Mixed Methods: OLS + Experiment as an approach to endogeneity

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Endogeneity in Categories Research

• Is the same thing that creates the category boundaries the same thing that drives your outcome?

• Are categories (and placement into them) random or non-random?

• Does the arrow go both ways—your outcome impacts the category, which leads to your outcome?
My Example (Simplified)

• One reason categories matter is because they set expectations for how categorized objects will behave.
  – Research suggests that objects that fit into multiple categories tend to have lower market value, and attribute this to audiences discounting them for not fitting their expectations
  – Assumption: anything that belongs to multiple categories violates expectations, anything that is a full category member doesn’t violate expectations
    • But, nobody studies the actual expectations!

• Make a case for studying expectations explicitly by:
  – Show that full category member can still violate expectations
  – Show that violation of expectations has different impact on market value depending on which measure you use
“Category expectations, category boundaries and market outcomes”

Rings from failed relationships sell for lower prices than those that aren’t.
1st Approach: Archival Data

• All eBay data between January 1, 2011 and February 15, 2012 in category 152899, diamond solitaire rings (including item description)
  – Removed buy-it-nows, fake diamonds, unusual outliers
  – 1,560,998 listings and 14,710 sales
    • 3870 have reference to failed relationship
    • Matched sample with replacement (Elfenbein & McManus 2007)
Size 7 Diamond Engagement Ring and Wrap .59 CT 14K Yellow Gold

Item condition: Pre-owned
Time left: 6d 10h (Nov 30, 2011 21:12:22 EST)
Bid history: 0 bids

Starting bid: US $1,000.00
Approximately C $1,046.80

Your max bid: US $
(Enter US $1,000.00 or more)

Price: US $1,200.00
Approximately C $1,256.16

Shipping: US $150.00 (approx. C $157.02) UPS Worldwide Express. See all details.

Delivery: Varies for items shipped from an international location.

Returns: No Returns Accepted.

Coverage: Pay with PayPal and your full purchase price is covered. See terms.

Seller assumes all responsibility for this listing.

Item specifics
Condition: Pre-owned. An item that has been used or worn previously. See the seller's listing for full details.

Exact Carat Total Weight: 0.46 - 0.69
59 per Professional Appraisal 10/28/11

Main Stone Shape: Marquise

Ring Size: 7


14K Yellow Gold Diamond Wrap. 26 total Carat Diamonds. Two 1.3mm Round Diamonds, Six 1.7mm Round Diamonds, & Four 2.5mm x 1.25mm Baguettes. Graded VS2 - SI1 Clarity. G-H in Color. Appraised at $390.00 on 10/28/11 by Certified Gemologist.

This was my wedding set and it is pretty much all "he who shall not be mentioned" allowed me to take when we divorced. Just appraised for a total of $2,250.00.

My loss is your gain!

Shipping will include insurance.
Variables

- Failed relationships: 1 or 0 from item description for words indicating a divorce or other failure, such as a failed engagement.
  - “divorce” and its roots, “marriage ended,” “ex-husband/wife,” “not/no longer married, ex-fiancé(e), right ring wrong guy, my loss is your gain” etc.
- Ring characteristics: cut, color, clarity, carats, metal type, certified, starting price, jeweler’s name
- Auction characteristics: extra pictures, auction duration, reserve price, # of listings
- Seller characteristics: # of prior items sold, engagement ring specialist, # of categories sold, success ratio, # of words in listing, seller feedback
- Buyer characteristics: # of engagement rings purchased in the last year
Method

- 2 stage model predicting likelihood of sale in first stage, use inverse Mills ratio in second stage predicting sales price
- DV of interest: Log(sales price)
### Results (abbreviated)

