

The Effect of ID Verification in Online Auctions: Evidence from a Field Experiment

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Abstract:

Problems that arise in online markets due to asymmetric information are exacerbated by the fact that transactions in these markets are completely anonymous. The online auction mechanism provided by eBay is an example of such a market. To combat the anonymity problem, eBay allows sellers to become "ID Verified" by paying a small fee to have their identity confirmed by a credit information company. Doing so may reassure potential bidders that the seller is legitimate since their identity is known, and there is more assurance that the seller could be tracked down and punished should a problem arise. Identifying the effect of ID verification is difficult using naturally occurring data, however, because the service tends to be used only by sellers who have a well-established reputation. It is thus difficult to determine whether an improved outcome is due to the seller's reputation or due to ID verification. This study alleviates this concern by conducting a field experiment where items are sold with different IDs that have different characteristics, and finds little evidence that bidders place any value on ID verification.

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I. Introduction

One of the most significant obstacles to the success of online markets is that the buyers and sellers involved in the transactions are completely unknown to each other. The anonymous nature of these markets exacerbates problems arising from asymmetric information. In the auction market supported by eBay, for example, asymmetric information problems arise because by convention, sellers are not expected to send the good being auctioned to the winning bidder until after payment has been received. Buyers accordingly must be wary of the possibility that sellers - who they will never meet or see - will either deliver an item that is not of the promised quality or fail to deliver the item at all.

The anonymous nature of the eBay market may worsen inefficiencies arising from asymmetric information problems for several reasons. First, if the seller's identity is unknown, it is far less likely that the seller will be tracked down and punished should a problem arise. Bidders may conclude that a seller is more likely to engage in a scam if their probability of being caught and punished is extremely low. Second, complete anonymity means that the perceived social distance between potential bidders and the seller is as wide as possible, so bidders may be less willing to believe that the seller is trustworthy.¹ Charness and Gneezy (2008) find evidence that even a small decrease in social distance can result in increased pro-social behavior, although they do not study trust or trustworthiness specifically. They examine dictator games and ultimatum games where subjects in the treatment group learn the family name of their

¹ The terms "trust" and "trustworthy" are used loosely in the same general way that they are often employed when discussing experimental or theoretical studies of a trust game, first introduced by Berg et. al. (1995). In this context, subjects are frequently said to "trust" their counterparts, or to be "trustworthy," regardless of the motivation behind their choices. The concept of trust is more complex than this, and has been studied extensively. In other contexts, for example, "trust" may refer only to faith that one's counterpart will behave in a pro-social manner, and not decisions that happen to be consistent with pro-social behavior but are actually made in the strategic pursuit of self-interest.

counterpart, while subjects in the control group remain completely anonymous. They find that this small decrease in social distance increases the amount donated in the dictator game, but has no effect on behavior in the ultimatum game because pro-social motivations are outweighed by strategic motivations. Third, many serious transgressions on eBay are conducted by seller identities that have been stolen from their rightful owners after capturing the owner's password via a fake email to the seller, a process known as phishing. Because eBay identities can be stolen and can also be easily faked, not knowing the true identity behind an eBay identity means that bidders can never be certain of the intentions of the seller, even ones that have very good reputations.

Fortunately, eBay provides a tool that is designed to combat the anonymity problem directly. Along with the well-studied reputation system,² eBay's offers a service called ID Verify. For a fee of \$5.00, sellers in the United States can have their identity confirmed by Equifax, one of the three major credit information companies that issues credit reports.³ A small graphical icon indicating that the seller has been ID verified is then displayed next to the seller's name and feedback rating on her auction pages. Similar services are provided in versions of eBay in other countries. If a seller's identity is verified, each of the problems listed above are mitigated. The chances of catching and punishing a fraudulent seller are increased, the perceived social distance between a buyer and seller is decreased slightly, and the chance that a seller's identity has been stolen or faked is decreased. Each of these rationales may lead bidders to find sellers more trustworthy, resulting in a willingness to bid higher amounts.

² Lucking-Reiley et. al. (2007) offered the first study of the effect of eBay's reputation system on auction outcomes. While this paper was not published until 2007, the initial working paper was made available in 1999 and remains the most widely cited study of reputation on eBay. Many others have followed; Bajari and Hortaçsu (2004) provide a survey of the results.

³ For further details on the process of becoming ID Verified, consult <http://pages.ebay.com/help/account/id-verify.html>.

The effect of this service on bidder behavior and auction outcomes has yet to be carefully studied. This is not surprising because its effect is difficult to identify using naturally-occurring data, for several reasons. First and most importantly, it tends to be employed only by sellers who have already established a good reputation. Accordingly, one cannot tell whether the better outcomes experienced by sellers who have purchased ID verification are due to the sellers' ID verification or due to their superior reputations.⁴ Second, the decision to become ID verified is endogenous. Third, auctions of similar items still typically have different characteristics, such as different descriptions, different shipping costs, different durations, different minimum bid levels, and the like which may impact auction outcomes. While these differences can be controlled for, the large number of factors that can vary make it likely that too many factors will change simultaneously, making it difficult to isolate the effect of variation in any one variable.

