Explaining gender differences in competitiveness*

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Abstract

This paper studies the results from a rich lab experiment with adolescents in Norway, where we link behavioral data from the experiment to official register data about family background. We find a large gender difference in competitiveness, and we show that this gender difference is largest among children with well-educated parents. In contrast, we do not find gender differences in risk-preferences, social preferences, self-confidence, abilities or personality. We furthermore show that parents' socio-economic background strongly affects the competitiveness of their children.

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1 Introduction

A growing experimental literature has identified important gender differences in the willingness to compete and these differences may potentially explain a wide range of real world economic phenomena, including observed gender differences in labor markets (Flory, Leibbrandt, and List, 2010; Gneezy, Niederle, and Rustichini, 2003; Gneezy and Rustichini, 2004; Niederle and Vesterlund, 2007, 2010, 2011).

The aim of the present paper is to shed light on what explains these gender differences. In order to do this, we use a rich data set on adolescents in Norway (14-15 years old) combining experimental data with official register data on family background. In addition to a measure of competitiveness our experimental data contain measures of risk, time, and social preferences, self-confidence and personality, whereas the register data provide information on parents' education and income. The sample is nationally representative for Norway, which means that there is a substantial amount of heterogeneity with respect to the family background of our participants.

We observe that boys are significantly more competitive than girls even in one of the most gender equal countries in the world. This gender difference is robust when controlling for performance in the task and for self-confidence. Furthermore, the gender difference in competitiveness does not primarily reflect gender differences in personality. The large and robust gender difference in competitiveness is particularly striking in light of the fact that we do not find any evidence of a gender difference in social preferences, time preferences or risk preferences in our sample.

Our main finding is that the gender difference in competitiveness is closely related to family background. We find that children from well-educated households are more competitive than other children. Family background does not, however, have the same effect on boys and girls. In particular, we find that the gender difference in competitiveness is much larger among children with well-educated parents than among children with less educated parents. Gender differences are, in other words, not a result of less educated parents reproducing traditional gender role attitudes. Instead results suggest that parents with high levels of human capital allow innate differences among boys and girls to play a greater role.

Our study contributes to two important literatures. First, it contributes to the literature on whether gender differences in competitiveness are a result of nature or nurture. Even though there are experiments identifying gender differences at a very early age (Sutter, Haigner, and Kocher, 2010), there is evidence suggesting that culture plays an important role in shaping people's willingness to compete (Booth and Nolen, 2009; Cárdenas, Dreber, von Essen, and Ranehill, 2011; Gneezy, Leonard, and List, 2009). This literature has primarily compared groups of individuals who has been exposed to different cultures and institutions. We add to this literature by providing, to our knowledge, the first study of how the level of competitiveness varies within a society, where everyone, at least at the national level, has been exposed to the same culture and political institutions.

Second, our study contributes to the literature on what explains the fact that the

most gender equal countries in the world, the Scandinavian countries, also are among the countries with the most gender segregated labor markets, both horizontally and vertically (Birkelund and Sandnes, 2003). Recent experiments, comparing the gender difference in competitiveness among Swedish and Columbian children, also suggest that the gender difference in competitiveness is larger in a highly gender equal Scandinavian country than in a much less gender equal Latin American country (Cárdenas et al., 2011). Our results suggest that gender equalization not necessarily causes boys and girls to make more equal choices, but may rather allow innate differences to play a larger role in their lives.

The paper unfolds as follows: Section 2 and Section 3 describes the sample and the experimental design respectively. Section 4 presents the data, Section 5 analyzes how competitiveness depends on personality and family background, while Section 6 concludes.

2 Sample

Our participants were recruited among Norwegian adolescents, 14 to 15 years old. This means that our participants have had their upbringing in a society that over a long period has had ambitious political goals of gender equality. The Norwegian Government has implemented numerous policies, including public day care, maternity leave policies, abortion laws etc. aimed at gender equality (Barne- og likestillingsdepartementet, 2008; Carneiro, Løken, and Salvanes, 2011). The effects of these policies manifest themselves in many areas of life; in the labor market the participation rate is high for women, the education level of women is higher than that of men and the number of female seats in parliament and the share of female ministers in Government is high (Barne- og likestillingsdepartementet, 2008). Consequently, Norway scores high on gender equality along many dimensions. In fact Norway ranks highest on the UN gender equality index which includes educational attainment, labor market participation and longevity. [1]

In order to have a sample that was representative for the Norwegian population in the selected age group, we randomly selected 10 schools in a municipality which is representative for Norway, Bergen municipality. All the invited schools accepted the invitation and all the 9th graders in the selected classes were sent a personal invitation to participate in the experiment. Participation was voluntary and both the pupils and their parents had to consent to the participation in the experiment. The participation rate was high, out of 630 invited pupils, 524 took part in the experiment, and these were 51.1% male.[2] Since the 9th grade is compulsory in Norway, with hardly any dropout, we believe that our sample is representative for 9th graders Norway.

