

The Limits of Reputation in Platform Markets: An Empirical Analysis and Field Experiment

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Platform Markets and Quality Control

Platform markets differ from retailers:

- Facilitate trade between anonymous buyers and sellers
- Do not control key variables (inventory, price, transaction quality,...)
- Variance in the quality of sellers on the platform

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For reputation systems to work:

- Reputation measures should accurately reflect quality
- Buyers should correctly perceive reputations-to-quality mapping

Possible Concerns with Reputation/Feedback Mechanisms

UNDERSTANDING ONLINE STAR RATINGS:



<http://xkcd.com/1098/>

Contributions

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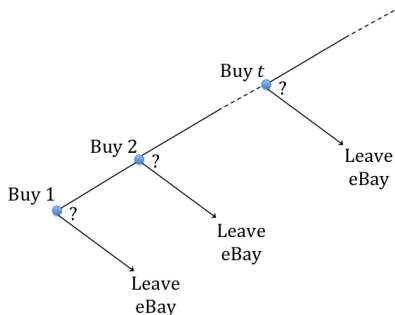
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- **Suggest to use search to affect buyer experience and outcomes**
 - ▶ CS literature documents the impact of ranking on choice
 - ▶ Intervene in search algorithm to control for seller quality

Conceptual Framework



- A Buyer's Dynamic Bayesian Decision Problem: buy again if,
 - ▶ Had good past experiences **relative to expectations**
- Buyers may use outcomes to update on platform, not just seller!

What do buyers use to form expectations? Reputation!

After every eBay transaction

- Buyers **choose** to leave feedback (positive, negative, neutral, nothing)

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Information is aggregated and displayed to potential future buyers as:

- Percent positive: $\left(\frac{pos}{neg+pos}\right)$
- Seller feedback score: $(pos - neg)$
- Seller standards: (ETRS)

APPLE MACBOOK 13.3 HD,OSX 10.6,CORE 2 DUO,RAM 1 GB, 2.16 GHZ,120GB HD,GREAT COND

★★★★★ 7 product reviews

Item condition: **Used**

"GREAT CONDITION, TESTED AND IN GREAT WORKING CONDITION, 120 GB HDD,13.3 HD ,OSX 10.6,COMES WITH"

... Read more

Quantity: 5 available

Price: **US \$274.99**

Buy It Now

Add to cart

SquareTrade 2 yr warranty **\$79.99**

Best Offer:

Make Offer

1 watcher

Add to Watch list

BillMeLater Spend \$99+ and get 6 months to pay
Subject to credit approval. [See terms](#)

Shipping: **FREE** Economy Shipping | [See details](#)
Item location: **Holiday, Florida, United States**
Ships to: **Worldwide**

Delivery: Estimated between **Tue. Sep. 3 and Wed. Sep. 11**

Payments: **PayPal**, Bill Me Later | [See details](#)

Returns: 14 days money back, buyer pays return shipping | [Read details](#)



eBay Buyer Protection

Covers your purchase price plus original shipping.

[Learn more](#)

| [Add to Watch list](#)

Seller information

samn04 (317)

96.9% Positive feedback

[Save this seller](#)

[See other items](#)

Carpe Vacay
Sale ends soon

One-way fares as low as

\$69

Based on nonstop flights.
Restrictions apply. Select markets.
14-day advance purchase.



AdChoice

Brand New Apple MacBook Pro MD101LL/A 13.3 Inch Laptop Latest Version

Factory Sealed, Apple Warranty, Fast free shipping!

★★★★★ 12 product reviews

Item condition: **New**

Quantity: More than 10 available / **164 sold**

Price: **US \$1,159.99**

Buy It Now

Add to cart

SquareTrade 2 yr warranty + accidents **\$239.99**

97 watchers

Add to Watch list

[Add to Watch list](#)

Seller information

blutekusa (44949 ) 

99.5% Positive feedback



Save this seller

See other items

Visit store:  **Blutek USA**



BillMeLater Spend \$99+ and get 6 months to pay
Subject to credit approval. [See terms](#)

Shipping: **FREE** Standard Shipping | [See details](#)

Item location: **Long Island City, New York, United States**

Ships to: United States and many other countries | [See details](#)

Delivery:

