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Inside the NBA Bubble:
How Black Players Performed Better without Fans[*]

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Abstract

In the NBA, predominantly Black players play in front of predominantly non-Black fans. Using the 'NBA bubble', a natural experiment induced by COVID-19, we show that the performance of Black players improved significantly with the absence of fans vis-à-vis White players. This is consistent with Black athletes being negatively affected by racist pressure from mostly non-Black audiences. We dispel several alternative hypotheses. Beyond hurting individual players, fans' behavior causes significant economic damage to the NBA by lowering the quality of the game.

Keywords: discrimination, harassment, racism, performance, basketball, NBA, COVID-19.

JEL Codes: D91, J15, J71, Z22.

1 Introduction

The National Basketball Association (NBA) is one of the richest and most prestigious sports leagues in the world. It is also characterized by a unique feature. While the majority of players are Black,[1] most fans in the stands, a majority of coaches and front-office executives, as well as most team owners, are not Black. This has historically led to cleavages between players and supporters, as well as to episodes of open racism on the court. Vivid recent examples of racially-motivated hostility include a New York Knicks fan spitting on the Atlanta Hawks star Trae Young in Madison Square Garden during the second game of a playoff series in 2021. The same season, a Philadelphia 76ers fan threw popcorn on the Washington Wizards' Russel Westbrook as he left the court following an injury. Such episodes are far from isolated, as documented by numerous media accounts. They are but the most visible result of racial divides that run deep in the sport, as in US society more broadly (Pew Research Center, 2016).

While such episodes have often made the headlines and fostered a heated debate, a careful analysis of how the pressure from predominantly non-Black fans affects predominantly Black players, and in turn the overall quality of the game, has never been conducted. We fill this knowledge gap using a natural experiment generated by the COVID-19 pandemic. Between July 30th and October 11th, 2020, NBA games were played behind closed doors without fans in the stands in an effort to curb the spread of the virus. This led to the creation of the so-called "NBA bubble", a controlled environment where players were isolated from the outside world and could avoid being infected. This provides a unique natural experiment to study the question of interest. To this end, we obtain data from August 17th to October 11th 2020, when playoff games took place inside the bubble, and compare the performance of Black vs. White players with the 2019 playoffs. Crucially, we have objective and comprehensive metrics of performance for every single NBA player in every game.

We find that the performance of Black players improved significantly in the

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[1] For the purpose of our analysis, this includes both Black and mixed-race/Black players.

bubble relative to the performance of White players. Specifically, we estimate that the performance of Black players improved by 27% of the average performance in the pre-bubble period relative to the performance of White players. We also find that the negative effect of playing with fans prior to the bubble was strongest among top players (those in the top 50 percent of the pre-bubble performance distribution). As these players contribute the most to the quality of the game and, in turn, to the profits of the league, this implies that racist pressures cause significant damage to the NBA.

This study contributes to a growing literature documenting the impact of racial discrimination in sports (e.g., Price and Wolfers, 2010; Parsons et al., 2011; Gallo et al., 2013). The closest study to our own investigates how the absence of fans impacts the performance of African players in the Italian top soccer championship (Caselli et al., 2022). By looking at the NBA, we not only provide corroborating evidence from a different sport and another major league, but we also show that pressure can have an impact even when the disadvantaged group is a prominent one in the league. Black players are the majority in the NBA and most top players are Black, but they play in front of predominantly non-Black audiences.

We also contribute to the broader literature documenting racial discrimination in the labor market (Bayer and Charles, 2018; Lang and Spitzer, 2020; Aizer et al., 2020; Caselli and Falco, 2021). We extend this body of knowledge by providing new evidence on the impact of racially-motivated social pressure on worker performance. The existing literature on the topic is still scant. While numerous studies document existing racial labor-market gaps in a range of contexts, little is known about how racist pressures can directly affect performance and contribute to creating those gaps in the first place.

2   Racial Divides in the NBA

The NBA is a racially diverse league with a defining feature: the majority of players are Black while the majority of fans are non-Black. In the period we analyse (2019-20), over 75 percent of players in NBA teams were Black, while only 27 percent of fans identified