[1] `http://hdr.undp.org/en/statistics`

[2] We also ran one pilot session with participants from a school outside of Bergen. The pilot was run with a less extensive questionnaire and we do not report data from the pilot in this paper.

In collaboration with Statistics Norway, we matched the behavioral data from the experiment to the official register data on parental education and income. For this we needed additional consent from parents, which not all gave, and matching to the registers had to be done by name. In total, out of 524 participants, we have detailed education outcomes for both parents for 505 participants. We also have access to official register data for the whole population of people in Norway and this enables us to test how representative our sample is in terms for family background. This test confirms that our sample is representative with respect to parents' income and education in our age group.

To ensure control over the experimental situation, all participants were transported with busses from their schools to a lab at NHH Norwegian School of Economics. On average 50 pupils participated in each session which lasted for approximately two hours.

3 Experimental design

In order to measure preferences for competitiveness, we used a set-up similar to the one used in the paper by Niederle and Vesterlund (2007). Participants were asked to add sets of four two-digit numbers over a three minute period and they earned one point for each correct answer. They did this first under a competitive tournament scheme, where they earned 50 NOK (approximately 8.5 USD) if they got at least as many point as the average number of points in the same session, nothing otherwise. A timer on their computer screen informed the participant of how much time that was left and the number of correct answers was updated each time the participant moved to a new set of four two-digit numbers.

Without getting any feedback on their own productivity relative to the other participants, they were then told to do the same task again for another 3 minutes. This time they were asked to choose whether they wanted be compensated with a fixed piece rate of 1 NOK per correct answer or with 3 NOK per correct answer if they got at least as many points as the average in the first round and nothing otherwise.

After getting the instructions about the real effort task, but before they worked in the first round, the participants were asked how they believed they would perform on the task relative to the other participants in that session. Specifically, they were asked to state what fraction of the other participants they believed would do better than them on the task. Comparing the participants' answers to this question with their actual performance provides us with a measure of overconfidence.

In addition to the experiment designed to measure competitiveness we also conducted experiments that measured the participants' risk preferences, social preferences and time preferences. To get a measure of the participants' risk preferences we asked the participants to choose between a safe alternative and a risky alternative in a structured sequence of situations. The safe alternative always gave 75 NOK and the lottery either gave 150 NOK or 0 NOK. The only difference between the 11 choice situations

was the probability of the high outcome in the lottery which varied with equal increments from 25 percent to 75 percent (Holt and Laury, 2002). One of the situations was randomly selected to determine the payment from this part of the experiment.

To get a measure of time preferences we asked the participants to choose between receiving 50 NOK after three weeks and a larger sum of money after six weeks. They made this choice in eight situations where sum of money received at the later data varied (51 NOK, 53 NOK, 57 NOK, 63 NOK, 70 NOK, 80 NOK, 90 NOK and 100 NOK respectively). After making these decisions, the participants were asked to choose between 50 NOK the same day or a larger sum of money three weeks later. Again they made this choice in eight situations where the larger sum of money was the same as in the first sequence of choices. For each of the two sets of situations, one situation was randomly drawn to determine the payment.

To measure social preferences we first asked all participants to work on a real effort task for five minutes. The task was to count the number of black squares in a sequence of boards. The participants received 1 point for each correct answer. Payment consisted of two parts. First, all participants received a fixed payment of 50 NOK independently of how many points they got. Second, the participants earned an additional 25 NOK if they got less than the average number of points in their session and an additional 75 NOK if they got at least as many points as the average in the sessions. To get a measure of how the participants made a trade-off between self-interest and fairness we matched the participants in pairs and asked them to decide how they would distribute the sum of the fixed payments (100 NOK) between themselves and the other participant in the pair. Both participants in the pair made this choice and one of the two choices was randomly drawn and implemented. To measure whether the participants had an egalitarian or a meritocratic view of fairness we asked all participants to decide how the additional money earned by two participants in another pair should be distributed between them. These pairs always had one participant who earned the low additional payment and one participant who earned the high additional payment. The decision makers had to choose between distributing the additional earning equally or according to their earnings.

