DOES MARKET EXPERIENCE ELIMINATE MARKET ANOMALIES?*

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This study examines individual behavior in two well-functioning marketplaces to investigate whether market experience eliminates the endowment effect. Field evidence from both markets suggests that individual behavior converges to the neoclassical prediction as market experience increases. In an experimental test of whether these observations are due to treatment (market experience) or selection (e.g., static preferences), I find that market experience plays a significant role in eliminating the endowment effect. I also find that these results are robust to institutional change and extend beyond the two marketplaces studied. Overall, this study provides strong evidence that market experience eliminates an important market anomaly.

I. INTRODUCTION

Neoclassical models include several fundamental assumptions. While most of the main tenets appear to be reasonably met, the basic independence assumption, which is used in most theoretical and applied economic models to assess the operation of markets, has been directly refuted in several experimental settings [Knetsch 1989; Kahneman, Knetsch, and Thaler 1990; Bateman et al. 1997]. These experimental findings have been robust across unfamiliar goods, such as irradiated sandwiches, and common goods, such as chocolate bars, with most authors noting behavior consistent with an endowment effect.[1] Such findings have induced even the most ardent supporters of neoclassical

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1. Thaler [1980] coined the term endowment effect, which implies that a good's value increases once it becomes part of an individual's endowment. In the remainder of this study, I will interchange "endowment effect," "reference-depen-

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theory to doubt the validity of certain neoclassical modeling assumptions. Given the notable significance of the anomaly, it is important to understand whether the value disparity represents a stable preference structure or if consumers' behavior approaches neoclassical predictions as market experience intensifies.

In this study, I gather primary field data from two distinct markets to test whether individual behavior converges to the neoclassical prediction as market experience intensifies. My data-gathering approach is unique in that I examine i) trading patterns of sports memorabilia at a sportscard show in Orlando, FL, and ii) trading patterns of collector pins in a market constructed by Walt Disney World at the Epcot Center in Orlando, FL. In addition, as an institutional robustness check, I examine explicit statements of value in actual auctions on the floor of a sportscard show in Tucson, AZ. All of these markets are natural settings for an experiment on the relationship between market experience and the endowment effect, as they provide natural variation across individual levels of expertise. In the sportscard show field experiments, I conduct some of the treatments with professional dealers and others with ordinary consumers. The design was used to capture the distinction between consumers who have intense trading experience (dealers) and those who have less trading experience (nondealers).

A major advantage of this particular field experimental design is that my laboratory is the marketplace: subjects would be engaging in similar activities whether I attended the event or went to the opera. In this sense, I am gathering data in the least obtrusive way possible while still maintaining the necessary control to execute a clean comparison between treatments. This highlights the naturalness of this particular setting, and the added realism associated with my field experiments.

The main results of the study fall into three categories. First, consistent with previous studies, I observe a significant endowment effect in the pooled data. Second, I find sharp evidence that suggests market experience matters: across all consumer types, marketlike experience and the magnitude of the endowment effect are inversely related. In addition, within the group of sub-

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dent preferences" [Tversky and Kahneman 1991], "WTA/WTP disparity," and "value disparity."

jects who have intense trading experience (dealers and experienced nondealers), I find that the endowment effect becomes negligible. Both of these observations extend quite well to statements of value in auctions, where offers and bids are significantly different for naive consumers, but statistically indistinguishable for experienced consumers.

While these empirical results certainly suggest that individual behavior converges to the neoclassical prediction as market experience intensifies, it remains an open question as to whether the endowment effect is absent for practiced consumers because of experience (treatment effect), or because a prior disposition toward having no such gap leads them to trade more often (selection effect). To provide evidence into this query, I returned to the sportscard market approximately one year after the initial sportscard trading experiment and examined trading rates for the same group of subjects who participated in the first experiment. Via both unconditional and conditional statistical analyses, which use panel data regression techniques to control for individual static preferences, I find that market experience significantly attenuates the endowment effect.

The balance of this study is organized as follows. Sections II and III present the experimental designs and empirical results from the sportscard and pin field experiments. Section IV provides insights into treatment versus selection issues by examining data from a follow-up sportscard field experiment. In Section V, I examine data from a fourth field experiment that obtains explicit statements of compensation demanded (WTA) and willingness to pay (WTP). Section VI broadens the scope of the study by examining whether this phenomenon extends beyond the memorabilia collector market. Section VII discusses the relevancy of these findings to markets. Section VIII concludes.

II. Experimental Design I

If the endowment effect is a fundamental and stable component of agents' underlying preferences, then market experience and the endowment effect should be uncorrelated. To provide a strict test of whether market experience influences the endowment effect, I follow Knetsch [1989] and Kahneman, Knetsch, and Thaler [1990] and use a straightforward random allocation de-

sign with two treatments.[2] In one treatment the subject is endowed with good A and has the option to trade it for good B. In a second treatment, a different subject is endowed with good B and has the option to trade it for good A. Since subjects are allocated to one of the two treatments randomly, fewer than 50 percent of the subjects should swap their good if an endowment effect exists. Alternatively, if an endowment effect does not exist, approximately 50 percent of the subjects should trade their good.[3] In Knetsch [1989] the evidence in favor of the endowment effect is sharp: 89 percent of those originally endowed with a mug chose to keep the mug, and 90 percent of those endowed with a chocolate bar decided to keep the chocolate bar. Results are equally as convincing in Kahneman, Knetsch, and Thaler [1990], where eleven subjects should have traded their Cornell University coffee mugs, but only three trades were observed over four repetitions.

My test of the endowment effect departs from previous studies by examining subjects' propensity to trade unique consumable items in a well-functioning marketplace—on the floor of a sports-card show. Good A, a Kansas City Royals game ticket stub dated June 14, 1996, was issued for admission to the baseball game in which Cal Ripken, Jr. broke the world record for consecutive games played. Good B, a dated certificate commemorating the game in which Nolan Ryan achieved what only 20 previous baseball players had done, winning 300 games (dated July 31, 1990), was distributed by the Milwaukee Brewers to fans in attendance at the ballgame. I was fortunate to obtain these two unique pieces of sports memorabilia in quantity because I attended both events.

The current experimental design matches real-world settings which economic theory attempts to explain: traders endogenously select into the market and they are likely to have previous experience trading related goods. This experimental strategy may lead to different results compared with an experiment where the roles are exogenously induced by the experimenter (e.g., some subjects are given experience while others are not), but it is my

2. Previous studies have examined learning over repeated trials in the lab (e.g., Coursey, Hovis, and Schulze [1987]). Critics contend that the evidence of learning is mixed, and overall the data do not support the underlying premise [Knetsch and Sinden 1987]. This conclusion is consistent with Camerer and Hogarth [1999], who note that useful cognitive capital builds up slowly, over days or years, rather than in the short run of an experiment.

3. More specifically, for preferences to be consistent, the proportion of subjects who choose B over A should be equal to one minus the proportion who choose A over B.

belief that a rigorous examination of behavior in an actual environment that our theory intends to explain is an important step in testing the validity of economic models.

Each participant's experience typically followed three steps: (1) completing a survey, (2) considering the potential trade, and (3) conclusion of the transaction and exit interview. In Step 1, I approached potential subjects entering the sportscard show and inquired about their interest in filling out a survey that would take about five minutes. If the individual agreed, I briefly explained that in return for completing the survey the subject would receive good A (or good B), where good A (good B) was the Ripken ticket stub (Ryan certificate). After physically giving the subject either good A or B, the subject proceeded to fill out the survey. In Step 2, I retrieved the other good from under the table and informed the subject that she had the opportunity to trade good A for good B, or vice versa. I allowed the subject to inspect both goods; after which the subject either consummated a trade or kept the original good. Step 3 closed the experiment and included an exit interview.

