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A LEMONS "MIRAGE": ERRONEOUS PERCEPTIONS OF ASYMMETRIC INFORMATION IN THE MARKET FOR ARIZONA RANCHETTES

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ABSTRACT

Owners of modest-sized, recreation-oriented ranch properties, known as "ranchettes," appear to judge a key characteristic of the quality of their properties, the extent of vegetative "greenness," based on their own observation, despite the greater reliability of publicly available climate data. The discrepancy between personal observation and public data is perceived erroneously by owners as reflecting an information asymmetry that favors the former. The consequence of this misperception is adverse selection: transplant owners, who are not familiar with long-term local weather patterns from direct observation, delay the sale of properties that are greener during their term of ownership. Econometric evidence is presented from the analysis of 694 ranchette sales in Yavapai County, Arizona during 1991-2000. The results demonstrate that the efficiency of the market mechanism is affected not just by the actual distribution of information on quality, but by its perceived distribution.

I. INTRODUCTION

In the archetypal desert B-movie, a traveler on foot, having drunk the last drop of water from his canteen, comes across what appears to be an oasis in the distance. Excitedly, he changes his course and travels miles in the wrong direction only to find, when he arrives where the water is supposed to be, that there is nothing there but sand. An attended phenomenon (a mirage) has led to an erroneous interpretation of reality (there must be water there), which in turn results in a suboptimal decision (to travel miles off-course).

> And so, it may be with economic decisions. This paper demonstrates how erroneously perceived information may lead to an incorrect economic characterization of a market situation and, consequently, suboptimal economic behavior and outcomes. Our evidence is from the market for recreational ranch

properties, known as"ranchettes," in Yavapai County, Arizona. Ranchettes consist of modest-sized parcels, often created by subdividing larger farms and ranches. They typically host nominal agricultural operations but are not operated for profit. Inputs are purchased with non-farm income rather than revenues from agricultural sales (Sengupta & Osgood, 2003).

For such properties in Yavapai County, the presence of green vegetation has been shown to be an important determinant of real estate value (Sengupta & Osgood, 2003). The long-term trend in "greenness" of a parcel is determined by its rainfall, so it is possible for anyone with access to historic climate data for the locality to assess a parcel's long-term greenness with the same accuracy as its owner. Yet, ranchette owners who originally come from out of state do not appear to act as if greenness were subject to full information. Rather, consistent with the findings of psychological research, out-of-state owners appear to judge a property's greenness based on what they see while they own it, placing weight on their own limited observations of the property despite the greater reliability of the full span of publicly available data. The discrepancy between personal observation and public data is judged erroneously by owners as reflecting an information asymmetry that favors the former. As we show empirically, this perception of asymmetric information leads to an adverse selection (i.e., "lemons") outcome: out-of-state owners delay the sale of properties that are greener during their term of ownership.

A number of empirical studies have found evidence of adverse selection in markets with actual asymmetric information (e.g., Genesove, 1993; Chezum & Wimmer, 1996; Dewan & Hsu, 2004; Ghose, 2005). To our knowledge, the present study is the first to present evidence of adverse selection based on an *illusion* of asymmetric information in a market exhibiting full information.

Relevant to the present paper are a number of studies that have looked at determinants of the duration of ownership or marketing/selling time of real estate (Haurin, 1988; Glower et al., 1998; Genesove & Mayer, 2001; Engelhardt, 2003; Levitt & Syverson, 2005). Perhaps the most closely related work in this vein is by Sirmans et al. (1995), who examine the effect of seller misinformation on selling time. In their framework, a seller develops a "stopping rule," indicating under what conditions she will accept an offer to buy, based on her expectations as to the distribution of bids. The authors find that sellers who underestimate the distribution of bids sell too quickly. Along similar lines, we find that sellers who erroneously rely on directly experienced quality information mistime the sale of their properties.

The rest of the paper is structured as follows. Section 2 elaborates on our hypothesis, drawing on the economic literature on asymmetric information and the

psychological literatures on availability and directly experienced evidence. Section 3 describes our data and empirical methodology for testing the hypothesis. Section 4 presents the empirical results. Section 5 concludes.

