IDENTIFYING FACILITATORS AND INHIBITORS OF MARKET STRUCTURE CHANGE: A HYBRID THEORY OF UNBIASED ELECTRONIC MARKETS

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Submitted to 38th Hawaii International Conference on Systems Sciences, Kona, HI, January 2005

ABSTRACT

The electronic markets hypothesis (EMH) in the information systems (IS) literature suggests that information technology (IT) will reduce coordination costs across firms, leading to market-based forms of economic activity. With the advent of the Internet, we have seen a move to unbiased electronic markets. However, in some industries electronic hierarchies or biased markets predominate, contrary to the predictions of the impacts of IT suggested by the EMH. We present a hybrid theory to explain how moves to unbiased markets are facilitated and accelerated by IT. This is based on electronic markets and hierarchies theory, and the theory of market design. We explore how different forces and situational factors can inhibit the move to advanced forms of market-based organization. Together, these theories offer valuable insights to understand which forces will predominate with respect to whether a vertical market will be transformed to a biased electronic market or an unbiased electronic market. We analyze mini-cases in the context of three business-to-business e-commerce settings: fixed income securities, the electric power industry, and corporate travel services. The industries we have selected exhibit different outcomes which illustrate the value of the new theory relative to predictions involving market structure transformations.

INTRODUCTION

The electronic markets hypothesis posits that IT reduces coordination costs between suppliers and buyers, leading to the predominance of market-based forms of economic organization (Malone, et al., 1987). The primary drivers of this move are advanced communication technologies such as the Internet, which provide a technological platform that reduces information search costs. In this environment, a large number of products and suppliers can be evaluated by buyers in order to make well-informed decisions, which may result in unbiased electronic markets.

However, other IS researchers point out that, despite the existence of information and communication technologies, some industries which were expected to move to electronic markets have not done so. Possible explanations have emerged to explain this apparent contradiction, including the move-to-the-middle hypothesis and the risk-augmented transaction cost theory. On the other hand, Malone, et al. (1987, p. 484) recognize that the EMH leaves other important forces aside, such as stock prices, antitrust regulations, and interest rates. We propose a hybrid theory and analysis framework that aims to understand these forces. We will explain how IT favors or inhibits a move to unbiased markets. We will take into account recent advances in IT, and consider real world cases where the interaction of forces that transform industry structures can be observed. In this way, we hope to create valuable insights on the dynamics of market structure transformation in the presence of IT.

To facilitate this research, we leverage the theory of market design (Schwartz, 1995), which studies the design of market mechanisms or market microstructures that enable trade. We also identify product-specific, competitive and legal forces that, together with IT, influence market design choices that may affect a move to unbiased electronic markets. These theoretical
contributions provide insights to explain why, in the presence of IT, some industries move to unbiased markets and why others do not.

We next present the theory of electronic markets and hierarchies and the theory of market design. We combine elements of these two theories to form a hybrid theory of unbiased electronic markets. This enables us to characterize the main drivers of the move to unbiased electronic markets. In the third section we apply this theoretical development to the market structure transformation of the U.S. bond markets, the electric power industry, and the corporate travel market. In the fourth section, we analyze the facilitators and inhibitors of the move to unbiased markets in these industries. We conclude with a discussion of our theoretical contribution and directions for future research.

THEORETICAL BACKGROUND

Electronic markets and hierarchies theory and the theory of market design provide foundational theoretical perspectives that we can leverage to explain the move from hierarchies to markets. Our key insight in this paper is that their combination—a hybrid market design-driven electronic markets and hierarchies theory—will enable us to explain the extent to which an industry advances in its path to become an unbiased electronic market.

The Electronic Markets Hypothesis (EMH)

The EMH predicts that IT will lead to higher use of market transactions as a means to conduct economic activity. The economic rationale is that IT reduces market coordination costs, such as the cost of searching for suppliers, establishing contracts, and buying supplies in the spot market. The EMH also predicts that moves to market-based forms of economic organization will be gradual, in several stages; they won’t occur all at once.

Stage 1 is a move from electronic hierarchies to biased electronic markets, where suppliers
benefit from implementing systems that conceal or distort information about competitors. In Stage 2 competitive and legal forces lead to the adoption of unbiased electronic markets, where all options for trading are made available. Finally, in Stage 3, the proliferation of information in unbiased markets leads to personalized markets, electronic markets with functionality that allows buyers to filter the options available for trading.