<table>
<thead>
<tr>
<th></th>
<th>Model 1 (Likelihood of sale)</th>
<th>Model 2 (Purchase price)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>0.0261 (0.0228)</td>
<td>-0.0267 (0.0268)</td>
</tr>
<tr>
<td>Clarity</td>
<td>0.0190 (0.0223)</td>
<td>0.0623 (0.0267)**</td>
</tr>
<tr>
<td>Carats</td>
<td>0.7098 (0.1316)**</td>
<td>1.5661 (0.1988)**</td>
</tr>
<tr>
<td>Carats squared</td>
<td>-0.1283 (0.0289)**</td>
<td>-0.2561 (0.0394)**</td>
</tr>
<tr>
<td>Metal (gold)</td>
<td>-0.1709 (0.1506)</td>
<td>0.0041 (0.1480)</td>
</tr>
<tr>
<td>Metal (platinum)</td>
<td>-0.0504 (0.1895)</td>
<td>0.4726 (0.2204)**</td>
</tr>
<tr>
<td>Seller feedback (Ln)</td>
<td>-0.0190 (0.0293)</td>
<td>(0.0293)</td>
</tr>
<tr>
<td>Number of prior ring purchases</td>
<td>0.0070 (0.0029)**</td>
<td></td>
</tr>
<tr>
<td>Number of bids</td>
<td>0.0583 (0.0065)**</td>
<td></td>
</tr>
<tr>
<td>Failed Relationship (1=yes)</td>
<td>-0.1900 (0.1016)*</td>
<td>-0.3389 (0.1274)**</td>
</tr>
<tr>
<td>Constant</td>
<td>0.5416 (0.9301)</td>
<td>0.9082 (1.0957)</td>
</tr>
</tbody>
</table>

| N        | 14,532 | 291 |
| R²       |        | 0.67 |
Problem: self-selection

- Divorce/failed relationship is not a random event
- Could divorce/failure variable be capturing something about the individual that is leading to the low price, rather than the failure of the relationship?
Evidence from the listings

• Mean number of words:
  – All rings:
    • 2026.72 (failed rings)
    • 1194.82 (non-failed rings)
  – Sold rings
    • 455.21 (failed rings)
    • 616.65 (non-failed rings)
• Casual reading suggests content of the listings does seem to differ:
  – non-failed relationship listings tending to include far more information about selling practices, such as very detailed information about shipping methods and returns,
  – while failed relationships tend to discuss more about the rings themselves
More evidence....

“My fiance cheated on me recently and decided to leave me and our daughter high and dry for another man, also leaving me with 20,000.00 in credit card debt. So she took her ring off to shower and forgot it as she ran off with another man. So I am selling it to pay down some bills. I bought the ring 3 years ago for 2500.00, I am not aware of the grade or color but it is beautiful and sparkles like crazy, no noticeable imperfections to the neaked eye. She got compliments on it all the time, it truely sparkles. It is on 14 carat white gold band, and it weighs around .85 carat. I cant wait till she finds out she forgot it, she deserves it for leaving our 4 year old daughter and myself with this debt. Oh well pay backs a bitch. Free priority shipping in united states. [...]”
What to do?

• Add more variables?
  – Reputation {only available for the second stage, may not capture full issue with listing}
  – Capture personal narrative {count of “I” or “we” not revealing}

• Change design/get additional data?
  – Not clear what other design using eBay data is possible
  – Non-auction setting makes it difficult to know consideration set (also hard to get)

• Complementary setting?
  – Distracts from theoretical goal
My answer: Use an experiment

- Mimic eBay data exactly \{was this wise?\}
  - Why not field experiment on eBay (as in Jin and Kato 2006)
- Allows seller characteristics and listing to be identical across advertisements
- Deals with issue of buyer experience, perception etc. via random assignment
- Can measure issues of authenticity, desperation, engagement “norms”
1 ct DIAMOND RING 18kt White Gold-GIA Certified-Color: I-Clarity: VS2 Engagement Ring

Item condition: Pre-owned
Time left: 3d 07h (Jun 18, 2012 17:31:23 PDT)

Starting bid: US $599.00 [ 0 bids ]

Enter US $599.00 or more
Place bid

Bill Me Later: $5 back on first Bill Me Later purchase
Subject to credit approval. See terms

Shipping: FREE - Standard Shipping | See all details
Item location: LAKEWOOD, NJ, United States
Sold by: United States, Europe, Canada, Australia


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
3 conditions

Buy with confidence! I accept returns and have 100% positive feedback! I am auctioning this gorgeous .70 carat diamond ring. It is a round brilliant cut and set in 18k white gold. The clarity is SI1 (the level of most quality diamonds) and the color is D (very rare and the highest color level you can get), and the cut is very good. It is certified by the GIA, and I will send you the certificate with the ring.

