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The Tournament Careers of Top-Ranked Men and Women Tennis Professionals: Are the Gentlemen More Committed than the Ladies?

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We ask whether top-ranked male tennis professionals are more dedicated or committed to their careers than the top-ranked female professionals. We find no evidence that this is the case in the 1979–1994 period. Despite substantially lower real earnings, the women pros competed for as many years as did the men and just as intensely in terms of annual number of tournaments played.

I. Introduction

The earnings gap between males and females in the U.S. is substantial. In 1996 the weekly earnings of females were 74 percent of the earnings of males among full-time wage and salary workers 25 years of age and over (U.S. Dept. of Labor Statistics, 1997). Differences in work histories explain up to 40 percent of the gap (Corcoran et al., 1979; Gunderson, 1989). Explanations of the remaining portion include smaller human capital stocks acquired by women over the life cycle because of shorter expected payoff periods (Goldin and Polachek, 1987); statistical discrimination against women by firms in the provision of firm-specific human capital (Lazear and Rosen, 1990); unmeasured differences in commitment to the family or the labor force (Becker, 1985); and pure discrimination (Bergman, 1989). Even in a sample of highly motivated individuals with near identical schooling (Michigan Law School graduates), Wood et al. (1993) found one-fourth to one-third of the earnings gap unexplained after controlling for child care, work history, school performance, and type of employment.

Research in psychology may help to explain some of the unmeasured determinants of the earnings gap. There is a substantial literature reporting that men are more physically and verbally aggressive and more competitive than women based on responses to questionnaires (Gladue and Bailey, 1995).¹ Men are also more likely to commit violent crimes than women (Daly and Wilson, 1988), three times as likely to be involved in fatal traffic accidents as drivers or passengers,² comprise the vast majority of the television and live audience for competitive sports (e.g., Carter, 1999), and are the main war makers in human societies (Goldstein, 1994). Some researchers attribute the dif-

ferences in aggressiveness and competitiveness between men and women to the effects of androgens (Monaghan and Glickman, 1992; Goldstein, 1994; Wrangham and Peterson, 1996) and others to the socialization of gender roles (Eagly and Steffen, 1986). It is not likely that aggressiveness, as measured in the questionnaire approach (see note 1), or as approximated by a propensity to commit violent crime, to drive aggressively, or to make war is desirable in most occupations. The indication that men are more competitive than women, however, could imply a greater commitment to careers. Men might be more dedicated or committed workers in some occupations because of a stronger desire than women to outperform their competition or their co-workers. Fuchs (1988) found in his surveys of Stanford University undergraduates that the women respondents placed more emphasis on personal satisfaction in a career than the men and less emphasis on making money or achieving power.

We examine the commitment of top-ranked male and female professional tennis players to their careers, as measured by the number of tournaments they play per year and by the number of years they compete. If for reasons of nature or nurture men are more competitive or more committed to their careers than women, such differences might show up in a study of the career profiles of men and women professional tennis players. Tour life is challenging — characterized by arduous travel, continuous competition, risk of injury, physical exertion, and execution that requires training and stamina, and a prize money distribution system that rewards the few players who can survive until a tournament's end.

II. Data

Annual data on the tournament records of men and women tennis professionals have been available at least since the mid-1970s in the February issues of *Tennis* magazine. These issues present tournament results and rankings for the top 250 players for the preceding calendar year for the separate men's and women's tours. Players' ages are available for the top 50 players on each tour, and singles rankings are available for the top 250 players on each tour. The top 50 players on each tour, according to tournament prize money won, have been listed since February, 1985.

