CAN YOU SEE WHAT I SEE? MARKET TRANSPARENCY, CONSUMER DEMAND
AND STRATEGIC PRICING IN B2C ELECTRONIC COMMERCE

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ABSTRACT

Internet technology has transformed the nature of business-to-business (B2B) and business-to-
consumer (B2C) transaction-making practices. One of the significant areas of impact has occurred with respect to the transparency of markets for end-consumers in many industries, including the market mechanisms, the prices, the quantities bid and offered, and the participating buyers and sellers. Market transparency is defined as the level of availability and accessibility of information about the product that is exchanged and the trading process. In the context of this recent reduction in the informational asymmetries of the marketplace, we propose a new theory-based framework to evaluate the potential impacts of transparency in B2C electronic markets. We also develop an economic model that allows us to examine the impacts of different levels of market transparency in the presence of firm-level strategic pricing decisions on consumer demand in the marketplace. We apply the findings from the model to the online travel agency (OTA) industry, where novel mechanisms with different degrees of transparency have emerged in recent years (e.g., Hotwire, Expedia, Orbitz, Travelocity and Priceline.com). Our results indicate that firms can take multiple approaches to increase their revenues by matching pricing decisions to the level of transparency provided by their market mechanism, which we now recognize as a key parameter of organizational strategy.

KEYWORDS: Business-to-consumer electronic commerce, economic theory, market transparency, pricing strategy, airline industry, online travel agencies.

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INTRODUCTION

The Internet revolution has brought about significant changes to “market transparency” in business-to-consumer (B2C) markets. Market transparency is the level of availability and accessibility of information about the product that is exchanged and the trading process, including prices and quality levels. (We provide additional justification for a related definition in the context of our review of the relevant literature.) Market transparency has reduced consumer search costs, and given consumers access to multiple purchasing channels and many new product options. In turn, sellers have obtained new avenues to attract customers and sell their products, and can now leverage innovative and new market mechanisms that are intended to increase the efficacy of transaction-making. In the process, however, senior managers in leading firms have come to recognize that the degree to which they make information available to the customer about the details of products, prices, inventories, delivery performance, warranty returns and other information has become a conscious and strategic decisionmaking process, apt to have an impact on the firm’s success in the market. As Eugene Polistuk, CEO of Toronto, Canada-based electronic manufacturing services firm, Celestica, asserts: “Before, companies guarded and filtered information. Now we’re all naked” (Ticoll, 2000).

The importance of this “Can you see what I see?” transformation of the market and selling environment in the presence of the Internet and related technological innovations has been widely recognized. Today, organizations are faced with the paradox that the very benefit of the Internet for corporations—making information available to facilitate product marketing and distribution—also makes it difficult for them to capture profits, according to Porter (2001). Sawhney (2002) takes a more aggressive stance, stating that the Internet has brought us one step closer to an “information democracy” by shifting the balance of power to consumers. However,
Adexa Inc. (2003), an automotive industry consultancy, states that “too much visibility” of information about products and production can expose firms to real risks, such as thinner margins. In order to address this issue, some consultants (e.g., Peoplesoft and Gartner Group) claim that embedded in their Enterprise Systems and Customer Relationship Management applications is the capability to implement information transparency strategies.

A good example of the revolutionary transformation of market transparency can be found in the air travel and online travel agency (OTA) industries. Travelers can now browse the Internet to make well-informed purchases about the many flights that are offered by large and small air carriers. When a consumer’s trip specification involves low complexity (e.g., the purchase of a domestic round-trip ticket), the consumer can act as her own travel agent, by either going direct to an air carrier’s travel booking Web site and eliminating the intermediary, or by going through an online travel intermediary, which consolidates booking information from the global distribution systems or direct from the airlines. These multiple channels, based on our preliminary research, appear to provide consumers with different levels of information about the travel services they hope to purchase. When a consumer’s trip specification involves high complexity (as is often the case with circuit trips involving multiple destinations and timed stopovers, multi-carrier ticketing and international trips), other factors become relevant in addition to transparency, such as Web site functionality, customers’ familiarity with the technology, and the experience of travel agents who can handle the product’s complexity.

The reader should consider the market for online travel services as it works today. On the high end of transparency are online travel agencies such as Orbitz (www.orbitz.com), Travelocity (www.travelocity.com), and Expedia (www.expedia.com), which display a wide range of travel options based on combinations of airline carrier, price, itinerary, and travel dates.
On the other hand, Hotwire (www.hotwire.com) offers a limited set of promotional fares, and the airline name and itinerary are only specified after purchase. On the lower end of transparency is Priceline (www.priceline.com), which shields price and product information until the consumer makes a contract-binding bid. (See Figure 1 for some initial indications of market transparency that a traveler who wishes to book any airline will encounter at Hotwire and Priceline.)

As the OTA example suggests, Internet technology has expanded the feasible levels of transparency by increasing the ability to reveal or conceal product and price information. But has this transformation tilted the balance in favor of the final consumers? If so, what are the implications for demand, prices, and market structure? And what can organizations do proactively to confront the challenges triggered by this information revolution? In this paper, we address these questions by developing a simple model of consumer demand and market transparency. The model is based on existing findings from the market microstructure literature in Industrial Organization and the financial market design literature in Finance.

We offer three primary contributions in this work. First, we provide a framework to define and classify various industry and transaction-making settings in terms of the concordance between their predicted and observed transparency in electronic markets. Second, we study the implications of market transparency on market demand. Third, our results show how firms can increase revenues by basing pricing decisions on the level of transparency provided by the market mechanism that they select. Taken together, these contributions offer interesting insights for both the academic and industry audiences, and encourage us to develop a more broadly-based research initiative on the impacts of market transparency in the e-commerce domain.
Note: To illustrate the first hints of market transparency that greet a consumer who wishes to use Hotwire and Priceline, we began the process for booking a round-trip fare for one of the co-authors departing October 17, 2003 from Minneapolis-St.Paul Int'l (MSP), and returning October 22, 2003 from Atlanta/Hartsfield Int'l (ATL).

- **Priceline**: Will book a ticket with a price matching bid price by traveler; no choices of airlines or tickets—just the matching flight; travel to occur in 6am to 10pm time frame; no control over air carrier; no more than one stopover. No guarantee that ticket is available at the bidder’s price. Taxes and processing fees presented.

