

What is the Value of Each Pick in the NBA Draft?

I. Introduction

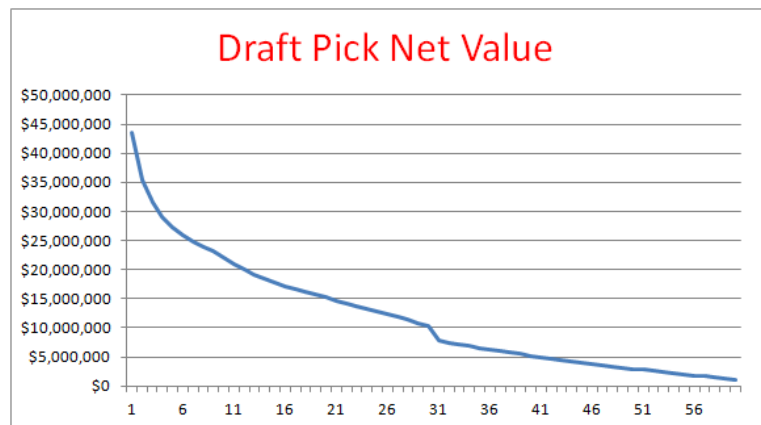
Each year, the top amateur basketball players across the globe enter the NBA Draft to reach their dream of playing in the NBA. Conversely, each NBA front office must find talent to improve their own team's outlook. In order to do so, this might mean moving up or down in the draft for the team to be in position to draft their targeted player.

For my project, I will attempt to quantify the value of each pick in the draft. In doing so, we can better understand where historically the best players are selected, where the value tends to fall off, and add greater context to draft pick trades.

II. Similar Research

a. Kevin Pelton (ESPN)

The closest work I could find to this was a study done by Kevin Pelton of ESPN Analytics. He sought to evaluate draft picks by the value those picks provide over their rookie contracts, using a metric he created known as WARP (Wins Above Replacement Player) to evaluate each pick. Looking at the NBA Drafts from 2000 to 2014, he took the mean WARP for the players selected in each slot to attribute a value to each pick. For each player, he took the sum of WARP provided



over the lifetime of their rookie contract (four years for first round draft picks and three years for second round draft picks).

After smoothing the averages to account for random variation, he multiplied each pick's mean WARP by the expected value of a win (in dollars), then subtracted the salary each pick would be expected to make (in dollars) from that. The slope of the curve was decreasing at a decreasing rate.

b. Aaron Barzilai, Ph.D.

In this paper, Barzilai took a slightly different approach. Barzilai elected to only look at the value of first round picks. As

opposed to focusing on one impact metric, he used four different metrics in conjunction with one another.

These metrics were Player Efficiency Rating (PER), Player Wins, Win Shares, and Estimated Salary. He also looked at all these variables over three

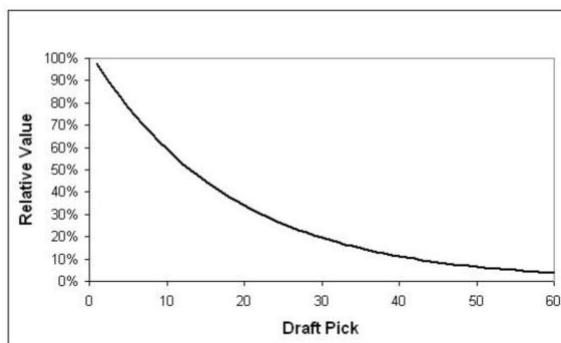


Figure 7: Estimated value of drafting with a given draft pick

Draft Pick	1	2	3	4	5	6	7	8	9	10
Relative Value	100%	92%	87%	83%	78%	74%	70%	66%	63%	59%

Draft Pick	11	12	13	14	15	16	17	18	19	20
Relative Value	56%	53%	50%	47%	45%	42%	40%	38%	36%	34%