In the nondealer treatments, the type of good (A or B) was changed at the top of each hour, so subjects' treatment type was determined based on the time they visited the table at the card show. The dealer treatments took place in the same fashion as the nondealer treatments, with one exception. Instead of waiting for participants to arrive at my table, I visited each dealer at his/her booth before the sportscard show opened, alternating the endowed good. The nondealer treatments took approximately six hours to complete (12 PM to 6 PM on Saturday), while the dealer treatments took about two hours (7 AM to 9 AM on Saturday). No subjects participated in more than one treatment.

A few noteworthy aspects of the experimental design merit further consideration. First, note that subjects received the good as payment for completing the survey, and had the good in their possession while filling out the survey. These two attributes have been found to strengthen the endowment effect. Second, since I ask subjects to (implicitly) rank the two goods, by definition I am controlling for all Hicksian income and substitution effects. Third, I took great care in selecting goods of approximately equal value to avoid a result of everyone selecting one type of good. Since the memorabilia used in this study are unique and not typically bought and sold on the sports memorabilia market, there was little guidance on the market value/preferences of

either good. In a market pretest at a 1998 Orlando trading card show, I asked 50 dealer and nondealer subjects to hypothetically choose one of the two items. Twenty-seven chose the Ripken ticket, whereas twenty-three chose the Ryan certificate. I therefore concluded that the goods were similar enough in value to use for a trading exercise.

Fourth, I was careful in choosing goods the individual would actually consume, rather than put up for trade or sale immediately after the transaction. During the exit interview, more than 95 percent (142 of 148) of the subjects stated that they planned to consume the piece of memorabilia (e.g., keep it for their own collection).[4] Finally, the uniqueness of the two goods guaranteed that the subject had not previously dealt with either piece of memorabilia. The test herein is therefore different from previous studies of market experience where the good is identical across multiple rounds of a laboratory experiment. Rather, the treatments in this experimental design allow a test of whether the level of market or trading experience with related goods affects the WTA/WTP disparity.

Columns 1 and 2 in Table I provide a statistical description of the subject characteristics in each subgroup. In total, I observed the trading decisions across 148 subjects: 74 dealers and 74 nondealers. Sample sizes in List [2001] and List and Lucking-Reiley [2002] are similar. Central tendencies of the variables reveal that dealers are much more active in trading cards and sports memorabilia, and have had more years of experience in the sportscard and memorabilia market. Sample statistics for the other variables are broadly consistent with previous studies and suggest that the two subgroups are similar in important demographic characteristics.

IIA. Experimental Results I

The top panel of Table II reports summary statistics for the pooled data. Most importantly, statistics in the pooled sample

4. In the follow-up experiment conducted one year later (described below), I asked each subject if he/she still owned the piece of memorabilia. Only one subject had sold or traded the good; results are not different if I delete this observation. This is potentially important because some evidence suggests WTA and WTP are roughly equivalent for securities—Kahneman, Knetsch, and Thaler [1990, p. 1328] note: "there are some cases in which no endowment effect would be expected, such as when goods are purchased for resale rather than for utilization." One explanation for this conjecture is that subjects dealing with resale goods do not allow themselves to get "attached to the good" because it will soon leave their portfolio.

TABLE I
SELECTED CHARACTERISTICS OF PARTICIPANTS

	Sportscard market I		Pin market	Sportscard market II
	Dealers mean (std. dev.)	Nondealers mean (std. dev.)	Consumers mean (std. dev.)	Nondealers mean (std. dev.)
Trading experience	14.82	5.66	6.98	6.84
	(11.0)	(6.42)	(13.63)	(7.98)
Years of market experience	10.36	6.95	5.05	7.13
	(6.75)	(9.37)	(5.64)	(9.05)
Income	4.26	4.04	4.06	4.36
	(1.92)	(2.06)	(2.25)	(1.82)
Age	34.68	34.70	31.48	34.83
	(11.98)	(14.06)	(13.68)	(12.51)
Gender (percent male)	0.93	0.86	0.48	0.89
	(0.25)	(0.34)	(0.50)	(0.32)
Education	3.42	3.84	3.10	3.85
	(1.42)	(1.49)	(1.53)	(1.50)
Good B	0.527	0.527		—
	(0.50)	(0.50)		
Good D	—	—	0.50	—
			(0.50)	
Good F	—	—	—	0.53
				(0.50)
N	74	74	80	53

a. *Trading experience* represents the number of trades made in a typical month.
b. *Years of market experience* denotes years that the subject has been active in the market.
c. *Income* denotes categorical variable (1–8): 1) Less than $10,000, 2) $10,000 to $19,999, 3) $20,000 to $29,999, 4) $30,000 to $39,999, 5) $40,000 to $49,999, 6) $50,000 to $74,999, 7) $75,000 to $99,999, 8) $100,000 or over.
d. *Age* denotes actual age in years.
e. *Gender* denotes categorical variable: 0 if female, 1 if male.
f. *Education* denotes categorical variable 1) Eighth grade or less, 2) High School, 3) 2-Year College, 4) Other Post-High School, 5) 4-Year College, 6) Graduate School Education.
g. *Good B (D) (F)* denotes the subject's initial endowment, and =1 if the subject was endowed with *Good B (D) (F),* 0 otherwise.

suggest undertrading occurred. Given that subjects were randomly allocated either good A or good B, equivalence of WTA and WTP would imply that approximately half of the goods were improperly allocated and should be traded. The actual percentages of subjects who chose to trade are 32.8 percent (23 of 70) and 34.6 percent (27 of 78), suggesting that $WTA > WTP$. These figures suggest that once endowed with one of the goods the subjects were close to two times more likely to select that good (computed as $\frac{1}{2}((P_{A|A}/P_{A|B}) + (P_{B|B}/P_{B|A}))$.

TABLE II
SUMMARY TRADING STATISTICS FOR EXPERIMENT I: SPORTSCARD SHOW

Variable	Percent traded	p-value for Fisher's exact test
Pooled sample (n = 148)		
Good A for Good B	32.8	<0.001
Good B for Good A	34.6	
Dealers (n = 74)		
Good A for Good B	45.7	0.194
Good B for Good A	43.6	
Nondealers (n = 74)		
Good A for Good B	20.0	<0.001
Good B for Good A	25.6	

a. Good A is a Cal Ripken, Jr. game ticket stub, circa 1996. Good B is a Nolan Ryan certificate, circa 1990.
b. Fisher's exact test has a null hypothesis of no endowment effect.

Although these results are suggestive, they may be an artifact of the sampling procedure—by chance subjects who preferred good A (good B) may have been endowed with good A (good B), leading to false inference. To amend this situation, I test the null hypothesis of no endowment effect by using a Fisher's exact test, which has a hypergeometric distribution under the null. The result of the exact test presented in row 1, column 2 of Table II, strongly suggests that the null hypothesis should be rejected ($p < .001$) for the pooled sample, implying that an endowment effect exists. This evidence, which is consistent with past experimental studies, is at odds with conventional economic theory, which assumes that indifference curves are completely reversible when transactions costs are zero [Knetsch 1989].

Panels two and three in Table II present split subsamples and tell an intuitive story consistent with the research hypothesis—dealers tend to trade more than nondealers, regardless of which good they were initially endowed. For example, whereas 43.6 percent and 45.7 percent of dealers chose to execute a trade, only 20–25 percent of nondealers chose to trade. These proportions suggest that nondealers were nearly 3.5 times more likely to select the good which they were endowed, whereas dealers were only 1.25 times more likely to choose their endowed good. A Fisher's exact test shows that for nondealers the null hypothesis of no endowment effect should be rejected at the $p < .001$ level.