Because player age is an important variable in this research, our data base consists of players who attained a singles ranking in the top 50 at least once on their respective tours between 1979 and 1994. This criterion was met by 236 men and 216 women. In the case of the male pros, 27 of the 236 dropped below a 250 ranking in one year and reappeared in the top 250 in a later year. All other males in the data had tournament careers with continuous rankings in the top 250 until they dropped off the list (or the data window closed). Female pros with discontinuous careers in the top 250 totaled 20. Average annual rank was 80 for the men in the sample and 73 for the women. The average career length of pros who gained a ranking in their tour's top 250 for the first time in any year between 1980–1984 (early in the data window) was 9.14 years for the men ($n=49$) and 9.02 years for the women ($n=48$). Ten of these early men entrants and ten of the early women were still active in 1994. The average number of years of tournament experience of female players in the sample who fell out of the top 250 in the

sample period (including those that entered the data window with pre-1979 experience that is not credited in the data) is 7.82 (s.d. 2.57). For male “retirees” in our data this figure is 8.27 (s.d. 2.60). Between 1979 and 1989, the average number of tournaments per year played by men and women in the sample was 17.3 (s.d. 4.9) and 17.2 (s.d. 5.1), respectively. In 1990, the men’s tour introduced a new ranking system to encourage more tournament participation by their top players. Rather than relying on the results from all tournaments played the previous 52 weeks, only the results from a player’s best 14 tournaments in the previous 52 weeks were used to compute the rankings. In the 1990–1994 period, the annual average number of tournaments participated in by the men increased to 22.0.³

Tournament prize money averages per year for the players in the sample were \$182,801 for the men and \$109,305 for the women (1982 dollars) in the 1984–1994 period.⁴ These figures are approximate because prize money data are only available for the top 50 earners in each year on each tour, while our data include approximately 100 players on each tour in each year. Ordinary least square regressions were used to predict earnings based on “computer points” (ranking points), doubles rank, and tournaments played to estimate the tournament earnings of players outside the top fifty. Because only a handful of players have notable earnings off the tour, casual observation suggests that tour earnings of \$50,000 or so would imply about zero net earnings in recent years.

Our research investigates whether men are more committed than women to competing on their professional tennis tours. In the summary statistics we see no evidence that this is the case. Despite lower earnings, women pros in our sample compete for about the same number of years as men and at about the same intensity, as measured by tournaments played per year. We continue our investigation of these issues by estimating statistically tennis tour “retirement” and tournament participation.

III. *Regression Models*

In Table 1, regression results are presented for discrete-time models that predict the probability that a tennis pro will fall out of the top 250 ranked singles players on his or her tour, after having been ranked at least once in the top 50 singles players in the 1979–1994 period. Independent variables are the player’s tour experience through the previous year, age, the previous year’s tournament winnings, and gender. Both age and experience are independent variables because women begin their pro tournament careers at younger ages than men.⁵

In most instances a year out of the top 250 players indicates retirement. Few, if any, tournament slots are available for players ranked this low outside some qualifying opportunities or sponsor exemptions. As discussed in section II, few players have a history of falling out of the top 250 and recovering ranking in a later year. Following discrete-time methods, we assign the dependent variable a zero in a player year when the player is ranked in the top 250 and one in the first year the player falls out of the 250. A player ranked for three years in the top 250 and then falling off the tour would contribute four observations to the data.⁶ The advantage of discrete-time models is their

Table 1
*Maximum Likelihood Logit Estimates of Tour Retirement for Top Ranked
 Men and Women Professional Tennis Players, 1984-1994*

Independent Variable	Men and Women		Men and Women over 24		Women over 24		Men over 24							
	coefficient	marginal effect	r value	marginal effect	coefficient	marginal effect	coefficient	marginal effect						
<i>exp</i>	0.14	4.19	0.006	0.27	7.25	0.007	0.21	5.18	0.007	3.25	0.006	0.23	4.08	0.008
<i>male=1</i>	-0.07	-0.45	-0.003	0.44	2.40	0.011	0.54	2.71	0.017					
<i>age</i>	0.21	8.68	0.009	0.16	6.58	0.004	0.16	5.27	0.005	0.151	3.45	0.005	0.16	3.81
<i>lagearn</i>				-0.0000081	-7.05	-2.00e-07	-0.0000077	-6.35	-2.40e-07	-0.0000052	-2.99	-1.70e-07	-0.0000092	-5.72
constant	-8.80	-15.62	-0.374	-7.95	-13.48	-0.12	-7.46	-8.65	-0.233	-7.17	-5.65	-0.235	-6.99	-5.88
<i>pseudo R</i> ²	0.19			0.26			0.16			0.11			0.20	
<i>chi-square</i>	268.20			364.51			151.24			41.08			112.92	
<i>n</i>	2,600			2,600			1,133			453			680	

