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## Out-of-Town Buyers, Mispricing, and the Availability Heuristic in a Housing Market

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Asymmetric information between buyers can cause severe valuation biases in housing markets.<sup>1</sup> In this article we study the effects of asymmetric information between local and out-of-town buyers using data from Arizona on repeat sales of “ranchettes”—small ranches used for agriculture and recreation.

Because ranchettes are used for agriculture and recreation, their value partly is determined by the average amount of vegetation surrounding them. Thus, the return a buyer obtains depends on her ability to estimate, prior to purchase, the average amount of vegetation.

Our results suggest that local buyers obtain greater returns than out-of-town buyers when they resell their properties, and that the difference becomes greater when out-of-town buyers visit a ranchette at a time when it is surrounded by greater than average amount of vegetation. As such, our results suggest that out-of-town buyers tend to use the amount of vegetation at the time of the visit as a cue for the typical amount of vegetation. Consequently, when the amount of vegetation at the time of the visit is large, out-of-town buyers often overestimate a ranchette’s value.

Furthermore, we find that the amount of vegetation affects the returns of out-of-town buyers despite the availability of reliable information on the average amount of vegetation surrounding each ranchette. Therefore, the results suggest that out-of-town buyers do not use the information they have effectively. Rather, it seems that they give greater weight to their personal one-time experience over more reliable but less salient information.

Thus, our results add on to findings in the literature that show that out-of-town buyers often make smaller returns than local buyers.<sup>2</sup> Our results may therefore add to the understanding of the price volatility observed in housing markets where a large share of the buyers is from out-of-town.<sup>3</sup>

Further, the results suggest that in our dataset at least some of the difference between local and out-of-town buyers is the outcome of *projection errors*, systematic errors in the predictions of benefits from future consumption of goods and assets.<sup>4</sup> Thus, our results provide further evidence suggesting that the effects of projection biases are not limited to small ticket assets and to situations where consumers are time constrained.<sup>5</sup> Indeed, the average price of an asset in our sample is over 124,000 US dollars in 1995 prices, and buyers have several

weeks to analyze all the available information before signing a contract.

Below, we suggest that the projection bias we find is likely to be an outcome of the *availability heuristic*, the tendency to judge information according to its availability to the cognitive process rather than according to its representativeness. Further, this article, as well as prior work, show that adding information usually does not cancel the effects of the projection biases.<sup>6</sup> These findings illustrate some of the reasons why available information about the amenities and quality of houses seems to have little effect on the price appreciations in housing markets with large shares of out-of-town buyers, such as Los Angeles, Las Vegas, Miami, and Santa Barbara in the early 2000s.<sup>7</sup>

### PROJECTION BIASES, AVAILABILITY HEURISTIC AND HOUSING MARKETS

There is evidence that in housing markets, out-of-town buyers obtain lower returns than locals. This often is attributed to information advantages of local buyers and to differences in utilization between local and out-of-town buyers.<sup>8</sup>

Below, we show that in some housing markets, projection biases caused by the availability heuristic could be another reason why out-of-town buyers overestimate the future returns from housing services. Thus, the availability heuristic can exacerbate the differences in realized returns between local and out-of-town buyers.

Projection biases are systematic errors in the evaluation of future benefits. Previous studies suggest that decisionmakers often are affected by contemporary cues when assessing future returns and, consequently, they often make significant errors in their evaluations. For example, it was shown that in winter, consumers often value the benefits from summer clothes more on sunny days than on cloudy days although the current weather has no effect on the eventual benefit. It also was found that when investors are in a good mood they tend to overvalue stocks although their mood is not correlated with information about the stocks' expected performance.<sup>9</sup>

Heuristics are likely to be another reason that can cause projection biases because heuristics are cognitive processes that simplify decisionmaking. The evidence suggests that when the cognitive efforts required for performing fully rational decisions are high and the necessary cognitive resources are scarce, most decisions are taken on the basis of

heuristic evaluation.<sup>10</sup> Heuristic decisionmaking seems to be common, for example, when consumers choose goods while facing time constraints or when they have to complete several tasks simultaneously.

