

# HOW TO WEAKEN THE ENDOWMENT EFFECT IN THE HOUSING MARKET? THE ROLE OF BEHAVIORAL INTERVENTIONS

Mateusz Tomal\*<sup>1</sup>

<sup>1</sup> Department of Real Estate and Investment Economics, Krakow University of Economics, ul. Rakowicka 27, 31-510 Krakow, Poland, e-mail: tomalm@uek.krakow.pl, ORCID: 0000-0002-8393-1614

\* Corresponding author

ARTICLE INFO	ABSTRACT
<p><b>Keywords:</b> endowment effect, prospect theory, behavioral interventions, housing market</p> <p><b>JEL Classification:</b> C91, C93, D46, R31</p>	<p>The endowment effect is one of the key behavioral biases causing friction in the housing market. It results in sellers' offer prices being inflated relative to buyers' bid prices. Although this effect has been confirmed in many studies, little is known about how it can be reduced or eliminated. Therefore, this article assesses the impact of behavioral interventions on the intensity of the endowment effect using the Polish housing market as a case study. The research was based on a lab-in-the-field experiment, in which a hypothetical transaction in the secondary sales housing market was simulated and the recruited respondents were randomly divided into sellers and buyers. The endowment effect was measured by the gap between the average value of minimum prices for which sellers would be willing to sell a dwelling (WTA) and the average value of maximum prices that buyers would be willing to pay to acquire that dwelling (WTP). The results show that the endowment effect significantly decreases but does not disappear after the application of behavioral interventions. The latter consists of highlighting relevant information about the market price of a property and visualizing it graphically. Specifically, before the intervention, the WTA-WTP gap was 7.01%, and after 2.48%.</p>
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## 1. Introduction

In the housing market, sellers' offer prices tend to be higher than buyers' bid prices, contrary to standard economic theory. Sources of this mismatch may include income and substitution effects (Willig, 1976; Hanemann, 1991), transaction costs, and the strategic motivations (Brown, 2005) of buyers and sellers. However, current research indicates that the dominant driver of this disparity is the endowment effect conceptualized in behavioral economics (Thaler, 1980). In the valuation paradigm, the endowment effect occurs as a positive gap between the price a seller is willing to accept (WTA) to sell a good and the price a buyer is willing to pay (WTP) to acquire that good (Morewedge & Giblin, 2015).

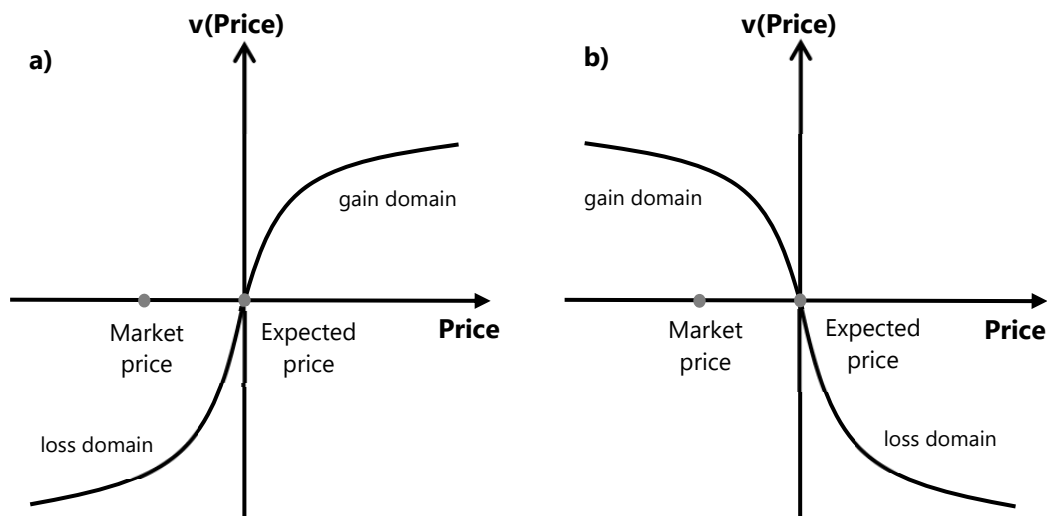
Although there has been little empirical research to date on identifying the endowment effect in the housing market, the results of these analyses are