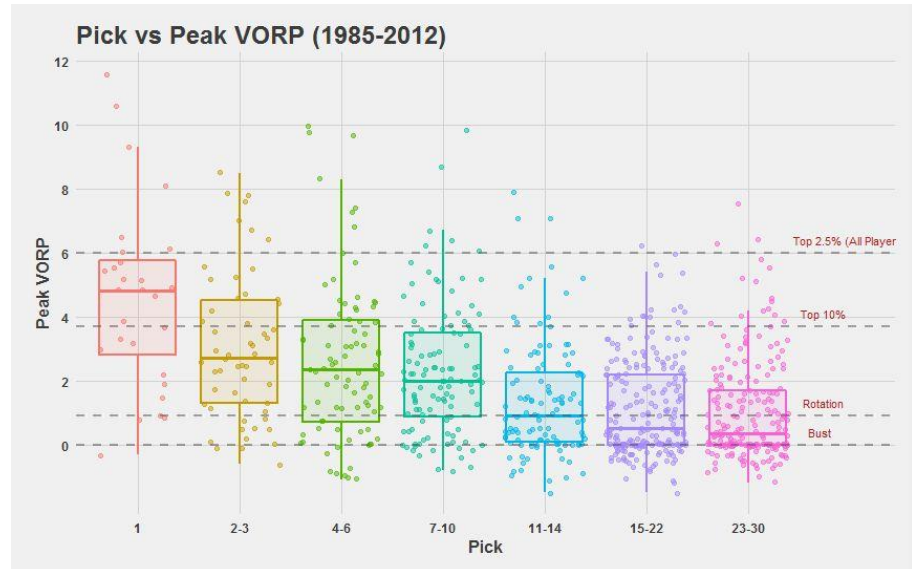
Draft Pick	21	22	23	24	25	26	27	28	29	30
Relative Value	32%	30%	29%	27%	26%	24%	23%	22%	21%	20%

Table 2: Estimate of relative value of the first 30 draft picks in the NBA draft

separate time frames, looking at how each player performed over their whole career, during their first four years, and during their years with the team that drafted him. As you can see in the above graph, the value as the first round goes on decreases at a decreasing rate. However, it is interesting to see that the drop off in the early stages of the draft isn't as steep as in Pelton's chart.

c. Saurabh Rane

Next, let us look at how Saurabh Rane went about solving this problem. Rane elected to use the same statistic that I used (VORP), however his approach was slightly different. As opposed to looking at how a player performed during their rookie contract, he only looked



at a player's best season, as judged by VORP. Furthermore, he didn't look at individual picks. Instead, he looked at seven ranges of picks: 1st, 2-3, 4-6, 7-10, 11-14, 15-22, and 23-30. Coupled with that, he classified players into four different groups: All-NBA First Team, All-Star, Rotation Player, or Bust.

In the above graph, it's easy to see how valuable the first pick is relative to the rest of the draft. One thing that jumps out to me is how close together the bar plots for picks 4-6 are to 7-10, and likewise for picks 11-14 and 15-22. The value there is certainly much closer than that of Pelton and Barzilai's work. I would imagine that has to do with using the Peak VORP rather than looking at the duration of the rookie contract. We can imply this means that while the pick seasons across picks might be closer together, those that are picked higher tend to be more consistent and/or impactful across a larger timeframe.