II. DIRECT EXPERIENCE AND PERCEPTIONS OF ASYMMETRIC INFORMATION

In his famous "lemons" paper, Akerlof (1970) demonstrates that low-quality goods may drive high-quality goods from a market when there are information asymmetries. Specifically, if the buyer is unable to observe product quality at the time of the transaction, prices offered will reflect the average quality of goods rather than their actual quality. Sellers of higher-than-average quality products consequently have insufficient incentives to offer them for sale. Only low-quality goods remain in the market, despite potential gains from trade accruing to the offer of high-quality goods.

The market described by Akerlof (1970) involves *centralized trade*. That is, a large number of agents exist on both sides of the market, and all agents have simultaneous access to the same trading opportunities. Therefore, a single price must prevail. In contrast, Blouin (2003) considers the problems of asymmetric information and adverse selection when trade is *decentralized*, that is, when a market is made by the random matching of agents in pairs. Such a situation may describe the market for real estate and online secondary goods markets, among other contexts. Blouin (2003) finds that transactions need not occur at the same price, and that price and time are both adjustment mechanisms. Consequently, sellers face a tradeoff between making a quick sale and obtaining a high price, which high-quality sellers resolve by setting a higher-than-average price and waiting longer on the market. In the end, all goods are offered, but high-quality goods sell with a delay.[1]

Empirical analysis of asymmetric information and adverse selection in decentralized markets has been limited thus far. In an analysis of the electronic secondary market hosted by Amazon, Ghose (2005) finds that high-quality goods wait longer on the market than other goods, corroborating the recent theory.

With full information, one would expect such lemons results to vanish. Quality would not be expected to affect the likelihood or timing of sale if all people had the same unimpaired ability to evaluate it. Psychological evidence suggests, however, that people exhibit judgmental biases, some of which appear relevant to evaluating

[1] Janssen & Karamychev (2002) and Janssen & Roy (2004) obtain similar results under centralized trade with the assumption that goods are durable.

product quality. Tversky & Kahneman (1973) observe that individuals make judgments relating to frequency and probability based on a heuristic approach called availability. Specifically, the frequency of classes of phenomena or the probability of events is judged based on how easily relevant instances are brought to mind. A number of studies provide evidence of the application of the availability heuristic in common situations involving judgment. For example, consumers have been found to base both their tendency to believe advertising messages and affective disposition toward products on availability (Lee & Labroo, 2004; Escalas, 2004). Meanwhile, Bukszar (1999) finds that availability influences the manner in which managers in organizations make sense of past events and draw "lessons learned" that affect future business strategies.

Related to availability is the notion that individuals give greater weight to vivid or directly experienced evidence in making inferences than pallid information (Nesbitt & Ross, 1980). This occurs even in cases in which such information should be given virtually no weight in the face of more pertinent statistical data (Rabin, 1998). The phrases "seeing is believing" and "go and see for yourself" reflect the importance of direct experience in the formation of judgments. Vivid evidence has been shown to affect judgment both through its increased availability in memory and also directly, without mediation by memory (Shedler & Manis, 1986).

Evidence of the effect of vivid and directly experienced information on attitude change is largely anecdotal, and most experimental studies do not support a connection (Taylor & Thompson, 1982). However, experimental evidence does support the notion that direct experience of an event leads to stronger judgments (Walster, 1966) and causes people to be more likely to act based on their judgments (Regan & Fazio, 1977). And Taylor & Thompson (1982) concede that direct experience may well have a strong impact on the acquisition of attitudes, albeit not their alteration.

The judgmental biases attributable to availability (and direct experience, to the extent that it affects judgment through availability) relate to the principle of sampling. People do not have the time or effort to conduct an exhaustive search of all cases in making a judgment, so instead they create a mental sample of the evidence. The trouble is that the most mentally available cases, which are most likely to make up the sample, may not be random or unbiased. This is because not all instances will be represented in memory or represented where they may be easily retrieved. Therefore, the sample will not be truly representative of the population of information (Sherman & Corty, 1984).

