

Team Analysis

This analysis will be conducted on the Golden State Warriors, a professional basketball team competing in the National Basketball Association (NBA). When talking about the Warriors, a common talking point is their notoriously expensive payroll and luxury tax payments, which are commonly attributed to as the reason for their success in recent seasons. Naturally, one would expect this success to bring in substantial revenue, but at the same time, one may wonder how much of it is mitigated by the high costs of maintaining a championship winning team. Thus, this analysis seeks to estimate the overall profitability of the Warriors, with a focus on the effects of having a high payroll and luxury tax.

According to a 2022 analysis by Forbes, the Warriors rank 1st in terms of operating income, as well as team value, making them the most profitable out of the 30 NBA teams.¹ Historically, the Warriors did not always do as well as they are now.² To understand how they reached this point, we begin by examining the market conditions, revenues and costs for the Warriors.

Regarding market conditions, according to a 2019 estimate, the Warriors have a metro population of 4.73 million, ranking them in the middle of the pack as the 16th largest of all NBA teams.³ As of 2021, the median household income in their metro area is \$116,005, the second-highest in the US.⁴ The Warriors unfortunately do not enjoy California's income tax rate, as it is the highest of all US states,⁵ and when combined with California's high cost of living, leaves its residents with less income for sports consumption. In addition, the Warriors' newly built Chase Center, which opened in 2019, did not benefit from taxpayers' money and was instead privately funded. However, the main feature of the San Francisco Bay Area is that it is one the largest economic capitals in the country. Hosting places such as Silicon Valley among other large companies provides the Warriors with a natural edge in corporate sponsorship. Given these factors, the market conditions for the Warriors appear to be somewhat optimistic, which is supported by Forbes reporting market conditions to constitute 43.2% of the Warriors' valuation, an unsurprisingly significant portion.¹

In terms of revenues and costs, Forbes reports \$257 million in gate receipts, and \$508 million in other revenues. These other revenues include a TV partnership with NBC Sports Bay Area, sponsorships with companies such as Google, Rakuten, and Verizon, as well as revenues

shared among all teams in the NBA. Forbes estimates \$559 million in costs, with Sportrac estimating \$346 million of this cost coming from the Warriors' payroll and luxury tax.⁶

League Analysis

The next step in answering our research question is to investigate the Warriors within the frame of the NBA, and see how payroll and luxury tax affect the profitability of other NBA teams under wider economic conditions. To do this, a multiple linear regression is used.

Data was collected from Professor Rodney Fort's website,² Sportrac,⁶ and Basketball Reference.⁷ The data contains variables over 15 NBA seasons from 2004 to 2019. Note that these seasons took place before COVID-19 had significant effects on the NBA and the market, so the research question can be answered under normal market conditions. The variables collected and to be included in the regression are as follows:

- **Team Dummy Variables:** controls for market differences between teams as different teams are situated in different cities
- **NBA Season Dummy Variables:** controls for league-wide increases in revenue over time for reasons such as basketball popularity growth or country-wide economic effects
- ***Operating Income in Millions USD:** variable to be estimated, represents overall profit in a season, data from Professor Rodney Fort's website²
- **Home Attendance in Thousands:** determinant of revenue by increase in ticket revenue, controls for market as well as stadium differences, data from Professor Rodney Fort's website²
- ***Average Ticket Price:** determinant of revenue by increase in ticket revenue, controls for market, data from Professor Rodney Fort's website²
- ***Payroll in Millions USD:** determinant of cost directly, main effect of interest, data from Professor Rodney Fort's website² and Sportrac⁶
- ***Luxury Tax Paid in Millions USD:** determinant of cost, main effect of interest, data from Professor Rodney Fort's website² and Sportrac⁶
- **Wins in Current Season:** determinant of revenue by brand value, controls for success, data from Basketball Reference⁷
- **Wins in Previous Season:** determinant of revenue by brand value, controls for success, data from Basketball Reference⁷

