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It's education, not gender: A research note on the determinants of an anchoring bias in experimental WTA elicitations

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Abstract
We study anchoring in an experiment with non-standard participants and find evidence that the influence of the anchor value differs by individual characteristics. Participants with lower levels of education and less labor market experience show a significantly larger anchoring bias in their wage demands for a work task. Gender differences in anchoring are due to gender-specific education and employment patterns –contributing a further channel to a persistent gender pay gap.

JEL Classification: D31; D44; J16; J31

Keywords
anchoring bias — gender — willingness-to-accept — second-price auction

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Introduction

The term "anchoring bias" or "anchoring heuristic" describes the phenomenon that an initially presented value can bias decision makers toward that value (Furnham and Boo, 2011: 25). The economists Ariely, Loewenstein and Prelec (2003) were among the first to show that experimental elicitations of willingness-to-pay (WTP) and willingness-to-accept (WTA) can be subject to such anchoring heuristics. A considerable amount of research was conducted to study this effect under varying circumstances (see Furnham and Boo, 2011, for an overview). However, empirical evidence regarding the impact that decision makers' individual characteristics might have as moderators in this process is still relatively scarce. Our research note contributes to this line of research by showing that important economic decisions, such as wage demands, may also be subject to anchoring, depending on an individual's background. In particular, we study whether cognitive ability, experience or gender affect the respondents' susceptibility to anchoring bias in experimental WTA elicitations for a work task.

Our results suggest that the observed gender wage inequality is nourished by an anchoring bias that exceeds the direct human capital effects of skill and experience differences between women and men. As much as this anchoring bias occurs not only in an experimental setting but also in real world labor markets, our results are highly relevant to policy makers. Having data from non-student participants, makes us confident to draw real world policy implications on how policy measures may reduce the impact of such cognitive biases. In the following, we will briefly review the literature, describe the data and methods, present our results and conclude.

Related literature

As Ariely et al. (2003) argue, price elicitations are not always formed on the basis of a stable underlying preference order. People may not have pre-formed preferences for every possible combination of goods, but that preference orders must be formed spontaneously in situations where they are (not yet) readily available. This process can be easily influenced by given initial values, as the authors show in their experiment where individuals' WTPs for a number of goods and WTAs for enduring slight pain was substantially influenced by random anchor values.

Empirical research has shown that anchoring effects exist not only in laboratory settings but also in "real-world" decision and judgement tasks (Furnham and Boo, 2011: 36) and that the decision makers' moods and individual characteristics can influence anchoring (Furnham and Boo, 2011: 38-41). Particularly relevant for our experimental application are a number of studies that analyze how cognitive ability, experience with the decision task at hand, and gender affect individuals' susceptibility to anchoring. Among these, Stanovich and West (2009) find no effect of higher SAT scores (which they use as a measure of cognitive ability) on the anchoring bias as well as a number of other cognitive biases. Oechssler, Roider and Schmitz (2009) let participants take a cognitive reflection task (CRT) and find that while high CRT scores are associated with a reduced influence of a number of other

biases, anchoring is not affected. In a replication study of Ariely et al. (2003), Bergman, Ellingsen, Johannesson and Svensson (2010) come to the same conclusion as Oechssler et al. (2009) when using CRT scores but find a significant reduction in anchoring when using a more sophisticated cognitive ability test (CAT). Participants, who score higher than the mean CAT, exhibit significantly less anchoring bias in their WTAs than those with scores below the mean, although anchoring remains always visible, even in the group with high test scores.

A similarly ambivalent picture can be drawn for the impact of experience on anchoring. In the experiment by Wilson, Houston, Etling and Brekke (1996) students had to answer a quiz question and those with higher self-reported knowledge in the respective field were found less influenced by the anchor treatment, suggesting that experience can reduce anchoring effects. However, this finding has been disputed by other studies (Furnham and Boo, 2011: 39), among these Englich, Mussweiler and Strack (2006) who show that legal experts are influenced by anchoring in their sentencing decisions and experience in the specific field of law, to which the experimental legal cases pertained, does not reduce the anchoring bias.

With regard to gender, Kudryavtsev and Cohen (2011) find a significant effect, as both, median and mean of their anchoring measure are significantly higher for women. It should be noted, however, that their experiment is based on a very small sample (16 women and 19 men).

Overall, the existing research suggests that anchoring may be influenced by cognitive ability, experience, and gender, although the findings on the former two are somewhat inconclusive and those on the latter are based on rather weak grounds. Furthermore, the results seem to depend very much on the specific measure of ability or experience as well as the experimental design applied. Finally, since price negotiations have been shown to be affected by first offers serving as anchors (Galinsky and Mussweiler, 2001), there is good reason to expect also wage demands to be biased toward the first offer.