TABLE III
NONDEALER SUMMARY STATISTICS FOR EXPERIMENT I: SPORTSCARD SHOW

Variable	Percent traded	p-value for Fisher's exact test
Experienced nondealers (n = 30)	46.7	0.32
Inexperienced nondealers (n = 44)	6.80	<0.001

a. Experienced nondealers are those consumers who trade 6 or more times per month (5.66 is the mean level of monthly trades for nondealers). Inexperienced nondealers trade less than 6 times per month.
b. Fisher's exact test has a null hypothesis of no endowment effect.

Alternatively, the null hypothesis cannot be rejected at conventional significance levels in the dealer treatments ($p = .19$). This result provides initial evidence that experienced consumers' utility functions may not reflect an endowment effect.

To investigate this finding further, I present Table III, which provides a breakdown of the nondealer data based on the level of trading experience of each subject. I split the sample of experienced and inexperienced nondealers according to the central tendency of the data. Experienced nondealers are those who trade 6 or more times in a typical month, where 6 is a shade above the mean level of monthly trades (5.66). Inexperienced nondealers are those subjects who trade fewer than six times per month. The results are compelling. For experienced nondealers, 14 of 30 (46.7 percent) opted to trade. This figure is very close to the dealers' trading strategy observed above, and using a Fisher's exact test the null hypothesis cannot be rejected at conventional significance levels ($p = 0.32$). For inexperienced nondealers the endowment effect is large: only 6.8 percent (3 of 44) of inexperienced subjects opted to trade, and the hypothesis of no endowment effect is rejected at the $p < 0.001$ level. This latter finding suggests that once inexperienced consumers are endowed with a good, they are thirteen times more likely to keep that good. This average increase in the likelihood that the subject chooses a good once endowed with it is slightly higher than that observed in Knetsch [1989].

Although analysis of the raw data provides evidence that supports the main conjecture of the study, there has been no attempt to control for other factors that may affect the propensity to trade. These other subject-specific variables can be adequately accounted for in a basic econometric model:

$$(1) \qquad trade = g(\alpha + \beta' X),$$

TABLE IV
ESTIMATION RESULTS FOR EXPERIMENT I: SPORTSCARD SHOW

	Dealers		Nondealers	
Variable	Logit trade function	Logit trade function	Logit trade function	Logit trade function
Constant	−0.58	−0.41	−4.41**	−5.12**
	(1.20)	(1.25)	(1.93)	(1.96)
Trading experience	0.03	0.01	0.14**	0.50**
	(0.02)	(0.06)	(0.05)	(0.16)
(Trading experience)^2	—	0.0005	—	−0.014**
		(0.001)		(0.005)
Years of market experience	−0.04	−0.04	−0.001	0.02
	(0.04)	(0.04)	(0.04)	(0.04)
Income	−0.28	−0.29	0.19	0.14
	(0.18)	(0.18)	(0.21)	(0.23)
Age	0.01	0.01	0.002	−0.02
	(0.03)	(0.03)	(0.03)	(0.04)
Gender	0.30	0.30	1.59	1.11
	(1.01)	(0.99)	(1.29)	(1.19)
Education	0.30	0.31	−0.006	−0.02
	(0.21)	(0.21)	(0.21)	(0.22)
Good B	−0.30	−0.30	0.13	0.37
	(0.51)	(0.50)	(0.70)	(0.74)
N	74	74	74	74

a. Dependent variable equals 1 if subject chose to trade, 0 otherwise. Gender = 1 if male, 0 otherwise; Good B = 1 if subject was endowed with Good B, 0 otherwise.
b. Standard errors are in parentheses beneath coefficient estimates. Parameter estimates in columns 2 and 4 are logit coefficients.
c. **Denotes coefficient estimate is significant at the $p < .05$ level.

where *trade* equals 1 if a trade was executed, 0 otherwise; $g(\bullet) = 1/(1 + e^{-m})$ is the standard logit function; X includes subject-specific variables that may affect the propensity to trade. Variables in X are listed in Table I and include the number of trades in a typical month, years of trading experience, yearly income, age, gender, education, and a dichotomous variable indicating whether the subject was endowed with Good B.

Summary estimates of equation (1) are presented in Table IV. I include estimation results from logit models that allow both linear and nonlinear learning. Regardless of estimation technique, there is evidence that the propensity to trade and trading experience are correlated. For example, in the nondealer model that restricts learning to be monotonic (column 3), the logit coefficient estimate of 0.14 is significantly different from zero at the

$p < .01$ level, suggesting that experience with trading has a positive influence on the propensity to trade. Alternatively, the effect of trading experience for dealers in the monotonic model, 0.03, is considerably weaker and not significant at conventional levels ($t \approx 1.5$). Note that the dealer trading experience coefficient is statistically different from the nondealer coefficient estimate at the $p < .09$ level. This result may suggest that some dealers have had substantial opportunity to interact in a market setting, rendering the marginal impact of another trade less important.

Logit models that allow nonmonotonic learning yield similar results. For nondealers, estimates in column 4 indicate that both linear and nonlinear learning terms are individually significant at the $p < .01$ level. Signs of the coefficients suggest that the probability of executing a trade is concave in learning, or that there are diminishing returns to experience. The peak of the curve occurs within sample, but near the boundary: 18.38 trades. This result is consonant with the linear logit estimates in the dealer subsample (column 1). Parameter estimates in the dealer models that allow nonmonotonic learning (column 2) again suggest that trading rates of dealers are not influenced by recent experience. Before proceeding, I should note that these results are robust to inclusion of higher order learning terms.[5]

III. Experimental Design II

In this section I examine the robustness of the sportscard show results by replicating the experiment in a much different marketplace—the collector pin market in Walt Disney World's Epcot Center in Orlando, FL. The collector pin market experiences much more activity among females and has a very rich history: pins have changed hands since the first modern Olympic Games in Athens in 1896, when Olympic athletes began exchanging pins as gestures of good will. A century later, at the Atlanta Olympic Games, more than 1.2 million people visited the two Olympic Pin Trading Centers, where an estimated 3 million pins changed hands during the Games.

5. Experience, as measured by the number of years in the sportscard market, is not a significant factor in the trading decision for either subsample. Many of the other coefficient estimates are also not significantly different from zero at conventional levels.

To maintain consistency with the sports market experiment, I again endow each subject with one unique good, both recently issued Millennium celebration pins: Good C is a cloisonné pin of Mickey and Minnie Mouse which was issued on Valentine's Day, 2000. The pin retailed for approximately $20 and sold out within days of issuance. Good D is a cloisonné pin of Mickey Mouse which was issued on St Patrick's Day, 2000. Similar to the Valentine's Day pin, the St Patrick's Day pin also retailed for approximately $20 and sold out quickly.

The pin field experiment, which was conducted in early May 2000, was identical to Experiment I. However, one important disparity is that the pin market is different from the sports memorabilia market in that there are very few pin dealers: the extent of being a "dealer" is trading with "pin pals" and selling over internet spots such as eBay. Hence, I focus on trading behavior of nondealers. The treatments took approximately eight hours to complete (11 AM to 7 PM). No subjects participated in more than one treatment. And, I should note that the same careful design parameters were used in this experiment as used above: i) subjects received the good as payment for completing the survey, and had the good in their possession while filling out the survey; ii) a pilot study suggested that the two pins were unique and similar enough in value to use for a trading exercise; and iii) a large majority—more than 97 percent (78 of 80) of the subjects stated that they planned to consume the pin personally.

Column 3 in Table I provides a statistical description of the subject characteristics. In total, I observed the trading decisions of 80 subjects. Central tendencies of the variables reveal that subjects in the pin market have had fewer years of experience in the market than nondealers in the sportscard market, but are more active traders. Sample statistics for the other variables suggest that the pin trading market has proportionally more women, and age and education levels tend to be higher in the sportscard market than in the pin market. Each of these characteristics suggests that we have a much different subject pool and associated market composition than the sports memorabilia market provides, which bodes well for a test of robustness.

