

## **Price Dispersion in Internet Auctions of Retail Gift Cards**

Lesley Chiou  
Department of Economics  
Occidental College  
lchiou@oxy.edu

Jennifer Pate\*  
Department of Economics  
Loyola Marymount University  
jpate1@lmu.edu

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This study investigates the level of price dispersion in Internet auctions for retail gift cards on eBay. Our results indicate that substantially less price dispersion exists than previously documented in other markets for consumer goods. Additionally, gift cards for discount retailer Wal-Mart exhibit less price dispersion than other large retailers.

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\*Corresponding author: Loyola Marymount University, Department of Economics, 1 LMU drive, Suite 4200, Los Angeles, CA, 90045. Phone: (310) 338-1738, Fax: (310) 338-1950.

## **1. Introduction**

With the growth of the Internet and online shopping, many predicted that the online environment would reduce the costs of search for consumers and this would lead to frictionless commerce with very little, if any, price dispersion. Several studies since then have challenged this view, by documenting the persistent price dispersion in online markets for books, CDs, and computer parts (Brynjolfsson and Smith, 2000; Clay, et al, 2001; Baye, et al, 2004).

This study investigates whether price dispersion exists in Internet auctions for homogeneous goods. In particular, we examine auctions of retail gift cards for Best Buy, Wal-Mart, and Home Depot on eBay. When studying auctions, one potential concern is that online price dispersion may be due to unobserved quality differences among goods and/or the seller. The market for gift cards provides an ideal setting for our study, since consumers have no uncertainty over the value of the item; gift cards are perfectly transferable and of identical materials and quality. Our dataset also has the advantage that it contains seller characteristics and transacted prices as opposed to posted prices (e.g., from retailer's website or price search engine). If consumers purchase only from a subset of the posted prices, then the full listing of prices may overstate the amount of price dispersion (Baye, et al 2004).

We find substantially less price dispersion than previously documented in other online markets. Furthermore, our results indicate that gift cards for Wal-Mart systematically exhibit less dispersion than other retailers even after controlling for auction and seller characteristics.

## 2. Empirical Analysis

### 2.1 Overall Price Dispersion

The data consist of the sale prices of gift cards for three retailers (Wal-Mart, Home Depot, and Best Buy) in the amounts of \$50, \$100, and \$200. We collected data from completed transactions that occurred on eBay during October 2005 to April 2006. As our primary interest is investigating the extent of price dispersion, we restrict our sample to transactions that occur on days where at least two gifts cards were sold within a given category.<sup>1</sup> We define a “category” as a particular retailer and face value combination – e.g., Wal-Mart gift cards for \$50. The retailers in our dataset have no maintenance fees or expiration dates for their gift cards (Offenberg, 2007).

Table 1 gives summary statistics for the final sample. Gift cards are sold on average at 10% below their commodity value. We also collected information on whether the seller paid additional fees for extra promotion (*extra*), whether the auction ended early with the Buy-It-Now option, the length of the auction in days (*length*), the number of bids on the item (*bids*), the seller’s feedback and number of negative ratings, and whether any payment restrictions to Paypal were imposed.<sup>2</sup>

In Table 2, we calculate four different measures of price dispersion for each category of gift cards on a given day: absolute deviation (which we define as the absolute difference between a gift card’s payment price and the average price for its category), range (i.e., the difference between the maximum and minimum price within a category),

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<sup>1</sup> Our results are qualitatively similar whether we use a cutoff of 2, 3, or 4 items sold per day.

<sup>2</sup> For descriptive statistics and an in-depth analysis of how these different auction characteristics affect sale price, see Pate (2006).

standard deviation, and coefficient of variation. Table 2 contains the average values of these dispersion measures across the different days of our sample; it also reports the average price across all gift cards within a category.

We find that our sample exhibits less price dispersion than previously reported in other online markets. Comparing the dispersion measures in columns (2) to (5) with the mean price in column (1), we find that across the different categories, the absolute deviation is anywhere from 1-3% of the mean price. The range varies from 4 to 8% of the overall mean price. The standard deviation and coefficient of variation vary from 2 to 4% of the overall mean price.

