When and Where Can Institutionalization Occur? The Case of Price Bubbles in Financial Markets*

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This study analyzes the oft-neglected linkage between the micro-foundations of institutionalization and their macro-institutional outcomes. We use price bubbles in financial markets to contextualize our analysis, and employ a well-established experimental methodology, allowing us to (1) analyze institutionalization processes at the most granular level, (2) examine institutions as they form, and (3) control more precisely for alternative, non-institutional explanations. We find evidence that institutionalization processes can quickly occur, even in seemingly efficient financial markets. Additionally, we specify, test, and reject alternative individual-level explanations such as skill deficiency or overconfidence. Finally, we address more precisely the mechanisms presumed to be driving institutionalization by demonstrating how institutionalization processes in markets respond to varying levels of ambiguity. We conclude with a discussion of our sociological explanation for price bubble outcomes, and its relevance for neo-institutional theory. (134 words)

Keywords: Institutionalization, Market, Price, Bubble, Experiment

Introduction

Over the last three decades, neo-institutional theory has emerged as one of the most influential theories addressing the relationship between organizations and their environments. The major tenets of this theory, which include the organizational pursuit of legitimacy and status (Meyer and Rowan, 1977), the spread of believes, norms and practices (DiMaggio and Powell, 1983), and the institutionalization of processes and structures into a rule-like status (Zucker, 1977), have become underlying assumptions of organizational theory. Neo-institutional theory has been used to explain a wide variety of important phenomena including organizational structure (Tolbert and Zucker, 1983), culture (Tolbert, 1988), response to external pressures (D'Aunno, Sutton, and Price, 1991; Oliver, 1991), spread and adoption of practices (Westphal, Gulati, and Shortell, 1997; Guler, Guillén, and Macpherson, 2002; Schneper and Guillén, 2004), organizational change (Greenwood and Hinings, 1996; Kraatz and Zajac, 1996), and the impact of institutions on individuals in organizations (Meyerson, 1994). The application of institutional theory has also broadened through research addressing the re-examination of what is considered institutional (Lounsbury, 1997) along with work that offers a complementary synthesis with other theories, such as structuration (Barley and Tolbert, 1997), population ecology (Zucker, 1989), and transaction cost economics (Roberts and Greenwood, 1997).

What remains less well-developed, however, is the foundational micro-macro linkage between individual cognition and behavior, on the one hand, and collective behavior (of organizations, markets, or other institutions), on the other hand. In other words, how exactly can neo-institutional theory move from individuals to organizations or markets? Zucker's early discussion of institutional theory made the important point that "macro-level and micro-level are inextricably intertwined," (1977:728), yet multi-level assessments of institutional processes are exceedingly rare. Institutionalization is defined by Zucker as "both a process and a property variable. It is the process by which individual actors transmit what is socially defined as real and, at the same time, at any point in the process the meaning of an act can be defined as more or less a taken-for-granted part of this social reality" (1977:728)[1]. The subsequent imbalance in research attention to process vs. property is noteworthy, however. Indeed, Barley and Tolbert have more recently suggested that "institutionalists…have pursued an empirical agenda that has largely ignored how institutions are created, altered, and reproduced, in part, because-their models of institutionalization as a process are underdeveloped" (1997:93).

[1] The process element of institutionalization is evident in more recent definitional discussions, such as in Lucas's assertion that "institutionalism is the process by which social processes or structures take on a rule-like status in social thought and action" (2003:406).

Given this situation, it is perhaps not surprising that, generally speaking, recent neo-institutional research has focused largely on studying institutionalized macro-structures and broad macro-patterns of institutionalization, rather than studying micro-macro processes or developing and testing the theory further at the level of the mechanisms presumed to be operating. As Lounsbury (1997:468) suggests, "the experimental social psychological work of Zucker (1977) and some of her subsequent work focusing on how context differences lead to multiple social orders offer insights into institutional variation at more local levels. This line of research is the most underdeveloped in institutional theory." We concur. Despite the dramatic growth of research taking a neo-institutional perspective, the micro-foundations of institutionalization have received scant attention in recent years.

A simple citation count reveals the surprisingly sparse attention given to micro-processes of institutionalization, relative to more macro-oriented work on institutional processes and outcomes. Zucker's early articles (1977, 1983), which are often viewed as classics of institutional theory, have received just 346 (11.2 citations per year on average) and 546 (21.8) citations to date, respectively. In contrast, consider two other classic articles: Meyer and Rowan (1977) has received 2,242 (72.3) citations during the same period and DiMaggio and Powell (1983) has received 2,703 (108.3) citations, despite being published six years later. [2]

What explains such an imbalance? We believe that the more macro-oriented work of Meyer and Rowan (1977) and DiMaggio and Powell (1983) has provided an easier, more natural fit with sociological and organizational research on popular topics such as status, legitimacy, the diffusion of administrative practices, and organizational change. Zucker's early work (1977, 1983), on the other hand, required a close connection to individual behavior, which typically requires detailed data and familiarity with experimental methods (or qualitative ones, e.g. Barley (1986; 1990). While Zucker's work was pioneering in establishing institutionalization processes at a very granular level, its emphasis on cultural transmission in small groups was likely seen as lacking a direct connection to macro-level outcomes more typically of interest in institutional researchers. Our approach, as we will note in detail below, blends pure experimental and experimental simulation methodologies to allow a theoretical and empirical analysis of both the micro-processes of institutionalization (à la Zucker) and the macro-outcomes (i.e., financial market behavior) that have become a growing focus of interest to institutional theorists (Zajac and Westphal, 2004; Zuckerman, 2004).

[2] The citation count was carried out in November 2008, using The Social Sciences Citation Index (SSCI) and Social SciSearch, which provide access to current and retrospective bibliographic information, author abstracts, and cited references from over 1,700 scholarly social sciences journals and selected items from approximately 3,300 science and technology journals (http://scientific.thomson.com/products/ssci/).

We view such an approach as having multiple benefits. First, empirical institutional research that is more macro-oriented has tended to rely on more distant archival measures to examine – in an admittedly indirect way – a macro institutionalization process that seems quite removed from the individual-level foundations of institutionalization. More specifically, macro institutional research typically studies how already-existing institutional environments have affected organizations or other institutional environments, or how the process of institutionalization unfolds over long periods of time (Tolbert and Zucker, 1983). While not critiquing the more distal approach typically taken in prior research, it should be noted that one of its limitations is that alternative explanations have also been notoriously difficult to rule out. In this way, we suggest that an experimental method, consisting of an experimental simulation and manipulation, which allows to observe macro-outcome such as market behavior, represents a valuable and underutilized complementary approach to institutional research (Zucker, 1977; notable exceptions include Elsbach, 1994; Lucas, 2003; Lucas and Lovaglia, 2006). The method we utilize allows researchers to (1) analyze institutionalization processes at the most granular level, (2) examine institutions as they form, and (3) control more precisely for alternative, non-institutional explanations.

Interestingly, the relative lack of attention to the earliest moments of an institutionalization has led to an untested assumption: that institutionalization takes a very long time to occur. As noted above, while macro-oriented studies in neo-institutionalism often rely on archival data spanning decades, there is no inherent reason why the process of institutionalization should require years or decades to occur (indeed, Zucker's research, supported by more recent work, shows that it does not). A theoretical and empirical analysis of institutionalization processes at the earliest stages of the formation of an institution thus provides an additional complement to prior approaches and also allows for a needed discussion of micro-macro linkages. In summary, while the relative imbalance in more purely macro-oriented (vs. micro-macro oriented) neo-institutional research is understandable, it has unnecessarily weakened the theory's ability to analyze the micro-processes of institutionalization with a linkage to macro-level behaviors. In our study, we provide a theoretical and empirical analysis that redresses this imbalance, and we do so using a particularly advantageous empirical context for assessing the micro-processes of institutionalization; namely, financial markets, to which we now turn.