Figure 1: Black Players, non-Black Fans
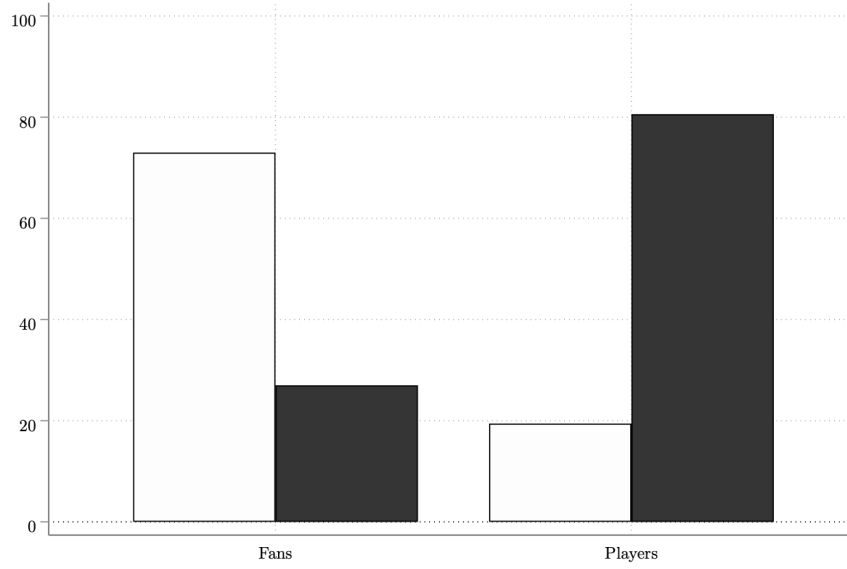
Notes: Percentage of Black and non-Black, fans vs players. Own elaborations based on Silverman (2020) for data on fans and Interbasket (2020) for data on players.

as Black according to the latest data available (Figure 1). This stark divide does not represent a source of tension per se, but in a society where racial cleavages run deep, basketball games have often become an outlet for racist sentiments. Such tensions are further exacerbated by the fact that basketball courts are the smallest among major league sports (football, basketball, soccer, baseball, and ice hockey), allowing fans to be very close to players during games.

Recent reports by Sports Illustrated, The Ringer, and the NBA itself, offer detailed accounts of racist episodes in NBA games (Selbe, 2021; Tynes, 2019; Reynolds, 2019).[2] There are also numerous reflections on the issue of racism in the league from major NBA players from different epochs. Bill Russell, one of the greatest players in NBA history,[3] wrote the following in his memoirs as he reflected on the atmosphere in the city of Boston, where he played in the 1950s: "The city had corrupt, city-hall-crony racists, send-em-back-to-Africa racist, and in university areas, phony radical-chic racists (long before they appeared in New York)" (Goldstein, 2022). A similar view was

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[2]In 2019 the NBA conducted an investigation and based on their findings they enacted a 'zero tolerance' policy towards racist behavior by fans. This has not solved the problem and episodes of racist behavior have continued to take place.

[3]He played for the Boston Celtics from 1956 to 1969 and won 11 championships, which arguably made him the greatest Boston athlete ever.

expressed decades later by Lebron James, the elder statesman of the NBA, and its best player since Michael Jordan. When discussing fan behavior Lebron James called Boston fans "...racist as [expletive]", going on to explain "They will say anything. And it's fine. I mean, [expletive], it's my life. It's [expletive] I've been dealing with my whole life. I don't mind it. Like, I hear it. Like if I hear somebody close by, I'll check them real quick. I'll move on to the game. They're going to say whatever the [expletive] they want to say...I mean, I got a beer thrown on me leaving the game. Like, it's Boston." (Himmelsbach, 2022). Russell Westbrook, a two-time NBA most valuable player, said this of Utah in 2019 when visiting as a player for the Oklahoma City Thunder: "Every time I come here, it's a lot of disrespectful things that's said." Going on to say that fans in Utah regularly call him "boy" during games and have yelled out insults such as "get down on your knees like you're used to" (Tynes, 2019).[4] In the 2019 season, the Boston Celtics banned a fan for two years for shouting racist language towards an opposing player. After the game, one of the Celtics' starting players, Marcus Smart, told the Boston Globe: "I've dealt with a lot of things, here in my own city, and out of this city," Smart said. "I get it. I've seen it. I'm not surprised, and it has to be fixed, plain and simple" (Himmelsbach, 2019). Another recent incident took place in May 2022 when the Phoenix Suns were visiting the Dallas Mavericks. The Phoenix Suns' Chris Paul, a star in the NBA as well as a former leader of the players' union, confronted Dallas fans in the stands for harassing his family and offering them unwanted hugs. Earlier in the same season, a Philadelphia 76ers fan was banned for life from the arena for calling Carmelo Anthony of the Los Angeles Lakers "boy", yelling "get in the corner boy" and "keep shooting boy" (Haynes, 2022).

The pressures faced by Black players in the NBA are not limited to fan behavior. There have also been high-profile incidents involving White owners behaving in overtly racist ways. One example that took place in 2014 led to Donald Sterling, the owner of the Los Angeles Clippers, being banned for life by the NBA due to overtly racist comments caught on tape about Magic Johnson, one of the greatest players in NBA history[5]. In

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[4]The term 'boy' has a racial history dating back to slavery. It has been deemed a racist term by US federal courts, and in certain contexts is legally considered to bear racial animus (Brinkerhoff, 2007; Bright, 2010).