After all the incentivized parts of the experiment were completed, all participants answered the 44-item Big Five Inventory (John, Donahue, and Kentle, 1991; Benet-Martínez and John, 1998).[3] Self-reported ratings are made on a Likert scale each of the 44 items. This test provides a quick and efficient assessment of five personality dimensions: Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness; and it allows us to study the extent to which the gender difference in competitiveness is mediated by differences in personality. For scoring, we preprocessed the item responses using the "ipsatizing" procedure developed to control for individual differences in acquiescent response style (John, Naumann, and Soto, 2008; Soto, John, Gosling, and Potter, 2008).

[3]Hallvard Føllesdal kindly made available a Norwegian translation of the Big Five Inventory made by Harald Engevik.

Participants were not given any feedback on the outcome of the different incentivized parts of the experiment before at the end of the experiment. They were then given an overview of the outcomes and paid the sum of what they earned in all parts. The average total payment from the experiment was 361 NOK (approximately 60 USD). All payments, except payments from the time preference decisions, were made in cash immediately after the experiment. Special care was taken so that the payment procedure ensured anonymity. The computer assigned a payment code to each of the participants and a group of assistants, who were not present in the lab during the experiment, prepared envelopes containing the payments corresponding to each payment code. After bringing the envelopes to the lab, the assistants immediately left and the envelopes were handed out in accordance with the payment codes. This procedure was explained to all participants at the start the experiment. Participants could also receive money at to later dates and at these days assistants visited each school and handed out envelopes according to the payments codes to everyone who had participated.

4 Experimental data

The main results from the competitiveness experiment is given in the first row of Table 1. We observe that 42 percent of the participants choose to compete and that boys are considerably more likely to choose competition than the girls: 51 percent of the boys, but only 31 percent of the girls choose to compete. This result corroborate the results from earlier experiments that find a large gender difference in the willingness to choose competition in this type of situation (Niederle and Vesterlund, 2007).

The gender difference is not the result of differences in the ability to solve the task. There is a significant difference in the average number of correct answers among boys and girls (11.0 versus 9.7), but this difference is not the main explanation of the difference in competitiveness. This is easily seen from the upper panel in Figure 2 which presents, for both boys and girls, the average share who choose to compete for each decile of actual productivity in the task. We observe that boys are more competitive than girls for all deciles of actual performance except the lowest.

[Figure 2 about here.]

The gender difference is furthermore not a result of a gender difference in self-confidence. The lower panel in Figure 2 presents the willingness to compete for a given self-reported decile of ability. We observe that the picture is very much the same, with boys being more willing to compete than the girls. In contrast to the result in Niederle and Vesterlund (2007) we do not find a large gender difference in overconfidence, i.e. the average difference between their actual performance and their own expected performance. From Table 1 we see that the boys are not, on average, more overconfident than the girls.

The difference in preferences for competitiveness is particularly striking when we compare with gender differences in social preferences, time preferences and risk preferences reported in Table 1. Women are often found to be more risk averse than men (Croson and Gneezy, 2009), but we find that risk preferences, measured by the number of times the risky alternative is chosen, are the same for both boys and girls in our sample. There is furthermore no significant difference in time preferences, measured as the average number of times the "late" alternative is chosen in the experiment. Finally, we find, in contrast to some other studies (Engel, 2011), no significant gender difference in our two measures of social preferences. Girls give somewhat more to the other participant in the dictator game, but this difference is not significant and the share who choose the egalitarian distribution when they make decisions as impartial spectator is almost identical for boys and girls.[4]

Looking at the measures of personality from the Big Five Inventory, we observe that the only significant gender difference is with respect to neuroticism. This is in line with what is found in most other countries, women are more neurotic than the men in developed countries (Schmitt, Realo, Voracek, and Allik, 2008).[5] Girls also scored higher on openness, agreeableness, extroversion and conscientiousness, but none of these differences are significant at the 5 percent level.

[Table 1 about here.]

From Table 1 we also observe, as we should expect, that there is no difference in parental income and education between boys and girls.

