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The Gender Gap in Aversion to COVID-19 Exposure: Evidence from Professional Tennis

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DISCUSSION PAPER SERIES

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Exposure: Evidence from Professional
Tennis**

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ABSTRACT

The Gender Gap in Aversion to COVID-19 Exposure: Evidence from Professional Tennis*

We study the gender differences in aversion to COVID-19 exposure. We use a natural experiment of the 2020 US Open, which was organized in the country with the highest number of COVID-19 cases and deaths, and was the first major professional tennis tournament that was held after the season had been paused for six months. We analyze the gender gap in the propensity to voluntarily withdraw because of COVID-19 concerns among players who were eligible and fit to play. We find that female players were significantly more likely than male players to have withdrawn from the 2020 US Open. While players from countries characterized by relatively high levels of trust and patience and relatively low levels of risk-taking were more likely to have withdrawn than their counterparts from other countries, female players exhibited significantly higher levels of aversion to pandemic exposure than male players even after cross-country differences in preferences are accounted for. About 15% of the probability of withdrawing that is explained by our model can be attributed to gender.

JEL Classification: J16, I12, J44

Keywords: COVID-19, exposure to disease, gender, aversion, tennis

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1. Introduction and motivation

The COVID-19 pandemic has been spreading rapidly around the world. By September 17, 2020, nearly 30 million people had been infected with the virus, and 941,000 people had died from it (according to data from the Johns Hopkins University). In the first half of 2020, non-pharmaceutical interventions, such as school closures and restrictions on economic activity and mobility, were widely implemented. As the first pandemic wave has waned, the focus has shifted to helping people safely return to work by managing their exposure to contagion in the workplace and during work-related activities, such as commuting (ILO 2020).

Evidence has also emerged that the COVID-19 pandemic has affected men and women differently. Compared to men, women are less likely to become severely ill or die from COVID-19,¹ but are as likely to be infected; and in 35 high-income countries with available data, women constitute the majority (52%) of those infected (according to the Global Health 50/50 data). Gender differences in engaging in workplace interactions that are critical for the spread of infectious diseases transmitted by the respiratory or close-contact route, such as COVID-19 (Mossong et al. 2008), are among the social factors that contribute to this gender gap. Compared to male workers, female workers have higher occupational exposure to contagion, and are more likely to work in highly exposed occupations (Lewandowski 2020). At the same time, the COVID-19 crisis has affected the employment outcomes of women more than those of men. This is in part because the crisis hit the female-dominated sectors particularly hard, and, within these industries, women have been more likely than men to lose their jobs (Adams-Prassl et al. 2020). Moreover, higher shares of women than men have reported suffering from deteriorating mental health due to the pandemic, being concerned about contracting and spreading SARS-CoV-2, and perceiving the virus as prevalent and lethal (Oreffice and Quintana-Domeque 2020). Across European countries, a substantially higher share of women than men say they are concerned about the potential side effects of a vaccine (36% of women vs. 19% of men), and a lower share of women than men say they are willing to get vaccinated (70% of women vs. 78% of men, Neumann-Böhme et al., 2020). Overall, women appear to be more concerned with the pandemic, and to be more exposed to contagion at work than men. An important question that arises in this context is whether these potential gender differences in perceptions of COVID-19 risk affect the labor market participation of men and women.

In this paper, we contribute to the literature on the gender dimension of the COVID-19 pandemic by studying the gender gap in aversion to pandemic exposure. We use a natural experiment of the US Open tennis tournament held in New York City between August 31 and September 13, 2020, which was the first major tournament that was organized after the tennis season had been put on hiatus due to COVID-19 concerns. We analyze the factors associated with the voluntary withdrawals of players who were eligible to play. The Grand Slam tennis tournaments, like the US Open, constitute a useful setting for studying gender differences in decision-making and performance, as the conditions for participation, the structure of the tournaments, and the prize money amounts are identical for men and women. In 2020, the health and safety protocols at the US Open were also the same for both genders. Hence, the gender differences in the propensity to voluntarily withdraw from the US Open can be interpreted as having been driven by gender differences in aversion to pandemic exposure, especially given that the tournament took place in the country that had the highest numbers of COVID-19 cases and deaths.

