

Do consumers benefit from low-price guarantees? Evidence from online travel agents

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Abstract

The literature on low price guarantees has not reached consensus on whether such policies are pro- or anti-competitive. This study explores a recent development in the online travel services industry to determine the competitive effects of change in a company's low price guarantee from 'meet-or-release' (MOR) to a 'most favored customer' (MFC) clause. We find that the company which adopts the MFC price guarantees (Orbitz) starts offering significantly lower prices compared to its competitors, while one of its two main competitors (Expedia) now offers significantly higher fares. Moreover, the MFC adoption has not adversely affected the number of flights offered to the consumer. In sum, our findings from the online travel agency industry support the theoretical claims that MFC has more pro-competitive potential than the MOR clause.

JEL Classification: D4; L4; L93

Keywords: Price-matching, price guarantees, most favored customer, meet-or-release

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“Our 2008 initiatives to reignite growth succeeded and resulted in good growth in net revenue...customers increasingly recognize the value of Orbitz Price Assurance and choose to book at Orbitz.com” -- Steven Barnhart, CEO and president of Orbitz Worldwide (Third Quarter, 2008 Earnings Release, November 10, 2008)

1. Introduction

Low price guarantees or assurances are strategies frequently employed by firms across the retail spectrum from discount retailers to home-improvement chains to office supply stores and electronics retailers. Low price guarantees can be classified into one of two categories. First, the ‘meet-or-release’ (MOR) clause promises that a firm will match any competitor’s price within a certain time period after the purchase is made. The second category: ‘most favored customer’ (MFC) policy promises that consumers will receive a refund if the firm reduces its own price in the near future. In either case, the refund is typically limited to, or is only slightly larger than, the relevant difference in prices.

This study explores a recent development in the online travel services industry, examining the price effects when a large competitor changes its low price guarantee from offering MOR (the industry standard) to MFC policy. Among online travel agents, Orbitz initiated a MFC policy beginning on June 6, 2008 with the launch of “Orbitz Price Assurance.” All consumers who purchase airline tickets on Orbitz are automatically enrolled in this program (there are no claims to file or lower prices to locate).² Consumers receive a check for the difference (between \$5 and \$250) in airfares if another Orbitz

² Initially, Orbitz’s price assurance program was limited to airline tickets only. In May, 2009 this program was expanded to also include hotel bookings at Orbitz.com.

consumer subsequently purchases an airline ticket with the identical itinerary (same carrier, dates, flight numbers, and class of service) prior to departure. While such a price guarantee according to Orbitz has been well-received by its customers, the other two large online travel agencies (Expedia and Travelocity) thus far have not changed their MOR price matching policies (which have been in effect since 2006). This paper conducts a difference-in-difference estimation of airfare quotes collected (in 2006 and 2008-09) before and after the MFC adoption by Orbitz to answer the question posed in the title: do consumers benefit from MFC price guarantees?

The evidence presented in our study is a strong manifestation of pro-competitive effects of the most-favored customer clause, since it comes from a unique industry. Unlike most other retailers, travel agents in the US market do not themselves set prices for the basic services they sell. Rather, they choose which of the service providers' offers to show to potential travelers. As such, we show that MFC low price guarantees can positively affect consumer welfare even when retailers do not have direct control over the prices of the products they sell.

In addition to shedding light on price guarantees this study also provides further evidence that the spread of the Internet increases product differentiation (as found by Bilotkach and Pejcinovska 2009; Bilotkach 2007, Baye et. al. 2004, Clay et al. 2001) rather than leading to convergence to the law of one price due to elimination of the search cost (e.g., Brown and Goolsbee, 2002).

Finally, this work adds to our understanding of the complex and intriguing online travel services distribution industry. In this respect, the most similar paper to ours is Bilotkach and Pejcinovska (2009), who examine price dispersion for the three largest

online travel agencies during a period when all three major online travel agencies used the same MOR clause. The rest of the paper is organized as follows. Section 2 reviews the relevant literature. Section 3 describes institutional details of the ticket distribution market. Sections 4 and 5 describe the data and present results of our data analysis, respectively. Section 6 discusses and concludes.

2. Literature Review

While Holt and Scheffman's (1987) examination of low-price guarantees revealed that such a strategy facilitates collusive pricing by firms; the literature on price guarantees has not reached consensus on whether such policies are pro- or anti-competitive. First, we investigate the competitive impacts of the MOR clause. Hviid and Shaffer (1999) show that even small hassle costs associated with obtaining information on competitors' prices can substantially diminish the effectiveness of MOR clauses to facilitate collusive prices (both Deck and Wilson (2003) and Dugar and Sorensen (2006) provide experimental evidence to the contrary); Png and Hirschleifer (1987) and Corts (1996) offer models which show that price-matching guarantees are a form of price discrimination (in the presence of both 'sophisticated' and 'unsophisticated' consumers); Moorthy and Winter (2006) develop a model where price-matching serves as a credible signal that a firm is low-priced.

The first formal theoretical analysis of 'most favorable customer' clause as a potential anti-competitive device was offered in Cooper (1986). That study examines the model of price-setting differentiated-product duopoly where the firms' strategy set is expanded to include the 'MFC clause'. It is shown that in equilibrium this strategy will be

employed by at least one firm. In a later study, Neilson and Winter (1993) show that for *both* firms to employ MFC clause in equilibrium of Cooper's model it is necessary that cross-price effects be larger in magnitude than own-price effects – they therefore rightly conclude that such an equilibrium is implausible. Neilson and Winter's result is consistent with the current pricing policies in the online travel services industry, since only one firm is using a MFC clause (assuming that the industry is currently in equilibrium).

Schnitzer (1994) offers a formal comparison of MOR and MFC strategies' potential as devices that can sustain collusion. She finds that the 'meet-or-release' clause has more anti-competitive potential than the 'most favorable customer' clause. Moreover, Schnitzer's model is closely linked to our study – since the first part of our data comes from the time when all major competitors were using MOR clauses (in 2006), whereas the second part of our dataset was collected when one player adopted the MFC clause (2008-09). In sum, we believe that our results provide empirical evidence in support of conclusions of both Schnitzer (1994) and Neilson and Winter (1993).

Turning to empirical research of low price guarantees, we observe the following strains. First, there is some literature examining consumers' perception of low price guarantees (mostly MOR clauses). General consensus from these studies (e.g., Lurie and Srivastava, 2001, 2005) is that consumers perceive price matching guarantees as low price signals, and that the typical consumer's response to MOR clauses is to search more, but only if search costs are low. Experimental work by Chatterjee and Roy (1997) reveals that subjects prefer sellers which offer price-matching guarantees; however, this study also confirmed the potential for a MOR clause to serve as a collusive device.

Second, several studies examine whether observed MOR clauses can be interpreted as consistent with collusive conduct. Arbatskaya *et al.* (2004) examine newspaper advertising and conclude that price-matching clauses contained therein are not consistent with collusive behavior due to the considerable hassle costs imposed on consumers. Arbatskaya *et al.* (2006) study of advertised tire prices reveals that only a portion of the price quotes could be interpreted as consistent with collusive behavior. In the supermarket industry, Manez (2006) finds that low-price guarantees via MOR clauses serve as advertising mechanisms rather than collusive devices.

Empirical studies of MFC clauses are less common. Scott-Morton (1997a, 1997b) examined pharmaceutical companies' response to the Medicaid most favored customer rules. As such, Scott-Morton's studies examine firms' *reaction to* MFC clauses imposed on them by the government, rather than the firms' choice on whether to voluntarily include 'most favored customer' clauses in contracts (in fact, Arbatskaya *et al.*, 2004 interpreted relative *absence of* MFC clauses in their sample of newspaper ads as suggesting lack of collusive conduct). Scott-Morton suggested that with MFC requirement firms would increase prices, and that price dispersion would shrink – hypotheses that were supported by the data. In the natural gas market Crocker and Lyon (1994) examine the adoption of MFC clauses and find that these devices are more commonly used to ensure efficient price adjustment rather than to facilitate collusion. In a recent study, Chen and Liu (2009) investigated price effects of Best Buy's (a leading US consumer electronics retailer) adoption of MFC clause, and found that both Best Buy and the competing firms lowered prices following this event.

The latter study is most similar to ours, as it examines a situation, in which a major player in the industry changes its price guarantee policy to offering a MFC clause. While the 2008 revenue of the largest consumer electronics retailer, Best Buy (\$45 billion) is comparable to the \$43 billion in yearly gross bookings revenue from the three largest online travel agencies; the type of goods and their typical pricing life-cycle, couldn't be more different between these two industries. For example, consumer electronics are typically durable goods, while travel agency services are non-durable goods. Perhaps more importantly, the nature of the retailers' strategies between the two industries is entirely different. Whereas electronics retailers profit from marking-up the manufacturers' prices; distributors of travel services simply convey the providers' prices to customers, choosing not how much to mark them up, but rather which of the offered prices to show to their customers.

In sum, all of the above studies, when examined jointly provide a confusing picture. Theory suggests that a number of qualifications are required for price-matching guarantees to successfully serve as collusive devices; Schnitzer's study concludes that MOR clauses have higher collusive potential. There is little empirical, but quite strong experimental evidence that MOR clauses support tacit collusion. We do not interpret Scott-Morton's results as suggesting MFC clauses can be successfully used as collusive devices, since pharmaceutical firms did not voluntarily implement MFC clauses to sustain collusion but rather MFC clauses were imposed on firms by the government. Chen and Liu's study, on the other hand, provides strong evidence of pro-competitive effects of MFC clause. Hence our study hopes to provide some clarity to a confusing picture as to whether MFC clauses are collusive or competitive devices.

