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Responding to Anticipated Bias: Evidence from Football in Israel

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Introduction

- Motivation: In many social situations agents may anticipate being adversely affected by bias.
- Research question: How does the anticipation of bias change the behavior of affected agents?
- This paper provides empirical evidence on this question by studying the decisions of Arab and Jewish referees and coaches in Israeli football (soccer) leagues for men.
- Advantages of the context:
 - Quasi-random assignment of referees to games.
 - Lots of data: >0.5M observations at the player-game level.
 - Ethnicity is identified not only at the individual level (player, referee) but also at the team level.
- The insights gained from the analysis may be relevant in other, more economically important, contexts.



Introduction

- The first part of the paper focuses on uncovering ethnic in-group bias in referee penalty card decisions.
 - Ethnic in-group bias: The tendency to favor members of one's ethnic group.
 - Why penalty cards?
 - Referees enjoy a lot of discretion in making penalty card decisions, and this opens the door for bias.
 - Referee decisions about penalty cards have potentially major effects on game outcomes.
- The second part of the paper focuses on coaches' response to anticipated bias through the adjustment of the ethnic composition of the starting lineup.



Context

- Club football for men in Israel consists of 5 sets of leagues, organized in a hierarchical structure.
 - In total, there are 16 leagues and around 240 teams.
- In the games we study, there are typically 3 referees: 1 main referee and 2 assistant referees
 - The main referee is solely responsible for all major decisions, including about penalty cards.



Data

- The data used in this paper were scraped from the website of the Israel Football Association.
- They cover the universe of games played in all leagues over 15 seasons.
- To classify the ethnicity of players and referees, we rely on a name-based procedure similar to that used in Shayo and Zussman (2011) and other studies.
 - We are able to classify the ethnicity of 96 percent of the players and 100 percent of the referees.
 - The others are excluded from the analysis.



Referee Assignment

- The ability to credibly identify bias and the response to bias depends on the assumption that the assignment of referees to games is as good as random.
- Referees in all leagues are assigned to games by the Assignment Committee of the Referee Union.
- There is no publicly available official information on the procedures used by this committee.
- However, media interviews with committee members and other sources suggest that the ethnic makeup of the teams participating in a game is not taken into account.
- Our empirical [analysis](#) shows that the assignment of referees to games is indeed quasi-random.



In-group Bias in Referee Decisions

Referee Bias in Penalty Card Decisions

Dependent variable:	Yellow Card				Red Card			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Arab player	0.0179*** (0.0012)				0.0064*** (0.0004)			
Arab referee	-0.0004 (0.0026)	0.0016 (0.0027)			0.0021*** (0.0007)	0.0018** (0.0008)		
Arab player x Arab referee	-0.0102*** (0.0033)	-0.0114*** (0.0035)	-0.0113*** (0.0037)	-0.0100*** (0.0038)	-0.0021** (0.0011)	-0.0027** (0.0012)	-0.0033** (0.0013)	-0.0031** (0.0014)
Player FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Referee FE	No	No	Yes	Yes	No	No	Yes	Yes
Team FEs	No	No	No	Yes	No	No	No	Yes
Observations	595,621	567,027	567,027	566,961	595,621	567,027	567,027	566,961
R-Squared	0.0005	0.2133	0.2229	0.2439	0.0007	0.1903	0.1988	0.2202
Mean of dependent variable	0.1728	0.1747	0.1747	0.1747	0.0147	0.0147	0.0147	0.0147



Salience of Ethnicity

- A large body of research shows that in-group bias tends to increase when group membership is salient.
- To study whether this effect is present here, we leverage a special feature of the context.
- Since football teams represent specific localities and since Israel is characterized by ethnic residential segregation, teams are effectively identified with a particular ethnicity.
- [This](#) is so despite the fact that many Arab teams have Jewish players and vice versa.
- We classify the games analyzed in this paper as either cross-ethnicity – when one team is Arab and the other is Jewish – or same-ethnicity and assume that the salience of ethnicity is higher in cross-ethnicity games.



Salience of Ethnicity

Salience of Ethnicity and Referee Bias in Penalty Card Decisions

Dependent variable:	Yellow Card		Red Card	
Type of games:	Cross-ethnicity	Same-ethnicity	Cross-ethnicity	Same-ethnicity
	(1)	(2)	(3)	(4)
Arab Player x Arab referee	-0.0166*** (0.0061)	-0.0017 (0.0066)	-0.0067*** (0.0022)	-0.0003 (0.0021)
Player FE	Yes	Yes	Yes	Yes
Referee FE	Yes	Yes	Yes	Yes
Team FEs	Yes	Yes	Yes	Yes
Observations	242,987	281,845	242,987	281,845
R-Squared	0.3417	0.3000	0.3141	0.2872
Mean of dependent variable	0.1727	0.1775	0.0155	0.0138



Effect of Bias on Game Outcomes

- How does referee bias affect outcomes at the team-game level?
- It is important to realize that the analysis at the player-game level may miss an important aspect of bias.
- Consider a game between team j and team k : An increase in the number of team j players who match the ethnicity of the referee will not only lead a biased referee to show fewer penalty cards to team j players but also to show more penalty cards to team k players.
- Price and Wolfers (2010) call the former effect the *direct effect* and the latter effect the *indirect effect*. We are interested in estimating the *total effect*, which is the sum of the two effects.
 - The analysis is conducted with two observations for each game.