To overcome these problems and to hold as many factors constant as possible, the present study joins a burgeoning literature by conducting a field experiment to study the issue (Lucking-Reiley 1999; Resnick et. al. 2006; Reiley 2006; Hossain and Morgan 2006; Katkar and Reiley 2006). The experiment examines the effect of two treatments: ID verification and having a good reputation. Sets of four matched auctions of iPod shuffles, which have a retail price of \$49.99, are conducted. The control group consists of auctions by a seller identity that is not ID verified and also has no reputation (a feedback rating of zero). The treated groups include auctions by a seller identity that is ID verified but has no reputation, auctions by a seller identity that is not ID verified but has a solidly positive feedback rating, and auctions by a seller identity that is ID verified and also has a solidly positive feedback rating. This design allows a rich examination

⁴ For example, in the three samples of eBay auctions examined by Livingston (2010) that were collected after the ID Verify service was introduced, there is not a single observation where the seller had a feedback rating of 0 and was ID verified.

of the degree to which ID verification and reputation can work in concert, as well as the degree to which ID verification can substitute for a good reputation.

The results provide no evidence that consumers in this marketplace react to ID verification. First, there is no evidence that it serves as a substitute for a good reputation. The identity that is only ID verified receives prices that are no different than those received by the control identity, while the identity that has only a good reputation earns prices substantially above those earned by the control identity. Further, it clearly does not serve as a complement to a good reputation. The identity that has both a good reputation and ID verification does not outperform the identity that has a good reputation only. In fact, the good reputation identity that is also ID verified earns substantially *less* than the good reputation identity that is not ID verified.

The remainder of the paper proceeds as follows. Section II describes the experimental design. Section III presents the data. Section IV presents and discusses the results of the analysis. Section V concludes.

II. Experimental Design

As noted above, identifying the effect of ID verification on auction outcomes is difficult using naturally occurring data because the service is typically used only by established sellers who have solid reputations. It is thus challenging to disentangle the effect of a good reputation from the effect of ID verification. To get around this problem, the present study conducts a field experiment by running sets of auctions using four distinct eBay identities: the control identity *umdec*, which is not ID verified and has no reputation (a feedback score of zero); *bclgecn*, which is ID verified but has no reputation; *pascholten*, which is not ID verified but began the experiment with a feedback score of 18; and *econku*, which is ID verified and also began the

experiment with a feedback rating of 18.⁵ Table 1 summarizes these characteristics. By comparing the four treatment cells, this design allows us to examine both whether ID verification can be a substitute for having a good reputation and whether ID verification can be a complement to having a good reputation.

Beginning on June 13th, 2008 and ending on July 21st, 2008, auctions were started each day using each of these four identities on 30 different days, resulting in a total of 120 auctions. The auctions all had a duration of three days, so the first set ended on July 16th and the final set ended on July 24th. The entire experiment lasted longer than 30 days because *econku*, the ID verified seller identity with a solid feedback rating, was ironically suspended by eBay from starting new auctions from July 4th through July 12th because the sudden increase in recent sales from a new computer was viewed as suspicious. The experiment recommenced on July 13th when the identity was reinstated.

The auctions shared as many features as possible. They all sold an identical product: a silver iPod shuffle with one gigabyte of memory that was brand new and in its original packaging. All auctions had a minimum bid of \$0.01 to guarantee that the item would sell and to avoid data censoring issues. They each also had no reserve price, a charge of \$6.99 for shipping via US Postal Service First Class Mail, and accepted payment by Paypal, money order or cashier's check. While the four daily auctions did overlap, they were staggered each day to end

⁵ The names of the good reputation identities, *econku* and *pascholten*, were determined before the experiment. They belong to myself and a colleague, respectively. They were employed because they happened to have the exact same feedback rating of 18 (18 positive reviews and zero negative reviews) which was developed through our natural personal participation in the eBay marketplace, and ratings of this magnitude are found to have a substantial, positive effect on auction outcomes relative to a feedback rating of zero by Livingston (2005). The new identities were named in a similar fashion to how I happened to choose my initial identity name: a combination of an abbreviation of a school with which I have been affiliated, and letters referring to economics (ec or ecn).

two hours apart in order to avoid competing against each other as much as possible.⁶ The scheduled ending times were 2:00 PM, 4:00 PM, 6:00 PM and 8:00 PM Eastern Daylight Time. The order of the auctions each day was determined randomly with the constraint that each identity have as similar a number of auctions ending at each time as possible. Table 2 presents the auction schedule for the experiment.

The auctions did differ in some necessary ways. While the auction pages of each seller contained exactly the same information, the titles of the auctions and the design of their auction pages were slightly different to make it appear that the four IDs were not connected. Each page was created using software provided by The Seller Sourcebook (<http://www.sellersourcebook.com>). The wording, layout, and pictures of the iPods on each page were all slightly different, but the pages all did look similar since the same software was used to design each page. It is possible that this might have lead bidders to be suspicious that the various identities were connected. However, casual observation shows that habitual sellers of similar products on eBay frequently copy each other's page designs, so observing similar designs from different sellers is common in this market.

Once the auction concluded, the winning bidder was sent an invoice email giving instructions for how to pay for the item. After payment was received, the iPod was shipped and another email was sent to the bidder letting them know that their winnings were on the way. The text of each of these emails, along with the text of a printed note that was sent with the iPod, is

⁶ Roth and Ockenfels (2002) show that because eBay auctions end at a pre-specified time, much of the bidding activity occurs in the closing moments of an auction. Spacing the end times of the auctions two hours apart thus promotes minimal overlap in the most intense periods of bidding in each auction in the sample.

presented in Appendix A. They provided the buyer with three notices that the auction was conducted as part of an economics experiment and asked that they not leave any feedback.⁷

Unfortunately, as occurred during the experiment conducted by Katkar and Reiley (2006), the bidders occasionally missed these requests and left positive feedback anyway. When the identities that had feedback ratings of zero were given feedback, they were replaced with new ones. *Umdec* and *bclgecn* each had to be replaced once; the replacements were named *umdec2* and *bclgecn3*. Once the positive feedback was available, any auctions using that identity that were active at the time the feedback was submitted were allowed to run to their completion. This resulted in three observations where the seller which was not ID verified (*umdec*) had a feedback rating of one when the auction ended, and four observations where the seller which was ID verified (*bclgecn*) had a feedback rating of one when the auction ended.