3. Institutions

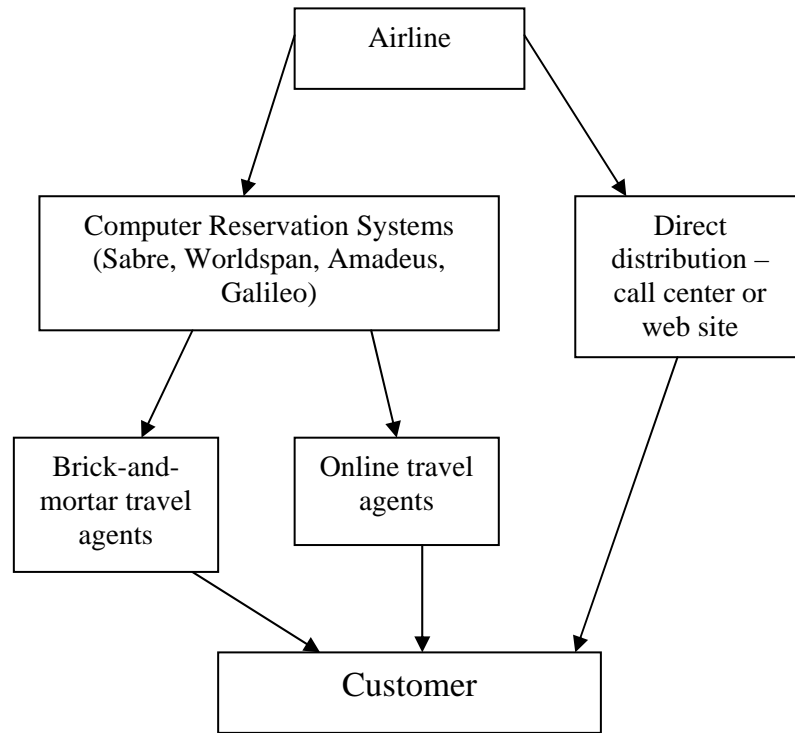
3.1 Ticket Distribution Market

In the past few years airline studies that utilize Internet price data where a price comparison is made between different online and off-line retailers have become more prevalent. The general question this literature addresses is whether lower search cost provided by the Internet will lead to convergence to the law of one price. Recently there has been a growing body of literature on the online travel services industry. Bilotkach and Pejcinovska (2009) demonstrated that travel agents appear to be more than simple ‘technical’ intermediaries, in that they strategically choose which fare quotes to present. Chen (2006) finds little disparity in fares quoted by the major online travel agents (Travelocity and Orbitz) and by the airlines themselves on the New York–Los Angeles air travel market. Clemons et al. (2002), however, observed substantial differences in fare quotes across five unidentified online travel agents.

The visual scheme of distribution of travel services (using the example of airline tickets) is presented on Figure 1.³ An airline can sell its tickets either directly (using its call-center or web-site) or via travel agents, by posting its fares into one or several computer reservation systems (CRS) which travel agents access to book tickets on behalf of their customers. Prior to 2001, the total price customers paid for tickets did not depend on the ticket distribution source, since airlines paid two commissions: one to the travel agent selling the ticket and a second commission or “booking fee” to the computer reservation system involved. Following the events of September 11, 2001, the airlines (seeking ways to control costs) gradually stopped paying travel agent commissions, so

³ For a thorough examination of the ticket distribution market see Bilotkach and Pejcinovsha (2009).

Figure 1 - Airline ticket distribution



that the agents had to start charging booking fees (which mostly fall in the range of \$5-25 per ticket) to their customers. Thus, customers who choose to book their ticket directly with an airline can save \$5-25 compared to an identical reservation made via a travel agent.⁴ The main difference between online and brick-and-mortar travel agents is that with an online agent the end customer can directly observe the search results; whereas with a brick-and-mortar agency it is the agent who looks at the screen and communicates available options to the customer. Brick-and-mortar agents also claim to offer more personalized service; yet, online agencies are moving into that territory as well.

⁴ Recently, a number of online travel retailers slashed their airline booking fees, in an apparent price war. It is not clear whether this development is transitory or permanent.

For the travel agent to see the airline's fare quote, it must appear in the CRS being accessed by the agent. The computer reservation systems were originally developed and owned by the airlines; but have later taken a life of their own as independent companies. There are four major CRS companies: Sabre (with about 45 percent U.S. market share and over 30 percent global market share), Worldspan (over 25 percent U.S. market share and 15 percent worldwide), Galileo and Amadeus (share of these two systems on the US market keeps declining while they remain solid players on the worldwide arena, with combined market share of over 50 percent).

Airlines are currently free to choose which systems to participate in and at what level to do so.⁵ Most carriers actively participate in multiple systems. An exception is Southwest Airlines, which only participates in Sabre at a low level. Consequently, Southwest Airlines consumers can only book tickets directly through the carrier's website call center, or via some brick-and-mortar agents. Another carrier, JetBlue Airways, only recently began actively participating in Sabre (in 2006) and in Worldspan (in 2007). As for the online travel agents covered by this study, Travelocity is linked to Sabre, whereas Expedia and Orbitz are both linked to Worldspan CRS.

Spread of the Internet altered the travel services industry dramatically. Emergence of online travel agents was the major innovation in the industry. Airlines also saw a huge potential in selling their tickets via their own web sites. As late as the 1990s, brick-and-mortar travel agents sold over three quarters of all airline tickets; with the remaining 25 percent sold directly by airline operated call centers. By 2002, online travel agents captured about 15 percent of the market from brick-and-mortar agents. The most recent

⁵ Initial CRS regulation, adopted in 1984, stipulated that an airline owning or marketing a CRS must participate in competing systems. This rule was scrapped in 2004.

available estimate by Citigroup Investment Research, states that in 2005 online travel agents have captured over 25 percent market share in the airline ticket distribution industry; the airlines still sell about a quarter of all tickets, primarily via their web sites.⁶ Hence, the brick-and-mortar agents' market share has declined to about 50 percent.

The online travel agent segment of the ticket distribution market in the U.S. is in turn dominated by the three major players: Travelocity (owned by Sabre, currently a privately held company), Expedia (founded within Microsoft in 1995, and an independent publicly traded company since 2005), and Orbitz (started through a partnership of several major airlines in 2001, currently a subsidiary of Travelport, owned by the Blackstone Group – a private equity company). According to the US Department of Transportation, in 2002, 28.5 percent of all bookings with online travel agents were on Travelocity; 28.7 percent on Expedia and 21.3 percent on Orbitz, for a total of 78.5 percent of all online U.S. travel reservations.⁷

Table 1 lists total revenues of the three largest online travel agents over the last three years from both domestic and international operations. Note that the numbers represent sales of all travel services, not only the airline tickets. Also, due to Expedia's large international presence it has considerably larger gross booking revenue than the other two travel agencies. If we exclude international revenue, then the growth in booking revenues between 2006 and 2008 for Expedia (13%) would have been closer to its peers. Assuming no drastic changes in the combined market share of the three biggest players, we can say that approximately one in five domestic trips are booked via one of

⁶ *Online Travel Gets Personal*, Forbes.com, posted 02/17/2006.

⁷ Travel agency market share data are from "Computer Reservations System Regulations: Final Rule", 14 CFR Part 255.

Table 1 - Total Annual Gross Travel Booking Revenue (in Millions US\$)*

| | 2006 | 2007 | 2008 | % change 2006-2008 |
|-------------|----------|----------|----------|-----------------------|
| Expedia | \$16,882 | \$19,632 | \$21,269 | 20.6% |
| Orbitz | \$9,780 | \$10,791 | \$10,808 | 9.5% |
| Travelocity | \$10,100 | \$10,689 | \$10,567 | 4.4% |
| Total | \$38,768 | \$43,119 | \$44,652 | 11.5% |

Source: Annual reports & earnings releases for Expedia, Orbitz, and Sabre Holdings.

*Gross bookings include hotel, car, & airfare for domestic & international operations.

the three largest online travel agents. Thus, our study is reflective of the entire online travel agent industry, and the segment we are looking at comprises a non-trivial part of the U.S. air travel distribution market.

3.2 Low Price Guarantees and Online Travel Agents' Strategies

The travel service distribution industry has only recently started offering low price guarantees. Of the major online travel agencies, Orbitz was the first to launch a type of meet-or-release policy applicable to airline tickets in October of 2004. That policy promised a \$50 travel voucher to any customer who located a lower priced ticket identical to the one purchased via Orbitz. To qualify, the fare had to be at least \$5 less than the Orbitz fare (not including the \$6 booking fee charged by the agent), and the customer had to notify Orbitz of the lower price by midnight of the day of purchase. Note that this policy did not entitle the traveler to a refund of the price difference; it only provided the customer with a \$50 travel voucher for future purchases on Orbitz.

Fifteen months later, Expedia (in January of 2006) and Travelocity (in August of 2006) introduced low price guarantees, which provided more generous perks to travelers who located lower fares (details of their price guarantees appear in the Appendix). These price guarantees stipulated that consumers would receive a refund of fare difference in

addition to a \$50 travel voucher for locating a lower fare quote within 24 hours of purchase (as with Orbitz's policy, booking fees charged by the online travel agents did not count towards the applicable fare difference). These meet-or-release low price policies for both Expedia and Travelocity are still in effect as of October 2009.