In contrast, previous work on online prices for books and CDs find that the range is anywhere from 25 to 40% of the mean price, and the standard deviation is 10% of the mean price (Ellison and Ellison, 2005, Brynjolfsson and Smith, 2000). The results from Baye, et al (2004) suggest that for online computer products, the average range in prices is approximately 20-30% of the mean while the coefficient of variation is 9.5%. In particular, they find that with only two firms listing prices, the gap between two lowest prices is approximately 23%, and the gap falls to 3.5% for products with 17 firms listing prices. In our dataset with an average of 7 sellers in each category daily, we are finding levels of dispersion within gift cards that are similar in magnitude to a market with 17 firms for online computer parts. One exception to this general finding of persistent dispersion is Ghose and Yao (2008) who find near-zero price dispersion in electronic markets for government buyers within the Federal Supply Service.

In an environment with an arguably homogeneous good – gift cards, we find significantly less price dispersion compared to other online markets. One possible

explanation is that gift cards represent a truly homogeneous good where characteristics are identical and known to all buyers. Item condition and quality may vary for other goods in unobservable ways. Moreover, limited opportunity exists for sellers of gift cards on eBay to engage in search obfuscation and multiproduct competition, which can be a source of price dispersion (Ellison and Ellison, 2005). Sellers post the individual items for sale on eBay and do not bundle the goods with other items. Finally, competition among bidders in an auction setting may lead to greater uniformity of prices.

## *2.2 Dispersion by Retailer*

Our results also suggest that price dispersion may vary by retailer. As shown in Table 2, under each category, Wal-Mart gift cards tend to exhibit less dispersion than gift cards for the other two retailers. For instance, the average range of a \$200 gift card for Wal-Mart is \$7 while the average range is \$11 and \$9 for Best Buy and Home Depot. As these differences may be due to auction or seller characteristics, we employ regression analysis on several different price dispersion measures to control for these factors and check for the robustness of this pattern.

First, we consider the absolute deviation and employ the following regression:

$$|P_{ijt} - \bar{P}_j| = X_{ijt}\beta + \varepsilon_{ijt}$$

where  $i$  denotes a particular card sold at time  $t$  for a given retailer and face value  $j$ . The independent variables  $X$  include controls for seller and listing-specific characteristics, such as seller rating, etc. We also include the number of other items sold that day in the same retailer-face value category to control for competition (Baye, et al. 2004) as well as monthly dummies to control for seasonal effects.

To check whether these patterns are robust to our measurement of price dispersion, we consider three alternative measures. Next, we regress the range and coefficient of variation for each category of gift cards on seasonal controls (monthly dummies) and the number of sellers in the market.<sup>3</sup> Finally, we also compute the residual range as another measure of price dispersion, since some of the dispersion in the range and coefficient of variation may be attributed to listing-specific characteristics, such as the seller's feedback.<sup>4</sup> To calculate the residual range, we run a price regression on item characteristics (see Table 3) to "net" out the part of the price variation due to these characteristics (Sorensen, 2000), and then we compute the range of the residuals to capture any remaining "unexplained" variation in prices.

The results of the OLS regressions are reported in Table 3. Across the different specifications, we still find that Wal-Mart gift cards exhibit less price dispersion even when controlling for seller and auction characteristics.<sup>5</sup> The negative coefficient on the Wal-Mart dummy indicates that Wal-Mart gift cards exhibit less dispersion relative to Best Buy and Home Depot. On average, the price of a Wal-Mart gift card is 50 cents closer to its mean compared to the other two retailers. The price range and residual price range of Wal-Mart gift cards are approximately \$1.50 and \$2.30 lower than the other two retailers.

Stahl (1996) demonstrates that price dispersion across stores can occur in equilibrium for a homogenous good when the population consists of some consumers

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<sup>3</sup> The results using the standard deviation had similar signs for the coefficients, but were not precisely estimated.

<sup>4</sup> The unexpected sign on the number of sellers may be due to correlations with auction characteristics. When we run the price regression to net out these auction specific characteristics, we find an expected negative coefficient on the number of sellers, though it is not estimated precisely.

<sup>5</sup> Recall that we restrict our sample to transactions that occur on days with at least 2 items sold in the same category. Our results are qualitatively similar whether we use a cutoff of 2, 3, or 4 items sold per day.

who price search and others that do not. Consistent with his model, if Wal-Mart shoppers are more price sensitive and engage in more search, then we would expect less price dispersion for Wal-Mart cards compared to Best Buy and Home Depot.