The identities with solid reputations could not be replaced after receiving new feedback, however, because no other such identities were available to work with. Both the identity that was ID verified (*econku*) and the identity that was not (*pascholten*) began the experiment with a feedback rating of 18, but they finished the experiment with feedback ratings of 23 and 20, respectively. Table 3 displays the evolution of each identity's feedback rating over the course of the experiment. Each of these good reputation identities received their first new feedback rating about halfway through the experiment - on June 29th for *econku* and on July 1st for *pascholten*.

III. Data

Table 4 presents summary statistics on the final auction prices by both seller identity and the end time of the auction. Prices are lower for auctions that end at 4:00 PM EDT, suggesting that controlling for end time is necessary. The prices earned by each seller identity evolved over

⁷ Since our subject buyers were not recruited but were naturally shopping for iPod shuffles, and they were unaware that they were participating in an experiment at the time they placed their bids, this experiment can be classified as a natural field experiment, as defined by Harrison and List (2004).

the course of the experiment. As noted above, all four identities received positive feedback at various times, and the *econku* identity was suspended from starting new auctions from June 4th through June 12th, forcing a pause in the experiment. Table 5 displays the mean prices by seller identity in the auctions during several intervals: June 16th through June 23th, before any identity had received any new feedback; June 16th through July 6th, the entire period preceding *econku*'s suspension; June 24th through July 6th, during which each of the identities received new positive feedback; and July 16th through July 24th, the period that followed *econku*'s suspension.

In the earliest part of the experiment, from June 16th through June 23rd, the prices in *pascholten*'s auctions were considerably higher than the prices in the auctions run using the other identities. *Pascholten* received an average price of \$42.94. *Econku* received an average price of \$39.71, \$3.23 less than *pascholten*. The other identities, each of which had no feedback history, both received an average price that was more than \$6.00 less than the average received by *pascholten*.

When the entire pre-suspension interval is pooled together, from June 16th through July 6th, the pattern is similar to what is observed in the initial interval, though the prices are less dispersed. The identities with solid reputations received relatively high average prices, while the identities with no reputation received relatively low average prices. *Pascholten* received the highest average price at \$38.82. *Econku* received the next highest average price at \$37.67. *Bclgecn* received substantially less, with an average price of \$35.55. *Umdec* received the lowest average price of \$34.47.

In the middle portion of the experiment, from June 24th through July 6th, *umdec* and *bclgecn* each ran three auctions with a feedback rating of one instead of zero, and *pascholten* and *econku* each received new positive feedback. This feedback does appear to have had an effect:

during this period, the prices received by each of the identities declined as a whole and converged substantially. Still, their relative positions remained the same. *Pascholten* received an average price of \$37.62, *econku* received \$36.51, *bclgecn* received \$35.87, and *umdec* received \$34.38.

Finally, in the auctions that occurred after *econku*'s suspension was lifted, the relative positions of the prices earned by each identity changed dramatically. From July 16th through July 23rd, *econku* received an average price that was nearly as low as what *umdec* received, while *pascholten* and *bclgecn* received average prices above what was earned by the other two identities.⁸ This pattern is rather surprising. While one is tempted to think that the suspension had a negative impact on *econku*'s results, buyers in these auctions had no way of knowing that the suspension had occurred. Since there is otherwise no difference between these auctions and the ones that were conducted prior to the suspension, the change in relative prices casts doubt on the validity of the data collected during this interval.⁹ Accordingly, the analysis that follows reports estimates using not only the entire sample, but also the subsamples from before the suspension in order to see if the results of the analysis are robust to the inclusion or exclusion of the post-suspension period from the sample.

In the section that follows we examine whether the price differences reported above are statistically significant and robust to controls for end time, while relying on within-day variation to estimate the differences.

IV. Results

⁸ The calculation of the average price received by *umdec* excludes an outlier from the final day, where two bidders entered a bidding war and the winner paid a price of \$77.00, which is \$27.01 over the retail price of the good. If this outlier is included, the pattern is even more perplexing - *umdec* received the highest average price among all of the identities.

⁹ For example, since the experiment had been ongoing for several weeks by this time, observant bidders might have noticed that each of the identities had been selling the same good at similar frequencies and become suspicious that the identities were connected, affecting their behavior. Indeed, this scenario may be one reason behind the overall convergence in prices that occurred over the duration of the entire experiment.

We first test the null hypotheses that the prices earned by each identity pair are drawn from the same distribution using Wilcoxon signed-rank tests. The p -values resulting from these tests are presented in Table 6. The differences are tested using the entire sample, the entire pre-suspension subsample, and the subsample during which each of the identities received new feedback.¹⁰ Consider first the results when the entire sample is used. The prices received by *bclgecn*, the identity that is ID verified but has no reputation, are not statistically different from the prices received by the control identity that has neither ID verification nor a reputation. This results is consistent with the conclusion that ID verification has no impact on auction price. However, reputation does affect prices. The prices received by the identity that is not ID verified but has a good reputation (*pascholten*) are significantly higher than the prices obtained by all of the other identities. This includes the identity that is ID verified in addition to having a good reputation (*econku*), suggesting that ID verification may even have a negative impact if the seller already has a good reputation. No other price differences are statistically significant, although the prices obtained by *econku* narrowly miss being significantly higher than the prices obtained by the control identity, *umdec*, at the ten percent level.