Thus, since August of 2006 all major online travel agents have implemented a type of meet-or-release low price guarantee policy for airline ticket sales. In June 2008, however, Orbitz decided to change its airline ticket policy with the launch of "Orbitz Price Assurance" which offered the most favored customer clause type of guarantee (see the Appendix for details). Under this arrangement, if another Orbitz customer subsequently books the identical flight (up to the flight numbers involved) at a lower price, then Orbitz will automatically issue a refund for the price difference (from \$5 to \$250) to the customer who paid the higher price. The refund is issued several weeks after travel has been completed (should a traveler cancel her plans, then the policy would not apply) in the form of a check mailed to the customer's address. The customer does not have to track airline prices or file a claim, and there is no time limit on when the price reduction must occur (it simply has to occur prior to departure). Neither Travelocity nor Expedia has chosen to match this MFC clause offered by Orbitz; in the Spring of 2009, however, a smaller player in the online travel market, Priceline, adopted a similar MFC policy.⁸

In light of the institutional structure of the travel distribution market; we can say the following about *what travel agents' strategies are*. Travel agents do not set the prices

⁸ Priceline is famous for its 'name your own price' pricing policy, whereby the customer places a bid for an air ticket, hotel, or car rental. Identity of the provider of the service is not revealed until after the customer has committed to the purchase.

themselves; but rather simply present what airlines offer via respective CRS; the agents can effectively only choose *how to present* the information obtained from the airlines to their customers. Specifically, the agent selects which fares offered by the airline to show to potential travelers.

Let us examine the risks faced by a travel agent offering MOR or MFC low price guarantee policies. Under MOR clause, the travel agent faces less risk of issuing refunds due to the price guarantee being effective for only a short time period (up to 24 hours) after the consumer's purchase. In addition, the customer incurs both the search cost of locating a lower price and the transactions costs of (i) notifying the travel agent and (ii) providing evidence of the lower price.⁹ With the MFC policy implemented by Orbitz, the agent faces considerably higher risk of issuing refunds since this policy guarantees that no future customer will pay a lower price for the identical flight. Hence every time an airline lowers its price, even if this price drop happens weeks after the purchase has been made, refunds become common occurrences due to MFC mandates. Hence, the MFC policy is 'riskier' for an agent than a MOR clause. Consequently, we believe that under the MFC policy, an agent has less incentive to show higher airline fares, since consumers who purchase the more expensive tickets are more likely to be issued refunds.

4. Data Collection and Description

4.1 Collection Process

⁹ In fact, many consumers may forgo the trouble of filing claims, sharing the sentiment of Jay Dubner, a science educator at Columbia University and Orbitz consumer: "It seems like a lot of work for \$50," (*Wall Street Journal*, 26 October 2004).

Airfare data were collected over two separate periods. First, we use 2006 airline pricing data when all three online travel agents offered MOR pricing policies. Second, we gather more recent airline fares in 2008-09, after Orbitz adopted its MFC policy. In both periods, the same data collection techniques are employed. We track fare quotes for the three leading online travel agents (Travelocity, Expedia and Orbitz) on fifty airport pair-markets, randomly selected out of the top 100 U.S. routes as measured by non-stop passenger traffic.¹⁰ Consequently, this selection criterion led to the inclusion of many markets with large hub airline operations (e.g., Atlanta, Denver, and Dallas-Fort Worth airports).

The data collection operates on the notion that a traveler is making a last minute purchase (within 48 hours prior to departure) for a three-day trip. We opt to track last minute fares since there is some evidence (coming from datasets provided by computer reservation systems and travel agencies) that a majority of flight bookings are made at the last minute (e.g., Puller et al, 2009). As a result, we are explicitly assuming that the traveler's uncertainty about whether or not he is going to fly has been realized. Thus, our last minute traveler is more concerned with finding a low price than a refundable ticket.¹¹ Hence we collect lowest available fare quotes for round-trip coach class tickets.

Our traveler is also assumed to have strong preference for both a given airport pair and non-stop flights. At the same time, our traveler does not exhibit brand loyalty.

¹⁰ The top 100 routes are determined from the 2006 T-100 Segment dataset.

¹¹One can legitimately claim that our hypothetical customer may still prefer some flexibility, especially with respect to being able to change the time of the return flight. However, conditional on the customer traveling, the difference between the refundable and the non-refundable ticket is similar to that between a lottery and a certain outcome (see also Escobari and Jindapon, 2009): once (and even before) the trip has begun, a customer on a non-refundable ticket can change his travel plans for a fee.

Airport-pair markets are directional, so that, for instance, JFK–LAX market is different from LAX–JFK. Consequently, we collect fares on both directions for the fifty airport pairs, resulting in 100 directional routings. A complete listing of all fifty randomly selected airport pairs used in this analysis appears in the Appendix.

The ‘before’ sample covers fare quotes collected between October 20 and November 17, 2006, while the ‘after’ sample involves the period between December 7, 2008 and January 4, 2009. All fare quotes were collected on Tuesdays (for departure on Thursday and return on Saturday of the same week) and Fridays (for departure on the nearest Sunday and return on the following Tuesday). We ended up collecting the data on nine different dates (pre-period) and eight different dates (post-period). For each airport-pair market on each day of data collection we attempted achieving near simultaneity of obtaining the fare quotes by launching three browser windows in parallel.

The sample for the pre-period includes 823 date-airport-pair market combinations out of 900 possible. During the data collection process a few computer issues hindered the data acquisition. In addition, web site maintenance at Orbitz.com prevented us from gathering Orbitz quotes for one day as well.¹² For every other date, we were able to obtain fare quotes from each of the three online travel agents. During the post-period we obtained quotes for 683 date-airport-pair market combinations out of 800 possible. The reason for the missing observations is that one evening the data collection process started too late in the day and could not be completed before midnight. Finally, we omit routes in which only Southwest Airlines offers non-stop service (HOU–DAL and OAK–BUR), since this carrier does not sell tickets via any of the three online travel agents.

¹² In an effort to minimize the loss of observations, we included airport-pair market fares whenever two or more travel agencies provided non-stop fare quotes.

For each date-airport-pair market-travel agent combination, we have retained *the lowest fare quotes offered by every airline providing non-stop service on a given airport-pair market*. For example, in the LAX-JFK market, non-stop services are offered by Delta Air Lines, American Airlines, United Airlines, JetBlue Airways, Alaska Airlines, and US Airways. Then, on each day of data collection we record up to six different fare quotes for each of the three travel agents (sometimes an agent would not provide a fare quote for an airline). The result is a total of 10,026 observations, of which 5,264 observations correspond to the ‘after’ (collected in 2008-2009) sample, and the rest constitute the ‘before’ sample.

4.2 Descriptive Statistics

Before proceeding with more sophisticated data analysis of the competitive effects of adopting a MFC price assurance policy, we start with the raw data. Table 2 provides a summary of the average lowest prices for the pre- and post-periods, at the travel agent level. We find that in the ‘before’ sample Travelocity offers the lowest average last minute fare quotes (\$548), followed by Expedia (\$576) and Orbitz (\$618). Approximately two years later, after Orbitz changed its low price guarantee policy to the most favored customer scheme, we find that ordering of the three travel agencies has not changed; however, the difference between travel agencies has shrunk. While Travelocity still offers the lowest average prices in the ‘after’ sample (\$494), Orbitz (\$547) is now closer to Expedia (\$528). Alternatively, when comparing the price changes between these two sample periods, we see that Orbitz has the largest price reduction \$71 (or 11.5%), while Travelocity and Expedia prices dropped by \$53 (9.7%) and \$48 (8.3%),

respectively. We also note a reduction in the variation of lowest fares in 2008-09 sample since the coefficient of variation decreases substantially for two of the three travel agents.

Table 2 - Summary statistics by online travel agent for fifty domestic routes: lowest last minute ticket price quotes for each carrier with non-stop service in the airport-pair market

| | Oct '06 - Nov '06 | | | Dec '08 - Jan '09 | | |
|-------------|-------------------|-----------|-------|-------------------|-----------|-------|
| | Mean | Std. Dev. | CV | Mean | Std. Dev. | CV |
| Expedia | 575.99 | 405.41 | 0.704 | 527.96 | 281.52 | 0.533 |
| Orbitz | 618.27 | 403.54 | 0.653 | 547.45 | 312.28 | 0.570 |
| Travelocity | 547.68 | 273.66 | 0.500 | 494.40 | 259.15 | 0.524 |

Note: we report fares when at least two travel agencies provide fare quotes for a route.

Unlike Table 2 which tracks the lowest fare for each non-stop carrier on the route, Table 3 compares the lowest available fare quotes for the two sample periods at the travel agent level. This table tracks which agent's lowest fares are the highest on a route (when all three agents provide fare quotes). In the 2006 sample period, when all travel agents offered similar MOR price matching policies, nearly three-quarters of the time (71.5%) Orbitz was the agent with the highest fare. Two years later, after Orbitz adopts its MFC price assurance policy, we find infrequent occurrences of Orbitz having the highest fare quotes (16.2%). These results are consistent with the hypothesis that an agent who offers the MFC price policy may be reluctant to report high airline fares for fear that the airline may drop the fare at a later time, forcing the agent to refund the difference to the customer.

