The Effects of Financial Incentives on Women's Performance: The Tournament Theory Applied to Female Tennis Players

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ABSTRACT
The purpose of this paper is to analyze the management model of women's professional tennis by using the theoretical framework of the tournament theory. Indeed, this sport is particularly appropriate to study the effects of financial incentives on women's performance in the context of competitive elimination tournament. Moreover, we take into account the direct opposition between players by building two relative performance indicators. Empirical tests are conducted, by using Ordinary Least Squares method, on the whole tournaments played by the 30 best women's tennis players, over the 2011 season. Interesting implication found is that one tournament theory principle, the incentive effect, is confirmed. In other words, an undistributed prize structure between tournament rounds increases the player performance. However, the other consequence of the tournament theory, the participative effect, is rejected because the monetary gains distributed by the tournament's organizer (either the premium earned or the total dollar endowment) do not induce better player performance.

KEYWORDS: *tournament theory, financial incentives, performance, women, professional tennis*

JEL CLASSIFICATION : *J33, L83, M12, Z2*

1. INTRODUCTION

Sport competition, characterized by a competitive nature and rational actors, provides an experimental field to study management issues. Indeed, data on performance and compensation are easily available in the case of sport. Thus, as noticed by Wolfe et al. (2005) or Adcroft and Teckman (2009), sport constitutes a relevant field to test some management models such as the tournament theory. This latter analyzes the worker performance in response to financial incentives (system of reward, bonus, promotion…) in a competitive environment, namely an elimination tournament offered by companies to select the best candidate for key position.

In addition, professional tennis tournaments are particularly appropriate to study the incentive effects of competitive tournament. On the one hand, the contest is an elimination tournament between two players, which is frequently observed in reality (instead of a tournament between several people). On the other hand, the rules of the game are known, which avoids situation of collusion, coalition, sabotage or doping. Moreover, the number of contests in professional tennis is limited, so that there is no problem of repeated tournaments. Finally, the management model of professional tennis is based on the tournament theory framework, namely the effects of financial incentives on performance (Barget, 2006). Indeed, organizers offer high

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endowments and an unequal prize distribution in order to encourage the most talented players to participate in the tournament, and to provide the highest performance level. Such incentive mechanism, coupled with seeding arrangements, ensure that the best tennis player does not play against another top player in the early rounds of the tournament. Thus, their level of effort will progressively increase in order to maximize the media and public interests at the final round.
As a result, we propose to use the tournament theory framework to investigate the responses and attitudes of women to tournament-style incentives and competition in the case of professional tennis tournaments. In other words, how do women respond as competitive pressure rises in a highly competitive environment, such as elimination tournament schemes, when they compete against other women. We use data from the 2011 women's professional tennis season to report new findings of the effects of prize money on player's performance. To our knowledge, few studies have tackled the issue of incentive effects on women's performance in sport tournaments.

The interests of this study are many and varied: first, we use the theoretical framework of the tournament theory in the context of professional tennis which is notably appropriate to study the incentive effects of competitive elimination tournament. Second, we focus on the case of women's tournaments, which is particularly relevant due to the rare literature on this topic. Moreover, tennis is the only sport where parity is observed in the allocation of prize money between men and women in the Grand Slam tournaments. Finally, we build two relative performance indicators, based on the whole contest, to measure female athlete's performance by taking into account the direct opposition between players.

The outline of this article is as follows: section 1 presents the tournament theory framework and a literature survey about models of sports tournaments. Section 2 outlines the methodology, based on relative performance indicators and the econometric model. Section 3 provides a data description and reports the empirical findings for the 30 best women's tennis players based on tournaments data of the 2011 season, by using Ordinary Least Squares method.

2. TOURNAMENT THEORY, A CONVENIENT FRAMEWORK TO TEST THE INCENTIVES EFFECTS ON INDIVIDUAL SPORTS

2.1. The tournament theory framework

Tournament theory was built to explain the increasing wage gap between managerial teams of a company and the incentive effects of such policy on individual and firm performance (Leonard, 1990; Knoeber & Thurman, 1994; Eriksson 1999). Lazear and Rosen (1981) proposed the first theoretical formulation with two rivals competing for the first and second place in a tournament organized by a firm. These employees will only participate in the challenge if the expected prize is high enough to offset the cost of the effort required. The decision process involves two steps:

- a) the candidate determines the level of effort to provide during the tournament, so that the probability of winning the first prize is maximum; this effort is an increasing function of the prize differential between the first and the second place;
- b) once the level of effort required is fixed, he determines whether the expected gain, *i.e*. the average of the two prizes at stake, is large enough to offset the effort required. And, he only participates if the expected gain offset the effort.

