Even on eBay it Pays to Buy in Volume: An Imitation of a Controlled Experiment

Mikhail Ion Melnik, Paul Richardson, and Peggy Choong

Mikhail Ion Melnik is Associate Professor of Economics at Southern Polytechnic State University. Paul Richardson is Associate Professor of Marketing, Niagara University. Peggy Choong is Professor of Marketing, Niagara University.

ABSTRACT

In this study, we replicate a controlled experiment setting by following a single established seller with a standardized method of listing items on eBay to investigate the effect that the quantity of items in a listing has on the bidder’s willingness to pay as captured by the realized auction price. The investigation focuses on a “commodity” like item, namely, a silver dollar coin in identical condition. Our results demonstrate that the per-item price in multi-item listings is a decreasing and non-linear function of the number of items in the listing. These results are important because they are the first to report on the effect of quantity of items in a listing on realized auction price on eBay.

DOI: http://dx.doi.org/10.15239/j.brcacadjb.2014.04.01.ja02
**Introduction**

Studies in marketing show how quantity discounts coordinate the functions of channel members and lead to channel efficiency and profit maximization (Dolan, 1987; Jeuland & Shugan, 1983; Ke & Bookbinder, 2012). Other studies have found that firms that take the quantity discount effect into consideration before setting prices are able to enhance their market performance and obtain greater profits (Gu and Yang, 2010). The quantity discount is also used by firms as a sales promotion or price discriminatory tool to segment the market according to the intensity of consumption thereby facilitating better price discrimination among heterogeneous consumers (Gu & Yang, 2010; Allenby et al., 2004; Klapper & Oetzel, 2011). In a heterogeneous market with less differentiated products, market equilibrium is found to require smaller discounting (Subramaniam and gal-Or, 2009). These studies report that the quantity discount is characterized by marginal prices that decline with quantity purchased. This decline is expected because consumers’ marginal willingness to pay decreases with quantity (Iyengar and Jedid, 2012). Suppliers also face reduced production, inventory, and transportation costs which allow for lower prices as quantity increases (Dolan and Simon, 1997).

The literature concerning e-retailing investigates quantity discounts from the perspective of incentives such as free shipping for orders exceeding some quantity threshold on additional sales. Results suggest that these strategies are effective in generating additional sales. However, loss of revenues from shipping and the lack of appeal of this offer to substantial segments of consumers may be substantial enough to make such promotions unprofitable (Lewis, Singh & Fay, 2006).

The purpose of this study is to examine the impact of quantity discounts in an imitation of a controlled experiment using data collected from eBay. To the authors’ knowledge this is the first study to explicitly investigate the impact of quantity on realized auction price on eBay. We focus on a homogeneous good that is almost indistinguishable from a
commodity, namely the silver dollar coin. We also attempt to control for seller specific characteristics by collecting data from listings generated by the same seller.

**Data Collection**

eBay presents researchers with a vast source of data. The sheer volume of trade that takes place on eBay is comparable to entire industries. In 2012, the volume of merchandise sold on the US eBay website, excluding the motor vehicles section, was $26,424 million dollars (eBay, 2013). When the international sites of eBay are added to the US results, the gross merchandise sales excluding auto reach $67,763 million dollars (eBay, 2013). eBay provides a vast amount of sales data and presents a number of unique opportunities to study the various aspects of ecommerce and auctions.

In this work we take a rather simple approach to investigating the effect of a penalty on a volume transaction. The seller selected for our study is an established business with a physical location and their own ecommerce website complete with product listings and a fully automated and functional checkout system that accepts multiple methods of payment. Our seller has a very high level of experience on eBay which is evident not only from the number of listings offered by the seller at any point in time, but also by their eBay rating which at the time of the completion of our data collection was 38,842. The seller has received 55,001 comments as a seller and only 114 comments as a buyer indicating the level of sales activity on eBay. The seller’s rating is almost entirely positive with only 14 negative comments.