Despite the theoretical predictions by several IS researchers, real world observations point out that IT has not necessarily been leading to the market-based forms of organization at the expected rate. For example, Hess and Kemerer (1994) analyzed the mortgage market in the financial services industry. They concluded that, despite conditions that favored a move to markets, electronic hierarchies and biased markets prevailed. Alternative hypotheses have emerged to explain the impact of IT on industrial organization. Clemons, et al. (1993) proposed a move-to-the-middle hypothesis. They recognize that IT may also reduce transaction risks. So buyers may prefer explicit coordination through long-term relationships with fewer suppliers over the purchase of supplies in the spot market. This outcome is comparable to the stage in the EMH where biased markets predominate. Wang and Seidman (1995) suggest that, due to negative externalities, it may be optimal for fewer suppliers to join an electronic data interchange (EDI) system. More recently, Kauffman and Mohtadi (2004a) proposed a risk-augmented transaction cost theory that is aimed at explaining why economic shocks (including both unexpected supply-side and demand-side events) might change the EMH’s predictions. They showed that the possibility of stochastic shocks that impact large buyers’ procurement may make them reluctant to transact in a market setting, and prefer more hierarchical approaches to transact.

Clearly, the EMH has not effectively explained the fall in the number of suppliers that
occurred in the automotive industry in the 1990s (Cusumano and Takeishi, 1991; Helper, 1991). To explain this, Bakos and Brynjolfsson (1993) proposed an interpretation based on the theory of incomplete contracts. They suggested that buyers have incentives to limit the number of suppliers to maintain supplier incentives to make non-contractible investments (e.g., quality, responsiveness, and innovation). Hence, the equilibrium number of suppliers may decrease in the presence of IT.

Although theories such as the ones described above help explain specific IT-driven outcomes for economic organization, there still is a need to develop a more unified theoretical perspective that can predict all these different outcomes. We next present the theory of market design, with its origins in Finance and application to financial markets, because we believe that it provides a useful complementary perspective that will permit us to craft our new hybrid theory of unbiased electronic markets.

**Market Design Theory**

In neo-classical economics, an exogenous mechanism selects prices that establish an equilibrium between supply and demand. The related theory—market design theory or market microstructure theory—attempts to illuminate this “black box” by taking an alternative view (Clemons and Weber, 1990; Levecq and Weber, 1997; Madhavan, 2000; Schwartz, 1995). Market microstructure is defined as the set of market participants, institutions and mechanisms that enable trade. It emphasizes that firms make explicit decisions to select trading prices and coordinate transactions that support exchange. Spulber (1999, p. 7) states that “[f]irms create and operate markets: setting prices, carrying out transactions, producing and distributing information, and forming and monitoring contracts.” From this perspective, equilibrium outcomes are the aggregate results of individual firm actions, including choices that affect a
market’s microstructure.

The theory of market design focuses on the economic consequences of a trading mechanism’s design. It has been extensively applied in the context of financial markets to understand how electronic trading influences liquidity, efficiency, and the distribution of wealth (Clemons and Weber, 1990; Pagano and Roell, 1996; Schwartz, 1995).

**IT and Market Design.** IT plays a role in the design of markets because it influences the market information that enables trade and exchange. In particular, new technologies often motivate different market design choices by firms. Some key features of market microstructure design that are influenced by IT are market transparency, market-making, price discovery, trading protocols, and market trading continuity. We now briefly discuss each of these in light of their potential role in refining the predictions of electronic markets and hierarchy theory.

*Market transparency* specifies the extent of the market information available to market participants (Hasbrouck, 1995; O’Hara, 1995), including pricing, product, and supplier information. In general, electronic trading increases the potential for market transparency. In turn, firms strategically decide whether to capitalize on this potential in two ways. First, they can make choices regarding the design of a market mechanism, such as their own Internet portal or an electronic exchange in which they have decision-making power (Granados, et al., 2005). Second, they can make strategic decisions to participate in trading based on information disclosure rules. For example, high-demand buyers may express concerns about sharing too much information about their demand forecasts, lest a “wired” supplier will exploit that information and turn prices against them (Kauffman and Mohtadi, 2004b). Similarly, large market participants often avoid trades in markets that require the disclosure of a trader’s identity, because it provides signals about their cost structure (Zhu, 2004) or their motivation to trade
Reliance on market-making is another important aspect of market design. To enable trade, some markets rely on intermediary firms that post buy and sell quotes (Madhavan, 2000; Spulber, 1999). These intermediaries are market-makers. They reduce the uncertainty risks of sellers and buyers by centralizing the trading process and setting trading rules. In general, IT that enables electronic intermediation transforms the roles that market-makers play to enable trade. For example, Internet-based air travel distribution has emerged in the 1990s through the creation of online travel agents (OTAs) and airline portals, forcing brick-and-mortar travel agencies to consolidate and shift their strategic focus towards value-added services.