¹ Sex-based immunological differences, or gender differences in the prevalence of comorbidities or behaviors that turn out to be risk factors for COVID-19, may contribute to gender differences in health outcomes (Wenham, Smith, and Morgan 2020).

We find that female players were significantly more likely to have voluntarily withdrawn from the tournament, which was organized in an epidemiologically risky setting. Higher ranked players and older players were also more likely to have withdrawn. Our findings are robust to controlling for cross-country differences in preferences. While players from countries characterized by higher levels of patience and trust and by lower levels of risk-taking were also significantly more likely to have withdrawn, the gender gap remains significant even after we control for these factors. It is also found to be particularly large among players ranked in the top 50, who are richer.

Gender differences in risk-taking and other psychological reactions have been cited as being among the main causes of gender gaps in employment outcomes, including the gender pay gap and the underrepresentation of women in top-tier jobs (Booth and Nolen 2012). Experimental studies have suggested that females are more averse to risk and tend to shy away from competitive settings (Croson and Gneezy 2009; Eckel and Grossman 2008). However, the estimated sizes of the gender differences in risk attitudes vary depending on the method used and the context in which decisions are made (Filippin 2016). For instance, the gender gap in risk-taking was found to be larger in abstract gambles than in day-to-day financial choices (Schubert et al. 1999), or in private contexts rather than in professional contexts (Drupp et al. 2020). The real-life studies of gender gaps in risk-taking tend to be focused on gender differences in investment choices in financial markets or pension funds (Eckel and Füllbrunn 2015). However, the differences in risk-taking behavior in real life may result not only from differences in risk preferences, but also, for instance, from differences in the availability of information. Hence, the determinants of gender differences in risk attitudes remain largely unknown. According to Falk and Hermle (2018), gender differences in preferences are positively related to countries' levels of economic development and gender equality, which suggests that having more equal access to material and social resources favors the manifestation of gender-differentiated preferences. In particular, women were found to be more impatient, less risk-tolerant, and more prosocial than men (Falk et al. 2018). We contribute to this strand of literature by studying gender differences in reactions to a specific type of risk related to exposure to a pandemic.

Grasping the differences in risk-taking behavior is harder in real-life situations than in lab experiments because outside of the laboratory, the available options are usually not restricted to a well-defined set of choices. Professional sports create opportunities to tackle this challenge. Sports involve rules that aim to ensure that the players have symmetrical information, and to define a set of options that can often be ranked by their level of risk. Incentive structures and rewards are linked to performance, which can be precisely measured. In individual sports such as tennis, each player makes his/her own decisions, which are not predefined by a group strategy. Therefore, players have fewer opportunities to adopt strategies that deviate from the optimal level of effort, and their effort levels mainly depend on the structure of the prizes and on the heterogeneity in the players' abilities. Finally, psychological factors, such as risk preferences, play an important role. It has been shown that female tennis players are less resilient to pressure if they lag behind, especially if the stakes are high (De Paola and Scoppa 2017). There is also evidence that women players tend to pursue a more conservative strategy as points become more important (Paserman 2007), but are not more likely than men to choke under pressure (Cohen-Zada et al. 2017). It also appears that tournament structures matter: it has, for example, been shown that a larger prize spread between successive rounds encourages female players to increase their effort levels, but also that the outcomes are defined by ranking differentials (abilities), rather than by incentives to increase their effort levels (Lallemand, Plasman, and Rycx 2008). While we do not study the actual performance of players during the tournament, we use its identical treatment of men and women to assess gender differences in the willingness to participate in a professional activity perceived as risky and inconvenient due the COVID-19 pandemic.

2. Data and Methodology

The professional tennis season was paused on March 12, 2020, due to concerns about COVID-19. The female tour resumed on August 3, 2020, with tournaments in Palermo and Prague, followed by the Western & Southern Open and the US Open tournaments played at the same venue in New York City. The male tour resumed on September 22, 2020, with the Western & Southern Open tournament, followed by the US Open, which were played at the same venue, and parallel to the female tournaments. During the tournaments in NYC, a “bubble” was created and the same health and safety rules were applied to all male and female players: (i) each player’s entourage could include up to three people, and (ii) the players had to stay in one of the two pre-approved hotels. The players were not allowed to leave the bubble, or to have contact with any people outside of it.² Audiences were not allowed in the stadiums.