[5]This eventually led to Donald Sterling selling the team.

2022 Robert Sarver, the owner of the Phoenix Suns was fined and banned from the NBA for a year due to racist and misogynist behavior that took place over the course of 18 years. Following pressure from inside and outside of the league, he recently announced that he is looking to sell his ownership of the team and permanently leave the NBA.

3   COVID-19 and the NBA Bubble

On March 11th, 2020 the NBA shut down all games in response to the global spread of COVID-19. As it became clear that the pandemic was not going to end quickly, the league faced the possibility of having to cancel the season, and so forgo enormous revenue from fan attendance and TV deals. The significant financial costs of a full shutdown led to the decision by the NBA, in agreement with the players, of finishing the season and conducting the post-season playoffs inside an isolated environment without fans in attendance, or "bubble".

At the end of July 2020, the NBA bubble officially opened at the Walt Disney World resort in Lake Buena Vista, Florida. For the subsequent two-and-a-half months, all NBA games took place inside the bubble without fans in the stands. To compensate for the lack of crowds, the NBA played music and fake crowd noise throughout the games. This was essentially akin to white noise and it primarily served the purpose of making the game sound more 'natural' on TV. For the purpose of our study, the bubble constituted a natural experiment that effectively turned off the presence of live crowds at NBA matches. A recent but consolidated literature has used the same approach in different contexts (Higgs and Stavness, 2021; Scoppa, 2021; Gong, 2022; Steinfeldt et al., 2022; Cross and Uhrig, 2022; Reade et al., 2022; Caselli et al., 2022).[6] The NBA bubble ended with the last game of the playoffs on October 11th, 2020.

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[6]A defining feature of the NBA bubble was that players were isolated from the outside world and had to follow strict rules that prevented them from leaving the bubble and having guests. Despite the NBA investing substantial resources to make the bubble as comfortable as possible, these restrictions may have taken a toll on players. Our results do indeed show a slight drop in average performance inside the bubble across all players (see the next section). This, however, does not affect our analysis, which looks at *differential* impacts on Black and White players, since all players faced the same personal restrictions and endured the same difficulties.

4 Data and Empirical Model

4.1 Data

For the purpose of our analysis, we construct a rich dataset combining several sources of information. The main challenge is to obtain a reliable and *objective* metric of players' performance that is not subject to potential bias in measurement.[7] In addition, our analysis requires detailed information on players' characteristics, positions (that is, center, forward, and guard, and combinations thereof), and style of play, in order to test for potential confounding factors.

To overcome these challenges, we rely on rich data from Stathead (2022), which is itself based on data provided by *SportRadar*, the official statistics partner of the NBA. This data uses the modern box score to provide information on all players' main characteristics and statistics, e.g., age, position, points, minutes played, field goals, free throws, offensive and defensive rebounds, assists, steals, blocks, personal fouls, and turnovers. Based on this very rich data, Stathead (2022) calculates the Game Score (GS), which is our objective metric of players' performance.[8] In sum, GS gives a measure of a player's productivity over an entire game by aggregating a player's positive accomplishments and subtracting the negative accomplishments. It is worth noting that the scale of the variable is comparable to that of points scored during a game, that is, 40 tends to be an outstanding performance, while 10 is an average performance. The variable can also take negative values for very poor performances. This is not the first study using this performance metric (see, for instance, (Berri et al., 2011)). We are the first, however, to use

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[7]Principe and van Ours (2022), for instance, note that newspaper ratings of professional football players can be subject to racial bias in the context of Italy.

[8]GS was created by John Hollinger, the former Vice President of Basketball Operations for the Memphis Grizzlies of the NBA, former columnist at ESPN, and current Senior NBA columnist at The Athletic. The exact formula for GS is: $GS = PTS + 0.4 \times FG - 0.7 * FGA - 0.4 \times (FTA - FT) + 0.7 \times ORB + 0.3 \times DRB + STL + 0.7 \times AST + 0.7 \times BLK - 0.4 \times PF - TOV$, where PTS is points, FG is field goals, FGA is field goal attempts, FT is free throws, FTA is free throw attempts, ORB is offensive rebounds, DRB is defensive rebounds, STL is steals, AST is assists, BLK is blocks, PF is personal fouls and TOV is turnovers. The weights assigned to the different dimensions are routinely used (see, for instance, (Berri et al., 2011)). While they may appear arbitrary, they do not influence our analysis which holds them constant throughout and compares the same players before and after the creation of the bubble.

GS for the purpose of investigating racial discrimination in the NBA.[9]

In addition to players' performance, Stathead (2022) provides general information on the game: what is the home team, score by quarter, whether the game is part of the regular season or the playoffs, and the date of the game. We use the date of games to construct *Bubble*, a dummy variable equal to one if the game was played during the NBA bubble. Finally, we obtain data on players' race and nationality from Interbasket (2020), based on information provided by the official NBA website.