- **Hotwire**: Will book a ticket from available fares selecting lowest price for traveler; no choice of carrier; flight time information not given prior to ticketing. Will result in an available ticket, since traveler is not asked to make a ticket price bid. Booking fee shown, but taxes built into ticket price.

Additional transparency issues arise for the traveler between the time that he specifies the trip details, does a sign-up procedure and gives credit card information, and makes a query on the Hotwire and Priceline ticket databases. We present more details later in the paper.

The rest of this paper is organized as follows. The next section provides the basis in the literature for a working definition of market transparency for this research. We also develop and discuss the elements of a transparency evaluation framework for B2C e-commerce. In the third section, we present and analyze a revenue maximization model for market transparency in terms of firm pricing decisions and the resulting consumer demand. The fourth section briefly discusses the broader implications of our findings, both in the OTA industry and with respect to other industries that also can manipulate market transparency in their organizational strategy.

INFORMATION REVELATION AND TRANSPARENCY IN B2C MARKETS

To provide a foundation for our market transparency and strategic pricing model, we define market transparency in terms of the relevant theoretical work. A second related task is to characterize the implementation and operation of different levels of market transparency in the marketplaces that we study. We do this through a new theoretical framework.

Defining Market Transparency in B2C Markets

The transparency of transaction-relevant information can take on multiple interpretations, depending on the context in which it is analyzed. In this section, we build on extensive literature on transparency in financial markets to propose a definition of transparency in B2C markets.

Transparency in Financial Markets. Most of the literature on information revelation and transparency has been built up in the context of financial markets, where researchers have explored the extent to which greater transparency in security trading in the financial markets leads to higher market efficiency and liquidity (Biais, 1993; Lyons, 1994; Gemmill, 1996; Madhavan, 1996; Pagano and Roell, 1996; Kofman and Moser, 1997). The main motivation for this line of research has been the ongoing policy debate about the appropriateness and breadth of the publication of information related to financial market trades (Schwartz, 1995). This literature
defines market transparency as the ability of market participants to observe information about the trading process (Harbrouck, 1995; O’Hara, 1995; Board and Sutcliffe, 2000). By obtaining more information about the trading process, including order flow, transaction history, quotes, and the identities of the traders, buyers and sellers are in a position to obtain economic benefits that would be otherwise be held up by market intermediaries, or inappropriately distributed, since financial market design involves multi-lateral bargaining among investors, dealers, market-making intermediaries and the regulators.

Market transparency is different from information transparency, defined by Zhu (2002) as “the level of availability and accessibility of information”. On the other hand, these two concepts are related. Market transparency exists when information is made available that provides value to a market participant. Greater information transparency is necessary for greater market transparency, which is probably why these terms have been used interchangeably (e.g. Zhu, 2002, Grover, Ramanlal and Segars, 1990).

Financial market order flow information provides a picture of market supply and demand through buy and sell orders (Pagano and Roell, 1996; Madhavan, 1996; Lyons, 1994). Aggregate measures, such as the difference between buy and sell orders, give market participants an idea about the pressure to buy or to sell a given financial instrument. Transaction history includes information about past order flow. Its availability is sometimes referred to as post-trade transparency (Pagano and Roell, 1996; Biais, 1993). In B2C markets, posted-price mechanisms make order flow transparent mainly to sellers, because buyers usually have information only about their own transaction. For example, in the air travel industry, airlines use aggregate history and estimates of demand to make strategic scheduling and pricing decisions, while a traveler is usually uninformed and hence relies on the information provided by the selling agent. In
addition, dynamic-price mechanisms, such as auction markets like eBay, reveal useful information for transacting buyers and sellers that changes over time, increasing willingness-to-pay on the part of the buyer and liquidity for the seller.

Another useful kind of information that is often revealed in financial market settings is *price quotes* (Pagano and Roell, 1996; Biais, 1993). These are price-quantity combinations of a financial instrument at which market participants are willing to trade. Quotes to buy or sell are called *bid prices* and *ask prices* (or *offer prices*), respectively. Dealers and market-making intermediaries may take a trading position for a security by posting a bid and ask price, such as what is seen with market specialists at the New York Stock Exchange. The difference between the bid price and ask price is called the *bid-ask spread*, and it represents the margin that intermediaries require to engage in trade. The Finance literature characterizes the public revelation of the bid-ask spread as being commonly associated with *pre-trade transparency*. In B2C markets, producers and retailers post selling prices to provide transparency regarding the ask price. However, they usually do not publish opportunity costs or the lowest prices at which they are willing to sell, effectively concealing margins or bid-ask spreads from consumers.

Another important determinant of transparency is the *identity of the trader* (Kofman and Moser, 1997). This provides clues about the reputation and motivation for trade (Narayan, Neuberger and Viswanathan, 1999). The motivations for making trades in financial markets include long-term investing, speculation, intra-day market-making, or immediate liquidity needs. Not all markets provide an equivalent degree of information revelation about the seller and the buyer. In fact, in many financial market settings, to ensure fair market operations—especially when there is trade occurring in large lots of a security—information on the seller is withheld until a transaction is completed. Similarly, buyers may also not be well served by the revelation
of their identities. In B2C markets, in contrast, the seller’s identity is commonly posted together with the selling price. But the consumer can hide his or her identity until transaction completion.

Domowitz (1995) breaks down the impact of transparency in financial markets into two categories: provision of liquidity and improvement of the price discovery process. He defines financial market liquidity as “the capacity to quickly execute orders near the last-sale price” (Domowitz, 1995, p. 390). Liquidity can be further classified in into two components. Insider liquidity is provided by market intermediaries who aggregate and match orders (Spulber, 1999). Outsider liquidity comes from outside investors who make bids and offers. In B2C electronic markets-based selling, liquidity can be viewed in a similar way, with insider liquidity provided by digital intermediaries and outside liquidity provided by sellers and buyers. Outsider liquidity is obtained when a market attracts many buyers, which increases the probability that a consumer’s valuation will match the offer made by a seller or intermediary (Spulber, 1999).