Let us consider how the psychological research findings just discussed relate to the market for ranchettes. As discussed in the introduction, a key characteristic of product quality with respect to ranchette properties is the greenness of the land, which is determined by the local rainfall. To predict how much rainfall a property will get typically, one can look at publicly available climate data. Thus, there is information on greenness available to all interested parties. However, psychological evidence suggests that people might overweight their own observations of greenness for a parcel relative to the public information. That is, they would rely on what they "saw for themselves" in preference to what was learned from pallid, historic data on the locality.

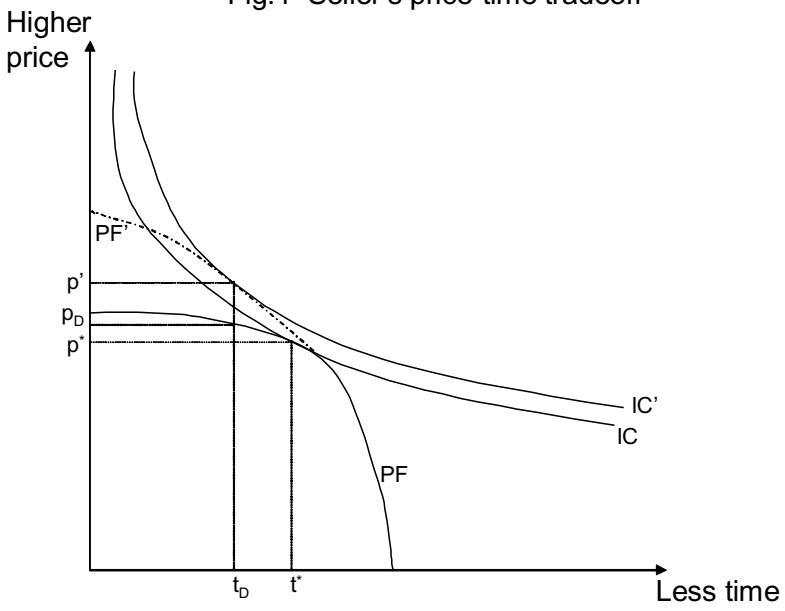
For long-term residents of the local area, this would not pose a problem. Observations from personal experience converge to the historic weather series as one's tenure in a region grows longer. Someone living in Yavapai County for long enough – say, 10 years or more – will have a set of personally-recalled weather experiences that approximate the historic data well. However, a landowner who has been in the area for a shorter period (e.g., a non-native Arizonan, buying for the first time in the state) would develop a sense of the greenness of her parcel that does not approximate its historic greenness. Thus, the out-of-state owner's assessment would tend to be biased.

How will a ranchette owner interpret her assessment of greenness in making decisions regarding the terms of sale, and what will be the effects of her interpretation? Our maintained hypothesis is that owners generally will interpret directly experienced evidence as superior information. Thus, they will consider themselves better informed than buyers about the greenness of their property. Since, in this context, owners form quality inferences that cannot be transmitted credibly to buyers, adverse selection should result just as it would in a market with true asymmetric information.

Let us examine how this plays out in a decentralized market, such as the market for ranchettes. As discussed above, sellers in decentralized markets face a tradeoff between making a quick sale and obtaining a high price (Blouin, 2003). Thus, the seller's decision may be diagrammed as involving indifference curves and a possibilities frontier in price/time space, as shown in Fig. 1. Though such a tradeoff always exists in a dynamic market with time discounting, it is particularly pronounced in the case of asymmetric information. The logic, provided by Blouin (2003), goes as follows. Asymmetric information results in low-quality products selling initially while high-quality products wait. The quality of the product pool therefore improves as time passes; buyers recognize this improvement, so prices rise over time.

An out-of-state owner perceiving asymmetric information expects the shift in average quality described by Blouin (2003) and the associated upward evolution in prices. This manifests as the expanded possibilities frontier, PF'. The owner who perceives she has a high-quality good therefore waits longer: instead of selling for p* at time t*, she waits to sell at t_D, expecting to receive price p' and reach indifference curve IC' rather than IC.[2] Thus, seller behavior is consistent with Blouin's adverse selection scenario.

