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THE ANCHORING EFFECT IN REAL ESTATE DECISIONS

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ARTICLE INFO

Keywords:

decision making, cognitive bias, behavioral economics, psychology

JEL Classification:

E31; R39; R53

ABSTRACT

The anchoring effect is one of the cognitive biases studied within the phenomena observed in psychology and behavioral economics. Through the anchoring effect, human judgments and decisions can be suboptimal due to excessive focus on random information. This phenomenon plays a significant role in many aspects of social and economic life, including the real estate market, leading to incorrect decisions among both consumers and professionals. The aim of this study was to evaluate the impact of the anchoring effect on decisions regarding the value of a random apartment among Polish specialists in real estate market, based on a simplified description of the apartment. The research group included real estate valuators, real estate brokers, real estate managers, and academicians. The sample size included 170 respondents. The research showed that the effect of "anchors" is evident in every professional group, regardless of the type of services provided, educational background, or years of professional experience. The anchoring index among the surveyed group was 46 percent. The study confirms that expertise in real estate market does not guarantee unbiased assessment, and therefore, there is a need to conduct the process of real estate evaluation in a careful way to increase the chances of obtaining trustworthy results.

Citation: Kazak, J.K., Zarębska, W., Sadowski, A. & Kamińska, J.A. (2026). The anchoring effect in real estate decisions. *Real Estate Management and Valuation*, *34*(1), 53-62. https://doi.org/10.2478/remav-2026-0005

1. Introduction

The anchoring effect constitutes one of the key issues in the fields of psychology and economics, specifically within the domain of behavioral economics. The phenomenon of anchoring manifests as decision-making based on the first piece of information received, referred to as an "anchor," which unconsciously and significantly influences subsequent judgments and final decisions (Tversky & Kahneman, 1974). This effect distinctly impacts choices made across various aspects of life. Even slight changes in the initial information provided to a recipient can lead to critical deviations in final decisions, which in turn can have significant practical implications (Kahneman, 2013).

The phenomenon of the anchoring effect has been widely analyzed across different scientific disciplines. Some of these studies also address decisions made within the real estate market (Northcraft & Neale, 1987; Gilovich, 2013). Many previous works mention the application of anchors and the resulting cognitive bias. Unfortunately, many of these studies do not present detailed research stages that would allow for tracing the method of defining anchor values. Some do not specify the size of the research sample used, nor do they provide a broader context of the studied group's characteristics regarding their education and industry experience. Meanwhile, Węgrzyn and Kuta (2024) indicate that gender and decision-making competencies can influence estimation patterns. Furthermore, many studies do not report the specific value of the anchoring index obtained from the research. Therefore, the aim of this study is to

investigate the anchoring effect in real estate valuation decisions, which would enable replicability and comparison of the obtained values across different research groups. This study involved 170 individuals professionally associated with the real estate market. The paper consists of a literature review presenting the theoretical context of the anchoring effect, a description of the methodology employed, the results of the conducted research, and a discussion on the relationship between the obtained findings and other studies.

2. Literature review

The anchoring effect is a concept originating from psychology and behavioral economics, first identified by Amos Tversky and Daniel Kahneman in their seminal work "Judgment under Uncertainty: Heuristics and Biases" (1974). It describes the human tendency to overemphasize the first piece of information received, known as "anchors," when making a final decision. Anchors can stem from various sources, such as suggestions, selected reference data, or even entirely irrelevant, random information (Tversky & Kahneman, 1974). The theory of the anchoring effect began with research on various heuristics, which are mental shortcuts that enable quick decision-making (Kahneman, 2013). Studies on the anchoring effect have shown that information not directly related to the subject matter can influence decisions. Anchoring is a phenomenon where the human mind, albeit unconsciously, becomes fixated on initial information and uses it as a reference point for subsequent evaluations.

An example of the anchoring effect was Tversky and Kahneman's experiment, where they asked participants to estimate the percentage of UN member states that are African countries (Tversky & Kahneman, 1974). Before posing the question and providing the answers, participants were shown a wheel of fortune manipulated to stop only on the numbers 10 and 65. Individuals who landed on 10 on the wheel of fortune, on average, estimated the percentage of African countries among UN members to be 25%, while those who landed on 65 estimated the percentage at 45% (Kahneman, 2013). Anchors do not necessarily have to be only numerical values serving as starting points for estimation; they can also be fragmentary calculations. An experiment involving estimating the result of multiplying digits from 1 to 8, but presented in different sequences, confirmed this phenomenon. One group received the equation written in an ascending sequence (1×2×…×8), while the other received it in a descending sequence (8×7×…×1). It was found that the median response for the ascending sequence group was 512, and for the descending sequence group, it was 2250 (Tversky & Kahneman, 1974).