III. A. Experimental Results II

To conserve space, all results are presented in the tables, and only a brief summary is provided here. The general data pattern observed in the pin market is consonant with the results from the

TABLE V
SUMMARY TRADING STATISTICS FOR EXPERIMENT II: PIN TRADING STATION

Variable	Percent traded	p-value for Fisher's exact test
Pooled sample (n = 80)		
Good C for Good D	25.0	<0.001
Good D for Good C	32.5	
Inexperienced consumers (<7 trades monthly; n = 60)	25.0	<0.001
Experienced consumers (≥7 trades monthly; n = 20)	40.0	0.26
Inexperienced consumers (<5 trades monthly; n = 50)	18.0	<0.001
Experienced consumers (≥5 trades monthly; n = 30)	46.7	0.30

a. Good C is a cloisonné Valentine's Day pin portraying Mickey and Minnie Mouse, circa 2000. Good D is a cloisonné St Patrick's Day 2000 portraying Mickey Mouse, circa 2000.
b. Experienced consumers are those consumers who trade 7 (or 5) or more times per month (6.55 is the mean level of monthly trades). Inexperienced consumers trade less than 7 (or 5) times per month.
c. Fisher's exact test has a null hypothesis of no endowment effect.

sportscard market: i) as Table V illustrates, an overall endowment effect exists at the $p < .001$ level; but individual behavior converges to the neoclassical prediction as trading experience intensifies (see the bottom two panels in Table V); and ii) the regression results presented in Table VI, which include expansions to the cubic, support these conclusions. Regression estimates also suggest that women tend to trade less than men, but the difference is only marginally significant. This finding may have been absent in the sportscard market because the sample was largely comprised of men. Although gender and the endowment effect appear linked, future research is necessary before any firm conclusions can be reached concerning this relationship.[6]

IV. EXPERIMENTAL DESIGN III

Although both sets of field results are consonant with the notion that neoclassical expectations are met when trading experience intensifies, it remains an open question as to whether

6. To examine whether information asymmetry is driving the results, I ran identical trading exercises using coffee mugs and candy bars on the floor of a sportscard show in Tucson, AZ. I find results consistent with the above findings. These results will be reported elsewhere [List 2002].

TABLE VI
ESTIMATION RESULTS FOR EXPERIMENT II: PIN TRADING STATION

Variable	Pin consumers		
	Logit trade function	Logit trade function	Logit trade function
Constant	−2.44**	−2.57**	−4.65
	(0.91)	(0.95)	(1.37)
Trading experience	0.05**	0.08*	0.74**
	(0.02)	(0.05)	(0.24)
(Trading experience)^2	—	−0.004	−0.04**
		(0.006)	(0.02)
(Trading experience)^3	—	—	0.007**
			(0.003)
Years of market experience	0.03	0.03	0.04
	(0.05)	(0.05)	(0.05)
Income	−0.11	−0.10	−0.03
	(0.18)	(0.18)	(0.19)
Age	0.005	0.006	0.005
	(0.02)	(0.03)	(0.03)
Gender	0.90	0.90	0.41
	(0.55)	(0.55)	(0.61)
Education	0.20	0.20	0.26
	(0.23)	(0.23)	(0.26)
Good D	0.26	0.29	0.84
	(0.55)	(0.56)	(0.63)
N	80	80	80

a. Dependent variable equals 1 if subject chose to trade, 0 otherwise. Gender = 1 if male, 0 otherwise; Good D = 1 if subject was endowed with Good D, 0 otherwise.
b. Standard errors are in parentheses beneath coefficient estimates. Parameter estimates in column 2 are logit coefficients.
c. **(*) Denotes that coefficient estimate is significant at the $p < .05$ (.10) level.

experienced consumers exhibit no endowment effect due to experience (treatment effect), or because a prior disposition toward having no such gap leads them to trade more often (selection effect). To provide experimental evidence into this issue, I return to the site of the first sportscard market experiment and run a similar treatment using the same subjects. To recruit subjects, in September 2000 I personally telephoned or emailed the 148 subjects who participated in the December 1999 sportscard show experiment. I was able to contact and obtain agreements from 108 subjects to meet me at a November 2000 sportscard show in Orlando, FL. As a reminder, within one week of the experiment I contacted the 108 subjects who agreed to participate. Unfortu-

nately, even after this reminder, only 72 subjects attended the sportscard show: 53 nondealers and 19 dealers. Given that my main conjecture revolves around learning, which mainly concentrates at the nondealer level, I focus on data from the 53 nondealers; but in Section V, I briefly describe empirical results for the dealer subsample.

In the follow-up sportscard field experiment I used established protocol, and again had each participant follow the three steps outlined above. However, I added one person-specific question to the exit interview: "Given that you stated you traded ____ times in a typical month last year, can you briefly explain how the change (if any) in your number of trades evolved and why?" The experiment took approximately two days to complete (Saturday and Sunday 10 AM to 5 PM). No subjects participated in more than one treatment, and the same design parameters were used in this experiment as used above. The two unique goods used were Good E, an attractive autographed 5 $\times$ 8 photo of Byron "Mex" Johnson, and Good F, an official National League baseball autographed by Byron "Mex" Johnson. Johnson was a Negro League baseball player for the Kansas City Monarchs from 1937–1940. I obtained numerous autographed photos and baseballs when I personally met him at a sportscard show in Denver, CO in 1995. Due mainly to his age, Johnson rarely signs autographs, and therefore a large majority of collectors have never seen (or heard of) a Johnson autograph. If one can find either good, they will most likely pay between \$7–\$20. Again, an exit interview revealed that a large majority of subjects (52 of 53) planned to keep the unique Negro League piece of memorabilia.

Column 4 in Table I provides a description of the subjects' characteristics. Central tendencies of the variables reveal that the average subject participating in the follow-up experiment tended to be a more active trader than the average subject in the first sportscard experiment (6.84 versus 5.66). This result may indicate that subjects gained experience over the year or that more active subjects gravitated toward participating in the second experiment. Indeed, both statements are to some extent correct, as the 53 subjects who participated in both experiments stated that they typically traded 5.70 times per month in Experiment I—significantly fewer trades than the 6.84 they reported in the follow-up experiment. And, given that the 21 subjects not participating in the follow-up experiment stated that they had average trading rates of 5.58 per month in Experiment I, slightly

TABLE VII
NONDEALER DATA SUMMARY FOR EXPERIMENT III: FOLLOW-UP SPORTSCARD SHOW

Variable	Percent traded	p-value for Fisher's exact test
Pooled sample (n = 53)		
Good E for Good F	40.0	<0.08
Good F for Good E	35.7	
Experienced consumers (n = 21)		
Good E for Good F	45.5	0.99
Good F for Good E	60.0	
Inexperienced consumers (n = 32)		
Good E for Good F	35.7	<0.02
Good F for Good E	22.2	

a. Good E is an autographed 5 × 8 photo of Byron "Mex" Johnson.
b. Good F is an official National League baseball autographed by Byron "Mex" Johnson.
c. Experienced consumers are those consumers who trade 7 or more times per month (6.84 is the average level of monthly trades). Inexperienced consumers trade less than 7 times per month.
d. Fisher's exact test has a null hypothesis of no endowment effect.

more active subjects tended to participate in the follow-up experiment, but the difference is not statistically significant (5.70 versus 5.58). Sampling means of the other variables suggest that the two data sets tend to be similar across the two experiments.

IV. A. Experimental Results III

Following the empirical analysis in the first two experiments, I provide Table VII, which summarizes the trading data. Results in Table VII are consistent with data from both the first sportscard field experiment and the pin field study. For example, an endowment effect is evident for inexperienced consumers, but not for experienced consumers: inexperienced traders (those who trade fewer than 7 times in a typical month) executed a trade at a rate of 28 percent (9 of 32), whereas 11 of 21 (52.3 percent) experienced consumers chose to trade. To complement these findings, I estimate the logit model given in equation (1) using the identical specification as discussed above. Summary estimates of equation (1) are presented in column 1 of Table VIII. Since the empirical results are insensitive to inclusion of higher order experience terms, I include estimates from only linear models. Parameter estimates again suggest that the propensity to trade and trading experience are positively related at conventional significance levels.