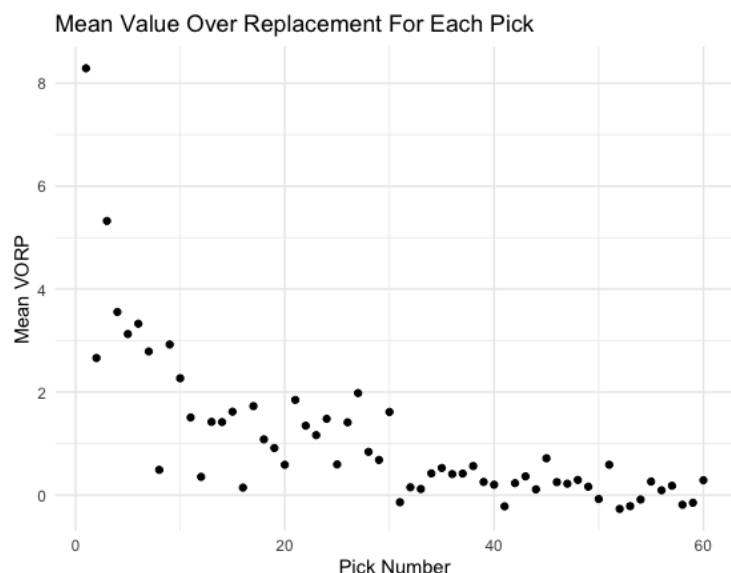
III. Data

- i. Value Over Replacement (VORP)
 - a. A box score estimate of the points per 100 TEAM possessions that a player contributed above a replacement-level (-2.0) player, translated to an average team and prorated to an 82-game season.
- ii. Draft Pick Number
 - a. This indicates which pick the player was selected at in his respective draft.
There are 60 picks in each draft.

IV. Approach

I had one dataset with all VORP data since 2005, and one dataset with all of the NBA Draft's selection history since 2005. I performed an inner join on the two datasets, which gave me 831 total observations, which is a strong sample size and gave me enough data to analyze each pick.

The reason why I elected to use only VORP as my metric was quite simple. The other variables used in previous research (Player Efficiency Rating, Player Wins, Win Shares, and Estimated Salary, etc.) all have flaws of their own. For instance, Player Efficiency Rating notoriously undervalues defense. By attributing Player Wins to that player, it comes with the assumption that the

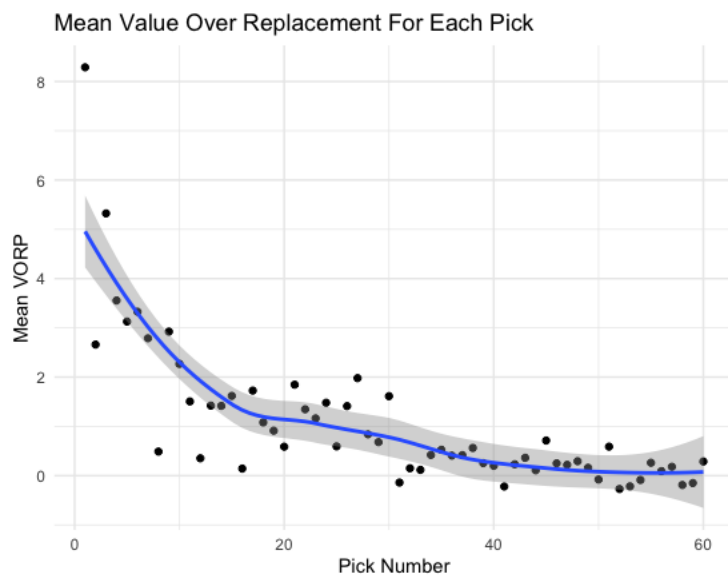


player was responsible for creating the win altogether. Value Over Replacement Player (VORP) works for this study because it accounts for that if a player is bad, he won't see get playing time.

My next steps were similar to that of Pelton. One notable difference is that I have additional data compared to his model, since his work was published in 2015. I calculated the VORP over the lifetime of each pick's rookie contracts. After taking the mean VORP for each pick, we are the historical value over replacement each pick has been able to provide a team, as we can see in the graph.