In the interest of full comparability, we focus on the post-season playoff games, which took place entirely inside the bubble, and compare them with playoff games from the previous year.[10] Since playoff games are the most important games of the year, this has the added advantage of focusing on higher-stake settings, where pressure from fans is most likely to play a role.

Our dataset spans 311 games over two playoff seasons (2019 and 2020). Overall, 19 teams take part in the two playoffs and 101 players appear in at least two games of each year analyzed. We drop players who appear in only one or no games in one of the two seasons as such cases do not lend themselves to a robust within-player analysis that controls effectively for individual fixed effects.[11] Table 1 shows the characteristics of the sample. Black players constitute about 80% of all the observations in our sample (the share is very similar in the pre-bubble and in the bubble period).[12] The average player in our sample is 28 years old during the 2019 playoffs. Average performance, as

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[9]John Hollinger has also created an alternative measure of players' productivity on the field, the Player Efficiency Rating (PER). That measure also takes into account three-point field goals and attempts, and normalizes players' performance within team and season (see Sports Reference, 2022, for all the details on the formula). The empirical analysis will show that our results are robust to using this alternative measure of players' performance.

[10]The alternative would have been to compare a mix of (relatively few) regular-season and (all) playoff games that took place inside the bubble with the entire previous season (regular plus playoffs). This would have been a much more imprecise comparison since the NBA bubble started at a time when teams had a different number of regular-season games left to play before the playoffs. Given the very different stakes of regular-season and playoff games, this imbalance would have caused major problems of comparability (Teramoto and Cross, 2010; Fromal, 2017).

[11]When we include players who appear in only one season or play only a single game in either season, our conclusions are qualitatively unchanged but they become less precise, as a result of lowering the degree of comparability between the pre-bubble and the bubble sample (the additional estimations are available upon request).

[12]Black players include mixed-race Black players. White players include one player who is mixed/Polynesian.

Table 1: Descriptive statistics

	Pre-bubble (2019)		Bubble (2020)	
	Mean	Std Dev	Mean	Std Dev
Game Score (GS)	9.408	8.148	9.185	8.476
Black	0.783	0.412	0.807	0.395
Starting 5	0.575	0.495	0.587	0.493
Personal fouls	2.370	1.553	2.318	1.527
Age	28.106	3.665	29.059	3.914
No obs	927		943	

Notes: The table shows the mean and standard deviation (Std Dev) in the sample of observations pre-bubble (2019 playoffs) and during the bubble (2020 playoffs). Game Score is a continuous variable representing a metric for a player's performance. Black is a dummy equal to 1 for Black players. Starting 5 is a dummy equal to 1 if a player is in the starting lineup in a game. Personal fouls is the number of personal fouls called to a player in a given game. Age is the age in years on the day when a game is played.

captured by the player Game Score (GS) was 9.4 before the bubble and declined to 9.2 inside the bubble. This slight drop is consistent with the fact that being in the bubble was challenging for players. Through an econometric model, we will show that this minor average decline conceals very different effects for Black and White players.

4.2 Empirical Model

Our main results are based on the estimation of the following empirical model:

$$GS_{itg} = \alpha + \beta Bubble_g + \gamma Bubble_g \times Black_{it} + \delta_i + \eta tg + u_{itg}, \tag{1}$$

where GS is the Game Score of player i in team t for match g; $Bubble_g$ is a dummy equal to 1 if game g takes place during the bubble without fans in the stands;[13] $Black_{it}$ is a dummy equal to 1 if player i in team t is Black; δ_i is a player fixed effect that allows us to control for ability, productivity, and any other individual traits that may play a role in the analysis (e.g., age, salary level); η_{tg} is a combined team-game fixed effect that

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[13]The coefficient on this variable is not identified on its own when we include $team \times game$ fixed effects. In this case, only its interaction with $Black_{it}$ is identified.

captures game-specific characteristics, such as home games and overall characteristics and performance of a player's team as well as those of the opponent team. u_{im} is an idiosyncratic error term. The inclusion of all these fixed effects implies that we are comparing the change in the performance of Black players relative to the White players who play in the same team and in the same games. This implies that we are controlling for any factors that may vary across teams and games between the two periods, such as referees. Standard errors are clustered at the team-game level to take into account potential correlation in the error terms between players who play in the same team and in the same game.[14]

5 Results

In this section, we discuss our core results and present a set of robustness tests to investigate alternatives to racist pressure as potential mechanisms.