 On or before **Tue. Sep. 03** to 60637
Estimated by eBay **FAST 'N FREE** 

Payments: **PayPal**, Bill Me Later | [See details](#)

Returns: 14 days money back, buyer pays return shipping, 15% restocking fee may apply | [Read details](#)



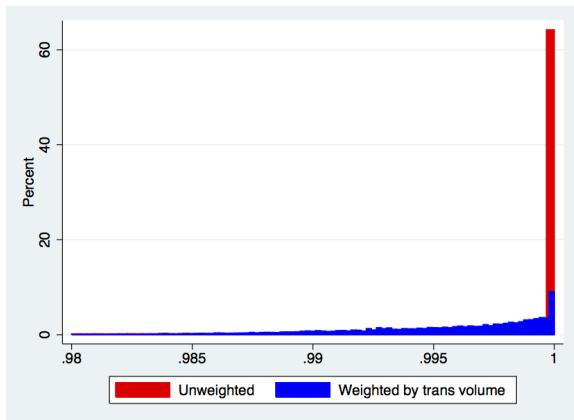
eBay Buyer Protection

Covers your purchase price plus original shipping.

[Learn more](#)

AdChoice 

Distribution of Reputation on ebay



- median = 100%, mean = 99.3%, 10th percentile = 97.8%
- **Case 1:** Sellers whose reputation drops are kicked out
- **Case 2:** Feedback is heavily biased

Is this Nirvana?

But, out of 44,604,802 transactions in October 2011:

	<u>No. of Trans.</u>	<u>% of Trans</u>
Negative FB	172,850	0.39%
email sent ex post	3,858,757	8.65%
“Bad” email sent	1,491,126	3.34%
Dispute filed	466,971	1.05%

Leaving negative feedback is costly!

The screenshot shows a news website interface. At the top, there are three banners: 'abc 7 NEWS The Denver Channel.com', 'UNITED' with a globe icon, and 'The United MileagePlus® Explorer Card. You're in. SM' with a man's image. Below the banners is a navigation bar with 'SEARCH' and 'Technology' highlighted. On the left is a search sidebar with radio buttons for 'Site' (selected) and 'Web', 'Yellow Pages', and 'A-List Businesses'. It includes a search input field with a 'GO' button and a 'SITE MAP >>' button. The main content area features a 'Technology' section with the headline 'eBay Shopper Says He Was Harassed By Seller' and a sub-headline 'CSU Student Wants To Return Bike, Gets Recorded Threats'. On the right is an 'E-Mail News Alerts' box with the text 'Get breaking news and daily headlines.', an input field for 'Enter E-Mail Address', a 'SUBMIT' button, and a link 'Browse all e-mail newsletters'.

- The first message he saved on his voicemail: “Don’t you play games with me, goddamn you. I’ll follow you to your grave.”
- “He knew everything about me,” said Blackwelder. “My phone number, my address, my name. ... It’s a little scary.”

Leaving negative feedback is costly!

The screenshot shows a Yahoo! Finance banner advertisement. On the left, the Yahoo! Finance logo is displayed above a search bar. To the right of the search bar are two buttons: "Search Finance" and "Search Web". Below the search bar, a status message reads "Tue, Mar 11, 2014, 8:12pm EDT - US Markets are closed". The main banner features the Quicken Loans logo on the left, with the text "Save Money on your Mortgage Today! Get all the information you need at Zing!" in the center. On the right, it advertises a "30-Year FIXED as low as 4.375% (4.643% APR)" rate. An "Expand" button is visible in the top right corner of the banner.

Here's how a bad Yelp review could land you in court

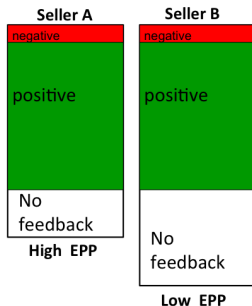
Last week, a Fairfax, Va., jury found that homeowner Jane Perez defamed her contractor when she wrote a pair of scathing [reviews](#) of his services, accusing him of botching her home renovation and stealing jewelry during the construction process. The contractor, Christopher Dietz, answered her allegations with a lawsuit, suing her for defamation and seeking \$750,000 in damages.