The Grand Slam tournaments such as the US Open have an identical structure for male and female competitions: 128 players are included in each draw, and the prize money is the same for men and women. In general, players ranked in the top 100 before a Grand Slam tournament are automatically eligible to play, while the remaining places are awarded to players who are successful in a qualifying tournament, and players who receive the so-called wildcards. In 2020, the qualifying tournament was not held, and entry lists were created based on rankings. However, we restricted our study to the top 100 male and female players, as these players could have expected long in advance that they would be eligible to play. To collect information about rankings, we scraped data from websites of Association of Tennis Professionals (www.atptour.com) and Women Tennis Association (www.wtatennis.com), and we merged it with the entry list to the US Open (www.usopen.org).

In 2020, 36 out of the top 100 male and female players did not participate in the US Open. Of these players, 25 (19 female and six male players) withdrew due to COVID-19 concerns (Table 1). Another 11 players withdrew for other reasons (Table 2): seven withdrew due to either injury or illness (four female and three male players), two withdrew due to parenting responsibilities (one female and one male player), and two were not able to play because of a diagnosed COVID-19 infection (both males).³ For each player, we specified the reason for his/her withdrawal using his/her social media channels and/or media interviews. The exact sources we used to determine the reason for each player’s decision are available upon request. Our final sample includes 189 players from 48 countries who were eligible and fit to play.

² Instead of staying at a pre-approved hotel, players were also allowed to rent a house and hire a security guard to ensure that they remained in the bubble. To our knowledge, only two players – Serena Williams and Novak Djokovic – decided to do so. The cost of such an arrangement was so high that even elite players, such as former world number 1 Andy Murray, announced that they would stay in the hotel bubble on financial grounds. Hence, it can be credibly assumed that staying in the bubble was the only option for nearly all players.

³ In 2019, 17 out of the top 100 male and female players withdrew from the US Open because of injuries or for personal reasons. In 2020, the number of injured players was lower than it was in 2019, which could be expected, as there was no competition between March and August. However, in 2020, the total number of players who withdrew was more than double the number in 2019.

Table 1. Players who withdrew from the 2020 US Open because of COVID-19

Ranking	Name	Country	Age	Ranking points	Tournaments played in the last year	Gender
1	Ashleigh Barty	AUS	24	8717	17	Female
2	Rafael Nadal	ESP	34	9850	18	Male
2	Simona Halep	ROU	29	6356	17	Female
5	Elina Svitolina	UKR	26	4580	24	Female
6	Bianca Andreescu	CAN	20	4555	10	Female
7	Kiki Bertens	NED	29	4335	25	Female
9	Gael Monfils	FRA	33	2860	22	Male
10	Belinda Bencic	SUI	23	4010	25	Female
15	Stan Wawrinka	SUI	35	2185	20	Male
30	Qiang Wang	CHN	28	1706	23	Female
32	Anastasia Pavlyuchenkova	RUS	29	1540	22	Female
33	Barbora Strycova	CZE	34	1530	21	Female
34	Svetlana Kuznetsova	RUS	35	1527	17	Female
36	Saisai Zheng	CHN	26	1510	24	Female
40	Nick Kyrgios	AUS	25	1170	18	Male
40	Julia Goerges	GER	32	1423	21	Female
43	Jelena Ostapenko	LAT	23	1360	24	Female
49	Polona Hercog	SLO	29	1205	23	Female
50	Jo-Wilfried Tsonga	FRA	35	1005	22	Male
55	Fernando Verdasco	ESP	36	945	25	Male
58	Su-Wei Hsieh	TPE	34	1035	23	Female
76	Tamara Zidansek	SLO	23	840	26	Female
80	Lin Zhu	CHN	26	830	30	Female
83	Yafan Wang	CHN	26	795	26	Female
90	Andrea Petkovic	GER	33	750	23	Female

Source: Own elaboration based on data web scraped from ATP, WTA, and US Open websites.

