Appendix to Corrigendum

Picchio, M. and J.C. van Ours (2024), The impact of high temperatures on performance in work-related activities, *Labour Economics*, 87, 102509, https://doi.org/10.1016/j.labeco.2024.102509.

1. **What happened:** In March 2025, we realized that our analysis is affected by a measurement error in our climate and air pollution variables. We erroneously assumed that these were recorded at 3 pm local time, whereas they were actually at 3 pm UTC (Coordinated Universal Time).

2. **The consequences:** In the analysis, the temperature effect is identified using temperatures in deviation from the tournament-edition mean. To the extent that the deviations are dependent on the local hour of the day, our mistake introduces a measurement error which increases with the distance of the tournament location from Greenwich.

3. **What was done:** We replicated all analyses in our paper.

4. **In this note:** we first show – without discussion – the main differences in temperature effects between the revision and the original paper. The parameter estimates are barely affected, and our main conclusions remain unchanged. Next, we report and discuss all the tables and figures from the original paper, now using the correct data.

1 Highlighting Differences Revision and Original Paper

Table 1: Descriptive temperature (°C)

	Mean	Std. Dev.	Min.	Max.
Revision	23.159	5.044	10.912	36.729
Original paper	20.543	4.630	8.871	31.444

Table 2: Effects Temperature on Performance

	First serve made rate (%)	Double fault rate (%)	Second serve made rate (%)
Revision	-0.1098***	0.0421***	-0.0755***
Original paper	-0.1061***	0.0365***	-0.0643***

Table 3a: Temperature effects with inclusion of wind speed and air pollution

	First serve made rate (%)	Double fault rate (%)	Second serve made rate (%)
Revision	-0.0937***	0.0376***	-0.0691***
Original paper	-0.0900***	0.0363***	-0.0681***

Table 4: Effect heterogeneity

		First serve made rate (%)	Double fault rate (%)	Second serve made rate (%)
a. Effect by gender (male is the reference)				
Revision	Temperature	-0.1075***	0.0421***	-0.0809***
	Temperature × female	-0.0054	0.00001	0.0127
Original paper	Temperature	-0.1076***	0.0404***	-0.0770***
	Temperature × female	-0.0038	-0.0071	0.0263
d. Effect by tournament round (before quarterfinal is the reference)				
Revision	Temperature	-0.1155***	0.0431***	-0.0753***
	Temp × quarterfinals or later	0.0329**	-0.0056	-0.0008
Original paper	Temperature	-0.1134***	0.0383***	-0.0658***
	Temp × quarterfinals or later	0.0422**	-0.0045	-0.0035

Table 5: Cumulative estimates of temperature effect

		First serve made rate (%)	Double fault rate (%)	Second serve made rate (%)
Revision	Current temperature $\widehat{\alpha}_0$	-0.1194***	0.0420***	-0.0737***
	Temperature previous match $\widehat{\alpha}_1$	0.0236*	-0.0079*	0.0104
	$\widehat{\alpha}_0 + \widehat{\alpha}_1$	-0.0958***	0.0342***	-0.0634***
	H_0: $\alpha_0 = \alpha_1 = 0$, p-value=	0.0000	0.0000	0.0000
Original paper	Current temperature $\widehat{\alpha}_0$	-0.1211***	0.0374***	-0.0595***
	Temperature previous match $\widehat{\alpha}_1$	0.0285*	-0.0056	0.0078
	$\widehat{\alpha}_0 + \widehat{\alpha}_1$	-0.0926***	0.0318***	-0.0517***
	H_0: $\alpha_0 = \alpha_1 = 0$, p-value=	0.0000	0.0000	0.0047

Table B1: Estimation results temperature effect indoor matches

	First serve made rate (%)	Double fault rate (%)	Second serve made rate (%)
Revision	-0.0522***	0.0088	-0.0078
Original paper	-0.0542***	0.0160	-0.0271

Table C1: Estimation results temperature effect by gender

	Men			*Women*		
	First serve made rate (%)	Double fault rate (%)	Second serve made rate (%)	First serve made rate (%)	Double fault rate (%)	Second serve made rate (%)
Revision	-0.1066***	0.0421***	-0.0811***	-0.1140***	0.0419***	-0.0673***
Original paper	-0.1069***	0.0404***	-0.0773***	-0.1052***	0.0333***	-0.0507**

Table C4: Effects of temperature on tournament-edition FE

Dependent variable:	First serve made rate (%)	Double fault rate (%)	Second serve made rate (%)
Revision	0.0470**	-0.0204**	0.0398**
Original paper	0.0229	-0.0084	0.0158

2 All tables and graphs redone

Below, we report all the tables and figures from the original paper, now obtained using the correct data. Changes in the significance of estimation results are highlighted in red. The number of observations increased by 66 in the computation of the summary statistics and by 60 in the regression analysis (after excluding singleton observations due to the fixed effects used in the regression analysis). This is because we had to reapply all the sample selection criteria, one of which involves keeping observations between the first and last percentile of the temperature distribution. As a result, the sample composition differs slightly. Another difference is that temperature, dew point temperature, and wind speed are now all obtained from the "ERA5 hourly time-series data on single levels from 1940 to present", a new Copernicus project launched on March 17, 2025.[1] The main advantage compared to the previously used "ERA5-Land hourly data from 1950 to present"[2] is that it allows for the extraction of time series at an exact location within a $0.25° \times 0.25°$ grid. However, a drawback is that the older dataset had a finer resolution ($0.1° \times 0.1°$).

- Table 1 has been updated. All the statistics have been updated because the sample changed marginally. We indeed removed observations in the first and last percentile of the temperature distribution. Since the temperature variable was affected by the measurement error problem (measured at 3 pm UTC instead of local time), when we replaced it with temperature measured at 3 pm local time, the selection based on the first and last percentile of the temperature distribution generated a slightly different sample and a slightly different sample size (135,012 instead of 134,946).
- Figure 1: graphs a-c have been updated and very similar to the old ones.
- Figure 2: graphs a-d have been updated. They are similar to the old ones and, especially those more affected by the measurement error, i.e. Australian Open and US Open (graphs a and d).
- Table 2 has been updated. All the point estimates are very close to the old ones.
- Figure 3: graphs a-c have been updated. New graphs are extremely similar to the old ones.