Kahneman expanded the concept of heuristics, including the anchoring effect, highlighting its prevalence and significance in everyday decisions. People often rely on heuristics, simplified thinking strategies that help them make quick decisions but can also lead to systematic errors (Kahneman, 2013). Research on anchoring appears, among other fields, in behavioral economics, where researchers indicate that even small anchor values can lead to a deviation in the final result. Thaler and Sunstein introduce the concept of a "nudge," a subtle push designed to encourage people to make more beneficial decisions while preserving freedom of choice (Thaler & Sunstein, 2021). They conducted experiments where various forms of anchoring were applied in the context of retirement savings, public health, and environmental protection. The research results show that even subtle anchors can significantly influence human behavior, which has important implications for policy and implemented regulations. The theory of representativeness heuristics explains why the anchoring effect is so common (Tversky & Kahneman, 1974). People often judge probability or value based on similarities between objects, and anchors act as reference points that shape these judgments. The anchoring effect, as one of the cognitive heuristics, significantly impacts the decision-making process in various areas of life.

The anchoring effect has been tested in numerous fields, including medicine (Ogdie et al., 2012), law (Enough & Mussweiler, 2001), marketing (Simonson & Drolet, 2004), negotiations (Malhotra & Bazerman, 2008), and finance (Shleifer & Vishny, 2003; Andersen, 2010). The real estate market has also been one such area. One empirical study in this domain was conducted by Brzezicka and Wiśniewski (2014). This research aimed to examine the influence of informational conformity on the decisions of real estate market participants. The experiment involved master's degree students in spatial management, divided into 6-person teams (5 participants + 1 leader). In each group, members deliberately influenced the leader to adopt a specific price per square meter (e.g., lower or higher than the actual price) and a price trend (increase/decrease), maintaining group unanimity. In the first city studied, the actual price was PLN 4500/m^2, but groups intentionally suggested values below PLN 3500/m^2 or above PLN 5500/m^2. In the second city (market price: PLN 4000/m^2), leaders were influenced

eISSN: 2300-5289

to adopt prices above PLN 5000/m^2. The unanimity condition - all team members had to agree with the chosen answer - reinforced conformist pressure. The leaders were unaware of the study's purpose, while the other participants received instructions to influence their decisions. The results confirmed that information gaps in the real estate market foster informational conformity, where participants are guided by group behavior instead of their own analysis. The study also showed that behavioral factors (e.g., availability heuristic) significantly influence price formation. This is one of the more detailed studies describing the anchoring effect in real estate market decisions. It confirmed the susceptibility of students studying the real estate market to the examined phenomenon. However, no similarly detailed study conducted on a group of actively working professionals in real estate-related fields has been found in the literature.

Historical data supports the presence of anchoring effects in real estate valuation, which proves the occurrence of this phenomenon regardless of time. In the 1875 cadastral survey conducted in Istanbul, property appraisals were influenced by irrelevant factors such as door numbers, leading to systematic valuation differences between otherwise identical properties (Ünveren & Baycar, 2019). In recent years, the anchoring effect is still the topic of scientific analyses (Ongchoco, 2023), identifying, for instance, psychologically hazardous real estate transactions (Stern, 2024). Cognitive biases, including anchoring, play a crucial role in real estate decision-making, especially under conditions of uncertainty. Sophisticated homebuyers are generally less susceptible to anchoring, but higher-priced real estate and systemic uncertainty can increase the likelihood of anchoring bias (Chang et al., 2016),. Additionally, the presence of round number thresholds can create discontinuities in valuations, with significant pricing differences observed around these psychological reference points (Wiltermuth et al., 2022).

3. Research methods

3.1. Determination of anchor value

To determine the value of the anchor used in the study, five experts from the real estate market (four licensed real estate valuers and one academic researcher specializing in the real estate market) were asked to review a description of the local real estate market and a residential property (content identical to the later survey form, excluding the sentence containing the anchor). The mean value was determined based on their responses. As it was expected that valuation estimates by participants in the subsequent study might vary within a range of ±3σ, a decision was made to apply anchor values at the level of ±6σ from the mean value determined without an anchor. The use of ±6σ values stems from the fact that a literature review confirmed that the anchor itself does not represent a value indicated by study participants, but rather expands the range within which the study participant provides their response.