5 Explaining gender differences in competitiveness

What explains differences in competitiveness and how robust is the gender difference in competitiveness? From the regressions presented in Table 2 we observe that the gender difference in competitiveness is robust to inclusion of new variables. Not surprisingly, participants who were good at adding numbers in the first round were more likely to choose competition in the second round, but including performance in the task only has a small effect on the coefficient for gender. We also observe that the participants who are overconfident in their own abilities, in the sense that they do worse relative to other participants than they expected, are more likely to choose competition. Including this variable, however, only results in a small reduction in the gender coefficient.

Adding measures of risk preferences and time preferences, we observe that those who are risk loving and patient also are more likely to choose to compete. Including

[4] This confirms results reported in Almås, Cappelen, Sørensen, and Tungodden (2010).

[5] If we were to compare the overall gender differences to those in Schmitt et al. (2008), we would place our sample at about average gender difference. However, Soto, John, Gosling, and Potter (2011) have shown that adolescence is not a representative age for measuring personality traits.

these measures does, however, not affect the gender coefficient. We furthermore find no effect of social preferences on competitiveness.

A possible explanation for the gender difference in competitiveness is that it reflects systematic differences in personality between boys and girls. If this was the case, the gender difference would fall when we included measures of personality in the regression. However, we observe from Table 2 that the Big Five personality measures contributes little to explaining differences in competitiveness, and they do not explain the gender difference.

[Table 2 about here.]

In sum, we find that the gender coefficient still is large and significant even when we have controlled for our rich data on preferences and personality.

5.1 Competitiveness and family background

How does competitiveness relate to family background? In particular, how does the gender difference in competitiveness depend on the parents' educational background? By linking our behavioral data to register data from Statistics Norway we are able to address these questions.

From Table 3 we observe that having parents with a long education has a large positive effect on the willingness to compete among boys. This holds even when we control for the possibility that children with well-educated parents might perform better on the math task, be more confident and be less risk-averse. Including these and other other controls, we find that the share of boys who choose to compete increases by 0.212 for those who come from households where parents have completed a degree above high school, compared to those from households where none of the parents have completed education beyond the compulsory school.

[Table 3 about here.]

The effect of parents education is, however, not the same for boys and girls. From Table 3 we see that the coefficient for being a girl with parents who has a long education is large and negative. As a result, girls with most educated parents are approximately as competitive as girls with the least educated parents in our sample.

One possible explanation for this result could be that there was a larger difference in the income of father and mother in well-educated families. To control for this possibility we have included father's share of household labor earnings, as well as dummies that capture whether the mother and the father has any registered labor earning, as controls. From Table 3 we observe that these variables have no effect on competitiveness and that they do not affect the gender difference.

In sum, we find that there is a large and significant gender effect among adolescents with parents who have moderate or high levels of education, but there is no significant difference in the competitiveness of boys and girls from families where the parents have low levels of education.

6 Conclusion

Our study has shown that family background is an important determinant for competitiveness among adolescents, where children with well-educated parents are much more likely to choose competition and there is a strong interaction between the gender difference in competitiveness and family background. Somewhat surprisingly, the gender difference in competitiveness is strongest among children with parents with the highest level of education and is non-existent among children from the least educated parents.

Our results have implications for the debate about the role played by nature and nurture in determining competitiveness. The fact that we find a large gender difference in competitiveness among adolescents in a country that has fully embraced policies aimed at gender equalization suggests that such policies might not be contribute to eliminate gender differences in competitiveness.

The link between gender differences and family background can also shed light on the paradox that the world most gender equal country also has one of the most gender segregated labor markets. In Norway, women are overrepresented in public sector jobs (70 percent females), in part time jobs and in some occupations (90 percent of nurses are women and 75 percent of teachers) (Barne- og likestillingsdepartementet, 2008)). Vertical job segregation is also substantial; only about 20 percent of managers are women (Barne- og likestillingsdepartementet, 2008). A potential explanation for this segregation could be that girls with well-educated parents shy away from competition and therefore are unwillingness to compete for promotions and top jobs. Our finding suggests that the labor market segregation may reflect that differences in competitiveness between men and women are more important among those with equal and good economic opportunities. In this respect our result corresponds to the finding in social psychology that "sex differences in personality traits are often larger in prosperous, healthy, and egalitarian cultures in which women have more opportunities equal with men" (Schmitt et al., 2008, p. 169).