Data and methods

Our dataset was generated during an economic experiment with couples in the city of Mannheim in South-West Germany. The sample comprised 190 individuals (95 mixed-sex couples) who were invited to perform several tasks related to financial and time use decisions, both separately as individuals and jointly as couples. As two individuals did not complete the selected experimental task, we ended up with 188 valid observations (95 women and 93 men). Participants were on average 41 years old, 40% had a university degree and 6% were employed at the time of the experiment[1].

In a WTA elicitation task, participants were asked to write down at which price they would be willing to stay for ten additional minutes at the end of the experiment to perform easy office work (i.e., sort, (un)fold, and check letters). The test subjects were not informed about the WTAs of the other participants (principle of sealed-bid auctions), but were told that for each experimental session, only the person with the lowest WTA would perform the task and that this person would be paid the second-lowest WTA (reverse Vickrey auction). This way, the participants were incentivized to reveal their true individual WTA for ten minutes of additional work, which we interpret as their wage demand for this task.

The treatment in this paper consists in different illustrative example values that were given to the participants before stating their WTA to ensure participants' understanding of the second-price mechanism. One subset (108 individuals) was instructed using an example with relatively low values (0.50€, 0.40€, 0.70€) while the other subset's example had relatively high values (5€, 4€, 7€), with both vectors following the same scaling.

The aim of this procedure was to control for possible anchoring effects of these example values on the stated WTAs. When analyzing whether participants' WTAs follow common wage patterns (e.g. with regard to gender gaps in wage demands) we noticed apparent differences in the magnitude of the anchoring effect by gender, education and employment status. This research note focuses on the influence of these individual characteristics on the anchoring bias.

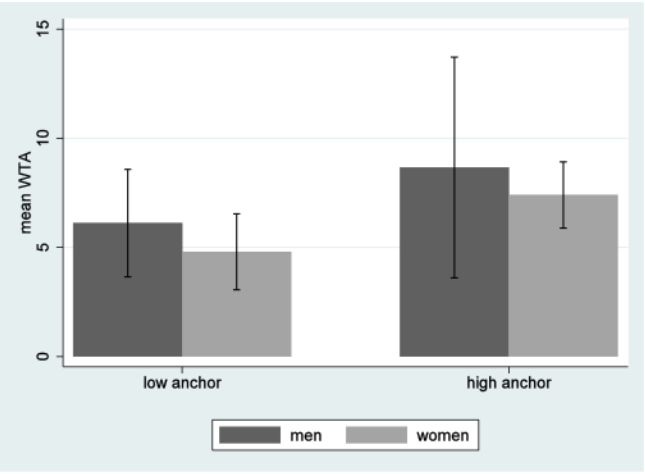

Figure 1. Mean WTAs by anchor level and gender

Results

WTAs are indeed affected by the anchor level. The mean WTA in the low anchor group is more than 30% lower than that of the high anchor group (4.45€vs. 8.01€). The difference is statistically significant at the 10%-level[2]. Figure 1 shows mean WTAs by anchor group and gender. At first sight, women seem to react more strongly to the anchoring than men, as the female mean deviates less from the anchor

[1] The participant pool and other features of the experiment are described in more detail in Beblo and Beninger (2016).

[2] With respect to differences in means we apply t-tests throughout the whole paper.