The work we report here aim to make a contribution not only to neo-institutional theory, but also to the sociological understanding of markets. The emergence of the new economic sociology (Guillén, et al., 2002) has brought renewed interest in markets as a phenomenon that

deserves sociological attention. Markets can no longer be treated as a mere mechanism that operates disconnected from social phenomena; rather, markets *are* social phenomena (Granovetter, 1985; Baker, Faulkner, and Fisher, 1998; Beunza and Stark, 2004; Zuckerman, 2004). Financial markets, with their vast economic and social impact, carry particular importance. It is surprising that the lens of institutional theory has only infrequently been used to study such markets. Notable exceptions highlight the promise of this line of research, including the work of Abolafia and Kilduff (1988), whose case study of the 1980 crisis in the silver futures market illustrated how market participants enacted an environment that created dramatic swings in participants' beliefs as well as the value of silver. MacKenzie and Milo (2003) detailed the creation of the Chicago Board Options Exchange to demonstrate how a normative theory of financial economics was institutionalized and reified until it became taken-for-granted reality (also see MacKenzie, 2006). Zajac and Westphal (2004) showed that the reactions of a financial market to corporate practices, such as stock repurchase plans, were not just a function of the inherent efficiency of such practices. Rather, such reactions were also the result of the prevailing institutional logic at the time as well as the degree of institutionalization of the practice.

While such studies have been valuable, it is still the case that the micro-foundations of institutionalization in markets remain conjectural to date. We suggest that a careful examination of the process of institutionalization in a (presumably) highly efficient market setting can extend Zucker's original insight on the micro-processes of institutionalization and also contribute to the sociological understanding of markets. We utilize a well-established experimental methodology from behavioral economics to observe and measure the micro-processes leading to institutionalization. This allows us to overcome one of the main difficulties in examining micro-level action and its collective consequences; namely, the garnering of fine-grained individual data while retaining the ability to assess macro-level outcomes (cf. Lucas and Lovaglia, 2006). Equally important, our approach and research design allows us to not only observe when and why institutionalization occurs in financial markets, but to also rule out purely non-sociological (i.e., purely individual-level) explanations from economic psychology and behavioral economics. Finally, we are able to test institutional theory at the level of the presumed mechanisms as the methodology allows us to assess whether institutionalization processes differ as a function of levels of ambiguity experienced by market participants.

Empirically, we find evidence strongly consistent with our predictions. We observe that financial markets, even under textbook conditions of high efficiency – perfect information, atomistic agents, no uncertainty – quickly develop patterns of behavior suggesting institutionalization, with the behavior of market participants becoming increasingly similar even

as prices rise to unreasonable heights. As neo-institutional theory predicts, these patterns are sensitive to varying levels of technological ambiguity: reduction in ambiguity leads to their virtual disappearance. We further show that purely individual-level explanations, such as those revolving around cognitive biases such as skill deficiency and overconfidence, cannot fully account for the patterns we observe.

Our findings regarding institutionalization processes in ostensibly efficient markets have wide-ranging implications, given the widely-held belief in economics and often in sociology that departures from market efficiency occur only under specific conditions. Our theoretical and empirical analysis, however, suggests that social interaction matters even in an environment of extremely *undersocialized* conditions (cf. Granovetter, 1985). Our findings demonstrate the power of institutionalization even in markets that strictly follow the normative conditions of economic efficiency. While institutions may typically require long time or intensive interaction to develop, we provide additional support to the argument that, given the right conditions, institutionalization processes can be generated both quickly and with little interaction among participants.

Institutionalization in Financial Markets: a Puzzle with Alternative Explanations

In the following sections we review the growing body of research on price bubbles in economics and finance and highlight the difficulty in determining the origin of bubbles. We propose that price bubbles are caused by institutionalization, contrasting it with more individual-based explanations and generating hypotheses. Sections devoted to the method, results, analysis and discussion follow.

The Puzzle of Price Bubbles in Economics and Finance

Contemporary economic theory recognizes that markets can develop price bubbles, defined as "trade in high volume at prices that are considerably at variance from intrinsic value" (King, et al., 1993:183). Cases such as the stock market crash of 1929 (White, 1990) demonstrate the enormous effect of bubbles on individuals, firms, markets and even nations, and explain the interest they draw from economists as well as the public (Kindleberger, 1978). More recently, the 2008 financial crisis, which was blamed on a housing price bubbles, had sweeping impact on both the US and the global economy. Venerable financial institutions, such as Lehman Brothers and the American Insurance Group, collapsed or required massive state-led rescue efforts, resulting in great losses not only to investors but also to pension holders and tax payers at large. It has also led to a near freeze of commercial credit, hurting other businesses (Uchitelle, 2008)

and venture capitalists (Stone, Cane Miller, and Vance, 2008), forcing operation cuts and layoffs, thus intensifying a downward spiral that further weakened the economy and shrunk employment. Internationally, the crisis had far-reaching effects, leading to huge losses to individuals and companies, forcing countries to nationalize entire sectors (Forelle, 2008), and leading international bodies to hand out emergency support to several nations (International Monetary Fund, 2008).

While bubbles clearly can have dramatic consequences, their causes are typically not well-understood. In popular thought, bubbles are often portrayed as the result of impulsive imitation, dubbed "herd behavior" or "mob psychology" (Bikhchandani and Sharma, 2000).[3] The main difficulty with such explanations is that in real-life markets, with their complexity and uncertainly, it is extremely difficult to differentiate impulsive behavior from one that may be fully rational. For instance, a run on the bank can stem from fear and anxiety, but it can also occur even if investors were fully rational but responding in a similar manner to the same information or learning from others (for a more general treatment, see Weber, 1968; on bank runs see Calomiris and Gorton, 1991). Indeed, phenomena such as the Dutch tulipmania (1634-37), made infamous in McKay's (1841) *Memories of Extraordinary Popular Delusions and the Madness of Crowds,* as well as the Mississippi (1719-20) and the South Sea (1720) bubbles have been interpreted through the lens of a rational information processing model (Garber, 1990). While theoretical economists have suggested that bubbles may be rational (De Long, et al., 1990; Garber, 1990), intrinsic (Froot and Obstfeld, 1991), and contagious (Topol, 1991), there is no widely accepted theory to explain their occurrence.

The existence of price bubbles seems at odds with common assumptions regarding the efficiency of financial markets. Even more puzzling is the finding that bubbles occur not only in real-world markets, where uncertainty and noise can lead to diverging rational expectations. Bubbles also appear in markets that arguably possess textbook characteristics of economic efficiency. Abundant evidence, beginning with the work of Noble laureate Vernon Smith and his associates (Smith, Suchanek, and Williams, 1988), shows that bubbles can also appear in highly efficient, uncertainty-free, experimental markets. As Smith, van Boening, and Wellford conceded after more than a decade of studies, "controlled laboratory markets price bubbles are something of an enigma" (2000:568).

[3] As the *New York Times* recently reported (complete with an illustration of a herd of sheep in a meadow): "Experts have long known that a classic phenomenon called herd behavior has a great deal to do with the wild swings of panic and exuberance that can seize Wall Street…" (Carey, 2008).

In a typical experimental market, participants engage in the trading of assets that are defined to have a finite lifespan and a known distribution of dividend payments. Uncertainty is eliminated and participants should be able to calculate the *intrinsic value* of the assets simply by examining the expected stream of dividends. With each individual acting simultaneously as a buyer and a seller, as common in stock markets, and communication strictly limited to the posting of bid and ask prices, collusion is unlikely and efficient prices should prevail. Nevertheless, price bubbles have been observed repeatedly in experimental markets, even with sophisticated participants such as business students, managers, and professional traders. Such bubbles have proven robust to a variety of conditions, including short-selling, margin (credit) buying, equal portfolio endowment, brokerage fees, dividend certainty, constant value, limitations imposed to reduce price changes, the presence of informed insiders (King, et al., 1993; Porter and Smith, 2003) and large number of market participants (van Boening, Williams, and LaMaster, 1993). Because prices do vary during trading, as they raise and occasionally crash, it is difficult to attribute the bubbles to pre-existing norms, priming or anchoring effects.