[1] https://cds.climate.copernicus.eu/datasets/reanalysis-era5-single-levels-timeseries?tab=overview (last accessed on April 1, 2025).

[2] https://cds.climate.copernicus.eu/datasets/reanalysis-era5-land?tab=overview (last accessed on April 1, 2025).

- Table 3 has been updated: the estimates are very similar to the previous ones. The only difference is that the coefficient for $PM_{2.5}$ is now significantly different from zero. In the old version, we lost 40 observations of male matches played on January 1, 2003, because data from the global greenhouse gas reanalysis (EGG4) of the Copernicus Atmosphere Monitoring Service was only available starting from January 2, 2003. Now, data for January 1, 2003, is also available, and we have recovered those 40 observations. The only noteworthy difference compared to the previous estimates is the negative impact of ozone on the second serve made rate. In the old version, this effect was significant at the 10% level, whereas it is now significant at the 1% level. This results from a larger point estimate in absolute value and smaller standard error.

- Table 4 has been updated. All the heterogeneity results are very similar to the old ones. Two coefficients were significant at 5% and now are no longer significant (the interaction between temperature and the dummy for Gand Slam tournaments for the double fault rate and the interaction between temperature and the dummy for age between the 33th and 66th percentiles of the age distribution for the second serve made rate). The coefficient of the interaction between temperature and age between the 33th and 66th percentiles of the age distribution for the first serve made rate was not significantly different from 0 and now it is. Young's (2019) tests for the null hypothesis of complete insignificance of heterogeneous effects yield the same conclusion as in the old version: overall, the heterogeneous effects are insignificant.

- Table 5 updated and all the results very similar to the old ones.

- Figures A.1 and A.2 have been updated and are extremely similar to the old ones.

- Figures B.1 and B.2 and Table B.1 have been updated and are very similar to the old ones.

- Table C.1 and Figure C.1 have been updated and are almost undistinguishable from the old ones.

- Table C.2 has been updated. Some pairwise correlations switched signed, especially those involving ozone and $PM_{2.5}$. For example, ozone and $PM_{2.5}$ are now positively correlated and both negatively correlated with wind speed.

- Table C.3 has been updated and all the point estimates are very similar to the old ones. There has been no change in the significance levels.

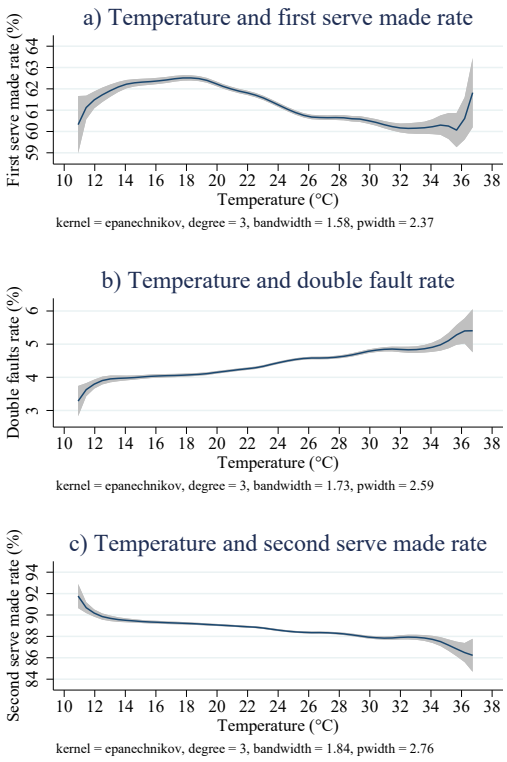
- Figure C.2 has been updated and is extremely similar to the old one.
- Figure C.3 Table C.4 have been updated. In Figure C.3, the increasing trend in temperature over time is more pronounced than in the older version. The estimates in Table C.4 show that the unexplained components of the performance indicators are significantly and positively correlated with the tournament-edition average temperature.

Table 1: Summary statistics

	Mean	Std. Dev.	Min.	Max.
a) Outcome variables				
First serve made rate (%)	61.426	8.367	0.000	100.000
Double fault rate (%)	4.375	3.246	0.000	37.705
Second serve made rate (%)	88.707	8.084	0.000	100.000
b) Covariates				
Temperature (°C)	23.159	5.044	10.912	36.729
Female	0.418	0.493	0.000	1.000
Best of 5 sets	0.136	0.343	0.000	1.000
Age (years at tournament start)	25.973	4.085	14.100	46.900
|Difference in players' ATP/WTA ranking|	69.640	105.162	1.000	2090.000
Sum in player's ATP/WTA ranking	148.582	137.269	3.000	2646.000
Playing home[(a)]	0.120	0.325	0.000	1.000
Round				
Less than quarterfinal	0.844	0.362	0.000	1.000
Quarterfinal	0.090	0.286	0.000	1.000
Semifinal	0.044	0.206	0.000	1.000
Final	0.022	0.146	0.000	1.000
Tournament series[(b)]				
Grand Slam[(c)]	0.233	0.423	0.000	1.000
ATP/WTA 1000	0.295	0.456	0.000	1.000
ATP/WTA 500	0.222	0.415	0.000	1.000
ATP/WTA 250	0.250	0.433	0.000	1.000
Surface				
Grass	0.132	0.338	0.000	1.000
Clay	0.351	0.477	0.000	1.000
Hard	0.517	0.500	0.000	1.000
Quarter				
January-February-March	0.290	0.454	0.000	1.000
April-May-June	0.343	0.475	0.000	1.000
July-August-September	0.324	0.468	0.000	1.000
October-November-December	0.044	0.205	0.000	1.000
# of observations[(d)]	135,012			

[(a)] The variable 'Playing home' is a dummy indicator equal to 1 if the nationality of the player matches the country where the match is played, 0 otherwise.
[(b)] These indicators are not used as covariates in models with tournament fixed effects because they are time constant within tournaments.
[(c)] We included in the category Grand Slam also the 30 matches of the 2003 and 2004 editions of the male Masters Cup, which were exceptionally played outdoors in Houston.
[(d)] Since in 9 cases there were no faults in the first serve in the whole match, we could not compute the second serve made rate. The number of observations for the second serve made rate is therefore 135,003.