generally consistent (Tomal & Brzezicka, 2024). For example, Bao and Gong (2016) identify the endowment effect in the sales housing market in Beijing using a field experiment based on a hypothetical transaction. The results indicate that the average WTA of sellers was 3% higher than the average WTP of buyers. However, this behavioral bias is magnified during property price increases. Further, Gong et al. (2019) also identified the endowment effect in Beijing with the findings of their analysis revealing that its intensity does not change depending on the phase of the cycle in which the housing market is in. Similarly, the basis of this research was an experiment but in a lab-in-the-field (online) form. Bao (2020) studied the UK housing market and noted that the endowment effect occurs only in the downward phase of the market, during which the average WTA value is 5% higher than the average WTP value. Mwanypedza and Mishi (2024) also detected an

endowment effect in the South African housing market. Finally, Tomal (2024), analyzing the Polish housing market, found that it appears in both the sales and rental markets, with it being weaker in primary markets than in secondary ones.

The main explanation for the endowment effect is the loss aversion tendency from the prospect theory (Kahneman & Tversky, 1979). The latter assumes that people frame the result of a decision as either a gain or loss depending on a reference point, with the loss being felt more than the equivalent gain. Therefore, in the housing market, sellers frame the sale of a dwelling as a loss (in relation to the ownership reference point), requiring additional compensation. Similarly, buyers frame the purchase of a dwelling as a gain. This leads to a situation in which selling prices are higher than the buying prices. The phenomenon of loss aversion in the housing market has been widely demonstrated, starting with the seminal paper by Genesove and Mayer (2001) and ending with the study by Brzezicka and Tomal (2023) for the Polish housing market.

Compared to transactions of everyday items, parties to a housing market transaction have many more reference points, which can increase the intensity of the endowment effect. For example, participants in the housing market usually consider price expectations (Waszczuk, 2024). In this context, the endowment effect may be the result of framing the outcome of the decision based on the expected price of the residential property. In particular, when the market is in an upward price phase, the seller treats the sale of the dwelling at the market price as a loss requiring compensation. This is because the expected price as a reference point is higher than the property's current market price (Figure 1a). On the other hand, for the buyer, this type of situation will be seen as a gain (Figure 1b), which will make the buyer willing to pay the market price, leading to the creation of a WTA-WTP gap. Other reference points in the housing market may relate to location (Morrison & Clark, 2016), the initial purchase price of the property (Bao & Gong, 2016), and social norms (Bao & Saunders, 2023).



**Fig 1.** The prospect theory value function when the reference point is the expected price for a) sellers and b) buyers. Notes: This situation is related to the upward phase of the housing market. *Source:* own study.

The housing market is one of the key sectors of the economy and frictions within it, for example, due to the endowment effect, can negatively affect its performance, justifying research into ways of mitigating the scale of this behavioral bias in this market. However, to date, little attention has been paid to this issue. Concerning the general economic literature, List (2003) shows that the endowment effect disappears as the parties to a transaction increase their market experience. However, this applies to

situations where traders perform more than six transactions per month. However, for residential goods, such mechanisms are unlikely to play a significant role because of the high capital intensity of real estate. Furthermore, Knetsch and Wong (2009) showed that the endowment effect was eliminated when participants in the experiment had no physical control over goods. However, this type of intervention is impossible in the housing market. Gong et al. (2019) and Mwanypedza and Mishi (2024) can be

highlighted in the context of housing studies. These authors observed a reduction in the WTA-WTP gap after disclosing specific information about the property's technical condition to the transacting parties.

Another promising way to overcome the endowment effect in the housing market is paradoxical behavioral interventions. Bao (2023) defines behavioral interventions as interventions in the public domain that use observations from behavioral economics to help people make decisions that are more appropriate for them and society. These interventions mainly use psychological factors to influence decision-making but do not impose constraints on choices or alter economic incentives. Building on Kahneman (2013), Bao (2023) classified these interventions into Systems 1 and 2 and distinguished the tools within these systems.