Table 2. Players who withdrew from the 2020 US Open for other reasons

Ranking	Name	Country	Age	Ranking points	Tournaments played in the last year	Gender	Withdrawal reason
4	Roger Federer	SUI	39	6630	16	Male	Injury
12	Fabio Fognini	ITA	33	2400	24	Male	Injury
23	Benoit Paire	FRA	31	1738	32	Male	Diagnosed with COVID
34	Kei Nishikori	JPN	30	1345	13	Male	Diagnosed with COVID
47	Fiona Ferro	FRA	23	1267	26	Female	Injury
59	Lucas Pouille	FRA	26	880	22	Male	Injury
69	Pierre-Hugues Herbert	FRA	29	775	28	Male	Parenting
71	Carla Suárez Navarro	ESP	32	881	19	Female	Illness
87	Anastasia Potapova	RUS	19	759	27	Female	Injury
89	Ana Bogdan	ROU	28	755	26	Female	Injury
98	Samantha Stosur	AUS	36	667	22	Female	Parenting

Source: Own elaboration based on data web scraped from ATP, WTA, and US Open websites.

In order to analyze the differences between female and male players in the propensity to withdraw from performing in a pandemic environment, we estimate logistic (1) regressions:

$$\Pr(\text{withdraw from US Open}_{jc} = 1) = F(\beta_0 + \beta_1 X_j + \beta_2 \lambda_c + \varepsilon_{jc}) \quad (1)$$

where $F(Z) = \frac{e^Z}{1+e^Z}$, j stands for individual, and c for country; X_j is a vector of personal characteristics (sex, age (log), ranking (log)); and λ_c is a vector of country-level controls: the measures of patience, risk-taking, altruism, and trust based on the Global Preference Survey conducted in 76 countries (GPS, Falk et al., 2018),⁴ and 2018 GDP per capita (in purchasing power parity, log) taken from the World Bank's World Development Indicators database. All country-level variables, ages, and rankings are standardized in our sample.

We control for country-level preference measures to account for the observed differences in the general willingness to take risks, as well as in other preferences that may affect attitudes toward the pandemic and compliance with containment policies. Bargain and Aminjonov (2020) found that the decline in mobility around mid-March 2020 was significantly stronger in European regions with higher levels of trust, which suggests that trust affects compliance. Compliance with health regulations (and, therefore, willingness to contribute to the common good) may be also influenced by levels of social capital. In European countries, locations with higher levels of social capital initially had higher numbers of COVID-19 cases due to the greater intensity of social and economic relations in these places, but they also recorded a slower spread of the virus after containment policies had been introduced (Bartscher et al. 2020). We control for GDP per capita, as gender differences in preferences may be expressed more frequently in more developed than in less developed countries (Falk and Hermle, 2018).

We estimate two variants of model (1). First, we control for individual characteristics only. Second, we add country-level controls. We also re-estimate our model on a subsample of non-US players, for whom the perceived risk of participation may be higher because they have to undertake international travel and may be unfamiliar with the local health system; as well as for subsamples of players ranked in the top 50 and in places 51-100. We also estimate probit and linear probability models instead of a logit model.

Finally, in order to assess the relative role of gender and other factors in the probability of withdrawing from the 2020 US Open, we use the Shapley decomposition proposed by Shorrocks (2013).

⁴ The GPS data are not available for the following countries that include a total of 21 top 100 male or female players who decided against participating in the US Open: Belgium, Belarus, Latvia, Montenegro, Norway, Puerto Rico, Slovenia, Slovakia, Taipei, Tunisia, Uruguay.

3. Results

The share of women among the top 100 players who voluntarily withdrew from the 2020 US Open is noticeably higher (76%) than it is among the players who participated (46%, Table 3). Moreover, the players who withdrew are, on average, older and higher ranked than the players who participated. These players also come disproportionately from countries that exhibit higher levels of patience, lower levels of risk-taking, higher levels of altruism and trust, and lower levels of GDP per capita.

Table 3. Descriptive statistics

	Female	Age	Ranking	Patience	Risk taking	Altruism	Trust	GDP per capita
Participant	46.3%	26.9	53	-0.02	0.03	0.00	-0.04	0.01
Withdrawn	76.0%	29.1	35	0.20	-0.05	0.10	0.45	-0.17

Note: All country-level variables- patience, risk taking, altruism, trust and GDP per capita are standardized in our sample.

Source: Own calculations based on data web scraped from US Open, ATP and WTA websites, GPS, and WDI data.