Effect of Bias on Game Outcomes

Effect of Referee Bias on Game-Level Outcomes

Dependent variable:	Yellow cards	Red cards	Goals	Points
	(1)	(2)	(3)	(4)
Arab starters x Arab referee (direct effect)	-0.0154*** (0.0051)	-0.0043** (0.0019)	0.0154*** (0.0056)	0.0111*** (0.0042)
Opponent Arab starters x Arab referee (indirect effect)	0.0126** (0.0052)	0.0059*** (0.0019)	-0.0057 (0.0056)	-0.0142*** (0.0043)
Total effect	-0.0280***	-0.0102***	0.0212***	0.0253***
P-value for test: total effect=0	0.0001	0.0000	0.0051	0.0025
Arab starters	Yes	Yes	Yes	Yes
Referee FE	Yes	Yes	Yes	Yes
Team FEs	Yes	Yes	Yes	Yes
Observations	56,184	56,184	56,184	56,184
R-Squared	0.3954	0.3407	0.5384	0.4247
Mean of dependent variable	2.1551	0.1846	1.6323	1.3950



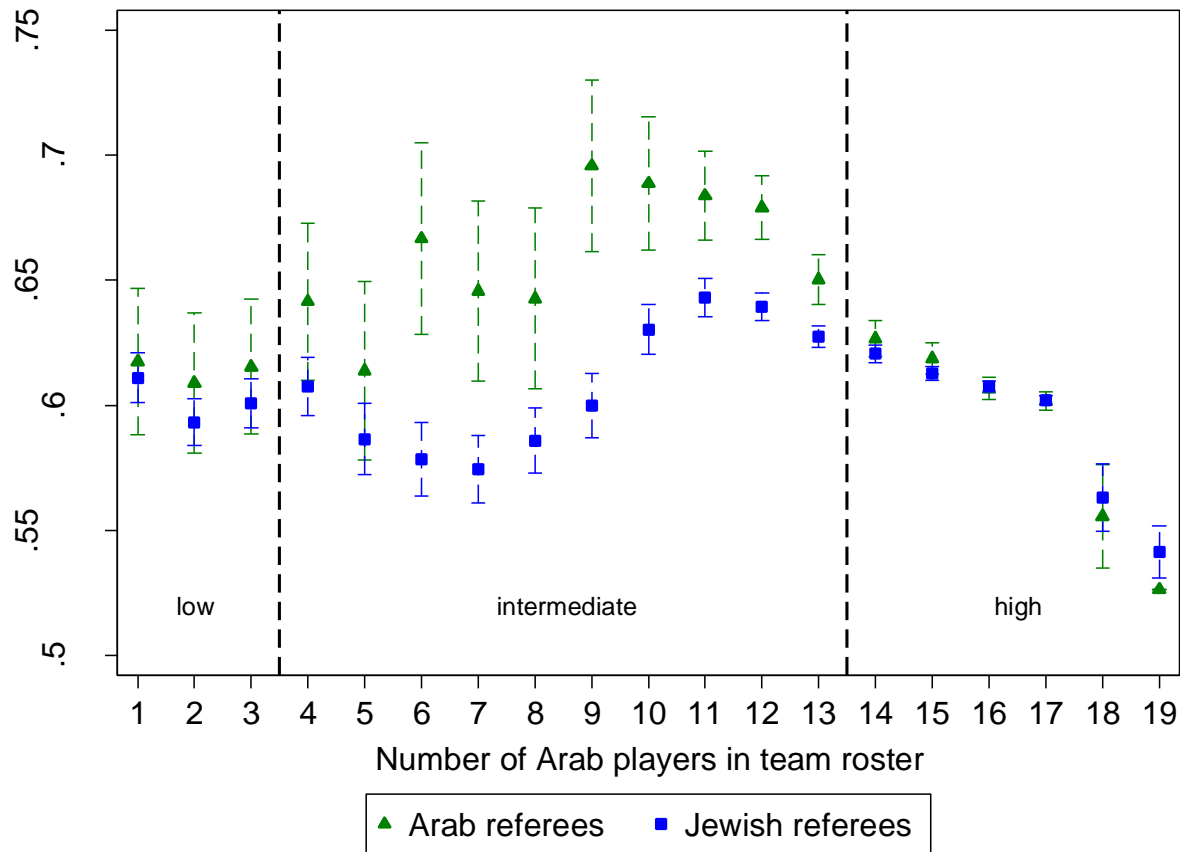
Responding to Bias

- The results presented so far suggest that referee bias incentivizes coaches to increase the number of players matching the ethnicity of the referee in the starting lineups of their teams.
- We restrict the analysis of starting lineup adjustment to teams which have in their rosters at least one Arab player and at least one Jewish player, since only in these cases can the adjustment of the starting lineup take place.
- We first study two key considerations in the adjustment:
 - Ethnic composition of roster: adjustment should be easier when the roster includes sufficiently large numbers of both Arab and Jewish players.
 - Player quality: adjustment should not involve star players.