5.1 Playing without fans improves the performance of Black players relative to White players

Our key result is that playing without fans improved the performance of Black players relative to White players. The estimates are presented in Table 2. As explained above, the bubble period captures all the 2020 playoff games, which took place behind closed doors, while the pre-bubble period captures the 2019 playoffs when fans could attend the games. In the first specification (Col. 1), we estimate a model with player fixed effects but no *team* nor *team* × *game* fixed effects. In this case, we find that inside the bubble the performance of Black players improves by 1.3 Game Score points with respect to the pre-bubble period relative to White players. This is a large effect, which corresponds to 13.6 percent of the average score players obtained in the pre-bubble period. When we include *team* fixed effects in the specification (Col. 2), the estimated impact grows to 1.9 GS points (20.4 percent of the pre-bubble average performance), and its statistical significance

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[14]We further test robustness to the use of two-way clustered standard errors at the level of player-season and team-game.

increases to the 1 percent level. When we include $team \times game$ fixed effects, the estimated impact of the bubble grows further (2.6 points, or 27.1 percent of the pre-bubble average), and it is statistically significant at the 1 percent level. Reassuringly, all the specifications we estimate deliver results in a rather tight range.[15] We also run a placebo test where we estimate the change in the performance of Black players relative to White players in regular season games that took place before the bubble (2019-20) compared to regular-season games the previous year (2018-19). We find no change (Appendix Table A2), which lends further credibility to the conclusion that our estimated impact is indeed due to playing inside the bubble.

To offer some insight into the monetary value of the productivity loss induced by racial pressure among Black players, we estimate the relationship between player salaries and productivity as captured by the Game Score we use in the analysis.[16] The results, not shown for conciseness, indicate that the negative effect of playing with fans on Black players relative to White players is associated with an earning loss per player of 2.58 million US dollars a year on average. This is a descriptive exercise, but the sheer magnitude of the monetary values involved is sufficient to underscore the economic implications of the problem, as discussed further in the next section.

Finally, we acknowledge that the ideal test of our hypothesis would have been to 'turn off' racist behavior per se as opposed to the presence of fans altogether. That source of exogenous variation is not available (and would be hard to induce), but we can at least check whether our results are consistent with recorded patterns of racist behavior among fans prior to the pandemic. Specifically, we can test whether the results are stronger when Black players inside the bubble play against teams whose supporters have been

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[15]The results are robust to the use of two-way clustered standard errors at the level of player-season and team-game (Col. 1 of Appendix Table A1). They are also robust to including players who only play a single game in either year (Col. 2 of Appendix Table A1), and to using Player Efficiency Rating (PER), an alternative measure of performance based on the same data as the dependent variable (Col. 3 of Appendix Table A1).

[16]We run a cross-sectional regression of salaries in the 2018-2019 season as the dependent variable on players' average GS across the entire 2018-2019 season using salary data from ESPN (2022). The regression also includes year of birth, position dummies, and team fixed effects among the controls. The sample includes all players who played in the 2018-2019 season, that is 389. The coefficient on average GS is 1.01 million, which implies that an increase by one unit of GS is associated with an increase in salary by 1.01 million US dollars per year.

more frequently associated with episodes of racial abuse in the past, relative to playing against those teams before the bubble. Since a complete record of racial abuse in the NBA is not available, the evidence is based on individual players' recollections (such as the ones reported above) and academic literature studying racist behavior across US regions. [17] Specifically, we rely on recent work by (Chae et al., 2015), who use large-scale data from Google searches to rank US states by the prevalence of racist attitudes. The results are compelling and have attracted the attention of the public (e.g., Ingraham (2015) on The Washington Post), but the analysis is descriptive and we treat the evidence as suggestive. Yet, we detect patterns that are consistent with our expectations (Appendix Table A3). The performance of Black players inside the bubble improves the most when they play against teams from the Northeast and the South of the United States, where racist attitudes are most prevalent according to (Chae et al., 2015) and where anecdotal evidence suggests that episodes of abuse in NBA games have been more prominent (Himmelsbach, 2019; 2022; Haynes, 2022).

5.2 Top players are the most affected by racial pressure

Our second main result is that the average effects described above are driven by top Black players, who are the ones who benefit the most from playing without fans. To rank players, we use wins above replacement (WAR), a statistic that evaluates each athlete relative to a replacement-level player while holding constant the value of the other players (Silver, 2019).[18] This is a known metric of performance in the NBA. When we split the sample in half by players' WAR in the pre-bubble season (Appendix Table A4), we find that players in the top 50 percent of the pre-bubble performance distribution are the ones whose performance improves the most inside the bubble relative to White players.[19] Since

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[17] Even if an official record did exist, it would be at best partial since racial abuse is difficult to record when it largely consists of slurs from a loud crowd comprising thousands of people who are difficult to monitor individually.

[18] Following Silver (2019), players are considered at the replacement level if they are on two-way contracts, that is, they are on the fringe between the NBA and the G League, NBA's minor league.