Our econometric results show that female players were significantly more likely (by 15.3 pp on average) to decide against participating in the US Open than men (column 1 of Table 4). Older players, and higher ranked players were also more likely to withdraw. The probable mechanism behind the effect associated with ranking is that higher ranked players are more affluent and earn higher incomes from endorsements, and thus may have been more willing to forego prize money from a tournament perceived as risky. The size of the effect associated with gender is found to be slightly smaller (12.5 pp) in a subsample of players for which the Global Preference Survey data are available (column 2 of Table 4). While controlling for country-level covariates reduces the size of the effects associated with gender, it remains highly significant and large (10.5 pp, column 3 of Table 4). Moreover, players from countries characterized by higher levels of patience and trust and by lower levels of risk-taking were significantly more likely to have decided against participating in the 2020 US Open (column 3 of Table 4).

Importantly, in a subsample of non-US players, the effect associated with gender is shown to be noticeably larger (15.6 pp), while the effects associated with other factors at both the individual and the country level are found to be similar to those estimated in the full sample (column 4 of Table 4). This suggests that the female players may have been particularly more concerned about exposure associated with travel than the male players. Finally, the female players were significantly more likely to have voluntarily withdrawn than the male players among the top 50 players, but among the players ranked 51-100 the effect is not significant (columns 6 and 7 of Table 4, respectively). The top 50 players (who constitute 1% of all players) earn more than 50% of all prize money, and the average earnings of top 50 players are about five times the average earnings of players ranked 51-100, both among women and men (ITF 2014).⁵ Hence, the gender gap in aversion to pandemic exposure is manifested to a larger extent among players with higher ranking and incomes. Our finding is consistent with Falk and Hermle (2018) who show that gender differences in preferences are more likely to be revealed when incomes are higher.

⁵ The differences in total earnings are even larger because top players earn the majority of their income from endorsements (Badenhausen 2020).

Our findings are robust to changes in the econometric methodology, as the probit and linear probability models (columns 7 and 8 of Table 4, respectively) deliver similar estimates as the logit model (column 3 of Table 4).

Table 4. The correlates of voluntary withdrawal from the 2020 US Open due to COVID-19 concerns (marginal effects)

	Player controls (1)	Player controls (sample w/ GPS data) (2)	Player and country controls (3)	Player and country controls, no US players (4)	Player and country controls, players ranked in top 50 (5)	Player and country controls, players ranked 51-100 (6)	Player and country controls (probit) (7)	Player and country controls (OLS) (8)
Female	0.153*** (0.051)	0.125** (0.051)	0.105** (0.048)	0.156*** (0.045)	0.154* (0.080)	0.041 (0.028)	0.095** (0.044)	0.104** (0.046)
Age (log)	0.068** (0.028)	0.071** (0.029)	0.067** (0.031)	0.101*** (0.032)	0.102* (0.052)	0.045 (0.032)	0.068*** (0.026)	0.070** (0.027)
Ranking (log)	-0.064*** (0.018)	-0.067*** (0.018)	-0.067*** (0.016)	-0.081*** (0.016)	-0.071** (0.032)	0.023 (0.096)	-0.069*** (0.017)	-0.099*** (0.031)
Patience			0.093** (0.037)	0.102*** (0.033)	0.107* (0.063)	0.069 (0.053)	0.092*** (0.035)	0.089** (0.035)
Risk-taking			-0.066** (0.031)	-0.051* (0.028)	-0.095* (0.057)	-0.046 (0.033)	-0.059** (0.029)	-0.042** (0.021)
Altruism			-0.005 (0.024)	0.073** (0.035)	-0.009 (0.045)	0.002 (0.013)	-0.008 (0.023)	0.000 (0.023)
Trust			0.042* (0.022)	0.009 (0.028)	0.048 (0.047)	0.047** (0.020)	0.044** (0.022)	0.052* (0.027)
GDP per capita (PPP, log)			-0.062*** (0.023)	-0.036 (0.026)	-0.054 (0.055)	-0.041* (0.021)	-0.062*** (0.024)	-0.091** (0.042)
Adj. R2 / R2	0.175	0.207	0.299	0.400	0.230	0.475	0.306	0.226
No. of obs.	189	168	168	141	85	83	168	168

Note: All parameters are presented as average marginal effects. All models include constant (not presented). R2 shown in the case of linear probability model (8). Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Own estimation based on data web scraped from US Open, ATP and WTA websites, GPS, and WDI data.