- **Playoff Wins in Current Season:** determinant of revenue by brand value and ticket revenue, controls for success, data from Basketball Reference⁷
- **Playoff Wins in Previous Season:** determinant of revenue by brand value and ticket revenue, controls for success, data from Basketball Reference⁷
- **Dummy for Championship Win in Current Season:** determinant of revenue by brand value, controls for success, data from Basketball Reference⁷
- **Dummy for Championship Win in Previous Season:** determinant of revenue by brand value, controls for success, data from Basketball Reference⁷
- **Dummy for Championship Win Two Seasons Ago:** determinant of revenue by brand value, controls for success, data from Basketball Reference⁷

*Adjusted for inflation to a reference year of 2019.

The regression model is thus given by:

$$\begin{aligned}
 \text{OperatingIncome}_{st} = & \beta_0 + \beta_1 \text{Payroll}_{st} + \beta_2 \text{LuxuryTax}_{st} + \beta_3 \text{AvgTicketPrice}_{st} + \\
 & \beta_4 \text{HomeAttendance}_{st} + \beta_5 \text{Wins}_{st} + \beta_6 \text{WinsLag1}_{st} + \beta_7 \text{PlayoffWins}_{st} + \\
 & \beta_8 \text{PlayoffWinsLag1}_{st} + \beta_9 \text{Championship}_{st} + \beta_{10} \text{ChampionLag1}_{st} + \\
 & \beta_{11} \text{ChampionshipLag2}_{st} + \sum_{i=12}^{40} \beta_i \text{TeamDummy}_{st} + \sum_{i=42}^{54} \beta_i \text{SeasonDummy}_{st} + \\
 & \epsilon_{st}
 \end{aligned}$$

where s is the season, t is the team, and ϵ is the residual

This model's results are shown in *Figure 1* below:

Characteristic	Beta	95% CI [†]	p-value
PayRollAdj	-0.15	-0.26, -0.04	0.008
LuxTaxAdj	-1.1	-1.3, -0.93	<0.001
ATPAdj	0.66	0.53, 0.79	<0.001
Home.Attendance..Thousand.	0.13	0.09, 0.16	<0.001
Wins	-0.18	-0.38, 0.02	0.075
Wins..Lag.1.	-0.31	-0.50, -0.11	0.002
Playoff.Wins	0.63	0.06, 1.2	0.031
Playoff.Wins..Lag.1.	-0.01	-0.59, 0.58	>0.9

as.factor(Championship)

0	—	—	
1	6.9	-3.0, 17	0.2

as.factor(Championship..Lag.1.)

0	—	—	
1	-0.49	-10, 9.4	>0.9

as.factor(Championship..Lag.2.)

0	—	—	
1	-6.9	-15, 1.5	0.11

Team			
ATLANTA HAWKS	—	—	
BOSTON CELTICS	4.2	-7.6, 16	0.5
BROOKLYN NETS	-18	-29, -6.8	0.002
CHARLOTTE HORNETS	-4.0	-15, 6.8	0.5
CHICAGO BULLS	11	-3.4, 25	0.14
CLEVELAND CAVALIERS	-9.7	-22, 2.7	0.12
DALLAS MAVERICKS	-14	-26, -1.3	0.030
DENVER NUGGETS	-2.5	-13, 8.4	0.7
DETROIT PISTONS	7.3	-3.9, 18	0.2
GOLDEN STATE WARRIORS	20	8.0, 32	0.001
HOUSTON ROCKETS	30	19, 41	<0.001
INDIANA PACERS	2.9	-7.7, 13	0.6
LOS ANGELES CLIPPERS	-11	-23, 0.67	0.064
LOS ANGELES LAKERS	23	8.5, 37	0.002
MEMPHIS GRIZZLIES	0.81	-10, 12	0.9
MIAMI HEAT	-18	-31, -5.9	0.004
MILWAUKEE BUCKS	-0.68	-11, 10	0.9
MINNESOTA TIMBERWOLVES	0.07	-11, 11	>0.9
NEW ORLEANS PELICANS	9.8	-0.97, 21	0.075
NEW YORK KNICKS	12	-4.4, 29	0.15
OKLAHOMA CITY THUNDER	-1.4	-12, 9.5	0.8
ORLANDO MAGIC	-0.34	-11, 11	>0.9
PHILADELPHIA 76ERS	-2.9	-14, 7.8	0.6
PHOENIX SUNS	3.9	-7.2, 15	0.5
PORTLAND TRAILBLAZERS	-27	-39, -15	<0.001
SACRAMENTO KINGS	-6.4	-17, 4.7	0.3
SAN ANTONIO SPURS	4.6	-7.0, 16	0.4
TORONTO RAPTORS	2.4	-9.1, 14	0.7
UTAH JAZZ	-4.8	-16, 6.8	0.4
WASHINGTON WIZARDS	-2.1	-13, 8.8	0.7