3.2. Data collection

To conduct the research, an electronic form consisting of two pages was prepared. The first page contained information about the study and a demographic section characterizing the participants (Fig. 1). The second page included a simplified description of the local real estate market and the property, along with a question asking for the suggested property price (Fig.2). The structure of the property presentation was based on typical features described in secondary market real estate sales advertisements in Poland. A conscious decision was made not to provide any specific property location to limit the potential influence of other variables arising from certain study participants' familiarity with a given market. At the end of the property description, a sentence containing the anchor was placed: "The proposed property price is...", indicating a lower or higher value, depending on the study group.

3.3. Research sample

A total of 170 individuals participated in the study. The research group included real estate valuers, real estate brokers, real estate managers, and academicians working in the domain of real estate. Study participants were volunteers recruited in two stages. The first stage involved presenting the research during the "Real Estate in Space" conference (20-21.04.2023, Kalisz, Poland), which was aimed at real estate practitioners. The second group of participants consisted of industry professionals whose contact database was built based on publicly available online data (email addresses of specific real estate valuers, real estate brokers, real estate managers, and academicians; no email addresses for companies, units, or organizations were used). Due to the fact that not all individuals who received the message chose to participate in the study, it was not possible to achieve equal sample sizes in the groups with lower and higher anchors. The form with the lower anchor value received responses from 90 individuals, while the survey with the higher anchor

value received responses from 80 individuals.

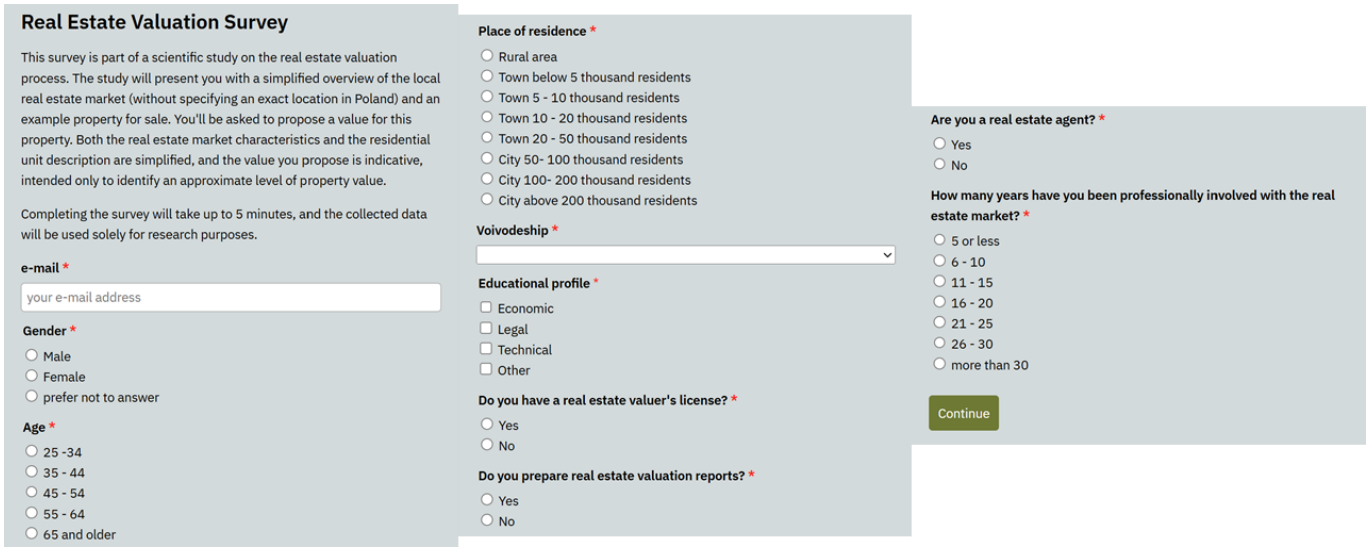

Fig. 1. Questionnaire form – first page. *Source*: own study.