As a result, the tournament theory emphasizes the incentive role of a differentiated prize structure increasing the player's average level of effort and performance. Moreover, in the case

of elimination tournaments with a finite number of competitors, the optimal prize structure should include an extra reward at the final for the best contestant, so that players maximize their effort (Rosen, 1986).

2.2. Tournament theory applied on individual sports: a literature review

Empirical studies testing the incentives on performance, through prizes distribution, are rare due to the lack of real data on tournaments organized by firms. However, sport can bridge this gap thanks to the available statistics. In addition, individual sports (for example golf, running or tennis) provide an ideal framework to determine the prize structure maximizing the agents' performance (Szymanski, 2003). Under these conditions, it is appropriate to consider the tournament theory in the context of competitive sports where two players are competing to win the match and the financial bonus.

Thanks to the availability of detailed statistics, an important academic literature was developed on sports tournament with financial incentives.

Thus, the incentive effects of tournament theory, namely a positive incentive effect of prizes and/or prize spread, are supported in male sports tournaments since the seminal work by Ehrenberg and Bognanno (1990a) (1990b) on golf (even if after, such study was reassessed and rejected by Orszag, 1994). Then, the literature was developed on other sports: professional bowling (Abrevaya, 2002), car racing (Becker & Huselid, 1992; Von Allmen, 2001), horse racing (Lynch et Zax, 1998; Fernie and Metcalf, 1999), motorcycle (Maloney & Terkun, 2002), marathon (Frick & Prinz, 2007) or professional tennis (Sunde, 2003; Sunde, 2009; Barget et al., 2011).

However, relatively few works have been applied in the case of women. On the one hand, studies on running (Maloney & McCormick, 2000, Frick & Prinz, 2007; Frick, 2011) find positive incentive effects of overall prize levels (but not from larger prize spreads or additional rewards such as bonus payments) on women's performance. On the other hand, the research of Matthews et al. (2007) on the female golf find no positive financial incentive effects on women's scores. Finally, two studies on the female professional tennis confirm the responsiveness of women to tournaments with monetary incentives, such as prize spread and global endorsement.

First, the work of Lallemand et al. (2008) applied the same methodology used by Sunde (2003) on the male tennis players. They take into account the two final rounds of all tournaments respectively for the women's professional tournament tour from 2002 to 2004 and for the male case between 1990 and 2002. In both studies, player performance is measured by the number of games won during the match m of tournament j, or by the difference between the number of games won by the favorite and the challenger during the match m of the tournament j. Thus, they found that the performance of player i is explained by (i) the heterogeneity in the relative level of participants, (ii) the distribution of the global prize money between rounds, (iii) the total dollar endowment tournament and (iv) the characteristics of player i and of tournament j. Hence, the results of both studies are consistent with the incentives effects of tournament theory. On the one hand, the prize money amount offered has, *ceteris paribus*, a positive and significant effect on the level of performance, measured by the number of games won. On the other hand, the incentive effect on the probability of winning the tournament is very significant. However, in the case of women (Lallemand et al., 2008), the difference between the number of games won by the favorite and the challenger increases with the difference in rankings between the

players. Therefore, the effort made by a female tennis player to win the match is determined more by their individual abilities, their intrinsic qualities (the capability effect) than by financial incentives of the tournament. This is the contrary in the case of men (Sunde, 2003; Sunde, 2009): financial incentives have a greater impact on the player's effort, so that differences in the capability of each player are not so prevalent than in the women's case.

Second, Gilsdorf and Sukhatme (2008) analyze the results on the female tennis over the 2004 season by using as effort proxy a dummy variable (equal to one if the higher ranked player won a tennis match). They find that an increase in prize money differential has a positive effect on the probability that the higher ranked player (the favorite) wins the match, so that they confirm the principles of tournament theory.