Fig.1 Seller's price-time tradeoff



This analysis yields the following hypothesis concerning seller conduct:

HYPOTHESIS: *The greener the property during the term of ownership for an out-of-state seller, holding historic greenness constant, the longer the seller will hold the property.*

Such conduct turns out to have adverse consequences for the seller's own welfare. Since properties held longer by out-of-state owners are actually *not* higher quality (they just looked greener to their owners), product pool quality does not improve over time. So, the price the seller can receive by waiting is not as great as expected, as reflected by the true possibilities frontier, PF, being inside the seller's

[2] By contrast, a low-quality seller would have steeper indifference curves, reflecting a greater relative preference for quick sale over high price, and would therefore sell sooner.

expected frontier, PF', in the upper region. At a certain point – perhaps at time t_D – the out-of-state owner realizes the true position of the possibilities frontier. She then sells at the best price the market will bear, p_D. The net result is suboptimal for the seller, since she could have done better for herself with a different point on the frontier.

III. DATA AND METHODOLOGY

To test the hypothesis above, we perform an empirical analysis of the determinants of duration of ranchette ownership in Yavapai County. Our regression model posits duration of ownership as a function of mortgage rates, owner characteristics, perceived and actual property characteristics, and interactions between owner and property characteristics. To wit:

$$Duration_i = f\left(\{mortgage_i\}, \{owner_i\}, \{property_i\}, \{owner_i\} \times \{property_i\}\right)$$

Data on real estate sales between 1991 and 2000 in Yavapai County were provided by the Yavapai County assessor's office. The dataset included sale dates, assessed value of improvements to properties, and the names and mailing addresses of purchasers. A ranchette is defined as a parcel of land between 2 and 40 acres.[3] Approximately 70,000 sales of such parcels occurred in the county during the sample period. Out of these, about 1000 repeat sales pairs were recorded, reflecting parcels that changed hands two or more times. Some 694 repeat sales pairs – those remaining after outliers and bad data were purged – form our sample for analysis. The dependent variable for the regression model is defined as the log of the time between the sales pairs, that is, the duration of ownership (in days) for the person owning the property following the first sale.

Several explanatory variables in the regression are based on statistics relating to the greenness of the property. Greenness is measured using the Normalized Difference Vegetation Index ("NDVI"), an index of the level of photosynthesis occurring in plants calculated from satellite imaging. NDVI is a dimensionless index that ranges from -1 (low photosynthetic activity) to 1 (vigorous photosynthetic activity). It has been used in many applications, including crop productivity, forage

[3] This definition follows from the literature on ranchettes, which uses a size classification based on recommendations from assessors and realtors. Tax and zoning classifications for ranchettes tend to be diverse and unreliable (Sengupta & Osgood, 2003).

estimation, and malaria prediction.[4] Bi-weekly global NDVI data are available at 1 km resolution[5] from 1981 to the present in a standardized form (Tucker et al., 2004). NDVI data were matched to parcels in the dataset based on the location of the parcel centroid.

Four greenness statistics are calculated for each observation: (1) the mean of NDVI over the entire history of NDVI for the property in question ("NDVI historic mean"); (2) the variance of NDVI over the entire history of NDVI for the property ("NDVI historic variance"); (3) the deviation of the mean of NDVI during the period between the sales from the NDVI historic mean ("NDVI owner-observed deviation"); and (4) the variance of NDVI during the period between the sales ("NDVI owner-observed variance"). These statistics are incorporated as regressors, both independently and interacted with a dummy variable reflecting whether the owner is from out of state, yielding eight greenness variables in all.[6] Our key explanatory variable consists of owner out-of-state status interacted with NDVI owner-observed deviation. This variable represents the effect on holding time by an out-of-state owner of observed greenness in excess of that expected for the parcel based on historic climate data. Based on our hypothesis, we expect the coefficient on this variable to be positive. The remaining seven greenness variables are included as controls. The out-of-state owner dummy is also included independently as a control variable.