Table 3 - Which Travel Agent's "Lowest" Fares on the Route are the Highest?

| | Oct '06 - Nov '06 | | | Dec '08 - Jan '09 | | |
|-------------|-------------------|-----------------------------|---------|-------------------|-----------------------------|---------|
| | Cases | Cases offering highest fare | Percent | Cases | Cases offering highest fare | Percent |
| Expedia | 520 | 91 | 17.5% | 684 | 549 | 80.3% |
| Orbitz | 520 | 372 | 71.5% | 684 | 111 | 16.2% |
| Travelocity | 520 | 44 | 8.5% | 684 | 26 | 3.8% |

Note: we only include route-day combinations in which all three travel agents reported fares. In 2006, there were 22 of 520 situations (2.5%) where all three travel agents identical low fares. These situations were not included in the "highest fare" count. Similarly, in 2008-09, there were 63 of 684 cases (9.2%) where all three agents listed identical low fares.

Figure 2 provides a histogram of the difference between travel agents' maximum and minimum "lowest" nonstop fare quotes by airport-pair market for both sample periods.¹³ The histogram reveals minimal difference (less than \$2) between travel agents' fare quotes for last minute tickets for half of the sample in 2006. Moreover, minimal fare differences become slightly more prevalent (52%) in the 2008-09 sample period. Approximately 20% of the time we find modest fare differences (between \$3 and \$50) among travel agents for both sample periods. Finally, large fare differences (over \$50) occurred with slightly greater frequency in 2006 (30%) compared to 2008-09 (28%).

We also report histograms for the differences between the individual travel agent's "lowest" fare and the best fare quoted on the route across all travel agents. Comparing the distribution of differences in fares across travel agents reveals two "stylized facts". First, Travelocity (see Figure 3a) is the undisputed low-price leader in both sample periods. Travelocity's best fares are rarely significantly higher than its competitors'. In fact, Travelocity's fares are over \$50 higher than its competitors' in a remarkable 6.7% (in 2006) and 5.4% (in 2008-09) of the cases. In comparison, large fare differences are two to three times more likely at both Orbitz and Expedia in 2006 and 2008-09 (see Figures 3b and 3c).

The occurrence of large (over \$50) fare differences at Expedia has been relatively unchanged between 2006 and 2008-09 at 17.1% and 17.0%, respectively. Somewhat surprisingly, however, is that Orbitz is more likely to provide significantly higher fare quotes in the more recent 2008-09 period (16.4%) compared to 2006 (13.0%). Hence, our second stylized fact: in 1 of 4 last minute fare quotes we find modest to large differences

¹³ For example, for a given airport-pair if Travelocity's lowest price at date t is \$200, Expedia's is \$203, and Orbitz's is \$205, then this route would have a maximum difference between travel agents of \$5.

in Orbitz and Expedia's lowest price compared to the best fare offered on the route across all travel agents in both sample periods.

Table 4 provides a comparison of the lowest price quotes by travel agent and airline for the fifty domestic routes included in our investigation. Comparing the differences in fares between 2006 and 2008-09 samples, we detect no distinct trend in increasing or decreasing airfares between the sample periods. While there may be no clear trend in pricing, one result that should not escape the reader's attention from Table 4 is the stickiness with which an online travel agent provides the lowest prices of a particular airline. Of the thirteen airlines listed on Table 4, just three carriers changed the travel agent with which they post their lowest prices between 2006 and 2008-09 samples. Or stated conversely, ten of the thirteen carriers posted their lowest prices with the same online travel agent in both samples. Specifically, we find that Travelocity in 2006 had the lowest average prices for the following carriers: American, Delta, Frontier, AirTran, Hawaiian, Northwest, and US Airways. Expedia had the lowest average prices in 2006 for Alaska, Continental, Island, United, and Mesa. While Orbitz in 2006 had the lowest prices for a single airline: Spirit. In 2008-09, there are only three airlines with different lowest price online travel agencies as Hawaiian and Island now post their lowest fares with Orbitz, while Alaska's lowest fares now appear in Travelocity. Note that this observation is consistent with findings of Bilotkach and Pejcinovska (2009).

4.3 Difference-in-Differences (DID) estimator

We employ a DID estimator to determine how fare quotes posted by online travel agents have changed between the two sample periods (2006 vs. 2008-09). We conduct the following OLS pricing regression for our sample of last-minute fare quotes:

$$P_{ij} = X'\beta + AGENT_i\gamma + AGENT_i*08\delta + AIRLINE_j\theta + AIRLINE_j*08\varphi + AGENT_i * AIRLINE_j\zeta + \varepsilon \quad (1)$$

where P_{ij} denotes the lowest price quoted by online travel agent i for a roundtrip coach-class ticket on airline j which provides non-stop service in the airport-pair market; X' is a vector of control variables, and includes a constant, non-stop travel time, income per capita, MSA population, temperature difference, Florida/Las Vegas destinations, airport-pair market Herfindahl index, and airport-specific dummies for both origin and destination airports to control for potential heterogeneities. $AGENT$ represents the three online travel agents (Travelocity, Orbitz, and Expedia); 08 is an indicator variable for the more recent 2008-09 sample period; $AIRLINE$ is an indicator for each carrier that offers non-stop service in the market.

In these difference-in-difference regressions, the 08 indicator variable captures the ‘after’ time effect, assumed the same for each agent. The agent dummy captures time-invariant agent-specific effects, while the $AGENT*08$ interaction term is the key variable, as it captures the specific agent’s change in strategy that has not previously been captured by the time trend and agent effect.

The DID estimator allows us to determine how individual travel agents changed their airfare presentation strategies between the 2006 and 2008-09 sample periods. While the focus of this paper is on the competitive effects from the change in the low price guarantee policy implemented by Orbitz; we note that the DID estimator measures the effect of *all relevant* developments in the industry over this two year period.

For our estimator to be valid, we need to be certain that the MFC price assurance policy of Orbitz was the only notable agent-specific development in the industry during our two year period of interest. Indeed, the online travel agents' business models have been established for over half a decade, and the three agents initially offered similar price matching MOR policies; the market has a rather established structure, with the main players' market shares being rather symmetric and stable. One notable industry development occurred in March 2009 (after our 2008-09 sample period ends), as the big three online travel agents began waiving booking fees on most flights.¹⁴

4.4 Variable Definitions

Below are the detailed definitions for each of the independent control variables used in our estimations:

- *Log(travel time)* is the natural logarithm of the minimum non-stop travel time between airports and serves as a proxy for distance.
- *Income per capita* is the geometric average of endpoints' income per capita, at the metropolitan statistical area level.
- *Population* is the geometric average of endpoints' population, at the metropolitan statistical area (MSA) level.
- *Temperature difference* between the trip's origin and destination (this variable serves as a measure of the route's attractiveness for vacation travelers).
- *Florida/Las Vegas destination* is an indicator variable that equals 1 for travel to Florida and Las Vegas (conventional vacation destinations).

¹⁴Expedia was the first major travel agent to waive flight booking fees on March 11, 2009. Thirty days later, every other major online travel agent (Travelocity, Orbitz, and Priceline) was waiving booking fees.

- Airport-pair market *Herfindahl index*.

In addition to the above listed variables, all regressions also include airline, airline-agent, origination and destination airport indicator variables. Coefficients for these variables are not reported to save space.

5. Data Analysis

5.1 DID Estimates

We conduct our data analysis at two ‘levels’. First, we present DID estimates for the entire sample of 10,026 observations; Second, we repeat the analysis for the sub-sample of lowest fare quotes for each agent on a specific route on a given day of data collection (e.g., lowest fare quotes offered by Expedia, Travelocity and Orbitz on a given day of data collection by market) – this sub-sample includes a single observation for each possible agent-route-date combination, and results in 4,540 observations.¹⁵ The purpose of this second level of analysis is to determine whether the adoption of a low price assurance policy has affected the best airfares available via an online travel agent for consumers.

Table 5 presents difference in difference regression estimates of equation (1) for the entire sample. This table provides results from six different regressions, each including the same set of control variables, but different combinations of travel agent and ‘after’ sample interaction dummy variables. The first three regressions include only one agent and ‘after’ sample interaction, to see how an individual agent’s behavior (in terms of which fare quotes a given travel agent chooses to show to its customers) changed

¹⁵ When several airlines offered identical lowest fares; we simply used the corresponding airline indicators as independent variables for such observations.

relative to its competition (the other two online travel agents). Regressions four through six offer another look at the travel agents' strategies, by presenting individual agent's effects relative to a 'baseline' agent's effect (i.e., the omitted travel agency). In addition to the online travel agents specific variables, Table 5 also reports coefficients for the key control variables from our regressions.

Given that this paper focuses on the competitive aspects of MFC pricing policy, we center our discussion on the online travel *AGENT*08* interaction terms since these variables reflect the changes in agents' strategies over and above time trend and time-invariant agent effects after Orbitz adopts MFC low price guarantees. Regression (1) in Table 5 shows lower, yet insignificant, changes to Travelocity's lowest last minute non-stop airfares compared to its competitors (Orbitz and Expedia) across carriers on fifty large domestic routes. The second regression indicates that Expedia's 2008-09 prices are significantly higher than the competition (Travelocity and Orbitz) – once again, over and above time trend and this agent's idiosyncratic effects. Given that we use the natural logarithm of price as the dependent variable, this *Expedia*08* coefficient of 0.0505 in Table 5 can be easily interpreted: controlling for the time trend and time invariant agent-specific effects, Expedia's fares in 2008-09 are 5% higher than its competitors. The third regression suggests that Orbitz has significantly lower fares (about 3% less) in 2008-09 compared to other online travel agents. This is the first piece of evidence to support the claim that Orbitz's MFC price guarantee is pro-competitive.