Feedback is Biased

- Leaving feedback is a hassle but that does not imply bias
 - ▶ Bias will happen if the cost of leaving feedback depends on the transaction quality
- **Claim:** Leaving negative feedback is “more costly” than leaving positive feedback
 - ▶ Harassing emails following negative
 - ▶ Threats of lawsuits and other harassment
 - ▶ Historical norm of reciprocity
- Implies that silence has more negative experiences than random
- **We can use this silence to help measure quality!**

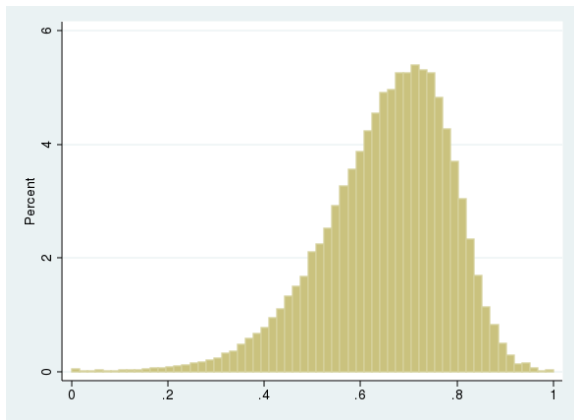
Effective Percent Positive (EPP)

$$EPP = \frac{\# \text{ of positive feedback}}{\# \text{ of transactions}}$$



- **Seller A:** $P = 99$, $N = 1$, Silence = 20 $\rightarrow PP = 99\%$, $EPP = 82.5\%$
- **Seller B:** $P = 99$, $N = 1$, Silence = 50 $\rightarrow PP = 99\%$, $EPP = 66\%$
- Seller A is **higher quality** than seller B!

EPP Distribution



- A lot more “spread” and information in EPP
- **But is it really a measure of seller quality?**

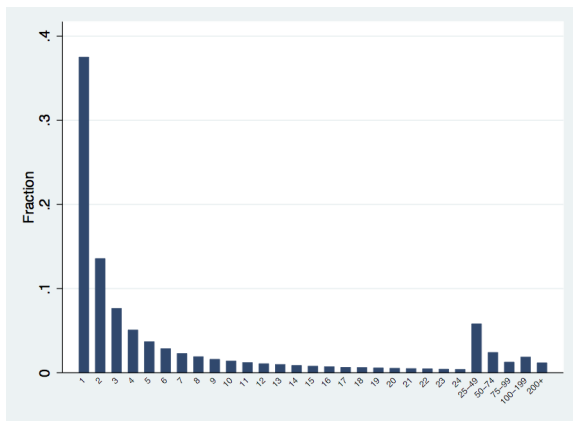
Data

- Cohort of new users who joined the the U.S. site anytime in 2011 and purchased an item within 30 days of setting up that account. (also run the analysis on 2008, 2009, 2010)
 - ▶ 10% random sample = 935,326 buyers
 - ▶ Tracked all of their usage purchase behavior until May 31, 2014 (15,384,439 observations)
 - ▶ Data includes price, item category, title, the seller, auction or fixed price, quantity purchased, etc.

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- There were a total of 1,854,813 sellers associated with all purchases
 - ▶ Seller information includes feedback score, PP, number of past transactions, etc.
 - ▶ For each transaction we look backward construct an EPP measure for that seller.
- We apply this data to our conceptual dynamic decision framework

The Distribution of Buyer Purchases



- 38% of new buyers purchase once and leave; an additional 14% purchase twice; the mean is 16 purchases before leaving ebay.
- Large right tail: the median number of transactions is 2, the 95th percentile is 65, and the max is 19.359.