Notes: Variable names, definitions, means, and (standard deviations) follow. The dependent variable is binary. The value of zero in those years when a player is ranked in the top 250 and one in the first year the player falls out of the top 250 (men .08 (.03), women .07 (.03)); *lagearn* is tournament prize money for preceding year in 1982 dollars, available for 1984-94 period (men 182,801 (211,231), women 109,305 (162,476)); *exp* is the number of years ranked in the top 250 through the preceding year (men 4.9 (3.1), women 5.1 (3.2)); and *age* is in years (men 24.8 (4.1), women 23.0 (4.6)).

Source: *Tennis*, annual statistical yearbooks.

ease of estimation and their ability to incorporate time-varying independent variables (Allison, 1984), such as tour experience and annual prize money.

In regression 1, independent variables are experience through the previous year, age, and gender (*male*=1) for the combined sample of male and female tennis pros. The marginal effect of the gender variable in regression 1 indicates women pros may have a slightly higher probability of retiring than men pros, holding age and experience constant. In regression 2, however, with the last year's real tournament earnings added to the model, the gender coefficient turns from negative to positive. Recall that female pros in our sample earn considerably less than the male pros. The earnings coefficient indicates that a \$50,000 reduction in real tournament earnings would increase the probability of "retiring" in the following year by .01 (mean retire=.07). Because low levels of tournament prize money may be less likely to cause a young pro to consider retirement than an older pro, the model is re-estimated in regression 3 with players 24 years of age and older. The coefficients and marginal effects are similar across regressions 2 and 3. There is the expected increase (in absolute value) in the marginal effect of earnings among the older players in regression 3. In regressions 4 and 5 the retirement model is estimated separately for men and women pros over age 24. The results are very similar for the two groups. There is no evidence in the results that women are less dedicated than men to professional tournament tennis as reflected in the "retirement" decision. In fact, the marginal effect of earnings on retirement is larger in absolute value for the males than for the females.

In Table 2, models similar to those in Table 1 are estimated by ordinary least squares with the annual number of tournaments played as the dependent variable. Because of the change in the men's ranking system effective in 1990, a dummy variable for the 1990 to 1994 years is added as well as an interaction of the gender variable with this time dummy. The results indicate no difference in the number of tournaments played that can be attributed to gender. The results do show the increase in tour participation by male pros in response to the change in their ranking system in 1990.

Our analysis indicates no differences in the tournament careers of men and women tennis professionals that might be attributed to "competitiveness" traits possessed in greater quantity by males than females. It is possible that female pros are less dedicated to their profession than male pros, but build similar career profiles because competition is less severe on the women's tour. However, it is difficult to argue that this is the case. Entry into the top 250 on each tour is highly competitive. Amateur tennis in the U.S., Western and Eastern Europe, Russia, South America, Asia, South Africa, Australia, and New Zealand produces substantial numbers of potential entrants to the men's and women's professional tours. Only about a dozen new faces each year break into the top 250 on each tour and at an average rank of 96 for the women and 117 for the men for the years covered in our data set. Also, rankings deteriorate with age at about the same rate on each tour. In Table 3, regression results for each tour for a fixed-effects model of tour rank as a function of age, age squared, and individual player identifiers are presented. The coefficient estimates indicate the slope of the rank function with respect to age is 2.1 and 4.1 at age 25 for men and women pros, respectively, and 13.7 and 11.2 at

Table 2
*Results of Regressing Annual Number of Tournaments
 Played by Top Ranked Men and Women Tennis Professionals
 on Selected Variables, 1979–1994*