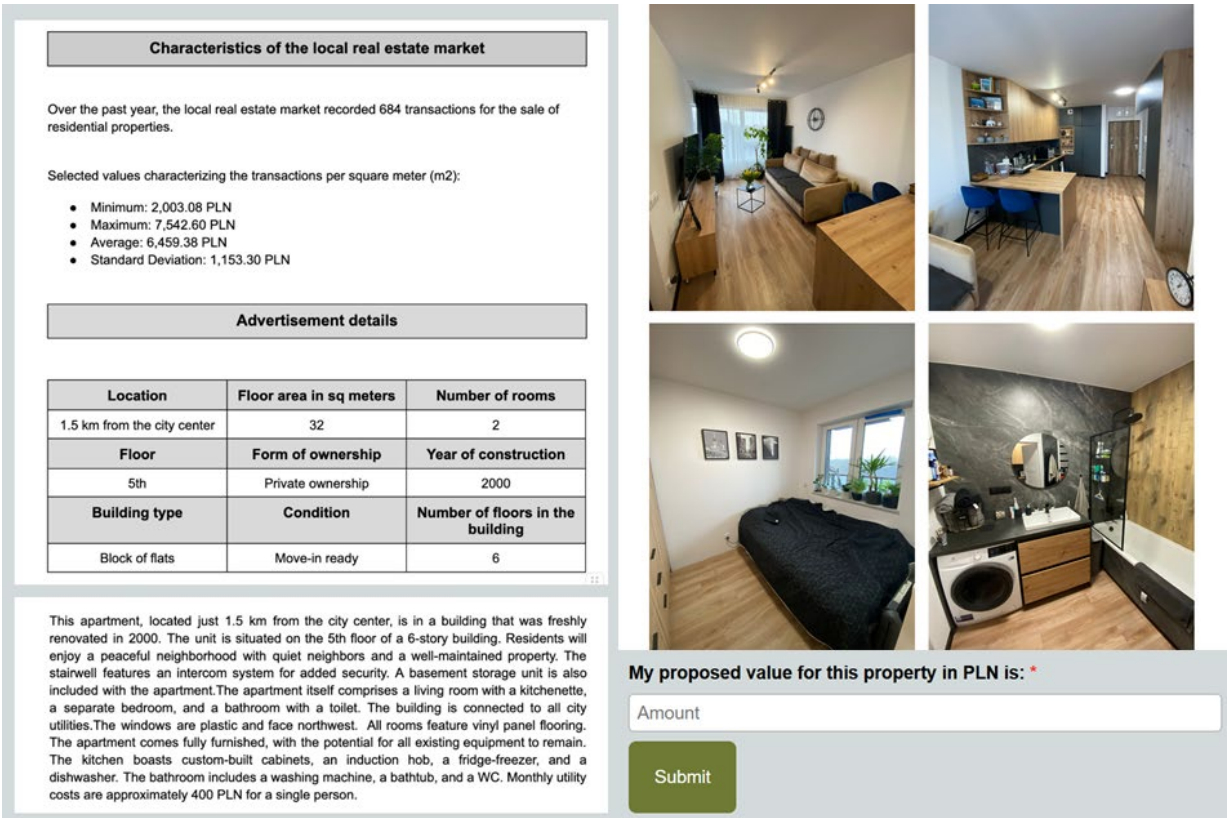

Fig. 2. Questionnaire form – second page. *Source*: own.

3.4. Data analysis

For relational analyses, valuation error defined as follows (Eq.1) was used as the estimation accuracy:

$$valuation\_error = \frac{estimated\ value - real\ value}{real\ value} \quad (1)$$

Where real value = 217 000.

Based on the collected data, multivariate analyses were performed to identify relationships among the various studied variables. Relationships between variables were analyzed by assessing their correlation. Due to the ordinal characteristics of the variables (Experience and Education), polyserial correlation and classic nonparametric Spearman and Kendall coefficients were used. To assess gender-based valuation differences (categorical variable), a t-test was

eISSN: 2300-5289

used on the basis of a large sample size (n=170), after prior verification of the assumption of homogeneity of variance. The anchoring index was defined as the percentage ratio of the difference in estimated values relative to the difference in the provided anchors (Kahneman, 2013).

4. Results

4.1. Determination of Anchor Value

Based on a survey form without an applied anchor, five real estate market experts submitted their responses regarding the estimated property value. The average estimated value of the presented property was PLN 217,000. For the submitted responses, the standard deviation was calculated to be approximately PLN 13,000. Subsequently, using the ±6σ approach, it was determined that the anchors would deviate from the mean value by PLN 78,000. Thus, the anchor values were set at PLN 139,000 and PLN 295,000, respectively.

4.2. Characteristics of Research Groups

A total of 170 respondents participated in the study (90 individuals responded to the survey with the lower anchor; 80 individuals responded to the survey with the higher anchor). The majority of the research sample consisted of women (108 individuals; 63.5%). The proportion of women and men in surveys with individual anchors was similar. Respondents came from various age groups, with the largest share being individuals aged 35 to 44 years (36%, 62 respondents). A significant group also comprised respondents aged 45 to 54 years (28%, 48 respondents) and 25 to 34 years (25%, 43 respondents). The vast majority of participants lived in cities with over 200,000 inhabitants (49%, 83 respondents). Regarding education, the leading profile was economic, indicated by 59 individuals (35%), with a similar distribution between the two survey variants. The second most frequently indicated educational profile reported by respondents was technical (31%). Eleven respondents (6%) indicated having more than one educational background. Among the participants in the study, 77 individuals (45%) held real estate appraiser licenses, and 82 individuals (48%) prepared real estate valuation reports. Furthermore, 83 individuals (49%) declared themselves to be real estate agents. In terms of professional experience, the most numerous group consisted of respondents with the shortest work experience (up to 5 years – 32%), with these values decreasing in subsequent ranges. For most respondent characteristics, a similar structure was maintained, which is important from the perspective of interpreting the results.