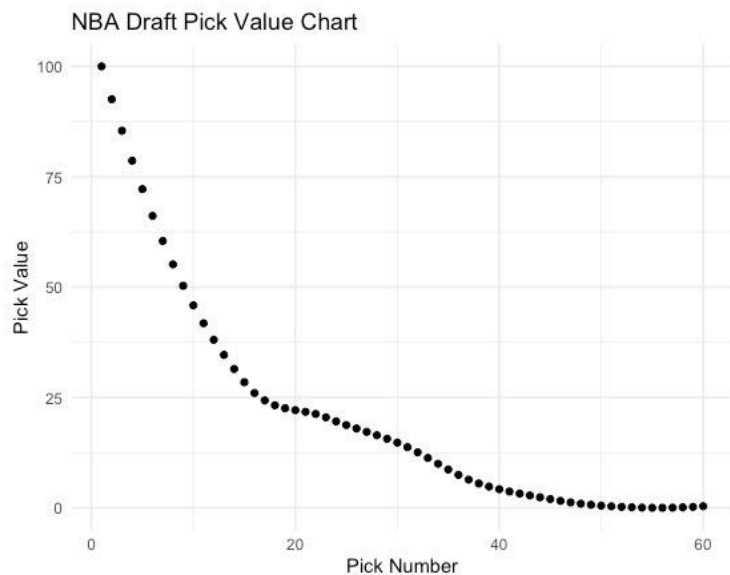
V. Regression Analysis

To fit the data points that we observe above, I used Local Polynomial Regression Fitting to better understand the trend of the data points. Local Polynomial Regression Fitting is often used to fit a smooth curve between two variables, which best suits our purposes here.

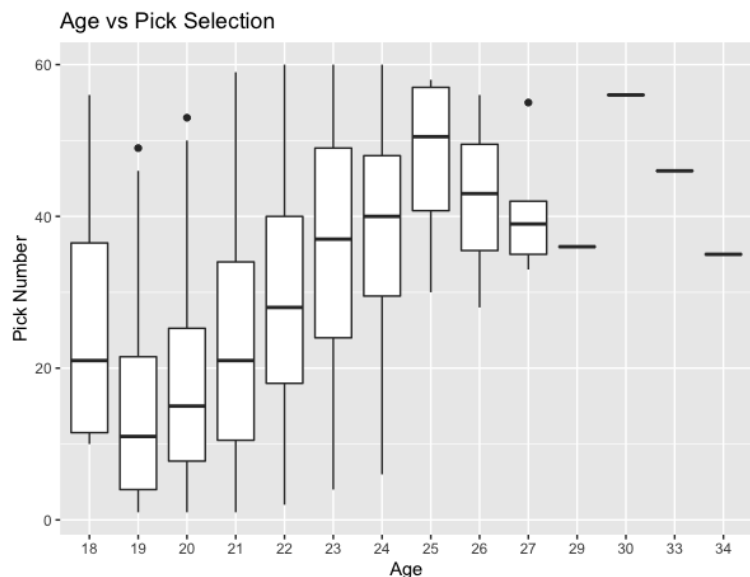


As we can see with the graph on the previous page, the first pick has by far the most value, then the impact each player provides quickly decreases. As the supply of “sure-thing prospects” diminishes, the potential return on investment falls. Once we get to the second round (pick 31), teams historically have not been able to find players with positive value over replacement on a regular basis. Those picks that are able to make substantial contributions to team success are very rare and major outliers.

From there, I elected to normalize the data points from the fitted curve above, with the first pick being valued at 100 points. Doing so makes the values look more practical, and it doesn't require an understanding of VORP to interpret.