The Scope for Externalities is real

Table: Total Transactions by Total Number of Sellers for buyers

Total Transactions	Total Number of Sellers						Total
	00-01	02-05	06-09	10-19	20-29	30-49	
00-01	350,881	0	0	0	0	0	350,881
02-05	27,603	253,032	0	0	0	0	280,635
06-09	1,206	19,374	60,590	0	0	0	81,170
10-19	492	2,802	15,959	64,112	0	0	83,365
20-29	116	386	767	13,513	23,367	0	38,149
30-49	67	207	273	1,810	11,685	24,106	38,148
Total	380,365	275,801	77,589	79,435	35,052	24,106	872,348

- This suggests that most buyers are not “loyal” to sellers, but come to ebay to purchase from multiple sellers

The Main Regression: “Loyalty, (Voice) and Exit”

Use a “revealed preference” approach: happy buyers are more likely to come back

$$\text{To Seller: } y_{ijt} = \alpha_0 + \alpha_1 EPP_{jt} + \beta \cdot \bar{b}_{it} + \gamma \cdot \bar{s}_{jt} + \delta \cdot \bar{d}_t + \varepsilon_{ijt}$$

$$\text{To Platform: } y_{it} = \alpha_0 + \alpha_1 EPP_{jt} + \beta \cdot \bar{b}_{it} + \gamma \cdot \bar{s}_{jt} + \delta \cdot \bar{d}_t + \varepsilon_{ijt}$$

$y_{ijt} = 1$ if buyer i bought transaction t from seller j and returned to **seller** j

$y_{it} = 1$ if buyer i bought transaction t from seller j and returns to **eBay**

\bar{b}_{it} is a vector of buyer characteristics (# of transactions they completed...)

\bar{s}_{jt} is a vector of seller characteristics (score, PP, ...)

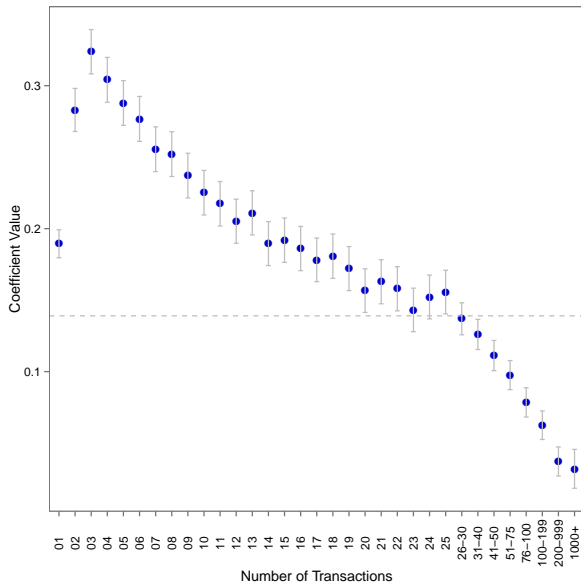
\bar{d}_t is a vector of transaction characteristics (auction, price,...)

Difference between the two is a measurement of the potential for seller externalities

Main Regression Results: Ever Return

	Same Seller	eBay
EPP Dummy (excluded: 0 < .517)		
≥ .517 < .592	0.00477**	0.0192**
≥ .592 < .668	0.00154	0.000253
≥ .668	0.0212***	0.0289**
	0.00178	0.000285
	0.0199***	0.0399**
	0.00221	0.000317
Seller Feedback Score	-0.000000385***	-1.52e-09
	2.13e-08	1.55e-09
Percent Positive Dummy (excluded: 0 < .994)		
≥ .994 < 1	0.0320***	-0.00897**
= 1	0.00140	0.000210
	-0.0353***	-0.0102**
	0.00162	0.000295
Item Price	-0.000326***	-0.000316**
	0.0000151	0.00000381
Seller Standards Dummy (excluded: Below Standard)		
Standard	-0.0908***	-0.00840**
	0.00232	0.000474
Above Standard	-0.00534**	-0.00763**
	0.00192	0.000412
ETRS	-0.00512*	-0.0115**
	0.00210	0.000425
Constant	0.169***	0.506**
	0.00490	0.000828
N	11,879,306	12,820,329

Buyers Behave as Bayesian Learners: EPP effect over time



Implementation: Incorporate EPP in Search

- Online marketplaces use search algorithms to direct users
 - ▶ Users put in queries for what they want to buy
 - ▶ The marketplace uses a variety of inputs to direct search (relevance, price,...)
- Incorporating seller quality can take any form between two extremes
 - ▶ **Hard hand:** very minor seller problems cause the seller to never appear (kick out)
 - ▶ **Laissez Fair:** give buyers feedback and let them decide who to buy from
- **Healthy middle ground:** sacrifice some relevance for quality