Price discovery is another important aspect of a market’s design, which is defined as the process by which market prices are established. Price discovery involves the recognition by market participants that prices embed new information (Madhavan, 2000; Domowitz, 1995). Market mechanisms such as auctions have a dynamic price discovery process: every bid is a new information signal to determine transaction prices. Other market mechanisms, such as posted prices, are more static. In the presence of market-makers, price discovery is embedded in the prices at which they are willing to buy and sell, and their difference is the bid-ask spread. IT artifacts that reduce information search costs tend to reduce the spread enjoyed by market-makers (Spulber, 1999).

Trading protocols represent the rules of trading and transactional exchange. Protocols in exchange are often the result of ongoing business practices and transactional norms (e.g., in financial markets, same-day or next-day settlement of funds or trades), and may also reflect government regulations to ensure fair trading practices, market participation fees and other fixed transaction costs for the market participants.
Market trading continuity is the manner in which trading is possible relative to time (Madhavan, 2000). Electronic trading facilitates continuity because the reliance on human intervention decreases. Hence, the degree of automation of a market mechanism plays an important role in the level of continuity.

Market design theory suggests that, taken together, these information-related features of a market influence its performance. However, the optimal choice of trading arrangements means different things to different parties. Performance criteria can be classified in two general categories: market quality and welfare effects. We next present the role of these criteria in the assessment of market quality. This is important relative to the development of our hybrid theory of unbiased electronic markets because it permits us to assess the efficacy of the market design choices that firms make that ultimately influence the evolution of a market’s structure.

Market Design and Market Quality. Market quality measures the extent to which a market satisfies its participants. Drivers of market quality include liquidity, immediacy, economic efficiency and transaction costs. We next discuss them in more depth.

Liquidity is a critical driver of perceptions of market quality. We define it as the extent to which a buyer (seller) is able to find a seller (buyer) to complete a trading transaction in a reasonable amount of time at a reasonable transaction cost. Generally, the higher is the number of market participants, the higher is the market’s liquidity. Market design choices affect liquidity to the extent that they can create market concentration, or based on the degree to which they help to attract buyers and sellers (Domowitz, 1995). IT artifacts that enable market concentration can have an impact on liquidity. For example, computerized reservation systems (CRS) technology in the air travel industry enabled market concentration by allowing travel agencies to receive price quotes from all major airlines (Copeland and McKinney, 1988).
Immediacy is another indicator of market quality. It is the ability of the market to enable a transaction when a market participant so desires. Generally, immediacy is tied to the continuity features of market design and to an intermediary’s ability to match buyers and sellers. The higher the continuity, the higher is the level of immediacy in a market. For example, in manufacturing industries firms need resources in time to meet production schedules, so IT artifacts that enable continuous B2B trading improve market performance by increasing immediacy.

Economic efficiency is the aggregate value extracted from a trade by its market participants. Generally, by reducing information search costs, IT can improve economic efficiency by enabling mechanisms that permit buyers to find a product or supplier that best fits their needs. Similarly, IT may enable sellers to find buyers with higher levels of willingness-to-pay.

Transaction costs represent an important determinant of market quality for both buyers and sellers. The EMH recognizes that IT reduces transaction costs directly, by reducing coordination costs to find a trading partner, transact, and enter into a contractual agreement. In addition, IT can influence transaction costs to the extent that it affects the design of a market. For example, an IT-enabled market mechanism that reduces product complexity enables buyers to reduce costs from transaction risks and opportunistic behavior.

There are trade-offs to be made, since improving one aspect of market quality may hurt another one (Levecq and Weber, 2002). For example, an increase in market continuity increases immediacy at the expense of liquidity, because it reduces the amount of participants willing to trade at one time.

We now leverage these observations about the dimensions of market design and the indicators of market quality—in combination with the EMH—to further develop our thinking
about the specification of a hybrid theory of unbiased electronic markets.

A HYBRID THEORY OF UNBIASED E-MARKETS

The increase in market quality due to unbiased electronic markets generally is more evident for buyers than for suppliers. For buyers, unbiased markets generate liquidity and immediacy by making more trade items available for purchase at any point in time. They increase efficiency if there is a higher probability that they will find a product that better fits their needs. Suppliers, on the other hand, have incentives to maintain information advantages and explicit coordination with buyers in the form of biased electronic markets (Malone, et al., 1987). How then, can the aggregate IT-enabled strategies of suppliers result in the predominance of unbiased markets? What are the forces that drive this process? Likewise, what are the inhibiting forces of a move to unbiased markets?

A move to unbiased markets can be viewed as a process by which suppliers, in aggregate, evolve to favor and implement unbiased markets. Therefore, market design theory can provide valuable insights to answer the above questions, by interpreting how the different IT-enabled forces will lead most suppliers to favor market mechanisms that are unbiased, and similarly, the forces that may inhibit them from doing so.

We next propose the new hybrid market design-driven electronic market and hierarchies theory. This theory recognizes the contribution of the EMH in the move from electronic hierarchies to biased markets, and it incorporates the insights offered by market design theory in the move from biased to unbiased electronic markets. To characterize the key ideas, we offer the following brief explanation.