Ethnic Composition of Roster

Referee Ethnicity and the Ethnic Composition of Starting Lineups



Ethnic Composition of Roster

Effect of Referee Ethnicity on Player Inclusion in the Starting Lineup

Dependent variable:	In Starting Lineup			
Number of Arab players on Roster:	All	Low	Intermediate	High
	(1)	(2)	(3)	(4)
Arab player x Arab referee	0.0095*** (0.0032)	0.0086 (0.0085)	0.0172*** (0.0057)	-0.0080 (0.0105)
Player FE	Yes	Yes	Yes	Yes
Referee FE	Yes	Yes	Yes	Yes
Team FEs	Yes	Yes	Yes	Yes
Observations	632,960	307,414	192,671	119,009
R-Squared	0.5208	0.5245	0.5610	0.5921
Mean of dependent variable	0.6380	0.6293	0.6554	0.6393



Player Quality

Lineup Adjustment by Scorer Status

Dependent variable:	In Starting Lineup				
	All	Non-scorers		Scorers	
Scorer status		No	Yes	No	Yes
Scoring adjustment		No	Yes	No	Yes
	(1)	(2)	(3)	(4)	(5)
Arab player x Arab referee	0.0097*** (0.0035)	0.0124*** (0.0040)	0.0114*** (0.0040)	-0.0031 (0.0081)	0.0021 (0.0082)
Player FE	Yes	Yes	Yes	Yes	Yes
Referee FE	Yes	Yes	Yes	Yes	Yes
Team FEs	Yes	Yes	Yes	Yes	Yes
Observations	547,357	425,248	419,151	121,863	127,938
R-Squared	0.4803	0.4967	0.4998	0.4826	0.4743
Mean of dependent variable	0.6905	0.6946	0.6964	0.6762	0.6712



Extent of Anticipated Bias

- Do coaches adjust the ethnic composition of the starting lineup merely based on a simple rule of thumb – increase the number of starters who match the ethnicity of the referee – or rather use a more sophisticated thought process that is based on the anticipated extent of bias?
- We provide two pieces of evidence in support of the latter alternative.
- First, we show that the lineup adjustment in response to the ethnic identity of the assigned referee is stronger when the salience of ethnicity and therefore the extent of anticipated bias are high, i.e. in cross-ethnicity games.



Salience of Ethnicity

Salience of Ethnicity and Starting Lineup Decisions

Dependent variable:	In Starting Lineup							
Number of Arab players on Roster:	All		Low		Intermediate		High	
Type of games:	Cross-ethnicity	Same-ethnicity	Cross-ethnicity	Same-ethnicity	Cross-ethnicity	Same-ethnicity	Cross-ethnicity	Same-ethnicity
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Arab player x Arab referee	0.0156** (0.0061)	0.0094* (0.0048)	0.0130 (0.0167)	0.0090 (0.0107)	0.0281*** (0.0097)	0.0136 (0.0090)	-0.0004 (0.0217)	-0.0111 (0.0127)
Player FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Referee FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Team FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	201,522	401,107	59,876	229,519	90,454	89,347	39,372	69,398
R-Squared	0.5816	0.5400	0.6062	0.5309	0.5920	0.5982	0.6448	0.6147
Mean of dependent variable	0.6536	0.6369	0.6599	0.6256	0.6551	0.6644	0.6490	0.6429