3. METHODOLOGY AND ECONOMETRIC MODEL

3.1. Performance indicators used

According to such literature, it appears that, except in the case of golf, men and women are very sensitive to tournament financial incentives in individual professional sport.

However, previously mentioned studies in tennis suffer from three loopholes:

- first, they have estimated the performance, match by match, which is not correct with the spirit of the tournament theory, whereas we need to consider the whole tournament;
- second, they use the number of games won as key performance indicator. This measure of the performance is not very relevant in tennis because it is possible to win more games than the opponent and nonetheless to lose the match. Indeed, all the points played do not have the same value (Klaassen & Magnus 2001), some are crucial while others are not so important (for instance at the beginning of a set).
- third, they measure performance without taking into account the quality of the opponent. Indeed, we cannot consider that the female tennis player has the same level of performance if she defeated, by the same score, the player ranked as world number 1 or 3000th at the Women's Tennis Association (WTA) rankings. There is a direct confrontation between two opponents, so that the level of the opponent must be taken into account in the calculation.

As a result, we need to use two relative performance indicators rather than an absolute one. The first indicator, called PERF1, only consider the victories of the player: it is the sum, on all rounds of the tournament, of the difference between the WTA rankings of the last player and the position of the player who was defeated at this round. Thus, we consider that if a tennis player i wins against a player j ranked 30th at the WTA rankings, it means that she plays better than the 2470 players ranked from the 31th to the 2500th at the WTA rankings. Such indicator has the advantage of taking into account the level of the opponent who was defeated. Implicitly, the assumption made is that the player defeated has a level of play corresponding exactly to its WTA ranking.

$$\text{PERF 1} = \Sigma \text{ (Number of players at the WTA rankings} - \text{Ranking of the defeated player)}$$

A second performance indicator is developed with two major improvements. First, the difference in the ranking between the player *i* and the opponents defeated is considered. Secondly, in addition to performances, a potential player underperformance in this tournament

is included. Indeed, performance in the tournament can be mitigated by the final defeat: when the number one (player i) in the ranking lost at the 3rd round against the 500th, it is an underperformance to include in the global measure of player's *i* performance during this tournament. The defeat is only considered in the case of loss against a lower ranked player. In addition, the calculation of PERF2 can give a negative value if the performance achieved (victories in earlier rounds) is more than upset by an underperformance (defeat against a lower ranked player). This is anyway the case when a disappointing performance occurs in the first round of the tournament. When it happens, no negative value is mentioned; PERF2 is considered as equal to zero.

PERF 2 = Σ [Number of players at the WTA rankings + (Ranking of the player i – Ranking of players defeated by i) – (Ranking of the player who won against i – Ranking of the player i)]

Finally, in the PERF 1 and PERF 2 formulas, we change the number of players at the WTA rankings (2500th) by the worst ranked female player playing the considered tournaments (118th in the 2011 WTA ranking). Indeed, our analysis focuses on the 30 best players, so that they will never have the opportunity to play against the worse WTA players. That is why we focus on the 2011 tennis season because in the other years, the worst ranked player qualified in a WTA tournament is ranked beyond the 300th position.

3.2. The econometric model

To apply the tournament theory to the case of female tennis, we propose to estimate the following relationship:

$$PERF_{it} = a_0 + a_1\, PRIZEt + a_2\, CARAC_t + a_3 CAPAi + v_{it} \qquad (1)$$

where

- $PERF_{it}$ is the player's i performance in the tournament t;
- $PRIZE_t$ is a vector reflecting the financial characteristics of the tournament t, including (i) the overall prize money allocated, (ii) the prize structure (calculated by the difference between the prize distributed for the round n and n-1, divided by the average prize distributed in the tournament) and (iii) the prize money won by the player i ;
- $CARAC_t$ is a vector incorporating variables related to the profile of the tournament t such as (i) the surface of the court (i.e. indoor or outdoor), (ii) the number of participants, (iii) the tournament category (i.e. Grand Slam, Premier Event, Premier), (iv) the number of WTA points allocated, (v) the month in the season;
- CAPAi is a vector related to the characteristics and abilities of the player i, including (i) the weight, (ii) the height, (iii) the age, (iv) the number of tournaments played during the year, (v) the rank of the player in the tournament, (vi) the WTA points won in the tournament, and (vii) a dummy variable indicating if she reached the quarter finals in this tournament before;
- v_{it} is a random term.