In order to assess the relative roles of gender and other factors in the probability of withdrawing from the 2020 US Open, we use the Shapley decomposition. We find that gender is the second-most relevant factor, behind rank. In the total sample, 13% of the explained variance in the withdrawal probability can be attributed to gender (Table 5); about 41% can be attributed to rank and 17% to age, and about 21% can be attributed to cross-country differences in preferences, in particular in levels of trust and patience. In a subsample of non-US players only, the contribution of gender (18%) and the contribution of preferences (29%) are even higher. Finally, the contribution of gender

amounts to 19% among both the players ranked in top 50, but only to 9% among the players ranked 51-100. Age and ranking are the two factors with the largest contributions to differences in withdrawal probability among the players ranked in top 50. Among the players ranked 51-100, however, age and ranking play a minor role, and the differences in withdrawal probability can be rather attributed to cross-country differences in preferences.

Table 5. The Shapley decomposition of the probability of voluntary withdrawal from the 2020 US Open

	Female	Age	Ranking	Patience	Risk taking	Altruism	Trust	GDP per capita	Total
All players									
Shapley value	0.029	0.039	0.092	0.015	0.006	0.002	0.024	0.020	0.226
Share in total	12.7%	17.2%	40.9%	6.5%	2.5%	0.8%	10.7%	8.7%	100.0%
Non-US players									
Shapley value	0.054	0.052	0.100	0.038	0.003	0.019	0.026	0.010	0.303
Share in total	17.8%	17.1%	33.1%	12.7%	1.1%	6.2%	8.6%	3.3%	100.0%
Players ranked in top 50									
Shapley value	0.041	0.066	0.053	0.015	0.011	0.002	0.017	0.008	0.214
Share in total	19.4%	30.8%	24.7%	6.9%	5.3%	1.0%	8.2%	3.8%	100.0%
Players ranked 51-100									
Shapley value	0.018	0.023	0.001	0.017	0.007	0.010	0.065	0.049	0.191
Share in total	9.4%	12.1%	0.4%	9.1%	3.7%	5.4%	34.2%	25.9%	100.0%

Note: Shapley decomposition based on a linear probability models shown in column 5 of Table 4.

Source: Own estimation based on data web scraped from US Open, ATP and WTA websites, GPS, and WDI data.

4. Discussion and conclusions

In this paper, we have studied the gender differences in aversion to COVID-19 exposure. To do so, we used a natural experiment of the professional tennis US Open tournament, which was the first major tournament organized after the tennis season had paused for six months due to the pandemic. It was held in the country with the highest numbers of COVID-19 cases and deaths, and 14% of eligible and fit players declined to participate. As the conditions and rules for participation, as well as the prize money amounts, were identical for men and women, we have argued that the differences found in the propensity to voluntarily withdraw reflect gender differences in aversion to pandemic exposure.

Our results show that female players were significantly more likely to have withdrawn from the 2020 US Open because of COVID-19 concerns. Players from countries characterized by higher levels of trust and patience and lower levels of risk-taking were more likely to have withdrawn. However, the female players exhibited significantly higher levels of aversion to pandemic exposure than male players, even if cross-country differences in preferences are accounted for. About 15% of the withdrawal probability explained by our model can be attributed to gender.

Professional tennis players are a relatively well-paid group of people who can afford to avoid participating in tournaments if doing so is perceived as risky, even though because of their young age they face a low risk of severe illness from COVID-19 (Williamson et al. 2020). In the general labor market, however, women are more exposed to contagion than men because of sectoral and occupational segmentation (Lewandowski, Lipowska, and Magda 2020), and can rarely shield themselves from this exposure (Adams-Prassl et al. 2020). Our findings suggest that because women have higher levels of aversion to exposure, working women who cannot avoid exposure may experience additional hardships, which may contribute to their reported worse mental health outcomes during the pandemic (Oreffice and Quintana-Domeque 2020). Our results also suggest that focusing on gender differences in labor market outcomes may underestimate the true gender impact of the COVID-19 pandemic in terms of wellbeing.

Our study has limitations, in particular related to sample size. However, the US Open is the only natural experiment in tennis that we can study. The participation of fit players in the tournaments in Europe, organized after the US Open, was likely affected by the fact that there was no COVID-19 outbreak at the US Open.⁶ Indeed, only four players – two Australian (one male, one female) and two Chinese (both female) players – did not participate due to COVID-19 concerns in Roland Garros, the next Grand Slam tournament taking place in Paris on September 27-October, 2020. To our knowledge, no other sport has held parallel competitions, especially competitions requiring two to three-week long stay, with identical rules and prize money amounts for men and women.