**Transparency in B2C Markets.** Relevant to our B2C electronic markets context is an observation made in an equity research report by Morgan Stanley Dean Witter (2000). It notes that market transparency is composed of several elements: price transparency, product transparency, supplier transparency, and availability transparency.¹ We will focus on just two, product and price transparency. Product transparency (also called characteristics transparency) exists when the characteristics of the product are made available (Mollgard and Overgaard, 2001), while price transparency exists when information about the trading process is made available, such as quotes and transaction prices. A more transparent market will result from

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¹ Availability transparency refers to the extent to which inventory information on the seller’s side is available to potential buyers. Supplier transparency refers to identifying the identity of the supplier. This information may be valuable to the consumers in several ways. For example, Sinha (2000) suggests that the Internet often allows consumers to ascertain sellers’ costs, which allows them to negotiate or stand firm on lower bids, effectively reducing market prices. Both of these transparency dimensions are relevant in our air travel and OTA setting which we will shortly discuss, however, since this research is still in the exploratory stage we do not model them directly. Instead we focus just on price transparency and product transparency.
greater transparency in one of these dimensions. Thus, we propose the following operational definition of B2C market transparency:

**Definition 1 (B2C Market Transparency).** *The level of availability and accessibility of information about the product for which an exchange transaction is made, as well as information about the trading process that supports the exchange.*

Notice that, contrary to the financial markets literature, this definition highlights the importance of *product information* for two reasons. First, consumer behavior researchers have found evidence that consumers may view a product with suspicion upon the absence of information about a salient attribute. For example, Johnson and Levin (1985) observed lower product ratings when the appropriate product information in a purchase process was missing. Thus, it is important to consider the dimension of product information to understand transparency in B2C markets.

Second, in financial markets, financial instruments typically are fungible: one share of a stock in IBM Corporation is the same as any other share, and their prices rise and fall in response to the same demand and supply conditions in the marketplace. You don’t need to see any specific instance of the exchange goods. However, due to the complexity of describing the risk characteristics of a security, traders try to infer value from signals embedded in the trading process, especially in the prices for quantities exchanged. In other B2C markets, we see a different situation. In addition to information about the trading process, explicit information about characteristics of the product is expected because consumers are not indifferent about buying any instance of a product (e.g., used cars of different quality, an airline seat on a Minneapolis to Atlanta flight at 6:00 a.m. or 10:00 p.m., etc.).

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2 Domowitz (1995) offers a related characterization of *full transparency* in financial markets as the set of information that provides all relevant *ex ante* and *ex post* information about the trading process. His definition provides a higher level of generality than what we are considering in this paper for B2B electronic markets.
Recognizing that consumers in B2C markets value product information, Table 1 lists determinants of market transparency for consumers, categorized by the product characteristic it describes and the consumer objective it satisfies.

**Table 1. Determinants of B2C Electronic Market Transparency for Consumers**

<table>
<thead>
<tr>
<th>PRODUCT CHARACTERISTICS</th>
<th>CONSUMER OBJECTIVE</th>
<th>Minimize</th>
<th>Maximize</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quality</td>
<td>Cost</td>
<td>Time</td>
</tr>
<tr>
<td>Digital</td>
<td>Warranty</td>
<td>Price</td>
<td>Price comparison</td>
</tr>
<tr>
<td></td>
<td>Privacy policy</td>
<td>Delivery</td>
<td>Delivery time</td>
</tr>
<tr>
<td>Non-Digital</td>
<td>Service quality</td>
<td>Warranty</td>
<td>Warranty</td>
</tr>
<tr>
<td></td>
<td>reputation</td>
<td>Tax</td>
<td>Tax</td>
</tr>
<tr>
<td></td>
<td>Product positioning</td>
<td>Production cost</td>
<td>Production cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transaction history</td>
<td>Transaction history</td>
</tr>
<tr>
<td></td>
<td>Friendliness</td>
<td>Risk of use</td>
<td>Risk of use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Search capability</td>
<td>Search capability</td>
</tr>
</tbody>
</table>

**Note:** The consumer objective categorization and the content in each cell was adapted from Keeney (1999), who interviewed over 100 Internet users to identify consumers’ information needs.

*Digital product characteristics* are *information-based features*, such as programming code or the travel itinerary in an airline ticket. *Non-digital product characteristics* are ones that cannot be easily transformed into digital form, such as smell or friendliness, which are *experience-based features*. We classify *determinants of transparency* based on individual contribution towards the goals of maximizing quality, comfort, and integrity, and minimizing cost and time.

**From Definition to Representation: Modeling Preliminaries**

We next model a firm that selects a *market transparency strategy tuple*, [Product Information Available, Price Information Available], under the assumption that both price and product information are key determinants of market transparency. Figure 2 depicts the space of possible strategy tuples that a firm may select.
Figure 2. Market Transparency Space in B2C Electronic Commerce

Note: Here, $i$ indicates a subset of information that a B2C seller makes available to the consumer from the superset of all possible available information $I$ on the product. Similarly, $j$ denotes the subset of information available out of all possible available information $J$ on price-related aspects.

The combined value of product and price information is not necessarily a monotonically increasing, continuous function, and the actual perception of value will differ for the buyer and the seller. Sellers, in general, will tend to prefer less price transparency, unless they fashion a strategy that is aimed at leveraging the revelation of all price information in the market (as we have seen with shopbots such as MySimon.com and DealPilot.com). In addition, the marginal contribution to value of an additional piece of information may be complex to measure or calculate. Increasing the complexity, it is also likely that the value associated with a given market transparency strategy tuple, $(i, j)$, selected by the seller will depend on other related factors, including the firm’s approach to market segmentation and price discrimination, as well as the kind of product or service that is actually being sold. For example, when try-or-buy “contingent pricing” is used, the weight of the consumer’s evaluation shifts away from price to the actual experience that is obtained for a service or the performance of the good (Bhargava and Sundaresan, 2003). Thus, we have concluded that there is inherent complexity in deriving a
transparency function. And so, rather than specifying a function of the value or utility of market transparency, we propose a framework to assess the potential for transparency to affect value.