The link between performance and the global prize money reflects a participative effect; in other words, a higher amount of prize money encourages players to participate.
The relationship between performance and prize structure constitutes the incentive effect. Thus, players will make more efforts if the prize money is very unequally distributed from a round of the tournament to the other.

The model had been estimated first for all the players, and then for those who reach the quarter finals of the tournament.

4. EMPIRICAL RESULTS

4.1. Sample and data

The WTA, which manages the organization of women's professional tennis since 1973, gives many information about tournaments characteristics (the overall endowment, distribution of prize money and premiums for every tournament and each round), the profile of players and their results.

Table 1. Prize money, prize spread and number of WTA points distributed in the women's professional tennis

Grand Slam	**Prize money in $**	**Prize spread**	**% of overall allocation for the winner**	**Number of WTA points**
W	$1 809 011	9,51	17,25%	2 000
F	$1 029 505	7,38	9,82%	1400
S	$425 074	2,59	4,05%	900
Q	$212 538	1,34	2,03%	500
R16	$102 736	0,55	0,98%	280
R32	$57 360	0,27	0,55%	160
R64	$35 114	0,19	0,33%	100
R128	$19 256	0,24	0,18%	5
WTA Premier Events	**Prize money in $**	**Prize spread**	**% of overall allocation for the winner**	**Number of WTA points**
W	$737 750	6,99	16,39%	1000
F	$368 875	3,97	8,20%	700
S	$159 724	1,71	3,55%	450
Q	$69 575	0,66	1,55%	250
R16	$34 613	0,29	0,77%	140
R32	$19 345	0,15	0,43%	80
R64	$11 659	0,22	0,26%	5
WTA Premier	**Prize money in $**	**Prize spread**	**% of overall allocation for the winner**	**Number of WTA points**
W	$108 875	2,41	16,26%	470
F	$58 500	1,29	8,74%	320
S	$31 425	0,7	4,69%	200
Q	$16 719	0,37	2,50%	120
R16	$9 081	0,2	1,36%	40
R32	$4 963	0,24	0,74%	1
WTA International	**Prize money in $**	**Prize spread**	**% of overall allocation for the winner**	**Number of WTA points**
W	$37 000	2,62	16,82%	280
F	$19 000	1,27	8,64%	200
S	$10 300	0,7	4,68%	130
Q	$5 483	0,36	2,49%	70
R16	$3 025	0,18	1,38%	30
R32	$1 775	0,26	0,81%	1

Source: WTA Tour 2011, and authors' calculations

Table 1 reveals that the amount of monetary gains distributed is very high. In addition, the prize structure is particularly unequal: amounts won by players nearly double from a round to another. Moreover, the most prestigious tournaments are characterized by a stronger

concentration of prize money on the last rounds of the tournament (column 2). Prize spread (column 3), which is calculated by the difference between the distributed prize, divided by the average prize, is 9,51 for Grand Slam tournaments against only 6,99 for the Premier Events, 2,41 for Premier 2,62 for International. Besides, the percentage of overall allocation, obtained by dividing the prize for the winner with the tournament prize money, represents between 16% and 18% of the global monetary allocation depending on tournament (column 4).

Therefore, we can notice that in the women's professional tennis, tournament organizers set up incentive models. Such system with seeded players help to improve the chances of best players to win the competition, so that the tournament keeps all the interest until the final and generates more economic benefits. In other words, the analysis of financial data in the female tennis reveals that the organizers implement the principles of tournament theory:

- on the one hand, monetary gains are very unequally distributed between the rounds. Indeed, organizers consider that the level of effort made by players will be higher by offering larger prize spread from a round to another. This is the incentive effect related to performance.
- on the other hand, it is assumed that the global endorsement is an important factor in the choice of players to participate in the tournament. The best players will register in a tournament if the global amount of prize money is high. This is the participative effect related to performance.

Moreover, we can build a measure of the heterogeneity of female tennis players according to their level (directly evaluated from their current WTA ranking) and their sport results in every tournament. The number of WTA points (column 5) depends on the tournament design (Grand Slam tournaments distribute a greater number of points) and the round reached in the competition.