Manipulating Search

The screenshot shows an eBay search results page for 'macbook air'. The page layout includes a top navigation bar with the eBay logo, a search bar containing 'macbook air', and a dropdown menu for 'Apple Laptops'. Below the search bar, there are related search terms and a breadcrumb trail: 'All > Computers/Tablets & Networking > Laptops & Netbooks > Apple Laptops'. The main content area displays three product listings, each with a thumbnail image, a title, price, and shipping information. The left sidebar contains various filters such as 'Categories', 'Release Year', 'Processor Speed', 'Processor Type', and 'Operating System'. The first listing is for an 'Apple MacBook Air MJVE2LL/A 13.3" Laptop (128 GB) NEWEST VERSION' priced at \$904.99. The second listing is for an 'Apple MacBook Air Core i5 1.8GHz 4GB RAM 128GB HD 13" MD231LL/A' priced at \$549.99. The third listing is for an 'Apple MacBook Air 13" (Mid-2011) 1.8 GHz Core i7/4 GB RAM/256 GB SSD, A1369 CTO' priced at \$600.00. The fourth listing is for a 'NEW Apple MacBook Air 13.3" Laptop i5 4GB 128GB (MD760LL/A)' priced at \$828.99.

ebay Shop by category ▾ macbook air Apple Laptops ▾

Related: macbook pro macbook air 2013 macbook air 13 macbook air 11 macbook air 2012 macbook pro 13 imac ..

All Listings Auction Buy It Now Sort: Best Match View: [Grid] [List]

All > Computers/Tablets & Networking > Laptops & Netbooks > Apple Laptops

macbook air 1,331 listings [Follow this search](#)

Apple MacBook Air MJVE2LL/A 13.3" Laptop (128 GB) NEWEST VERSION
\$904.99
Buy It Now
Free shipping
547 sold

Apple MacBook Air Core i5 1.8GHz 4GB RAM 128GB HD 13" MD231LL/A
Apple Certified MacBook Air - Warranty - Free Shipping
\$549.99
Buy It Now
Free shipping
305 sold

Apple MacBook Air 13" (Mid-2011) 1.8 GHz Core i7/4 GB RAM/256 GB SSD, A1369 CTO
\$600.00
0 bids
5m left (Today 2:18PM)

NEW LISTING NEW Apple MacBook Air 13.3" Laptop i5 4GB 128GB (MD760LL/A)
\$828.99
Last price: \$1,000.00
Buy It Now
Free shipping

Categories

- Computers/Tablets & Networking
- Laptop & Desktop Accessories
- Laptops & Netbooks
- iPad/Tablet/eBook Accessories
- Computer Components & Parts
- Other Computers & Networking
- More ▾

[See all categories](#)

Release Year [see all](#)

- 2015 (212)
- 2014 (148)
- 2013 (205)
- 2012 (175)
- 2011 (151)
- 2010 (69)
- 2008 (36)

Processor Speed [see all](#)

- 3 GHz or more (10)
- 2.5 GHz or more (23)
- 2 GHz or more (92)
- 1.5 GHz or more (183)
- 1 GHz or more (466)

Processor Type [see all](#)

- Intel Core 2 Duo (113)
- Intel Core i5 2nd Gen. (59)
- Intel Core i5 3rd Gen. (102)
- Intel Core i5 4th Gen. (346)
- Intel Core i7 1st Gen. (7)
- Intel Core i7 2nd Gen. (12)
- Intel Core i7 3rd Gen. (13)
- Intel Core i7 4th Gen. (31)

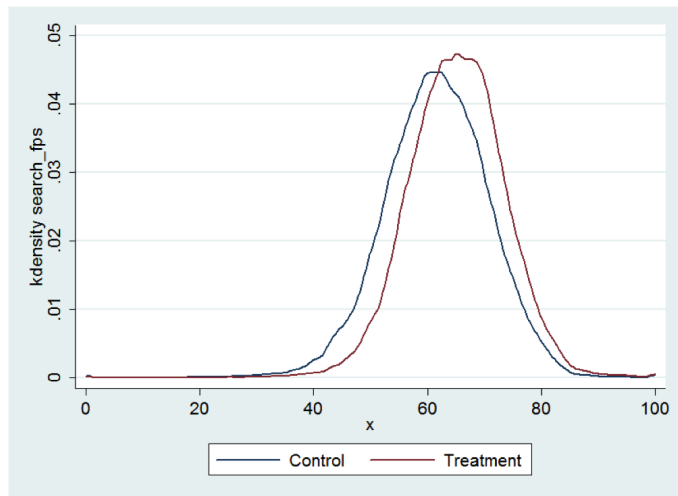
Operating System [see all](#)