A Transparency Framework for B2C Electronic Markets

We define transparency potential as the closest point to full transparency that is feasible in a given market setting. Regarding product transparency, the more digital are the characteristics of a product (up to the point where the product becomes a pure information product), the higher is the potential for product transparency when the product is traded electronically. For example, airline tickets are information-based products that can be described electronically better than tangible goods, such as food or clothes, or intangible goods, such as tax consulting services or home repair services, whose description will be even more complex. Regarding price transparency, the literature on financial markets suggests that market mechanisms that generate more information about the trading process have a higher potential for price transparency. Therefore, we propose a framework that classifies transparency potential in B2C electronic markets based on product characteristics and market microstructure. (See Table 2.)

Table 2. Transparency Potential in B2C Electronic Markets

<table>
<thead>
<tr>
<th>TYPE OF PRODUCT</th>
<th>MARKET MICROSTRUCTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Static</td>
</tr>
<tr>
<td>Digital</td>
<td>Low price transparency</td>
</tr>
<tr>
<td></td>
<td>High product transparency</td>
</tr>
<tr>
<td></td>
<td>Example: airline tickets</td>
</tr>
<tr>
<td>Non-Digital</td>
<td>Low price transparency</td>
</tr>
<tr>
<td></td>
<td>Low product transparency</td>
</tr>
<tr>
<td></td>
<td>Example: clothing</td>
</tr>
</tbody>
</table>

Product transparency is potentially higher when the product characteristics are digital. While in reality most goods have a combination of digital and non-digital characteristics, the point is that the higher the degree of digital characteristics, the higher is the potential for transparency in B2C electronic markets. Conversely, the greater the extent of non-digital characteristics, the
higher is the potential for transparency in channels where physical inspection or live demonstrations are possible.

Furthermore, the more dynamic the trading process, the higher is the potential for price transparency. Static markets are those where posted prices prevail and changes occur over a relatively extended period. Dynamic markets are those where prices fluctuate constantly based on demand-supply pressures (hence the term “dynamic prices,” as we mentioned earlier), such as in double auctions where both buyers and sellers can influence transaction prices. With some exceptions, the more dynamic the process of price-setting in a market, the more information related to prices is potentially available to its participants.

Industries can be positioned in a quadrant of the framework based on their product and market characteristics. For example, at the low end of product and price transparency potential are tangible goods such as food and clothes, which defy accurate description on the Internet (e.g., how they taste, how they feel to the touch, and how they fit the shape of a person’s body). At the high end of transparency potential is securities trading. Securities are information goods that are traded using dynamic market mechanisms such as auction or dealer markets.

Our framework is also useful to understand the viability of technological support for transaction-making. New technology that transforms non-digital product characteristics into digital form increases transparency potential in electronic markets. In terms of the framework, this technology causes a shift from the bottom quadrants to the upper quadrants. For example, technological developments to convert music and photos into digital form have increased the potential for product transparency in B2C electronic markets, enabling fast and inexpensive distribution via the Internet, spurring new products and business, and challenging the status quo of their respective industries.
In addition, technological advances may enable market mechanisms that provide higher transparency compared to traditional trading practices. In terms of the framework, these novel mechanisms cause a shift from the left quadrants to the right quadrants. For example, the success of eBay may have come, in part, because it laid bare the strategic vulnerability of traditional posted-price, static mechanisms for selling goods. Although eBay originally started with a traditional business concept as an auctioneer of collectibles, its expansion strategy came to include auctions of any products for which it was able to structurally increase price transparency for sellers and buyers in many industries, thus increasing liquidity (Chircu and Kauffman, 2000).

The concept of market transparency may come across as complex or elusive. We hope that we have dispelled this faulty notion for the reader. We developed our conceptualization of market transparency in the context of B2C markets, based on existing literature on market microstructure and transparency in financial markets. We proposed a conceptual framework that characterizes market transparency in B2C electronic markets based on the type of product that is exchanged and the type of market in which exchange occurs. *First,* we noted that products that are on the high or low end of the transparency dimension are so positioned due to the proportion of their digital and non-digital characteristics. The greater are the digital characteristics of a product, the larger is the potential for product transparency when it is exchanged in a B2C electronic market setting. *Second,* conceptualizing transparency based on market microstructures facilitates the assessment of potential for price transparency. With some exceptions, the more dynamic the price-setting mechanism, the higher is the potential for price transparency.

**THE IMPACT OF MARKET TRANSPARENCY ON CONSUMER DEMAND**

Based on the operational definition and framework we proposed, we will now model the impact of transparency on consumer demand and the implications for a firm’s pricing decisions.
To give this analysis more contextual meaning to assist the reader, we have chosen to apply it to the air travel and online travel agency (OTA) industry, where new market mechanisms with different levels of market transparency have emerged.

In this section of the paper, we characterize three different market transparency impact scenarios. In one scenario, we assume transparency impacts the liquidity of market exchange. In a second scenario, we explore the impact of transparency on the price and product discovery process. Finally, a third scenario combines these effects of transparency and derives a more complex set of implications. Before we set up the details and analyze each scenario, we provide background description of the online air travel industry.

The Online Air Travel (OTA) Industry

Online travel agencies emerged in the 1990s to sell travel services over the Internet. Table 3 describes four different types of OTAs and their respective market transparency levels.

<table>
<thead>
<tr>
<th>EXAMPLES</th>
<th>PRICE TRANSPARENCY</th>
<th>PRODUCT TRANSPARENCY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orbitz, Expedia, Travelocity</td>
<td>High</td>
<td>High</td>
<td>Multiple airlines, itineraries, and fares</td>
</tr>
<tr>
<td>Britishairways.com, Delta.com</td>
<td>High</td>
<td>Medium</td>
<td>Multiple itineraries and fares on one airline</td>
</tr>
<tr>
<td>Hotwire</td>
<td>Medium</td>
<td>Low</td>
<td>Price quotes with no information about airline or specific itinerary</td>
</tr>
<tr>
<td>Priceline</td>
<td>Low</td>
<td>Low</td>
<td>Price bid, no information until purchase completed</td>
</tr>
</tbody>
</table>

Note: For the purposes of analyzing OTA market transparency, we distinguish between “price transparency” and “product transparency.” Price transparency is characterized by the extent of the information that is available related to the price and exchange process. Product transparency is the extent to which the characteristics of the product are made available to the consumer. We make no assertion about which, if either or both, provide a more effective basis to support market exchange in airline tickets. This probably depends on the firm’s strategy.