Figure 1: Kernel-weighted local polynomial smoothing of the relation between temperature and tennis performance



Notes: This figure is obtained using 134,946 player-level observations. The gray areas are 95% confidence intervals.

Figure 2: Temperature deviations from tournament edition mean during 2019 ATP Grand Slams tournaments

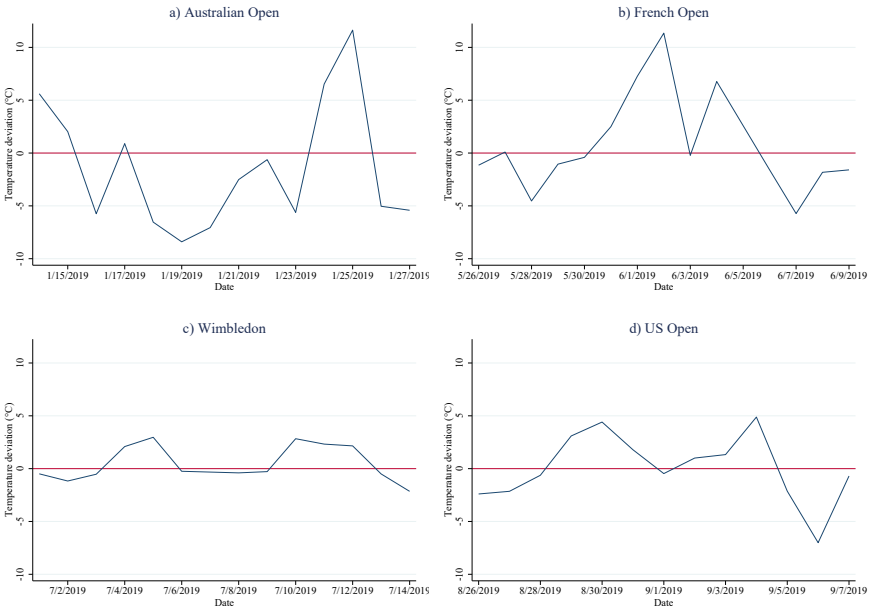


Table 2: Estimation results of tennis performance Equation (5)

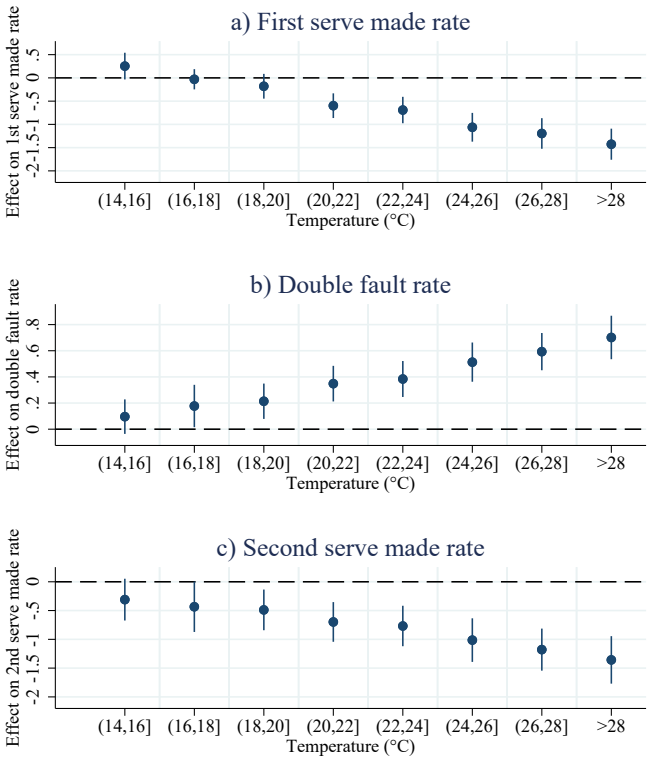
Dependent variable:	(1) First serve made rate (%)	(2) Double fault rate (%)	(3) Second serve made rate (%)
Temperature at 3 pm (°C)	-0.1098***	0.0421***	-0.0755***
	(0.0101)	(0.0044)	(0.0105)
Best of 5 sets	-0.3411	0.3226*	-0.9314**
	(0.6776)	(0.1761)	(0.3794)
Ranking difference[a]	-0.1786***	0.0280	-0.0082
	(0.0621)	(0.0224)	(0.0507)
Ranking sum/100	0.2002***	-0.0070	-0.0565
	(0.0652)	(0.0212)	(0.0481)
Home advantage	0.0253	-0.0269	0.0369
	(0.0979)	(0.0328)	(0.0801)
Round - Reference: Before quarterfinal			
Quarterfinal	0.6658***	-0.2616***	0.4866***
	(0.1090)	(0.0434)	(0.1008)
Semifinal	1.0067***	-0.4471***	0.7818***
	(0.1799)	(0.0753)	(0.1630)
Final	1.4308***	-0.6059***	1.2099***
	(0.2728)	(0.1078)	(0.2310)
# of observations[b]	134,158	134,158	134,149
# of players[b]	1,728	1,728	1,728
# of tournaments	152	152	152
Adjusted R^2	0.3012	0.2605	0.2425

* p-value$<$0.10, ** p-value$<$0.05, *** p-value$<$0.01. Two-way clustered standard errors are in parenthesis; clusters are at the level of tournaments and players. In the continuous spline specifications of the temperature function, the Wald test for the joint significance of the slope changes at the different knots returned p-values equal to 0.004 for Model (1), 0.065 for Model (2), 0.127 for Model (3). All the models include player FE, opponent FE and tournament-edition FE. They also include dummies for the day of the week, for the quarter of the year and a flexible specification for age (yearly dummies apart from those younger then 19 and those older than 35 grouped into single dummies). The corresponding parameters are not reported for the sake of brevity and they are available from the authors upon request. Young's (2019) randomization-t p-value for Westfall-Young multiple testing of the null of complete insignificance of temperature across equations is 0.0009 (1,000 randomization iterations).

[a] The ranking difference is the absolute value of the difference in the ATP/WTA rankings divided by 100.

[b] The number of observations are smaller than those reported in Table 1 because, when estimating the model with tournament-edition, player FE and opponent FE, 854 players were not used in the estimation because singleton observations.