When decisionmakers have the time and the cognitive resources to further analyze the information, however, it seems that they usually make their decisions on the basis of in depth information processing. The likelihood that decisionmakers will process the information in depth increases also when the costs of making an error increase.<sup>11</sup>

It should be expected, therefore, that heuristics only will have a small effect on decisions in housing markets because the values of these assets usually are high and the decisionmakers typically have several weeks to consider their decisions. Decisionmakers therefore have both the time and the incentives to implement an efficient decision.<sup>12</sup>

It seems, however, that because the heuristic processing is almost automatic and is highly salient, the outcomes of heuristic processing often are fed as inputs into the in depth analysis. Thus, the outcomes of in depth evaluations often are biased by the outcome of the heuristic valuation.<sup>13</sup> Therefore, even when in depth analyses are performed, the compensations for the initial, heuristic estimates usually are insufficient.<sup>14</sup>

One of the most studied heuristics is the availability heuristic.<sup>15</sup> When decisionmakers are affected by the availability heuristic they judge information on the basis of its salience to the cognitive process rather than by its representativeness.

For example, being close to winning increases the likelihood that gamblers will bet again because although the winning probability is the same regardless of the outcome, the image of a win becomes more salient after a close miss.<sup>16</sup> Participants in a survey often judge the frequency of a letter in the English language as higher after they observe a list containing a large number of words beginning with that letter, because it becomes easy for them to think of examples that use that letter.<sup>17</sup>

The availability heuristic also is likely to affect consumers that have to judge the value of goods and assets when salient information about the goods differs from information from other sources. For example, it has been shown that car buyers that intend to buy a certain model after reading the results of large consumer surveys change their decisions after hearing the story of a single dissatisfied consumer. Apparently, the saliency of the one incident gives it greater weight in the decisionmaking process than the information from the surveys, although the surveys' results represent the

opinions of thousands of consumers whereas the anecdote represents the opinion of a single consumer.<sup>18</sup>

Considering the aforementioned evidence, we hypothesize that buyers that judge the value of real estate assets will be similarly affected. Thus, we expect that because personal experience is more salient than second hand information, a buyer that is exposed to a large amount of written and other second hand information about the quality of an asset will nevertheless often base her decision on personally acquired information.<sup>19</sup> Therefore, when the personal experience deviates from the second hand information in favor of the asset, we expect that a buyer will overvalue the asset.

The market we study is the Arizona market for ranchettes, small ranches used for agriculture and recreation. Previous studies suggest that one attribute that affects the value of a ranchette is the average amount of vegetation surrounding it. Vegetation has both aesthetic value that appeals to recreational owners and practical value for owners that use the land for pasture and/or for growing crops. Large, consistent amount of vegetation therefore adds to the value of a ranchette.<sup>20</sup>

Buyers, therefore, have to estimate the average amount of surrounding vegetation before deciding on their reservation prices. The greater is the expected amount of average vegetation, the higher the reservation price.

Buyers can acquire reliable information about ranchettes' amenities, including vegetation, at low prices from several sources. This information is available from local authorities, real estate agents, neighbors, newspapers, and more. Thus, if buyers use the available information efficiently, they should not make systematic errors in estimating a ranchette's values.

We expect, however, that the availability heuristic will bias the judgments of buyers about the value of ranchettes when the buyers have salient information about the amount of vegetation that is different from the information provided by other sources. For out-of-town buyers, the most salient information they are likely to have is their personal experience when visiting the ranchette. Hence, we expect that the amount of vegetation surrounding a ranchette at the time of a visit will affect an out-of-town buyer's valuation. When the amount of vegetation is above the average level, we expect that an out-of-town buyer will overvalue the ranchette relative to other out-of-town buyers that visit when the amount of vegetation is about average.

We do not expect, however, that local buyers will be affected by the availability heuristic to the same extent because local buyers are likely to have a large number

of personal experiences with the amount of vegetation around ranchettes. The amount of vegetation they observe when they visit a ranchette at a particular time is just one more experience that they have and that has similar status as their other experiences. Hence, we expect that the amount of vegetation at the time of a visit will increase the wedge between local and out-of-town buyers beyond the difference predicted by other information advantages that local buyers might have over out-of-town buyers.