Regression (4) in Table 5 provides further evidence of significantly higher Expedia fares in 2008-09. The interpretation of the *Expedia*08* coefficient, however, is slightly different than in regression (1), since a single travel agent (Orbitz) is now

excluded. Regression (4) suggests that Expedia has nearly 6% higher airfares than Orbitz in the more recent 2008-09 sample. We also note that there is no significant difference in Travelocity fares compared to Orbitz. Regression (5) shows that both Orbitz and Travelocity have significantly lower fares than Expedia in 2008-09. In sum, we find that Orbitz's 2008-09 fares are lower than one of its competitors' (Expedia), yet no different than its other rival's (Travelocity). These findings are consistent with the claim that Orbitz's MFC price guarantees are pro-competitive.

Table 6 presents results from regressions on a sub-sample that only includes observations for the *lowest available* fares offered by each travel agent on a specific route and date. Regression (7) reveals that the lowest prices offered by Travelocity are significantly lower (4%) than its competitors' in 2008-09. In comparison, we find no significant differences among the lowest price offerings of Expedia and Orbitz in 2008-09 (see regressions (8) and (9)). Regressions (10) & (12) provide statistical evidence that Travelocity's lowest route fares in 2008-09 are significantly lower (5% less) than Orbitz's.

In sum, we find that the change in Orbitz's low price guarantee policy did not affect Expedia's or Orbitz's presentation of *lowest available* fare quotes for non-stop travel in our 2008-09 sample. We did find, however, that Travelocity has reduced its *lowest available* fare quotes compared to its competition (and Orbitz in particular).

Returning to the entire sample of the lowest non-stop fares by carrier, as reported in Table 5; during the same time period we find significant pricing changes for all three leading online travel agents in terms of how they present *lowest available* fare quotes across all airlines which offer non-stop service on the route. Not only does Table 5

include more than twice as many observations as Table 6, it also may be more representative of the fare options available to the consumer (or depth of fares) because it reflects the best price for each carrier offering non-stop service on fifty busy domestic routes. Moreover, due to the prevalence of frequent flier programs in the airline industry, many air travelers may exhibit strong brand loyalty and hence be willing to pay more to fly on a particular carrier (Lederman 2008, Basso et al., 2009). After Orbitz adopts MFC price assurance program, comparing fares for our 2006 vs. 2008-09 samples we document the following changes in travel agency behavior (above the time trend) when each carrier's lowest fare are included: Orbitz offers significantly lower fares (between 3-6% less than its peers), Expedia's fares are significantly higher (5-6%), while Travelocity's fare are lower than Expedia (5% less) and we detect no significant changes when comparing Travelocity vs. Orbitz fares.

5.2 Online Travel Agents and Non-stop Ticketing Options

In this sub-section we further explore whether travel agents have changed their strategy in deciding which last minute non-stop fares to offer to consumers between 2006 and 2008-09. One possibility is that Orbitz might have become reluctant to present higher fare quotes, fearing that the airline might drop its price later on, and Orbitz would have to compensate the difference to the traveler who (driven by, for instance, the flight's non-price characteristics or brand loyalty) purchases the higher fare before the price drop. This story is not as implausible as a skeptical reader might think. We realize that our data covers a sample of 'last minute' fare quotes; so that a reader can rightfully question both how likely an airline will drop the price and a different customer purchase a ticket on the

same itinerary within a couple of days remaining between the date we picked up the quote and the date of departure. At the same time, the literature on ‘flight-offer’ curves (with researchers tracking fare quotes for a given flight over time) has documented numerous instances of such price drops. In sum, if Orbitz is suppressing the number of higher fare quotes, then we should see a reduction in the number of nonstop ticketing options for Orbitz in the 2008-09 sample compared to its peers.

Table 7 displays the number of nonstop ticketing options (i.e., the total number of non-stop fare quote – airline combinations in the data we collected) by online travel agency in 2006 and 2008-09 when at least two travel agents offer fares on the route. In 2006, Travelocity provided the most non-stop ticketing options in our sample (1910), whereas Orbitz and Expedia provided 1474 and 1409 such quotes, respectively. Since on one of our nine data collection days in 2006 we were unable to obtain fares at Orbitz.com, a better comparison of ticketing options may be reflected by restricting the sample to include routes in which all three carriers report fares. In these situations, Travelocity still provides the traveler with the most carrier options in our sample routes (1445); however, Orbitz is now a close second with 1425 flights, followed by a distance third: Expedia with 1071 offerings. When all agents report fares, Travelocity and Orbitz present 33% more non-stop options (at the airline-route level) than Expedia in 2006.

In 2008-09, Travelocity and Orbitz are providing online ticket purchasers with the most non-stop carrier options in our sample of airport-pair markets: 1825 and 1800 observations, respectively. While Expedia has narrowed the gap in the number of non-stop carrier options, nonetheless, it still remains in last place with 1635 non-stop flights in our sample; or 10% fewer non-stop flight offerings than its peers. This difference is more

meaningful if we adjust the number of observations by the number of routes; we find that Travelocity provides an average of 2.33 non-stop carrier ticketing options per route followed by Orbitz (average of 2.3 different carriers) and Expedia (2.09 carriers) in 2008-09. Clearly, we find no evidence that Orbitz is suppressing the number of ticketing options for its consumers. Hence the above findings are consistent with the hypothesis that Orbitz's MFC low price guarantees are pro-competitive.

6. Discussion and Conclusions

This paper examines the effects on both a firm's own price as well as its competitors' price when a firm changes its low price guarantee policy moving from using a 'meet-or-release' (MOR) clause to a 'most favored customer' (MFC) clause. In the Summer of 2008, a leading online travel agent (Orbitz) implemented a MFC clause for every consumer purchasing airline tickets. Orbitz consumers were issued refunds of the price difference should a different Orbitz customer make a future purchase of an identical itinerary at a lower price. This change in pricing policy provides a natural experiment for our study, since we are able to observe the ticket distribution strategies of Orbitz and its two largest competitors (Expedia and Travelocity) both before and after MFC clause is adopted. This work is one of the first to empirically examine the effects of MFC clause. Unlike other studies addressing the issue of low price guarantees, ours examines firms' strategies in an industry in which retailers do not have direct control over the final product price: they can only choose which options to offer to their customers at prices set by the producers.

In our study, we use samples of fare quotes, collected via the three leading online travel agents both before (in 2006) and after (in 2008-09) Orbitz introduced the most favored customer clause. Comparing all fares for our 2006 vs. 2008-09 samples we find that after Orbitz adopts MFC price assurance program, the lowest fares offered via this travel agent are significantly lower (between 3-6% less than those offered by its peers); Expedia's fares are significantly higher (5-6%); Travelocity's fare are lower than Expedia's (5% less); and we detect no significant changes between Travelocity vs. Orbitz fares. For the subset of *lowest available* fare quotes on the route, we find that the change in Orbitz's low price guarantee policy did not affect Expedia's or Orbitz's presentation of *lowest available* fare quotes for non-stop travel in our 2008-09 sample.

Finally, we can put to rest the notion that Orbitz may not be displaying higher airfares (due to concerns about issuing refunds to its customers), since we find no evidence that Orbitz has reduced the number of non-stop fare offerings to its customers.

In sum, our findings support the theoretical claims (see Schnitzer, 1994) that most-favored customer types of low price guarantees can lead to more competitive pricing and hence increase consumer welfare. At the same time, the effect we have observed is not industry-wide: one of the major players, having retained its meet-or-release type of low price guarantee, changed its strategy to the one which can be considered anti-competitive. Our findings thus suggest that adoption of the MFC low price guarantees, while beneficial to customers purchasing from the adopting firm, may fail to discipline competitors which choose not to offer a similar policy.

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Appendix Table A.1: List of Airport-Pair Markets

| | |
|--|--|
| Anchorage – Seattle | Dallas-Fort Worth – Orlando |
| Atlanta – Boston | Dallas-Fort Worth – Miami |
| Atlanta – Washington (National) | Dallas-Fort Worth – Chicago (O’Hare) |
| Atlanta – Denver | Dallas-Fort Worth – San Diego |
| Atlanta – Dallas-Fort Worth | Dallas-Fort Worth – San Antonio |
| Atlanta – Fort Lauderdale | Dallas-Fort Worth – Seattle |
| Atlanta – Jacksonville | Detroit – Minneapolis-St. Paul |
| Atlanta – Las Vegas | Fort Lauderdale – New York (JFK) |
| Atlanta – Los Angeles | Honolulu – Lihue |
| Atlanta – Orlando | Honolulu – Kahului |
| Atlanta – Miami | Houston (Intercontinental) – Los Angeles |
| Atlanta – Chicago (O’Hare) | New York (JFK) – Los Angeles |
| Atlanta – West Palm Beach | New York (JFK) – Orlando |
| Atlanta – Philadelphia | New York (JFK) – San Juan, Puerto Rico |
| Atlanta – San Francisco | Las Vegas – Phoenix |
| Atlanta – Salt Lake City | Las Vegas – Los Angeles |
| Baltimore – Atlanta | Los Angeles – Seattle |
| Denver – Dallas-Fort Worth | Los Angeles – San Francisco |
| Denver – Los Angeles | New York (LaGuardia) – Chicago (O’Hare) |
| Denver – Chicago (O’Hare) | Miami – San Juan, Puerto Rico |
| Denver – San Francisco | Oakland – San Diego |
| Dallas-Fort Worth – Las Vegas | Chicago (O’Hare) – San Francisco |
| Dallas Fort Worth – Los Angeles | Tampa – Atlanta |
| Dallas-Fort Worth – New York (LaGuardia) | Seattle – Minneapolis-St. Paul |

Note: Markets selected for the study are fifty airport-pair markets randomly chosen from among the top 100 US airport-pair markets by non-stop traffic in 2006 (Source: T100 Segment dataset, US Department of Transportation). For each of the above airport-pair markets, we collected round-trip airfares for both directions (e.g., Anchorage to Seattle and Seattle to Anchorage).