Tools within System 1 influence people's decision-making processes through the activation of particular behavioral biases and heuristics. Within System 1, the tools nudge, social influence, commitment devices and reminders, and appeals can be recognized. Under this system, the most well-known tool is a nudge, defined as a factor that predictably changes a human individual's behavior without prohibiting decision-making options (Thaler & Sunstein, 2008). Brzezicka et al. (2016) point to several examples of the application of behavioral interventions in the form of nudges in the context of housing policy. Bao (2023) suggests that a popular behavioral bias to nudge people in the housing market is, in particular, the framing effect.

System 2 tools, on the other hand, aim to increase the rationality of decisions through mental effort (Robson & Greenhalgh, 2023). System 2 includes the tools of education and awareness, visualization, and gamification. The first is to provide and/or highlight relevant information to the transacting parties. The visualization tool presents this information graphically, improving its ability to process it. Finally, the gamification tool enables active participation in the selected actions. It should be noted that, in contrast to the mainstream behavioral economics literature, which primarily associates the concept of behavioral intervention with System 1 tools, Bao (2023) also considers tools in System 2 as full-fledged behavioral interventions.

Tomal (2024) emphasized that, in the context of the housing market, the vital behavioral interventions proposed by Bao (2023) that can overcome the endowment effect are education and awareness, as

well as visualization. However, to date, the literature lacks empirical verification of these suppositions. Therefore, this study aims to assess the impact of behavioral interventions (education and awareness, visualization) on the intensity of the endowment effect in the Polish housing market, where, as recent research indicates, the endowment effect is substantial. To accomplish this goal, the study tests the hypothesis that the simultaneous activation of the tools of education and awareness as well as visualization leads to a reduction in the intensity of the endowment effect in the housing market.

This study contributes to the current literature in that it is the first empirical verification, to the best of the author's knowledge, of the applicability of the behavioral interventions defined by Bao (2023) to reduce the endowment effect in its narrow sense, that is, resulting from loss aversion rather than other factors.

The remainder of this paper is organized as follows. Section 2 contains a description of the research methodology, including the design of the experiment, characteristics of the research sample, and the econometric framework. Section 3 presents and discusses the results of the study. Finally, Section 4 presents the main conclusions of the study, its limitations, and implications for housing policies.

## 2. Material and methods

### 2.1. Experiment design

Due to the unobservability of WTA and WTP values, data for the study were obtained through a lab-in-the-field experiment using an online panel data platform from Prolific (<https://www.prolific.com/>). Compared with other platforms, responses collected using Prolific are characterized by the best quality (Douglas et al. 2023). On 18 April, 2024 individuals owning/co-owning residential property and living in Poland were invited to participate in the experiment. The use of respondents with experience in the housing market increases the reliability of the results.

The experiment was designed to simulate transactions in the housing market, and the respondents acted either as sellers or buyers. Before starting the proper experiment on the Prolific platform, a preliminary study was carried out on a group of 64 students from the Krakow University of Economics, specializing in Real Estate and Investment, with a major in economics. The results of this pre-study did not indicate any significant problems with the design of the experiment, and the detailed

conclusions of this study are available upon request.

In the first stage of the experiment, participants were given information about a hypothetical dwelling and were asked to disregard financial constraints and transaction costs. It was pointed out that it would not be possible to change the answers to these questions. The hypothetical dwelling has the characteristics of a standard residential property located in the center of a city with 200,000 inhabitants. Respondents were also informed that they were interested in entering into a transaction but were not compelled to do so. This specification reduced the impact of income and substitution effects, transaction costs, transaction demand, and strategic motivations on the WTA-WTP gap. Respondents were also told that similar dwellings are currently being sold between PLN 700k and PLN 800k, and were asked to indicate the WTA value (the minimum price for which a seller is willing to sell a dwelling) or the WTP value (the maximum price for which a buyer is willing to buy a dwelling). According to standard economic theory, parties should aim to conclude the transaction at a price equal to PLN 750k. The distribution of respondents between sellers and buyers is random.

In the second stage of the experiment, additional information was provided on the price of the dwelling four years ago (PLN 620k), the price of the dwelling two years ago (PLN 685k), the alternative bid/transaction price (PLN 800k), the price trend in the market over the next year (+5%), the support of family and friends to complete the transaction, and the absence of real estate agent participation in the transaction. This information introduces additional reference points into the experiment that occur in real-life situations in the housing market (Bao & Saunders, 2023). Respondents were then asked again to indicate their WTA and WTP values. Taking the above information into account, a growing trend in the housing market has been simulated, but as Tomal's (2024) research indicates, the endowment effect in each segment of the Polish housing market

does not change in intensity depending on its phase.