The results are somewhat different when using only the subsample that was collected prior to *econku*'s suspension, but the key results for the purposes of this study remain. The difference between the prices earned by *bclgecn* and *umdec* are still statistically insignificant. Both *pascholten* and *econku*, the identities with solid reputations, have statistically different prices than the identities with no reputation, *umdec* and *bclgecn*. There is no longer a statistical difference between the prices earned by *pascholten* and *econku*. Still, these results remain consistent with the conclusion that there is no benefit to becoming ID verified, but there is a

¹⁰ Tests of the price differences in the post-suspension subsample are not reported since each identity pair contains only 18 observations, so the tests have very little power. The results are available by request.

benefit to having a solid feedback rating. The possible penalty to becoming ID verified once a good reputation has been established is not detectable in the pre-suspension subsample, but there is no evidence that doing so has any benefit either.

Finally, during the period where each of the identities received new feedback, there are no statistically significant differences between the prices received by any two identities. Each identity pair contains only 26 observations, however, so the tests have limited power. But again, the results are consistent with the hypothesis that ID verification does not impact bidder behavior. If the results represent a true pattern and are not simply due to power limitations, one possible explanation of the fact that there are also no statistically observable effects of reputation is that bidders may weigh recent feedback more heavily than older feedback. Eaton (2007), for example, finds that recent negative feedback has a bigger effect than older negative feedback. Since each identity received recent positive feedback in this interval, this may have caused their prices to converge.

One potential difficulty with these tests occurs because there is a large amount of variation in the price earned by each identity from day to day. As shown in Table 4, the standard deviations of the prices earned by each identity are all over \$4.00, and the ranges of prices received by each identity are all above \$17.00. It is possible that this high variance masks true differences in the prices received by each identity.

To guard against this possibility, the data are smoothed by calculating the three day moving average of price for each identity.¹¹ Table 7 presents the means of these moving averages during the same intervals examined in Table 5, as well as for the entire sample. The mean moving averages are very similar to the raw averages, but the standard deviations are

¹¹ Similar results are obtained if two day moving averages are used instead of three day moving averages.

smaller by construction. Table 8 provides the results of Wilcoxon sign-rank tests examining whether the price differences are observable statistically.

Indeed, smoothing the data affects the results. Using the entire sample, the difference between the prices earned by *bclgecn* and *umdec* is statistically significant. If we accordingly take the point estimate literally, this suggests that ID verification has a small benefit of \$0.82 when the seller has no reputation. However, the price difference between *pascholten* and *econku* is also significant, suggesting that ID verification has a substantial negative effect of \$2.22 if the seller does have a solid reputation. The only price difference that is not statistically significant is the difference between the prices earned by *econku* and *bclgecn*.

Using the pre-suspension subsample, the only price difference that is not statistically significant is the difference between the prices earned by *bclgecn* and *umdec*. Accordingly, the results imply that ID verification has no effect on price if the seller has no reputation, and has a negative effect on price if the seller does have a solid reputation. This negative effect is not significant when considering only the sample during which the identities received new feedback, however.

These tests do not control for potentially confounding effects resulting from the end time of the auction, however, and do not hold constant fluctuations in unobservables that may have occurred over time despite the fact that prices as a whole clearly converged over time. To alleviate these concerns, the following equation is estimated by Ordinary Least Squares:

$$P_{it} = \alpha + \beta_1 ID_{it} + \beta_2 O_{it} + \beta_3 D_t + \varepsilon_{it} \quad (1)$$

where P_{it} is the price received by seller identity i on date t , ID_i is a vector of dummy variables indicating the identity of the seller,¹² O_{it} is a vector of dummy variables indicating whether the auction of identity i on date t ended at 2:00, 4:00, 6:00 or 8:00 PM EDT, D_t is a vector of day-specific dummy variables, and ε_{it} is normally distributed with mean 0 but allowed to be correlated within date; robust standard errors that are clustered by date are calculated.¹³

The regression is estimated four times on each subsample, altering the identity that is omitted so that the significance of the differences between each identity can be tested.¹⁴ Table 9 reports the results of estimating equation 1 using the entire sample in columns one through four, the pre-suspension subsample in columns five through eight, and the subsample where the identities received new feedback in columns nine through 12. The results suggest that ID verification has no impact on auction price. Regardless of the subsample employed to conduct the estimation, there is no statistical difference between the prices earned by the identity that is ID verified but has no reputation (*bclgecn*) and the prices earned by the control identity which has neither ID verification nor a reputation (*umdec*), and the point estimate of this difference is less than \$1.00 for a product that sold for an average of \$36.84. Reputation, however, has a substantial effect. Consider the results using the entire sample. *Pascholten*, the identity that is not ID verified but has a solid reputation, earns substantially more than the other identities.

¹² In principle, the specification could instead control for an ID verification dummy variable, a dummy variable that equals one if the identity has a good reputation, and interactions between the two. However, even if the omitted category is changed with one or both of these indicators, there would be no way to test whether the differences in the prices earned by the identities that differ on both dimensions (*econku* vs. *umdec* and *pascholten* vs. *bclgecn*) are statistically significant. Controlling for dummy variables indicating the identity of the seller and altering the identity that is omitted does allow these tests, however.

¹³ The specifications do not control for the feedback rating of the identities despite the fact that the ratings varied over the course of the experiment. If the identity indicators are interacted with dummy variables indicating the feedback rating, the results show that there are no significant changes in the effects of the identity indicators as the feedback ratings of the identities change. However, there are very few observations available where the feedback ratings had changed, so these tests lack power. The estimates calculated using only the July 24th through July 6th subsample are instead provided to shed some light on how the receipt of feedback affected the results.