Table 1

Characteristics of the research groups

	Lower Anchor Group		Higher Anchor Group		Total	
Gender	Count	Percent	Count	Percent	Count	Percent
Women	55	61%	53	66%	108	64%
Men	35	39%	27	34%	62	36%
Total	90	100%	80	100%	170	100%
Age	Count	Percent	Count	Percent	Count	Percent
25-34	24	27%	19	24%	43	25%
35-44	38	42%	24	30%	62	37%
45-54	22	24%	26	33%	48	28%
55-64	5	6%	7	9%	12	7%
65 and over	1	1%	4	5%	5	3%
Place of residence	Count	Percent	Count	Percent	Count	Percent
Rural area	9	10%	3	4%	12	7%
Town under 5,000 inhabitants	1	1%	3	4%	4	2%
Town with 5,000-10,000 inhabitants	2	2%	3	4%	5	3%
Town with 10,000-20,000 inhabitants	4	4%	4	5%	8	5%
Town with 20,000-50,000 inhabitants	7	8%	13	16%	20	12%
City with 50,000-100,000 inhabitants	9	10%	14	18%	23	13%
City with 100,000-200,000 inhabitants	10	11%	5	6%	15	9%
City with over 200,000 inhabitants	48	53%	35	44%	83	49%
Educational Profile*	Count	Percent	Count	Percent	Count	Percent
Economic	36	40%	33	41%	69	41%

Legal	9	10%	9	11%	18	11%
Technical	29	32%	31	39%	60	35%
Other	27	30%	10	13%	37	22%
Real Estate Valuation License	Count	Percent	Count	Percent	Count	Percent
Yes	34	38%	43	54%	77	45%
No	56	62%	37	46%	93	55%
Preparation of Valuation Reports	Count	Percent	Count	Percent	Count	Percent
Yes	38	42%	44	55%	82	48%
No	52	58%	36	45%	88	52%
Real Estate Broker	Count	Percent	Count	Percent	Count	Percent
Yes	52	58%	31	39%	83	49%
No	38	42%	49	61%	87	51%
Professional Experience in Real Estate (in years)	Count	Percent	Count	Percent	Count	Percent
Up to 5	28	31%	27	34%	55	32%
6-10	21	23%	15	19%	36	21%
11-15	19	21%	17	21%	36	21%
16-20	12	13%	9	11%	21	12%
21-25	5	6%	3	4%	8	5%
25-30	2	2%	6	8%	8	5%
30 and more	3	3%	3	4%	6	4%

* Question regarding educational profile was multiple-choice, therefore the sum of responses may be higher than the number of study participants.
Source: own study.

Table 2

Experience and education-based assessment differences

Method	Experience			Education		
	coefficient	SE	p-value	coefficient	SE	p-value
Polyserial correlation	-0.130	0.085	0.128	-0.011	0.086	0.903
Spearman's correlation coefficient	-0.011	0.000	0.888	-0.043	0.000	0.581
Kendall's τ	0.003	0.006	0.965	-0.033	0.006	0.569

SE-standard error.

Source: own study.

4.3. The relationship between the variables

Both females and males showed a tendency to overestimate property values (positive valuation error), with three women overestimating by more than double. A quantitative assessment of the impact of gender on estimation accuracy was performed using a t-test. The assumption of the normality of distribution was considered to be met based on the central limit theorem (n=170). The assumption of homogeneity of variance was verified using Levene's test. The obtained values of F=0.5699 and p-value=0.4514 allow to conclude that the variances in both groups are homogeneous. The mean valuation error values differed slightly between genders (0.091 for females and 0.001 for males). The lack of a statistically significant difference in valuation is confirmed by the t-test: t=1.834, p-value=0.069. It can therefore be concluded that gender does not affect the accuracy of property valuation.

The relationship between education and experience with the accuracy of valuation was examined using correlation analysis. Due to the ordinary characteristics of the features, polyserial correlation, Spearman's and Kendall's correlation coefficients were determined (Table 2). No impact of education or experience on the accuracy of the estimate was observed. However, there is noticeably greater variation in the errors made in the valuation among respondents with the least professional experience, not exceeding 5 years, with a clear positive valuation error (Fig. 3).