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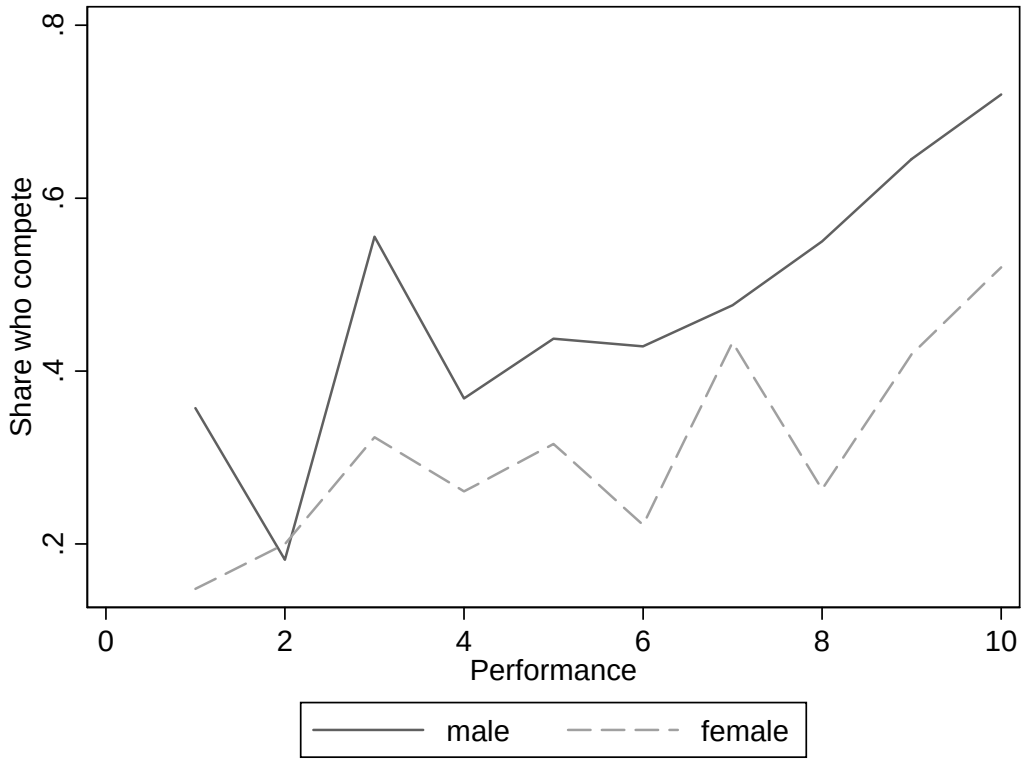
Figure 1: Share who compete