TABLE VIII
ESTIMATION RESULTS FOR EXPERIMENT III: FOLLOW-UP SPORTSCARD SHOW

	Sportscard consumers		
Variable	Logit trade function	Probit trade function	Sample-selection bivariate probit trade function
Constant	−2.40	−1.45	−1.26
	(1.81)	(1.06)	(0.98)
Trading experience	0.18**	0.112**	0.106**
	(0.08)	(0.044)	(0.040)
Years of market experience	−0.09	−0.06	0.02
	(0.09)	(0.05)	(0.05)
Income	0.18	0.09	0.07
	(0.29)	(0.17)	(0.15)
Age	−0.05	−0.03	−0.02
	(0.04)	(0.03)	(0.02)
Gender	−0.34	−0.15	−0.24
	(1.03)	(0.63)	(0.55)
Education	0.52	0.30	0.26
	(0.28)	(0.16)	(0.14)
Good F	0.29	0.19	0.16
	(0.78)	(0.47)	(0.47)
N	53	53	74

a. Dependent variable equals 1 if subject chose to trade, 0 otherwise. Gender = 1 if male, 0 otherwise; Good F = 1 if subject was endowed with Good F, 0 otherwise.
b. Standard errors are in parentheses beneath coefficient estimates. Parameter estimates in column 2 are probit coefficients, while estimates in column 3 are probit coefficients corrected for sample selectivity.
c. **(*) Denotes that coefficient estimate is significant at the $p < .05$ (.10) level.

One potential nuance associated with these parameter estimates is that they could be plagued by sample selection bias if only those subjects who remained interested in the sportscard market participated in the follow-up experiment. While this bias appears minimal given that mean trading rates of the 21 subjects not participating in the follow-up experiment were only marginally less than mean trading rates for those who chose to participate, it remains an empirical issue that must be settled to avoid presentation of inconsistent estimates. To correct the estimates, I use the bivariate probit model with sample selection proposed by van de Ven and van Praag [1981]:

$$(2a) \qquad Y_1^* = \Phi(\beta_1' V) + \varepsilon_1; \quad Y_1 = 1 \text{ if } Y_1^* > 0, \text{ 0 otherwise}$$

$$(2b) \qquad Y_2^* = \Omega(\beta_2' Z) + \varepsilon_2; \quad Y_2 = 1 \text{ if } Y_2^* > 0, \text{ 0 otherwise;}$$
$$\varepsilon_1, \varepsilon_2 \sim \text{bivariate normal } (0, 0, 1, 1, \rho).$$

Equation (2a) is the participation equation measured over the 74 subjects in the first experiment. In equation (2a), while Y_1^* is unobserved, I can observe its sign since Y_1 equals 1 if the subject participated in the follow-up experiment, 0 otherwise. Variables in V include measures of the number of trades in a typical month, years of trading experience, yearly income, age, gender, and education obtained from the first survey. Equation (2b), which is the trade equation, is observed only when $Y_1 = 1$; hence the selectivity model arises. The specification of the probit model in (2b) follows the logit model previously used (see equation (1)). In estimation of the system, I use full information maximum likelihood, where the log-likelihood is given by

$$(3)\quad \Sigma_{y1,y2=1}\ln\phi_2(\beta_1'V, \beta_2'Z, \rho) + \Sigma_{y1=1,y2=0}\ln\phi_2(\beta_1'V, -\beta_2'Z, -\rho) + \Sigma_{y1=0}\ln\phi(-\beta_1'V).$$

ϕ_2 denotes the bivariate standard normal cumulative density function and ϕ denotes the univariate standard normal cumulative density function.

Empirical results are presented in Table VIII. To provide a baseline of comparison, column 2 in Table VIII contains parameter estimates from a univariate probit trade equation that uses the 53 observations from the follow-up experiment. While there are some minor differences between the logit and probit parameters (column 1 versus column 2), the general results are consistent across model type and imply that experience and trading rates are associated. More importantly, the results are robust when the model is corrected for sample selection: coefficients of experience are nearly identical, 0.112 versus 0.106, and the standard error is slightly less in the selection model (0.040 versus 0.044). Even though ρ is significant at conventional levels ($p < .01$), the sample selection bivariate probit estimates suggest that little evidence exists to indicate that selection bias is a major problem. Given that some consumers may have opted to attend other larger sportscard shows rather than attend the follow-up experiment, this result makes intuitive sense, as their absence may be statistically balancing the absence of consumers who became disinterested in the sportscard market over the year.

While these empirical results provide insights into the selection issue and whether trading experience and trading rates are associated, they use purely between-person variation to identify any learning effects. To disentangle the issue of selection versus

TABLE IX
SUMMARY STATISTICS FOR EXPERIMENT III: FOLLOW-UP SPORTSCARD SHOW

	Increased number of trades	Stable number of trades	Decreased number of trades
No trade in Experiment I; trade in Experiment III	13	1	2
No trade in Experiment I; no trade in Experiment III	8	7	11
Trade in Experiment I; Trade in Experiment III	4	0	0
Trade in Experiment I; No trade in Experiment III	2	0	5
N	27	8	18

a. Columns denote changes in subjects' trading experience over the year; rows denote subjects' behavior in the two field trading experiments.
b. Fifty-three subjects participated in both Experiment I and the follow-up experiment.

treatment, what is necessary is a within-person analysis, which by definition controls for individual-specific heterogeneity that is left uncontrolled in a cross-sectional analysis.

A first straightforward test of whether experience and trading activity are positively associated within subjects is to examine individual trading rates over time. Table IX summarizes the four possible outcomes across three trading dimensions. The raw data show that over the course of the year, many subjects experienced a growth in their personal number of trades: 27 subjects (51 percent) increased their monthly trading rate, whereas 18 (34 percent) and 8 (15 percent) subjects decreased or had flat trading rates compared with the previous year. This result suggests that a slight majority of subjects gained trading experience over the year. At a superficial level, this is weak evidence in favor of the research hypothesis.

A closer examination of the data in Table IX suggests that 42 of 53 (79.2 percent) subjects did not execute a trade in the initial experiment (summation of rows 1 and 2). Of those 42 subjects, data in rows 1 and 2 of Table IX indicate that 21, 13, and 8 reported an increase, decrease, and no change in their monthly trading rate compared with the previous year. Of the 21 subjects who increased their trading rate over the year, 13 (62 percent) chose to trade in the follow-up experiment. This percentage compares favorably to the two of thirteen subjects (15.4 percent) or

one of eight subjects (12.5 percent) who opted to trade from the group that had a decrease or flat trading trend. Using data for only those subjects who opted not to trade in Experiment I (top two rows and in Table IX) to form a 2×3 contingency matrix, I test for homogeneity across learning cells using a Pearson chi-square test of homogeneity of distributions. The calculated test statistic is distributed as χ^2 with two degrees of freedom and equals 10.11. Inclusion of all four rows of data to form a 4×3 contingency matrix makes little inferential difference—the calculated χ^2 (six degrees of freedom) equals 24.03. In either test, the homogeneity null can be rejected at the $p < .01$ level, suggesting that the likelihood of executing a trade during the experiment is related to changes in trading activity during the year.