The economics literature offers dozens of studies on bubbles, and a review of this literature suggests the two general explanations for the appearance of bubbles, which can be referred to as *skill deficiency* and the *Greater Fool* explanations. Briefly, the former suggests that bubbles appear because market participants lack pricing skills and misprice assets, at least initially. As they continue to trade, learning occurs, pricing skills improve and so bubbles abate. The latter suggests that bubbles occur because traders are overconfident in their pricing acumen. Far from lacking skills, they consciously acquire overpriced assets, believing that they can find buyers that will buy those assets at even more-inflated prices.

We endeavor to also analyze these two explanations conceptually and empirically, and we juxtapose them against our institutionalization argument. We discuss these arguments below and highlight a number of key empirical indicators that allow us to adjudicate across these different explanations: 1) the market participants' pricing skills *ex-ante* (before trading begins) and *ex-post* (during trading); 2) the presence of overconfidence bias among market participants; 3) the degree to which pricing discrepancies are correlated between market participants and over time; and 4) the degree to which bubbles would correlate with the degree of ambiguity in the environment.

Institutionalization

We begin by suggesting that bubbles stem not from lack of skills, overconfidence, or otherwise individually-based biases, but from institutionalization processes whereby "routines are followed because they are taken for granted as 'the way we do these things'" (Scott, 2007:58). Institutionalization of cognitive patterns, as in response to stimuli, has been shown in previous

experiments (Zucker, 1977) and large-scale financial markets studies (Westphal and Zajac, 2001; Zajac and Westphal, 2004). Institutionalization can lead to coordinated action through the internalization of beliefs and interpretations of facts by individuals, even without formal agreement or explicit sanctions. Certainly within, but even outside institutional theory, there is understanding that while institutions can be formal, such as the legal system, they can also emerge to provide order endogenously: "Behavior becomes stable and patterned, or alternatively institutionalized, not because it is imposed, but because it is elicited" (Bates, et al., 1998:8). It is widely accepted that such processes can sustain practices across individuals and over time, even when the practices are inefficient or plain wrong (Meyer and Scott, 1992).

Contemporary economic theory acknowledges that individuals observe each other and base their decisions, at least partly, on imitation of others rather than on their own cognition (Shleifer and Summers, 1990; Banerjee, 1992; Bikhchandani, Hirshleifer, and Welch, 1992). It has been theorized, however, that such behavior would not occur in efficient markets, where participants can counter and profit from misguided trades (Avery and Zemsky, 1998; Drehmann, Oechssler, and Roider, 2005). The understanding that market participants observe and follow others is, of course, a tenet of institutional theory. This understanding is shared with the Keynesian notion that markets can reward behaviors that are *intrinsically* incorrect, but that are correct in matching "what average opinion expects average opinion to be" (Keynes, 1936:156).

In her early laboratory experiment, Zucker (1977) demonstrated how institutionalization facilitated the transmission of a belief and a practice – estimation of distance travelled by a light dot that was in fact stationary – that would have clearly appeared counter-factual to an outside observer, but not to the participants involved. Building on earlier studies that demonstrated the influence of cognitive-normative rules of behavior on perception and interpretation of facts (Sherif, 1935; Asch, 1955), Zucker showed the persistence of such beliefs among participants that were not exposed to the initial stimulus, but heard about it from others. Similarly, financial economists found that market participants learned to coordinate their asset price expectations without direct communication and even when such coordination led to erroneous outcomes (Hommes, et al., 2005). In a recent example of institutional behavior outside the laboratory, it was shown that US stock markets have systematically responded favorably to announcements of stock buybacks, although it was publicly known that a significant proportion of announcing firms did not act on their announcements (Zajac and Westphal, 2004).[4]

[4] One might question whether institutionalization must be "incorrect" or "irrational," as the examples above seem to imply. We recognize that behaviors that are technically-rationally correct can be institutionalized as well (e.g. Westphal, Gulati, and Shortell, 1997). However, for analytical purposes, it is important to disentangle technical-rational reasons from institutional reasons for an observed behavior. As Weber (1968) commented, pedestrians

Along these lines, we hypothesize that price bubbles are caused by the institutionalization of pricing technologies (or routines) among market participants.[5] If institutionalized behavior causes bubbles, then the individual pricing skills participants, defined as the ability to calculate the intrinsic value of an asset, should show a marked deterioration as institutionalization causes individuals to disregard their own understanding of the situation and replace it with the emerging institutional definition, much as in the earlier studies. Thus,

> H1a: Market participants' pricing skills *ex-ante* (before trading) will be better than market participants' pricing skills *ex-post* (during trading).

Note that if price bubbles were caused by skill deficiency, one would expect the opposite of that: traders' skills should have improved as they traded, and so pricing skills *ex-post* should have been better than pricing skills *ex-ante*.

We also predict that institutionalization will cause market participants' pricing technologies to grow similar. Empirically, we would expect to see growing correlation in transaction prices, a correlation that we measure by using the distance between the market price of an asset and the intrinsic value of that asset, known as the pricing discrepancy (Hommes, et al., 2005). Correlation between those measures should increase the more market participants interact, as institutionalization spreads and settles. Thus,

> H1b: Pricing discrepancies will be become more similar among market participants over time.

The Role of Ambiguity in Institutionalization. Institutionalization thrives on ambiguity. While it may not be necessary for institutionalization to appear, early theorists stressed how ambiguity facilitates the appearance of institutions. When Zucker sought an experimental setting to test institutionalization, she chose to build on Sherif's (1935) auto-kinetic light movement experiment because it offered "a setting which is ambiguous" (1977:730), and this would provide greater variance in institutionalization. Similarity, ambiguity of organizational technologies (and goals) is expressly stated as a cause of mimetic isomorphism elsewhere in theory (Meyer and Rowan, 1977; DiMaggio and Powell, 1983).

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simultaneously opening their umbrellas when rain begins does not constitute social action. Thus, it is easier to identify institutionalization when there is clear deviation from rational-technical logic, rather than when the technical-rational and the institutional logics overlap.

[5] Following tradition, we use "technology" in a broad sense, which also include technical procedures, rules, and practices, such as those needed to calculate the price of a financial asset (cf. Meyer and Rowan, 1977:344).

The theoretically hypothesized relationship between ambiguity and institutionalization leads to an additional hypothesis. If bubbles are indeed the result of institutionalization, then a decrease in ambiguity should lead to a decrease in the appearance of bubbles, and vice versa. This is a particularly strong test, because the environment is which experimental price bubbles appear is largely devoid of Knightian uncertainty (Knight, 1921), i.e. all of the information necessary to calculate the exact value of the assets is provided. However, ambiguity does not equate uncertainty. Following institutional theory, we identified the potential effect of ambiguity regarding the *social appropriateness* of the technologies applied by market participants, as opposed to ambiguity about the performance of the assets traded.[6] If the magnitude of bubbles is related to the ambiguity of these technologies, it provides further indication that institutionalization is indeed responsible for the appearance of bubbles. Hence,

H1c: The lower the environmental ambiguity, the lesser will be the price bubble.