Figure 3: Non linear effect of temperatures on tennis performance



Notes: The reference category is temperature below 14°C. Estimation results of the parameters of the other regressors are available from the authors upon request. The number of observations is the same as those reported in Table 2. Segments are 95% confidence intervals computed with two-way clustered standard errors; clusters are at the level of tournaments and players.

Table 3: Estimation results with air quality controls

Dependent variable:	(1) First serve made rate (%)	(2) Double fault rate (%)	(3) Second serve made rate (%)
a) Wind speed and air pollution as further controls			
Temperature at 3 pm (°C)	-0.0937***	0.0376***	-0.0691***
	(0.0100)	(0.0039)	(0.0097)
Wind speed at 3pm (m/sec)	0.0589***	0.0219***	-0.0776***
	(0.0162)	(0.0074)	(0.0195)
$PM_{2.5}$ at 3pm (mg/m^3)	1.1519	-1.7464*	4.1529**
	(1.9317)	(0.8845)	(1.9525)
O_3 at 3pm (mg/kg)	-4.4108**	3.0830***	-6.4992***
	(1.8113)	(0.6575)	(1.6269)
b) Humidex index instead of temperature			
Humidex index at 3 pm (°C)	-0.0751***	0.0254***	-0.0426***
	(0.0076)	(0.0035)	(0.0087)
# of observations[(b)]	134,158	134,158	134,149
# of players[(b)]	1,728	1,728	1,728
# of tournaments	152	152	152

* p-value$<$0.10, ** p-value$<$0.05, *** p-value$<$0.01. Two-way clustered standard errors are in parenthesis; clusters are at the level of tournaments and players. All the models also include player FE, opponent FE, tournament-edition FE and all the other covariates included in the benchmark specification. The corresponding parameters are not reported for the sake of brevity and they are available from the authors upon request.

Table 4: Effect heterogeneity

Dependent variable:	(1) First serve made rate (%)	(2) Double fault rate (%)	(3) Second serve made rate (%)
a. Effect by gender (male is the reference)			
Temperature 3 pm	-0.1075***	0.0421***	-0.0809***
	(0.0010)	(0.0010)	(0.0010)
Temperature 3 pm× female	-0.0054	0.00001	0.0127
	(0.9431)	(0.9970)	(0.8392)
b. Effect by surface (hard or grass is the reference)			
Temperature 3 pm	-0.1113***	0.0425***	-0.0729***
	(0.0010)	(0.0010)	(0.0150)
Temperature 3 pm× clay	0.0043	-0.0010	-0.0074
	(0.9431)	(0.9780)	(0.8661)
c. Effect by tournament series (non Grand Slam tournament is the reference)			
Temperature 3 pm	-0.1075***	0.0364***	-0.0582***
	(0.0010)	(0.0010)	(0.0010)
Temperature 3 pm × Grand Slam tournaments	-0.0060	0.0150	-0.0451***
	(0.9431)	(0.1099)	(0.0100)
d. Effect by tournament round (before quarterfinal is the reference)			
Temperature 3 pm	-0.1155***	0.0431***	-0.0753***
	(0.0010)	(0.0010)	(0.0010)
Temperature 3 pm × quarterfinals or later	0.0329**	-0.0056	-0.0008
	(0.0250)	(0.3956)	(0.9151)
e. Effect by ATP/WTA player's ranking (not in the top 50% is the reference)[(a)]			
Temperature 3 pm	-0.1202**	0.0452***	-0.0789***
	(0.0010)	(0.0010)	(0.0010)
Temperature 3 pm × in the top 50%	0.0200	-0.0059	0.0067
	(0.1239)	(0.5924)	(0.8661)
f. Effect by age (age $\geq P_{66}$ is the reference)[(b)]			
Temperature 3 pm, age	-0.1300***	0.413***	-0.0659***
	(0.0010)	(0.0010)	(0.0010)
Temperature 3 pm × $< P_{33}$	0.0273**	0.0037	-0.0209**
	(0.0250)	(0.5924)	(0.0290)
Temperature 3 pm × $P_{33} \leq$ age $< P_{66}$	0.0308**	-0.0012	-0.0069
	(0.0100)	(0.9740)	(0.8392)
g. Effect on home advantage (not playing home is the reference)			
Temperature 3 pm	-0.1108***	0.0431***	-0.0789***
	(0.0010)	(0.0010)	(0.0010)
Temperature 3 pm × playing home	0.0090	-0.0089	0.0067
	(0.8751)	(0.1588)	(0.2008)
h. Young's (2019) randomization-t p-values for Westfall-Young multiple testing of the null of complete insignificance of heterogeneous effects[(d)]			
Randomization-t p-value	0.2208	0.6734	0.3407

* p-value<0.10, ** p-value<0.05, *** p-value<0.01. In parenthesis, we report Romano and Wolf's (2005a; 2005b) step-down adjusted p-values robust to multiple hypothesis testing, with two-way clusters at the level of tournaments and players (1,000 bootstrap replications). The number of observations is 134,158 in model (1) and (2) and 134,149 in model (3).

[(a)] The median of the ATP/WTA ranking is 53.

[(b)] P_i stands for the ith percentile of the age distribution across matches The 33rd and 66th percentiles of age are 24 and 28 years, respectively.

[(c)] P_i stands for the ith percentile of the absolute value of the difference in the ATP/WTA ranking across matches. The 33rd and 66th percentiles of this variable are 25 and 62, respectively.