In the third stage of the experiment, respondents were subjected to behavioral interventions using education and awareness as well as visualization tools. Three valuers valued the dwelling: PLN 747k, PLN 755k, and PLN 751k. The above was intended to raise respondents' awareness of the market price of the dwelling, which was already provided in the first phase of the experiment. In addition, the above valuations, together with the minimum (PLN 700k) and maximum transaction prices (PLN 800k) among similar properties, were visualized in a bar chart. Finally, respondents were asked to provide WTA and WTP values. It is assumed that through the above behavioral interventions, that is, the information from the valuers and the visualization of the information in the drawing, respondents will be encouraged to make an intellectual effort, which will contribute to their more rational decisions. The data used in the study are available at <https://doi.org/10.58116/UEK/RR3JUI>.

## 2.2. Sample

Using quota sampling, which is often used in behavioral studies (Levy et al., 2020), 189 people were recruited for the experiment. By calculating the effect size from Gong et al. (2019), this is a sufficient sample to achieve an analysis power of 80%. Nine observations were discarded due to unreliable responses. Ultimately, 180 people participated in the study, of which 97 were sellers (54%) and 83 buyers (46%). The average age of the former was 35, and that of the latter was 32, which is a desirable characteristic for the representativeness of the sample given that the majority of active transactions in the housing market are carried out by people aged between 30 and 40 years (Prajnsnar, 2023). The average monthly income among sellers was PLN 6,882, and among buyers - PLN 6,953. In both groups, the vast majority had a university degree (approximately 70%) and lived in an urban area (approximately 85%). The descriptive statistics of the respondents are presented in Table 1.

**Table 1**

Category	N	Gender <sup>a</sup>	Respondents' characteristics					
			Age <sup>b</sup>	Income <sup>c</sup>	Education <sup>d</sup>	Employment <sup>e</sup>	Location <sup>f</sup>	Standard <sup>g</sup>
Sellers	97	W – 42% M – 58%	Less than 20: 0%	Less than 4,000: 15%	H – 74%	E – 90%	C – 87%	G – 74%
			Between 20 and 40: 75%	Between 4,000 and 8,000: 58%	O – 26%	N – 10%	S – 13%	O – 26%
			More than 40: 25%	More than 8,000: 27%				
Buyers	83	W – 35% M – 65%	Less than 20: 0%	Less than 4,000: 22%	H – 67%	E – 88%	C – 82%	G – 75%
			Between 20 and 40: 78%	Between 4,000 and 8,000: 55%	O – 33%	N – 12%	S – 18%	O – 25%
			More than 40: 22%	More than 8,000: 23%				

Notes: <sup>a</sup> W represents women and M represents men. <sup>b</sup> In years. <sup>c</sup> In PLN. <sup>d</sup> H represents higher education, and O represents other. <sup>e</sup> E represents employed and N is not employed. <sup>f</sup> C represents the city and S the countryside. <sup>g</sup> G represents at least a good standard, and O represents other.

Source: own study.

### 2.3. Econometric framework

The impact of behavioral interventions on the intensity of the endowment effect, that is, the WTA-WTP gap, was examined using data from the second and third stages of the experiment by applying the following two-equation model:

$$y_{i1} = \alpha_1 + \beta_1 s_{i1} + \sum_{k=1}^K \gamma_{k1} x_{ik1} + \varepsilon_{i1} \quad (1)$$

$$y_{i2} = \alpha_2 + \beta_2 s_{i2} + \sum_{k=1}^K \gamma_{k2} x_{ik2} + \varepsilon_{i2}$$

where:  $y_i$  is the log WTA or WTP value,  $\alpha$  is the model constant,  $s_i$  takes the value 1 if the respondent acts as a seller and 0 otherwise,  $x_{ik}$  is the  $k$ -th control variable. The control variables included gender (1 – female, 0 – male), log age, income, education (1 – tertiary, 0 – other), employment (1 – employed, 0 – unemployed), place of residence (1 – city, 0 – countryside), and standard of housing (1 – at least good, 0 – other). The selection of control variables that are likely to affect the value of WTA and/or WTP was based on previous research on the endowment effect in the housing market. The endowment effect occurs when  $\beta_r > 0$ , where  $r$  is the equation number.