The seller’s rating may play an important role in the determination of the willingness to pay in online auctions. By focusing on a single seller with an established rating we effectively control for the rating effects by eliminating its variability from our data. There are numerous works
that demonstrate the importance of the seller’s eBay rating (see Lucking-Reiley et al, 2007; Melnik & Alm, 2002)

The seller was selected for their high volume of listings. On average the seller has maintained 138 listings running on any given day in February of 2013. The seller sells exclusively silver bullion in the form of recently minted coins of US, Canadian, New Zealand and other mints and various size silver bars. Furthermore, the seller uses an identical listing format, shipping and payment structure, general listing appearance, starting values, and duration of the listing in all of their auctions. It is important to note that all of the listings are of auction format and have no buy-it-now option.

In our study we decided to focus on what appears to be a “commodity” like silver bullion coin: the 2012 US Silver Eagle dollar coin. The seller sells these coins in their original plastic holders provided by the US mint. None of these coins are graded. All listings are of auction format with the starting bid at $0.99 and the no buy-it-now option. Most importantly, the seller offers listings with various quantities of the coin. The quantity varies from one coin per listing to five coins per listing. In addition, the seller also offers listings containing ten coins. Table 1 shows the quantity distribution.

From Table 1 we can see that the average price declines with the number of coins per listing. There is a clear penalty per coin imposed by the buyers and this penalty appears to be a function of the size of the listing. It is also important to note that the propensity of the multi-item listings remains roughly constant during the period of data collection.

However, making any inference directly from the summary statistics presented in Table 1 should be done with caution as the data was collected over a period of time. The data consists of all listings for US Silver Eagle Dollar coins that closed between February 2 and February 26, 2013. During this time period the price of silver, the underlying commodity that accounts for the bulk of the value of the coin, fluctuated.
Table 2 shows the complete summary statistics of the variables in our data set.

Table 2 includes the variables collected from the eBay listings. These include the number of coins in the listing, the number of bids placed in the listing, the closing price, and the time of the closing of the listing. Note that the time is normalized to vary from 0.0 for 12:00 am to 1.0 for 11:59:59 pm. The data also includes several variables obtained on the price of silver itself. The silver price data is constructed from the silver ETF, SLV. The data includes the closing price of the ETF and the volume of trade on the date of the completion of the listing. We also include a binary variable to reflect the market conditions of the day. Market Open assumes the value of one if the stock market where SLV is traded was open on the day of completion of the listing and one otherwise.

Note that the price of the SLV and the volume of trade are not weighed by the number of listings, i.e. the summary statistics are computed based on each day constituting one observation. Market Open is weighted by the number of listings. As a result we can interpret the price of SLV as the average daily price over the data collection period, while the Market Open as the percentage of listings completing on a day when the market is closed.

SLV is one of the most commonly held commodity ETFs at this time. One share represents 96.667% of one OZ of pure silver (ishares.com, 2013). Since the American Silver Eagle Dollar coin contains one OZ of silver, we adjust the price of SLV by 1.0344 to obtain the equivalent of the value of the silver content of the coin (SLV-adjusted). Based on this adjustment and the average value of silver during this time period, the average value of the silver content of the coin was about $29.998, representing 80.7% of the value of the coin based on the average per coin price in our dataset. The per coin price is computed by dividing the closing price of the listing by the quantity of coins in the listing. It is important to note that our seller provides free insured shipping. If we were to assume
that the value of the shipping service is on average about $3/coin, then the silver content would account for 87.8% of the average price\(^1\).

By selecting this high volume seller who uses a standardized approach in all of their listings, we effectively were able to produce a controlled experiment. All listings are identical in every respect, except the time and date of listing, the time and date of completion, and the quantity of the coin sold. In our case the controlled nature of the study is accomplished by selecting a high volume seller who utilizes the same listing template. Alternatively, an experiment can be constructed by creating a seller with a standard template (see Resnick et al, 2005; Katkar & Reiley, 2006).

**Results**

Table 3 presents the results of three OLS estimations. In the first two of these estimations the dependent variable is *Price Per Coin*, while in the third specification the dependent variable is \(\text{Ln}(\text{Price Per Coin})\). In all of the specifications the coefficient on *Number of Coins* (\(\text{Ln}[\text{Number of Coins}]\) in case of Specification III) is negative and statistically significant.