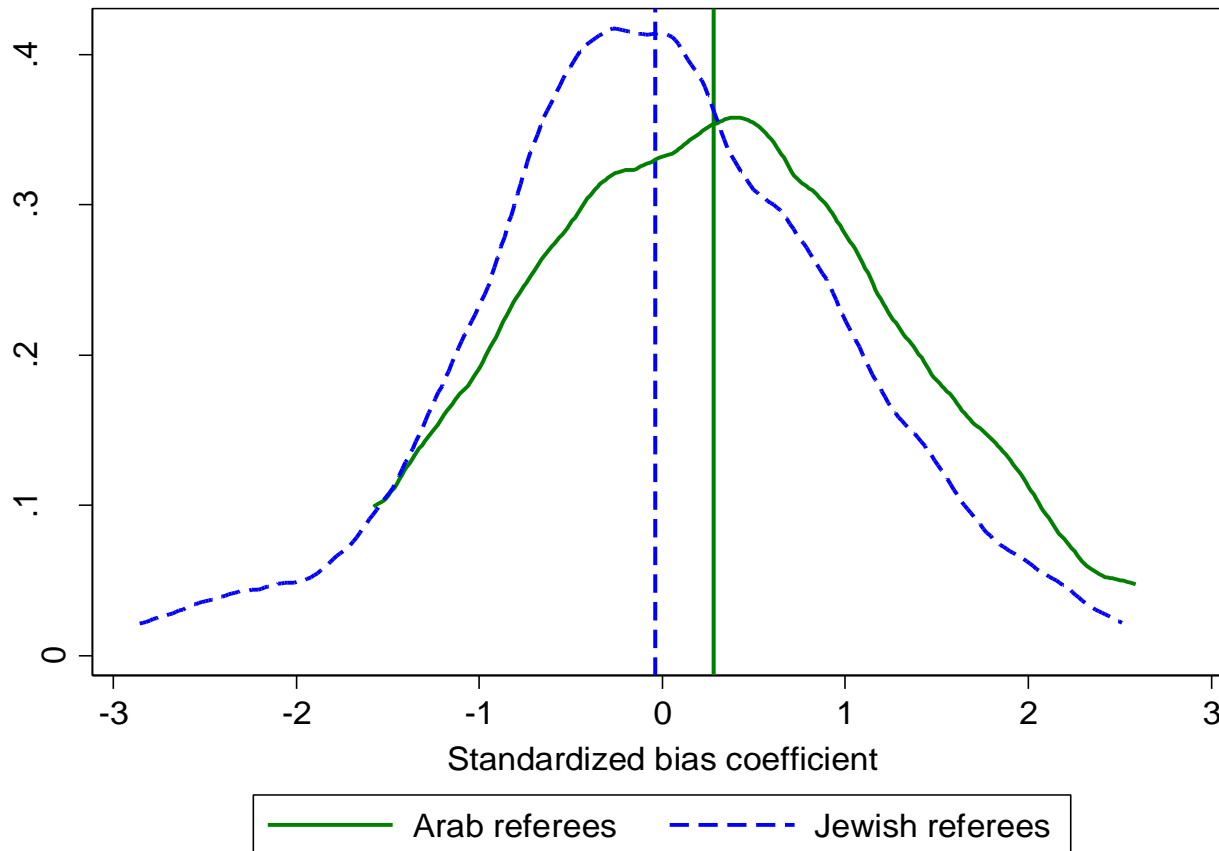
Referee-Specific Bias

- Second, we use a two-step procedure to show that coaches respond to anticipated referee-specific bias.
- In the first step, we use the individual level data to measure ethnic bias in refereeing by regressing, for each referee separately, an indicator taking the value of one when the referee shows a player a yellow card on an indicator for Jewish players.
 - The coefficient on the explanatory variable is a rough measure of (relative) bias: high values imply bias in favor of Arab players.
 - In order to improve precision, we focus on estimates obtained for referees who refereed at least 50 games.
 - We focus on yellow cards rather than on red cards because yellow cards are shown an order of magnitude more frequently than red cards and because at the team-game level we find evidence of bias in both cross- and same-ethnicity games.



Referee-Specific Bias

Distribution of Referee Bias



Referee-Specific Bias

- In the second step of the procedure, we use individual level data to estimate the effect of measured referee bias on starting lineup decisions.
- We divide Arab and Jewish referees into those exhibiting most in-group bias and others and then examine whether coaches increase the number of Arab starters more when facing Arab referees who exhibit most in-group bias relative to when facing Jewish referees who exhibit most in-group bias.



Referee-Specific Bias

Strength of Referee Bias and Starting Lineup Decisions

Dependent variable:	In Starting Lineup				
Percentile threshold:	50	40	30	20	
	(1)	(2)	(3)	(4)	(5)
Arab player x Arab referee	0.0108*** (0.0041)				
Arab player x High bias		0.0117** (0.0057)	0.0133** (0.0062)	0.0157** (0.0069)	0.0171** (0.0084)
Arab player x Low bias		-0.0028 (0.0027)	-0.0019 (0.0029)	-0.0032 (0.0032)	-0.0039 (0.0039)
Difference		0.0145**	0.0153**	0.0189***	0.0210**
P-value		0.0120	0.0188	0.0096	0.0193
Player FE	Yes	Yes	Yes	Yes	Yes
Referee FE	Yes	Yes	Yes	Yes	Yes
Team FEs	Yes	Yes	Yes	Yes	Yes
Observations	454,373	454,373	454,373	454,373	454,373
R-Squared	0.5324	0.5324	0.5324	0.5324	0.5324
Mean of dependent variable	0.6305	0.6305	0.6305	0.6305	0.6305



Conclusion

- How do agents who anticipate being affected by bias respond to it?
- We address this question by studying the decisions of referees and coaches in Israeli football leagues.
- Analysis at the player-game level yields robust evidence of ethnic in-group bias in referee penalty card decisions.
- This bias is much stronger when the salience of ethnicity in the game is high (cross-ethnicity games).
- Referee bias has a meaningful effect on game level outcomes.



Conclusion

- Coaches respond to anticipated bias by including in the starting lineups of their teams more players who match the ethnicity of the referee.
- This adjustment depends on several factors:
 - Adjustment is stronger when the team's roster includes sufficiently large numbers of both Arab and Jewish players.
 - Adjustment does not involve star players.
 - Adjustment is stronger in situations in which stronger bias is anticipated:
 - When the salience of ethnicity is high.
 - When a more biased referee is assigned to the game.



Related Literature

- Literature on in-group bias.
 - A large literature in psychology, based on lab experiments.
 - Some research using natural experiments shows evidence of in-group bias in different market and non-market contexts.
 - Within this literature, a small number of papers study racial and ethnic in-group bias in sport refereeing (e.g. NBA and MLB).
- Literature on discrimination.
 - It has long been recognized theoretically that anticipation of bias changes agents' behavior.
 - However, empirical evidence on such behavior is rare.