The driving forces in the move to unbiased markets are IT, competition, product characteristics, and behavior promoted by the legal environment of transaction-making and
regulatory compliance. Together, these forces promote a move to unbiased markets by influencing market design choices and their outcomes. Next, we explain how these forces interact in each stage of the move to unbiased markets, as depicted in Figure 1.

**Figure 1. The Driving Forces for Unbiased E-Markets**

![Diagram showing the driving forces for unbiased e-markets](image)

**Note:** The stages of the EMH are illustrated in the dashed rectangle. Link A represents the reduction in coordination costs and transaction risks due to IT, which leads to biased electronic markets. Link B shows the impact of IT on market design choices. Link C shows the impact of product characteristics and competitive and legal forces on market design choices. Link D shows that, together, these forces favor a move to unbiased electronic markets.

**Link A (Electronic Markets and Hierarchies).** The EMH suggests that IT facilitates the move to market-based electronic trading by diminishing coordination costs. However, as the move-to-the-middle (Clemons, et al., 1993) and other hypotheses suggest, IT does not fully eliminate the incentives for market participants to implement biased markets. Suppliers may not have full incentives to support a move to unbiased markets, where all purchase options that are
available for sale are clearly displayed to buyers. Therefore, other forces must come into play that facilitate the predominance of unbiased electronic markets.

**Link B (IT-Driven Market Design Choices).** IT enables new market design choices that improve market quality. Examples include Internet-based auction mechanisms that have created new markets and enhanced existing ones by providing liquidity, immediacy, efficiency, and low transaction costs (e.g. [www.ebay.com](http://www.ebay.com)).

First-movers will benefit most from proprietary technological innovations that increase market quality, but competition is likely to follow. For example, to fully exploit the benefits of reservation systems technology for air travel, Rosenbluth Travel developed an information system that consolidated travel offers from major CRSs to provide an unbiased, value-added service to its corporate travel customers (Clemons and Row, 1991). The company gained competitive advantage by improving liquidity and efficiency for its customers, through a wider variety of product offers tailored to specific customer needs. Soon competitors replicated this technological innovation, but at that point Rosenbluth travel had consolidated its position in the B2B travel agency services market worldwide. This leads to our first proposition:

**Proposition 1 (The Market Mechanism Competition Proposition):** In the presence of advanced ITs, suppliers and intermediaries will implement innovative electronic market mechanisms that improve market quality.

On the other hand, firms can take advantage of product complexity, asset specificity and incomplete contracts to lock in buyers through vertical relationships that capitalize on the buyers’ associated uncertainty risks, asset-specific sunk costs, and opportunism risk (Clemons, et al., 1993; Brynjolfsson, 1993). In these environments, biased market mechanisms provide market quality by reducing the transaction costs associated with these risks. Note that product complexity can also be embedded in the details of the purchase process. For example, products
that can significantly influence the economic outcome of buyers often require complex and
detailed evaluation of purchase options. This may explain why mortgage markets have not easily
made a move to unbiased markets, despite their information-intensive nature. The large potential
impact on the financial performance of dealers and investors requires complex evaluations of the
investment risk, including the financial stability and reputation of the issuer. In these cases,
biased market mechanisms reduce transaction costs for buyers by reducing transaction risks and
opportunism risks.

However, by reducing product complexity and asset specificity, IT may in turn reduce the
competitive viability of biased mechanisms. For example, motivated by the complexity of
airline schedules and prices, airline owners of CRSs originally enjoyed economic benefits by
controlling and selling airline schedule and price information through preferential agreements.
However, travel agencies developed technologies to aggregate, filter and simplify complex
information displayed by CRSs, to the benefit of corporate travel customers (Clemons and Row,
1991; Granados, et al., 2005). In response, CRSs have become more open and service-oriented.
This leads to our second proposition:

**Proposition 2 (The Biased Electronic Market Mechanism Competitiveness Hypothesis):**
In the presence of reduced product complexity and asset specificity due to advanced ITs, there
will be a reduction in the relative competitiveness of biased electronic market mechanisms.

Together, these two propositions suggest that IT creates competitive pressures for firms to
adopt unbiased market mechanisms. However, they fall short of suggesting that, through these
economic effects on firms’ market design choices, IT leads to the predominance of unbiased
markets. In other words, the notion that IT enables new market designs that improve market
quality and reduce the effectiveness of unbiased mechanisms does not imply that most firms will
favor and implement unbiased market mechanisms. This may explain why some markets have
remained biased despite the presence of IT. We contend that, together with IT, other factors and forces must be present in order for unbiased market mechanisms to prevail.

