Gender Differences in Competition: Evidence from Swimming Data

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Abstract

We examine that the gender differences in the sensitivity of the influence from others using swimming data. We focus on the existence of competitor and existence of co-worker, and measure the impact of both effects. Using absent-competitor data, we can compare directly the performance of individual swimmers with and without an adjacent competitor. We found female swims faster with competitors than male. We also compare the records of medley relay records and that of the individual event, and found female cannot do better with co-workers than alone.

Keywords: Gender difference, Competition, Peer effects, Swimming, Online data
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1. Introduction

As Aristotle said “man is by nature a social animal”, we live with others, and we influenced by others in many aspects of life. The most common “others” are the competitors or the co-workers. In this paper, we focus how the existence of competitors and co-workers influences one’s performance and investigate whether there is any difference between males and females in its sensitivity.

We begin with the influence of the competitors. Gender difference in competitiveness is an explanation of gender gap in labor market outcomes; income level or the number of top level supervisory employees. There are some studies about the gender gap of performance under the competitive environment, for example, Gneezy and Rustichini (2004) shows the existence of competitors improves only male’s performance. There are also some recent studies which focus on the gender differences in the preference of competitiveness. Nierderle and Vesterlund (2007) found men prefer to competition than women by economic experiment, and Mizutani et al. (2009) expands their studies and found the overconfidence of men determines the preference for competition. They also found the male-female ratio influences the degree of overconfidence in both men and women.

Next, concerning the existence of the co-workers, peer effects might be well known. Peer effects in economics are concerned in crime rates and educational first. Falk and Ichino (2006) studied the peer effect in the workplace. While Falk and Ichino (2006) conducted a laboratory experiment, Mas and Moretti (2009) and Bandiera, Barankay, and Rasul (2010) measured peer effects using actual

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workplace data. Lavy and Schlosser (2011) examine the gender differences of peer effects in classroom, and they found the proportion of girls improves boys and girls' cognitive outcomes.

In this study, we reveal the gender differences in the sensitivity of the influences from other person; competitors and co-workers. Swimming data is suitable for testing the influence of the competitors or co-workers. We can compare directly the performance of individual swimmers with and without an adjacent competitor using absent-adjacent competitor data. The swimmers primarily are aware only of competitors in adjacent lanes. So if both adjacent competitors are absent, swimmers perceive themselves to be swimming alone. We can also examine directly the existence of co-workers comparing medley relay and individual event. Medley relay is swum by four swimmers in order of Backstroke, Breaststroke, Butterfly, Freestyle. So in 4×50 medley relay, the first swimmers are in the same condition as the 50m individual Backstroke swimmers except for having three teammates who are following them. We consider these teammates as co-worker. To compare the performance of medley relay and that of individual event, we investigate the influences from the existence of co-workers.

2. Data

We made two dataset; both from "Swim-Record dot com"[3], the official Internet search site of the Japanese Swimming Federation (JSF). The site includes approximately 1,500 official competition records per year from competitions held by each JSF member organization (mainly in each prefecture). Members are obliged to reveal all records of official JSF competitions to the public. The official record contains only JSF- registered swimmers in competitions governed by international rules. We use the meet held in 2007 to 2010.

Our first dataset is Timed-Final dataset. In this dataset, we have two records for each swimmer; the records when the swimmer has no competitor and when he has two competitors in his right and left adjacent lanes. We count the swimmers who do not participate in the race at all for the abstentions. This dataset has 42198 records of 9849 unique swimmers (21966 records of 5196 unique male swimmers, 20232 records of 4653 unique female swimmers). Our second dataset is Relay dataset which includes 84995 records (43292male and 41702female). In this dataset, we have also two records in for each swimmer; the records of Medley relay and the records of individual event. We have 4×50 medley relay (paired with 50 meter individual event) and 4×100 medley relay (paired with 100 meter individual event). All of the records in this dataset are Backstroke.