Data

ליגה א' דרום מחזור 8

פרטי המשחק

הפ' מרמורק רחובות חיים	21:30 30/10/2022 1 : 1 מחצית: 1 : 1 פתח תקוה מושבה דרומי	הפ' בקעת הירדן
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שערים: שכטר ענר 33

שערים: סולר יוסי אנבנאו 11

מהלך משחק

הרכב

אורחת

ביתית

הרכב פותח

מס' 1

נדב מדינה - (GK)

מס' 3

אורי אשרם
55 ↓ 40

מס' 4

אלעד אשרם

מס' 5

שון קלימקין

מס' 7

ים כהן

מס' 1

אופק עברי - (GK)

מס' 5

רוני ספקטור

מס' 6

ירדן אזולאי - (C)

מס' 7

מישל חורי
78

מס' 8

תום איידה
81 ↓



Data

מס' 8 דני רוזנבלט - (C) 81 ↓	מס' 9 שחר ביליטי 81 ↓
מס' 11 רוי צעירי 85 ↓ 50	מס' 11 יוסי אגננאו סליך 11
מס' 16 יונתן אשכנזי 61 ↓	מס' 12 דניאל דרסיין טסאו 45 ↓
מס' 19 אור כהן גרינברג 45 ↓	מס' 14 יובל אורן 45 ↓
מס' 20 ענר שכטר 70 ↓ 41 33	מס' 19 ניר גואטה 33
מס' 77 אינדאלאו אשר מרשה 33	מס' 23 איתן קומיסרוב 33

מחליפים

מס' 12 אמיר תלמי 55 ↑	מס' 10 חיים יוסף 45 ↑
מס' 10 בן אמסלם 61 ↑	מס' 26 טמסגן טואבה 45 ↑
מס' 99 בר סויסה 70 ↑	מס' 16 יאן נבראל בנבניסטי 81 ↑
מס' 9 עידו שחואל בנבניסטי 85 ↑	מס' 4 לני יוסף יהושוע טייב 81 ↑