Equation 1 uses the WTA and WTP values from the second stage of the experiment (before the intervention) and Equation 2 from the third stage (after the intervention). Error terms between equations may be correlated; therefore, the seemingly unrelated regression (SUR) method is used for the estimation. However, both equations have the same covariates; therefore, the estimates obtained from SUR are

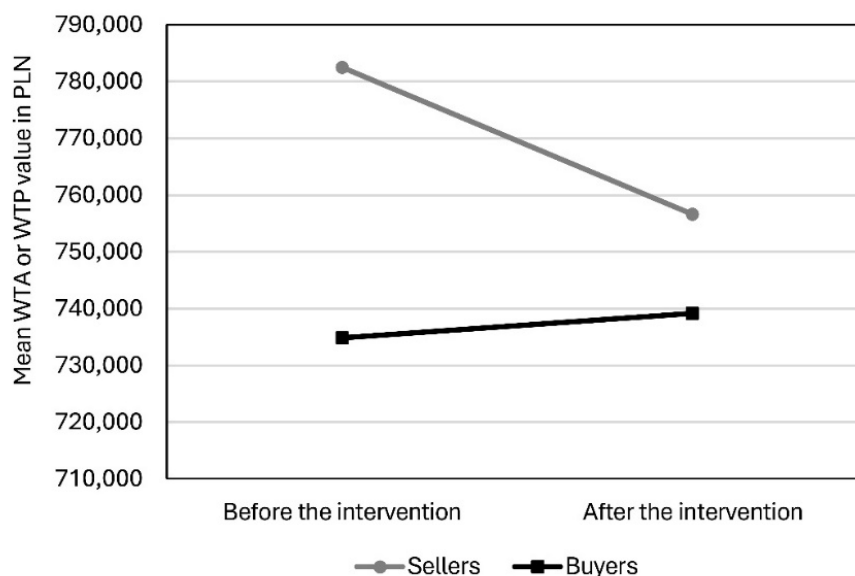
equivalent to those obtained from the ordinary least squares method.

Finally, to test how the intensity of the endowment effect changes following the introduction of behavioral interventions, the parameters  $\beta_1$  and  $\beta_2$  should be compared as follows:

- if  $\beta_1 = \beta_2$  the intensity of the endowment effect has not changed
- if  $\beta_1 > \beta_2$  the intensity of the endowment effect has decreased
- if  $\beta_1 < \beta_2$  the intensity of the endowment effect has increased

