The Other Side of the Court

A novel approach to assessing NBA talent based on defensive impact

Problem

All basketball players perform both offensive and defensive roles, but traditional basketball stats such as points and assists only capture offensive performance. Quantifying the other half of the game is tough and current approaches are typically too generalized, and thus lacking the nuance to provide insight on who a given player should guard.

Motivation

Providing metrics that determine which players a given player can guard effectively will allow NBA coaches to optimize lineups which exploit good matchups and will allow NBA GMs to build balanced rosters and discover underrated talent (and overrated talent). These metrics can also be used by sports bettors to predict winners of games and how many points will be scored in games.

Approaches

Player Impact & EDA (Algorithms)

Our defensive stats look at how a defensive player impacts offensive players relative to how well those offensive players do on average. We did this across 3 metrics that give a holistic view of the offensive game: player efficiency, player points, and team points.

For player points, our impact metric for a selected defender $[Impact_{defender}]$ is the percent difference, on average, between how many points per minute an offensive player typically scores $[ppm_{average}]$ versus how many points the offensive player scores when guarded by the selected defender $[ppm_{defender}]$.

$$Impact_{defender} = \frac{\sum_{offensive\ players} \frac{100 \times [ppm_{defender} - ppm_{average}]}{ppm_{average}}}{n_{offensive\ players}}$$

The calculations for the other 2 metrics (efficiency, team points) were similar.

Impact Metrics:
(On opposing PGs)
1. True Shooting (TS%): -11%
2. Player scoring per minute: -53%
3. Team scoring per minute: -45%

In Layman's Terms:
1. Steph Curry holds opposing point guards to an 11% lower true shooting percentage than their average
2. He holds opposing PGs to a 53% lower scoring rate than their average
3. The offensive team scores 45% less points than their average during matchups where Steph Curry is guarding opposing PGs

Steph Curry's impact metrics

Image: https://s.hdnux.com/photos/01/20/73/47/21215743/3/1200x0.jpg

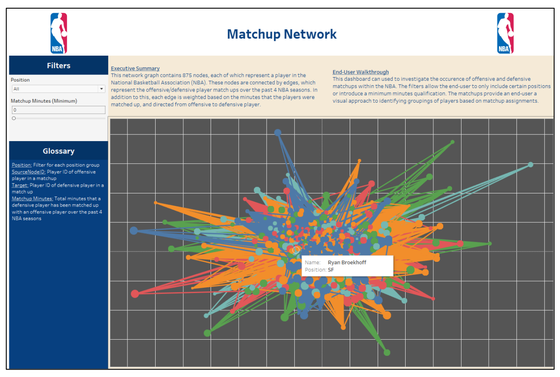
We also used PCA and linear regression to determine which factors in each matchup were most predictive of a positive or negative defensive impact. We found that the offensive and defensive player position matchup and the height difference between the two players most significantly affected our metrics. As such, we used this information to drill into our data via our interactive dashboards.

Interactive Visualizations

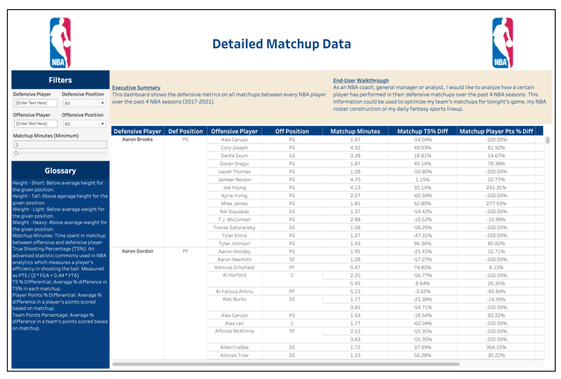
Using Tableau, we created a series of interactive dashboards to present the detailed data. These dashboards provide an effective, innovative and easy-to-use solution to non-technical staff such as coaches, general managers and bettors to analyze and interact with our metrics.

We integrated our network graph results into an interactive program to visualize our directed graph of player matchups. This allowed for exploratory research based on our network results using network analysis methodologies.

In addition, we provided a full detailed view of every single matchup from our dataset with easy-to-use filters for granular analysis.