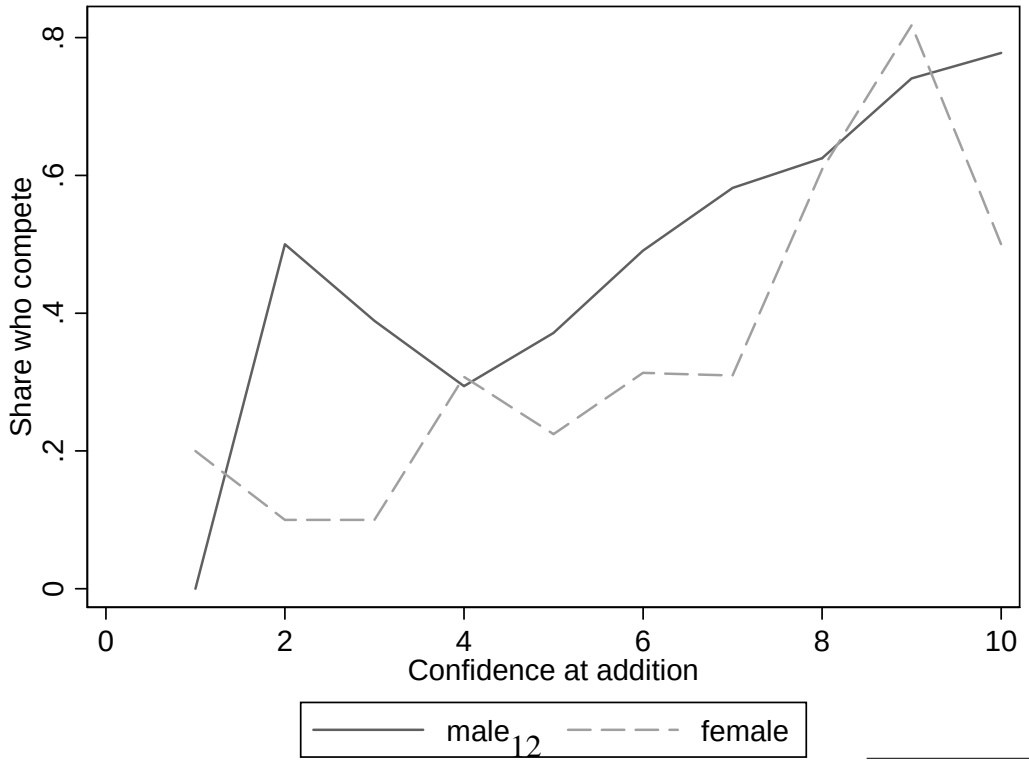


Figure 2: The upper panel show the share of boys and girls who compete against actual performance (reported as the deciles they are in). The lower panel show the share who compete against the participants' belief about their own performance relative to the other participants (reported in deciles they believe they are in).

Table 1: Overview of gender differences

	Boys	Girls	p-value (two sided test)	Pooled standard deviation	No of obs
Preferences					
Compete	0.522	0.312	0.000	0.494	505
Egalitarian	0.267	0.264	0.946	0.442	505
Share given	0.303	0.322	0.372	0.236	499
Gambler	3.663	3.596	0.737	2.229	505
Patient 0	4.278	3.992	0.112	2.024	505
Patient 3	4.306	4.332	0.889	2.095	505
Personality					
BFopenness	0.306	0.362	0.129	0.416	505
BFconscientiousness	0.429	0.490	0.150	0.471	505
BFextraversion	0.381	0.444	0.071	0.391	505
BFagreeableness	0.712	0.762	0.136	0.379	505
BFneuroticism	-0.573	-0.358	0.000	0.461	505
Abilities and confidence					
Performance	10.996	9.688	0.002	4.713	505
Overconfidence	0.051	0.128	0.761	2.837	505
Background					
edu 1	0.196	0.212	0.403		505
edu 2	0.541	0.484	0.500		505
edu 3	0.263	0.304	0.451		505
Father's labor earnings	486.680	491.392	0.866	307.753	485
Mother's labor earnings	247.087	244.503	0.860	163.826	500

Note: "Compete" is an indicator variable (1: participant chose to compete, 0: participant did not compete), "Egalitarian" is an indicator variable (1: participant as spectator shared equally between two players with different production in a dictator game, 0: participant did not share equally), "Share given" gives share given to other participant when dictator and equal production, "Gambler" indicates how many times gamble was chosen over the certain alternative, "Patient 0" indicates how many times the participant chose to wait when choosing between money 'today' and in three weeks, "Patient 3" indicates how many times the participant chose to wait when choosing between money in three weeks and in six weeks, "BFopenness", "BFconscientiousness", "BFextraversion", "BFagreeableness" and "BFneuroticism" give personality traits according to the Big Five personality test, "Performance" indicates how many correct answers the participant had in the addition task, "Overconfidence" indicates the difference between what the participant believe about own performance and actual performance (reported in deciles), "Parent's education" measures the mean level of education of the parents (0: no education, 1: 1-7 years of schooling, 2: 8-10 years of schooling, 3: 11-12 years of schooling, 4: 13 years of schooling, 5: 14 years of schooling, 6: 14-17 years of schooling, 7: 18-19 years of schooling, 8: 20 or more years of schooling), "Father's labor earnings" indicates the labor income of the father (given in 1000 NOK), "Mother's labor earnings" indicates the labor income of the mother (given in 1000 NOK).