To sum up, our hypothesis states that out-of-town buyers that visit the ranchettes when the amount of vegetation is significantly greater than the average amount will be affected by the availability heuristic and, therefore, will tend to overestimate the ranchettes' value relative to out-of-town buyers that visit ranchettes when the amount of vegetation is about average. Therefore, we expect that out-of-town buyers that visit when the amount of vegetation is uncommonly large will not only make smaller returns when selling their ranchettes than local buyers, but they will also make smaller returns than other out-of-town buyers that visit when the amount of vegetation is average.

### DATA

We use data on a market for real estate assets known as ranchettes. Ranchettes are small ranches used for agriculture or for recreation. We have observations on 1,013 repeated sales of ranchettes in Yavapai County, Arizona, between January 1991 and September 2000. The data was provided by the Yavapai County assessor.

For each repeated sale, we have the dates, prices, lot sizes in acres, assessed value of improvements between the repeated sales, billing address of the buyer and location of the ranchette. We use the information on locations to calculate the ranchettes' distances from the nearest city, from the nearest main road, and from the nearest river. We use the dates of sales to augment the dataset with information about the interest rate, the GDP growth rate and the number of housing starts in the United States at the time of each sell.

One attribute that was previously found to have a positive effect on ranchettes' prices is the average amount of vegetation surrounding it. It seems that large amount of vegetation makes a ranchette attractive for two main reasons. First, for buyers that are interested in using the ranchette for agricultural or semi agricultural purposes, ranchettes that are rich with vegetation offer greater value because vegetation is a signal of arable land and of pasture. Second, buyers that

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use ranchettes for recreation seem to attach aesthetic value to natural vegetation.<sup>21</sup>

We therefore measure the amount of vegetation around each ranchette by using observations on the Normalized Difference Vegetation Index (NDVI), which is an index of the level of photosynthesis occurring in plants. Healthy vegetation absorbs most of the visible radiation and reflects large amounts of near-infrared radiation, whereas stressed or dead vegetation reflects more red light and less infrared light. Barren land and land without vegetation have a more even reflectance across the light spectrum than vegetated areas.

The NDVI is calculated by taking satellite measurements of the near-infrared and visible radiation and then measuring the ratio between them. The NDVI receives values between -1 and 1. Negative NDVI values usually indicate water. NDVI of zero indicate barren land. Values between zero and one indicate some amount of vegetation with values above 0.8 indicating extremely dense vegetation that is typical of rain forests.

NDVI scores are commonly used to study vegetation. They were used, for example, for studying crop vegetation, draughts, climate, and forage estimation.<sup>22</sup> For the area we study, observations are collected every two weeks and are available at a resolution of 1 km<sup>2</sup>.<sup>23</sup>

As proxies for the amount of vegetation at a time that a buyer visits a ranchette, we record for the location of each ranchette the NDVI one and two months prior to the sale.

We also calculate for each ranchette the average NDVI and the standard deviation of the NDVI.<sup>24</sup>

Summary statistics about the ranchettes and the macro-economic conditions during the relevant period are presented in Exhibit 1, which describes the summary statistics of the data used in our empirical exercise. The data corresponds to ranchettes located in Yavapai County, Arizona, and was provided by the Yavapai County assessor. We have observations on 1,013 repeated sales of ranchettes between January 1991 and September 2000. For each repeated sale, we have the dates, prices, lot sizes in acres, assessed value of improvements between the repeated sales, billing address of the buyer and geo-coded location of the ranchette.

The average ranchette has an area of 6.9 acres. It is located about 5.2 miles from the nearest city and 3.6 miles from a river. The average amount of vegetation, as measured by NDVI score, is 0.33, suggesting that the vegetation surrounding the average ranchette is sparse and mostly composed of shrubs.<sup>25</sup> An increase of one standard deviation in the NDVI score to 0.44, means that the amount of vegetation becomes quite dense whereas a decrease of one standard deviation to 0.22 suggests an amount of vegetation typical of arid lands.