4.4. Anchoring index

From the obtained responses, it was possible to calculate the extent to which the anchoring effect influenced the decisions of the respondents, based on the anchoring index proposed by Kahneman (2013). The average valuation amount from the survey containing the higher anchor was PLN 267,508, while from the survey with the lower anchor it was PLN 195,882. The property value estimated by expert methods was PLN 217,000, and the applied anchors were: higher – PLN 295,000, lower – PLN 139,000. Based on these values, the anchoring index was calculated (Eq.

eISSN: 2300-5289

2). An anchoring index of 46% indicates that the use of price anchors successfully modified respondents' perception away from the established mean value.

$$\frac{(267\,508-195\,882)}{(295\,000-139\,000)} \times 100\% = \frac{71\,626}{156\,000} \times 100\% = 0{,}4591 \times 100\% \approx 46\% \quad (2)$$

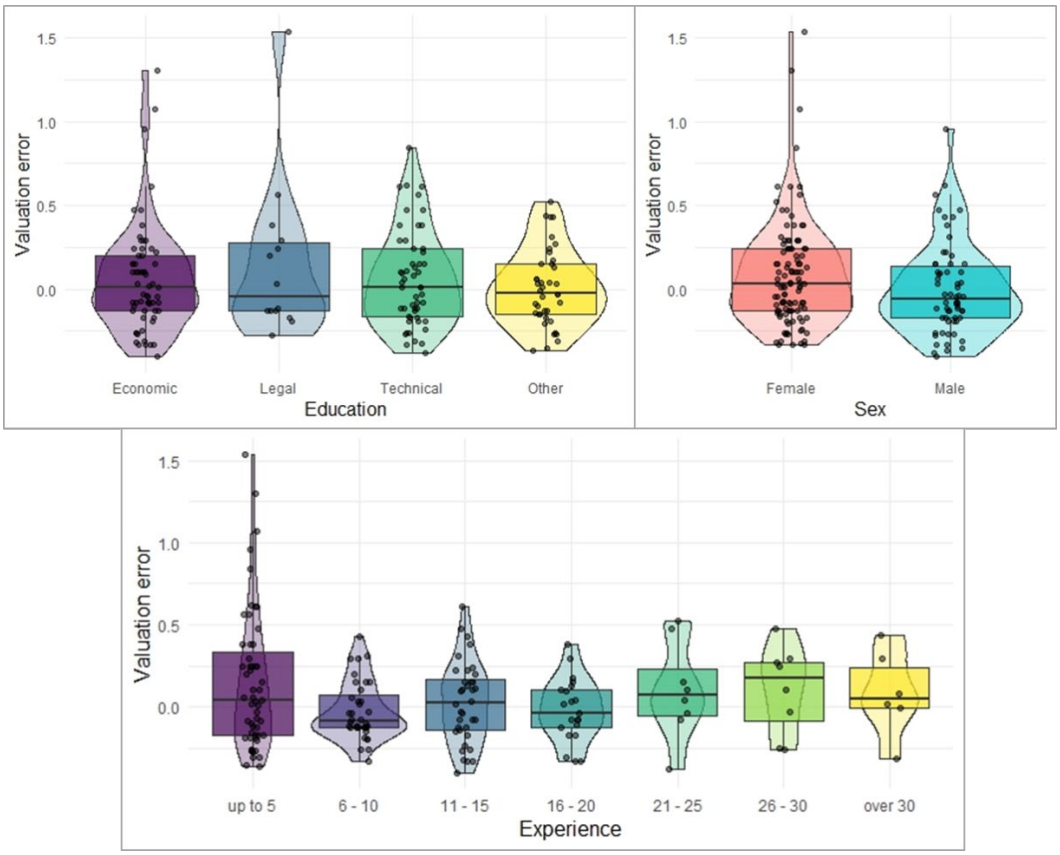

Fig. 3. Valuation error variation depending on experience, education and sex of the respondents. *Source*: own.

The numerical value indicates that a substantial portion, nearly 50%, of the disparity between the initial anchor points was absorbed into the participants' final real estate valuations. This outcome provides strong evidence of the anchoring effect's powerful influence on how individuals perceive and ultimately determine property values. In essence, the initial, potentially arbitrary numbers provided as anchors significantly skewed the final judgments of the respondents, rather than allowing them to arrive at a value independently. It is worth noting that the purpose of placing anchors is not for the participant to indicate the exact value of the anchor, but only to expand the area in which they can indicate their answer (expand the spectrum of response dispersion). The anchoring index value therefore indicates the extent to which the anchor itself has been transposed into an error in assessment.