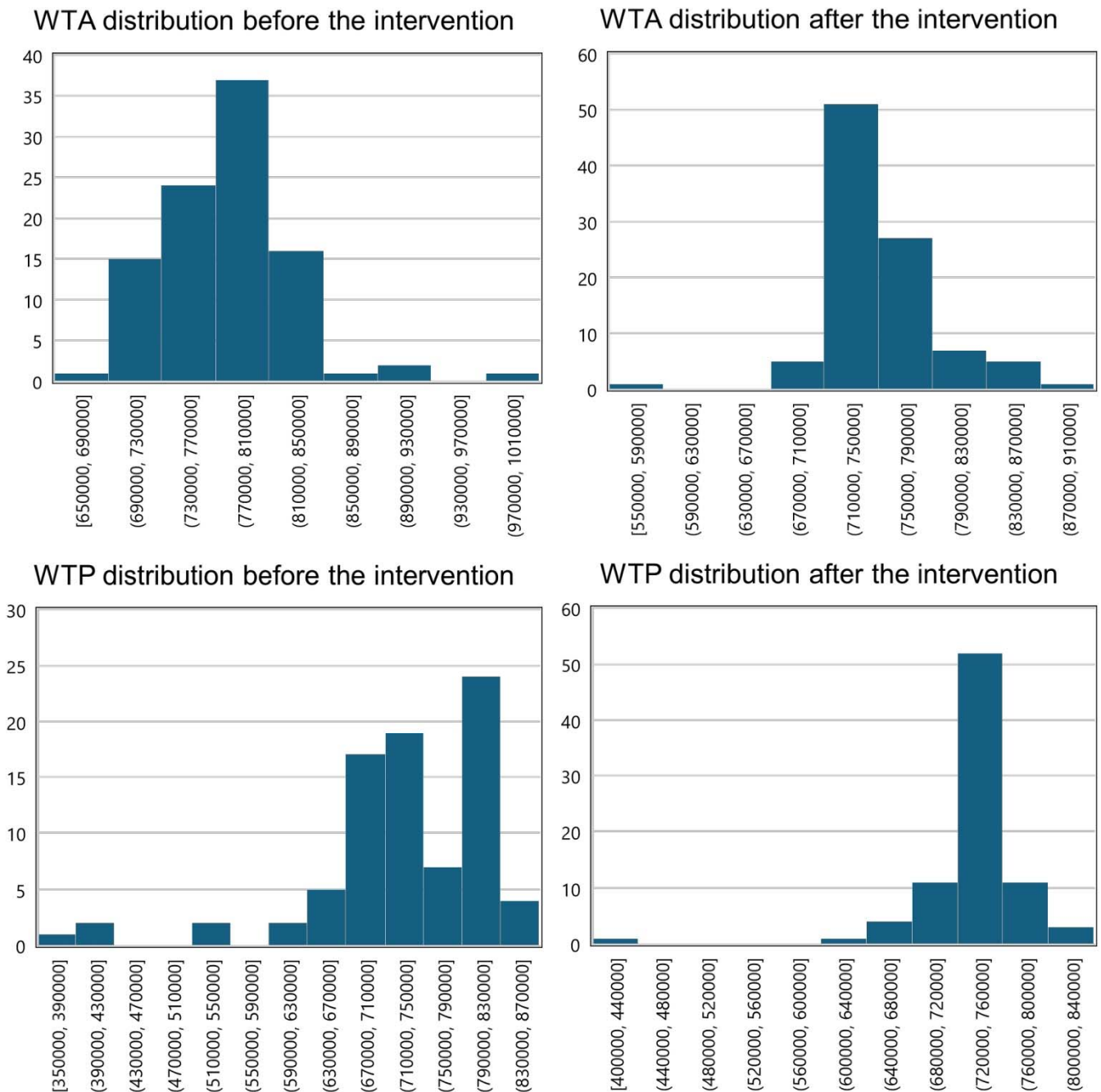
### 3. Results and discussion

The study began by calculating the mean WTA and WTP values before and after behavioral interventions, as shown in Figure 2 and Table 2. Before the intervention, the mean WTA value was substantially higher than the mean WTP value, whereas the WTA-WTP gap decreased after the intervention. In particular, the WTA-WTP gap before the intervention was PLN 47,649, and after - only PLN 17,491. This decrease is particularly due to a much lower average WTA value after the intervention. On the other hand, buyers were not particularly affected by the intervention, that is, the average WTP value increased by only a few thousand following the intervention. It can also be seen from Table 2 that the intervention caused the distributions of the WTA and WTP values to become less differentiated, as evidenced by the estimated standard deviations and Figure 3.



**Fig 2.** WTA and WTP values before and after the intervention. *Source:* own study.





**Fig 3.** WTA and WTP distributions before and after the intervention. *Source:* own study.

**Table 2**

Descriptive statistics for WTA and WTP values before and after the intervention

Category	Mean [PLN]	Standard deviation [PLN]
Pre-intervention WTA	782,474	50,586
Post-intervention WTA	756,649	39,934
Pre-intervention WTP	734,825	95,118
Post-intervention WTP	739,158	50,534

*Source:* own study.

To formally verify the decline in the intensity of the endowment effect, Model (1) was estimated with the

SUR method using a heteroskedasticity-robust estimator of variance. Before estimation, the data were checked for potential collinearity and specification issues. For all variables, the resulting VIF (variance inflation factor) value was less than two, indicating the absence of collinearity. Also, the RESET test suggested that equations 1 and 2 in the model (1) are correctly specified ( $p > 0.1$ ).

The estimation results show that the estimates for parameters  $\beta_1$  and  $\beta_2$  are significantly greater than zero, indicating the presence of the endowment effect

(Table 3). Next, using the F-test (Table 3), it was confirmed that the endowment effect significantly decreased after behavioral interventions by 4.53 percentage points (Table 4). This result is almost identical to the calculations based solely on WTA and WTP averages (Table 4). These results verified the study hypothesis positively.