⁶ Only one player, Benoit Paire, tested positive in the US Open bubble. None of his contacts have tested positive (Fitzgerald 2020).

References

- Adams-Prassl, Abi, Teodora Boneva, Marta Golin, and Christopher Rauh. 2020. 'Inequality in the Impact of the Coronavirus Shock: Evidence from Real Time Surveys'. *Journal of Public Economics* 189 (September): 104245. <https://doi.org/10.1016/j.jpubeco.2020.104245>.
- Badenhausen, Kurt. 2020. 'The Highest-Paid Tennis Players 2020: They Are Barely Playing, But The Top 10 Pros Still Earned \$340 Million'. *Forbes*. 2020. <https://www.forbes.com/sites/kurtbadenhausen/2020/08/28/the-highest-paid-tennis-players-2020-they-are-barely-playing-but-the-top-10-pros-still-earned-340-million/>.
- Bargain, Olivier, and Ulugbek Aminjonov. 2020. 'Trust and Compliance to Public Health Policies in Times of COVID-19'. No. 13205. IZA Discussion Paper Series.
- Bartscher, Alina K., Sebastian Seitz, Sebastian Sieglöcher, Michaela Slotwinski, and Nils Wehrhöfer. 2020. 'Social Capital and the Spread of Covid-19: Insights from European Countries'. No. 20-023 | 05/2020. ZEW DP. <https://www.ssrn.com/abstract=3616714>.
- Booth, Alison L., and Patrick Nolen. 2012. 'Gender Differences in Risk Behaviour: Does Nurture Matter?' *The Economic Journal* 122 (558): F56–78. <https://doi.org/10.1111/j.1468-0297.2011.02480.x>.
- Cohen-Zada, Danny, Alex Krumer, Mosi Rosenboim, and Offer Moshe Shapir. 2017. 'Choking under Pressure and Gender: Evidence from Professional Tennis'. *Journal of Economic Psychology* 61 (August): 176–90. <https://doi.org/10.1016/j.joep.2017.04.005>.
- Croson, Rachel, and Uri Gneezy. 2009. 'Gender Differences in Preferences'. *Journal of Economic Literature* 47 (2): 448–74. <https://doi.org/10.1257/jel.47.2.448>.
- De Paola, Maria, and Vincenzo Scoppa. 2017. 'Gender Differences in Reaction to Psychological Pressure: Evidence from Tennis Players'. *European Journal of Work and Organizational Psychology* 26 (3): 444–56. <https://doi.org/10.1080/1359432X.2017.1307178>.
- Drupp, Moritz A., Menusch Khadjavi, Marie-Catherine Riekhof, and Rudi Voss. 2020. 'Professional Identity and the Gender Gap in Risk-Taking. Evidence from Field Experiments with Scientists'. *Journal of Economic Behavior & Organization* 170 (February): 418–32. <https://doi.org/10.1016/j.jebo.2019.12.020>.
- Eckel, Catherine C., and Sascha C. Füllbrunn. 2015. 'Thar SHE Blows? Gender, Competition, and Bubbles in Experimental Asset Markets'. *American Economic Review* 105 (2): 906–20. <https://doi.org/10.1257/aer.20130683>.
- Eckel, Catherine C., and Philip J. Grossman. 2008. 'Chapter 113 Men, Women and Risk Aversion: Experimental Evidence'. In *Handbook of Experimental Economics Results*, 1:1061–73. Elsevier. [https://doi.org/10.1016/S1574-0722\(07\)00113-8](https://doi.org/10.1016/S1574-0722(07)00113-8).
- Falk, Armin, Anke Becker, Thomas Dohmen, Benjamin Enke, David Huffman, and Uwe Sunde. 2018. 'Global Evidence on Economic Preferences'. *The Quarterly Journal of Economics* 133 (4): 1645–92. <https://doi.org/10.1093/qje/qjy013>.
- Falk, Armin, and Johannes Hermlé. 2018. 'Relationship of Gender Differences in Preferences to Economic Development and Gender Equality'. *Science* 362 (6412): eaas9899. <https://doi.org/10.1126/science.aas9899>.
- Filippin, Antonio. 2016. 'Gender Differences in Risk Attitudes'. *IZA World of Labor*, May. <https://doi.org/10.15185/izawol.100>.