This ring is absolutely beautiful and I always got many compliments whenever I wore it. It cost $3500. But you can have it for much less than that! Bidding starts at only $300.

Divorce condition:
Due to a divorce, I am auctioning this gorgeous .70 carat diamond ring..... Since my ex and I split up I don’t wear it anymore, but someone else should!

Happy marriage condition:
I am still happily married—I prefer to wear only my wedding band because I work with my hands.

Store condition:
This ring originally cost $3500. Due to excess inventory, Ring Depot is selling it for much less than that! Bidding starts at only $300.
Study Information

• 300 subjects from Amazon’s Mechanical Turk (20 unusable). Randomly shown one of the 3 conditions and then asked
• “If you were planning to buy an engagement ring on eBay, how much money would you pay for this ring?”
  – They were able to choose a value on a sliding scale from $0 to $4,000.

• Also asked (after pricing the ring)
  – How authentic they thought the ring was as above (after they chose a value)
  – “How desperate do you think the seller is to sell this ring? (That is, how important is it for the seller to receive cash quickly?)”
  – Then asked series of questions designed to capture their beliefs about engagement rings, purchasing behavior, and provided demographic information.
Results

![Bar chart showing Mean Price (Ln) for different conditions. Divorce condition has the lowest price at approximately 6.3, happy marriage condition is slightly higher at around 6.7, and store condition has the highest price at about 6.8.]}
## Results

<table>
<thead>
<tr>
<th></th>
<th>Price (Ln)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authenticity</td>
<td>0.1764</td>
</tr>
<tr>
<td></td>
<td>(0.0535)**</td>
</tr>
<tr>
<td>Desperation</td>
<td>-0.1077</td>
</tr>
<tr>
<td></td>
<td>(0.0431)*</td>
</tr>
<tr>
<td>Female (1=yes)</td>
<td>-0.0380</td>
</tr>
<tr>
<td></td>
<td>(0.1545)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.0035</td>
</tr>
<tr>
<td></td>
<td>(0.0387)</td>
</tr>
<tr>
<td>Income</td>
<td>0.0964</td>
</tr>
<tr>
<td></td>
<td>(0.0976)</td>
</tr>
<tr>
<td>Uncertainty (Ln)</td>
<td>0.1271</td>
</tr>
<tr>
<td></td>
<td>(0.1067)</td>
</tr>
<tr>
<td>Married (1=yes)</td>
<td>-0.1259</td>
</tr>
<tr>
<td></td>
<td>(0.1767)</td>
</tr>
<tr>
<td>Divorce condition</td>
<td>-0.3667</td>
</tr>
<tr>
<td></td>
<td>(0.1824)*</td>
</tr>
<tr>
<td>Happy marriage condition</td>
<td>-0.1226</td>
</tr>
<tr>
<td></td>
<td>(0.1809)</td>
</tr>
<tr>
<td>Constant</td>
<td>5.5457</td>
</tr>
<tr>
<td></td>
<td>(0.6171)**</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.09</td>
</tr>
<tr>
<td>$N$</td>
<td>280</td>
</tr>
</tbody>
</table>
What I learned….

• Best time to deal with endogeneity concerns is before you have run any regressions. Choose mixed methods up front….
  – Think carefully about what research design concern each is solving and how it should solve them. You get one chance with field & lab experiments!
• Fix the problems with your individual methods that you can fix
• Assume you will get a reviewer (sometimes editor) who has strong competence in one area, and has heard of the other
• Need to be explicit about why these choices and how they solve specific problems in your research
  – “The experiment addresses the issue of unobserved heterogeneity in buyer preferences through random assignment.”
    • Obvious to experiment expert. Possibly not obvious to the regression expert.
Some examples in org research


• Doering, L. 2014. “Rethinking escalation of commitment: Relational lending in microfinance.”

• Battilana, Pache, Sengul & Model. 2013. “Keeping a foot in both camps: understanding the drivers of performance in hybrid organizations.”
Taking a mixed methods approach

- Small, M. 2013. “Causal thinking and ethnographic research.” American Journal of Sociology 119: 597-601 (whole issue is about causal research)

— Also forthcoming issue on mixed methods in Organizational Research Methods
Thanks!