Appendix Table A.2: Online Travel Agency Price Guarantees

A. Orbitz: How Orbitz Price AssuranceSM works

Once you book on Orbitz, we start tracking to see if another Orbitz customer subsequently books the same flight or hotel reservation on Orbitz at a lower price.

If that happens, we'll issue a refund for the difference. Amounts range from \$5 to \$250 per airline ticket or \$5 to \$500 per hotel reservation.

We'll continue tracking until the day you leave. So each time the price drops and another customer subsequently books your same itinerary for a lower amount, your refund amount will increase.

Expect to receive your refund check approximately 6-8 weeks after your trip is complete. We'll mail it to the billing address for the credit card used to make the booking. You'll have 90 days from the date the check is issued to cash it.

<http://www.orbitz.com/pagedef/content/legal/priceAssuranceTCs.jsp?tcs=false&popupsDisabled=false> (accessed Orbitz.com on 16 October 2009)

B. Travelocity: WHAT IS THE TRAVELOCITY LOW PRICE GUARANTEE?

1. The Travelocity Low Price Guarantee ("Low Price Guarantee") is available to travelers who have booked travel on Travelocity.com ("Travelocity") on or after August 25, 2006.
2. If you find a Qualifying Lower Rate within twenty four (24) hours of your booking, we will provide you with the following per booking:
 - o One \$50 Promo Code for a future "Good Buy" Hotel or Flight + Hotel vacation package booking on Travelocity and
 - o A refund of the difference between the price you paid through Travelocity and the Qualifying Lower Rate.

A Qualifying Lower Rate is a lower rate found on Travelocity or another

U.S.-based Web site that satisfies the requirements of these Terms and Conditions, as determined by Travelocity in its sole discretion.

http://svc.travelocity.com/info/info_popup/0,2766,TRAVELOCITY:EN|GUARANTEE_TERMS,00.html (accessed Travelocity.com on 16 October 2009).

C. **Expedia:** - Best Price Guarantee

1. Best Price Guarantee. In the unlikely event that you find a lower rate on Expedia.com or on another U.S.-based website within 24 hours of booking with Expedia.com, we will credit or refund to you the difference. In addition, we will give you a fifty dollar (\$50.00) coupon good on a future booking of an Expedia Special Rate hotel or air plus hotel package on Expedia.com. This Best Price Guarantee is subject to the terms and conditions listed below.
2. Notifying Expedia of a Claim. You must contact us at 1-800-EXPEDIA within twenty-four (24) hours after your Expedia.com booking to make a claim under the Best Price Guarantee. The lower rate must be available for booking at the time you contact us, as determined by our customer service representatives.
3. Must be "Apples to Apples" Comparison. The Best Price Guarantee is available only for exact itinerary matches, for example, specific carrier or provider (including class of service)...applicable refund policy, and the exact same dates and times of travel or service as booked through Expedia.com

http://www.expedia.com/daily/highlights/best-rate-guarantee/default.asp?mcid=hp.why_bpg#terms (accessed Expedia.com 16 Oct 2009)

Table 4: Comparison of Lowest Price Quotes by Online Travel Agent and Airline for Fifty U.S. Domestic Routes

| Travel Agent | Airline | Oct '06 - Nov '06 | | | Dec '08 - Jan '09 | | | Price Chg |
|--------------|-------------|-------------------|-----------|-------|-------------------|-----------|-------|-----------|
| | | Mean | Std. Dev. | CV | Mean | Std. Dev. | CV | |
| Expedia | American | 509.53 | 218.77 | 0.429 | 606.71 | 362.52 | 0.598 | increase |
| Orbitz | American | 540.68 | 249.34 | 0.461 | 611.49 | 349.27 | 0.571 | increase |
| Travelocity | American | 508.57 | 194.34 | 0.382 | 531.08 | 251.38 | 0.473 | increase |
| Expedia | Alaska | 552.94 | 223.68 | 0.405 | 643.13 | 326.78 | 0.508 | increase |
| Orbitz | Alaska | 690.60 | 299.89 | 0.434 | 620.19 | 259.47 | 0.418 | decrease |
| Travelocity | Alaska | 665.17 | 306.33 | 0.461 | 586.80 | 254.38 | 0.433 | decrease |
| Expedia | Continental | 522.71 | 214.07 | 0.410 | 630.94 | 315.83 | 0.501 | increase |
| Orbitz | Continental | 536.30 | 226.63 | 0.423 | 824.42 | 195.42 | 0.237 | increase |
| Travelocity | Continental | 664.59 | 74.79 | 0.113 | 640.90 | 324.19 | 0.506 | decrease |
| Expedia | Delta | 599.05 | 236.25 | 0.394 | 545.37 | 255.84 | 0.469 | decrease |
| Orbitz | Delta | 646.08 | 270.99 | 0.419 | 542.68 | 254.26 | 0.469 | decrease |
| Travelocity | Delta | 596.76 | 194.09 | 0.325 | 505.49 | 218.49 | 0.432 | decrease |
| Expedia | Frontier | 426.74 | 145.72 | 0.341 | 411.05 | 106.94 | 0.260 | decrease |
| Orbitz | Frontier | 448.98 | 138.12 | 0.308 | 432.89 | 113.68 | 0.263 | decrease |
| Travelocity | Frontier | 405.50 | 135.06 | 0.333 | 395.02 | 99.55 | 0.252 | decrease |
| Expedia | AirTran | N/A | | | 459.57 | 135.63 | 0.295 | |
| Orbitz | AirTran | 507.77 | 116.95 | 0.230 | 468.74 | 141.67 | 0.302 | decrease |
| Travelocity | AirTran | 477.46 | 109.93 | 0.230 | 440.63 | 135.85 | 0.308 | decrease |
| Expedia | Hawaiian | 89.77 | 9.02 | 0.100 | 140.11 | 15.25 | 0.109 | increase |
| Orbitz | Hawaiian | 94.48 | 2.18 | 0.023 | 138.39 | 16.85 | 0.122 | increase |
| Travelocity | Hawaiian | 88.64 | 9.62 | 0.108 | 139.32 | 15.18 | 0.109 | increase |
| Expedia | Island | 118.00 | 0.00 | 0.000 | 154.52 | 10.46 | 0.068 | increase |
| Orbitz | Island | 118.62 | 2.84 | 0.024 | 150.59 | 10.36 | 0.069 | increase |
| Travelocity | Island | 118.46 | 8.09 | 0.068 | 158.89 | 10.93 | 0.069 | increase |
| Orbitz | Spirit | 455.00 | 133.54 | 0.293 | 413.13 | 53.88 | 0.130 | decrease |
| Travelocity | Spirit | 491.21 | 152.29 | 0.310 | 415.50 | 55.10 | 0.133 | decrease |
| Expedia | Northwest | 704.43 | 397.90 | 0.565 | 745.55 | 285.36 | 0.383 | increase |
| Orbitz | Northwest | 693.85 | 416.25 | 0.600 | 697.17 | 302.85 | 0.434 | increase |
| Travelocity | Northwest | 502.67 | 241.09 | 0.480 | 601.68 | 243.29 | 0.404 | increase |
| Expedia | United | 485.24 | 189.64 | 0.391 | 476.49 | 226.37 | 0.475 | decrease |
| Orbitz | United | 548.76 | 267.02 | 0.487 | 518.52 | 274.69 | 0.530 | decrease |
| Travelocity | United | 512.31 | 224.28 | 0.438 | 493.33 | 260.18 | 0.527 | decrease |
| Expedia | US Airways | 1050.78 | 736.12 | 0.701 | 589.51 | 250.97 | 0.426 | decrease |
| Orbitz | US Airways | 1126.10 | 637.40 | 0.566 | 668.78 | 487.67 | 0.729 | decrease |
| Travelocity | US Airways | 802.29 | 383.21 | 0.478 | 562.93 | 402.47 | 0.715 | decrease |
| Expedia | Mesa | 86.92 | 8.64 | 0.099 | 142.82 | 19.95 | 0.140 | increase |
| Orbitz | Mesa | 89.24 | 8.73 | 0.098 | 147.86 | 18.03 | 0.122 | increase |
| Travelocity | Mesa | 87.14 | 8.90 | 0.102 | 150.14 | 18.63 | 0.124 | increase |

*Note, some carriers operated in 2006 but not in 2008 (e.g., Aloha and America West). Likewise, others operated in 2008 but not in 2006 (e.g., JetBlue and Virgin American). These carriers are not reported above.