**Link C (Product-Specific, Competitive, and Legal Impacts on Market Design Choices).** Malone, et al. (1987, p. 492) remind us that “[p]roducers who start out by providing an electronic hierarchy or a biased electronic market will eventually be driven by competitive or legal forces to remove or significantly reduce the bias.” Our hybrid theory posits that these forces constrain a firm’s ability to compete with biased market mechanisms and eventually favor the use of unbiased market mechanisms. Further, the nature of a product may favor or inhibit a move to markets. Products with high digital product characteristics and low complexity are more prone to unbiased market mechanisms.

*Digital product characteristics* can be easily represented electronically, enabling information brokerage at a low cost. Since unbiased market mechanisms offer more product options to buyers, they are generally more information-intensive and require flexible tailoring and manipulation of information for buyers. Therefore, the higher are the digital characteristics of a product, the higher is the ability of firms to compete with unbiased market mechanisms relative to unbiased ones. Also, the ease of representing products electronically makes it more difficult for suppliers to distort or conceal information because there is competitive pressure from other players who can also provide this information at a low cost.

It follows that IT artifacts that enable digital representations of a product favor a move to unbiased markets. For example, in 2003 online retailer Amazon.com ([www.amazon.com](http://www.amazon.com)) introduced a “Search Inside the Book” feature on its Web site that allows customers to search the text of more than 120,000 books (*Economist*, 2004), effectively increasing market transparency in the book industry. Another example is IT that allows online exchange of music in digital
form, which has reduced transaction costs and supported transactional immediacy. This led to the creation of peer-to-peer music exchange markets that support direct artist-led selling and created pressure for record labels to re-evaluate their selling and distribution strategies (Bockstedt, et al., 2004).

Competitive forces tend to make unbiased market mechanisms more viable than biased ones. In the absence of product differentiation strategies, price competition prevails. This is the case of many commodity markets, where price is a key determinant of buyer preferences and possible product differentiation strategies are scarce. In these environments, firms will have an incentive to adopt IT-enabled market designs as strategies for differentiation, rather than fuel the losses from price competition.

In particular, facing the choice of implementing an IT-enabled unbiased market mechanism or competing with prices, firms will prefer to compete with unbiased market mechanisms. The implication is that potential incremental benefits from a biased market mechanism will not offset the potential losses that price competition brings. The implementation of unbiased market mechanisms further increases pressure to eliminate price discrimination. For example, Internet technology has allowed consolidation of international financial and air travel markets, diminishing the ability of firms to price-discriminate based on regional and national borders (Economides, 2001; Reuters, 2004).

Legal forces that have the capability to accelerate the move to unbiased markets arise from public policy that promotes a competitive environment, such as anti-trust laws, consumer protection laws, and regulations that prohibit predatory behavior by firms with market power. These regulations restrict a firm’s ability to compete with biased market mechanisms or favor the use of unbiased market mechanisms.
Some laws are explicitly developed to prohibit market design biases that favor a supplier. For example, in the 1980’s the airline owners of CRSs would give preferential treatment to their own travel options in travel agent screen displays (Copeland and McKenney, 1988), so regulations were created to prohibit this practice. In addition, laws that prohibit anti-competitive behavior indirectly favor unbiased mechanisms, because in the presence of regulations that make explicit price collusion illegal, suppliers may prefer unbiased mechanisms to tacitly collude and hence avoid losses from price competition.

This analysis of the forces that influence an IT-enabled move to unbiased markets can be summarized in the following proposition:

**Proposition 3:** *In the presence of high price competition, high digital product characteristics, low product complexity, and anti-competitive policies, an increasing move from biased to unbiased electronic markets will be observed.*

**Link D (The Move to Unbiased Electronic Markets).** The product-specific, competitive and legal forces described above, together with IT-enabled market design choices, lead to the predominance of unbiased electronic markets. However, there are inhibiting forces, which we discuss in the context of industry mini-cases presented next.

**INDUSTRY APPLICATIONS OF THE MODEL**

The robustness of a theoretical model is largely based on its ability to explain different kinds of outcomes that are observed for a given phenomenon. In our case, the proposed theory is intended to explain differences in the extent and amount of time it takes unbiased electronic market mechanisms to prevail. Some industries make it to that point sooner, while others arrive later (and possibly not at all). Thus, it is our goal to determine the extent to which the proposed theory is an effective *variance theory:* we wish to see how well its elements make different predictions related to the different kinds of outcomes that we observe in the marketplace. To
accomplish this, in this section we present and discuss three U.S. B2B e-commerce mini-cases: the bond market, the electric power industry, and the corporate air travel market.