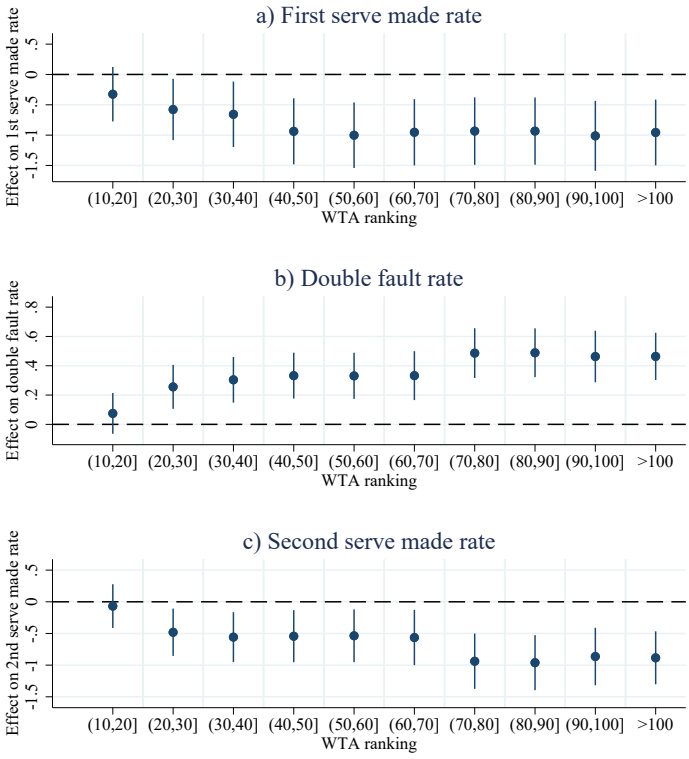
[(d)] For each outcome variable, we used the Westfall-Young approach to test the joint significance of heterogeneous effects on the basis of Young's (2019) randomization-t procedure with 1,000 replications. We report the p-values for the null of complete irrelevance of heterogeneous effects.

Table 5: Cumulative dynamic estimates of temperature effect on tennis performance

Dependent variable:	(1) First serve made rate (%)	(2) Double fault rate (%)	(3) Second serve made rate (%)
Current temperature $\widehat{\alpha}_0$	-0.1194***	0.0420***	-0.0737***
	(0.0183)	(0.0053)	(0.0155)
Temperature previous match $\widehat{\alpha}_1$	0.0236*	-0.0079*	0.0104
	(0.0135)	(0.0042)	(0.0118)
$\widehat{\alpha}_0 + \widehat{\alpha}_1$	-0.0958***	0.0342***	-0.0634***
	(0.0160)	(0.0071)	(0.0198)
H_0: $\alpha_0 = \alpha_1 = 0$, p-value=	0.0000	0.0000	0.0000
# of observations	62,332	62,332	62,329
# of players	1,179	1,179	1,179
# of tournaments	152	152	152
Adjusted R^2	0.3162	0.2624	0.2449

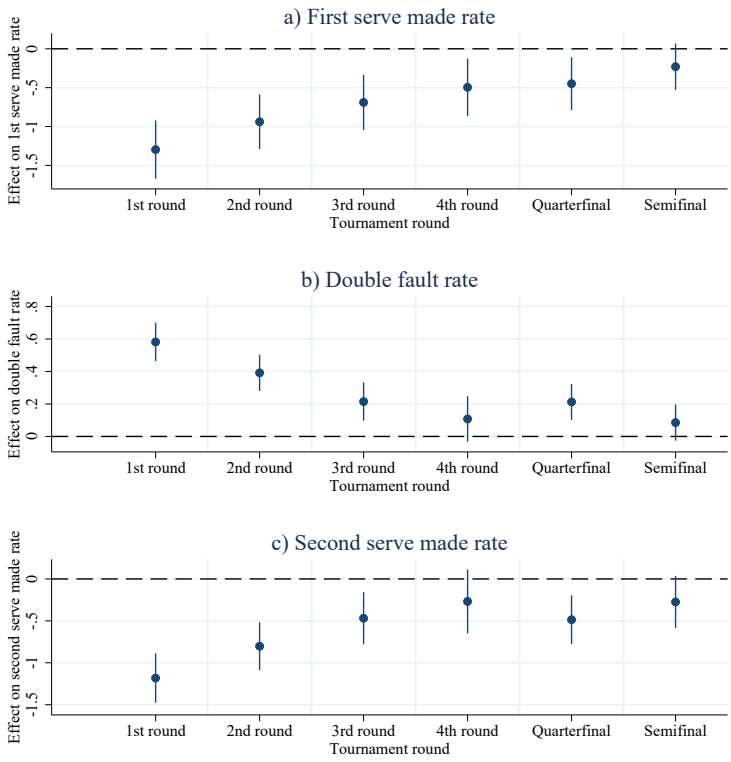
* p-value$<$0.10, ** p-value$<$0.05, *** p-value$<$0.01. Two-way clustered standard errors are in parenthesis; clusters are at the level of tournaments and players. The estimated equation includes also player FE, opponent FE, tournament-edition FE and all the covariates as in the baseline model.

Figure A.1: Relation between ATP/WTA ranking and tennis performance with player and opponent FE



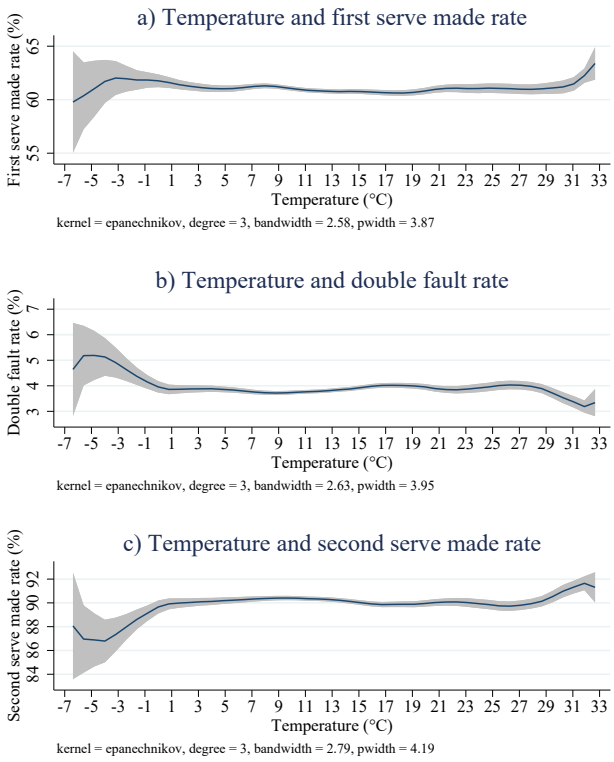
Notes: The reference category is ATP/WTA ranking in $[1, 10]$. The number of player-level observations is 134,158 (134,149 when the outcome if the second serve made rate). Segments are 95% confidence intervals computed with clustered standard errors at player's level.