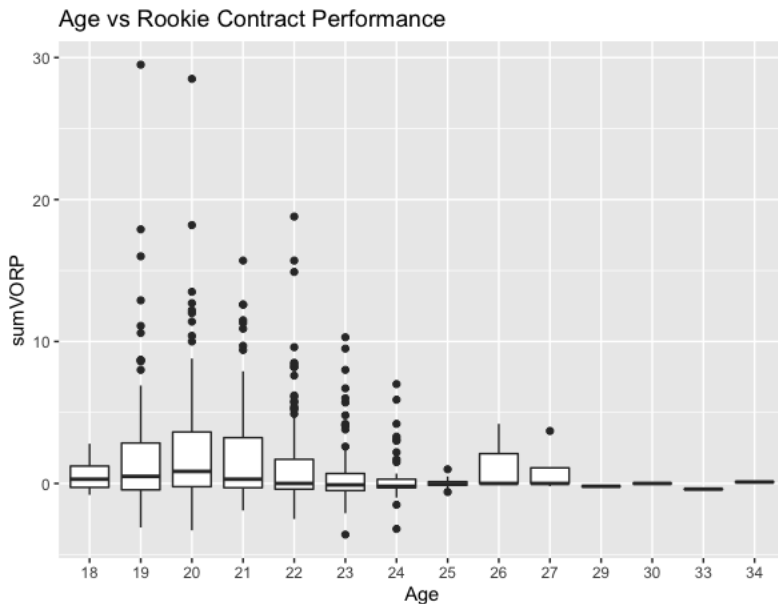


Next, I decided to look into potential explanatory variables for where players tend to be selected. Admittedly, this is quite a tall order. If this were easy to do, then every NBA team would have honed in on them and perfected the art of drafting already. To the right, please find a graph comparing rookie season age to pick number.



As we can see, age isn't really a strong predictor. However, we can see that the highest draft slots tend to be used on 19-20

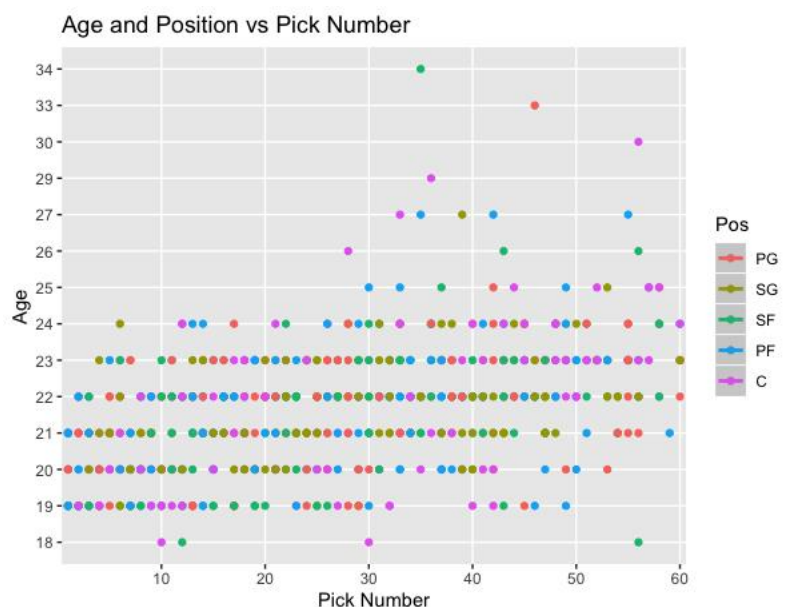
year olds. Furthermore, in the graph to the right, we can see how the age a player was when he played his rookie season relates to the sum Value Over Replacement Player during his rookie contract. We can see that the



outliers, the superstars, all came into the NBA at an early age. This makes intuitive sense, as those who have the potential to become superstars are sure to show enough talent to at the very least make an NBA roster at a young age.

Next, I decided to look at how Position plays a role. To the right, please find a graph looking at where different

positions and ages tend to be selected. There isn't really a clear, observable trend in terms of position. We do, however, still see that players aged 19-21 tend to be drafted higher than other age groups.



While these Age and Position don't seem to be too predictive, one thing that would be interesting to look at would be collegiate performance. This is the basis of many draft models, and is realistically the best one can do. This is something that I intend on researching in the future.

VI. Conclusion

I believe that this research can be of major importance to NBA decision makers. Having quantitative data on what each pick has historically produced makes it much easier to understand the draft process in itself. Hypothetically, if a team is actively looking to acquire young talent, my research demonstrates that there is a real drop-off in talent after the fifteenth pick, so trading up into the top fifteen might be worth consideration. Furthermore, the exact values of each pick can be used in trade negotiation talks to see if historical data indicates whether it is a positive or negative move in terms of draft capital.

One thing to think about for future research is to understand the value of trading future draft picks. The NBA Draft order isn't set until a month before the draft, but teams will still deal out long-term draft capital in the short term if they think it is in their best interest. In doing so, teams are making trades without the certainty of where the draft pick will be in the draft. Not to mention, teams tend to be much more willing to deal out their future draft capital than their current draft capital. There are a lot of different avenues that this research can take us with regards to deciding upon optimal basketball strategy.

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