**Case 1: Emerging Unbiased Electronic Bond Markets**

The markets for fixed income securities in the U.S. have traditionally been the province of a group of powerful investment banks that have been able to exercise considerable market power. The result for private corporations and public organizations that wish to issue bonds to obtain capital in the primary market, as well for investment management firms and individuals that wish to trade bonds in the secondary market, is that they have not been able to benefit from some of the efficiencies that are normally associated with the equities market. These include multiple market designs for trading (e.g., the New York Stock Exchange, NASDAQ, and the after hours crossing markets and electronic communication systems) (Levecq and Weber, 2002). Instead, for bonds, up until 1997 there were a few viable private electronic markets that permitted bond issuance and trading, but not many (e.g., Bloomberg, Morgan Stanley, First Boston Corporation, etc.) (Bond Market Association, 1997a).

There have been significant public policy debates related to the relative “opaqueness” of the bond market (Bond Market Association, 1997b). Prices have been difficult for investors to see because trade-related information has been closely guarded by the market-making investment banks. It has been in their interest to stall the move to newer market designs that permit fuller transparency (Kauffman and Lu, 2004). This practice is facilitated by the inherent complexity of bonds relative to equities. Firms that have one or two issues of stock (common and preferred) may have numerous bond series, reflecting coupon values and the maturity of the debt. In addition, some bonds are callable (can be paid off early), and thus embed options while others are not. Therefore, there may be millions of fixed income securities compared to a few thousand

During the 1990s though, the impacts of new technologies began to be felt (Economides, 2001). For example, in the beginning of the decade and prior to gaining authority as a primary issuer of bonds like investment banks, commercial bank J. P. Morgan innovated with a dial-in screened-based bond issuance market for “vanilla debt” (i.e., the most well known corporate names). Although the system, Capitalink, did not succeed, it nevertheless sensitized the market to the possibilities that technology held for transforming market design in support of bond issuance.

Then, during the growth of the Internet, other well known investment banks, government agencies and entrepreneurs staked out positions with technology-based approaches to the trade of various kinds of fixed income securities (Bond Market Association, 1998-2003). These included MarketAxess (www.marketaxess.com) for bond trading among institutional investors, the Bloomberg Municipal System (www.bloomberg.com), and the U.S. Treasury’s TAAPsLink (www.publicdebt.treasury.gov), among others. In fact, a variety of players in the marketplace put together different types of electronic markets, including: auction systems, inter-dealer systems, multi-dealer systems, single-dealer systems, and cross-matching systems (Bond Market Association 2003). The last of these brings together institutional investors and bond dealers in periodic Internet sessions, to give them a chance to “negotiate” somewhat more complex matches (e.g., complicated portfolio strategies and large positions).

Because of the existence of many single-dealer markets which are using the Internet as a means to involve their own institutional investment clients, there is still a good level of bias in the bond market. Some of these systems are reachable via the Internet, while others are only available through an intermediary, Bloomberg Inc., the preeminent quote vendor and financial
news network (Bond Market Association, 2002). They include Lehman Brothers (www.lehmanlive.com), Credit Suisse First Boston (www.csfb.com), Merrill Lynch (www.ml.com), Morgan Stanley (www.morganstanley.com) and J. P. Morgan (www.jpmorganexpress.com), among others, and reflect the fact that the prior “oligopoly players” are still using the new technologies to make markets for bonds based on client relationships, instead of a full-fledged market-based approach.

However, there have been significant advances in liquidity, transparency and market fairness in the trade of bonds thanks to Internet technology. Kauffman and Lu (2004) analyzed the structure and performance of digital bond markets in the U.S., and concluded that the range and depth of their innovations is path-breaking. We note the following representative examples: BondHub (www.bondhub.com) is an Internet-based cross-matching bond-trading digital intermediary. It provides an open, price-transparent, anonymous counter-party service for trading of municipal and corporate bonds and mortgage-backed securities. BondHub is primarily for financial advisors, mutual funds managers, and bond market-makers. Market participants are able to post bids and offers, as well as requests for quotes on an Internet-based secondary market trading system. A second example is the proprietary system, the Bloomberg Bond Trader (www.bloomberg.com). The firm provides customers with live bid and offer quotes of all contributing dealers in both a composite and attributed format. Portfolio managers and traders benefit from price discovery. Yet it gives them the flexibility to submit requests for single or multi-dealers orders and inquiries to aid in price discovery.

The Internet has provided a basis for pushing the capabilities for bond exchange beyond what was historically observed (Economides, 2001), when bonds were largely traded in biased electronic markets. In addition, it is clear that with this new technology has come greater
impetus for competition around new and enhanced market designs (Kauffman and Lu, 2004). But the emergence of unbiased electronic markets for bonds has been slowed down by their own nature. Bonds are not as commodity-like as stocks. So the considerations that are necessary to produce a high liquidity, immediate and transparent market process may still be affected by the inherent complexity of bonds. This may explain why only 10% of corporate bonds were electronically traded in 2000 (Allen, et al., 2001).