Control variables are also included that capture additional characteristics of the property. We incorporate the following "permanent" land characteristics: number of acres in the parcel; elevation of the parcel centroid (in meters); distance from the parcel centroid to the nearest road, river, and major city (in kilometers); and adjacency of the parcel to publicly owned land (dummy variable). Data on elevation and the locations of roads, rivers, cities and public land were obtained from the Arizona Regional Image Archive. We also control for the existence of improvements to the property or, alternatively, the assessed value of improvements. Improvements consist of assessed structures, such as houses or barns, or other developed features of the property, such as a driveway or corral. It is hypothesized that improved properties are likely to be held longer, because they are likely to have a resident owner or tenant and are therefore less likely to be held simply for speculative purposes.[7]

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[4] See, e.g., Nivens et al. (2002).

[5] This is a useful level of resolution for attenuating endogeneity accruing to potential manipulation of NDVI by individual ranchette owners. A individual ranchette-sized parcel is miniscule compared to a 1 km pixel.

[6] Out-of-state status for the owner is based on the mailing address given when the parcel was originally purchased. This methodology attempts to elicit the owner's residence prior to buying (and potentially occupying) a property in Yavapai County.

[7] Typically, regressions on amenity value in real estate are performed on single family homes, controlling for characteristics of the home with a multitude of descriptive variables (e.g., number of bedrooms, etc.). We take a different approach here, accounting only for the value or existence of improvements. Approximately two-thirds of

Finally, we also incorporate as explanatory variables corresponding to each sales pair the mortgage rate at the date of the second sale and the change in mortgage rate relative to the date of the first sale. It is hypothesized that duration of ownership will vary positively with the former and negatively with the latter. That is, owners will delay sale of their properties when mortgage rates are high or are falling; conversely, they will sell sooner when rates are low or are rising. Monthly data for mortgage rates were obtained from Freddie Mac;[8] the rates correspond to conforming 30-year fixed-rate mortgages.

Ordinary least squares regression was used. Three different models were estimated, representing variations in the methodology used for incorporating parcel improvements: the first incorporates the value of improvements, the second includes both the value and the square of the value of improvements, and the third incorporates only a dummy variable indicating the presence of improvements.

IV. EMPIRICAL RESULTS

The regression results are displayed in Table 1. Summary statistics for the sample data are presented in Table 2. The key explanatory variable, owner out-of-state status interacted with NDVI owner-observed deviation, is significant at the 5% critical level in all three specifications. It has the positive sign predicted, consistent with our hypothesis. Mortgage rate and change in mortgage rate are strongly significant in their impact on the duration of ownership, also with the signs predicted. In addition, as expected, properties with improvements are more likely to have longer durations of ownership, as indicated by positive coefficients on the value of improvements in the first two regressions and on the improvements dummy in the third. The results in the second regression suggest that improvements of greater value may increase the duration of ownership, but to a decreasing extent as value increases.

the parcels in the sample have no improvements at all, hence most of our exogenous variation arises from features of the land rather than improvement characteristics.

[8] Available at http://www.freddiemac.com/pmms/pmms30.htm.