To remove the effects of monetary inflation, we report all prices in 1995 constant prices. We find that the average ranchette was purchased in November 1995 for a price of 80,525 US dollars and resold in August 1998 for a price of

### EXHIBIT 1—SUMMARY STATISTICS

	<b>Average</b>	<b>Standard Deviation</b>
Original price of the ranchette (1995 prices)	US\$80,525.20	US\$115,720.10
Resale price of the ranchette (1995 prices)	US\$124,112.90	US\$241,437.30
Average value of renovations (1995 prices)	US\$23,400.30	US\$70,600.50
Ranchette's Area (Acres)	6.9	9.13
Distance from a road (yards)	1,940.9	3,394.33
Distance to a river (yards)	6,304.5	6,574.90
Distance to a city (yards)	9,211.1	16,597.20
Average NDVI	0.33	0.110
Annual GDP growth	1.4%	0.62%
Average Annual Federal Interest Rate	4.92%	1.05%
Monthly number of US housing starts	1,405.9	204.54

124,113 US dollars. The average return per annum was 17.6 percent. The average return per annum made by owners from Arizona, is 20 percent, about twice the average return made by owners from outside Arizona, which is around 10 percent. The difference between both returns is statistically significant ( $t=4.45, p<0.01$ ).

### ANALYSIS

#### Predictions

The availability heuristic predicts that market participants will overweigh salient information and underestimate information that is less salient, even when the less salient information is more reliable or more representative. In the ranchette market, the only firsthand experiences that out-of-town buyers often have with an asset are obtained when they visit it. Local buyers, on the other hand, are likely to have other firsthand experiences with the asset and with similar ones in addition to any visit that they make before purchasing a specific one.

We therefore expect two sources of divergences in realized returns between ranchette buyers. First, we expect that local buyers are likely to have an informational advantage over out-of-town ones as in other real estate markets.<sup>26</sup> Second, we expect that because of the availability heuristic, out-of-town buyers that visit a ranchette at times when the amount of vegetation was large will make lower returns than other out-of-town buyers who visit when the amount of vegetation is average or below average. Hence, we expect that the availability heuristic will not only increase the difference between local and out-of-town buyers but that it also will create a difference between the returns obtained by out-of-town buyers that visit at times with different vegetation density.

#### Definitions

Our data is on repeat sales. We use the term *owners* to refer to home buyers that bought an asset at the beginning of the period and then resold it. An average *owner* in our dataset purchased a ranchette in November 1995 for a nominal price of 82,388 US dollars and then sold it in August 1998 for a nominal price of 135,783 US dollars.

Below, we differentiate between local owners that live in Arizona and out-of-town owners that live elsewhere. We define owners as *Arizona owners* if their billing addresses are in Arizona and as *non-Arizona owners* if their billing addresses are in another state.

#### Results

The amount of vegetation surrounding a ranchette is an attribute that has a positive effect on a ranchette's price. Buyers, therefore, have to estimate the typical amount of vegetation that is likely to surround a ranchette when predicting the expected benefits.

To test our hypotheses about the difference between Arizona and non-Arizona owners and also between non-Arizona owners that bought when the amount of vegetation was different we use OLS regression with robust standard error. The dependent variable is the annualized returns that an owner made in the period between buying and selling a ranchette.

The benchmark regression includes dummies for Arizona owners, for the amount of vegetation (NDVI) two months before each transaction, and an interaction between the Arizona owners' dummy and the NDVI two months before a transaction. We use the information about the amount of vegetation two months before the sale because real estate agents informed us that this is the average duration between a buyer's visit and the completion of the transaction. Moreover, this is similar to the duration between a buyer's visit and the signature of the contract in other US markets.<sup>27</sup> Robustness checks using information about the NDVI one month before the transaction yield similar results.<sup>28</sup>

The regression also includes random effects for the months of the year in which the transaction was signed because seasonality might affect the prices either because of differences in sellers' and buyers' time constraints in different months, self selections, differences in demand in different months, etc.<sup>29</sup> For example, it might be that non-Arizona buyers have more vacations in summer months and, therefore, they are more likely to search for a ranchette in summer than in winter.