Skill Deficiency

While economic theory is yet to provide a complete explanation of experimental bubbles (Smith, van Boening, and Wellford, 2000), it has been argued that the phenomena may be the result of deficient pricing skills or – more generally – a form of bounded rationality. Some have attributed the first stage in the appearance of bubbles to "confusion and irrationality" (Lei, Noussair, and Plott, 2001:858) or "a form of myopia" (cf. Tirole, 1982; King, et al., 1993:183), caused by market participants who do not understand the nature of the task or the structure of the asset early in the process, but "learn eventually that capital gains expectations cannot be sustained indefinitely" (King, et al., 1993:183). That bubbles are caused by deficiency and alleviated by subsequent learning seems plausible, especially since it has been shown that bubbles abate (but not disappear completely) when participants traded repeatedly within the same group (King, et al., 1993; van Boening, Williams, and LaMaster, 1993) or in the presence of those who participated in prior experimental sessions (Dufwenberg, Lindqvist, and Moore, 2005). Hence, these arguments suggest that bubbles are caused by lack of knowledge and can be eliminated by repeated exposure to trading situations, i.e., learning. A skill deficiency explanation does not require an institutional perspective as it is entirely individualistic. If bubbles are indeed caused by skill deficiency and alleviated by individual learning, as opposed to institutionalization, then we

[6] Similarly, social comparison theory (Festinger, 1964) predicts that ambiguity, broadly defined, would lead individuals to compare themselves and be influenced by others, to the extent that there is no objective standard against which they can check the propriety of their conduct or decisions.

should see indications that market participants *improve* their asset pricing skills as they trade. Thus,

> H2a: Market participants' pricing skills *ex-post* will be better than market participants' pricing skills *ex-ante*.

If price discrepancies are the result of individuals initially lacking pricing skills, we would not expect to see those errors correlated. Rather,

> H2b: Pricing discrepancies will *not* be become more similar among market participants over time.

"Greater Fool" (or Others' Irrationality)

Also turning on a psychological bias, the Greater Fool explanation suggests that bubbles are fueled by speculators, who *knowingly* purchase overpriced assets hoping to sell these assets, even more dearly, to other investors, i.e. "greater fools" (e.g. Dreman, 1993; The Economist, 2003). Economists Smith, Suchanek, and Williams conjectured that bubbles may be the result of "agent uncertainty about the behavior of others" (1988:1148), which indicates an assumption of irrational behavior from other market participants, something that financial economists have explicitly suggested (e.g. Barberis, Shleifer, and Vishny, 1998). Similarly, an entry in the *New Palgrave Dictionary of Economics*, states that bubbles come to exist "because current owners believe they can resell the asset at an even higher price" (Brunnermeier, 2008).

Although prior research has already undermined this explanation by showing that bubbles appear even when gains from speculation are impossible (Lei, Noussair, and Plott, 2001), we decided to add indicators for *overconfidence* in this study, as an additional test. Overconfidence is related to the Greater Fool explanation, because for markets to be influenced, a sufficiently large part of market participants must be overconfident about their pricing acumen, believing that it is better than the others' (and therefore the others' will buy overpriced assets). In other words, Greater Fool would *not* hold in a market where market participants know that assets are overpriced and believe that others also know this. . In such situation, no one will buy overpriced assets, leading prices to fall.

The psychological literature provides plenty of evidence that people assess themselves to be above average in various positive characteristics, notwithstanding the objective impossibility of such assessment (Svenson, 1981; Babcock and Loewenstein, 1997). People were shown to be generous in self-assessment versus the population average when asked about their driving skills,

managerial acumen, ethics, productivity, and other desirable characteristics. In the economics arena, overconfidence has also been shown to be prevalent among stock analysts (Stotz and Nitzsch, 2005) as well as ordinary investors (Bhandari and Deaves, 2006) and to affect decisions, leading for instance to excessive entry into markets (Camerer and Lovallo, 1999), poor acquisition decisions (Billett and Qian, 2008), and diminished performance in trading (Cheng, 2007). Hence, if bubbles develop because multiple market participants suffer from overconfidence, then

> H3: The presence of a price bubble will be associated with the presence of an overconfidence bias among market participants.

Method

Experimental sociology has found greater interest in recent years as it promises to answer the repeated calls for more evidence on the micro-foundations of social phenomena. Citing Coleman (1990), Hedström recently commented in *Science*: "even if we are exclusively interested in explaining the relationship between two macrolevel properties…a proper explanation would require us to try to explicate the microlevel processes that brought it about" (2006:786). Notwithstanding the complexity of institutionalization, students of the theory have been using experiments to investigate micro-processes for over three decades, including the effects of institutionalization on cultural persistence (Zucker, 1977), the production of institutionalization through the communication of "proper" procedures for structuring (Lucas, 2003), the trust-building nature of legitimation (Lucas and Lovaglia, 2006), and the protection of organizational legitimacy following controversial events (Elsbach, 1994).

In general, experiments provide the most unambiguous evidence of causation thanks to a strictly controlled environment and randomization of extraneous variables (Cook and Campbell, 1979; Kanazawa, 1999). In our context, the experimental method is particularly suitable because it allows testing hypotheses in what is a close approximation of a perfectly efficient market, creating an extremely conservative test for institutionalization. The empirical investigation began with an experimental simulation, a method common in behavioral economics but also present elsewhere (e.g. Haney, Banks, and Zimbardo, 1973; Krackhardt and Stern, 1988), which allowed us to recreate a realistic market in the laboratory. We continued with a pure experimental approach, in which we introduce a treatment that manipulated the level of ambiguity and observed the consequences for institutionalization.

Utilizing a design well-established in behavioral economics, we constructed an experimental double auction market (Smith, 1962), which is known to possess characteristics of extreme economic efficiency or competitiveness (Holt, 1995). In such markets, each participant is endowed with experimental cash and assets, and he is free to post bid and ask prices to buy and sell assets at will. The experimental markets were programmed and conducted in z-Tree (Fischbacher, 2007), a computer-based experimental platform. They were based on the seminal design of Smith, Suchanek and Williams (1988) and replicated a recent design (Dufwenberg, Lindqvist, and Moore, 2005).

The importance of peer influence in converging behavior in groups has been shown by social psychologists early in the development in the discipline (e.g. Sherif, 1935; Festinger, Schachter, and Back, 1950; Asch, 1951; Festinger, 1964). However, it would appear that the evidence of convergence was induced in small groups using deception or confederates (e.g., as in Asch's and Zucker's), direct interaction among the participants (e.g., as in Sherif's), by exposing participants to social pressure (Asch's results reversed when participants were anonymous) and/or by providing partial information. We avoided all of these issues in our design: there was no deception whatsoever, decisions were made by unidentifiable individuals barring direct interaction, and information was complete and publicly available to all participants. Further, participants knew that they would be paid in cash based on performance, providing an incentive to be thoughtful. Taking a rigorous approach, we expected that institutionalization would emerge even though the experimental design eliminated factors discussed in prior research, such as interaction, incomplete information, reputation, market power and uncertainty.

By definition, high efficiency markets feature extremely undersocialized settings. Participants traded electronically, interacting only publicly through computer terminals, as to counter the tendency for increased similarity of behavior when participants can communicate directly. Long established in classic accounts in psychology and sociology, this tendency has recently been utilized in the economics and finance literature to explain decisions among investors and professional traders (e.g. Shiller and Pound, 1989; Griffins, et al., 1998; Kelly and O'Grada, 2000; Hong, Kubik, and Stein, 2001; Duflo and Saez, 2002). We did not allow for direct contact, verbally or otherwise, between the participants. The sole means of communication was the public posting of bid and ask prices through a computer system. The participants were randomly assigned to each market, did not have shared history as a group, and were guaranteed anonymity to eliminate the shadow of any future consequences. Keeping participants unidentifiable was meant to reduce the likelihood of an endorsement effect (Hirshleifer and Teoh, 2003), where the actions of a single market participant, who is perceived

to be knowledge or prestigious, as followed by others, as with investments made by a "celebrity" money manager.