¹⁴ The estimates are again conducted excluding the outlier price of \$77.00 received by the control identity in the final set of auctions of the experiment. Including this observation has no impact on the qualitative results.

Auctions by *pascholten* earn \$3.47 more than auctions by *umdec*, the identity that has no reputation and is not ID verified, and \$2.66 more than auctions by *bclgecn*, the identity that has no reputation but is ID verified.

There is no evidence, however, that becoming ID verified in addition to gaining a good reputation has any effect. Regardless of the subsample employed, the prices earned by the good reputation, ID verified identity (*econku*) are not statistically different from the prices earned by the good reputation, non-ID verified identity. In fact the point estimates using both the entire sample and the pre-suspension subsample suggest that ID verification has a substantial negative effect once the identity has a good reputation. Further, while an improved reputation alone results in higher prices, the combination of a good reputation and ID verification does not: there is no statistical difference between *econku*'s prices and the prices of the control identity or the prices of the ID verified identity that has a feedback rating of zero.

In the period during which all of the identities received new feedback at some point, none of the price differences remain statistically significant; however, this subsample contains only 52 observations so the tests have limited power.

As noted above, the large amount of variation in the prices earned by each identity from day to day may mask true differences between the prices received by each group. In principle this could be investigated by replacing price with its three day moving average in equation 1, but controlling for order effects via end time indicators would be meaningless since the end time of each auction in a given three day window is typically different, and controlling for date indicators would be inappropriate since the moving averages are made up of information from three different dates. Still, it is important to control for end time and date effects. Accordingly, the following two step procedure is employed. First, in order to remove variation that is due to

these effects, price is regressed against the end time indicators and the date indicators, and the residuals $\hat{u}_{it}$ are saved:

$$P_{it} = \alpha + \beta_1 O_{it} + \beta_2 D_t + u_{it}. \quad (2)$$

For each identity, the three day moving averages of the residuals $\bar{\hat{u}}_{it}$ are then calculated, and the following equation is estimated by Ordinary Least Squares:

$$\bar{\hat{u}}_{it} = \alpha + \beta_1 ID_{it} + v_{it}. \quad (3)$$

Table 10 reports the results of estimating equation 3 using the entire sample in columns one through four, the pre-suspension subsample in columns five through eight, and the subsample where the identities received new feedback in columns nine through 12.¹⁵

As before, the results using the entire sample and the pre-suspension sample are similar. Consider the results from the estimation performed using the pre-suspension subsample; results using the entire sample are similar. The point estimates of the effects are extremely similar to those reported in Table 8, but results of the significance tests are different due to the smoothing of the variation in the price data. The crucial difference is that the estimated differences between the prices earned by the ID verified, good reputation identity (*econku*) and the other identities are now statistically significant. Still, there remains no evidence that ID verification alone has any effect on price. The difference between prices earned by the identity that is ID verified but has no reputation (*bclgecn*) and the prices earned by the control identity which has neither ID

¹⁵ The results that follow are extremely robust to changes in specification and estimation procedure. Four other models were also estimated, and all yielded qualitatively and quantitatively similar results to what follows. These models include 1) simply replacing price with the three day moving average of price in equation 1; 2) removing only variation due to end time effects in step one, and controlling for date effects in step two; 3) removing only variation due to date effects in step one, and controlling for end time effects in step two; and 4) treating the data as a single time series, forcing gaps to occur where the moving average should not be calculable (e.g. the first two days for a particular identity), and estimating an ARIMA model with either zero or one autoregressive components and three moving average components and controlling for identity effects, end time effects and date effects. The first three alternative models are not presented because it is inappropriate to control for end time indicators and date indicators in step two when the dependent variable is the three day moving average of price, as explained above, and the fourth model is not presented because the ARIMA model artificially treats the data as a single time series. The model presented in the text avoids all of these problems.

verification nor a reputation (*umdec*) remains small and insignificant. Reputation alone still has a substantial positive effect, however. Taken together these results imply that ID verification cannot serve as a substitute for a good reputation.

Also, the effect of ID verification appears to be negative when the seller already has a good reputation. The identity that has both a good reputation and is ID verified earns \$2.08 less than the identity that has only a good reputation; this result is significant at the five percent level. While this result is no longer significant in the subsample where new feedback was received, the point estimate is still negative. ID verification certainly does not serve to increase prices in conjunction with a good reputation, suggesting that the two are also not complements. Why ID verification might have a negative effect is perplexing; some possible explanations are offered in the conclusion.

The results as a whole display a clear pattern. Even though there is substantial convergence in the prices earned by the various identities over time, and the feedback left for the identities coincides with further convergence of these prices, the main results of the study are robust across the various subsamples and the type of test and estimation method employed. There is very little evidence that ID verification has any impact on auction price in the absence of a good reputation, while a good reputation alone results in substantial price increases. Bidders clearly value the seller's reputation far more than they value knowing that the seller is who she says she is. Also, once a good reputation has been developed, ID verification does nothing to further increase price at best, and actually decreases the price one can expect to earn at worst.