Table 2: Regression of competitiveness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female	-0.210***	-0.178***	-0.155***	-0.151***	-0.146***	-0.149***	-0.142***
	(0.043)	(0.043)	(0.042)	(0.041)	(0.041)	(0.042)	(0.042)
Performance		0.024***	0.044***	0.044***	0.042***	0.042***	0.039***
		(0.004)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)
Overconfidence			0.047***	0.047***	0.045***	0.045***	0.042***
			(0.010)	(0.009)	(0.009)	(0.009)	(0.010)
Gambler				0.044***	0.043***	0.045***	0.046***
				(0.009)	(0.009)	(0.009)	(0.009)
Patient					0.027***	0.027***	0.027***
					(0.010)	(0.010)	(0.010)
Egalitarian						-0.052	-0.051
						(0.047)	(0.048)
Share given						-0.013	-0.013
						(0.086)	(0.087)
BFopenness							-0.027
							(0.049)
BFconscientiousness							0.023
							(0.045)
BFextraversion							0.077
							(0.055)
BFagreeableness							-0.016
							(0.056)
BFneuroticism							-0.063
							(0.050)
Constant	0.522***	0.257***	0.037	-0.130*	-0.219***	-0.203**	-0.227**
	(0.031)	(0.057)	(0.069)	(0.072)	(0.075)	(0.088)	(0.097)
Adj. R-Squared	0.043	0.093	0.127	0.164	0.175	0.184	0.185
No Obs	505	505	505	505	505	499	499

Standard errors in parentheses

Note: "Female" is an indicator variable (1: female, 0: male), "Egalitarian" is an indicator variable (1: participant as spectator shared equally between two players with different earnings in a dictator game, 0: participant did not share equally), "Share given" gives share given to other participant when dictator and equal earnings, "Gambler" indicates how many times gamble was chosen over the certain alternative, "Patient" indicates how many times the participant chose to wait when choosing between money 'today' and in three weeks, "BFopenness", "BFconscientiousness", "BFextraversion", "BFagreeableness" and "BFneuroticism" give personality traits according to the Big Five personality test, "Performance" indicates how many correct answers the participant had in the addition task, "Overconfidence" indicates the difference between what the participant believe about own performance and actual performance (reported in deciles).

Table 3: **Competitiveness and parents' education**

	(1)	(2)	(3)	(4)	(5)	(6)
Interaction (female*edu1)	-0.136	-0.084	-0.032	-0.020	-0.015	-0.009
	(0.093)	(0.091)	(0.088)	(0.086)	(0.084)	(0.085)
Interaction (female*edu2)	-0.211***	-0.187***	-0.173***	-0.187***	-0.180***	-0.181***
	(0.060)	(0.058)	(0.058)	(0.057)	(0.057)	(0.057)
Interaction (female*edu3)	-0.275***	-0.248***	-0.227***	-0.199**	-0.197**	-0.194**
	(0.081)	(0.081)	(0.078)	(0.077)	(0.077)	(0.078)
edu2	0.100	0.102	0.112	0.123*	0.112	0.116
	(0.082)	(0.078)	(0.076)	(0.072)	(0.072)	(0.072)
edu3	0.257***	0.236***	0.223***	0.223***	0.208**	0.212***
	(0.091)	(0.089)	(0.086)	(0.082)	(0.082)	(0.082)
Performance		0.023***	0.043***	0.044***	0.042***	0.042***
		(0.004)	(0.006)	(0.005)	(0.005)	(0.005)
Overconfidence			0.046***	0.046***	0.045***	0.045***
			(0.010)	(0.009)	(0.009)	(0.009)
Gambler				0.045***	0.044***	0.044***
				(0.009)	(0.009)	(0.009)
Patient					0.024**	0.024**
					(0.010)	(0.010)
Fathershare						-0.094
						(0.099)
No father						-0.069
						(0.131)
No mother						0.011
						(0.225)
Constant	0.400***	0.152*	-0.074	-0.251***	-0.325***	-0.269***
	(0.070)	(0.080)	(0.084)	(0.084)	(0.084)	(0.102)
Adj. R-Squared	0.057	0.102	0.134	0.174	0.182	0.179
No Obs	505	505	505	505	505	505

Standard errors in parentheses

Note: "Female" is an indicator variable (1: female, 0: male), "edu1" is an indicator variable (1: parents on average have middle school as their highest education), "edu2" is an indicator variable (1: parents on average have high school as their highest education), "edu3" is an indicator variable (1: parents on average has completed at a degree beyond high school), "Performance" indicates how many correct answers the participant had in the addition task, "Overconfidence" indicates the difference between what the participant believe about own performance and actual performance (reported in deciles), "Gambler" indicates how many times gamble was chosen over the certain alternative, "Patient" indicates how many times the participant chose to wait when choosing between money 'today' and in three weeks, "Fathers share" gives father's share of total parent labor earnings (share is set to zero if there is no information on father's labor earnings, share is set to one if there is no information on mother's labor earnings). "No mother" is an indicator variable (1: no information on mother's labor earnings), "No father" is an indicator variable (1: no information on father's labor earnings).