Case 2: The Move to E-Markets for Electric Power

The electric power industry has three supply functions: generation, transmission, and distribution. Once electricity is generated, it is transmitted to a distribution center, which in turn delivers it to final customers. This is accomplished through complex electric networks or grids.

The electric power industry has been vertically-integrated since its inception. Policy makers advocated single ownership of electricity’s production process in a location under the notion that a regulated electric power monopoly, through economies of scale, would lead to higher efficiency, lower costs, and hence lower prices for consumers. Led by the UK, since the 1980s several countries have introduced deregulation to increase market-based structures in the industry. Unbundling of the production functions is now common, where generation, transmission, and distribution are run by separate business units within a firm (or in some cases by different companies). In addition, independent producers that generate power for their own use (i.e. non-utilities) got access to the power grid in order to sell excess production. Nevertheless, natural monopolistic structures remain, especially in the transmission and distribution sectors, since it is economically unlikely that competitors will emerge for already well-established grid infrastructures.
In addition to these major structural and regulatory changes in the industry, e-commerce technology has become available to enable novel electronic market designs. Auction-based mechanisms are now common in the trade of U.S. electric power. In particular, power exchanges have emerged that allow firms to make bids and offers for electric power and transmission rights (Cramton, 2003). For example, in 1998 the California Power Exchange was established (www.caiso.com). In this exchange, sellers and buyers trade electric power a day in advance. However, inherent industry complexities have caused complications in the effort to develop efficient markets. These complexities are the inability to store electricity and transmission constraints (Cramton, 2003).

Because of an inability to store electricity, there is a need for markets to effectively balance real-time supply and demand. An imbalance can lead to waste of electric power or power outages. Therefore, close to the day of delivery, demand becomes price-inelastic. Strategic behavior by suppliers in this situation also results in higher prices, as experienced in several markets during peak periods since deregulation (Mount, 2000).

Power grids are fragmented geographically, so not all electric power supply is available to a specific region. In addition, transmission is constrained by potential network congestion. In auction markets for transmission rights, large power generators have incentives to withhold on offers in order to increase the price of the remaining offers. These incentives may result in sub-optimum power allocation and higher prices (Joskow and Tirole, 2000). Therefore, market mechanisms for electric power need to consider these issues in order to offer high market quality.

Despite the regulatory and technological changes in the electric power industry, a true competitive environment will take years to develop. In addition, by ignoring the complexities of the electric power market, instances of flawed market mechanisms have emerged that have
resulted in higher prices, power outages, and dissatisfied customers (Cramton, 2003). Government policy and competitive forces have yet to evolve to enable the development of sound and unbiased markets.

**Case 3: Unbiased Markets for Corporate Travel**

Corporate travel accounts for approximately 55% of total air travel passengers (PhocusWright, 2003). Historically, brick-and-mortar travel agencies created liquidity and efficiency in the market by searching for the best prices and services for business travelers. Travel agencies took advantage of the high complexity of airline prices and product description in computer reservation systems to intermediate the market. In addition, they aggregated demand for corporations to negotiate lower prices and value-added service with airlines (Clemons and Row, 1991), contributing to the segment of the industry known as managed business travel.

With the advent of the Internet, online travel sales increasingly threaten the market-making position of traditional travel agencies. In 2003, approximately 40% of U.S. airline tickets were sold via the Internet (Airline Business and SITA, 2003). An important driver of this trend is the increased level of market transparency facilitated by technologically-innovative, unbiased and customer-friendly online travel agencies (OTAs) such as Orbitz (www.orbitz.com) and Expedia (www.expedia.com) (Granados, et al., 2005). In the same year, approximately 20% of U.S. corporate travel revenue was managed online (Phocuswright, 2003), a significant amount relative to the overall percent of retail sales through the Internet, which was approximately 2% (U.S. Census Bureau, 2004).

However, while unbiased OTAs have successfully penetrated the leisure and unmanaged business travel markets, they are just beginning to make inroads in the managed business travel
segment. This is because, due to the service requirements of business travelers, there may be a limit to the value that can be extracted from Internet-based reservation-making (Chircu and Kauffman, 2001). Nevertheless, recently major OTAs have developed strategies to further penetrate the corporate travel business segment, and brick-and-mortar travel agencies such as Carlson Wagonlit Travel are being forced to respond with their own Internet-based market mechanisms that offer the lowest prices in the market (Reinan, 2004).

DISCUSSION

Electronic commerce technologies have facilitated a move from electronic hierarchies to electronic markets in the U.S. bond market, electric power, and corporate travel industries. In this section we discuss the different facilitators, inhibitors, and market design dimensions that explain each industry’s status in the move from biased to unbiased markets. (See Figure 2.)