V. Conclusion

Despite the potentially positive effects of ID Verify reviewed in the introduction, this study finds no evidence that ID verification has an effect on bidder behavior, but does find that

reputation has a substantial effect. Perhaps the most likely explanation for this finding is that the feedback score of the seller is more salient than the IV verified icon. The reputation system of eBay is well-known and well-publicized, and the seller's reputation is summarized as a simple number which invites investigation. The ID Verify service, however, is not nearly as well-known and is indicated by a graphical icon rather than a number. Hossain and Morgan (2006) provide evidence that bidders do not fully account for information that should affect their behavior should they behave fully rationally, and react more strongly to more salient information. Their study notes that an auction's effective reserve price is equal to the opening bid amount plus the charge for shipping and handling, and auctions that have the same effective reserve price should be strategically equivalent regardless of how the reserve price is distributed across these two factors. They find, however, that auctions with lower opening bids but higher shipping charges attract more bidders and earn higher revenues than strategically equivalent auctions with higher opening bids and lower shipping charges. Bidders apparently fail to fully account for shipping charges, despite the fact that information about the amount of these charges is presented on the auction page. They find some evidence consistent with the hypothesis that this occurs because information about the opening bid amount is more salient than information about the shipping charge.

Still, this explanation does not account for the odd finding that among auctions where the seller has a good reputation, becoming ID verified results in lower prices. Competing explanations of why *pascholten* consistently received prices that are higher than those received by *econku* cannot be tested given the information at hand. Several possibilities include the following. First, while the feedback ratings of the identities were the same at the beginning of the experiment, *pascholten*'s feedback was much more recent. *Econku* had not received any

feedback since June 2004, while *pascholten* had received feedback as recently as November 2007, and all of its feedback had been posted in 2006 or later. It is possible that more recent feedback has a larger impact on auction outcomes; Eaton (2007), for example, finds that this is the case for negative feedback but not positive feedback. Second, Tufano (2010) provides evidence from lab experiments that bidders in an auction setting adjust their bids towards prices observed in previous periods. If bidders in these auctions focused solely on the seller from whom they eventually made a purchase, then the initial price spread may have persisted because bidders were shaping their preferences on the previous prices of that particular seller. Since *pascholten* initially earned substantially higher prices than *econku* (perhaps because it possessed more recent positive feedback), this scenario may have caused the initial gap to persist. Finally, bidders may have perceived the social distance between themselves and the *pascholten* identity to be smaller simply because the identity consists of a person's name rather than a seemingly random set of characters, as with the other identities. Bolle (1998) examines hypothetical trust games where second movers decide how much to return to two separate first movers. Along with the amount selected to send to the second mover, first movers chose a pseudonym that could be viewed by the second mover. He offers suggestive evidence that students frequently correctly predicted which of the two first movers would receive a greater reward from the second mover; if one examines the table presenting this evidence, it appears that the first mover receiving the greater return typically gave a pseudonym resembling a real name such as "Patterson" or "H. Gottlieb" instead of an obviously fake or uninformative name such as "Frankenstein" or "FR." Also, as noted above, Charness and Gneezy (2008) find increased donation amounts in dictator games merely when the subjects are told the last name of their counterparts instead of being completely anonymous.

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Appendix A: Bidder Communication

A.1: invoice email

Congratulations on winning my auction for an iPod shuffle! Click the "Pay Now" button above for payment details. As soon as payment is received, it will be shipped. Payment by Paypal will speed up shipping considerably.

This auction was part of an economics experiment. I ask that you please **do NOT leave me any feedback!** I need to keep my feedback rating unchanged during the experiment for it to work. Thanks!

A.2: shipping notification email

Hi (name here),

Your iPod Shuffle was shipped this morning to:

(address here)

Thanks for your business!

This auction was conducted as part of an economics experiment, **so I ask that you NOT leave me any feedback!** For the purposes of the experiment, I need to keep the feedback rating of the ID used to sell the iPod unchanged. Thanks much!

A.3: shipping insert

Hello,

Enclosed is your new iPod Shuffle. Thank you for your purchase!

This auction was run as part of an economics experiment. I ask that you **please do NOT leave me feedback!** I need to keep the feedback rating unchanged throughout the experiment for it to work. Thanks!

Table 1. Seller identity characteristics

Identity	Starting feedback rating	ID verified?	ID code
<i>umdec</i>	0	No	1
<i>bclgecn</i>	0	Yes	2
<i>pascholten</i>	18	No	3
<i>econku</i>	18	Yes	4

Table 2. Experiment Design

Start Date	End Date	End time of ID codes			
		2:00	4:00	6:00	8:00
June 13	June 16	2	3	1	4
June 14	June 17	1	4	3	2
June 15	June 18	3	1	2	4
June 16	June 19	1	3	4	2
June 17	June 20	4	1	2	3
June 18	June 21	3	2	1	4
June 19	June 22	1	2	3	4
June 20	June 23	4	3	2	1
June 21	June 24	2	3	4	1
June 22	June 25	3	4	1	2
June 23	June 26	2	1	4	3
June 24	June 27	2	4	3	1
June 25	June 28	3	4	1	2
June 26	June 29	1	2	4	3
June 27	June 30	4	1	3	2
June 28	July 1	2	1	4	3
June 29	July 2	4	3	2	1
June 20	July 3	3	1	2	4
July 1	July 4	2	4	1	3
July 2	July 5	4	2	1	3
July 3	July 6	1	3	2	4
July 13	July 16	4	1	3	2
July 14	July 17	2	4	3	1
July 15	July 18	1	2	4	3
July 16	July 19	4	2	1	3
July 17	July 20	3	1	4	2
July 18	July 21	1	2	3	4
July 19	July 22	3	1	2	4
July 20	July 23	2	3	4	1
July 21	July 24	3	4	2	1