The results are reported in the first column of Exhibit 2. Heteroscedastic robust standard errors are reported in parentheses.

The results suggest that Arizona owners have an informational advantage over non-Arizona owners because on average, Arizona owners earn about 10 percent more in annualized returns than non-Arizona buyers. We also find that as hypothesized above, the amount of vegetation at the time of the visit does not affect Arizona owners, as the effect of the NDVI two months before the transaction is small and not significant.

At the same time, the effect of the amount of vegetation two months before the sale on non-Arizona owners is

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**EXHIBIT 2—OWNERS' REAL RETURNS**

	(1)	(2)	(3)	(4)
Interaction Arizona Owner × NDVI	0.49* (0.289)	0.53* (0.287)	0.54** (0.278)	
Arizona Owner	0.10*** (0.023)	0.09*** (0.023)	0.08*** (0.023)	0.09*** (0.023)
NDVI	0.03 (0.089)	0.03 (0.088)	0.05 (0.091)	
GDP growth rate before ownership		-11.94** (3.983)	-12.10*** (4.135)	-11.95*** (4.128)
GDP growth rate before resale		-0.02 (0.011)	-0.02 (0.011)	-0.02 (0.011)
Interest rate between owning and reselling		0.06** (0.031)	0.05* (0.029)	0.05 (0.032)
Linear time trend		$4.16 \times 10^{-5}$ ** ( $1.9 \times 10^{-5}$ )	$4.02 \times 10^{-5}$ ** ( $1.9 \times 10^{-5}$ )	$3.98 \times 10^{-5}$ ** ( $1.9 \times 10^{-5}$ )
Log area			0.001 (0.013)	-0.001 (0.013)
Log distance to road			-0.004 (0.007)	-0.004 (0.007)
Log distance to city			0.003 (0.006)	0.003 (0.006)
Log distance to river			-0.01* (0.007)	-0.01* (0.007)
Value of renovations			$7.45 \times 10^{-5}$ *** ( $1.39 \times 10^{-5}$ )	$7.47 \times 10^{-5}$ *** ( $1.39 \times 10^{-5}$ )
Average NDVI			-0.23 (0.484)	
Standard deviation of NDVI			-0.18 (0.179)	
Interaction Arizona Owner × difference between NDVI at visit and average NDVI				0.57* (0.319)
Difference between NDVI at visit and average NDVI				0.06 (0.090)
Constant	0.07 (0.046)	-0.49** (0.214)	-0.34 (0.223)	-0.32 (0.224)
Fixed-Effects for months of first and second transactions	YES	YES	YES	YES
<i>N</i>	1013	1013	1013	1013
<i>R</i> <sup>2</sup>	0.028	0.038	0.075	0.075
<i>F</i>	2.06**	2.81***	3.46***	3.46***

\* – significant at 10%. \*\* – significant at 5%. \*\*\* – significant at 1%.

large and marginally significant. The difference in annual appreciation between a non-Arizona owner that bought her ranchette when the amount of vegetation was average and one that bought it when the amount of vegetation

was one standard deviation (0.11) greater is  $0.49 \times 0.11 = 5$  percent.

Thus, the results of the benchmark regression provide evidence that the returns for non-Arizona owners depend on

the amount of vegetation at the time they visit the property. Non-Arizona owners make smaller returns than Arizona owners not only because of the information advantage that the Arizona owners seem to have, but also because non-Arizona owners are affected more than the Arizona owners by the amount of vegetation at the time of the visit.

However, there is a possibility that the differences in the appreciation rates are not because of differences in the amount of vegetation but because differences in vegetation are correlated with differences in macroeconomic conditions or because of differences in the preferences for ranchettes' attributes, or differences between owners that purchase at different times. For example, it might be that ranchette buyers that buy when the amount of vegetation is large do so because buyers that come to search for ranchettes at times when the amount of vegetation is large have different time preferences or are affected differently by macroeconomic conditions from other buyers. In Column 2 of Exhibit 2 we therefore add controls for the macro economic conditions and in Column 3 we also add controls for ranchettes' attributes.