In addition, WTA ranking and prizes are given *ex ante*, i.e before the beginning of the tournament, so that the theoretical conditions are satisfied to avoid endogeneity problems. Moreover, there is no information asymmetry between the players: indeed, before a match, each player knows the level of the opponent according to the WTA ranking and their previous head to head confrontation.

Finally, a large number of control variables are available, such as the characteristics of the player (age, height, weight…) and tournament (court surface, category of the tournament, number of participants, month in the season), so that we can check the robustness of the model. As a result, our database includes the results for the 30 best WTA players in all tournaments that they have played during the 2011 season (Grand Slam, WTA Premier Events, WTA Events, WTA International), namely 610 observations.

The participation of each player in a tournament gives many information since forty variables can be computed each time. Some of these variables are directly observed such as the player's personal characteristics (age, size, prize money won during the competition…) and for the tournament (location, category of the tournament, surface, number of rounds, WTA points distributed…).

Other variables are built such as the player's performance in the tournament (PERF 1 and 2), the prize structure of the tournament (see table 1 above) and binary variables. Concerning the characteristics of the tournaments, 53 tournaments were played in 2011 by the best 30 WTA players, namely 4 Grand Slams, 10 Premier Events, 11 Premier and 28 Internationals.

Moreover, 34% of tournaments are played on hard surface, 33% on clay, 13% on indoor and 7% on grass.

Concerning the characteristics of the best 30 WTA players, we notice that:

- the average age is 26 years and 7 months old (the youngest is 20 years old and the oldest is 31 years old), and notably 23 years and 4 months old for the best 5 WTA players.
- the average height is 169 cm with the tallest (188 cm) and the shortest (161 cm).
- the average weight is 62 kgs with the thinner (55 kgs) and the more muscular (75 kgs).

4.2. Econometrics results over the best 30 WTA players

Table 2. Empirical results by using Ordinary Least Squares method

Explanatory Variables	**PERF1**	**PERF1**	**PERF1**	**PERF1**	**PERF2**	**PERF2**	**PERF2**	**PERF2**
Independent variables	B	Prob.	B	Prob.	B	Prob.	B	Prob.
Intercept	120,1	0,055	-33,13	0,848	1,283	0,003	-157,59	0,395
Overall prize money	0	0,000	0	0,000	0	0,000	0	0,000
Prize structure	89,84	0,000	77,58	0,000	102,39	0,000	84,61	0,000
Prize money won	-0,004	0,000	-0,004	0,000	-0,004	0,000	-0,004	0,000
Event point	4,53	0,000	4,69	0,000	4,599	0,000	4,868	0,000
Tournament classification	-10,65	0,058	-	-	-40,68	0,002	-	-
Grand Slam	-	-	-232,66	0,037	-	-	-495,96	0,000
Premier Event	-	-	-331,85	0,001	-	-	-210,87	0,009
Premier	-	-	-204,08	0,000	-	-	-207,91	0,000
Tour Championship	-	-	-248,82	0,000	-	-	-246,91	0,000
Ranking	2,89	0,000	2,836	0,000	5,79	0,000	5,26	0,000
Weight	10,85	0,033	5,394	0,044	6,32	0,032	6,44	0,024
Quarter Finals	600,2	0,000	558,44	0,000	637,87	0,000	580,62	0,000
R-squared	0,872		0,881		0,866		0,874	
Adjusted R-squared	0,87		0,88		0,864		0,872	
Standard error	361,4		348,2		384,3		372,5	
N	610		610		610		610	

Source: authors' calculations

Estimates were performed by using SPSS 21.0 with Ordinary Least Squares method (heteroscedasticity is corrected by using White correction). We introduce explanatory variables, step by step, in the equations. The results are presented in Table 2, containing only variables with significant explanatory power on the calculated performance. All the other variables included in the regressions were consistently rejected: the height, the age (the average age for the best 5 WTA players is young, reaching 23 years and 4 months old), the average percentage of points won in the tournament, the participation in her home country tournament, the ranking variations between two WTA tournaments (to show if the player is in run of success instead of defeats) or again variables characterizing the tournament (month, location of the tournament, indoor or outdoor surface, number of participants).