The presence of complete and public information ruled out the possibility of price bubbles stemming from herding (Banerjee, 1992) or informational cascades (Bikhchandani, Hirshleifer, and Welch, 1992)[7]. According to these influential views in economics, herding – when individuals abandon private information and move to imitate others' behavior – occurs because the adoption by others causes each individual to doubt the correctness of her private information. Imitation is not presented as mindless, but as a rational response to the growing number of adopters. However, the theory emphatically excludes efficient markets from its scope because a price in an efficient market arguably incorporates all publicly available information (Avery and Zemsky, 1998; Drehmann, Oechssler, and Roider, 2005). For instance, market participants can profit from bubbles by selling over-priced assets.

For the first set of experimental sessions, we recruited 62 undergraduate students with no prior experience in such experiments for 10 separate markets in what was described to them as a "study of economic decision making". Upon arrival to the experimental laboratory, participants received experimental instructions that included the detailed information necessary to calculate intrinsic asset values with precision. The instructions also stressed that the participants will receive cash payment based on their earnings at the end of the experiment, and the assets (shares) they trade will have no value at that point. It was made clear that the experiment will have 10 trading periods, each lasting 120 seconds, and that at the end of each period, each share would pay a dividend of 20 cents with a probability of 0.5. The instruction also showed that the intrinsic value of a share to be 100 cents and that the value decreased by 10 cents after each round.[8]

After reviewing the instructions at their leisure, the participants received a Price Questionnaire, in which they were asked to provide *ex-ante* prices for the shares, allowing us to assess their skills with the standard asset-pricing model. The questionnaire asked, for instance, "In the first period, write the minimum price you will be willing to sell a single share for" and "In the fourth period, someone wants to sell you his share. Write the maximum price you will be willing to pay for it". The Price Questionnaire included 10 questions, one for each trading round, in random order. The participants could consult the detailed information in the instructions to answer the questions. All of them finished before the 10 minutes allocated for the task.

[7] Both resemble the notions of *rational imitation* in sociology (Hedström, 1998) and fad theories of *bandwagon effect* in organizational theory (Abrahamson and Rosenkopf, 1997).
[8] Because the expected dividend per period is 20x0.5=10¢, each share is expected to generate a stream of dividends equal on average to 10x10+0=100¢ over its life of 10 periods with no residual value.

After returning the Price Questionnaires, the participants were asked to complete an Assessment Questionnaire, which included questions designed to assess overconfidence and social comparison. In it, each participant was asked to provide 1) an assessment of the accuracy of his or her own responses; 2) an assessment of the accuracy of other participants' responses; and 3) an assessment of the other participants' view of his or her own responses. This was followed by a brief demographics questionnaire.

After returning the completed questionnaires, the participants moved to a trading room, where they sat in separate cubicles in front of networked personal computers. Each participant was randomly assigned to receive either two shares and 600 cents or six shares and 200 cents, such that the expected payoff was identical at 800 cents. Conditions resembled a highly efficient stock market: any participant could place an offer to sell (ask) and/or an offer to buy (bid) or initiate a transaction by accepting an existing ask or bid. All trading information was public: bid and ask offers and completed transactions were visible to all of the participants. Actual trading began only after a round of practice, meant to familiarize the participants with the trading interface, and after they were given a chance to ask questions. A summary screen appeared at the end of each period and presented individualized trading and divided results.

Each of the 10 first markets consisted of six participants[10] who traded for 10 periods (excluding mock trading period), resulting in 517 distinct transactions. At the conclusion of trading, the participants received a $5 show-up fee and their earnings in cash. We occasionally picked a participant for a post-experimental interview. The average payment was $13.38 (s.d.=2.87; range=$5.30-$18.30).[11]

Ambiguity Reduction Treatment. If bubbles are caused by institutionalization, as we hypothesize here, and because institutionalization is said to be related to ambiguity (Zucker, 1977; DiMaggio and Powell, 1983), then the magnitude of bubbles should be related to the degree of ambiguity present (H1c). To test the hypothesis, we designed an additional treatment that was meant to reduce ambiguity. Because the intrinsic value of the shares could easily be calculated, and was even provided in the instructions, one might assume that our experimental design eliminated uncertainty about prices. However, one cannot necessarily expect that elimination of such rational uncertainty will eliminate social uncertainty as to the *appropriateness* of

[10] With the exception of the first market, which had eight participants. Previously, bubbles were observed in substantially larger markets (e.g. van Boening, Williams, and LaMaster, 1993), so manipulation of this variable appeared unnecessary.

[11] Requiring participants to trade with (and risk) their own money would not have been appropriate, as it raises ethical questions and does not necessarily improve the generalizability of the results (Clark, 2002).

one's actions.[12] There may still be lingering ambiguity about the technology used to price the shares. This ambiguity is related to institutionalization, and if institutionalization is the cause of bubbles, then the level of ambiguity should be positively correlated with the severity of bubbles.

Thus, our treatment is meant to reduce ambiguity around the technology employed. Specifically, we gave the participants feedback on the correctness of the method they used to calculate asset prices. To compare the effect of ambiguity reduction, we conducted ten *additional* markets involving 60 participants and 424 transactions, following the method described above but with an added step: after completion of the Price Questionnaire, we reviewed the responses and gave each participant a score between zero and 10 based on the number of answers that were within ±5 points of the corresponding intrinsic values. Each participant received her or his score on a separate sheet of paper and saw it before proceeding to trade. To prevent bias, we did not indicate which answers were correct; we just provided a single number score as feedback.

We expected that providing a score would reduce ambiguity around the technology each participant used to produce his or her answers in the Price Questionnaire, and would result in lower institutionalization and less severe bubbles. This is a strong test yet again, because we did not provide guidance in the "right" technology, just a score representing the correctness of the technology used (cf. Westphal, Gulati, and Shortell, 1997).

Results

In total, the results are taken from a sample of 20 experimental markets comprised of 122 participants and 941 transactions. We replicated prior findings as we observed bubbles in most of the first ten markets. Although the Price and Assessment Questionnaires could have primed participants and certainly gave them a chance to plan their trading strategies at leisure, their trading behavior ultimately was not affected. Figure 1 illustrates the intrinsic prices, the prices declared in the Price Questionnaire, the actual prices obtained in trading over the 10 trading periods. It is clear that the average trading price is higher than the average present value of a share for much of the trading duration. Occasionally, it evens raises above the maximum present value (the sum of the highest possible dividends).

Importantly, we found that the average trading price was at odds with the average prices declared in the Price Questionnaire. Participants did not follow their own declared pricing strategies. We also found that discrepancies between market prices and intrinsic values were *increasingly correlated* among participants over time. We have no indication that bubbles were

[12] This, of course, is a tenet of institutional theory, and also appears in other treatments of decision making (e.g. Cyert and March, 1992).

caused by lack of knowledge. Quite the contrary: participants had *better* understanding of the theoretical pricing model *ex-ante,* but – astonishingly – seem to have partly abandoned that understanding during trading. We also found no evidence of overconfidence bias among participants.

[Figure 1 about here]

Ex-Ante vs. Ex-Post Pricing Skills. A comparison of average prices declared in the Price Questionnaire with those obtained in actual trading revealed that the prices declared *ex-ante* were better fit to intrinsic values. We used Haessel's R^2 (Haessel, 1978) to measure fit between the responses to the Price Questionnaire and intrinsic values and between the trading prices and intrinsic values. We found better fit *ex-ante* in nine out of the first 10 markets. Figure 1 shows an illustration of the discrepancy between the prices declared *ex-ante* and the actual trading prices. Other measures of bubble magnitude tell a similar story: prices in trading also had higher normalized average price deviation in nine out of 10 markets. This statistic was calculated by summing the absolute deviation between mean trading prices and intrinsic values for each period and dividing by the number of shares outstanding. Prices in actual trading also had wider price amplitude in 10 out of 10 markets. This statistic was calculated by finding the highest and the lowest discrepancies between intrinsic value and trading prices, subtracting the lowest from the highest and dividing by 100 (the initial intrinsic value). These measures have been used frequently to assess the magnitude of bubbles (King, et al., 1993; van Boening, Williams, and LaMaster, 1993; Porter and Smith, 2003; Dufwenberg, Lindqvist, and Moore, 2005). Taken as a whole, the findings suggest support for H1a and lack of support for H2a.