The first specification presents a linear formulation of the relationship. The magnitude of the coefficient shows that for each additional coin included into the listing, the winning bid per coin decreases by nearly 25 cents, which represents about 0.67% of the average value in our dataset. This may seem like a small amount, but recall that this is on per coin basis. The difference between a single coin listing and a ten coin listing is $22.50 (see Table 4). Our seller formally absorbs the shipping and insurance costs of each listing\(^2\). If we assume that the shipping cost to the seller for each single item listing is about $3, then the shipment of ten separate items will result in $30. As long as the cost of combining ten coins together into one shipment does not exceed $7.50, the seller is actually better off facing the bid penalty on the multi-item winning bid in a ten coin listing.
Even on eBay it Pays to Buy in Volume: An Imitation of a Controlled Experiment

Mikhail Ion Melnik, Paul Richardson, and Peggy Choong

Mikhail Ion Melnik is Associate Professor of Economics at Southern Polytechnic State University. Paul Richardson is Associate Professor of Marketing, Niagara University. Peggy Choong is Professor of Marketing, Niagara University.

ABSTRACT

In this study, we replicate a controlled experiment setting by following a single established seller with a standardized method of listing items on eBay to investigate the effect that the quantity of items in a listing has on the bidder’s willingness to pay as captured by the realized auction price. The investigation focuses on a “commodity” like item, namely, a silver dollar coin in identical condition. Our results demonstrate that the per-item price in multi-item listings is a decreasing and non-linear function of the number of items in the listing. These results are important because they are the first to report on the effect of quantity of items in a listing on realized auction price on eBay.

DOI: http://dx.doi.org/10.15239/j.brcacadjb.2014.04.01.ja02
The literature concerning e-retailing investigates quantity discounts from the perspective of incentives such as free shipping for orders exceeding some quantity threshold on additional sales. Results suggest that these strategies are effective in generating additional sales. However, loss of revenues from shipping and the lack of appeal of this offer to substantial segments of consumers may be substantial enough to make such promotions unprofitable (Lewis, Singh & Fay, 2006).

The purpose of this study is to examine the impact of quantity discounts in an imitation of a controlled experiment using data collected from eBay. To the authors’ knowledge this is the first study to explicitly investigate the impact of quantity on realized auction price on eBay. We focus on a homogeneous good that is almost indistinguishable from a
commodity, namely the silver dollar coin. We also attempt to control for seller specific characteristics by collecting data from listings generated by the same seller.

**Data Collection**

eBay presents researchers with a vast source of data. The sheer volume of trade that takes place on eBay is comparable to entire industries. In 2012, the volume of merchandise sold on the US eBay website, excluding the motor vehicles section, was $26,424 million dollars (eBay, 2013). When the international sites of eBay are added to the US results, the gross merchandise sales excluding auto reach $67,763 million dollars (eBay, 2013). eBay provides a vast amount of sales data and presents a number of unique opportunities to study the various aspects of ecommerce and auctions.

In this work we take a rather simple approach to investigating the effect of a penalty on a volume transaction. The seller selected for our study is an established business with a physical location and their own ecommerce website complete with product listings and a fully automated and functional checkout system that accepts multiple methods of payment. Our seller has a very high level of experience on eBay which is evident not only from the number of listings offered by the seller at any point in time, but also by their eBay rating which at the time of the completion of our data collection was 38,842. The seller has received 55,001 comments as a seller and only 114 comments as a buyer indicating the level of sales activity on eBay. The seller’s rating is almost entirely positive with only 14 negative comments.

The seller’s rating may play an important role in the determination of the willingness to pay in online auctions. By focusing on a single seller with an established rating we effectively control for the rating effects by eliminating its variability from our data. There are numerous works
that demonstrate the importance of the seller’s eBay rating (see Lucking-Reiley et al, 2007; Melnik & Alm, 2002)

The seller was selected for their high volume of listings. On average the seller has maintained 138 listings running on any given day in February of 2013. The seller sells exclusively silver bullion in the form of recently minted coins of US, Canadian, New Zealand and other mints and various size silver bars. Furthermore, the seller uses an identical listing format, shipping and payment structure, general listing appearance, starting values, and duration of the listing in all of their auctions. It is important to note that all of the listings are of auction format and have no buy-it-now option.

In our study we decided to focus on what appears to be a “commodity” like silver bullion coin: the 2012 US Silver Eagle dollar coin. The seller sells these coins in their original plastic holders provided by the US mint. None of these coins are graded. All listings are of auction format with the starting bid at $0.99 and the no buy-it-now option. Most importantly, the seller offers listings with various quantities of the coin. The quantity varies from one coin per listing to five coins per listing. In addition, the seller also offers listings containing ten coins. Table 1 shows the quantity distribution.

