0AA3NzcAAAAAAAAAAACYmJgALS0tAC0tLQCYmJgAAAAAAM/PzwB5eXkAq6urAIqKigD4+PgAAAAAAJiYmAAtLS0ALS0tAJiYmAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA8PDwAGhoaAAtLS0ALS0tAM/PzwDw8PAAiYmJAMbGxgB1dXUA39/fAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAPj4+AD09PQAEBAQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADw8PAAtLS0AE1NTQAICAgAAAAAAPDw8AAMDAwACAgIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA8PDwAAEBAQAREREAAAAAAAAAAADm5uYA+Pj4AAAAAAAAAAAAAAAAAAAAAAAAAAAANzc3AKysrAAmJiYAAAAAAAAAAAAAAAAACQkJAJSUlABubm4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAPDw8ADQ0NAANzc3AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADw8PAAAQEBABEREQAAAAAAAAAAAObm5gD4+PgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAACQkJAJSUlABubm4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA6OjoAPj4+AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADw8PAAAQEBABEREQAAAAAAAAAAAObm5gD4+PgAAAAAAAAAAAAAAAAAAAAAAPDw8AABAQEAERERAAAAAAAAAAAA5ubmAPj4+AD4+PgA6urqABwcHAAAAAAAAAAAAAAAAADl5eUAAAAAAAAAAAB4eHgAgoKCAAwMDAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADw8PAAAQEBABEREQAAAAAAAAAAAObm5gD4+PgAAAAAAAAAAAAAAAAAAAAAAPDw8AABAQEAERERAAAAAAAAAAAA5ubmAPj4+AD4+PgA6urqABwcHAAAAAAAAAAAAAAAAADl5eUAAAAAAAAAAAAAAAAAAAAAAPDw8ADQ0NAANzc3AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADw8PAAAQEBABEREQAAAAAAAAAAAObm5gD4+PgAAAAAAAAAAAAAAAAAAAAAAPDw8AABAQEAERERAAAAAAAAAAAA5ubmAPj4+AAAAAAACQkJAJSUlABubm4AAAAAAAAAAAAAAAAAAAAAAAAAAADw8PAAs7OzAGhoaAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAPDw8AABAQEAERERAAAAAAAAAAAA5ubmAPj4+AAAAAAAAAAAAAAAAAAAAAAA8PDwAAEBAQAREREAAAAAAAAAAADm5uYA+Pj4AAAAAAAcHBwA6urqAPj4+ADw8PAA0NDQADc3NwAAAAAAAAAAAAAAAAD4+PgAs7OzAExMTAAQEBAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAeHh4AIKCggAMDAwAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAANzc3ANLS0gDn5+cAAAAAAN/f3wAAAAAAISEhAAAAAAC0tLQA6urqAMvLywDDw8MA0NDQALS0tAAxMTEAh4eHAFVVVQB2dnYACAgIALS0tADq6uoAy8vLAMvLywDq6uoAtLS0AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAD4+PgAs7OzADAwMAAQEBAA+Pj4AJKSkgBMTEwA09PTALKysgCYmJgA7+/vAHd3dwA6OjoAi4uLACEhIQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADv7+8A3t7eAE5OTgAtLS0ALS0tAM/PzwAAAAAAAAAAAAAAAAAAAAAAxMTEABoaGgApKSkAAAAAAAAAAADl5eUAq6urADU1NQAtLS0AaGhoAPDw8AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAaGhoACAgIAAAAAAAQEBAADg4OAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADExMQAAAAAAAAAAAAAAAAAAAAAAAAAAABgYGAAYGBgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAJiYmAA9PT0AGhoaACkpKQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABoaGgAICAgAAAAAABAQEAAODg4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAubm5ABsbGwAZGRkAAAAAABgYGAAYGBgAAAAAAAAAAAAAAAAAAAAAAAgICAAWFhYAtLS0APDw8AAAAAAAubm5AN7e3gDv7+8AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABoaGgAICAgAAAAAABAQEAAODg4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGhoaAAgICAAAAAAAEBAQAA4ODgAAAAAAAAAAAAAAAAAbGxsAAAAAAAgICAAWFhYAAAAAAAAAAAAQEBAAICAgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABoaGgAICAgAAAAAABAQEAAODg4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGhoaAAgICAAAAAAAEBAQAA4ODgAAAAAAAAAAAAAAAAAbGxsAAAAAAAgICAAWFhYAAAAAAAAAAAAAAAAAAAAAAJiYmAA9PT0AGhoaACkpKQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABoaGgAICAgAAAAAABAQEAAODg4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGhoaAAgICAAAAAAAEBAQAA4ODgAAAAAAAAAAABgYGAAYGBgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAxMTEADIyMgAQEBAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGhoaAAgICAAAAAAAEBAQAA4ODgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAaGhoACAgIAAAAAAAQEBAADg4OAAAAAAAAAAAATExMAE1NTQA1NTUAZGRkAHd3dwAxMTEAAAAAAAAAAAAAAAAA19fXAObm5gA8PDwAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAEBAQACAgIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAACAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAACEhIQAUFBQA8PDwAAAAAADJyckAMDAwABAQEAD4+PgAzs7OADIyMgAICAgAEBAQAExMTADOzs4A+Pj4AAAAAAAAAAAAAAAAAPj4+ADOzs4ATU1NAAgICAAICAgATU1NAM7OzgD4+PgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAXl5eAC0tLQAtLS0ANTU1AAAAAABgYGAAAAAAAOfn5wDl5eUAKysrAAAAAAAhISEAmZmZACEhIQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA8PDwAAAAAACysrIA09PTAKKiogCFhYUA39/fAAAAAAAAAAAA+Pj4AM7OzgAyMjIACAgIAAAAAAAAAAAA5OTkAFVVVQDLy8sA09PTADAwMACSkpIA+Pj4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABoaGgA09PTABYWFgCKiooA+Pj4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAtLS0ALy8vABdXV0ACAgIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAYGBgABoaGgA9PT0ALS0tABMTEwATExMAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABoaGgA09PTABYWFgCKiooA+Pj4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA39/fANra2gBEREQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAJiYmACzs7MAy8vLAKSkpACjo6MAtLS0AAAAAAAAAAAAAAAAAMnJyQAwMDAAEBAQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAQEBAAMDAwAMnJyQDw8PAA0NDQADc3NwAADy3LRwAAIABJREFUAAAA+Pj4AObm5gAbGxsAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAD4+PgA5ubmAF5eXgAtLS0ALS0tAF5eXgDm5uYA+Pj4AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAKKiogDT09MA09PTANPT0wB+fn4ACAgIAAAAAADw8PAAAQEBABEREQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADExMQCsrKwAISEhAAAAAAApKSkALi4uANXV1QAAAAAAAAAAAPj4+AD09PQAKysrAAAAAAAAAAAAAAAAAGhoaAB+fn4ACAgIAAAAAABHR0cA5eXlAOfn5wAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAObm5gD4+PgAAAAAAPDw8ADy8vIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABHR0cA5eXlAOfn5wAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA5ubmAPj4+AAAAAAA8PDwAPLy8gAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAtLS0AKCgoACLi4sAISEhAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAgICAB+fn4A09PTANPT0wAkJCQAAQEBABEREQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA5ubmAPj4+AAAAAAA8PDwAPLy8gAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADm5uYA+Pj4AAAAAADw8PAA8vLyAAAAAAAAAAAAAAAAAOXl5QAAAAAA+Pj4AOrq6gAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA5ubmAPj4+AAAAAAA8PDwAPLy8gAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADm5uYA+Pj4AAAAAADw8PAA8vLyAAAAAAAAAAAAAAAAAOXl5QAAAAAA+Pj4AOrq6gAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABHR0cA5eXlAOfn5wAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA5ubmAPj4+AAAAAAA8PDwAPLy8gAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADm5uYA+Pj4AAAAAADw8PAA8vLyAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAALm5uQBBQUEACAgIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADm5uYA+Pj4AAAAAADw8PAA8vLyAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAObm5gD4+PgAAAAAAPDw8ADy8vIAAAAAAPDw8ADQ0NAATU1NAAgICAAICAgATU1NALS0tA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In line with the prior discussion, the maximum and mean values are what define the different systems. The highest voting percentage accrued with the first set up was only 52.2%, whereas a number of players have recorded a “perfect” vote percentage with the other two. Additionally, there is an increase in the mean vote percentage from the first model to the second because more votes were available to assign to a given player, but a decrease from the second model to the third, because a saturation of sorts occurred. A number of players receive one fifth place vote each year, yielding a very low vote percentage and bringing down this average.