The macroeconomic controls that we add are the average interest rate in the period between the sale and the resale, the GDP growth in the years prior to the sale and the resale and a linear time trend for the time of the purchase. The controls for the ranchette's attributes include the log of each ranchette's area, the log of the distances from the nearest river, main road and city, the sum spent on renovations between the purchase and the resell, and the average and standard deviation of the amount of vegetation in each ranchette.

We include the GDP growth rate in the period before the sale and the resale because these are likely to affect reservation prices at the time that the transactions took place. We include the interest rate in the period between the sales because it is a proxy for the opportunity costs of owning a ranchette and should therefore have a positive effect on the appreciation rates.

We include the ranchettes' area and distances from rivers, cities and roads to capture changes in buyers' tastes over time. If the buyers' tastes did not change over the period, then these attributes should affect the price level, but not the appreciation rates for a ranchette with a given attribute. Similarly, the average and standard deviation of the amount of vegetation should affect the prices of ranchettes because the amount of vegetation and its predictability affect the value for both agricultural and recreational uses. As long as buyers' tastes do not change over time, however, these

controls should have only little effects on the appreciation rates.

We find that, as in the benchmark regression, in both columns 2 and 3 of Exhibit 2, Arizona owners make greater returns than non-Arizona owners. These coefficients suggest that Arizona owners make these larger returns because they have an absolute advantage over non-Arizona owners. Second, we also find that whereas vegetation conditions at the time of the visit do not affect Arizona owners, they negatively affect the returns of non-Arizona owners. Consequently, a non-Arizona owner who happens to visit her ranchette at a time when the amount of vegetation is greater than normal makes smaller returns than another non-Arizona owner who visits the same ranchette when then amount of vegetation is average.

Hence, the results of Columns 2 and 3 suggest that the baseline result of a negative effect on returns from the amount of vegetation at the time of the visit cannot be attributed to a time of year effect, to differences in tastes for ranchettes' attributes, to renovations' values or to macroeconomic conditions. Furthermore, including these variables only strengthen the statistical significance of the main controls and therefore adds further robustness to the conclusions.

As a further robustness check, we replace the NDVI variable with a variable that captures the difference between the average NDVI and the NDVI two months before the transaction. As the owners care about the amount of vegetation throughout the year, this variable captures the difference between the true level of the vegetation amenity and the level as perceived by an owner before he purchases.

With this specification, we estimate the effects of any differences between the amount of vegetation around the ranchette that an owner should expect on the basis of reliable second hand information and the amount of vegetation the owner observed while visiting the ranchette. We also include all the controls for the macroeconomic conditions and for the ranchette's attributes as in the previous regression.

The results show that the main findings remain unchanged. We find that the coefficient of Arizona owners is significant and positive, suggesting that Arizona owners have information advantages over non-Arizona owners and, consequently, Arizona owners earn almost 9 percent more in annual appreciation than non-Arizona owners. Furthermore, the differences in the returns between Arizona and non-Arizona owners become greater when the amount of vegetation at the time of the visit is greater. The coefficient of the interaction between Arizona owner and the difference

between the NDVI at the time of the visit and the average NDVI suggests that a non-Arizona owner that visits when the amount of vegetation is greater than average by one standard deviation unit of the difference (0.03 NDVI units) earns approximately 1.8 percent less in annual appreciation than a non-Arizona owner who visits at a time when the amount of vegetation is average.

Thus, as predicted by the hypothesis that out-of-town owners are affected by the availability heuristic, the results show that there are differences beyond those we expect to observe between local and out-of-town owners. More precisely, there also are differences in annual appreciation between out-of-town owners that depend on the amount of vegetation they observe when they visit the ranchettes.

As we discussed above, the differences between out-of-town owners cannot be attributed to differences in information, because different out-of-town owners are likely to have access to similar information about the local vegetation conditions. Furthermore, it seems that this information is cheap, easily available, and reliable, and it should therefore be accessible to all owners.