[19] These results are robust to ranking players based on *average* WAR over the previous two (2017-2019) or three (2016-2019) seasons before the bubble. They are also robust to using an alternative metric of

Table 2: Effect of bubble (no fans) on players' performance

Dep. var.: Game Score. Pre-bubble mean: 9.408			
	(1)	(2)	(3)
Bubble	-0.731	-1.100*	
	(0.540)	(0.606)	
Bubble × Black	1.284*	1.915***	2.552***
	(0.666)	(0.738)	(0.779)
Individual controls	yes	yes	yes
Player FE	yes	yes	yes
Team FE	no	yes	no
Team-Game FE	no	no	yes
Observations	1,870	1,870	1,870
R-squared	0.479	0.484	0.561

Notes: The dependent variable is players' Game Score. Bubble is a dummy equal to 1 for all games played inside the NBA bubble (without fans). Black is a dummy equal to 1 for Black players. Individual controls include a dummy equal to 1 if a player is in the starting lineup of a game, and the number of personal fouls called to a player in a game. Standard errors are clustered at the team-game level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

top players are the ones who generate the most revenue for the league (they are the ones who attract most fans and sponsors) and receive the highest salaries (players above the median are paid 13.8 million US dollars a year, on average, in the NBA), this implies that racist pressures are not only detrimental to the performance and well-being of individual players but *they also cause major economic damage to the NBA*. Furthermore, the fact that top players are the ones most negatively affected by fans suggests that the effects we uncover are unlikely to be the result of sheer faltering under pressure (as further discussed below). Top players should be, if anything, the ones who are best equipped to withstand sheer tension from playing before large crowds. On the contrary, the evidence is consistent with an explanation based on racist pressure, whereby top players are targeted most heavily by racist fans seeking to inflict the most damage by affecting the most productive players.

performance called PREDATOR (Silver, 2019), which is a predictive statistic that measures the number of points a player is expected to contribute to his team's offense and defense per 100 possessions, relative to a league-average player. Finally, they are robust to simply ranking players based on average Game Score (the outcome variable we use throughout the analysis) over the season prior to the bubble. These additional results are available upon request.

5.3 Competing Mechanisms to Racial Pressure

In this section, we explore a number of mechanisms other than racist pressure that could theoretically lead to the detected change in the performance of Black players vis-à-vis White players inside the bubble. The results are presented in Table 3.

First, recent studies have shown that Black players may be subject to adverse bias in the judgment of referees (Price and Wolfers, 2010; 2012). Coupled with evidence that referees can be affected by crowd pressure (Reade et al., 2022), this may in principle lead Black players to perform better inside the bubble as a result of fairer referee judgment. To shed light on this mechanism, we add referee fixed-effects to the estimation and interact them with playing inside the bubble. When we do this, our results are unchanged (Table 3, Col. 1). It is also worth noting that the number of personal fouls called to each player is among the control variables used in all the specifications outlined above.[20]

Second, one may hypothesize that the effect we detect is in fact due to Black players being more likely to play in positions where average performance improved inside the bubble relative to performance in other positions for reasons that were not connected to the absence of fans. For example, since the bubble started after a prolonged break in the season due to the initial COVID-19 shutdown, players' training routines were disrupted and one could theorize that such disruption affected players in different positions differently. It may also have affected players differently depending on their prior level of fitness and athleticism. While we have no reason to believe that such traits correlate with race, we can test this hypothesis for completeness. We begin by testing the effect of adding to the model an interaction between the bubble dummy and a player's position (Table 3, Col. 2). Next, we test the effect of including the difference between a player's average performance in the 2019-20 regular season and the 2018-19 regular season as a measure of the degree to which a player was in shape just before the bubble relative to the previous year. In both cases, our results are unchanged (Table 3, Col. 3).

A related hypothesis is that age may play a role insofar as players' performance

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[20]Since foul calls depend directly on the judgment of referees, investigating whether the inclusion of this variable changes the result is an indirect test of referee bias. When we exclude the variable from the regressions, our conclusions do not change. The additional results are available upon request.

falls with aging and given that the bubble occurred a year after the previous playoff season. If Black players are typically younger, this may generate the result we observe. When we control for the interaction between the bubble and the age of a player in our regressions, we find no evidence in support of this hypothesis (Table 3, Col. 4).

Fourth, COVID-19 was a major source of stress for people throughout the world and NBA players were no exception. Among relatively young athletes who faced limited personal health risks from contracting COVID-19, the biggest worries may have been about the health of their relatives back home. To test whether such worries affected players' performance, we exploit the fact that many NBA players are not from the United States (21 percent of all players in 2019-20) and COVID-19 did not spread evenly across the world. Some areas were affected earlier and more heavily. Adding players' country of origin to the estimation constitutes an indirect test of the role that COVID-19 worries may have played in driving our results. When we add controls for players' country of origin aggregated by macro-regions, the results do not change (Table 3, Col. 5).