**Table 3**

Estimates of the SUR model		
Variable	Coefficient	Robust standard error
$s_{i1}$	0.068**	0.018
$s_{i2}$	0.024*	0.011
Controls	Yes (Eq. 1)	Yes (Eq. 2)
N	180 (Eq. 1)	180 (Eq. 2)
R <sup>2</sup>	0.103 (Eq. 1)	0.058 (Eq. 2)

Notes:  $\beta_1 = \beta_2$  ( $p = 0.002$ ),  $\beta_1 > \beta_2$  ( $p = 0.999$ ),  $\beta_1 < \beta_2$  ( $p = 0.001$ ).  
\* $p < 0.05$ , \*\* $p < 0.01$ . Source: own study.

**Table 4**

WTA-WTP gap before and after the intervention			
Category	Pre-intervention WTA-WTP gap [%]	Post-intervention WTA-WTP gap [%]	Difference in percentage points
Average values	6.48	2.37	4.12
SUR model	7.01 <sup>†</sup>	2.48 <sup>†</sup>	4.53

Notes: <sup>†</sup> Calculated as  $(e^{coefficient} - 1) * 100\%$ . Source: own study.

The results obtained in this study confirm the existence of the endowment effect in the housing market, which is in line with research by Bao and Gong (2016), Bao (2020), and Tomal (2024), among others. This behavioral bias diminishes following the application of the behavioral interventions proposed by Bao (2023). Sellers whose WTA values have changed much more strongly (toward the market price) than buyers' WTP values are especially susceptible to the intervention. This type of situation is desirable, because sellers are particularly vulnerable to making decisions based on multiple reference points. These findings are consistent with the study by Gong et al. (2019), which focused on the role of information asymmetry in the process of shaping the WTA-WTP gap. On the other hand, this study does not provide new information to the transacting parties but focuses on forcing buyers and sellers to process the information already available to them more effectively (regarding the dwelling market price).

It should also be emphasized that the results of this study, indicating the presence of the endowment effect, are in line with the literature on the identification of behavioral biases and imbalances in

the Polish housing market. Among others, one can refer to the work of Brzezicka (2016) and Kokot (2023), who demonstrate the existence of an anchoring effect among participants in the Polish housing market. Furthermore, Brzezicka et al. (2013), using a laboratory experiment, proved the occurrence of the certainty and isolation effect. Finally, Brzezicka and Wiśniewski (2013) and Rubaszek and Czerniak (2018) found that behavioral elements of the housing market are important for its participants in Poland.

#### 4. Conclusion

The present study confirms the hypothesis set out in the Introduction. Specifically, behavioral interventions consisting of education and awareness as well as visualization tools resulted in a significant reduction in the endowment effect analyzed in the simulated housing market. Specifically, the WTA-WTP gap decreased by 4.53 percentage points and, on average, after the intervention, sellers reported prices that were only 2.48% higher than those presented by buyers.

This study had some limitations. First, the experiment was performed on a hypothetical example owing to the unobservability of the data on WTA and WTP values. Therefore, the estimated endowment effect may be undervalued given that some respondents may not have truly felt the role of a seller or buyer. Second, this study is only concerned with a slice of the housing market, that is, the secondary residential sales market. It is possible that the behavioral interventions applied in this study may work differently in other segments of the housing market. Finally, the experiment tested the combined impact of education and awareness as well as visualization tools on the intensity of the endowment effect. Subsequent studies should attempt to estimate the influence of individual interventions on the analyzed behavioral effect independently. This will provide an opportunity to test whether using behavioral interventions together leads to a synergy effect.

Our findings have valuable implications for government intervention in the housing market. Currently, in many countries, only offer prices are available at the micro level, which in Poland, for example, are overestimated in relation to transaction prices by an average of 10%. This situation encourages the persistence of the endowment effect and contributes to a state of imbalance in the housing market, as well as the development of price bubbles. Therefore, legislators should aim to provide citizens

with easy access to up-to-date housing transaction prices, preferably combined with the ability to visualize them on a map or in graphical form.

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### Conflict of interest

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