Figure A.2: Relation between tournament round and tennis performance with player and opponent FE



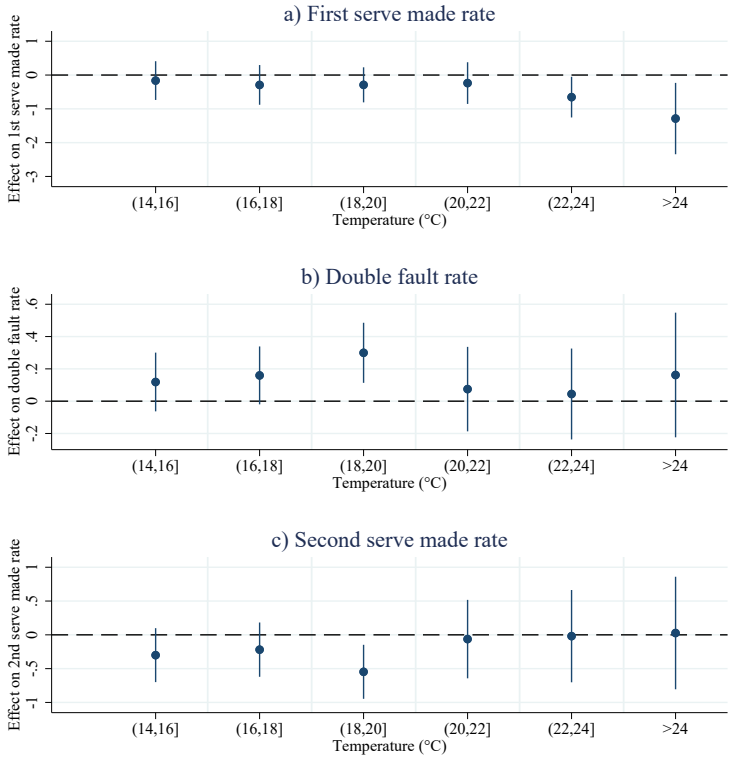
Notes: The reference category is the tournament *final*. The number of player-level observations is 134,589 (134,580 when the outcome if the second serve made rate). Segments are 95% confidence intervals computed with clustered standard errors at player's level.

Figure B.1: Kernel-weighted local polynomial smoothing of the relation between outdoor temperature and indoor tennis performance



Notes: This figure is obtained using 23,120 player-level observations. The grey areas are 95% confidence intervals.

Figure B.2: Non linear effect of outdoor temperatures on indoor tennis performance



Notes: The reference category is temperature below 14°C. The number of observations is the same as those reported in Table B.1. Segments are 95% confidence intervals computed with two-way clustered standard errors; clusters are at the level of tournaments and players.

Table B.1: Estimation results of tennis performance Equation (5) for indoor matches

(1) Dependent variable:	First serve made rate (%)	(2) Double fault rate (%)	(3) Second serve made rate (%)
Temperature at 3 pm (°C)	-0.0522***	0.0088	-0.0078
	(0.0150)	(0.0088)	(0.0206)
Ranking difference[(a)]	-0.2565**	0.0791*	-0.1144
	(0.1190)	(0.0417)	(0.1246)
Ranking sum/100	0.1987	-0.0463	0.0507
	(0.1194)	(0.0425)	(0.1281)
Home advantage	-0.2830	0.0528	-0.0181
	(0.1959)	(0.0627)	(0.1637)
Round - Reference: Before quarterfinal			
Quarterfinal	0.2201	-0.2326**	0.5641*
	(0.2526)	(0.1088)	(0.2832)
Semifinal	0.5110*	-0.6403***	1.5432***
	(0.2893)	(0.1378)	(0.3770)
Final	2.0155***	-0.8199***	1.2964***
	(0.4516)	(0.1515)	(0.3814)
# of observations	22,428	22,428	22,428
# of players	968	968	968
# of tournaments	54	54	54
Adjusted R^2	0.2786	0.2366	0.2275

* p-value$<$0.10, ** p-value$<$0.05, *** p-value$<$0.01. Two-way clustered standard errors are in parenthesis; clusters are at the level of tournaments and players. In the continuous spline specifications of the temperature function, the Wald test for the joint significance of the slope changes at the different knots returned p-values equal to 0.897 for Model (1), 0.070 for Model (2) and 0.623 for Model (3). All the models include player FE, opponent FE and tournament-edition FE. They also include dummies for the day of the week, for the quarter of the year and a flexible specification for age (yearly dummies apart from those younger then 19 and those older than 35 grouped into single dummies). The corresponding parameters are not reported for the sake of brevity and they are available from the authors upon request.

[(a)] The ranking difference is the absolute value of the difference in the ATP/WTA rankings divided by 100.

Table C.1: Estimation results of tennis performance Equation (5) by gender

	Men			*Women*		
Dependent variable:	(1) First serve made rate (%)	(2) Double fault rate (%)	(3) Second serve made rate (%)	(4) First serve made rate (%)	(5) Double fault rate (%)	(6) Second serve made rate (%)
Temperature at 3 pm (°C)	-0.1066***	0.0421***	-0.0811***	-0.1140***	0.0419***	-0.0673***
	(0.0121)	(0.0052)	(0.0115)	(0.0136)	(0.0063)	(0.0170)
Best of 5 sets	-0.2636	0.2467	-0.7774*			
	(0.6960)	(0.1851)	(0.4143)			
Ranking difference[(a)]	-0.1551*	0.0328	-0.0423	-0.2297***	0.0180	0.0556
	(0.0823)	(0.0249)	(0.0548)	(0.0863)	(0.0381)	(0.0853)
Ranking sum/100	0.2180***	-0.0210	-0.0158	0.1787*	0.0202	-0.1329
	(0.0773)	(0.0224)	(0.0498)	(0.0976)	(0.0381)	(0.0889)
Home advantage	0.0369	-0.0582	0.1268	0.0288	0.0166	-0.0960
	(0.1310)	(0.0360)	(0.0870)	(0.1546)	(0.0618)	(0.1422)
Round - Reference: Before quarterfinal						
Quarterfinal	0.6510***	-0.1734***	0.2815***	0.6709***	-0.3592***	0.7141***
	(0.1475)	(0.0437)	(0.0866)	(0.1400)	(0.0648)	(0.1725)
Semifinal	0.8993***	-0.3465***	0.6409***	1.1391***	-0.5506***	0.9145***
	(0.2310)	(0.0760)	(0.1454)	(0.1925)	(0.1043)	(0.2690)
Final	1.2118***	-0.3829***	0.7580***	1.7174***	-0.8404***	1.6672***
	(0.3716)	(0.1020)	(0.1928)	(0.3051)	(0.1510)	(0.3758)
# of observations[(b)]	78,134	78,134	78,130	56,024	56,024	56,019
# of players[(b)]	972	972	972	756	756	756
# of tournaments	91	91	91	108	108	108
Adjusted R^2	0.2906	0.2013	0.1722	0.3054	0.2441	0.2068