Finally, a prominent hypothesis based on a large literature on the pressure effects of crowds (so-called 'choking effects') is that players from different backgrounds may be differently able to withstand pressures from large audiences, regardless of racist behavior. While we have no reason to believe that Black basketball players should be less able to deal with pressure, this is a theoretical possibility since life experiences that may affect one's susceptibility to crowd pressure and in turn athletic performance may correlate with one's upbringing and family background (Moore et al., 2018). We conduct several tests to investigate this hypothesis. First, we attempt to capture high-pressure situations by controlling for whether a match takes place in an arena that had above median fan attendance prior to the COVID-19 lockdown (Table 3, Col. 6). Second, we introduce a control for the difference between a player's average performance in playoff and regular season games in the 2018-19 (pre-bubble) season. This difference interacted with the bubble dummy serves as a control for a player's ability to perform in high-stake situations (the playoffs) relative to low-stake situations (regular season) in normal circumstances before COVID-19 (Table 3, Col. 7). None of these control variables affects

15

the results. Third, we restrict our sample to games in which there should be lower pressure on individual players because the final point difference between the two teams is larger than 20 (and a player's individual actions are unlikely to be pivotal in changing the outcome of the game). We find that the performance of Black players relative to White players improves inside the bubble even when we focus on games when pressure is lower (Table 3, Col. 8).[21]

6 Conclusions

This paper shows that playing in the absence of fans as a result of the COVID-19 pandemic significantly improved the performance of Black NBA players relative to White players. The result is particularly compelling because Black players are the majority in the NBA. They play, however, in front of predominantly non-Black audiences and they are employed by predominantly non-Black team owners. Mounting evidence of racist behavior among NBA fans and owners is a clear sign of the presence of cleavages reflecting broader societal tensions. Our analysis provides evidence of the impact of these racial divides on player performance.

We also show that the presence of fans is most detrimental for top players, who receive the highest salaries and generate most revenue for the NBA. This leads to an important conclusion: by lowering players' performance, racist pressures lower the quality of the game and cause economic damage to the NBA. Further work will be necessary to produce precise estimates of these costs, but in a league where the average player has a multi-million dollar yearly salary, the loss of productivity we estimate deserves close attention from NBA executives, who should realise that fighting racism is not only a

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[21]Since our analysis focuses on playoff games, one may worry that pressure is always high during such games independently of the point difference and that certain players may be particularly prone to faltering in those circumstances. To the contrary, existing work by Cao et al. (2011) shows that NBA players do not exhibit more faltering under pressure during games with higher stakes. This work also shows that performance under pressure is not affected by attendance, which supports our claim that sheer pressure from crowds is unlikely to explain our results and corroborates our conclusion that racist pressure is the most likely mechanism at play.

Table 3: Effect of bubble (no fans) on players' performance, mechanisms

	Referee Bias (1)	Position/Athleticism (2)	(3)	Age (4)	C.try Origin (5)	Sheer Pressure (6)	(7)	(8)
Bubble × Black	2.664*** (1.014)	2.548*** (0.796)	1.762** (0.798)	2.086*** (0.769)	3.059*** (0.999)	2.578*** (0.771)	3.406*** (0.748)	3.747*** (1.366)
Bubble × Center-Forward		-3.308** (1.600)						
Bubble × Forward		-3.961*** (1.356)						
Bubble × Forward-Center		-0.968 (2.675)						
Bubble × Forward-Guard		-0.738 (1.571)						
Bubble × Guard		-0.418 (1.427)						
Bubble × Guard-Forward		-2.508 (1.719)						
Bubble × ΔGS RS20/RS19			0.463** (0.182)					
Bubble × Age				-0.395*** (0.099)				
Bubble × Europe/C. Asia					0.596 (1.168)			
Bubble × Latin America					-4.885 (3.203)			
Bubble × Africa					-2.731* (1.509)			
Bubble × Others					0.992 (2.597)			
Black × High attendance						0.373 (0.785)		
Bubble × ΔGS PO19/RS19							-0.784*** (0.142)	
Bubble × Refs	yes	no	no	no	no	no	no	no
Individual controls	yes	yes	yes	yes	yes	yes	yes	yes
Player FE	yes	yes	yes	yes	yes	yes	yes	yes
Team-Game FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1870	1870	1870	1870	1870	1870	1870	350
R-squared	0.569	0.567	0.563	0.566	0.562	0.561	0.572	0.657