Independent Variable	Full Sample	Age>24
<i>male=1</i>	0.63 (1.78)	0.03 (0.04)
<i>lexp</i>	-0.23 (-3.21)	-0.50 (-4.48)
<i>age</i>	-0.26 (-5.29)	-0.68 (-7.97)
<i>lagearn</i>	5.51e-06 (9.72)	8.52e-06 (9.43)
<i>d9094</i>	-0.54 (-1.39)	0.21 (0.29)
<i>maled9094</i>	5.18 (9.98)	3.69 (4.16)
constant	21.35 (22.58)	35.15 (15.94)
R^2	0.18	0.24
F	94.94	58.57
n	2,600	1,133

Notes: t values are in parentheses. The mean and (standard deviation) of number of tournaments played per year are: men 18.9 (5.6), women 16.7 (4.7). *d9094* is a binary variable equal to one for each year in the 1990–1994 period. *maled9094* is an interaction between *male=1* and *d9094*. All other variables are defined in Table 1.

Source: *Tennis*, annual statistical yearbooks.

age 30. Finally, female athletes may be more susceptible to injury to the knee, ankle, and shin and more likely to suffer stress fractures than male athletes (Petosa, 1989; Levy and Fuerst, 1993). This means it may take more training and dedication on the part of the female players to compete successfully on their professional tour.

IV. Conclusion

We have asked whether top-ranked male tennis professionals are more dedicated or committed to their careers than the top-ranked female professionals. Our research was motivated by literature that suggests differences in aggressiveness and competitiveness

Table 3
*Fixed Effects Model of Tour Rankings for Top Ranked
 Men and Women Tennis Professionals, 1979–1994*

Independent Variable	Men	Women
<i>age</i>	–55.89 (–9.84)	–31.40 (–7.27)
<i>age</i> ²	1.16 (10.22)	0.71 (7.83)
constant	793.80 (7.71)	403.96 (4.81)
<i>player dummies</i>	a	b
<i>R</i> ²	0.34	0.31
<i>F</i>	3.18	2.78
<i>n</i>	1,695	1,573

Notes: ^aregression includes 235 player binary identifiers. ^bregression includes 216 player binary identifiers. *t* values are in parentheses. Rank is tour singles rank, with one the highest. mean and (standard deviation) men 80.8 (84.7), women 72.8 (76.0).

Source: *Tennis*, annual statistical yearbooks.

between men and women. We have found this not to be the case, at least within the demanding career of the touring tennis professional. In fact, despite substantially lower real earnings, the female pros compete for as many years as do the males and just as intensely in terms of annual number of tournaments played.

NOTES

¹Sample items from the questionnaire approach: “When another person picks a fight with me, I fight back.” (physical aggression); “If somebody annoys me, I am apt to tell him what I think of him.” (verbal aggression); “I think winning is important in both work and games.” and “I would want an A because that means that I did better than other people.” (interpersonal competitiveness). These examples are from Gladue and Bailey (1995).

²In 1996 the involvement fatality rate per licensed driver was 45.02 for males and 16.48 for females 15 years of age and over (National Highway Traffic Safety Administration, 1998).

³For men under the pre-1990 system, points were awarded to players for each match won, with the number of points depending on the quality of the tournament (prize money offered) and “round” of the match. These points were added and divided by the number of events played, with a minimum divisor of 12. The ranking system used by the women’s tour is very similar to this “average system.”

⁴In 1984, the first, tenth, twentieth, and fiftieth on the money list for the men earned (\$000's): 1,289; 208; 148; and 79. For the women the corresponding earnings were \$2,128; 162; 105; and 49. In 1994 the nominal dollar figures for the same rankings for the men were (\$000's): 3,607; 1,211; 689; and 389. For the women: 2,943; 601; 318; and 140.

⁵The average age of the male professionals in our data set is 24.9 years and their average years of experience is 4.8. The average age of the female professionals is 23.1 years and their average years of experience is 5.0. Eight percent of the male pros are under 20 years of age in our data set as compared to 22 percent of the female pros.

⁶The few players that recover a ranking in the top 250 in a subsequent year come back into the data and are afforded the opportunity to retire a second time. The experience variable on the right hand side reflects cumulative experience through the second episode.

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