The next two statistics, Team Points Percentage and Point Share Percentage, are independent of the era or Hart voting system. The distribution of Team Points Percentage, or the proportion of points a team records in the standings over the course of a season compared to a perfect 164, is consistently greater than 50%. This illustrates that players who are nominated for the Hart trophy tend to play on teams with at least a mild level of regular season success.



A separate calculation, Point Share Percentage, is taken to be the proportion of point shares recorded by a player over the course of a regular season with respect to the total recorded by his team. Point shares are meant to estimate the number of points a player contributes to their team in the standings, and summed across all players on a team, one can gather an expectation for a team’s overall performance. Point Share Percentage attempts to directly address the idea that the Hart Trophy is meant to consider each individual player in the context of their team. Most players nominated for the Hart feature a PS% of around 10%, with rare exceptions creeping below 5% or above 20%.



Although the following graph does not give us an indication of expected vote percentage based on the player’s position, it does portray the landscape of all players who received at least one Hart vote. Centers are decisively nominated the most often, with the other four positions represented about equally.

Chart, bar chart

Description automatically generated

**Inferential Statistics**

To address the research query, we are interested in a regression model of the following form

where there are indicator variables representing the three voting systems and the five positions in the data set, as well as variables for Team Points Percentage and Point Share Percentage. Subsequently, we are curious if the coefficients related to the player’s position are significantly different, first from zero and then from each other. An arcsine-square root transformation followed by a log transformation were applied to Vote Percentage to ensure normality conditions of the regression were met, and the resulting coefficients followed in the multiple regression equation, with a baseline given as the first voting era and the position of center:

Table

Description automatically generated

Each continuous predictor and factor level with the exception of the intermediate voting system produced significant results in the model compared to the baseline. This indicates that the four positions listed in the above table may be receiving biased voting compared to centermen, and that players receive more votes if they are on a good team versus a poor one. Point Share Percentage is by far the most useful predictor in the model, which makes sense, as it should be an unbiased assessment of a player’s value, and all other predictors represent unfair variation from it.

The confidence intervals for each coefficient as follows:

Table

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The coefficients for defensemen and goalies do not significantly differ from each other but are smaller than the similar pairing of left wingers and right wingers. In other words, given a defenseman, goaltender, left winger, right winger, and center who are equally valuable to their respective teams, the defenseman and goaltender will consistently receive fewer votes than the wingers simply because of their position, who in turn will consistently receive fewer votes than the center. These results support the initial intuition of the report.

**Discussion**

The Hart Trophy is perhaps the premier individual award in the NHL; winning it sets a player on track for Hall of Fame induction and yields them significant praise. But the analysis shows in this report the PHWA has been significantly biased against wingers compared to centers, and even more so with defensemen and goaltenders. Additionally, the PHWA rewards players who play on great teams compared to those who do not, even if the players in question are equally deserving of winning the Hart.

One reason why this may be is due to the presence of the Norris and Vezina Trophies, awards annually given to the top defenseman and goaltender, and the absence of such an award for centers and wingers. Therefore, if a great goaltender emerges, the PHWA may be more comfortable awarding the Hart to an offensive player with the knowledge that the goaltender is still likely to walk away with hardware. Additionally, they may be swayed by the increased media spotlight on players rostered on winning teams, leading to a blind spot in their voting. Whatever the reasons, front offices need to be aware that the Hart is partially decided by the biased opinions of sportswriters. The usage of a much more objective statistic like Point Share Percentage will likely lead to more accurate assessments of players, especially in the context of their current teams.

Given that Point Share Percentage is an excellent metric, its application of point shares is flawed to some extent. Point shares are generally considered to be a good assessment of a player’s value to their team, especially the offensive and goaltending components of the statistic. Issues arise, however, with regards to how defensive point shares are calculated, particularly the inclusion of plus/minus and the failure to discern between power play, even strength, and shorthanded time on ice. These issues are certainly addressable, but the data used in this analysis did not account for them.