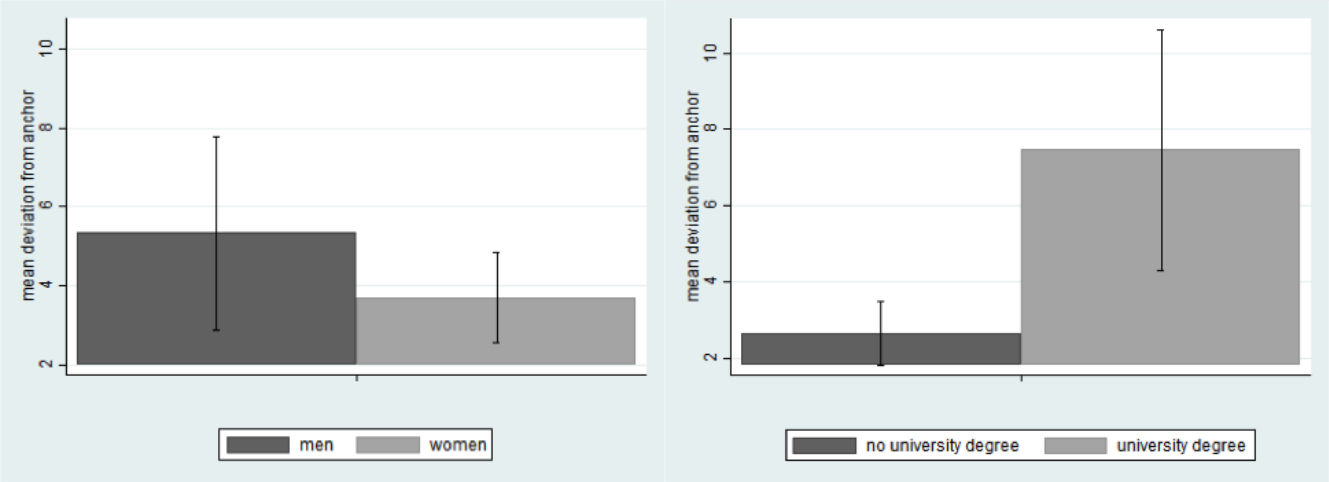

Figure 2. Mean absolute deviation from the anchor by gender and by university degree

in both cases. The difference by anchor level is significant at the 5%-level for females but not significant for males and the difference between the mean WTAs of the two anchor groups is slightly higher for women than for men (2.60€vs. 2.55€)[3].

To further investigate this relationship, we define the variable da_i, as the "deviation from the anchor", i.e. the measure of the individual anchoring bias in absolute values:

$$da = |WTA_i - ma| \tag{1}$$

The variable is defined for every participant as the absolute difference between the individually stated WTA and the mean anchor value ma, which is $\frac{(4+5+7)}{3} = 5.33$ in the high anchor group and $\frac{(0.4+0.5+.07)}{3} = 0.533$ in the low anchor group.

Thus, we compute a monotonically increasing variable, which captures the magnitude of the anchoring effect: the smaller da_i, the closer the participant's wage demand is to the anchor value.

The left-hand side of Figure 2 shows mean deviations from the anchor da_i by gender. As in Figure 1, women seem to react more strongly to the anchoring than men as their WTAs on average deviate less from the anchor. Males' absolute deviation is 5.32 on average, vs. 3.7 for females. The gender difference is economically significant although it lacks statistical significance ($p = 0.23$).

Statistically more evident is the correlation between anchoring effect and education level, displayed in the right-hand graph of Figure 2. It is obvious that the WTAs of respondents with a university degree deviate further from the anchor than the WTAs of those without: Mean absolute deviation for respondents with university degree (7.46) is almost three times the deviation of those without a degree (2.67). This difference is statistically significant at the 1%-level (p=0.0005).

To analyze the relationship between anchoring bias, gender, and individual characteristics beyond descriptive statistics, we perform a multivariate analysis, that is, we run an Ordinary Least Squares (OLS) regression on the dependent variable da_i. As explanatory variables, we include gender, age, and two binary variables that indicate whether the participant has a university degree, and whether the participant is employed[4]. We expect employed individuals to be more experienced with placing a value on their time and to have a clearer idea about stating a WTA, even if the setting is experimental. Thus, the employment variable can also be interpreted as a proxy for experience with the relevant market –that is, the labor market and its wages–. We could suppose that the participants might have perceived the values in the low anchor group as unrealistically low and that, accordingly, they have little or no influence at all (Furnham and Boo, 2011: 38). To account for this possibility, we perform the estimation with the combined sample of both anchor groups as well as separately for the two.

Table 1 reports the regression results. The negative coefficient of the female gender indicator may at first sight lead us to conclude that women state WTAs closer to the anchor values than men, but the coefficient for neither of the estimations is statistically significant. Therefore we conclude, contrary to Kudryavtsev and Cohen (2011) and the apparent differences suggested in the univariate correlation analysis that males and females do not differ in their reaction to anchoring.

In contrast to gender, education has a statistically significant effect. A university degree is associated with a smaller anchoring bias, as the coefficient of the university degree indicator is positive in the combined model, and the regression coefficients in the low and high anchor equations are jointly positive (testing joint significance reveals a p-value of 0.01).

[3] As the error-bars indicate, male WTAs in the high anchor treatment have a substantially larger variance than all other groups. The reason is that there are more outliers toward the upper end of the WTA distribution in this group, which suggests that some men are influenced particularly strongly by the higher anchor value.

[4] See Table A.1 in the appendix for summary statistics of those variables.