Table 3. Evolution of feedback ratings

End Date	umdec	bclgecn	pascholten	econku
June 16	0	0	18	18
June 17	0	0	18	18
June 18	0	0	18	18
June 19	0	0	18	18
June 20	0	0	18	18
June 21	0	0	18	18
June 22	0	0	18	18
June 23	0	0	18	18
June 24	0	1	18	18
June 25	0	1	18	18
June 26	0	1	18	18
June 27	0	0	18	18
June 28	1	0	18	18
June 29	1	0	18	19
June 30	1	0	18	19
July 1	0	0	19	19
July 2	0	0	19	19
July 3	0	0	19	20
July 4	0	0	20	20
July 5	0	0	20	20
July 6	0	0	20	20
July 16	0	0	20	23
July 17	0	0	20	23
July 18	0	0	20	23
July 19	0	0	20	23
July 20	0	0	20	23
July 21	0	0	20	23
July 22	0	0	20	23
July 23	0	0	20	23
July 24	0	1	20	23

Table 4. Summary Statistics

	<u>Seller identity</u>			
	<i>umdec</i>	<i>bclgecn</i>	<i>pascholten</i>	<i>econku</i>
mean price	\$35.13	\$36.27	\$38.93	\$36.27
(standard deviation)	(4.12)	(4.36)	(5.35)	(4.92)
maximum price	\$43.75	\$50.00	\$52.89	\$52.89
minimum price	\$26.00	\$31.01	\$28.00	\$24.50
mean number of bidders	6.60	6.65	6.93	7.55
	<u>Auction end time</u>			
	<i>2:00</i>	<i>4:00</i>	<i>6:00</i>	<i>8:00</i>
mean price	\$38.15	\$35.21	\$37.01	\$36.98
(standard deviation)	(3.29)	(4.95)	(5.42)	(5.26)
maximum price	\$44.06	\$46.00	\$52.89	\$52.89
minimum price	\$31.00	\$24.50	\$27.00	\$31.00
mean number of bidders	7.00	6.69	7.07	6.93

Table 5. Mean prices by seller identity and time interval^a

Seller identity:	<u>Auction end dates</u>			
	June 16 - June 23 (1)	June 16 - July 6 (2)	June 24 - July 6 (3)	July 16 - July 24 (4)
<i>umdec</i>	\$36.66 (4.49)	\$34.47 (4.32)	\$34.38 (4.15)	\$34.81 (3.78)
<i>bclgecn</i>	\$35.53 (5.16)	\$35.55 (3.92)	\$35.87 (3.17)	\$37.52 (5.30)
<i>pascholten</i>	\$42.94 (6.19)	\$38.82 (6.14)	\$37.62 (5.36)	\$37.26 (2.24)
<i>econku</i>	\$39.71 (5.86)	\$37.67 (5.45)	\$36.51 (5.02)	\$35.17 (2.91)

^aStandard deviation in parentheses

Table 6. Wilcoxon signed-rank tests^a

All observations (June 16th - July 24th)				
	<i>umdec</i>	<i>bclgecn</i>	<i>pascholten</i>	<i>econku</i>
<i>umdec</i>	-			
<i>bclgecn</i>	0.4210	-		
<i>pascholten</i>	0.0029***	0.0109**	-	
<i>econku</i>	0.1042	0.2867	0.0623*	-
Before <i>econku</i>'s suspension (June 24th - July 6th)				
	<i>umdec</i>	<i>bclgecn</i>	<i>pascholten</i>	<i>econku</i>
<i>umdec</i>	-			
<i>bclgecn</i>	0.5795	-		
<i>pascholten</i>	0.0145 **	0.0141 **	-	
<i>econku</i>	0.0554*	0.0760*	0.1660	-
Identities received new feedback (June 24th - July 6th)				
	<i>umdec</i>	<i>bclgecn</i>	<i>pascholten</i>	<i>econku</i>
<i>umdec</i>	-			
<i>bclgecn</i>	0.2921	-		
<i>pascholten</i>	0.1109	0.1906	-	
<i>econku</i>	0.1501	0.5551	0.5209	-

^a This table reports p-values from the tests of the hypotheses that the prices in the auctions from each pair of identities are drawn from the same distribution.

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

Table 7. Mean three day moving price averages by seller identity and time interval^a

Seller identity:	Auction end dates				
	Entire sample (1)	June 16 - June 23 (2)	June 16 - July 6 (3)	June 24 - July 6 (4)	July 16 - July 24 (5)
<i>umdec</i>	35.06 (1.92)	\$36.04 (2.24)	\$34.93 (1.96)	\$34.41 (1.66)	\$35.47 (1.90)
<i>bclgecn</i>	35.88 (1.61)	\$35.13 (1.79)	\$35.48 (1.35)	\$35.64 (1.14)	\$36.98 (1.86)
<i>pascholten</i>	39.09 (3.04)	\$43.19 (1.73)	\$39.70 (3.31)	\$38.08 (2.51)	\$37.43 (1.10)
<i>econku</i>	36.87 (2.90)	\$39.74 (4.25)	\$37.59 (3.06)	\$36.59 (1.77)	\$34.92 (0.94)

^aStandard deviation in parentheses

Table 8. Wilcoxon tests, three day moving average of price

All observations (June 16th - July 24th)				
	<i>umdec</i>	<i>bclgecn</i>	<i>pascholten</i>	<i>econku</i>
<i>umdec</i>	-			
<i>bclgecn</i>	0.0433**	-		
<i>pascholten</i>	0.0000***	0.0002***	-	
<i>econku</i>	0.0051***	0.2190	0.0160**	-
Before <i>econku</i>'s suspension (June 24th - July 6th)				
	<i>umdec</i>	<i>bclgecn</i>	<i>pascholten</i>	<i>econku</i>
<i>umdec</i>	-			
<i>bclgecn</i>	0.1839	-		
<i>pascholten</i>	0.0000***	0.0001 ***	-	
<i>econku</i>	0.0013***	0.0136 **	0.0522 *	-
Identities received new feedback (June 24th - July 6th)				
	<i>umdec</i>	<i>bclgecn</i>	<i>pascholten</i>	<i>econku</i>
<i>umdec</i>	-			
<i>bclgecn</i>	0.0426**	-		
<i>pascholten</i>	0.0004***	0.0044***	-	
<i>econku</i>	0.0047***	0.0768*	0.2089	-

^a This table reports p-values from the tests of the hypotheses that the three day moving averages of price in the auctions from each pair of identities are drawn from the same distribution.