3. Result

First of all, we show the descriptive statistics. The average records of male is 64.43 seconds (sd = 7.94), and 68.02 seconds (sd = 6.18) in female. The average records of male in 50m individual event

[3] http://www.swim-record.com/index.html

is 33.71 (sd = 5.11), in relay is 33.72 (sd = 5.09). In female, the average records of 50m individual event is 34.55 (sd = 4.62), that of relay is 34.59 (sd = 4.64). In a similar way, the average records of men's 100m individual event is 64.93 (sd = 8.73) and that of medley relay is 65.04 (sd = 8.71). The average records of women's 100m individual event is 69.71 (sd =8.43) and 69.87 (sd = 8.45) in relay.

3.1 The effects of competitor

In this section, we examine the competitor effects. We can see the effect from existence of competitor by regressing one's performance on the dummy variable of the competitor existence. The left column of Table 1 presents the result of panel fixed effects estimation using all samples in Timed-Final dataset. The variable "d_competitor" is the dummy variable which takes 1 if the record includes data when both adjacent swimmers are present and 0 otherwise. The variable "d_competitor_f" means the cross term of "d_competitor" by the female dummy. We have two records which recorded in two other meets, so we need to control the development during two meets. We first collect the records when the swimmers had no competitor, then identify the nearest competition which adjacent competitor exists for each swimmer. We represent the date by serial value in which 1st January 1900 takes numeric value 1 and 2nd January 1900 takes 2 and so on. Definitions of all variables appear in Appendix.

The coefficient of existence of competitor is negatively significant. That is, swimmers can swim faster with competitors than alone. The cross term also negatively significant. We found female swims faster with competitors than male. But there might be some selections in whether to continue swimming. If only the competitive female is continuing swimming, it is natural that we get above result. To check this selection, we investigate the ratio of male swimmer to female swimmer. Table 2 presents the percentage of each gender and the result of the goodness of fit test. The ratios of male to female are significantly different from the distribution of population after school age 10 (first grade of high school). So we can consider there is no selection before school age 9, then we do above regression using only the swimmers who is under the school age 9. The result is showed in the right column of Table 1. Female swims still faster with competitors than male. Next, we divide sample by gender and school age. Table 3 shows the result of estimation. Column 1 of Table 3 presents the result using all sample, column 2 is the result of elementary and junior high school student, column 3 is the result of high school and adult. There is competitor effect in both of junior and senior female student. Male is not influenced competitors until under the junior high school, but he become influenced with getting older. It is often said that girls grow at a much faster than boys. This might be a cause of our result; people are not influenced by competitor in the early stage of the process of one's development, but they become sensitive with their growth.

3.2 The existence of co-worker

To reveal the existence of co-workers, we generate the dummy variable which 1 when the swimmers swim faster medley relay than individual event and 0 otherwise. We do probit estimation for this variable using female dummy and other control variables. The estimation result is presented in Table 4. The female dummy is significantly negative; female can swim faster individual event than medley relay. While we also divide sample by school age 9, the result is not changed.

4. Conclusion

In this study, we investigated the gender differences in the influence of the existence of competitors and co-workers using swimming data. We examine the effect of competitor existence using the adjacent-absent record, and the effects of co-workers existence using the records of medley relay and individual event. First, we reveal the existence of competitor improves the performance of swimmers, and female is more influenced than male. Second, we also found female swims individual event faster than medley relay which has following teammates. Female cannot demonstrate their ability with co-workers. It might that they feel more responsibility in medley relay than individual event, so they cannot do well because of pressure. But there is another thought that female tend to lost their motivation in medley relay because the rewards and pressure per person is 1/4 compared with individual event. We cannot discuss this result in more detail without collect more evidence that clarify whether medley relay or individual event is more pressured condition. But it is our contribution by directly investigate the effects of competitor existence and co-worker existence and find the gender differences in its sensitivity.

5. References

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Table 1: The existence of competitors.