Year			
2004-05	—	—	
2005-06	12	1.3, 22	0.027
2006-07	3.6	-3.9, 11	0.3
2007-08	8.0	0.46, 15	0.038
2008-09	4.8	-2.8, 12	0.2
2009-10	6.1	-1.6, 14	0.12
2010-11	2.9	-4.6, 10	0.4
2011-12	25	16, 34	<0.001
2012-13	22	15, 30	<0.001
2013-14	22	15, 30	<0.001
2014-15	23	15, 30	<0.001
2015-16	29	21, 36	<0.001
2016-17	43	35, 51	<0.001
2017-18	53	44, 61	<0.001
2018-19	62	53, 71	<0.001

Figure 1: Regression Results

The key result from the regression, as indicated by a coefficient of -0.15 is that a 1 million USD increase in payroll leads to an average decrease of \$0.15 million in operating income, all else equal. This implies that an average of 0.85 million dollars is made back for every 1 million spent on players, thus spending on players is not as costly as it may seem. However, the -1.1 coefficient on luxury tax spending makes it clear that there is a penalty for going above the salary cap, where for every 1 million spent in luxury taxes, an additional 0.1 million is lost, suggesting that the average team should not be going past the salary cap.

Furthermore, we see that increasing ticket prices and attendance increase profits, as expected. On the other hand, wins and lagged wins appear to decrease profits significantly, though the former is only significant at the 0.10 level. This result is somewhat surprising, but can be attributed to the fact that winning is correlated with team cost and is costly. Playoff wins seem to create large profits, while lagged playoff wins have little effect and has an insignificant p-value. Recent championship titles do not appear to be significant, which can be understood in light of the fact that most teams have not won consecutive titles like the Warriors have, so teams may not feel these effects. Looking at the dummy variables for teams, it can be seen that there are many significant coefficients as well as insignificant coefficients. We can infer that teams such as the Warriors and the L.A. Lakers have markets that have a much more greatly positive effect than the baseline market of the Atlanta Hawks, while teams such as the Portland Trailblazers do not have beneficial markets. Other teams see little difference when compared to the Hawks. This variable may also be capturing other biases, such in the case of the Brooklyn Nets, which sees significant losses despite being located in New York. Looking at the year variables, we do see significant increase in profitability over the years, despite there being little change in some.

The Team in the Context of the League

The model's prediction for the Warriors' 2019 season operational income is 70.9 million USD. Given that their operational income for this season is actually 109 million, it appears that the Warriors are massively overperforming expectations. This may be due to flaws with the model stemming from violating linear regression assumptions, such as multicollinearity or missing predictors, or it may be that the Warriors are simply just exceptional at converting the money they put into their players into additional revenue. This is exemplified by Steph Curry,

who is synonymous with the Warriors and brings huge value to the Warriors brand. Based on the team's current trajectory coming out of the 2018-2019 season, one would expect the Warriors to continue to succeed in their business. However, they would certainly take one of the biggest losses if a shock were to occur in the market, as seen by COVID, where the Warriors were forced to lose profits due to lower revenues caused by the pandemic, while still having to pay their notorious payroll.

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