It therefore seems that despite the large value involved in the transaction and the availability of both information and time for making in depth value judgments, the salient effect of watching the amount of vegetation in the ranchette at the time of the visit has a significant effect on the valuation. This effect seems to bias the value that out-of-town owners expect to receive from their ranchettes and consequently make them buy ranchettes that yield them lower than expected returns.<sup>30</sup> According to the results in our benchmark regression, for example, the projection bias caused by the availability heuristic renders non-Arizona owners that visit when the amount of vegetation is one standard deviation larger than the average, a reduction of about 5 percent in annualized returns. This means that non-Arizona owners that visit when the amount of vegetation is large lose about 4,000 US dollars per year in 1995 fixed prices relative to other non-Arizona owners that visited the amount of vegetation is average.

## CONCLUSIONS

It has been shown that out-of-town buyers tend to pay more than locals for similar assets due to information asymmetries.<sup>31</sup> In this article we contribute to this literature by showing that projection biases can exacerbate the pricing errors observed in transactions involving out-of-town buyers. Importantly, we not only show that projection biases can

exacerbate observed differences in realized returns between local and out-of-town buyers, but they also generate differential returns between different out-of-town buyers.

It was suggested that projection biases and systematic misjudgments of values can occur when temporary events affect decisionmakers' evaluations.<sup>32</sup> It also was suggested that such biases should be small in markets where decisionmakers have time to reconsider their decisions and the monetary incentives are large.<sup>33</sup>

We study the effect of the availability heuristic in Arizona's market for ranchettes, small ranches used for recreational and agricultural activities. Our results suggest that non-locals (not Arizona) buyers seem to be affected by the availability heuristic, because although information about the average conditions is inexpensive and available, there are large differences between the returns made by non-locals. Furthermore, these differences seem to depend on the time that the non-locals visit. Non-locals that visit when the amount of vegetation in the ranchette is untypically large make significantly smaller returns than non-Arizona buyers that visit when the amount of vegetation in the ranchette is average.

Thus, it seems that although all non-Arizona buyers are likely to have the same information about the local conditions from local press, authorities, real estate agents, neighbors, etc., the effect of the salient information from the time of the visit lasts and affects value judgments even though it is less representative than information available from other sources. Hence, our results suggest that the availability heuristic seem to cause projection biases that have significant effect on returns in a housing market where assets have a value of over 124,000 US dollars in 1995 prices and when buyers have time to consider their decisions.

The results therefore suggest that the large difference in the returns between local and non-local buyers is not only the information advantage that locals are likely to have over non-locals,<sup>34</sup> but because non-locals are affected differently from locals by the conditions at the time that they visit. Consequently, non-locals that visit at a time that the conditions are uncommonly good are likely to make lower returns than other non-locals that buy at a different time.

Hence, our results suggest that research on heuristics can contribute to understanding deviations of asset prices from their fundamental values.<sup>35</sup> For example, evidence on housing prices in places such as Phoenix and Miami before the subprime mortgage crisis of 2008 suggests that the pricing

behavior there might have been affected by out-of-state buyers' valuation errors. This similarity between the market we study and other markets that were strongly affected in the crisis of 2008 suggest that studying heuristic valuation may contribute to understanding price fluctuations in some of the housing markets that were most significantly affected by the subprime mortgage crisis.<sup>36</sup>

The findings reported in this article also may contribute to improving selling techniques. For example, real estate agents in Arizona suggested to us in private conversations that they try to convince potential buyers to come for a visit during the rainy season. We do not find evidence in the data, however, that the share of houses that are bought by out-of-town buyers increases when the amount of vegetation is large.

This might be explained if times with large amount of vegetation coincide with the time in which local buyers, as well as out-of-town buyers tend to make more transactions. This might also be explained if the number of potential out-of-town buyers is relatively fixed at each point in time and real estate agents cannot wait too long before closing deals. Nevertheless, the findings suggest that both home buyers and real estate agents should be aware of the effect of projection biases.

Finally, the results also may assist authorities in designing policies that will reduce price variability in housing and similar markets: providing buyers with reliable information might not be enough to prevent pricing errors. Under some conditions, it might even exacerbate the errors if it affects the buyers' confidence or if it causes them to split their attention between too many sources of information.<sup>37</sup>

## NOTES

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