[Table I about here]

Overconfidence. We found no indication of overconfidence bias. Results obtained from the Assessment Questionnaire (Table II) suggest that participants generally viewed their own price assessment to be as precise as the others'. The same is true about their assessment of others' perception of themselves – they assumed that the others had a correct assessment of their own capabilities. Measures of Cronbach's alpha (Cronbach, 1951) show high reliability for each group of questionnaire items. Thus, we reject H3.

[Table II about here]

Decomposition of Price Discrepancy. The average discrepancy between a given market price and the matching intrinsic value can be decomposed into two components: *dispersion* and *common* (Hommes, et al., 2005). The former measures the deviation from a common pricing method while the latter measures correlation between discrepancies in the market. Formally, where *t* designates the trading period (1…10) and *h* is a counter of transactions, the average price for period *t* is:

$$\bar{P}_t = \frac{1}{h}\sum_{h=1}^{n} P_{ht}$$

(1)

The average pricing discrepancy can be decomposed as:

$$\frac{1}{10h}\sum_{h=1}^{n}\sum_{t=1}^{10}(P_{ht} - P_t^i)^2 = \frac{1}{10h}\sum_{h=1}^{n}\sum_{t=1}^{10}(P_{ht} - \bar{P}_t)^2 + \frac{1}{10}\sum_{t=1}^{10}(\bar{P}_t - P_t^i)^2$$

(2)

The first term on the right-hand side of equation (2) measures the dispersion between prices in market transactions. It is the squared distance between a price in a specific transaction and the average price for that period, averaged across transactions and periods. The less similar are prices in the market, the higher this component would be. The second term on the right-hand side measures the common component. It is the squared distance between the average price in a period and the intrinsic value for that period, averaged over periods. If price discrepancies are serially uncorrelated and uncorrelated with the discrepancies of others, this component will be zero. The higher the common component, the higher is the similarity between the pricing discrepancies in the market.

[Table III about here]

Table III reveals that the common component played a major role in the discrepancies between market price and intrinsic values. It accounts for most of the variance in all 10 markets but one. Moreover, as Figures 2 and 3 show, the common component tends to *increase* during trading, showing that errors became more correlated as trading progressed. This provides support for H1b and leads to the rejection of H2b.

[Figure 2 about here]

[Figure 3 about here]

Ambiguity Reduction Treatment. To examine the impact of the ambiguity reduction treatment, we constructed a dependent variable that measures the magnitude of institutionalization through the deviation of actual prices from those declared in the Price Questionnaire. Formally, we calculated a goodness-of-fit measure, Haessel's R^2, for the declared and actual value, and defined:

$$\Delta \boldsymbol{R^2} = \boldsymbol{R_d^2} - \boldsymbol{R_a^2}$$

(3)

Where $\boldsymbol{R_d^2}$ is Haessel's R^2 goodness-of-fit measure ex-ante (calculated from the Price Questionnaire responses) and $\boldsymbol{R_a^2}$ is the same ex-post (calculated from the prices in actual trading). A positive value means that prices in actual trading were a *worse* fit to the intrinsic value than the price declared in the Price Questionnaire. As discussed above, we find repeated deviations from the declared prices during actual trading. Using the deviation as the dependent variable, rather than absolute level of goodness-of-fit, controls for the base-level average skills in asset pricing and makes it possible to compare markets populated by participants with heterogeneous skills.

The results show that the ambiguity reduction treatment had a significant and negative effect on the magnitude of bubbles, as hypothesized. Table IV shows that while in the original treatment (first 10 markets) prices drifted away from the declared values during trading, the ambiguity reduction treatment effectively eliminated this drift and also reduced variance across markets. While bubbles were not completely eliminated, participants tended much more to adhere to their initial, individually-obtained understanding of the situation. A t-test comparing the means of the two treatments confirms that the ambiguity reduction treatment resulted in significantly ($p<0.05$) smaller bubbles ($df=15.44$; $t=2.52$), implying lower institutionalization in less ambiguous situations.[13] Thus, H1c is also supported.

[Table IV about here]

Discussion and Implications

We began by suggesting that while neo-institutional theory has emerged over the last few decades as one of the most influential theories of organization-environment relations, there has been very little research that either focuses on the micro-processes of institutionalization and/or

[13] We used T-test for two independent samples with equal variances not assumed. The results were similar when we conducted a U Mann-Whitney nonparametric test.

links such micro-processes to macro-outcomes. We proposed, designed, and tested a way in which this imbalance can be redressed; specifically, our study shows of how individual-level data can be used to assess the process of institutionalization and its aggregated market-level consequences, using the experimental and simulated context of an emerging financial market. In this way, we offer an original and unique contribution to the neo-institutional literature, complementing the purely macro-level studies typically found in the neo-institutional literature.

Our choice of empirical context was also intended to provide additional research contributions to the burgeoning domain of research that examines the sociological understanding of financial markets. Many of these studies have helped build the foundation for appreciating the role of sociological influences on market behavior. Our study builds on this foundation, yet stands in contrast to the tendency of prior research to look retrospectively at historical trends and offer institutionalization as a plausible explanation for otherwise puzzling trends. Instead, we design a prospective study using an experimental design that captures the mechanisms by which institutionalization is presumed to be driven. We show that evidence of institutionalization can be produced (and produced quickly) even in settings that are seemingly efficient from an economics standpoint and seemingly undersocialized from a sociological standpoint. The undersocialized setting of anonymous participants who cannot directly interact and are paid based on own performance distinguishes this study from those investigating norm emergence and maintenance in small groups within the tradition of social psychology.

Another related contribution is our ability to manipulate the level of ambiguity facing market participants and observe the changes in institutionalization. Consistent with neo-institutional theory, we find that where ambiguity is higher, the micro-processes of institutionalization take deeper root and generate greater prices bubbles. While ambiguity has long been considered a cornerstone of neo-institutional arguments for institutionalization, we believe our study is the first to directly test and empirically support this assumption.

While we have tried to accentuate the rarity of experimental studies of institutionalization processes in the context of financial markets, we have acknowledged and discussed the growing body of behavioral economics research in this area, along with the economic explanations for prices bubbles. In fact, we were able to create and use several variables that corresponded with such economic (and purely individual-level) explanations, which allowed us to rule out alternative explanations for our findings.

Overall, the results suggest that individual biases cannot be the sole cause of price bubbles. We found that participants exhibited better understanding of intrinsic value *ex-ante* than *ex-post*, but this understanding was apparently abandoned during trading, resulting in worse fit to

the fundamental model, higher price deviation, and higher amplitude *ex-post*. Because we have an indication of better knowledge ex-ante*,* individual-level skill deficiency or overconfidence alone cannot explain the deviations from the fundamental model. It is unlikely that time pressure is responsible for the poorer performance during trading, because participants spent double the time in actual trading (20 minutes) than answering the Price Questionnaire (10 minutes).[14]

Surveying the perception of participants about their own pricing skills and those of the others ruled out the possibility of widespread overconfidence bias. Taken together with prior work that documented bubbles even when speculation was not possible (Lei, Noussair, and Plott, 2001), these findings suggest little support for the Greater Fool explanation.