Two types of OTAs offer higher levels of transparency to the consumer. One type is an independent OTA such as Orbitz, which offer multiple combinations of air carrier, itinerary, and
fare information related to a given reservation request. The other type is an airline portal such as britishairways.com. Airline portals are an automated extension of the airlines’ physical reservation offices, which can normally be accessed either by phone or by going to a reservation “ticket office” in person. These Web sites tend to be less transparent than the airline consortium Web sites because they offer travel options for only one airline rather than multiple ones. As a result, there is no opportunity for the consumer to do much price comparison and price shopping.

Two OTAs that have introduced novel market mechanisms are Hotwire (www.hotwire.com) and Priceline (www.priceline.com). Both offer lower levels of market transparency to the consumer than traditional distribution channels, but, in exchange, consumers may get lower fares. In Hotwire, the traveler requests a ticket based on origin, destination, and travel dates, and Hotwire responds with a set of ask prices that the consumer can evaluate. Information about the airline and the specific itinerary is only revealed after the purchase is completed.

On the other hand, Priceline patented and introduced a “name-your-own-price” market clearing reverse auction mechanism, where customers bid for an airline ticket while specifying the origin, destination, and travel dates. Priceline agrees to sell the ticket if a carrier agrees to provide one that meets the required characteristics at an ask price lower than or equal to the consumer’s bid price. Once a consumer’s bid is submitted, if the bid is accepted, the consumer must pay the bid price. However, prior to purchase completion, the consumer does not receive information about carrier, itinerary, or available ask prices. The difference is that Hotwire provides transparency regarding ask prices, while Priceline does not. (See Appendix.)

Scenario 1: Impact of Market Transparency on Liquidity

Our evaluative framework suggests that B2C electronic markets and Internet-based sellers that transact in products with more digital product characteristics or that deploy more dynamic
market microstructures will tend to attract more consumers. As a result, the marketplace will provide more liquidity to market participants. This, in turn, should lead to a higher base level of demand. This leads us to offer the following conjecture about the relationship between consumer demand and market transparency:

□ **Conjecture 1 (The Market Transparency-Demand Proportionality Conjecture):**

Consumer demand is proportional to the level of market transparency. However, market transparency does not influence consumers’ price elasticity of demand.

We further expect that the base level of demand for a seller who offers greater market transparency will be greater than for a seller who offers less. This scenario is represented by Orbitz and Travelocity in the OTA industry. For each booking information request by a customer, Orbitz’s market mechanism for airline ticket selling lists multiple travel options organized with the lowest ticket prices and fewest stopovers first. As a result of its relatively transparent market mechanism, it is likely that the demand for tickets on Orbitz is higher than for Travelocity, which makes biased offers (Granados, Gupta, and Kauffman, 2003). Although some customers may search both Web sites for tickets, others may only search on Orbitz due to its higher level of transparency. Again, we expect the price elasticities of consumer demand to be the same regardless of the site they search.

We next present a simple analytical model to provide pricing strategy and market transparency configuration guidance for firms under Scenario 1. We assume that consumer demand can be represented by a linear demand function. Further assume that there are two sellers in the market under perfect competition. In Scenario 1, lower transparency leads to a downward shift in the demand curve, *ceteris paribus*. (See Figure 3.)

The following proposition summarizes the implications for relative prices and market shares:

□ **Proposition 1 (The Market Share Ratio and Price Ratio Equivalence Proposition):** If two sellers price at different levels of market transparency to maximize revenue, their market share ratio will be equal to the price ratio.
Proof. Let Seller 1 have consumer demand $D_1(p) = \beta_o - \beta_1 p_1$, where $\beta_o$ is the base demand and $-\beta_1$ is the slope of the demand curve. If Seller 2 offers lower market transparency and our Market Transparency-Demand Proportionality Conjecture (Conjecture 1) holds, then its base demand will be equal to $\alpha\%$ of Seller 1’s demand, with $0 < \alpha < 1$. The demand curve of Seller 2 can be represented by $D_2(p) = \alpha \beta_o - \beta_1 p_2$. Let $M$ be the market share ratio $D_2 / D_1$, so that $M = (\alpha \beta_o - \beta_1 p_2) / (\beta_o - \beta_1 p_1)$. The result of simplifying this expression is:

$$\beta_o (M - \alpha) + \beta_1 (p_2 - M p_1) = 0 \tag{1}$$

To maximize revenue, we take the first order conditions of the revenue function. So the sellers will price respectively at $p_1^* = \beta_o / 2\beta_1$ and $p_2^* = \alpha \beta_o / 2\beta_1$. The resulting price ratio is $p_2^* / p_1^* = \alpha$. Substituting the resulting price ratio into Equation 1 results in $M^* = \alpha$. This implies that if the sellers set prices to maximize revenue, the price ratio will be equivalent to the market share ratio. Now, if we observe $p_2 / p_1 > M$, then Seller 2 is overcharging (or Seller 1 is undercharging), and if $p_2 / p_1 < M$, then Seller 2 is undercharging (or Seller 1 is overcharging).

This proposition can be empirically tested in scenarios where market transparency attracts consumer demand, and for industries where pricing decisions are based on revenue-maximizing objectives. For example, in the airline industry, the need to provide stable route scheduling creates the basis for fixed supply with low marginal costs (i.e., the cost of carrying a passenger),
so short and medium-term pricing decisions are based on a revenue maximization objective.

If the relationship between market transparency and consumer demand behave as we have sketched out here, then the Market Share Ratio and Price Ratio Equivalence Proposition (Proposition 1) suggests that Travelocity should charge a lower price for the same airline ticket than Orbitz in order to maximize revenue, since it offers a lower level of market transparency. It also follows that if the market share ratio of these Web sites is different than the price ratio, the existing price levels that are chosen may be sub-optimal. For example, if the price ratio is higher than the market share ratio, then Orbitz can charge a higher fare or Travelocity can charge a lower fare to increase revenue.

**Scenario 2: Impact of Market Transparency on the Product and Price Discovery Process**

When market transparency goes up, consumer surplus increases three ways. (See Figure 4).