4.5. Distribution of results

The distribution of responses provided by the respondents was visualized using a box plot (Fig. 4). The spans of the boxes indicate that the interquartile ranges for both sets are disjoint. The third quartile (Q3) value for the lower anchor is approximately PLN 219 thousand, while the first quartile (Q1) value for the higher anchor is approximately PLN 224 thousand. The median for the lower anchor is PLN 190,000 (−2.07σ from the preliminary estimated mean value), and the median for the higher anchor is PLN 252,750 (+2.75σ from the preliminary estimated mean value). Both datasets contain outliers, and in both cases, they appear only on the right side (for both anchors, the lower fence is equal to the minimum value). In the case of the lower anchor, the upper fence is PLN 284 thousand, and the outliers are PLN 330 thousand and PLN 350 thousand. For the higher anchor, the upper fence is PLN 400 thousand, and the outliers are PLN 425

thousand, PLN 450 thousand, PLN 500 thousand, and PLN 550 thousand. The rightward skew of the responses may stem from the fact that values on the left side would approach a value of 0, which is improbable for determining property values.

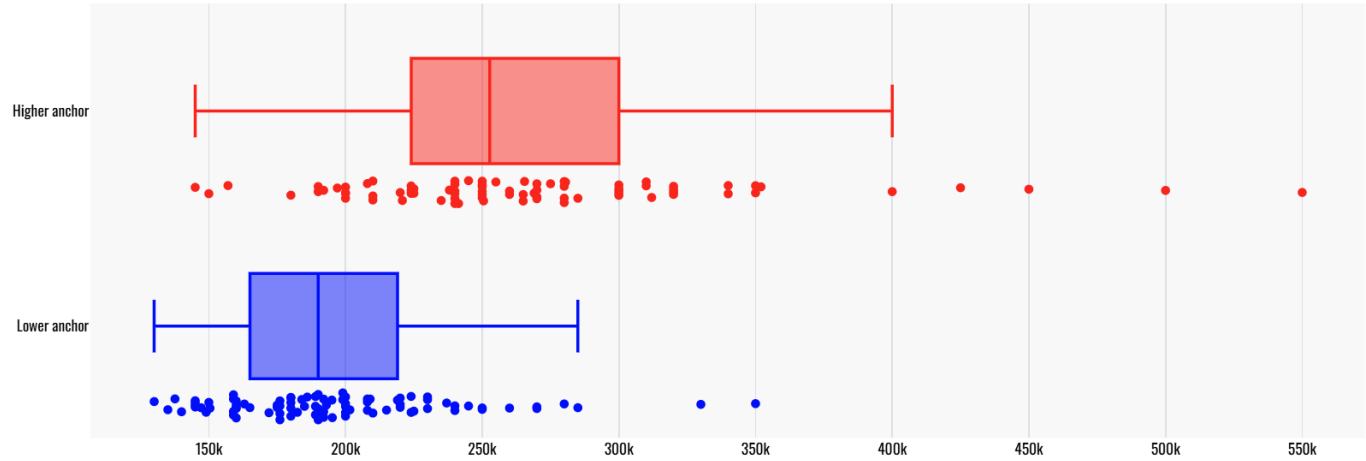

Fig. 4. Distribution of respondents' answers (blue - lower anchor; red - higher anchor). *Source*: own.

5. Discussion

In the case of individuals with limited experience in cognitive psychology, those who specialize in other domains, studies that lack detailed descriptions may provoke skepticism or uncertainty. This is especially true when interpreting results that involve complex psychological phenomena such as the anchoring effect. By focusing on the specific results obtained for a given group, it becomes possible to raise a question on how individual differences - such as personal characteristics - might influence the outcomes. In this study, correlation analysis was employed to investigate these potential influences. The findings confirmed no significant correlation between the valuing of a real estate with variables such as gender, education profile, and professional experience in the real estate market. This suggests that these demographic and experiential factors did not systematically affect participants' susceptibility to the anchoring effect. Such results emphasize the robustness of the observed phenomenon across diverse participant profiles while also highlighting the utility of correlation analysis in disentangling the relationships between independent variables and psychological outcomes. It also stands in line with other studies in the field, proving that people follow the anchor despite their gender (Chang et al., 2016), professional experience or age (Da Silva et al., 2019). Although the study did not identify clear determinants influencing the role of personal factors on real estate valuation under the anchoring effect, the results confirm that professions related to the real estate market are not immune to heuristics. The fact that these professions largely rely on calculations based on a statistical approach, and the description presented in the study allowed for simplified calculation, does not guarantee an independent valuation.