Table 5: Difference in Difference Estimates of On-line Travel Agent's Lowest Airfare by Carrier on Fifty Domestic Routes in October-November 2006 ("before period") and December 2008-January 2009 ("after period")

| | (1) | (2) | (3) | (4) | (5) | (6) |
|------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| On-line Travel Agents | | | | | | |
| Travelocity | 0.1334 ** (0.0477) | | | 0.0834 (0.0690) | 0.1815 ** (0.0610) | |
| Travelocity*08 | -0.0154 (0.0137) | | | 0.0114 (0.0163) | -0.0463 ** (0.0168) | |
| Expedia | | -0.1661 ** (0.0611) | | -0.0981 (0.0888) | | -0.1815 ** (0.0610) |
| Expedia*08 | | 0.0505 ** (0.0155) | | 0.0577 ** (0.0183) | | 0.0463 ** (0.0168) |
| Orbitz | | | -0.0408 (0.0688) | | 0.0981 (0.0888) | -0.0834 (0.0690) |
| Orbitz*08 | | | -0.0337 * (0.0150) | | -0.0577 ** (0.0183) | -0.0114 (0.0163) |
| Control Variables | | | | | | |
| 08 | -0.0908 ** (0.0094) | -0.1105 ** (0.0082) | -0.0842 ** (0.0084) | -0.1176 ** (0.0127) | -0.0599 ** (0.0135) | -0.1062 ** (0.0104) |
| Log(Travel Time) | 0.6748 ** (0.0170) | 0.6751 ** (0.0169) | 0.6752 ** (0.0170) | 0.6748 ** (0.0169) | 0.6748 ** (0.0169) | 0.6748 ** (0.0169) |
| Income per Capita | -0.0001 ** (0.00001) | -0.0001 ** (0.00001) | -0.0001 ** (0.00001) | -0.0001 ** (0.00001) | -0.0001 ** (0.00001) | -0.0001 ** (0.00001) |
| Population - Geo. Avg. | 4.25E-08 ** (6.11E-09) | 4.24E-08 ** (6.11E-09) | 4.26E-08 ** (6.11E-09) | 4.24E-08 ** (6.11E-09) | 4.24E-08 ** (6.11E-09) | 4.24E-08 ** (6.11E-09) |
| Temperature Difference | -0.0250 ** (0.0043) | -0.0252 ** (0.0043) | -0.0253 ** (0.0043) | -0.0250 ** (0.0043) | -0.0250 ** (0.0043) | -0.0250 ** (0.0043) |
| Florida/Las Vegas Dest. | 1.2850 ** (0.1046) | 1.2879 ** (0.1046) | 1.2889 ** (0.1048) | 1.2867 ** (0.1046) | 1.2867 ** (0.1046) | 1.2867 ** (0.1046) |
| HHI - Airport Market | 0.4205 ** (0.0397) | 0.4202 ** (0.0397) | 0.4219 ** (0.0397) | 0.4196 ** (0.0397) | 0.4196 ** (0.0397) | 0.4196 ** (0.0397) |
| R-squared | 0.655 | 0.655 | 0.655 | 0.656 | 0.656 | 0.656 |
| Observations | 10,026 | 10,026 | 10,026 | 10,026 | 10,026 | 10,026 |

Note: White-robust standard errors appear in parentheses. Regressions also include controls for both "Airline Fixed Effects" and "Airport Fixed Effects" due to the inclusion of indicator variables for each airline and each origination and destination airports. In addition, all above estimates include agent*airline interaction terms and a constant. ^, *, and ** indicate statistical significance at 10%, 5%, and 1%, respectively. The fifty domestic routes were randomly selected from the Top 100 domestic routes based on 2005 passenger traffic. The selected airport-pair routes appear in the Appendix. We include coach-class round-trip airfares whenever at least two travel agents fare quotes for the airport-pair market.

Table 6: Difference in Difference Estimates of Lowest Price Quotes on Fifty Domestic Routes by On-line Travel Agent in October-November 2006 ("before period") and December 2008-January 2009 ("after period")

| | (7) | (8) | (9) | (10) | (11) | (12) |
|------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| On-line Travel Agents | | | | | | |
| Travelocity | -0.0099 (0.0429) | | | 0.0588 (0.0523) | -0.0467 (0.0549) | |
| Travelocity*08 | -0.0421 * (0.0193) | | | -0.0498 * (0.0233) | -0.0354 (0.0227) | |
| Expedia | | 0.0618 (0.0540) | | 0.1055 (0.0689) | | 0.0467 (0.0549) |
| Expedia*08 | | 0.0141 (0.0207) | | -0.0144 (0.0249) | | 0.0354 (0.0227) |
| Orbitz | | | -0.0685 (0.0525) | | -0.1055 (0.0689) | -0.0588 (0.0523) |
| Orbitz*08 | | | 0.0345 (0.0212) | | 0.0144 (0.0249) | 0.0498 * (0.0233) |
| Control Variables | | | | | | |
| 08 | -0.0767 ** (0.0131) | -0.0975 ** (0.0119) | -0.1036 ** (0.0116) | -0.0689 ** (0.0186) | -0.0833 ** (0.0176) | -0.1187 ** (0.0149) |
| Log(Travel Time) | 0.5796 ** (0.0265) | 0.5795 ** (0.0265) | 0.5797 ** (0.0265) | 0.5795 ** (0.0265) | 0.5795 ** (0.0265) | 0.5795 ** (0.0265) |
| Income per Capita | -0.0001 ** (0.00001) | -0.0001 ** (0.00001) | -0.0001 ** (0.00001) | -0.0001 ** (0.00001) | -0.0001 ** (0.00001) | -0.0001 ** (0.00001) |
| Population - Geo. Avg. | 6.22E-08 ** (8.71E-09) | 6.27E-08 ** (8.71E-09) | 6.23E-08 ** (8.72E-09) | 6.21E-08 ** (8.71E-09) | 6.21E-08 ** (8.71E-09) | 6.21E-08 ** (8.71E-09) |
| Temperature Difference | -0.0140 * (0.0058) | -0.0139 * (0.0058) | -0.0139 * (0.0058) | -0.0141 * (0.0058) | -0.0141 * (0.0058) | -0.0141 * (0.0058) |
| Florida/Las Vegas Dest. | 0.7206 ** (0.1342) | 0.7211 ** (0.1345) | 0.7168 ** (0.1339) | 0.7197 ** (0.1342) | 0.7197 ** (0.1342) | 0.7197 ** (0.1342) |
| HHI - Airport Market | 0.4527 ** (0.0558) | 0.4521 ** (0.0559) | 0.4518 ** (0.0559) | 0.4532 ** (0.0558) | 0.4532 ** (0.0558) | 0.4532 ** (0.0558) |
| R-squared | 0.696 | 0.696 | 0.696 | 0.697 | 0.697 | 0.697 |
| Observations | 4,540 | 4,540 | 4,540 | 4,540 | 4,540 | 4,540 |

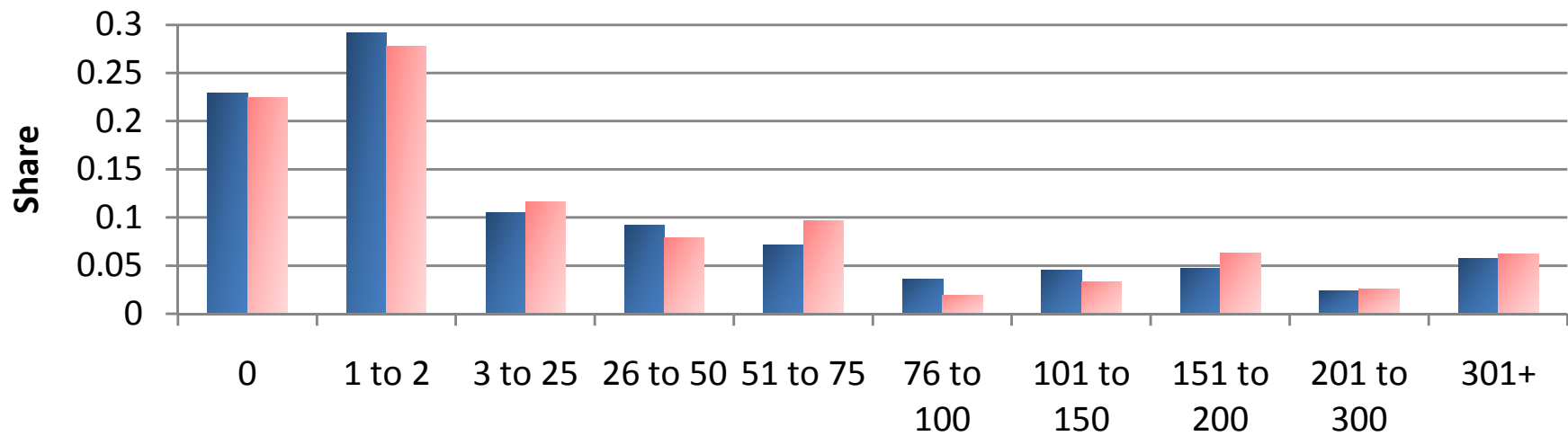
Note: White-robust standard errors appear in parentheses. Regressions also include controls for both "Airline Fixed Effects" and "Airport Fixed Effects" due to the inclusion of indicator variables for each airline and each origination and destination airports. In addition, all above estimates include agent*airline interaction terms and a constant. ^, *, and ** indicate statistical significance at 10%, 5%, and 1%, respectively. The fifty domestic routes were randomly selected from the Top 100 domestic routes based on 2005 passenger traffic. The selected airport-pair routes appear in the Appendix. We include coach-class round-trip airfares whenever at least two travel agents provide fare quotes for the airport-pair market.