Table 1
Regression results: log (duration of ownership), N=694

	(1)		(2)		(3)	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Mortgage rate	48.96***	(9.08)	48.82***	(9.07)	48.95***	(9.13)
Change in mortgage rate	-40.44***	(-12.36)	-40.15***	(-12.28)	-40.08***	(-12.32)
NDVI historic mean	-0.385	(-1.38)	-0.339	(-1.21)	-0.401	(-1.44)
NDVI historic variance	22.36	(0.54)	24.10	(0.59)	24.55	(0.60)
NDVI owner-obs deviation	-2.718	(-1.44)	-2.694	(-1.43)	-2.761	(-1.47)
NDVI owner-obs variance	18.46	(0.84)	19.03	(0.87)	19.14	(0.88)
Non-AZ owner	-0.0072	(-0.03)	0.030	(0.13)	0.020	(0.09)
Non-AZ owner · NDVI historic mean	1.045*	(1.66)	0.936	(1.48)	1.029	(1.64)
Non-AZ owner · NDVI historic variance	-43.72	(-0.57)	-47.94	(-0.63)	-52.01	(-0.68)
Non-AZ owner · NDVI owner-obs deviation	7.809**	(2.09)	7.787**	(2.09)	7.765**	(2.09)
Non-AZ owner · NDVI owner-obs variance	-28.55	(-0.73)	-23.79	(-0.61)	-24.35	(-0.62)
Number of acres	0.00089	(0.26)	0.0013	(0.39)	0.0017	(0.50)
Elevation	0.000026	(0.31)	0.000023	(0.29)	0.000040	(0.49)
Distance to road	0.0098	(1.28)	0.010	(1.35)	0.010	(1.37)
Distance to river	-0.0039	(-0.79)	-0.0042	(-0.85)	-0.0044	(-0.90)
Distance to major city	-0.00099	(-0.50)	-0.00088	(-0.45)	-0.00098	(-0.50)
Adjacent to public land	-0.022	(-0.39)	-0.019	(-0.34)	-0.011	(-0.19)
Value of improvements ($000)	0.00098***	(2.69)	0.0022***	(2.80)		
Value of improvements squared			-0.000006*	(-1.77)		
Improvements dummy					0.186***	(3.93)
Constant	2.955***	(6.67)	2.930***	(6.62)	2.892***	(6.56)
R-squared	0.2133		0.2170		0.2226	

***,**, and * represent significance at the 1, 5, and 10 percent levels, respectively.

Focusing on the result with respect to our key explanatory variable, let us consider whether there are plausible alternatives to the lemons "mirage" explanation that are consistent with rational behavior. If out-of-state owners simply had stronger tastes for greenness than other people, one might expect them to hold green properties longer. But this effect would be reflected in the variable that interacts out-of-state status with the NDVI historic mean. On that variable, we observe only very weak significance in the first regression specification, and no significance in the other two specifications. The outcome with respect to our key explanatory variable implies, rather, that the out-of-state owner perceives additional value in the deviation of her property's greenness from its historic mean.

What could be the source of this value? Perhaps it is the expectation that deviating properties will remain atypically green into the future, in other words, that greenness is serially correlated.[9] But if this were true, everyone, including potential buyers, would know it, so the only reason for a longer holding time for out-of-staters would be if, again, greenness represented a greater amenity for them than other people. As discussed above, the evidence for this is weak at best. We are left with

[9] There is evidence of serial correlation in rainfall, at least for some regions of the world, in that meteorologists have been able to predict seasonal and annual rainfall variations. See, e.g., Yu et al. (1997) and White (2000).

the best explanation being that out-of-state owners erroneously interpret discrepancies between their own observations and public perceptions of greenness as reflecting an information asymmetry.

Table 2
Summary Statistics

	Mean	Standard Dev.	Minimum	Maximum
Log duration of ownership (days)	6.864	(0.637)	4.511	8.070
Mortgage rate	0.076	(0.006)	0.067	0.092
Change in mortgage rate	-0.0027	(0.0092)	-0.0259	0.0232
NDVI historic mean	0.308	(0.094)	0.200	0.609
NDVI historic variance	0.0027	(0.0009)	0.0013	0.0052
NDVI owner-obs deviation	-0.0032	(0.014)	-0.0714	0.0524
NDVI owner-obs variance	0.0028	(0.0015)	0.0004	0.0142
Non-AZ owner	0.245	(0.430)	0	1
Non-AZ owner · NDVI historic mean	0.073	(0.135)	0	0.573
Non-AZ owner · NDVI historic variance	0.0006	(0.0012)	0	0.0046
Non-AZ owner · NDVI owner-obs deviation	-0.0008	(0.0071)	-0.0551	0.0348
Non-AZ owner · NDVI owner-obs variance	0.0007	(0.0014)	0	0.0098
Number of acres	7.100	(7.994)	2.001	39.999
Elevation (meters)	1413.36	(282.69)	609	2355
Distance to road (km)	2.0010	(3.5178)	0.0002	30.6897
Distance to river (km)	5.9368	(5.9052)	0.0019	34.4685
Distance to major city (km)	9.1325	(16.0806)	0.0007	76.0575
Adjacent to public land	0.203	0.402	0	1
Value of improvements ($000)	31.625	(61.004)	0	403.186
Value of improvements squared	4716.3	(15085.6)	0	162559
Improvements dummy	0.336	(0.473)	0	1