The anchoring index of 46% in the analyzed study indicates that the difference between the average valuations obtained from the higher and lower anchors (PLN 267,508 vs. PLN 195,882) accounts for 46% of the difference between the anchors themselves (PLN 295,000 vs. PLN 139,000). This value suggests that almost half of the difference between the anchors was "transferred" to the respondents' final decisions, confirming a significant impact of the anchoring effect on the perception of real estate value. In the literature, anchoring indices often hover around 50% (Błasiak et al., 2015), which results from the "adjustment" mechanism – people do not fully correct the initial anchor, remaining under its influence. An anchoring index of 46% is consistent with the theory of anchoring and adjustment heuristics, although lower than in some laboratory studies. The result may suggest the importance of context (e.g., boundary values obtained in the real estate market) in modifying the effect, while simultaneously confirming its significance in real market decisions. Other studies prove that, when rating a product, customers in high-uncertainty avoidance cultures seek to engage in highly "effortful thinking" for evaluation, thereby stimulating a large pool of anchor-consistent information to increase their susceptibility to the anchoring effect (Wang et al., 2022). The other option which can be associated culturally is a different level of trust among people (Ferris et al., 2024). Therefore, cultural aspects may

eISSN: 2300-5289

influence a different level of vulnerability of social groups to the anchoring effect.

The data reveals a pronounced anchoring effect in real estate valuation judgments, though with notable exceptions. Respondents exposed to the lower anchor generally provided price estimates clustered between 130,000 - 250,000, while those exposed to the higher anchor showed estimates spanning from 145,000 to 550,000, with a higher concentration in the 200,000 - 350,000 range. This aligns with the cognitive bias theory, where initial numerical cues systematically influence subsequent judgments. These results are consistent with the theory explaining the anchoring effect (Tversky, Kahneman, 1974) and various positions verifying its existence in different areas of life, which were indicated in the literature review section. However, the presence of outliers (e.g., a 550,000 estimate in the case of respondent exposed to a higher anchor and a 350,000 estimate in case of respondent exposed to a lower anchor) suggests contextual factors or individual variability may override anchoring in extreme cases. Based on the literature review conducted in previous sections, it can be concluded that this aspect seems to be omitted in most of publications. The observed larger deviation of values in the case of the higher anchor is associated with the fact that, on this side of the value axis, there are no values that could be considered boundary values due to other logical conditions. Conversely, in the case of the lower anchor, such a boundary value is 0 (negative values are rejected due to the illogicality of the result). Regarding the research sample, it should be noted that, when selecting a sample that takes into account so many analyzed factors (gender, experience in the property market, educational profile, specific scope of activities performed in the property market, etc.), it is almost impossible to collect samples that are perfectly identical in terms of their characteristics in both groups (low anchor and high anchor). The characteristics presented in Table 1 show the extent to which these groups were similar to each other. The lack of a perfect, even mirror-like reflection of the groups studied, is a typical limitation of this type of research conducted in social behavior studies, and therefore also occurs in this study.

Being aware of the effects of anchoring in real estate decisions, measures can be proposed to reduce the impact of this effect. Such measures include education and awareness, as well as the use of different reference levels. The basic step in mitigating any cognitive bias is education and awareness. Professionals such as estate agents, valuers and analysts should be trained in behavioral psychology to recognize their own errors as well as those of their clients. In the context of our study, we will highlight how education can help to identify situations where the initial price (anchor) becomes overly dominant. Another measure could be to increase the number of reference points. Instead of relying on a single asking price, professionals should introduce multiple, diverse reference points for assessing property value. For example, comparative analyses based on different methodologies can be presented to clients: historical transaction prices, valuations from independent sources, and market forecasts. This approach allows us to methodically counteract harmful reliance on a single (potentially false) reference point, which was mentioned in the context of real estate investment decision making (Beracha & Skiba, 2014). Furthermore, key behavioral factors influencing investment decisions have been identified and divided into six main behavioral factors (e.g. herd effect, emotional decisions) that are particularly relevant in real estate markets. This will allow us to create an analytical framework that will help us understand why clients and professionals succumb to anchoring in different market conditions (e.g., in optimistic versus pessimistic markets) (Fateje et al., 2024). Another strategy helping to minimize the negative effect of bias could be a transparent price system (Raya & Giusti, 2021), as this is an element currently studied in the western European conditions. Efforts to mitigate anchoring effects have shown mixed results. For instance, providing reference points on numerical scales can prevent sequential anchoring effects in some cases (Bahník et al., 2019). Similarly, some decision support tools designed to reduce bias have been effective in producing more consistent market values (Lausberg & Dust, 2017).

Data availability

The data acquired during the research has been deposited in a repository under the CC-BY 4.0 http://dx.doi.org/10.57755/vvmg-b892.

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