From Table 1 we can see that the average price declines with the number of coins per listing. There is a clear penalty per coin imposed by the buyers and this penalty appears to be a function of the size of the listing. It is also important to note that the propensity of the multi-item listings remains roughly constant during the period of data collection.

However, making any inference directly from the summary statistics presented in Table 1 should be done with caution as the data was collected over a period of time. The data consists of all listings for US Silver Eagle Dollar coins that closed between February 2 and February 26, 2013. During this time period the price of silver, the underlying commodity that accounts for the bulk of the value of the coin, fluctuated.
Table 2 shows the complete summary statistics of the variables in our data set.

Table 2 includes the variables collected from the eBay listings. These include the number of coins in the listing, the number of bids placed in the listing, the closing price, and the time of the closing of the listing. Note that the time is normalized to vary from 0.0 for 12:00 am to 1.0 for 11:59:59 pm. The data also includes several variables obtained on the price of silver itself. The silver price data is constructed from the silver ETF, SLV. The data includes the closing price of the ETF and the volume of trade on the date of the completion of the listing. We also include a binary variable to reflect the market conditions of the day. Market Open assumes the value of one if the stock market where SLV is traded was open on the day of completion of the listing and one otherwise.

Note that the price of the SLV and the volume of trade are not weighed by the number of listings, i.e. the summary statistics are computed based on each day constituting one observation. Market Open is weighted by the number of listings. As a result we can interpret the price of SLV as the average daily price over the data collection period, while the Market Open as the percentage of listings completing on a day when the market is closed.

SLV is one of the most commonly held commodity ETFs at this time. One share represents 96.667% of one OZ of pure silver (ishares.com, 2013). Since the American Silver Eagle Dollar coin contains one OZ of silver, we adjust the price of SLV by 1.0344 to obtain the equivalent of the value of the silver content of the coin (SLV-adjusted). Based on this adjustment and the average value of silver during this time period, the average value of the silver content of the coin was about $29.998, representing 80.7% of the value of the coin based on the average per coin price in our dataset. The per coin price is computed by dividing the closing price of the listing by the quantity of coins in the listing. It is important to note that our seller provides free insured shipping. If we were to assume
that the value of the shipping service is on average about $3/coin, then the silver content would account for 87.8% of the average price\(^1\).

By selecting this high volume seller who uses a standardized approach in all of their listings, we effectively were able to produce a controlled experiment. All listings are identical in every respect, except the time and date of listing, the time and date of completion, and the quantity of the coin sold. In our case the controlled nature of the study is accomplished by selecting a high volume seller who utilizes the same listing template. Alternatively, an experiment can be constructed by creating a seller with a standard template (see Resnick et al, 2005; Katkar & Reiley, 2006).

**Results**

Table 3 presents the results of three OLS estimations. In the first two of these estimations the dependent variable is *Price Per Coin*, while in the third specification the dependent variable is Ln(*Price Per Coin*). In all of the specifications the coefficient on *Number of Coins* (ln[Number of Coins] in case of Specification III) is negative and statistically significant.

The first specification presents a linear formulation of the relationship. The magnitude of the coefficient shows that for each additional coin included into the listing, the winning bid per coin decreases by nearly 25 cents, which represents about 0.67% of the average value in our dataset. This may seem like a small amount, but recall that this is on per coin basis. The difference between a single coin listing and a ten coin listing is $22.50 (see Table 4). Our seller formally absorbs the shipping and insurance costs of each listing\(^2\). If we assume that the shipping cost to the seller for each single item listing is about $3, then the shipment of ten separate items will result in $30. As long as the cost of combining ten coins together into one shipment does not exceed $7.50, the seller is actually better off facing the bid penalty on the multi-item winning bid in a ten coin listing.
From the results reported in Table 3 we also note that the relationship between the number of coins per listing and the realized per coin winning bid is better represented by a non-linear representation. This is seen in a higher adjusted R-square of specifications II and III. In Table 4 we present the predicted effects on the per coin basis and on the total value of the winning bid under each specification.