V. CONCLUSION

This paper has shown that the tendency of ranchette owners to rely on direct observational evidence in assessing property greenness leads to a lemon's outcome. The greener their properties appear during the period of ownership, holding historic greenness constant, the longer out-of-state owners delay selling them. Since properties that appear green to their owners are falsely interpreted as atypically green, the decision not to sell sooner is suboptimal. The owner would be better off relying only on publicly available climate data and not placing any weight on her direct observations.

The observed behavior is cause for concern from a market efficiency standpoint. Whereas in markets with asymmetric information the bad may drive out the good, we find that under full information the apparently bad might nevertheless drive out the apparently good. Transactions that are delayed or that do not occur as a result of sellers' judgmental errors represent lost welfare, as opportunities are missed

for exploiting gains from trade. The extent to which this happens depends upon the share of sellers whose judgments are biased by direct observation. In the present analysis, the affected sellers were out-of-staters, who represented roughly 24% of the transactions in our sample.

A likely factor in ranchette owners' substitution of direct observation for more reliable public data is that owners believe it is possible to develop an informational advantage over buyers. Thus, our observed lemons problem depends upon there being some uncertainty about the existence of quality certainty. This suggests that the institutions discussed by Akerlof (1970) – quality guarantees, brand names, licensing and certification – can help counteract not only the conventional lemons problem, but also the type of derivative lemons problem examined here. For example, the relevant climatic characteristics of a ranchette could be certified by a qualified (and potentially licensed) professional as part of the property survey or a pre-sale inspection. Out-of-state owners' perceptions that they have superior knowledge of property greenness might thereby be minimized and associated selling delays and welfare losses might be reduced or eliminated.

The results have important implications for real estate markets in the mountain west region. In our empirical analysis, the tendency of property owners to rely on directly observed evidence of greenness only had implications for the sale timing of transplant owners, since only their direct observations diverged from the long-term climate data. This divergence, we suggested, had to do essentially with lack of familiarity with the local region and its climate. Given the large presence of recent in-migrants in the mountain west, many people buying and selling real estate in the region lack familiarity with it. Thus, generally speaking, it seems inappropriate to model regional transactions with "fully rational" buyers and sellers. Dynamic models incorporating learning and experience may provide more accurate depictions of behavior in the region. Though the gullibility of newcomers to the West in matters of real estate is legendary and has the status of an old joke, it should, in practical ways, be incorporated more systematically into research analysis.

Further work seems indicated. In the empirical analysis, we tested for adverse selection, essentially taking as given, based on general psychological research results, that owners assess property greenness from direct observation. The notion that buyers and sellers in real estate markets rely heavily on direct observational evidence should be tested explicitly. In addition, the welfare implications of the lemon's mirage, discussed conceptually earlier in this concluding section, should be modeled rigorously.

REFERENCES

Akerlof, G.A. (1970). The market for "lemons": quality uncertainty and the market mechanism. *Quarterly Journal of Economics,* 84, 488-500.

Blouin, M.R. (2003). Equilibrium in a decentralized market with adverse selection. *Economic Theory*, 22, 245-262.

Bukszar, Jr., E. (1999). Strategic bias: the impact of cognitive biases on strategy. *Canadian Journal of Administrative Sciences*, 16(2), 105-117.

Chezum, B. & B. Wimmer (1997). Roses or lemons: adverse selection in the market for thoroughbred yearlings. *Review of Economics and Statistics,* 79(3), 521-526.

Dewan, S. & V. Hsu (2004). Adverse selection in electronic markets: evidence from online stamp auctions. *Journal of Industrial Economics,* 52(4), 497-516.

Engelhardt, G.V. (2003). Nominal loss aversion, housing equity constraints, and household mobility: Evidence from the United States. *Journal of Urban Economics,* 53, 171-195.

Escalas, J.E. (2004). Imagine yourself in the product. *Journal of Advertising*, 33, 37-48.