- Mac OS X 10.6, Snow Leopard (24)

Large Scale Field Experiment

- We conduct an experiment to manipulate search rankings in order to:
 - ① Reinforce observational data regressions
 - ② Demonstrate a middle ground in platform governance
- Implementation: treatment ranking algorithm incorporates EPP
 - ▶ December 14th, 2011 though January 2, 2012
 - ▶ 10% of ebay's U.S. site traffic—about 5 million searches per day
 - ▶ selection into treatment uses GUID (cookie) → measurement error
- Collect data both during and **after** experiment to measure outcomes
 - ▶ Main analysis: Conditional on purchase, are buyers in the treatment group more likely to come back to eBay?

Measuring Treatment Effect: Discounted Search EPP



Intent to treat estimates

Table: Two-sample test of proportions

Group	Obs	Mean	Std. Err.	95% Conf. Interval	
Control	11,486,810	.6155062	.0001435	.6152249	.6157875
Treatment	1,258,455	.6185275	.000433	.6176788	.6193762
diff		.0030213	.0004562	.0021272	.0039153
diff	prop(1) - prop(0)			z = 6.6151	

$$\frac{\Delta Pr\{\text{return}\}}{\Delta DSEPP} = \frac{(0.6185275 - 0.6155062)}{(0.6227 - 0.6157)} = 0.43$$

- Quite a bit higher than 0.14 from non-experimental OLS, but controlling for observables brings this much closer (about 0.16)
- Experimental results also support the “Bayesian Updating” framework

Experimental Results: Effect on Treated

Table: Probability of return in 180 days

	ols b/se	ols b/se	firststage b/se	ivresults b/se
EPP		0.261*** 0.00174		0.246*** 0.0985
Treatment Dummy	0.00137** 0.000550		0.00557*** 0.000134	
Seller Feedback Score	8.94e-09*** 6.07e-10	5.64e-09*** 6.07e-10	1.27e-08*** 1.48e-10	5.83e-09*** 1.39e-09
Percent Positive Dummy excluded: 0 < .994 ≥ .994 < 1	0.0145*** 0.000403	-0.00760*** 0.000429	0.0847*** 0.0000984	-0.00631 0.00835
= 1	0.0203*** 0.000563	-0.00740*** 0.000592	0.106*** 0.000137	-0.00579 0.0105
Item Price	-0.0000662*** 0.000000943	-0.0000624*** 0.000000941	-0.0000144*** 0.000000230	-0.0000626*** 0.00000170
Seller Standards Dummy excluded: Below Standard Standard	-0.0420*** 0.00116	-0.0366*** 0.00116	-0.0208*** 0.000284	-0.0369*** 0.00236
Above Stand	-0.0208*** 0.00106	-0.0197*** 0.00105	-0.00433*** 0.000258	-0.0198*** 0.00114
ETRS	-0.0383*** 0.00105	-0.0339*** 0.00105	-0.0166*** 0.000256	-0.0342*** 0.00195
Constant	0.782*** 0.00108	0.634*** 0.00146	0.566*** 0.000265	0.643*** 0.0558
N	5502532	5503316	5502532	5502532

No “costs” of relevance

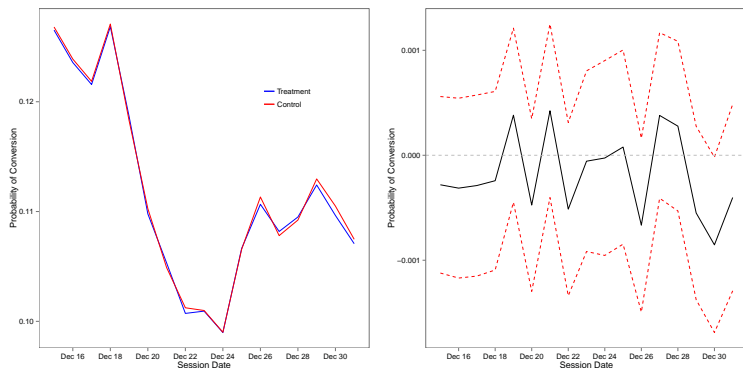


Figure: Differences in Prob. of Purchase across Groups During the Experiment

- No impact of including EPP on relevance for the treatment group
- Recall: VERY modest change in the search algorithm