Data

לא שותפו

מס' 6
בן אלול

מס' 17
לוקאס אומנסקי

מס' 21
יעקב אנדרו לובינגר

מס' 55
ירין יהונתן בן סיני

מס' 66
גיא פרגן

מס' 17
עמית מניסקו

מס' 20
אור בוקריס

מס' 24
סער אלמוזנינו

מס' 29
אור טזוז דרבה

מס' 77
אברהם פרטוש

מאמן

מס' n
דוד מרטן

מס' n
חנן אזולאי

שופטים

עמר הדר
ע. שופט 2

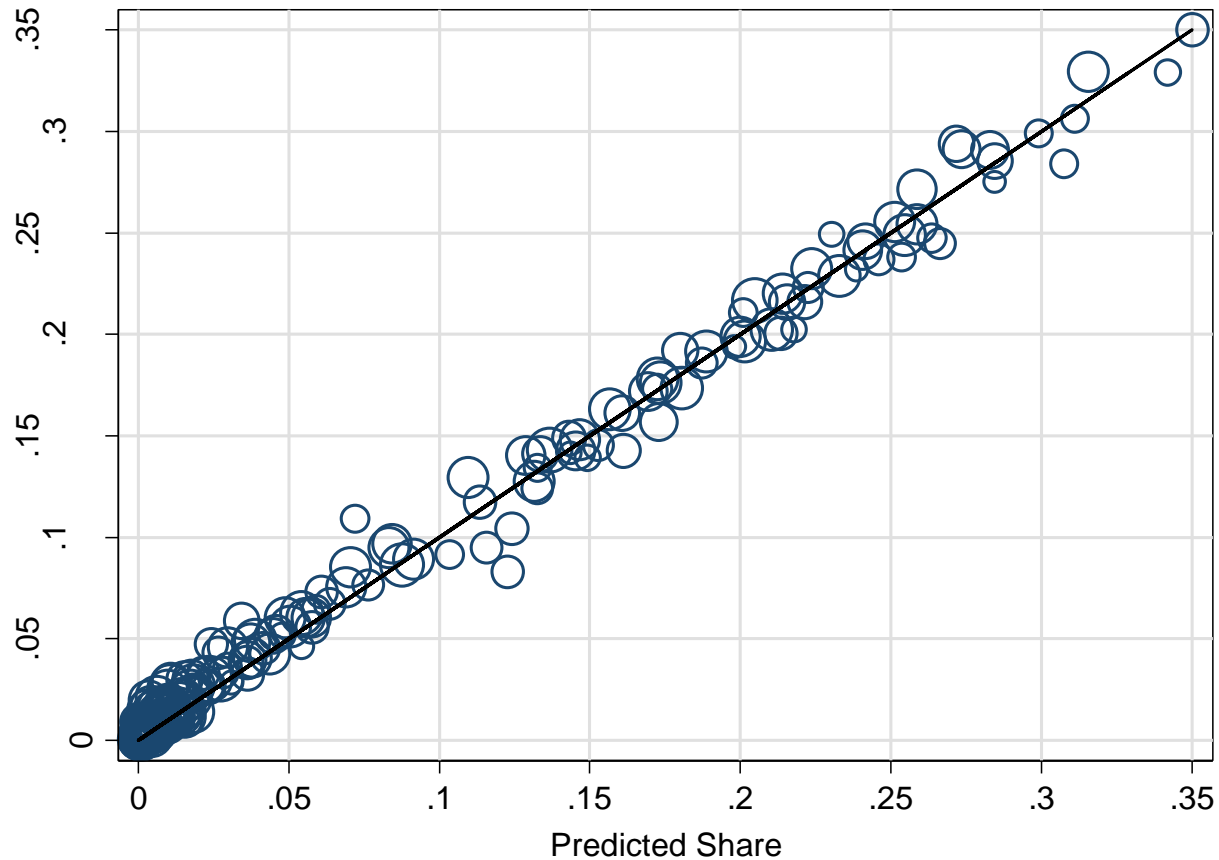
סעד סתיו
ע. שופט 1

מרגי עמית
שופט ראשי



Referee Assignment

Quasi-Random Assignment of Referees to Games



Summary Statistics

Summary Statistics at the Player-Game Level

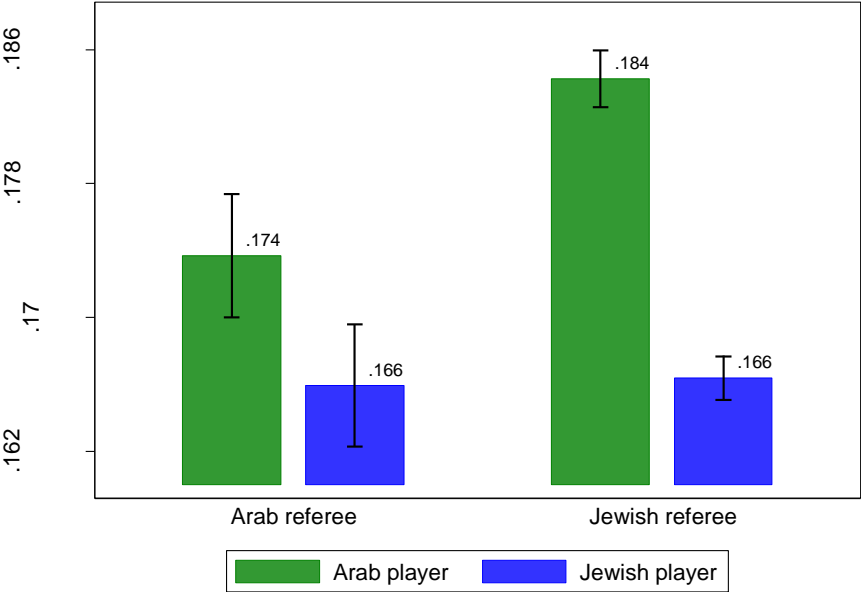
	N	Mean	St. Dev
Yellow card	595,621	0.1728	0.3781
Red card	595,621	0.0147	0.1203
Goals scored	595,621	0.1273	0.4066
Arab referee	595,621	0.1350	0.3417
Arab referee 2	588,440	0.2049	0.4037
Arab referee 3	588,301	0.2076	0.4056
Arab team	595,621	0.4216	0.4938
Arab coach	528,527	0.3217	0.4671
Cross-ethnicity game	595,621	0.4379	0.4961