In contrast, we found that bubbles exhibited indicators of institutionalization: they were driven by increasingly coordinated action and responded to the level of ambiguity in the environment. A decomposition of price discrepancy shows how substantial the common component is in such discrepancies and highlights the increasing similarity in discrepancy as trading progressed. When this analysis is taken together with the evidence about better individual pricing skills *ex-ante* and the absence of overconfidence bias, it seems to indicate that bubbles originate from institutionalization of pricing technologies. If bubbles were the results of a pre-existing norm or anchoring, for instance, it is hard to see why errors would become *increasingly* correlated as trading progresses. Further indication that institutionalization is indeed responsible for the appearance of price bubbles comes from the ambiguity reduction treatment, i.e., by reducing/eliminating one source of institutionalization, we predicted and found a significant reduction in the deviation from participants' ex-ante pricing.

Our theoretical and empirical analysis problematize the tenet of neo-classical economics that emphasizes the presumed efficiency of markets characterized by atomicity, product homogeneity, perfect information, equal access to technology and resources, free entry, and no regulation (Hirschman, 1982). This presumption is central in public policy and is used both to justify regulation, as in anti-trust action, and in advocating less government intervention, as in privatization. The same is true among institutional economists: while they recognize that path dependency could result in institutions that are suboptimal, such outcomes are hypothesized to occur only when markets are less than perfectly efficient, for it is believed that, in an efficient market, suboptimal institutions will be eliminated by evolutionary forces (North, 1990; Scott, 2007). Even in sociological thought, which is generally indifferent about departure from market efficiency, it presumed that such departure will occur only under certain circumstances, such as the embeddedness of social and economic relations (Granovetter, 1985; Uzzi, 1997). Our results,

[14] It was recently shown that shortening the trading time, even by as much as a third, did not have a significant effect on any of the bubble indicators (Schoenberg, 2008).

however, show that markets, even in an ideal state of presumed efficiency, may be more institutionalized than commonly thought.

While we do not doubt that markets can lead to efficient allocation of resources, our research on institutionalization in financial markets seems particularly salient in the present economic situation. . Specifically, the financial crises of 2008 have come to symbolize the gloomy consequences of leaving markets to regulate themselves. As Alan Greenspan, who oversaw the Federal Reserve for 18 years, testified before the U.S. Congress: "those of us who have looked to the self-interest of lending institutions to protect shareholders' equity, myself included, are in a state of shocked disbelief," and proceeded to observe, "this modern risk-management paradigm held sway for decades…the whole intellectual edifice, however, collapsed in the summer of last year" (quoted in Andrews, 2008). Our findings demonstrate how institutionalization can rapidly take hold in even in a market where complete information is present, uncertainty is eliminated, and communication between participants is absent.

If institutionalization appears so rapidly and settles so profoundly in a synthetic market specifically designed for high efficiency, it seems reasonable to expect that even greater institutionalization can occur in real-world markets (financial or non-financial), given their inherent uncertainty, lower efficiency, and the presence of direct and frequent communication between market participants (Baker, 1984). Thus, markets may be realms of coordinated action, much like organizations, further blurring the distinction between the two social structures.

We believe that our design, with its blending experiment with simulation, alleviates generalizability concerns typically associated with experimental methods, i.e., the extent to which findings emerging from the laboratory correspond to behavior outside it. Specifically, we used a market structure that resembles modern financial markets (and may even be more efficient than them), we engaged participants that are trained in the relevant skills, and we motivated them to make good decisions by paying according to performance. Of course, our perspective is that there is value in using experiments to complement, rather than replace, other methods used by neo-institutional researchers.

An important extension of our research would be to apply a similar analytical lens to explain the *disappearance* of price bubbles. While some economists may retrospectively ascribe rationality to such events, our approach would see crashes as reversals of institutionalization. Understanding when they occur is akin to asking "how do institutions change or disappear," a question drawing increasing attention in neo-institutional theory in recent years (cf. Kraatz and Zajac, 1996). Another meaningful extension for future research would be to investigate how social interaction leads to institutionalization in markets. Recently, it was shown that small initial

differences can lead to dramatically different outcomes in markets for cultural products (Salganik, Dodds, and Watts, 2006). As our understanding of the micro-foundations of institutionalization processes continues to progress using multiple methods, the benefit to new-institutional theory would be gains in predictive power and understanding to explain the both incremental and more radical changes in institutional environments.

We began our study by noting that three decades after Zucker's (1977:728) important point that "macro-level and micro-level are inextricably intertwined," in the institutionalization process, multi-level assessments of such processes have been exceedingly rare. We hope that our study provides some momentum for reversing this imbalance, allowing institutional researchers to move more confidently from the analysis of individual behavior to behaviors and outcomes in important institutions such as organizations or markets. Given today's current economic crisis, it also seems clear that developing a deeper sociological understanding of institutionalization processes in financial markets could also have significant policy implications.

	Market									
	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a
Haessel's R^2										
Declared (D)	0.927	0.903	0.859	0.916	0.888	0.906	0.969	0.004	0.927	0.758
Actual (A)	0.552	0.962	0.691	0.698	0.069	0.747	0.896	0.000	0.810	0.525
A>D	No	Yes	No	No	No	No	No	No	No	No
Normalized Absolute Price Deviation										
Declared (D)	0.356	0.279	0.779	0.675	0.454	0.392	0.288	0.793	0.452	0.456
Actual (A)	0.594	0.176	0.567	0.757	1.342	0.394	0.167	1.289	0.203	1.856
A>D	Yes	No	No	Yes	Yes	Yes	No	Yes	No	Yes
Normalized Average Price Deviation										
Declared (D)	0.016	0.036	0.083	0.067	0.044	0.041	0.083	0.113	0.057	0.052
Actual (A)	0.142	0.040	0.120	0.131	0.162	0.092	0.034	0.204	0.039	0.295
A>D	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Price Amplitude										
Declared (D)	0.119	0.123	0.317	0.367	0.195	0.133	0.142	0.602	0.200	0.398
Actual (A)	0.678	0.149	0.560	0.443	0.786	0.479	0.186	0.785	0.395	1.329
A>D	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table I: Measures of Goodness of Fit, Price Deviation, and Price Amplitude for Average Declared versus Actual Prices

Construct	No. of Items	Mean	Standard Deviation	Cronbach's Alpha
Participant's self-assessment	3	2.90	1.04	0.79
Participant's assessment of the other participants	6	3.00	0.79	0.69
Participant's assessment of the other participants' perception of him/her	3	2.95	0.77	0.83

Table II: Items measured in Assessment Questionnaire

Market	Average Individual Error $\frac{1}{10h}\sum_{h=1}^{n}\sum_{t=1}^{10}(P_{ht}-P_t^i)^2$	Average Dispersion Error $\frac{1}{10h}\sum_{h=1}^{n}\sum_{t=1}^{10}(P_{ht}-\bar{P}_t)^2$	Average Common Error $\frac{1}{10}\sum_{t=1}^{10}(\bar{P}_t-P_t^i)^2$
A1	1809.811	30.990 (2%)	1778.821(98%)
A2	128.689	17.068 (13%)	111.620 (87%)
A3	1324.818	129.751 (10%)	1195.067 (90%)
A4	1231.000	155.975 (13%)	1075.025 (87%)
A5	3160.076	981.072 (31%)	2179.003 (69%)
A6	590.917	19.452 (3%)	571.464 (97%)
A7	254.326	164.033 (64.5%)	90.292 (35.5%)
A8	3358.302	143.153 (4%)	3215.148 (96%)
A9	281.455	59.723 (21%)	221.731 (79%)
A10	11839.706	2569.031 (22%)	9270.669 (78%)

Table III: Decomposition of the average individual pricing discrepancy into dispersion and common components

Treatment	n (markets)	Mean	S.D.
Original	10	0.211	0.246
Ambiguity reduction	10	-0.023	0.160

Table IV: Descriptive statics for $\boldsymbol{\Delta R^2}$ in two treatment conditions