While this particular within-person analysis provides important information related to treatment effects, within a panel data regression model individual-specific effects can be controlled to allow a more thorough examination of the role that both treatment and selection play in shaping the endowment effect. To perform regression-based tests of learning, I use Chamberlain's [1980] logit model for panel data:

$$\text{(4)} \quad \text{prob}[trade_{it} = 1] = \exp(z_{it})/[1 + \exp(z_{it})],$$
$$\text{where } z_{it} = \alpha + \beta_1 X_{it} + \mu_i,\ i = 1, 2, \ldots, N,\ t = 1, 2.$$

In equation (4), μ_i are fixed-effects that control for unobservable subject characteristics such as static propensity, or preference, to trade. The conditional probability for any particular group is computed as follows:

$$\text{(5)} \quad \text{prob}\left(trade_1, \ldots, trade_T \,\middle|\, \sum_t trade_{it} \,\middle|\right) = \frac{\Pi_t [P1_{it}^{yit}(1 - P1_{it})^{1-yit}]}{\Sigma_{\text{all possible arrangements of the same sum}} \Pi_t [P1_{it}^{yit}(1 - P1_{it})^{1-yit}]}.$$

Empirical estimates of equation (4) are presented in Table X. Given that correcting for attrition via a random effects Probit selection model again did not qualitatively change the estimated parameters, I use data from only those subjects who participated in both experiments. And, given that the controls are either static (gender), change little (education and income), or increase by exactly one unit over the year (market experience and age), I present estimates only from models that suppress these

TABLE X
ESTIMATION RESULTS USING PANEL DATA FROM EXPERIMENTS I AND III

	Logit trade function			Chamberlain trade function		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	−1.57**	−2.01**	−2.91**	—	—	—
	(0.34)	(0.44)	(0.65)			
Trading experience	0.11**	0.21**	0.55**	0.23*	0.45**	1.33**
	(0.04)	(0.07)	(0.17)	(0.12)	(0.20)	(0.51)
(Trading experience)^2	—	−0.003*	−0.03**	—	−0.005*	−0.07**
		(0.002)	(0.01)		(0.003)	(0.03)
(Trading experience)^3	—	—	0.004**	—	—	0.009**
			(0.002)			(0.004)
χ^2 ($\mu_i = 0$)	—	—	—	3.98**	5.29*	8.47**
N	106	106	106	106	106	106

a. Dependent variable equals 1 if subject chose to trade, 0 otherwise.
b. Standard errors are in parentheses beneath coefficient estimates.
c. **(*) Denotes that coefficient estimate is significant at the $p < .05$ (.10) level.
d. χ^2 ($\mu_i = 0$) is a simple Hausman test of the Chamberlain fixed effects model. Each test suggests that there are unobserved fixed effects at the $p < .10$ level; hence the Chamberlain trade estimates are appropriate.

variables.[7] Columns (1)–(3) in Table X contain standard logit estimates, whereas columns (4)–(6) present Chamberlain estimates. A first interesting result is that Hausman tests suggest that there is heterogeneity across individuals at the $p < .10$ level for all model types ($\chi^2 = 3.98$ (1 df), 5.29 (2 df), 8.47 (3 df)).[8] This result is consistent with the notion that unobservables shape the endowment effect and that individuals have static preferences toward trading.

More importantly, parameter estimates from all six econometric specifications suggest that trading experience has an important influence on the magnitude of the endowment effect. Furthermore, in the Chamberlain models, which explicitly control for individual heterogeneity and therefore an individual's static preference toward trading (selection effects), every coefficient estimate is individually significant at conventional levels. Results are strengthened when higher order terms are included. In these

7. Gender cannot be included because it is static and therefore inclusion violates the rank condition; and since changes in age and market experience are identical, only one of these regressors can be included in any given model. Since inclusion of age or market experience does not change the nature of the estimates, by default therefore empirical results are robust to inclusion of time effects.

8. Note that traditional likelihood-ratio tests for heterogeneity cannot be used because the Chamberlain model is estimated conditionally on the sum of observations while the simple logit model is unconditional.

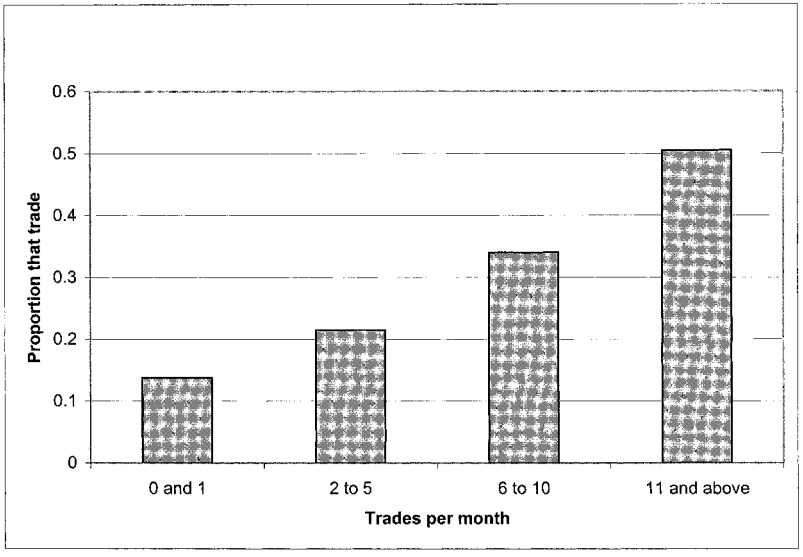

FIGURE I
Summary of Trading Results

panel data logit models a clear result is that a significant relationship exists between trading experience and the probability of executing a trade, but diminishing returns are again evident.

V. FURTHER EXPERIMENTAL EVIDENCE

As previously mentioned, in the follow-up sportscard field experiment I also obtained data from nineteen dealers. The endowment effect can again be rejected in these data, as ten of the nineteen dealers (52.6 percent) chose to trade their endowed good. Overall, therefore, I find a substantial amount of evidence that suggests individual behavior converges to the neoclassical prediction as trading experience intensifies. This major insight is perhaps best illustrated in Figure I, which pools the data across the three field trading treatments—a total of 300 subjects. Figure I, which makes the trade probability a function of previous trading experience, clearly illustrates that individual behavior converges to the neoclassical prediction as consumers gain experience.

V. A. Statements of Value in Auctions

A well-known experimental result is that institutions influence behavior; thus, a test of whether experience influences the

endowment effect in a different market institution seems worthwhile. To provide initial insights into whether experience affects the disparity between explicit statements of WTA and WTP, I conduct a fourth field experiment in September 2000 at a sportscard show in Tucson, AZ. In this fourth field experiment I use a sheet of University of Wyoming basketball trading cards distributed to fans in attendance at "Midnight Madness" at the Arena-Auditorium on the campus of the University of Wyoming in October 1994. The sheet has market value since it is a unique collectible that contains the first sportscard of Theo Ratliff, a current basketball player employed by the Atlanta Hawks. Given that I have never seen this particular piece of memorabilia on the market, market value is difficult to determine, but similar items of other players have been sold for upwards of $50.

I use a random nth-price auction [List and Shogren 1998] to elicit individual values. Each subject's auction experience followed four steps: (1) survey completion, (2) inspection of the good/learning the auction rules, (3) actual bid (offer), and (4) debriefing. In the WTP treatment, in step 3 each participant privately wrote a bid on the bidding sheet and placed it in an opaque box. The monitor informed the participant that his bid would not be opened until after the show and that all bids would be destroyed when the research project was completed. In the WTA treatment, following the methodology in the trading experiments above, after physically giving the subject the sheet of University of Wyoming basketball trading cards, the subject filled out the survey. He or she proceeded to learn the auction rules and then completed the recording sheet by stating his minimum WTA to sell the sheet of trading cards.

In the debriefing stage of the experiment, the monitor explained that the participant would be contacted within three days after the show if he or she was among the $n - 1$ highest (lowest) bidders (offerers). Each WTP subject was further informed that winners would receive the sheet after they had sent a check or money order in the amount of the nth highest bid. WTA subjects were informed similarly—after winners mailed me the sheet they would be sent a check for the nth lowest bid (plus postage). Within three days the winners of each auction were notified by phone or email, and when I received the checks (or sheets), I mailed out the sheets (checks).