First, the overall tournament endowment and the prize money won are significant but they have no impact on the level of player performance. Therefore, these results seem at odds with one principle of the tournament theory. Indeed, we do not find participative effect, i.e. female tennis players do not register in tournaments according to the total amount of bonus paid. This result is not surprising, because we study the best top 30 WTA players, and their participation in the most prestigious events is necessary to achieve a better WTA ranking and to obtain a seed in next tournaments (so that the best players do not play each other in the early rounds). Moreover, their participation in the most prestigious tournaments is compulsory. Thus, from a managerial point of view, it appears that it is not necessary for the tournaments organizers to increase monetary endowments, since player performance is not affected. In fact, increasing premiums paid can be explained by the competition between WTA tournaments to attract the best and most famous female tennis players.

However, tournament prize structure appears as a strong incentive to performance. In other words, more the prize structure is uneven (because of the high difference of the monetary gain from a round to another), better is the player performance. As a result, the second postulate of the tournament, *i.e* the incentive effect, is confirmed in our study. It significates that an unbalanced prize structure encourages players to make more efforts to improve their game and to reach a more advanced round of the competition.

In addition, the number of WTA points gained at the tournament (*i.e* the event point) and the player's rank contribute positively to the player's performance, whatever the calculation method.The sensitivity to the WTA points suggests that, if the best women's tennis players are interested by the tournament monetary gain (the financial incentive), WTA points also constitute a significant motivation to obtain a high ranking position. Indeed, a best ranking guarantees a direct entry to major tournaments and a seed (whereas lower ranked players have to participate in a qualifying tournament or to receive a wildcard from the organizers). Moreover, higher ranked players can be invited to lucrative exhibition tournaments.

Finally, dummy variables on the tournament classification only show a negative effect on the player's performance. It significates that more the tournament is important, more it is difficult to obtain good results. Conversely, it is easier to obtain a best performance in less prestigious tournaments than in Grand Slam. In addition, weight is significant and has a positive impact on performance reflecting the advantage of physical strength.

4.3. Econometrics results from players qualified for the quarter finals

A second set of estimates was carried out on players who reached the quarter finals of the tournament. It is also at this last phase that the effort becomes more intense. Moreover, at this stage of competition, level of players becomes closer.

The results are presented in Table 3 below: they reveal once again that the monetary gains distributed in the tournament (either the premium earned or the total dollar endowment) do not affect the performance of tennis players, contrary to the prize structure. Thus, the incentive effect on performance is confirmed through this second estimation on high skilled players.
Similarly, WTA points influence very positively the performance of the players. It supports the idea that reputation and the dream of glory of professional tennis players seem more important than the amount distributed in monetary gains; this explains the strong participation of the best players to the most prestigious tournaments (distributing more WTA points).

Moreover, it appears that from the quarter finals, age is not significant to explain the performance, so that there is no experience effect gained from the player career.

In addition, it is important to note that by testing tournament theory on the women's tennis players, we focus on monetary gains distributed by the tournaments organizers.

However, the income earned by tennis players includes on the one hand, prize money won during competitions and on the other hand, premiums for tournament participation (namely, financial guarantees established by the organizers to ensure the participation of top players). This practice of commitment bonuses distributed by the organizers of the most important tournaments, creates a two-tier professional tennis: with the lower ranked athletes playing for monetary endowment, and on the other side, top ranked athletes, who partially play for monetary gain, because they receive commitment bonuses from a tournament organizer.

Moreover, tennis players benefit from advertising and sponsorship contracts, fees from exhibition matches, or again gifts offered by the tournament sponsors. In these conditions, incentives on performance may also result from future advertising contracts offered to the tournament winner and to the top ranked and charismatic players. However, the value of these contracts is difficult to observe for all WTA players. Indeed, according to the Forbes 2011 ranking, seven of the top 10 highest-paid female athletes were tennis players. However, there is a strong inequality between the tennis player income. Indeed, if the prize money generally constitutes the tennis player income; in the case of superstars (such as the Russian Maria Sharapova or the Chinese Li Na), sponsorship contracts and appearance fees (for instance in the case of exhibitions games) are largely the most important part of their income. Indeed, prize money earnings in tournaments only represent 10% of Sharapova revenues and 16% of Li Na revenues. Moreover, Maria Sharapova is number one in this money list of sport women income in the world (with an annual income of $25 million in 2011), but she ranks fifth among the best paid sportsmen in the world.