The non-linear specifications also shows a somewhat greater penalty placed on a multi-item listing. Specification III, which has the best overall goodness of fit, shows that a ten coin listing would result in a 26 dollar lower winning bid value than ten one coin listings combined. If we continue to operate under the assumption that the cost of shipping one coin is $3, then for the seller who offers a free shipping option absorbing the winning bid penalty of $26 would makes sense only if the combined shipping cost does not exceed $4, which is an unlikely scenario as the insurance cost of a $360 purchase exceeds that by itself. The non-linear formulation demonstrates that the marginal penalty declines on per coin basis as the number of coins in the listing increases.

We include several control variables into our estimations. However, only two of these demonstrate statistical significance: namely, Number of Bids and SLV Adjusted. As expected, a higher level of bidding activity increases the realized bid on per coin basis. eBay deploys an incremental bid structure. We also find that the value of the US Silver Eagle coin on eBay appears to closely follow the behavior of the price of silver as measured by the adjusted value of SLV (the silver ETF).

The timing of the closing of the listing, and the weekday of the closing (work day versus weekend as represented by Market Open) do not appear to have a statistically significant impact on the per coin realized winning bid nor does the volume of trade of SLV on the US stock exchange.
From the results reported in Table 3 we also note that the relationship between the number of coins per listing and the realized per coin winning bid is better represented by a non-linear representation. This is seen in a higher adjusted R-square of specifications II and III. In Table 4 we present the predicted effects on the per coin basis and on the total value of the winning bid under each specification.

The non-linear specifications also shows a somewhat greater penalty placed on a multi-item listing. Specification III, which has the best overall goodness of fit, shows that a ten coin listing would result in a 26 dollar lower winning bid value than ten one coin listings combined. If we continue to operate under the assumption that the cost of shipping one coin is $3, then for the seller who offers a free shipping option absorbing the winning bid penalty of $26 would makes sense only if the combined shipping cost does not exceed $4, which is an unlikely scenario as the insurance cost of a $360 purchase exceeds that by itself. The non-linear formulation demonstrates that the marginal penalty declines on per coin basis as the number of coins in the listing increases.

We include several control variables into our estimations. However, only two of these demonstrate statistical significance: namely, Number of Bids and SLV Adjusted. As expected, a higher level of bidding activity increases the realized bid on per coin basis. eBay deploys an incremental bid structure. We also find that the value of the US Silver Eagle coin on eBay appears to closely follow the behavior of the price of silver as measured by the adjusted value of SLV (the silver ETF).

The timing of the closing of the listing, and the weekday of the closing (work day versus weekend as represented by Market Open) do not appear to have a statistically significant impact on the per coin realized winning bid nor does the volume of trade of SLV on the US stock exchange.
Conclusion

This paper uses a particular item, a 2012 US Silver Eagle Dollar coin. The dataset consists of all listings generated during February 2 – February 26 of 2013 by a single high volume eBay seller who utilizes an identical listing format. This effectively enables us to control for all listing/seller characteristics except the number of items per listing, the timing of the listing, and the price of the underlying commodity (silver). The statistical results allow us to conclude that a multi-item listing receives a sizable penalty in the form of a lower winning bid. The relationship between the penalty on per item basis and the quantity of the items in a multi-item listing appears to be non-linear with the marginal reduction on a per item basis diminishing with quantity.

It is important to note that the estimations in this study have a relatively low level of adjusted R-square. In addition, the study focuses on listings with limited variability in the quantity of items listed (1, 2, 3, 4, 5, and 10). Also, this study is performed on a single item (US Silver Eagle Dollar coin), and the same behavior of buyers may not be expected in other categories/items.

References


Web Appendix

The web appendix for this paper is available at:
http://dx.doi.org/10.15239/j.brcacadjb.2014.04.01.wa02

Citation Information

Notes

1. Our seller does not charge for shipping, so we do not know the exact value of shipping in the value of the coins, but based on listings by other sellers who charge shipping, the average shipping value is about $2.95.

2. This study does not investigate the incidence of shipping costs on eBay. Recall that our seller provides free shipping in all listings. For shipping incidence studies see Hou and Blodget (2012), and Melnik and Richardson (2010).

3. The insurance cost for a first class package valued at $360 is $6.25 (USPS, 2013).