	Low anchor		High anchor		Combined	
Variable	**Coeff.**	**s.e.**	**Coeff.**	**s.e.**	**Coeff.**	**s.e.**
Female (0/1)	-0.907	(1.492)	-1.060	(2.457)	-0.885	(1.340)
Age (in years)	0.013	(0.050)	-0.028	(0.085)	-0.007	(0.045)
University degree (0/1)	2.051	(1.657)	6.489**	(2.637)	4.058***	(1.463)
Employed (0/1)	3.180*	(1.815)	0.324	(3.069)	1.789	(1.638)
High anchor (0/1)					-0.807	(1.349)
Constant	1.927	(2.823)	3.180	(5.341)	2.802	(2.696)
N	108		80		188	
R^2	0.078		0.090		0.075	

Table 1. Regression results for the distance between mean anchor values and WTA

Note: Asterisks indicate statistical significance at the 1% (***), 5% (**), and 10% (*) level.

Employment has the expected positive effect as well. However, it is not statistically significant in the combined model, nor are the coefficients of the employment indicator jointly different from zero in the low and high anchor equations.

An explanation for the apparent puzzle that women seem to be more strongly affected by the anchoring bias than men, although gender does not have a significant effect when controlling for other characteristics, may be traced to gender differences in employment and education. Table A.1 in the appendix shows summary statistics for these variables in our sample. 46% of males but only 31% of the females have a university degree (p= 0.03). In employment, the difference is smaller though (6 percentage points), and it lacks statistical significance (p= 0.35).

Conclusions

Beyond findings in line with the literature, our research note provides novel evidence on gender effect in anchoring. The observed gender specificity is an artifact produced by an education and experience gap between the genders. This conclusion could only be brought to light by our pool of established and heterogeneous couples in the place of standard student participants.

Following the argument of Ariely et al. (2003) that most people do not have pre-formed preference orders for every possible decision, it seems sensible that individuals with more experience in pricing a specific good are more likely to have stable preferences concerning this good. This would make the more experienced less prone to anchoring bias. In our particular case, the good to be priced was the participants' time; thus, employed participants would be expected to have more experience in evaluating their time since they are confronted with such prices in the real labor market. Here, the employed seem indeed less influenced by the illustrative example, although the effect is barely significant in statistical terms.

If a university degree were perceived an indication of higher cognitive ability, individuals with an academic degree would have developed higher skills in reasoning and information processing. They would therefore be less influenced by the values of the anchor, and would experience reduced behavioral bias in their decision making, as in Bergman et al. (2010), described above. Our experiment supports this reasoning as participants with lower education state WTAs significantly closer to the example values than participants with a university degree. Since the shares of participants with a university degree and those who are employed are both higher among men than women in our sample (see Table A.1), as well as in most societies, the raw gender difference in the magnitude of anchoring that seemed to emerge from our data at first glance (as illustrated in Figure 1) is evidently due to gender differences in these dimensions.

As much as our experimental setting offers new insights by drawing on a rather typical population set of couple participants instead of the standard student participants, we should also address two concerns. First, the participating spouses may share characteristics, i.e. they may be an assortative match, which could lead to a bias in the observed gender difference in our anchoring measure. Our finding of other observable differences, such as education and experience, seems to lessen the potential bias, though. Secondly, the spouses' WTAs may have been correlated for yet another reason, namely that a low enough wage demand, leading to the job, would have made the partner wait after the experiment until having finished the job. To avoid those concerns of the participating couples, we designed the end of our experiment such that any time not spent working would be considered as leisure time, by inviting everybody into the lobby where cookies and magazines were offered at free disposal. Although we still cannot deny the possibility of correlated WTAs between spouses, the actual correlation coefficient is as low as 0.09 with a p-value of 0.37.

Our findings call for more research on anchoring and other behavioral biases and specifically on the matter of gender differences. Beyond its contribution in this respect, our study has real-world policy implications. Policy makers should be aware that decision makers in many different fields are biased by

(arbitrary or purposefully selected) anchor values. The labor market and its wage setting processes are just one prominent example. Our finding that education and experience mitigate these effects, and are able to explain group differences, e.g. by gender, offers a potential solution to this problem. If gender wage inequality is nourished by differences in cognitive skills and experience beyond the obvious human capital effects, individuals with higher cognitive skills and more experience in the labor market may receive higher wages simply because they are less affected by anchoring in the wage negotiation process. Thus, even though we do not find a direct effect of gender on anchoring, our results can have meaningful implications for the persistence of a gender wage gap. Women are still much more likely than men to interrupt their employment to take on care responsibilities and thus, on average, have less labor market experience than men (as is also evident in our experimental sample). Our findings imply that these career interruptions do not only harm human capital accumulation but may also put women in a less favorable cognitive situation when negotiating their re-entry wages. Measures that encourage continuous labor force participation as well as training programs for wage negotiations seem to be the most evident policy recommendations.

Acknowledgments

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