Table 3. Econometric results from the players qualified for the quarter finals

Explanatory variables	**PERF1**	**PERF1**	**PERF1**	**PERF1**	**PERF2**	**PERF2**	**PERF2**	**PERF2**
Independent variables	B	Prob.	B	Prob.	B	Prob.	B	Prob.
Intercept	-320,1	0,433	2753,5	0,001	897,51	0,000	1825,4	0,009
Overall prize money	0	0,000	0	0,000	0	0,000	0	0,000
Prize structure	163,5	0,000	96,34	0,000	161,97	0,000	103,06	0,000
Prize money won	-0,002	0,000	-0,003	0,000	-0,002	0,000	-0,003	0,000
Event point	3,063	0,000	3,966	0,000	3,12	0,000	4,126	0,000
Grand Slam	-	-	-930,58	0,000	-	-	-931,9	0,000
Premier Event	-	-	-747,36	0,000	-	-	-755,9	0,000
Premier	-	-	-351,61	0,000	-	-	-360,7	0,000
Tour Championship	-	-	-412,20	0,000	-	-	-427,1	0,000
Ranking	5,021	0,000	2,852	0,017	10,403	0,000	6,764	0,000
Weight	12,75	0,011	16,129	0,002	22,029	0,021	16,53	0,002
Height	-17,69	0,023	-12,444	0,006	-18,67	0,020	-10,10	0,024
R-squared	0,798		0,833		0,785		0,825	
Adjusted R-squared	0,792		0,825		0,78		0,818	
Standard error	372,6		341,47		399,79		363,78	
N	228		228		228		228	

Source: authors' calculations

To conclude this study on the effects of financial incentives on women's performance, it is relevant to interpret our result by taking into account the gender differences in athlete performance. Indeed, according to some empirical studies (Eber, 2006; Wozniak, 2012) and recent experimental research (Croson & Gneezy, 2009), males and females are different concerning competition, namely that "women are more averse to competition than are men" (p. 1). They are also "more reluctant than men to engage in competitive interactions like tournaments" whereas "men's performance, relative to women's, is improved under competition" (p. 17). Moreover, sport would make men more "competitive" than women (Eber, 2006; Wozniak, 2012) and less sensitive to these inequalities.

Thus, by comparing our results and the literature on the case of male tennis players, it appears that we find the same conclusion concerning the principles of the tournament theory, namely a reject of the participative effect and a validation of the incentive effect. However, gender differences can moderate the effects of prize spread incentives, so that female tennis players seem less sensitive to prize spread than men. In other words, women may be motivated by other factors than financial incentives. Indeed, the effort made by a female tennis player to win the match is related more to their individual abilities, their intrinsic qualities than the financial incentives of the tournament.

Finally, the influence of physical characteristics on performance is different. We find that the weight is significant for the women whereas this is the case of height for the man. This can be explained by the difference in the style of play.

CONCLUSIONS

This study found that the monetary gains offered by tournaments (either the premium earned or the total dollar endowment) in the women's professional tennis do not induce better player performance. However, the strong inequality in the allocation of prizes between rounds is statistically legitimized. As a result, the organizers must focus on prize money distributed during the last phases of tournaments to encourage players to make more efforts and play better. Thus, the principles of tournament theory are only confirmed concerning the effects of prize structure on performance, but not for the effect of global endorsement. In other words, the difference in the earnings from a round to the other matters, but not the global amount allocated.

Generally speaking, the aim of the tournament organizers is to generate the biggest public interest for their competitions. That is why, WTA regularly changes the player's classification system, the calendar of sporting events, and the rules of the game in order to optimize the sporting interest tournaments and the financial benefits. Therefore, the tournament theory framework can help us to analyze these choices by studying the key determinants of performance. In this respect, and contrary to the tournament theory, our results show that the financial gains distributed in the tournament (either the premium earned or the total dollar endowment) are not necessarily the most decisive factors in the performance; variables such as the WTA points or income distributed outside courts seem equally important. Indeed, one of the reasons why women do not react strongly to an increase in global endorsement could be that prize money is only a part of their revenue.

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