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

Table 9. Effect of ID Verification and Reputation on Price^{a,b}

	Entire sample				Before <i>econku</i> 's suspension (June 16th - July 6th)				New feedback received (June 24th - July 6th)			
	<i>umdec</i> omitted (1)	<i>bclgecn</i> omitted (2)	<i>pascholten</i> omitted (3)	<i>econku</i> omitted (4)	<i>umdec</i> omitted (5)	<i>bclgecn</i> omitted (6)	<i>pascholten</i> omitted (7)	<i>econku</i> omitted (8)	<i>umdec</i> omitted (9)	<i>bclgecn</i> omitted (10)	<i>pascholten</i> omitted (11)	<i>econku</i> omitted (12)
ID characteristics: not ID verified, 0 feedback		-0.81 (0.89)	-3.47*** (1.22)	-1.54 (1.18)		-0.24 (1.05)	-4.37** (1.69)	-2.38 (1.40)		-0.77 (1.19)	-2.71 (1.90)	-2.04 (1.80)
ID verified, 0 feedback	0.81 (0.89)		-2.66* (1.35)	-0.73 (1.46)	0.24 (1.05)		-4.13** (1.75)	-2.13 (1.73)	0.77 (1.19)		-1.94 (1.87)	-1.27 (1.98)
not ID verified, good feedback	3.47*** (1.22)	2.66* (1.35)		1.93 (1.63)	4.37*** (1.69)	4.13** (1.75)		2.00 (2.37)	2.71 (1.90)	1.94 (1.87)		0.67 (2.79)
ID verified, good feedback	1.54 (1.18)	0.73 (1.46)	-1.93 (1.63)		2.38 (1.40)	2.13 (1.73)	-2.00 (2.37)		2.04 (1.80)	1.27 (1.98)	-0.67 (2.79)	
Constant	42.48*** (0.91)	43.30*** (0.96)	45.95*** (1.28)	44.03*** (1.13)	42.35*** (1.19)	42.59*** (1.24)	46.72*** (1.73)	44.73*** (1.26)	41.94*** (1.63)	42.71*** (1.33)	44.66*** (2.28)	43.98*** (1.43)
Observations	119	119	119	119	84	84	84	84	52	52	52	52
R-squared	0.44	0.44	0.44	0.44	0.46	0.46	0.46	0.46	0.442	0.442	0.442	0.442

^a Standard errors in parentheses

^b The regressions also control for dummy variables indicating the end time and dummy variables indicating the date the auction closed.

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

Table 10. Effect of ID Verification and Reputation on Three Day Moving Average of Price^{a,b}

	Entire sample				Before <i>econku</i> 's suspension (June 16th - July 6th)				New feedback received (June 24th - July 6th)			
	<i>umdec</i> omitted (1)	<i>bclgecn</i> omitted (2)	<i>pascholten</i> omitted (3)	<i>econku</i> omitted (4)	<i>umdec</i> omitted (5)	<i>bclgecn</i> omitted (6)	<i>pascholten</i> omitted (7)	<i>econku</i> omitted (8)	<i>umdec</i> omitted (9)	<i>bclgecn</i> omitted (10)	<i>pascholten</i> omitted (11)	<i>econku</i> omitted (12)
ID characteristics:												
not ID verified, 0 feedback		-0.64 (0.39)	-3.71*** (0.59)	-1.58** (0.61)		-0.25 (0.44)	-4.57*** (0.69)	-2.49*** (0.66)		-0.87* (0.45)	-3.24*** (0.85)	-2.15* (0.99)
ID verified, 0 feedback	0.64 (0.39)		-3.07*** (0.72)	-0.94 (0.81)	0.25 (0.44)		-4.32*** (0.77)	-2.24** (0.90)	0.87* (0.45)		-2.37** (0.86)	-1.29 (1.04)
not ID verified, good feedback	3.71*** (0.59)	3.07*** (0.72)		2.13*** (0.68)	4.57*** (0.69)	4.32*** (0.77)		2.08** (0.93)	3.24*** (0.85)	2.37*** (0.86)		1.08 (1.33)
ID verified, good feedback	1.58** (0.61)	0.94 (0.81)	-2.13*** (0.68)		2.49*** (0.66)	2.24** (0.90)	-2.08** (0.93)		2.15* (0.99)	1.29 (1.04)	-1.08 (1.33)	
Constant	-1.51*** (0.25)	-0.87** (0.41)	2.20*** (0.42)	0.07 (0.47)	-1.83*** (0.25)	-1.58*** (0.44)	2.74*** (0.52)	0.66 (0.56)	-1.56*** (0.37)	-0.70 (0.40)	1.67** (0.68)	0.59 (0.78)
Observations	103	103	103	103	76	76	76	76	52	52	52	52
R-squared	0.34	0.34	0.34	0.34	0.49	0.49	0.49	0.49	0.281	0.281	0.281	0.281

^a Standard errors in parentheses

^b The dependent variable in these regressions is the three day moving average of the residual resulting from a regression of price on dummy variables indicating the end time of the auction and dummy variables indicating the date the auction closed.

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level