Notes: The dependent variable is players' Game Score. Bubble is a dummy equal to 1 for all games played inside the NBA bubble without fans. Black is a dummy equal to 1 for Black players. Individual controls include a dummy equal to 1 if a player is in the starting lineup in a game, and the number of personal fouls called to a player in a game. Column (1) includes interactions of Bubble and referee dummies (42). These coefficients are not reported. Column (2) includes interactions between Bubble and players' position. The baseline position is center. Column (3) includes the interaction between Bubble and ΔGS RS20/RS19, the difference in a player's average performance (ΔGS) between the regular season of 2020 (RS20) and the regular season of 2019 (RS19). Column (4) includes the interaction between Bubble and players' age. Column (5) includes interactions between Bubble and players' country group of origin. The baseline country group is USA/Canada. Column (6) includes the interaction between Black and High attendance, a dummy equal to one if a team plays in an arena with above median fan attendance. Column (7) includes the interaction between Bubble and ΔGS PO19/RS19, the difference in a player's average performance (ΔGS) between the playoffs of 2019 (PO19) and the regular season of 2019 (RS19). Column (8) only includes games with an absolute margin of victory larger than 20 points. Standard errors are clustered at the team-game level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

moral imperative, it is also good for business.

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Appendix

A   Additional Tables and Figures

Table A1: Effect of bubble (no fans) on players' performance, robustness checks

Dep. var.	GS Clustering (1)	GS Large sample (2)	PER Alt. dep. var. (3)
Bubble × Black	2.552***	2.274***	4.080***
	(0.804)	(0.780)	(1.153)
Individual controls	yes	yes	yes
Player FE	yes	yes	yes
Team-Game FE	yes	yes	yes
Observations	1,870	3,242	1,870
R-squared	0.561	0.585	0.524

Notes: The dependent variable is players' Game Score (GS) in columns (1) and (2), and the player efficiency rating (PER) per game in column (3). Bubble is a dummy equal to 1 for all games played inside the NBA bubble without fans. Black is a dummy equal to 1 for Black players. Individual controls include a dummy equal to 1 if a player is in the starting lineup in a game, and the number of personal fouls called to a player in a game. Standard errors are two-way clustered at the player-season and team-game levels in column (1). Standard errors are clustered at the team-game level in columns (2) and (3). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A2: Effect of bubble (no fans) on players' performance, placebo

	Larger sample (1)	Only teams in playoffs (2)
Season 2020 × Black	0.208	0.295
	(0.168)	(0.229)
Individual controls	yes	yes
Player FE	yes	yes
Team-Game FE	yes	yes
Observations	39,519	22,901
R-squared	0.457	0.494

Notes: The dependent variable is players' Game Score. Season 2020 is a dummy equal to 1 for all games played before the bubble in the regular season of 2019-2020 and equal to 0 for all games played in the regular season of 2018-2019. Black is a dummy equal to 1 for Black players. Individual controls include a dummy equal to 1 if a player is in the starting lineup in a game, and the number of personal fouls called to a player in a game. Column (1) includes all observations part of the regular seasons and outside the bubble. Column (2) restricts the sample to teams that played in the 2019 or 2020 playoffs. Standard errors are clustered at the team-game level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Effect of bubble (no fans) on players' performance, by opponents' region

	Northeast & South (1)	Midwest & West (2)
Bubble × Black	5.676***	-0.012
	(1.180)	(1.562)
Individual controls	yes	yes
Player FE	yes	yes
Team-Game FE	yes	yes
Observations	789	1081
R-squared	0.619	0.580

Notes: The dependent variable is players' Game Score. Column (1) uses a sample of games in which the opponent teams are from the Northeast and the South. Column (2) uses a sample of games in which the opponent teams are from the Midwest (including the Toronto Raptors) and the West. Bubble is a dummy equal to 1 for all games played inside the NBA bubble without fans. Black is a dummy equal to 1 for Black players. Individual controls include a dummy equal to 1 if a player is in the starting lineup in a game, and the number of personal fouls called to a player in a game. Standard errors are clustered at the team-game level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A4: Effect of bubble (no fans) on players' performance, by pre-bubble performance

	Below median performance (1)	Above median performance (2)
Bubble × Black	0.091	5.173***
	(1.067)	(1.411)
Individual controls	yes	yes
Player FE	yes	yes
Team-Game FE	yes	yes
Observations	1080	790
R-squared	0.529	0.601

Notes: The dependent variable is players' Game Score. Column (1) uses a sample of players with an average pre-bubble performance below the median based on the 2019 value for wins above replacement (Silver, 2019). Column (2) uses a sample of players with an average pre-bubble performance above the median based on the 2019 value for wins above replacement. Bubble is a dummy equal to 1 for all games played inside the NBA bubble without fans. Black is a dummy equal to 1 for Black players. Individual controls include a dummy equal to 1 if a player is in the starting lineup in a game, and the number of personal fouls called to a player in a game. Standard errors are clustered at the team-game level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.