### **3. Conclusion**

Despite predictions of costless search and intensified price competition, previous studies have indicated a substantial amount of price dispersion exists for the online market for books, CDs, and computer parts. In this study we consider whether this price dispersion persists in an auction setting of a homogeneous good – retail gift cards. We document substantially lower levels of price dispersion under several different measures. Compared to online prices for books and CDs whose range (i.e., difference between the maximum and minimum price) often lie 25 to 40% of the mean price, the price range for gift cards on any given day varies from 4 to 8% of the overall mean price (Ellison and Ellison, 2005, Brynjolfsson and Smith, 2000). This finding establishes a lower bound of online price dispersion for consumer goods in this literature.

We also find that price dispersion is systematically lower for gift cards from the discount retailer Wal-Mart compared to Home Depot and Best Buy. This result is consistent with search models that predict price dispersion as the result of two types of consumers – shoppers and non-shoppers. Consumers of discount retailers may be more price sensitive and all engage in intensive price search.

Our results suggest that online price dispersion may vary widely by market and the price determination mechanism, but when considering the auctions of homogeneous goods, it appears that e-commerce may be close to frictionless.

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Table 1. Summary statistics

Variable	Number of observations	Mean	Standard Deviation
Payment price			
Face value \$50	605	45.23	2.40
Face value \$100	847	90.22	4.45
Face value \$200	231	181.18	9.88
Best Buy	1683	0.49	0.50
Home Depot	1683	0.43	0.50
Wal-Mart	1683	0.08	0.27
Face value \$50	1683	0.36	0.48
Face value \$100	1683	0.50	0.50
Face value \$200	1683	0.14	0.34
Extra promotions	1683	0.43	0.56
Buy It Now	1683	0.36	0.48
Length of auction	1683	2.72	2.20
Number of bids	1683	7.80	7.45
Seller feedback	1683	342.49	818.43
Negative ratings	1683	1.62	3.83
Payment restrictions	1683	0.63	0.48
Number of items sold on same day	1683	6.16	4.25

Table 2. Measures of Average Dispersion and Price

	price	absolute deviation	range	standard deviation	coefficient of variation
Best Buy \$50	45.05 (2.15)	1.09 (1.33)	3.65 (3.19)	1.67 (1.75)	0.04 (0.05)
Best Buy \$100	89.63 (4.37)	2.39 (2.39)	6.58 (5.18)	3.04 (2.20)	0.03 (0.03)
Best Buy \$200	178.29 (11.68)	3.73 (4.73)	10.72 (9.66)	6.12 (5.24)	0.04 (0.03)
Home Depot \$50	45.51 (2.83)	1.35 (1.82)	3.78 (3.94)	2.08 (2.05)	0.05 (0.05)
Home Depot \$100	90.34 (4.35)	2.53 (2.60)	7.48 (5.37)	3.18 (2.36)	0.04 (0.03)
Home Depot \$200	182.78 (7.01)	2.90 (3.85)	8.91 (8.64)	5.42 (5.70)	0.03 (0.03)
Wal-Mart \$50	46.83 (4.31)	0.42 (0.78)	1.91 (1.96)	1.23 (1.33)	0.03 (0.03)
Wal-Mart \$100	92.51 (5.15)	1.37 (1.91)	4.67 (4.20)	3.07 (2.98)	0.03 (0.03)
Wal-Mart \$200	185.99 (6.28)	1.94 (2.64)	7.32 (5.63)	4.60 (3.87)	0.02 (0.02)

Note: Averages are reported with standard deviations in parentheses.

Table 3. Measures of Price Dispersion

	(1)	(2)	(3)	(4)
	Absolute Deviation	Range	Coefficient of Variation	Residual range
Best Buy	-0.011 (0.139)	-0.114 (0.595)	-0.003 (0.004)	0.404 (0.594)
Wal-Mart	-0.501* (0.221)	-1.456+ (0.755)	-0.008+ (0.005)	-2.340** (0.731)
face value \$100	1.215** (0.112)	2.954** (0.473)	-0.006 (0.004)	2.707** (0.462)
face value \$200	2.882** (0.309)	6.804** (0.996)	-0.008 (0.005)	5.492** (0.982)
number of items	0.013 (0.014)	0.522** (0.097)	0.000 (0.001)	
Observations	1683	406	406	406
R-squared	0.16	0.21	0.01	0.14

Notes: Robust standard errors in parentheses

+ significant at 10%; \* significant at 5%; \*\* significant at 1%

The omitted retailer is Home Depot, and the omitted face value is \$50.