**Figure 4. Contribution of Market Transparency to Consumer Surplus**

![Figure 4](image)

*Note:* Consumer Surplus A = Consumer surplus without transparency  
Consumer Surplus B = Consumer surplus with transparency

First, the value of a purchase increases if the consumer discerns product characteristics of existing alternatives with higher precision, resulting in more accurate product valuation (Harbrouck, 1995). In financial markets, for example, Internet brokerage firms are able to
provide instantaneous and detailed information about a given stock, which enables a more accurate valuation by the investor. Likewise, in the music or software industry, the ability to experience online product demonstrations increases product transparency for consumers.

Second, search costs may decrease such that more product alternatives are made available. For example, through the Internet, major OTAs such as Orbitz, Travelocity, and Expedia now provide immediate and inexpensive access to tables with multiple combinations of air carriers, flight itineraries, and ticket prices. By purchasing a ticket via these OTAs, consumers can evaluate multiple alternatives and act as their own travel agents in some travel scenarios, such as the purchase of a domestic round-trip ticket between major cities. This contrasts with the limited options that are offered by a traditional travel agent or an airline’s reservation office, where some pre-selection and screening services are provided to make the travel consultation more effective.

Third, information may become available that allows a consumer to transact at a lower price for a given product. Stigler (1961) showed that a lower price may result if search costs are reduced such that a lower market price is discovered. Several papers in the recent literature support this assertion. Furstenberg (2001) states that greater transparency in a principal-agent scenario often harms the principals. Wise and Morrison (2000) suggest that even though the Internet has brought higher liquidity and transparency, sellers have little incentive to participate due to the risk of price pressures. Likewise, Zhu (2002) suggests that transparent electronic environments are detrimental to large, high cost suppliers in a B2B exchange. Brynjolfsson and Smith (2000) suggest that in B2C markets some retailers charge low prices to attract informed consumers, while others charge high prices to uninformed consumers. In this case, prices decrease because consumers use increased price transparency to appropriate surplus away from the seller. While this is a key consequence of price transparency, we do not model this problem
due to its extensive coverage in the economic, financial, and IS (electronic markets) literature. Rather, we focus on the two first cases, where consumers generate value due to the increased accessibility of product information in the market rather than by appropriating surplus from the seller.

We conjecture that an increase in product transparency may lead to a lower price elasticity of demand. The economic intuition behind this is that if consumers are better informed about product characteristics, they are more certain about the benefits and hence their maximum willingness-to-pay increases. This results in a higher variance of the valuation distribution and a consequent lower change in demand from a change in price.

**Conjecture 2 (The Market Transparency-Price Elasticity of Demand Conjecture):**

*There is a negative relationship between market transparency and price elasticity of demand. However, market transparency does not affect the total potential market size.*

In this scenario, the base consumer demand for two sellers with different levels of market transparency is the same, but the demand for the more market transparent seller is less sensitive to price changes than for the less transparent seller. This scenario is well represented by Hotwire and Priceline. The firms target the same market for price-sensitive consumers by offering low levels of transparency in exchange for lower prices. However, due to a less transparent market mechanism, purchases on Priceline may induce higher sensitivity to price changes among consumers than purchases on Hotwire.

Using the same linear demand model as above, in Scenario 2 a lower level of transparency leads to a more steeply sloping demand curve. Figure 5 illustrates this effect, where Seller 1 has greater transparency than Seller 2. The implications for pricing and market share are different than those found for Scenario 1. This leads to a second proposition:
Proposition 2 (The Similar Market Shares Proposition): If two sellers price at different levels of transparency to maximize revenue, their market shares will be equal.

Proof. Let Seller 1 have a demand $D_1(p) = \beta_0 - \beta_1 p_1$ as before. If Seller 2 has lower market transparency, then the demand curve for Seller 2 will have a more negative slope than Seller 1’s, so the former’s demand can be represented by $D_2(p) = \beta_0 - \beta_1 \frac{p_2}{\alpha}$, where $0 < \alpha < 1$. $\alpha$ is a parameter such that $1/(\alpha - 1)$ represents the percent decrease in the slope of Seller 2’s demand curve relative to that of Seller 1. Next let $M$ be the market share ratio $D_2/D_1$, also as before. Then with $M = (\beta_0 - \beta_1 \frac{p_2}{\alpha})/\beta_0 - \beta_1 p_1$, we see that

$$\alpha \beta_0 (M - 1) + \beta_1 (p_2 - \alpha M p_1) = 0 \tag{2}$$

Now, to maximize revenue, Sellers 1 and 2 will price at $p_1^* = \frac{\beta_0}{2\beta_1}$ and $p_2^* = \alpha \frac{\beta_0}{2\beta_1}$, respectively. Notice that the price ratio, $p_2^*/p_1^* = \alpha$, is the same result as in Scenario 1. Finally, substituting $p_1^*$ and $p_2^*$ in Equation 2 results in $(\alpha \beta_0 / 2) (M - 1) = 0$. This equation suggests that if the sellers set prices to maximize revenue, their market share ratio will be 1, so their respective market shares will be the same.

The results of the Similar Market Shares Proposition (Proposition 2) offer insights into price competition and market mechanism choices of Hotwire and Priceline. We learn that if their target market is the same but consumers are more price-sensitive when purchasing on Priceline,
then it should charge lower prices than Hotwire to compensate for its lower transparency, to the point where market shares equate. This strategy will maximize revenue for both OTAs.

**Scenario 3: Combined Effects of Market Transparency**

Scenarios 1 and 2 are not mutually exclusive, which suggests that they can occur together. This is likely if, in addition to attracting consumers, an increase in market transparency decreases price elasticity of demand for the seller’s new and existing consumers. This leads to:

- **Conjecture 3 (The Willingness-to-Pay and Price Elasticity of Demand Conjecture).** Market transparency has a positive relationship with willingness-to-pay, which results in higher consumer demand and lower price elasticity for firms with greater transparency.

  The related Scenario 3 is illustrated in Figure 6. Here, Seller 1 has a more transparent market mechanism, which results in a higher base demand and a less steep slope of the demand curve.