Figure 2. Relative Status of U.S. Industry Sectors in the Move to Unbiased Markets

Note: Unbiased electronic markets are less predominant in bond markets than equity markets and less predominant in corporate travel than leisure travel. On the other hand, while electric power is increasingly traded through unbiased market mechanisms, the distribution function is still hierarchical in nature.
IT and Product Complexity: Electronic Bond Markets

Bonds exhibit a high level of product complexity relative to other financial securities. This may explain why the proliferation of unbiased market mechanisms has been slower than in equity markets. Technologies and innovative market mechanisms that reduce product complexity will further enable the trade of bonds through unbiased market mechanisms. However, IT-driven pressure to adopt unbiased market mechanisms is structurally weakened by the complexity of bonds, which still makes biased market mechanisms viable. Experienced market-makers and suppliers such as investment banks will continue to benefit from IT-enabled market mechanisms that focus on differentiated services to generate liquidity and provide efficient selling mechanisms that lock in dealers and investors, despite higher transaction costs. In contrast, equity markets have made a faster move to unbiased markets because product complexity is not an inhibitor in this process.

More generally, the higher the level of product complexity, the less is the pressure that IT exerts on suppliers and intermediaries to adopt unbiased market mechanisms. (See the Biased Electronic Market Mechanism Competitiveness Proposition). This is because firms can provide value-added services to simplify product complexity for the buyer. Buyers face uncertainty and opportunism risks that suppliers and intermediaries can mitigate by offering long-term contractual agreements and business relationships, resulting in the viability of biased markets.

IT and Legal Forces: The Electric Power Industry

The interaction of IT and legal forces that influence a move to unbiased markets is best represented by the case of the electric power industry. Deregulation and pro-competition laws have enabled a move to markets in an industry that was historically regulated to maintain hierarchical forms of organization. In addition, the move to markets was facilitated by the
commodity nature of electricity, where opportunities for product differentiation by power
generators and distributors are scarce. Therefore, in a few years after deregulation laws started
in 1985, market-based pricing and the introduction of centralized electronic exchanges were
initiated in several U.S. regions. This led to price competition and the decrease of market prices
(Silverman, 1994).

However, it is worth noting that recent research and analysis of U.S. electric power
exchanges suggests market design flaws have caused inefficient outcomes and monopolistic
behavior by suppliers in the electric power and transmission rights markets. Regulators have
ignored the inherent risks that exist because electric power cannot be stored, which makes power
generation and demand load uncertainties risky for suppliers and buyers.

Better price discovery mechanisms such as futures markets and negotiated contracts should
be considered to enable market valuation of these risks. This is consistent with the risk-
augmented theory of electronic markets (Kauffman and Mohtadi, 2004a), which suggests
hierarchical or biased market approaches are viable in settings where demand and supply shocks
add risk to trade.

**IT and Competitive Forces: Corporate Travel**

Competition for market transparency has led independent OTAs to penetrate air travel
distribution with unbiased electronic market mechanisms. However, the competitive forces that
favor unbiased electronic mechanisms in leisure air travel are mitigated in corporate travel by a
lower degree of price competition. The market power that corporations obtain through
consolidation of demand by travel agencies and the need for value-added services (e.g., handling
complex trips and time-sensitive itinerary changes) reduces the pressure on corporate travel
providers to compete with unbiased market mechanisms. Therefore, opportunities for product
differentiation make biased market mechanisms viable in corporate travel.

However, the battle for corporate travel consumers will continue. The current efforts of
OTAs to penetrate the managed corporate travel business will depend on their ability to design
market mechanisms that combine market transparency with an ability to provide quality service
to the business traveler. Likewise, brick-and-mortar travel agencies are responding to the
competitive pressure of better informed customers due to the Internet-enabled market
transparency, by reducing the level of bias of their market mechanisms.

CONCLUSIONS AND RESEARCH DIRECTIONS

We have proposed a new hybrid market design-driven electronic markets and hierarchies
theory to explain and predict the role of IT on market structure transformations. Our core
rationale is as follows: We assume that suppliers have economic incentives to adopt biased
market mechanisms. However, IT advances and product-specific, competitive, and legal forces
will create competitive pressure for firms to adopt unbiased market mechanisms, resulting in a
move to unbiased markets.

Our analysis suggests that the variance in extent or pace of the move to unbiased markets in
the bond, electric power, and corporate travel markets can be well explained by this hybrid
theory of electronic markets and hierarchies. In particular, we found that the inhibitors of a move
to unbiased markets are forces opposite to the ones that favor this move (i.e. high product
complexity in bond markets, low price competition in corporate travel).

As directions for future research, we propose analytical model development that explains
how IT, product-specific, competitive, and legal forces constrain a firm’s ability to adopt biased
market mechanisms, in favor of a move to unbiased markets, as well as more in-depth case studies of current real-world, IT-enabled market transformations to test and enhance our theory.

REFERENCES