* p-value$<$0.10, ** p-value$<$0.05, *** p-value$<$0.01. Two-way clustered standard errors are in parenthesis; clusters are at the level of tournaments and players. In the continuous spline specifications of the temperature function, the Wald test for the joint significance of the slope changes at the different knots returned p-values equal to 0.253 for Model (1), 0.100 for Model (2), 0.167 for Model (3), 0.001 for Model (4), 0.068 for Model (5) and 0.077 for Model (6). All the models include player FE, opponent FE and tournament-edition FE. They also include dummies for the day of the week, for the quarter of the year and a flexible specification for age (yearly dummies apart from those younger then 19 and those older than 35 grouped into single dummies). The corresponding parameters are not reported for the sake of brevity and they are available from the authors upon request.

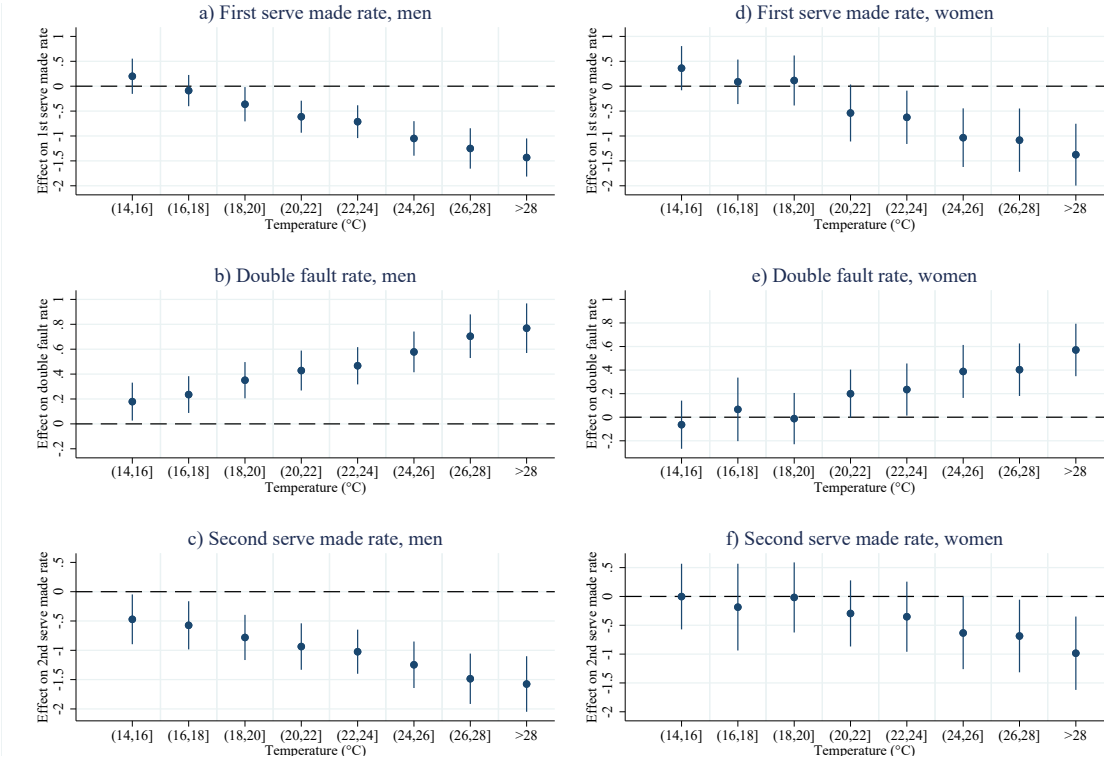
[(a)] The ranking difference is the absolute value of the difference in the ATP/WTA rankings divided by 100.

Table C.2: Correlation between temperature and other air-related variables

	Temperature (°C)	Dew point temp. (°C)	Wind speed (m/sec)	Ozone (mg/kg)	$PM_{2.5}$ (mg/m^3)
Temperature (°C)	1.0000				
Dew point temp. (°C)	0.4350***	1.0000			
Wind speed (m/sec)	-0.1874***	0.0881***	1.0000		
Ozone (mg/kg)	0.4014***	0.0768**	-0.2079***	1.0000	
$PM_{2.5}$ (mg/m^3)	0.1241***	0.1565***	-0.0099***	0.3076***	1.0000

*** p-value$<$0.01.

Figure C.1: Non linear effect of temperatures on tennis performance by gender



Notes: The reference category is temperature below 14°C. Estimation results of the parameters of the other regressors are available from the authors upon request. The number of observations is as in Table C.1. Segments are 95% confidence intervals computed with two-way clustered standard errors; clusters are at the level of tournaments and players.