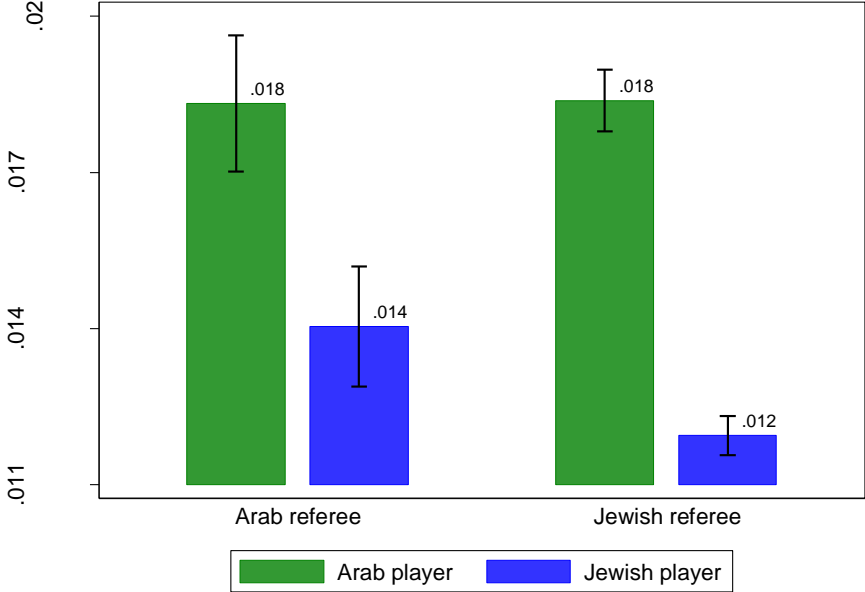
In-group Bias in Referee Decisions

Ethnic In-group Bias in Referee Penalty Card Decisions

Panel A: Yellow cards



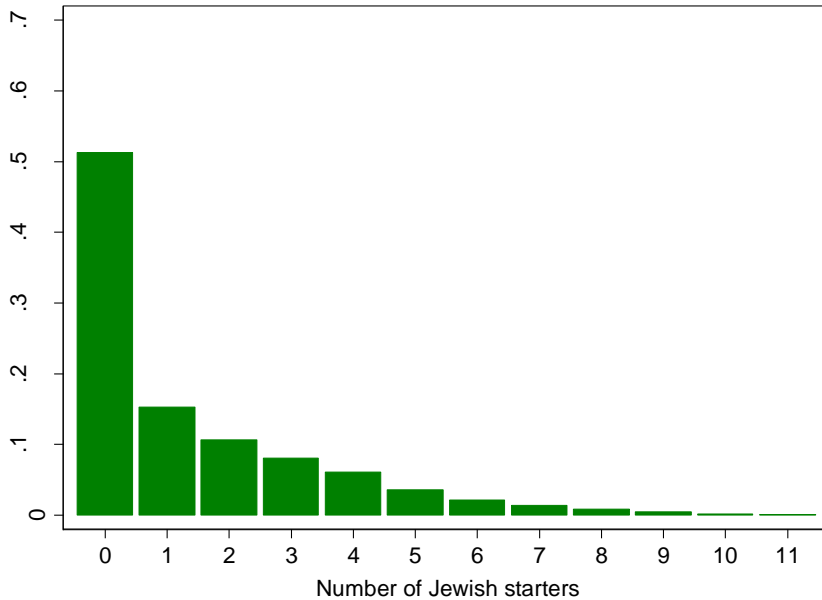
Panel B: Red Cards



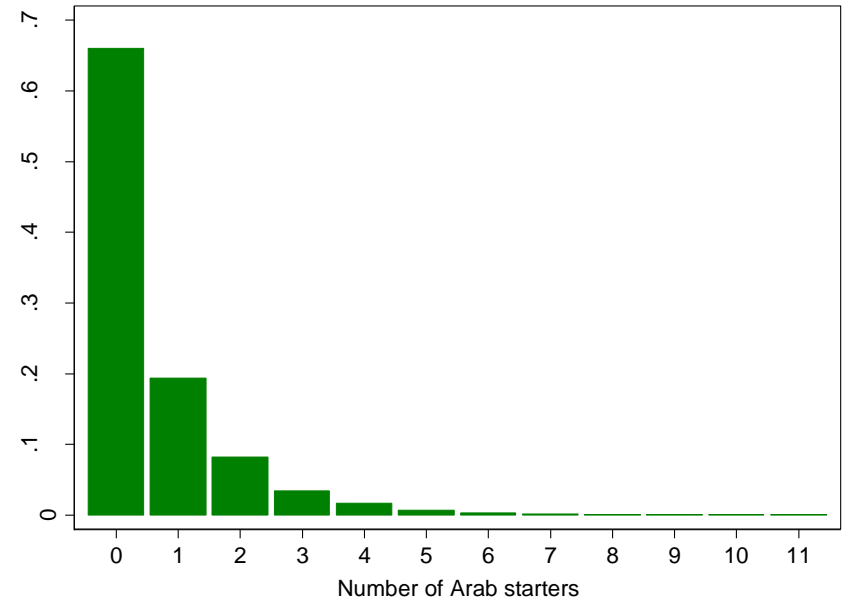
Salience of Ethnicity

Ethnic Composition of Starting Lineups

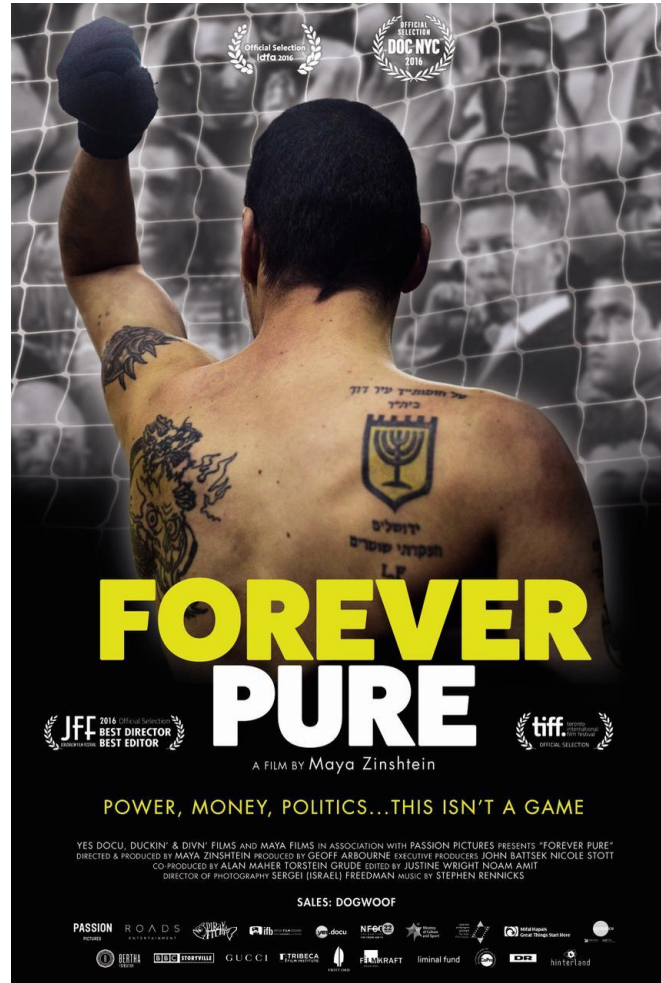
Panel A: Number of Jewish starters in Arab Teams