**Figure 6. Impact of Market Transparency: Mixed Effects**

![Graph](image)

This competitive scenario may be best represented by Orbitz and Priceline. On one hand, the base demand for Priceline is likely to be lower because it specifically targets customers that are less concerned about the product characteristics. On the other hand, due to its less transparent mechanism, purchases on Priceline may be subject to higher consumer price-sensitivity. Here, the analysis and implications for strategic pricing and market share capture are more complex than in the single-effect cases. We characterize the impacts with the following proposition:

- **Proposition 3 (The Mixed Effects Proposition): If two sellers price at different levels of transparency to maximize revenue, then their price ratio will be equal to the square of the market share ratio.**
Proof. Assume that Seller 1 has demand $D_1(p) = \beta_o - \beta_1 p_1$. If Seller 2 has lower transparency and the Willingness-to-Pay and Price Elasticity of Demand Conjecture (Conjecture 3) holds, the demand curve of Seller 2 will have a lower base demand and a steeper slope than Seller 1’s. Seller 2’s demand can be represented by $D_2(p) = \alpha_1 \beta_o - \beta_1 p_2 / \alpha_2$, where $0 < \alpha_1 < 1$ and $0 < \alpha_2 < 1$. To further simplify our analysis for this initial exploratory work, we assume that $\alpha_1 = \alpha_2 = \alpha$ holds.\(^3\) Again, let $M$ be the market share ratio, $D_2 / D_1$. Then

$$M = (\alpha \beta_o - \beta_1 p_2 / \alpha) / (\beta_o - \beta_1 p_1)$$

which can be expressed as:

$$\alpha \beta_o (M - \alpha) + \beta_1 (p_2 - \alpha M p_1) = 0 \quad (3)$$

To maximize revenue, Sellers 1 and 2 will price at $p_1^* = \beta_o / 2 \beta_1$ and $p_2^* = \alpha^2 \beta_o / 2 \beta_1$, respectively. Therefore, the price ratio is given by $p_2^*/p_1^* = \alpha^2$. When we substitute $p_1^*$ and $p_2^*$ into Equation 3, we obtain the following:

$$(\alpha \beta_o / 2) (M - \alpha) = 0 \quad (4)$$

From the price ratio expression, $p_2^*/p_1^*$, and Equation 4, it follows that $p_2^*/p_1^* = M^2$. This implies that sellers can maximize their revenue by setting prices so that the price ratio is the square of the market share ratio. Now, if we observe $p_2 / p_1 > M^2$, Seller 2 is overcharging (or Seller 1 is undercharging), and if $p_2 / p_1 < M^2$, Seller 2 is undercharging (or Seller 1 is overcharging). This is suggestive of the strategic pricing policies that will be appropriate for the firms to be revenue-efficient in the marketplace.

In Scenario 3, due to a lower market transparency mechanism, Priceline’s consumer demand is affected in two ways compared to Orbitz. First, some consumers may only browse for fares in Orbitz due to its more transparent mechanism and avoid Priceline, so the base demand of

\(^3\) The assumption that $\alpha_1 = \alpha_2 = \alpha$ holds means that market transparency influences base demand and price elasticity equally. This seems like a reasonable first step in our analysis. However, we recognize it will be appropriate to examine the cases of $\alpha_1 < \alpha_2$ and $\alpha_1 > \alpha_2$ more fully and such an analysis is a part of our ongoing study.
Priceline will be smaller. Second, Orbitz and Priceline are likely to have a common set of consumers who check both Web sites in the search for the lowest fares. However, consumers purchasing on Priceline are more price-sensitive than if they purchase via Orbitz due to the lesser transparency of its market mechanism. This “double effect” of lower transparency is reflected in the quadratic nature of the price ratio relative to market share in the Mixed Effects Proposition (Proposition 3). By the same token, if Priceline only reduces prices such that the price ratio is equal to the market share ratio, it will get less than optimum revenue. Instead, to maximize revenue, Priceline must reduce the ticket prices to the point where its price ratio is equal to the square of the market share ratio. If the price ratio is observed to be higher (lower) than the square of the market share ratio, then Priceline can decrease (increase) prices even further or Orbitz can increase (decrease) prices. These strategies will maximize revenue.

DISCUSSION

If transparency has the potential to increase the base demand in a market, sellers with more transparent mechanisms are likely to enjoy higher market share, unless other sellers reduce prices to compensate for their less transparent mechanisms. In theory, since Orbitz provides more transparency in airline prices, it should be able to charge higher prices than other OTAs. This may not be feasible in practice due to the fierce competition for passengers and the tendency of airlines to “match” each other’s prices. Hence, our Market Share Ratio and Price Ratio Equivalence Proposition (Proposition 1) suggests that the consequences of different levels of transparency under the same prices will result in a more than fair market share for the more transparent seller, in this case Orbitz. This may partially explain why Orbitz has captured a 30% market share of online air travel in just two years since its launch. (For a more detailed discussion, see Granados, Gupta and Kauffman, 2003). More generally, in e-commerce, firms
have the option to implement price transparency strategies to enter or compete in a market. Under the assumption that demand is proportional to the level of transparency, a failure to implement an appropriate strategy may reduce a firm’s ability to compete.

The Market Transparency-Price Elasticity of Demand Conjecture (Conjecture 2), that transparency influences price elasticity of demand, provides a similar analytical result to that of the Market Transparency-Demand Proportionality Conjecture (Conjecture 1), that firms should charge a lower price in less transparent markets to maximize revenue. This suggests that price transparency strategies can be used to segment markets and influence consumer behavior. Similarly, they can encourage purchases by attracting price-sensitive consumers to less transparent mechanisms at a lower price, or by attracting consumers to more transparent mechanisms at a price premium. In the U.S. airline industry, major airlines have implemented a dual transparency strategy by offering higher prices under a transparent OTA (e.g. Orbitz) and lower prices under a less transparent OTA (i.e. Hotwire).