Table C.3: Estimation results of natural logarithm tennis performance equation and of main model without player and opponent FE

	Natural log performance			*No player & opponent FE*		
Dependent variable:	(1) Ln of first serve made rate (%)	(2) Ln of double fault rate (%)	(3) Ln of second serve made rate (%)	(4) First serve made rate (%)	(5) Double fault rate (%)	(6) Second serve made rate (%)
Temperature at 3 pm (°C)	-0.0018***	0.0171***	-0.0008***	-0.1087***	0.0308***	-0.0484***
	(0.0002)	(0.0020)	(0.0002)	(0.0134)	(0.0064)	(0.0157)
Best of 5 sets	-0.0043	0.3786***	-0.0097*	-0.6481	-1.3209***	3.6793***
	(0.0110)	(0.0828)	(0.0050)	(0.4886)	(0.1499)	(0.3455)
Ranking difference[(a)]	-0.0031***	-0.0193*	-0.0005	-0.0881	-0.0059	0.0668
	(0.0010)	(0.0110)	(0.0007)	(0.1093)	(0.0370)	(0.0882)
Ranking sum/100	0.0034***	0.0206**	-0.0003	0.0623	0.0467	-0.1569*
	(0.0011)	(0.0098)	(0.0007)	(0.1165)	(0.0371)	(0.0856)
Home advantage	0.0007	-0.0253	0.0008	-0.0884	-0.1383	0.3804**
	(0.0017)	(0.0175)	(0.0010)	(0.2929)	(0.0866)	(0.1816)
Round - Reference: Before quarterfinal						
Quarterfinal	0.0107***	-0.0928***	0.0059***	0.8176***	-0.2870***	0.5170***
	(0.0018)	(0.0247)	(0.0015)	(0.1575)	(0.0539)	(0.1321)
Semifinal	0.0170***	-0.1853***	0.0098***	1.1777***	-0.4349***	0.7481***
	(0.0029)	(0.0490)	(0.0020)	(0.2417)	(0.0941)	(0.2376)
Final	0.0234***	-0.2471***	0.0156***	1.8219***	-0.5963***	1.0881***
	(0.0045)	(0.0592)	(0.0029)	(0.3572)	(0.1329)	(0.3132)
# of observations	134,158	134,158	134,159	135,012	135,012	135,003
# of players	1,728	1,728	1,728	2,155	2,155	2,155
# of tournaments	152	152	152	152	152	152
Adjusted R^2	0.2778	0.1308	0.1709	0.0661	0.0866	0.0796
Player & opponent FE	Yes	Yes	Yes	No	No	No

* p-value<0.10, ** p-value<0.05, *** p-value<0.01. Two-way clustered standard errors are in parenthesis; clusters are at the level of tournaments and players. In the continuous spline specifications of the temperature function, the Wald test for the joint significance of the slope changes at the different knots returned p-values equal to 0.004 for Model (1), 0.449 for Model (2), 0.345 for Model (3), 0.000 for Model (4), 0.164 for Model (5), and 0.567 for Model (6).

[(a)] Since the double fault rate is equal to 0 for 12,498 observations, in order not to lose them when applying the natural logarithm, we used as dependent variable the natural logarithm of the double fault rate plus 0.01 percentage points. This also applies to the first serve made rate, because in 2 (7) cases the first (second) serve made rate is equal to 0.

[(b)] The ranking difference is the absolute value of the difference in the ATP rankings divided by 100.

Figure C.2: Age effects

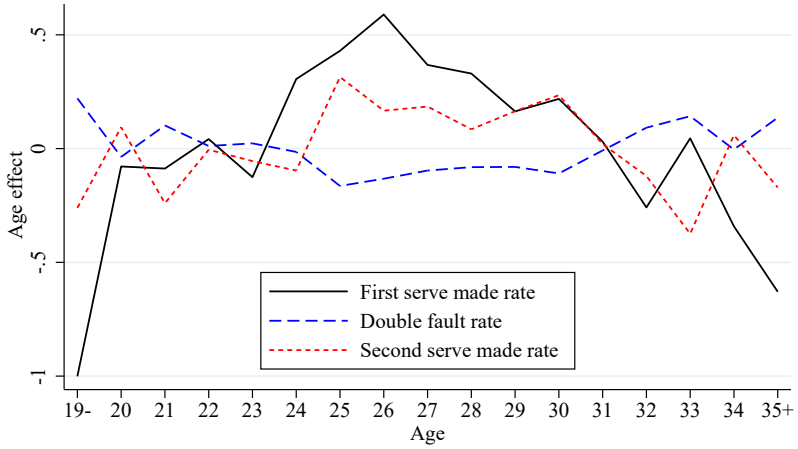
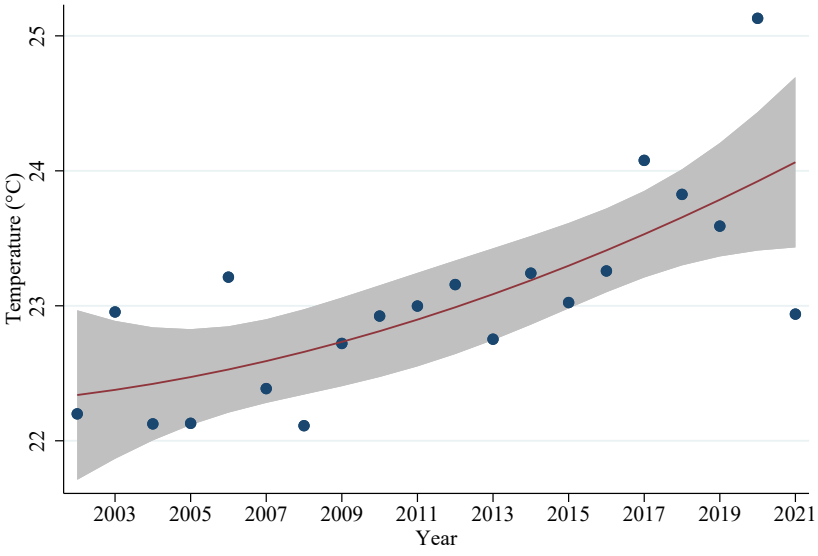


Figure C.3: Average temperatures by calendar year



Note: The red line represents the local polynomial smooth.

Table C.4: Estimates of the effect of average temperature in a tournament-edition on the estimated tournament-edition FE

Dependent variable:	First serve made rate (%)	Double fault rate (%)	Second serve made rate (%)
Average temperature (°C)	0.0470**	-0.0204**	0.0398**
	(0.0194)	(0.0080)	(0.0174)
# of observations	1,543	1,543	1,543
# of tournaments	125	125	125
Adjusted R^2	0.6666	0.7564	0.7791

In this analysis 35 observations are excluded because they are tournaments which were in our sample only once (singleton observations); standard errors in parentheses are clustered at tournament level; * p-value$<$0.10, ** p-value$<$0.05, *** p-value$<$0.01. All the models also include year FE and gender specific tournament FE.

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