Panel B: Number of Arab starters in Jewish Teams



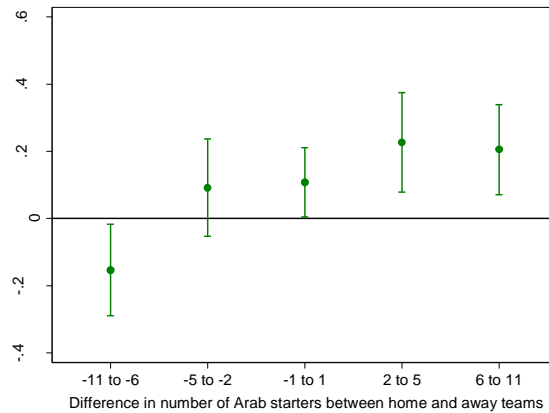
Salience of Ethnicity



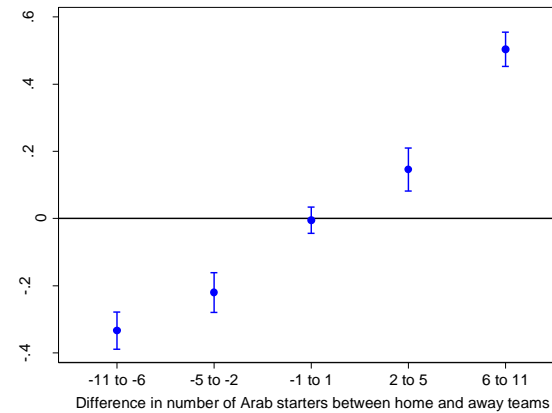
Effect of Bias on Game Outcomes

Referee Bias in Penalty Card Decisions: Game Level Analysis

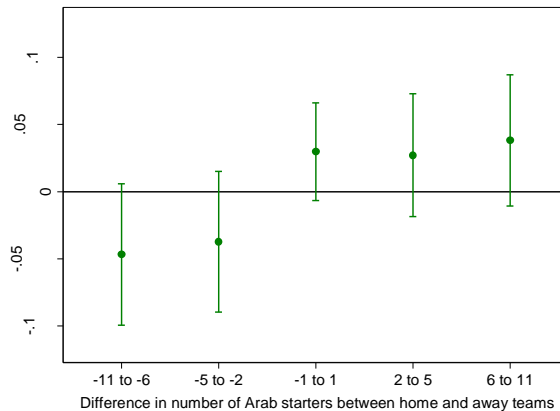
Panel A: Yellow Cards – Arab Referees



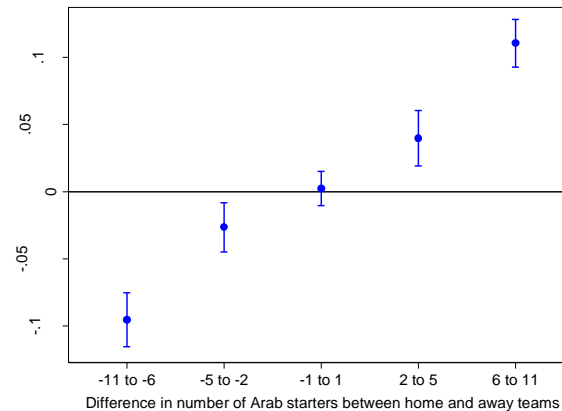
Panel B: Yellow Cards – Jewish Referees



Panel C: Red Cards – Arab Referees



Panel D: Red Cards – Jewish Referees



Effect of Bias on Game Outcomes

Effect of Referee Bias on Game-Level Outcomes by Type of Game

Type of Games:	Cross-ethnicity				Same-ethnicity			
Dependent variable:	Yellow cards	Red cards	Goals	Points	Yellow cards	Red cards	Goals	Points
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Arab starters x Arab referee	-0.0709*** (0.0180)	-0.0085 (0.0065)	0.0139 (0.0195)	0.0074 (0.0064)	-0.0321** (0.0141)	-0.0001 (0.0048)	-0.0040 (0.0138)	-0.0064 (0.0155)
Opponent Arab starters x Arab referee	-0.0507*** (0.0174)	0.0022 (0.0065)	-0.0180 (0.0194)	-0.0232*** (0.0064)	0.0287** (0.0134)	0.0023 (0.0047)	0.0206 (0.0142)	0.0079 (0.0157)
Total effect	-0.0202**	-0.0107***	0.0319***	0.0306***	-0.0608***	-0.0024	-0.0246	-0.0143
P-value for test: total effect=0	0.0153	0.0006	0.0010	0.0030	0.0140	0.7757	0.3265	0.6455
Arab starters	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Referee FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Team FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,174	22,174	22,174	22,174	30,236	30,236	30,236	30,236
R-Squared	0.5905	0.5468	0.6701	0.5572	0.4915	0.4583	0.6213	0.4686
Mean of dependent variable	2.0966	0.1997	1.7700	1.4062	2.2011	0.1721	1.5192	1.3865



Ethnic Composition of Roster

Effect of Referee Ethnicity on the Ethnic Composition of the Starting Lineup

Dependent variable:	No. of Arab Starters / No. of Arab Players on Team Roster			
Number of Arab players on Team Roster:	All	Low	Intermediate	High
	(1)	(2)	(3)	(4)
Arab referee	0.0111** (0.0044)	0.0109 (0.0110)	0.0148*** (0.0052)	0.0010 (0.0024)
Team FEs	Yes	Yes	Yes	Yes
Observations	38,568	17,239	10,578	5,451
R-Squared	0.4836	0.5269	0.6772	0.6520
Mean of dependent variable	0.6122	0.6050	0.6137	0.6127