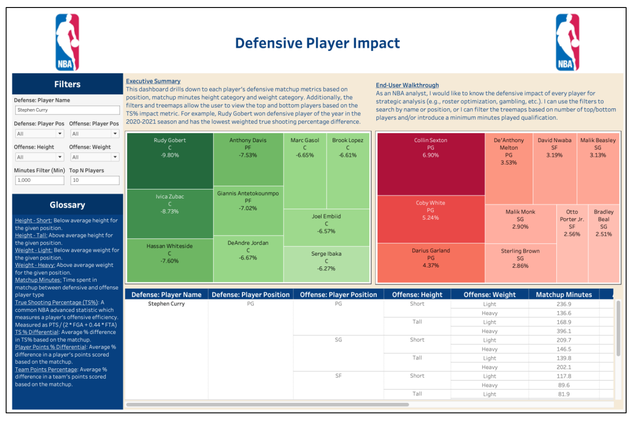


The matchup network

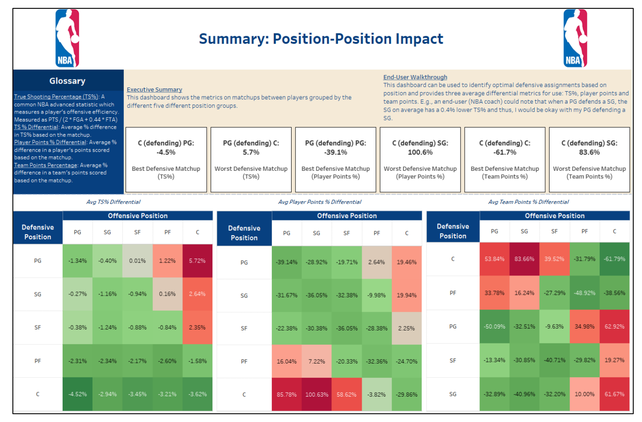


Detailed matchup data

Our other dashboards use tables to present player data, along with high-level graphs, highlight tables and treemaps to display key summary information. They incorporate filters and search functionalities for insight into specific teams, players, and matchups to provide end-users insight into detailed data from various perspectives. The dashboards aggregate at different levels, ranging from no aggregation to aggregation by player, position, height and weight.



Grouping by player - here we see how Steph Curry defends each position grouped by height & weight



Grouping by position - here we see best and worst matchups

Data

Sources

1. Used NBA_API to scrape NBA.com for matchup data, individual player stats and characteristics, and team statistics.
2. Scraped player positions from basketball-reference.com.

Offense	Matchup	Defense
Player: Steph Curry	Minutes: 18.6	Player: Chris Paul
Position: PG	…	Position: PG
…	Points Scored: 11	…
Height: 74"		Height: 72"

Visual representation of one row in our data table

Fast Facts

- One row per matchup (one offensive and one defensive player)
- 1.3 Million Rows, 36 columns
- Contains characteristics about each player (height, weight, position, total season points, points per game, efficiency (i.e., TS%)
- Also contains characteristics about matchups that season (minutes, points, shooting efficiency)
- All data compromises about 100MB

Evaluation

Due to the innovation of our metrics, we evaluated their effectiveness by comparing them against the defenders whom the NBA itself deems the best. This standard is the NBA All-Defensive First and Second teams, which are the top 10 ranked defensive players each season.

Results and Comparisons

Our metrics show that All-Defensive players perform, at a minimum, in the top 32% of the total NBA player population, as their metrics are at least one standard deviation to the left of the norm. In about half of the cases, player metrics are 1.5-2 standard deviations from the norm, placing them in the top 5-20% of the NBA, for defensive performance.

These all-defensive players typically hold their opponent to 30-60% fewer points scored individually, and 40-70% lower team scoring. So, their effectiveness is not only in shutting down their individual opponent, but also in contributing to the overall team defense.

In addition, we aggregated the top-3 players by position, per our TS% differential metric for a list of 15 top ranking defenders. We found that 7 of these players have received All-Defensive honors or Won the Defensive player of the Year award. Of the remaining 8, four players are commonly considered underrated defenders and our metrics suggest that the remaining four players are worth further investigation.

Thus, our metrics compare favorably with the NBA's assessment of its best defenders and provide innovative value to end-users.

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