Intent to treat: Bayesian Updating

Table: Intent to treat estimates by quartile

LHS: Prob of return	b/se
Treatment dummy	
Excluded: Control	
Treatment	0.00249***
	0.000726
Top quartile dummy	
Excluded: Bottom quartile	
Top quartile	0.582***
	0.000326
Interaction dummy	
Top quartile * treatment	-0.00219*
	0.00104
Constant	0.294***
	0.000227
N	6,655,839

Using Messages (Masterov, Mayer and Tadelis, EC15)

Should buyers ever send sellers messages *after* a transaction has completed?

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Non Negative:

Hallo and good morning, I am glad to tell you that the two items arrived safely today. So I am very happy because I needed it for a dinner party tomorrow evening. Thanks a lot and kind regards [name]

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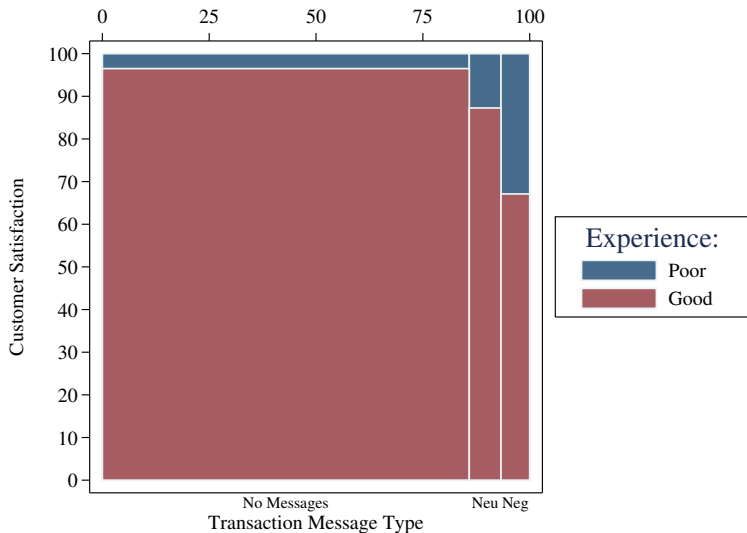
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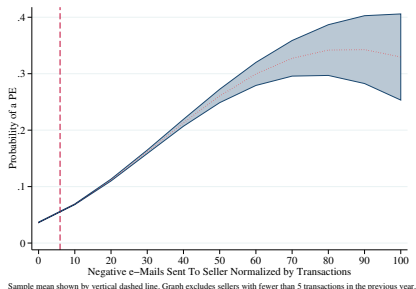
Negative:

I purchased two pairs of shorts from you at the same time one pair gold/red (which i have recieved) and one pair ebony/red (which i havent recieved), so i should still be recieving a refund for the ebony/red pair, as i have paid you for them and it's in my payment history, the item number is [...] and the describtion says [auction title]

Distribution of Poor Experiences By Message Type



Probability of Poor Experience by B2S Quality Score



- M2M message quality score can be used to flag sellers that cause poor experiences and as a result may disengage buyers.
- We show that this M2M message quality score has as much **independent** power as EPP does in predicting exit.

Concluding Remarks

- Platform markets face challenges of asymmetric information
- **Externalities** across sellers and **bias** limit feedback effectiveness
- This discussion is missing from the academic literature
- Contributions:
 - ▶ Uncover biases and reputational externalities in a large platform market
 - ▶ Suggest a general approach of “active screening” by platforms
 - ▶ Suggest further Improvements with personalized search
 - ▶ Follow up using email messages (w/ Materov and Mayer, EC 2015)
- Growth of online marketplace will depend on how they augment biased feedback mechanisms with active screening approaches
- Implies that marketplaces have the incentives to self-regulate
- Cat and mouse game? (disequilibrium...)