The nondealer treatments took approximately twelve hours to complete (11 AM to 5 PM Saturday and Sunday). At the top of

each hour the auction treatment was switched from WTA to WTP, and vice versa the next hour. The dealer treatments, which were again run before the sportscard show opened, took a little more than three hours to complete (8:00 AM to 11:10 AM on Saturday). In each auction I informed the bidders (offerers) that 60 people would participate. And, since I am not testing the incentive compatibility of the allocation institution and want to avoid excess noise, I informed subjects that it is in their best interest to bid (offer) their true value. I reinforce this notion via several examples that illustrate the optimal strategy of truth-telling.[9]

V. B. Experimental Results and Discussion

Columns 1–4 in Table XI provide a statistical description of the subjects' characteristics.[10] In total, I observed 120 auction decisions equally distributed across the 4 categories: WTA (30 nondealers and 30 dealers) and WTP (30 nondealers and 30 dealers). Across each of the 30-person subsamples, sampling means of the variables suggest that subject differences across demographic characteristics (between WTA and WTP subsamples) are minimal within the dealer and nondealer cohort. Furthermore, there is significant natural variation in experience across the dealer and nondealer samples to examine whether it plays a role in shaping the endowment effect.

Data in row 1 of Table XI suggest that more experienced bidders exhibit a much lower WTA/WTP disparity than inexperienced consumers. For dealers, the mean WTA ($8.15) is approximately 1.30 times larger than the mean WTP ($6.27). While this magnitude may appear significant, one needs to consider that a large-sample t-test cannot reject the null hypothesis that the mean WTP and WTA are equivalent at conventional significance levels ($t = 0.87$). Alternatively, data from the nondealer auctions strongly suggest that a significant wedge exists between WTA and WTP statements of value. For nondealers, mean WTA ($18.53) is approximately 5.6 times larger than mean WTP ($3.32), a difference that is significant using a large-sample t-test ($t = 4.13$).[11]

9. All of the experimental protocol are available upon request. Note that this is a very rough test of WTA-WTP because I am comparing value statements along different indifference curves.

10. I should note that I discarded two nondealer WTA statements—offers of $1000 and $500. Of course, results reported below become stronger if these two data points are included.

11. I do not consider the point estimates herein to fully support neoclassical theory. For example, neoclassical theory provides a basic relationship between a

TABLE XI
SELECTED CHARACTERISTICS OF TUCSON SPORTSCARD PARTICIPANTS

	Dealers		Nondealers	
	WTA mean (std. dev.)	WTP mean (std. dev.)	WTA mean (std. dev.)	WTP mean (std. dev.)
Bid or offer	8.15	6.27	18.53	3.32
	(9.66)	(6.90)	(19.96)	(3.02)
Trading experience	16.67	15.78	4.00	3.73
	(19.88)	(13.71)	(5.72)	(3.46)
Years of market experience	10.23	10.57	5.97	5.60
	(5.61)	(8.13)	(5.87)	(6.70)
Income	3.46	3.40	3.37	3.40
	(2.17)	(2.03)	(2.14)	(2.24)
Age	29.20	31.00	28.40	29.00
	(12.20)	(14.70)	(14.90)	(15.30)
Gender (percent male)	0.87	0.90	0.90	0.90
	(0.35)	(0.31)	(0.31)	(0.31)
Education	3.36	3.40	3.03	3.23
	(1.77)	(2.03)	(1.73)	(1.81)
N	30	30	30	30

a. *Trading experience* represents the number of trades made in a typical month.
b. *Years of market experience* denotes years that the subject has been active in the market.
c. *Income* denotes categorical variable (1–8): 1) Less than $10,000, 2) $10,000 to $19,999, 3) $20,000 to $29,999, 4) $30,000 to $39,999, 5) $40,000 to $49,999, 6) $50,000 to $74,999, 7) $75,000 to $99,999, 8) $100,000 or over.
d. *Age* denotes actual age in years.
e. *Gender* denotes categorical variable: 0 if female, 1 if male.
f. *Education* denotes categorical variable 1) Eighth grade or less, 2) High School, 3) 2-Year College, 4) Other Post-High School, 5) 4-Year College, 6) Graduate School Education.

VI. EVIDENCE FROM NONMEMORABILIA COLLECTORS

Even though the data in each field experiment reveal similar insights, the scope of the study may be interpreted narrowly due to the nature of the sample used—memorabilia collectors. In this section I rectify this potential shortcoming by i) presenting new evidence from a laboratory experiment that indicates the findings

WTA/WTP-tuple that can be summarized accordingly: $\partial WTP/\partial y = 1 - WTP/WTA$, where y is income (see, e.g., Bateman et al. [1997]). As such, taken literally, the disparity observed suggests that, roughly, if a dealer's income increased by $100, she would spend an additional $23.07 on sheets of University of Wyoming basketball trading cards. Likewise, if a nondealer's income increased by $100, she would spend an additional $82.10 on sheets of University of Wyoming basketball trading cards. Running the risk of making too much of a few point estimates rather than relying on inference gained from the statistical tests, I view these estimates as implausibly large.

observed above are not merely due to the nature of the underlying markets; ii) summarizing recent empirical studies, which make use of completely uncontrolled field data but nonetheless report results consonant with the general theme of this study, and iii) estimating a hedonic regression model using ask prices from the Orlando housing market to provide further support of the received results in the literature.

The laboratory experimental setup is a simple ABCD DCBA design run over two four-week periods at the University of Arizona. Monitors recruited two *different* groups of 40 subjects each from the undergraduate student body at the University of Arizona. Each group was scheduled to attend four weekly sessions over a four-week period: group 1 from February 2001–March 2001 and group 2 from May 2001–June 2001. Subjects were given a consumable good in each session, and to encourage perfect attendance, after session No. 4 a $10 bonus was paid to subjects who attended all four sessions (35 and 33 subjects participated in every session—I focus on these complete data, but note that insights gained from the entire sample are qualitatively similar). I ran all sessions in a classroom at the University of Arizona. I again use a straightforward random allocation design. For example, in treatment A the subject is endowed with either a University of Arizona coffee mug or a chocolate candy bar and has the option to trade it for the other good. Treatments B, C, and D also use everyday consumables: ballpoint pens and magic markers; cans of coke and pencils; highlighters and letter openers.

Experimental results, only summarized here for brevity, yield similar insights to those gained from the field experiments above: in the initial trading exercise (treatment A for group 1 and treatment D for group 2), I find results that are in line with past laboratory evidence: only 11.4 percent (4/35) and 12 percent (4/33) of subjects traded their endowed good in treatments A and D. Yet, when trading rates from group 1 treatment A (D) are compared with trading rates in group 2 treatment A (D), I find trading rates that are consistently higher in the later trading sessions—27 percent (9/33) of group 2 subjects traded their good in treatment A, which compares favorably with the 11.4 percent in group 1. Furthermore, while only 12 percent of group 1 subjects traded in treatment D, 25.7 percent (9/35) of group 2 subjects traded in treatment D. Although significant evidence of an endowment effect remains even after four rounds of trading experience, I find via a Fisher's exact test that for treatment A (D) data the null

hypothesis of no treatment effect is rejected at the $p < .05$ ($p < .06$) level using a one-sided alternative. These results support the findings above and reinforce the notion that useful cognitive capital builds up slowly, over days or years, rather than in the short run of an experiment.