- Fitzgerald, Matt. 2020. "‘I’m Breaking’": Paire Retests COVID-19 Positive, Still Plays Hamburg'. Tennis.Com. 2020. /pro-game/2020/09/im-breaking-benoit-paire-retests-positive-covid-19-still-plays-hamburg-ruud/90915/.
- ILO. 2020. 'Safe Return to Work: Guide for Employers on COVID-19 Prevention'. Report. Geneva: International Labour Organisation. http://www.ilo.org/actemp/publications/WCMS_744033/lang--en/index.htm.
- ITF. 2014. 'ITF pro Circuit Review'. International Tennis Federation.
- Lallemant, Thierry, Robert Plasman, and François Rycx. 2008. 'Women and Competition in Elimination Tournaments: Evidence From Professional Tennis Data'. *Journal of Sports Economics* 9 (1): 3–19. <https://doi.org/10.1177/1527002506296552>.
- Lewandowski, Piotr. 2020. 'Occupational Exposure to Contagion and the Spread of COVID-19 in Europe'. 02/2020. IBS Working Papers. IBS. <https://ibs.org.pl/en/publications/occupational-exposure-to-contagion-and-the-spread-of-covid-19-in-europe/>.
- Lewandowski, Piotr, Katarzyna Lipowska, and Iga Magda. 2020. 'The Gender Dimension of Occupational Exposure to Contagion in Europe'. 05/2020. IBS Working Papers. IBS. <https://ibs.org.pl/en/publications/the-gender-dimension-of-occupational-exposure-to-contagion-in-europe/>.
- Mossong, Joël, Niel Hens, Mark Jit, Philippe Beutels, Kari Auranen, Rafael Mikolajczyk, Marco Massari, et al. 2008. 'Social Contacts and Mixing Patterns Relevant to the Spread of Infectious Diseases'. *PLoS Medicine* 5 (3): e74. <https://doi.org/10.1371/journal.pmed.0050074>.
- Neumann-Böhme, Sebastian, Nirosha Elsem Varghese, Iryna Sabat, Pedro Pita Barros, Werner Brouwer, Job van Exel, Jonas Schreyögg, and Tom Stargardt. 2020. 'Once We Have It, Will We Use It? A European Survey on Willingness to Be Vaccinated against COVID-19'. *The European Journal of Health Economics* 21 (7): 977–82. <https://doi.org/10.1007/s10198-020-01208-6>.
- Oreffice, Sonia, and Climent Quintana-Domeque. 2020. 'Gender Inequality in COVID-19 Times: Evidence from UK Prolific Participants'. No. 13463. IZA Discussion Paper Series.
- Paserman, M. Daniele. 2007. 'Gender Differences in Performance in Competitive Environments: Evidence from Professional Tennis Players'. No. 2834. IZA Discussion Paper Series. <http://www.ssrn.com/abstract=997269>.
- Schubert, Renate, Martin Brown, Matthias Gysler, and Hans Wolfgang Brachinger. 1999. 'Financial Decision-Making: Are Women Really More Risk Averse?'. *American Economic Review* 89 (2): 381–85. <https://doi.org/10.1257/aer.89.2.381>.
- Shorrocks, Anthony F. 2013. 'Decomposition Procedures for Distributional Analysis: A Unified Framework Based on the Shapley Value'. *The Journal of Economic Inequality* 11 (1): 99–126. <https://doi.org/10.1007/s10888-011-9214-z>.
- Wenham, Clare, Julia Smith, and Rosemary Morgan. 2020. 'COVID-19: The Gendered Impacts of the Outbreak'. *The Lancet* 395 (10227): 846–48. [https://doi.org/10.1016/S0140-6736\(20\)30526-2](https://doi.org/10.1016/S0140-6736(20)30526-2).
- Williamson, Elizabeth J., Alex J. Walker, Krishnan Bhaskaran, Seb Bacon, Chris Bates, Caroline E. Morton, Helen J. Curtis, et al. 2020. 'Factors Associated with COVID-19-Related Death Using OpenSAFELY'. *Nature* 584 (7821): 430–36. <https://doi.org/10.1038/s41586-020-2521-4>.