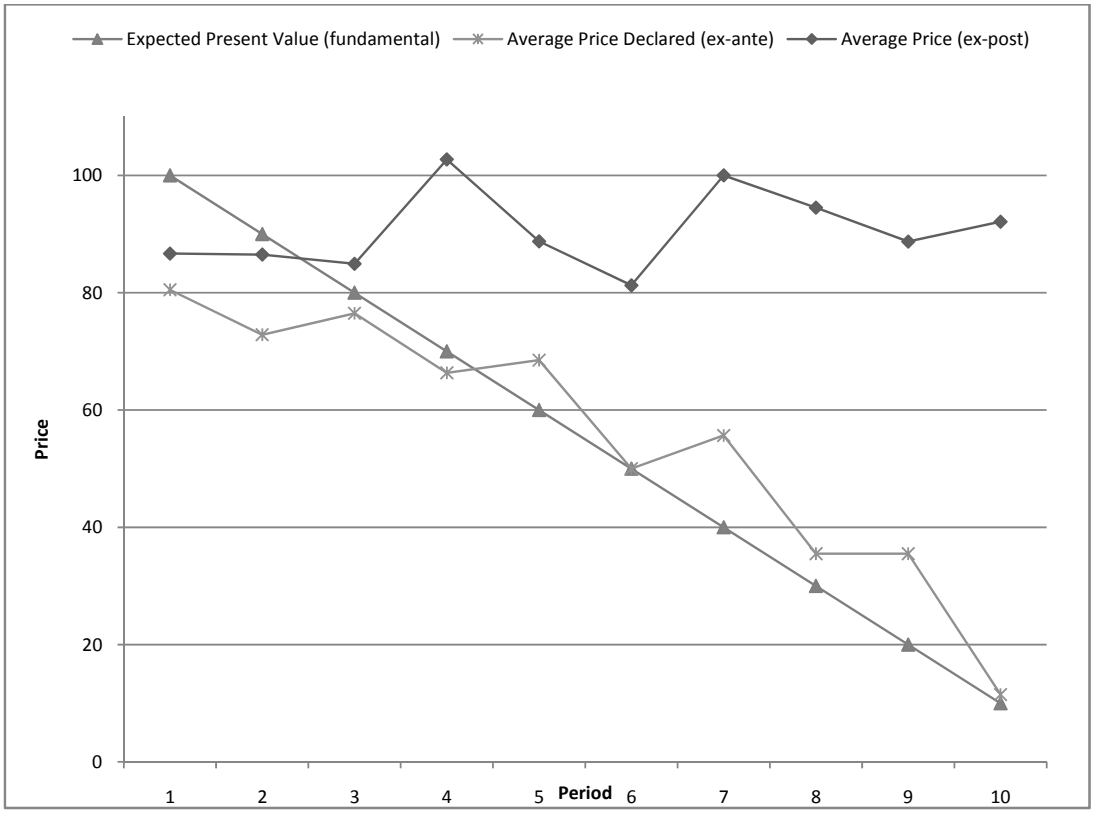

Figure 1: Illustration of expected present values (fundamental), average prices *ex-ante*, and average prices *ex-post*.

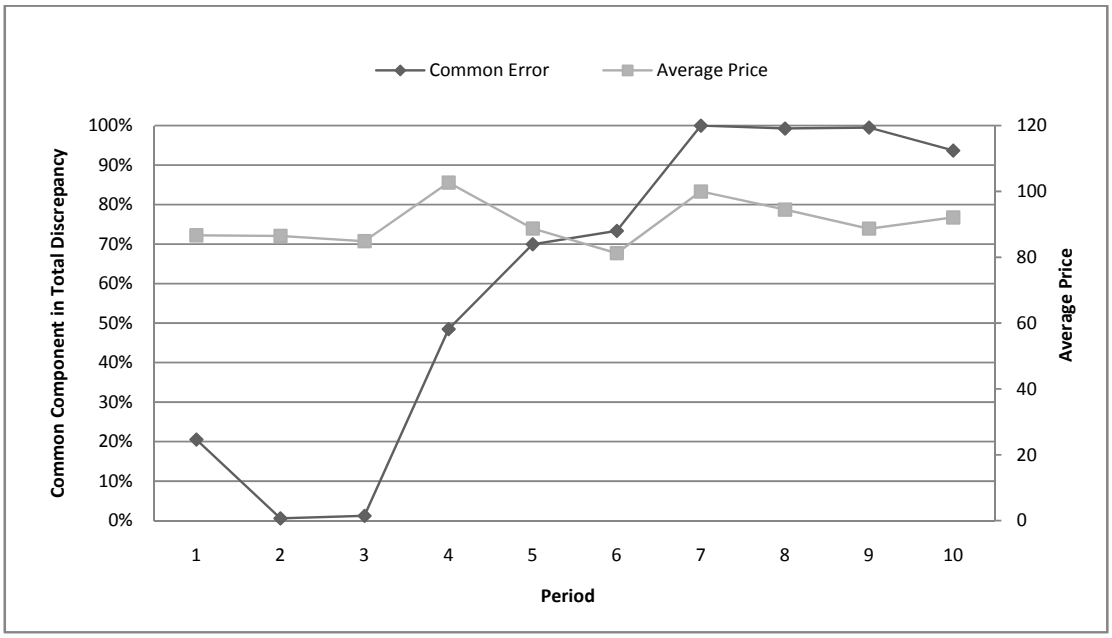

Figure 2: Illustration of common component in price discrepancy over trading periods

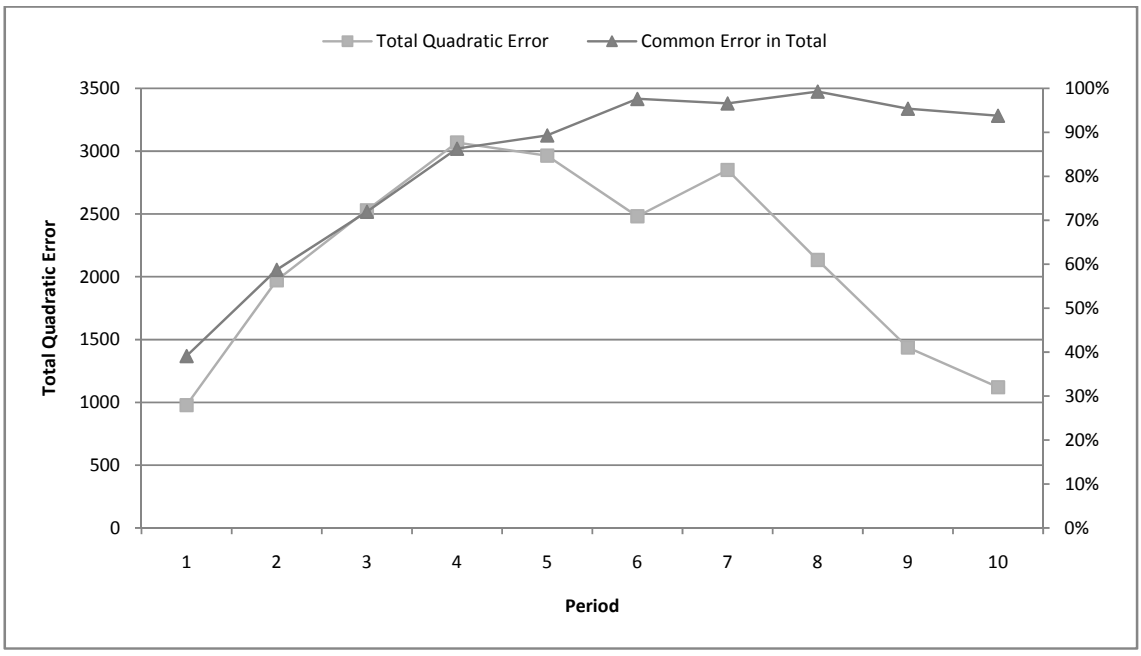

Figure 3: Total quadratic error and common component in total (average for all markets)

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