Is there evidence of this effect outside of experiments? While the lab data are in line with the field data discussed above, it would be comforting to find consistent evidence from the empirical literature. In this regard, results in Genesove and Mayer [2001], Shapira and Venezia [2000], and Locke and Mann [2000] each lend important insights and suggest that this effect occurs in many different settings—from U. S. housing markets to Israeli and U. S. stock markets. For example, using a unique housing market data set drawn from Boston, Genesove and Mayer [2001] find that seller behavior across investors and owner-occupants is different: owner-occupants exhibit about *twice the* degree of loss aversion that investors exhibit.[12] While many factors could be at work, the empirical results are certainly consistent with the notion that individuals with more market experience (investors) exhibit a lesser degree of loss aversion compared with sellers who presumably have less market experience (owner-occupants).

Perhaps providing a cleaner result for the purposes herein, Shapira and Venezia [2000] analyze investment patterns of a large number of Israeli investors and report that professionals exhibit considerably less loss-averting behavior than independent investors exhibit. Finally, studying trade histories for professional floor traders, Locke and Mann [2000] present evidence that suggests certain classes of "successful" traders exhibit less loss-averting behavior than their less-successful rivals.

VII. Relevance to Markets

To provide insights into how the findings herein could potentially influence markets and the distribution of rents, I turn to some simple models of general equilibrium that help to illuminate the welfare effects of intermingling "sophisticated" and "unsophisticated" traders in a pure exchange economy. Following the general framework of Akerlof and Yellen [1985], I use a two-good

12. Using data from the Orlando housing market in the late 1990s, I have obtained similar insights using a hedonic regression approach. My analysis rests on comparing ask prices across investors and owner-occupants. *Remax200* graciously furnished the data, and the results are available upon request.

pure exchange economy with two types of equally numbered consumers populating the economy: type A and type B. Within both consumer types, a proportion Φ of consumers is unsophisticated, or inexperienced, while the remaining consumers are sophisticated, or experienced. The inexperienced consumers have downward inertial consumption of one of the goods (e.g., an extreme case of an endowment effect), while the experienced consumers have no such characteristic inherent in their preference structure, perhaps due to learning. Further assume that all consumers maximize Cobb-Douglas utility functions of the form: $U = G_1^{\phi j} G_2^{1-\phi j}$, where j denotes consumer type.

I begin by computing the initial long-run equilibrium, with P denoting the relative price of good 1. After observing equilibrium price, utility, and allocation levels, I then perturb the system so that the endowment of G_1, the good which the Φ proportion of consumers have downward inertial consumption, decreases by α. Thus, inertia arises in the form of inexperienced consumers' unwillingness to lower their consumption levels of good 1 after this shock. For brevity, I note that simulation of such a system yields insights consonant with Akerlof and Yellen [1985]: the inertia is synonymous with "undertrading," and induces a larger increase in P, making net sellers of good 1 better off and net purchasers of good 1 worse off. Equilibrium utility levels are second-order different for experienced and inexperienced consumers within each group, but the overall welfare effects represent first-order movements along the economy's utility frontier. Hence, while under most parameter vectors departures from the frontier are typically not as great as the endowment shock (e.g., an α-percent shock typically leads to less than an α-percent difference in experienced and inexperienced consumers' utility levels), the overall effect on the economy is first-order. Yet, similar to Akerlof and Yellen, in an economy with initial distortions the presence of inexperienced consumers can lead to first-order changes in social welfare as well as first-order changes in income distribution.

My simulation results that suggest i) unsophisticated agents suffer important losses, and ii) their presence considerably influences the distribution of incomes, are in accord with published results in the industrial organization literature, where it has been found that even small deviations from maximization can considerably alter the equilibrium (e.g., Kreps and Wilson [1982]). While these studies and my results provide insights into

individual and overall market losses, further real world examples can serve to highlight the micro-level interaction of agents and how experienced agents can potentially use their knowledge to influence the overall level and allocation of rents.

A well-known result from the published literature is that WTA exceeding WTP reduces the number of voluntary trades and therefore overall rents. A simple example reveals the intuition for such inference, and serves to highlight the possibilities for the experienced agent to gain from his knowledge of the value disparity among the naive. Assume that Gary's WTA and WTP for a lamp are \$200 and \$50, whereas Milton's WTA and WTP are \$160 and \$40. These numbers suggest that if Gary (Milton) initially owns the lamp he would only be willing to part with it for \$200 (\$160); yet at most Gary (Milton) would offer \$50 (\$40) if Milton (Gary) initially owned the lamp. One can readily see that Coase's invariance result is disturbed in such a situation: the allocation of initial property rights will determine who ultimately owns the lamp. A profit-maximizer, however, could alter this scenario considerably. For example, assuming that John knew the value structures of Gary and Milton, and Milton initially owned the lamp, John could purchase the lamp from Milton for \$160 and allow Gary to use the lamp as if he owned it. If this action raised Gary's WTP to WTA, which is consistent with many of the empirical findings on instantaneous endowment effects for inexperienced consumers, then John could receive \$200 from Gary in exchange for the lamp. In this sense, John has made a considerable profit and the highest valued consumer ultimately owns the good (restoring Coase's invariance result). Of course, if Milton was a sophisticated consumer and knew what John knew, then he could carry out this profitable strategy himself.[13]

Beyond the considerable effects that sophisticated agents may have on overall market rents and the distribution of those

13. This general result easily transforms to markets if consumers are price seekers. If buyers and sellers are price takers, however, then a simple graphical analysis in supply-demand space, assuming that WTA exceeds WTP, suggests that higher prices and fewer units transferred are general results when WTA > WTP. Yet, again the generality of this result merits an important caveat: if the marginal market participants are experienced and have WTA = WTP, then WTA exceeding WTP for inframarginal participants will not affect market prices or transactions. Accordingly, much like the price seeker example above, the presence of experienced market participants may preclude one from observing reluctance to trade and higher prices from market data. Thus, in a competitive market the presence of sophisticated consumers yields equilibria consistent with a market that contains only experienced consumers. The interested reader should see Hoffman and Spitzer [1993] for examples closely related to those explicated above.

rents, one can also envision the role experienced consumers may have in changing rules in the court of law, which uses the Coase theorem as the starting point for much economic analysis of legal rules. The presence of endowment effects upsets Coasian bargaining because allocation of property rights matters. But, if for experienced litigants endowment effects disappear, then the basic independence assumption is restored and the basis for many normative arguments (Coase theorem) remains intact. Hence, it suggests a nuance to the law in which inexperienced parties subject to endowment effects require judicial attention in allocation of property rights, but experienced parties do not.[14]

VIII. Conclusions

Whether preferences are defined over consumption levels or changes in consumption merits serious consideration. If preferences are defined over changes in consumption, then a reevaluation of a good deal of economic analysis is necessary since the basic independence assumption is directly refuted. Several experimental studies have recently provided strong evidence that the basic independence assumption is rarely appropriate. These results, which clearly contradict closely held economic doctrines, have led some influential commentators to call for an entirely new economic paradigm to displace conventional neoclassical theory.

In this study, I depart from a traditional experimental investigation by observing actual market behavior. Examining behavior in four field experiments across disparate markets yields several unique insights. First, the field data suggest that there is an overall endowment effect. Second, within both institutions—observed trading rates and explicit value revelation—I find strong evidence that individual behavior converges to the neoclassical prediction as trading experience intensifies. This major insight is perhaps best illustrated in Figure I, which illustrates that in the trading exercises individual behavior converged to the

14. Several other real-world examples of how the experience/endowment effect relationship can play an important role also come to mind: for example, galleries, surrogate mothers, and the use of money-back guarantees. Art and antique galleries represent a hybrid case because one can imagine that a gallery owner may absorb a piece of art into her endowment. If the owner does not eventually learn that parting with it is necessary, then she may not sell enough art. This has important implications for turnover and entry into businesses like galleries where there are no real scale economies.

neoclassical prediction. These results provide initial evidence consistent with the notion that market experience eliminates market anomalies.

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