Our analysis suggests that increased market transparency potential in itself does not determine the right strategy to follow because there are trade-offs to be made. On one hand, increased market transparency potential may result in higher price transparency and lower prices (Stigler, 1961). For example, our interviews with executives of an airline show that they are cautious when using the Internet to distribute their product because of the risk of price erosion. On the other hand, there is a recognition that higher product transparency potential yields strategic alternatives that can be used to obtain an advantage, but there is uncertainty as to what the right pricing policy may be across distribution channels, OTAs, and market segments. We conjecture that transparency can attract consumers and reduce their price elasticity of demand. Based on these conjectures, our analysis suggests that firms can develop sound transparency
strategies to counter price erosion by choosing the product-price transparency tuple that maximizes revenue, because consumers are willing to pay for transparency. In addition, the analytical models show that market share can be a measure of the soundness of a transparency strategy. For example, market share gains of Orbitz since its launch may be the consequence of a transparency advantage that has not been followed by lower prices from competitors.

The Willingness-to-Pay and Price Elasticity of Demand Conjecture (Conjecture 3), the scenario where our first two conjectures hold, only compounds the impact of market transparency in the terms we described above. If an industry is such that increased market transparency increases consumer demand and decreases price elasticity, the general rule holds: a less transparent selling mechanism must have lower prices to compensate for its lack of transparency. Under this scenario, the impact of transparency may be exponential. So it increases the need for the firm to determine an appropriate product-price transparency strategy.

Another issue that can be studied using our framework is changes in industrial organization that relate to market transparency. For example, we have seen that in the airline and OTA industry with the creation of Orbitz, which was conceptualized as a “reintermediation” play on the part of five airlines—American, Continental, Delta, Northwest and United—to counterbalance the airlines’ share of the market for intermediation services on the Internet. In their Electronic Markets Hypothesis, Malone, Yates and Benjamin (1987) suggested that information and communication technologies, the precursors of e-commerce on the Internet, would shift industrial organization from hierarchies to markets and that competitive forces would lead to unbiased market mechanisms, in which all buyers and suppliers would have an equal footing in the conduct of mercantile exchange. In the airline industry, the creation of Orbitz as an unbiased OTA and recent pressure in supplier agreements to provide full pricing information
to all Web sites support the prediction of a move to unbiased markets (Granados, Gupta, and Kauffman, 2003).

Our preliminary analysis of the impact of market transparency, defined in both product transparency and price transparency terms, suggests a range of opportunities for the application of these ideas. In terms of application areas, there are many other contexts in e-commerce for which our theory and analysis can offer insights. They include hotel and rental car booking, music and video sales, and so on. For example, in more typical Internet-based selling, pressure to bring about greater price and product transparency has been promoted by the popular shopbots, which aggregate information and provide decision support capabilities to consumers. The shopbots now support transaction-making and consumer choice in many product areas, including software tools and computer games, electronics goods, consumer appliances, and computers. By aggregating information about product descriptions and prices, they provide a degree of “virtual” market transparency in a way that the Web sites of the individual sellers alone cannot provide—and in the same way independent OTAs provide higher transparency.

The strategic options for firms have been recently multiplied with the advent of the Internet because it opens the possibility for intentional openness or concealment of information available to consumers. The concept of transparency and the analysis in this paper provide some normative insights into the possible strategies that firms can follow in this new environment. In addition, the implications are not only relevant for pricing strategists, but also for practitioners and researchers concerned about the impact of Internet-driven transparency on market structure.

CONCLUSION

In the effort to implement management strategies to confront the new challenges of the Internet revolution, senior managers must realize the impact of this new technology on market
transparency. We contend that transparency in B2C electronic markets will likely be higher in industries where products have more digital characteristics, where the traditional market microstructure is dynamic, and where new technologies have enabled a digital representation of product information or novel market mechanisms for transaction-making.

We analyzed the impacts of changes in market transparency on consumer demand and derived ways in which senior managers can evaluate the effectiveness of their pricing strategies. As a first step, firms can observe their market shares relative to competitors and assess whether their prices are in line with their level of market transparency. Specifically, in linear demand environments, pricing levels should be evaluated when market transparency affects: (1) consumer demand but not price elasticity, and the price ratio is not equal to the market share ratio; (2) price elasticity but not consumer demand, and market shares are not the same; and (3) both price elasticity and consumer demand, and the price ratio is not equal to the square of the market share ratio. These findings suggest that senior managers whose firms utilize some of the new market mechanisms that are made available by the Internet must have an awareness of their market transparency relative to competition. To illustrate this point, we provided a comparison of the relative transparency among OTAs.

We see three limitations of this paper which suggest there is potential for improvement. First, the analysis scenarios of transparency, demand, and prices are based on linear demand functions. Further development is necessary to relax this assumption, obtain new results and determine the robustness of our modeling approach to different market conditions. In general, we expect to obtain normative insights that are directionally in line with those of this analysis. Second, in Scenario 3 the impact of increased transparency was assumed to be the same for the base demand and the slope of the demand curve. It will be useful to relax this assumption as
well, since it constrains the applicability of our findings. Third, the analysis that we report in this paper is based on observations and interviews in the airline industry. Validation in other industry environments is missing, so we recognize the potential to improve generalizability by investigating other competitive contexts.

REFERENCES


## Appendix. Categories of Pre-Transaction Market Transparency for Hotwire Vs. Priceline

<table>
<thead>
<tr>
<th>INFORMATION CATEGORY</th>
<th>INFORMATION</th>
<th>HOTWIRE</th>
<th>PRICELINE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximize quality</strong></td>
<td>Airline name (seller identity)</td>
<td>Major airline, type of aircraft</td>
<td>Major airline, type of aircraft</td>
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<tr>
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<td>Same airline each direction</td>
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<td></td>
</tr>
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<td></td>
<td>Departure, arrival, and layover times</td>
<td>Peak and off-peak departures, maximum number of connections, maximum length of domestic connections</td>
<td>Peak and off-peak departures, maximum number of connections maximum length of domestic connections</td>
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<td>No</td>
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<td>Refundability/transferability</td>
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<td></td>
<td>Flexibility to change plans</td>
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<td>Policy for cancelled and delayed flights</td>
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<td>Customer complaint rules</td>
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<td></td>
<td>Online payment options and security</td>
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<td><strong>Maximize integrity</strong></td>
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<td>Airline on-time performance, customer complaint records, luggage lost record</td>
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*Note: Differences between Hotwire and Priceline are marked in *italics*. |