Dependent variable is own records (with individual fixed effect)

	all sample		schoolage<=9	
	Coef.	p value	Coef.	p value
Constant	200.857	[0.000]**	214.579	[0.000]**
d_competitor	-0.104	[0.000]**	0.002	[0.939]
d_competitor_f	-0.122	[0.000]**	-0.174	[0.000]**
date	-0.008	[0.000]**	-0.008	[0.000]**

Table 2: Player number and Population

School	Player numbers		Population of Japan		Goodness of fit test	
age	Male	Female	Male	Female	chi^2	p value
1	51.77	48.23	51.29	48.71	0.009	0.923
2	51.41	48.59	51.35	48.65	0.000	0.991
3	51.13	48.87	51.27	48.73	0.001	0.978
4	53.3	46.70	51.25	48.75	0.168	0.682
5	53.84	46.16	51.17	48.83	0.284	0.594
6	53.95	46.05	51.22	48.78	0.298	0.585
7	58.37	41.63	51.20	48.80	2.057	0.152
8	59.48	40.52	51.24	48.76	2.716	0.099
9	60.24	39.76	51.30	48.70	3.198	0.074
10	63.4	36.60	51.28	48.72	5.882	0.015
11	63.28	36.72	51.24	48.76	5.804	0.016
12	63.44	36.56	51.25	48.75	5.947	0.015
13	69.29	30.71	51.21	48.79	13.089	0.000
14	68.18	31.82	51.24	48.76	11.489	0.001
15	70.75	29.25	51.20	48.80	15.302	0.000
16	70.67	29.33	51.49	48.51	14.726	0.000
17	71.13	28.87	51.44	48.56	15.523	0.000

Table 3: The result of estimation by school age and gender.

Dependent variable is own records (with individual fixed effect)

	male (all sample)		male (school age <= 9)		male (school age > 9)	
	Coef.	p value	Coef.	p value	Coef.	p value
Constant	220.114	[0.000]**	242.446	[0.000]**	99.946	[0.000]**
d_competitor	-0.151	[0.000]**	-0.043	[0.230]	-0.096	[0.007]**
date	-0.009	[0.000]**	-0.01	[0.000]**	-0.002	[0.000]**

	female (all sample)		female (school age <= 9)		female (school age > 9)	
Constant	183.74	[0.000]**	193.284	[0.000]**	87.039	[0.000]**
d_competitor	-0.192	[0.000]**	-0.141	[0.000]**	-0.188	[0.003]**
date	-0.006	[0.000]**	-0.007	[0.000]**	-0.001	[0.000]**

Table 4: The existence of co-worker.

Dependent variable is the fast medley relay dummy (probit)

	all sample		schoolage <= 9		schoolage > 9	
	Coef.	p value	Coef.	p value	Coef.	p value
Constant	0.118	[0.000]**	0.098	[0.000]**	-0.043	[0.635]
d_female	-0.038	[0.000]**	-0.029	[0.003]**	-0.075	[0.000]**
schoolage	-0.00007	[0.907]	-0.001	[0.807]	0.019	[0.000]**
distance	-0.002	[0.000]**	-0.002	[0.000]**	-0.002	[0.000]**
poolsize	-0.061	[0.000]**	-0.042	[0.000]**	-0.158	[0.000]**

Appendix: Definition of the variables

variable name	define
d_female	Female dummy: 0 if male, 1 if female
schoolage	School age; 7 corresponds to the first year of junior high school, school age 10 to the first year of high school, and 13 to the first year of college.
date	Date by serial value in which 1st January 1900 takes 1 and 2nd January 1900 takes 2 and so on
d_competitor	Dummy variable: 1 if the record includes data when both adjacent swimmers are present and 0 otherwise
d_competitor_f	Cross term of female dummy by competitor dummy
distance	1 if 50m backstroke and 200m medley relay, 0 if 100m backstroke and 400m medley relay
poolsize	1 if long course pool (50m), 0 if short course pool (25m)