Table 7: Average number of unique non-stop carriers flight options presented by on-line travel agent

| Agent | 2006 | | 2008-09 | |
|-------------|------------------------------|---------------------------|------------------------------|---------------------------|
| | Total Unique Carrier Options | Average Options per route | Total Unique Carrier Options | Average Options per route |
| Expedia | 1409 | 1.74 | 1635 | 2.09 |
| Orbitz | 1474 | 1.82 | 1800 | 2.30 |
| Travelocity | 1910 | 2.36 | 1825 | 2.33 |
| Total | 4793 | 1.97 | 5260 | 2.24 |

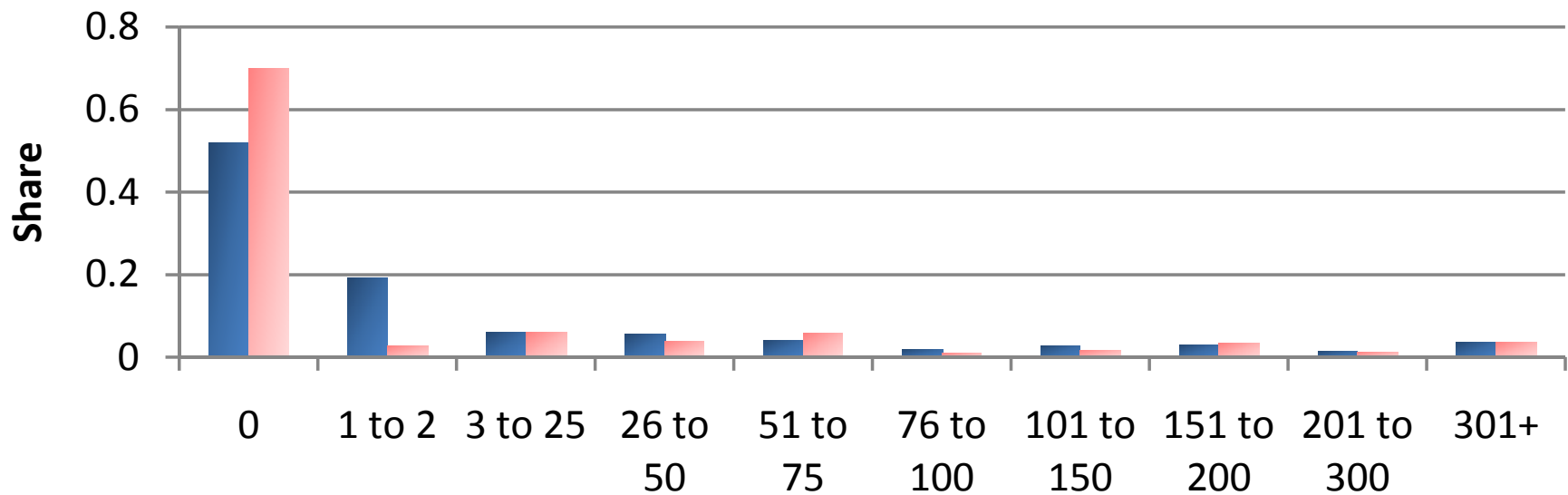
Note: In 2006, during one of our days of data collection, we had difficulty obtaining fares at Orbitz.com. The above observations reflect situations when at least two on-line travel agents reported route fares. If we require that all three travel agent report route fares, then the 2006 sample of total unique carrier options would include: Expedia (1071), Orbitz (1425), & Travelocity (1445); while only minor changes occur in the 2008 sample: Expedia (1612), Orbitz (1775), & Travelocity (1789).

Figure 2: Histogram of difference between online travel agents maximum and minimum "lowest" nonstop fares: 2006 vs. 2008-09



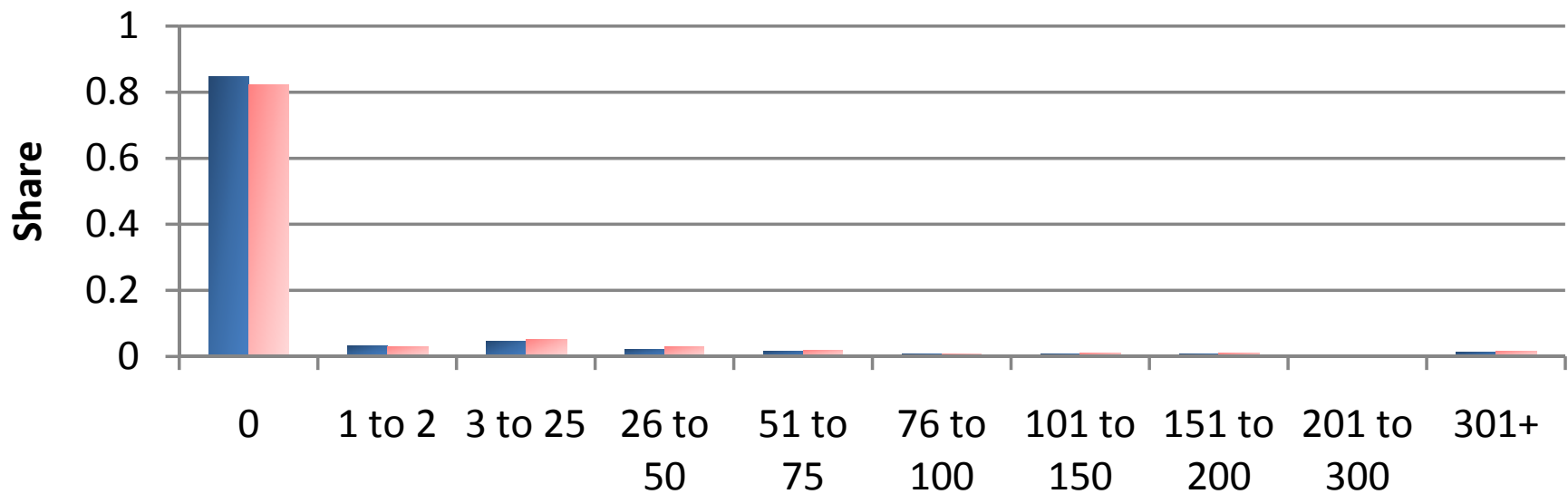
Differences (\$) 2008-09 (blue) and 2006 (red) reflect non-stop prices for fifty domestic airport-pairs (e.g., if the lowest travel agent price on the route is \$200 (Travelocity), \$203 (Orbitz), and \$205 (Expedia), then the maximum difference is \$5).

Figure 3a: Comparing difference between Expedia's best fare and "lowest" nonstop fare available on route 2006 vs. 2008-09



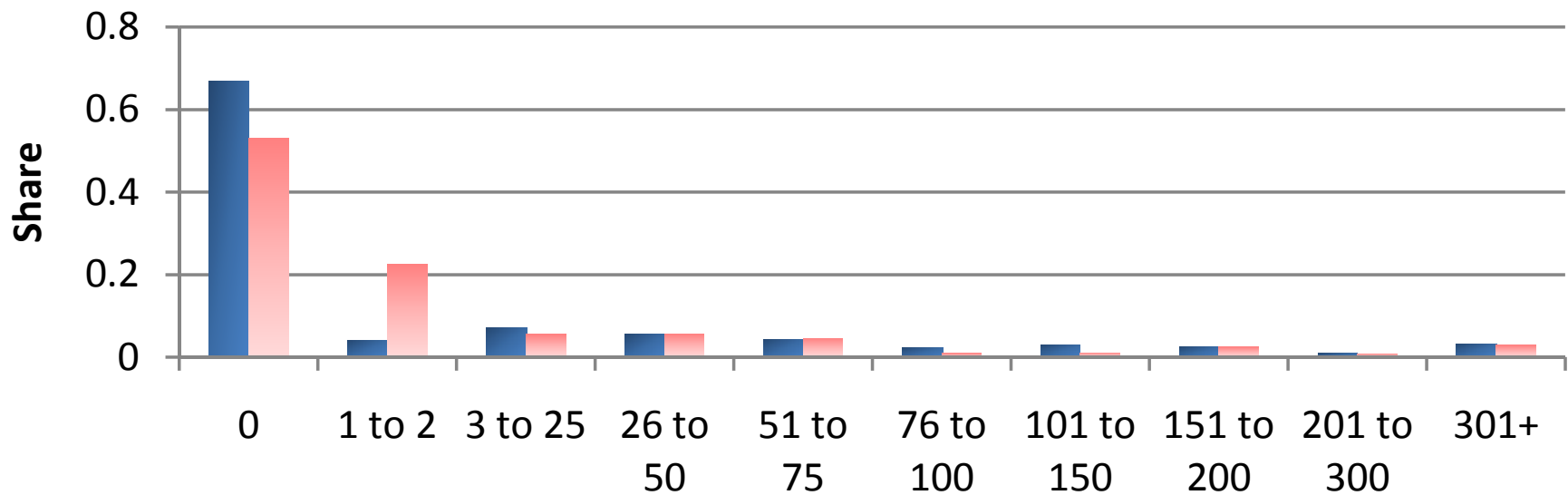
Differences (\$): **2008-09 (blue)** and **2006 (red)** reflect non-stop travel agent fares for fifty domestic airport-pairs at date t (e.g., if Expedia's lowest price on the route is \$203 vs \$200 (Travelocity or Orbitz) then the difference is \$3).

Figure 3b: Comparing difference between Travelocity's best fare and "lowest" nonstop fare available on route 2006 vs. 2008-09



Differences (\$): 2008-09 (blue) and 2006 (red) reflect non-stop travel agent fares for fifty domestic airport-pairs at date t (e.g., if Travelocity's lowest price on the route is \$203 vs \$200 (Expedia or Orbitz) then the difference is \$3).

Figure 3c: Comparing difference between Orbitz's best fare and "lowest" nonstop fare available on route 2006 vs. 2008-09



Differences (\$): 2008-09 (blue) and 2006 (red) reflect non-stop travel agent fares for fifty domestic airport-pairs at date t (e.g., if Orbitz's lowest price on the route is \$203 vs \$200 (Travelocity or Expedia) then the difference is \$3).