Genesove, D. (1993). Adverse selection in the wholesale used car market. *Journal of Political Economy,* 101(4), 644-665.

Genesove, D. & C. Mayer (2001). Loss aversion and seller behavior: Evidence from the housing market. *Quarterly Journal of Economics,* 116, 1233-1260.

Ghose, A. (2005). Used good trade patterns: a cross-country comparison of electronic secondary markets. Working paper #05-19, NET Institute. Retrieved September 25, 2006, from www.NETinst.org.

Glower, M., D.R. Haurin, & P.H. Hendershott (1998). Selling time and selling price: the influence of seller motivation. *Real Estate Economics,* 26(4), 719-740.

Haurin, D. (1988). The duration of marketing time of residential housing. *AREUEA Journal* 16 (4), 396-410.

Janssen, M.C.W. & V.A. Karamychev (2002). Cycles and multiple equilibria in the market for durable lemons. *Economic Theory,* 20, 579-601.

Janssen, M.C.W. & S. Roy. (2004). On durable goods markets with entry and adverse selection. *Canadian Journal of Economics*, 37, 552-589.

Lee, A.Y. & A.A. Labroo (2004). The effect of conceptual and perceptual fluency on brand evaluation. *Journal of Marketing Research*, 41, 151-165.

Levitt, S.D. & C. Syverson (2005). Market distortions when agents are better informed: the value of information in real estate. Working paper #11053, NBER. Retrieved September 25, 2006, from http://www.nber.org/papers/w11053.

Nesbitt, R. & L. Ross (1980). *Human inference: strategies and shortcomings of social judgment.* Englewood Cliffs, NJ: Prentice-Hall.

Nivens, H.D., T.L. Kastens, K.C. Dhuyvetter, & A.M. Featherstone (2002). Using satellite imagery in predicting Kansas farmland values. *Journal of Agricultural and Resource Economics*, 27(2), 464-480.

Rabin, M. (1998). Psychology and economics. *Journal of Economic Literature*, 36, 11-46.

Regan, D.T. & R. Fazio (1977). On the consistency between attitudes and behavior: look to the method of attitude formation. *Journal of Experimental Social Psychology*, 13, 28-45.

Sengupta, S. & D.E. Osgood (2003). The value of remoteness: a hedonic estimation of ranchette prices. *Ecological Economics,* 44, 91-103.

Shedler, J. & M. Manis (1986). Can the availability heuristic explain vividness effects? *Journal of Personality and Social Psychology*, 51, 26-36.

Sherman, S.J. & E. Corty (1984). Cognitive heuristics. In R.S. Wyer & T.K. Srull (Eds.), *Handbook of Social Cognition* (pp. 189-286). Hillsdale, NJ: Erlbaum.

Sirmans, C.F., G.K. Turnbull, & J. Dombrow (1995). Quick house sales: seller mistake or luck? *Journal of Housing Economics,* 4, 230-243.

Taylor, S.E. & S.C. Thompson (1982). Stalking the elusive "vividness" effect. *Psychological Review*, 89, 155-181

Tucker, C.J., J.E. Pinzon, & M.E. Brown (2004). Global inventory modeling and mapping studies (GIMMS) satellite drift corrected and NOAA-16 incorporated normalized difference vegetation index (NDVI), Monthly 1981 to present. Dataset, University of Maryland, Department of Geography.

Tversky, A. & D. Kahneman (1973). Availability: a heuristic for judging frequency and probability. *Cognitive Psychology*, 5, 207-232.

Walster, E. (1966). Assignment of responsibility for an accident. *Journal of Personality and Social Psychology*, 3, 73-79.

White, W.B. (2000). Influence of the Antarctic circumpolar wave on Australian precipitation from 1958 to 1997. *Journal of Climate,* 13, 2125-2141.

Yu, Z.-P., P.-S. Chu, & T. Schroeder (1997). Predictive skills of seasonal to annual rainfall variations in the U.S. affiliated Pacific islands: canonical correlation analysis and multivariate principal component regression approaches. *Journal of Climate,* 10, 2586-2599.