The Economic Effects of Social Networks: Evidence from the Housing Market

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Facebook  Harvard  NYU Stern  NYU Stern

Empirical Household Finance PhD Class
Motivation

- Growing sense that social dynamics might affect house prices:
  - Shiller (2008): "People were excessively optimistic about housing investments; this optimism was part of a social epidemic."
  - Little systematic empirical evidence for underlying mechanism.
Motivation

• Growing sense that social dynamics might affect house prices:
  • Shiller (2008): "People were excessively optimistic about housing investments; this optimism was part of a social epidemic."
  • Little systematic empirical evidence for underlying mechanism.

• This Paper: Provides empirical evidence for following story:
  1. Individuals discuss property investments with friends, and adjust their expectations based on house price experiences within social network.
  2. By influencing expectations, social interactions have a large effect on individual-level housing investment decisions:
     • Extensive margin
     • Intensive margin
     • Willingness to pay
Social Network Data from Facebook

- Facebook largest global and U.S. online social network
  - ~ 60% of U.S. adults regularly use Facebook.

- Observe anonymized snapshot of social graph of friendship links.
  - Average user in sample: 420 friendship links
  - >90% have met more than once in real life.

- Demographics, including county-level location.
Empirical Strategy and Data

Friends’ House Price Experiences  Social Interactions  Beliefs about Local Housing Market Investments
Empirical Strategy and Data

- Friends’ House Price Experiences
- Social Interactions
- Beliefs about Local Housing Market Investments

Facebook Social Graph + House Price Movements in Friends’ Location

Survey on Facebook, 1,242 Responses
Friends’ House Price Experiences

\[ \text{FriendHPExp}_{i,t,t-24m} = \sum_{c} ShareFriends_{i,c} \times \Delta HP_{c,t,t-24m} \]
Friends’ House Price Experiences

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- Example: LA resident I
Friends’ House Price Experiences

\[ \text{FriendHPExp}_{i,t,t-24m} = \sum_c \text{ShareFriends}_{i,c} \times \Delta \text{HP}_{c,t,t-24m} \]

- Example: LA resident II
Friends’ House Price Experiences

\[ \text{FriendHPExp}_{i,t,t-24m} = \sum_{c} \text{ShareFriends}_{i,c} \times \Delta HP_{c,t,t-24m} \]

- Example: LA resident III
Friends’ House Price Experiences

\[
\text{FriendHPExp}_{i,t,t-24m} = \sum_c \text{ShareFriends}_{i,c} \times \Delta HP_{c,t,t-24m}
\]

- Average user in Los Angeles has:
  - 420 total friends
  - 30% of U.S.-based friends living outside of California
  - 25% of friends living more than 500 miles away
  - Friends in 55 unique counties
Friends’ House Price Experiences

\[ \text{FriendHPExp}_{i,t,t-24m} = \sum_c \text{ShareFriends}_{i,c} \times \Delta HP_{c,t,t-24m} \]
Interpretation of Friend Experiences

- Want to measure effect of friend experiences through "social interactions"
Interpretation of Friend Experiences

- Want to measure effect of friend experiences through "social interactions"

- **Concern:** Own experiences and friend experiences might be correlated
  - Many local friends → might just extrapolate from own experience.

- **Solution:** Instrument for $FriendExp_{pi,t_1,t_2}$ with experiences of geographically-distant friends.
Friend Experiences and Housing Market Expectations

Geographically-Distant Friends’ House Price Experiences

Facebook Social Graph + House Price Movements in Friends’ Location

Social Interactions

Beliefs about Local Housing Market Investments

Survey on Facebook, 1,242 Responses
Housing Survey

- November 2015: Target FB users through newsfeed; 1,242 responses
- Focus on a few LA zip codes; Fairly representative demographics
Housing Survey

- November 2015: Target FB users through newsfeed; 1,242 responses
- Focus on a few LA zip codes; Fairly representative demographics

- Housing investment regularly topic of discussion within social network.

How often do you talk to your friends about whether buying a house is a good investment?

- Never: 100 responses
- Rarely: 300 responses
- Sometimes: 450 responses
- Often: 50 responses
Housing Survey

- November 2015: Target FB users through newsfeed; 1,242 responses
- Focus on a few LA zip codes; Fairly representative demographics

![Bar chart showing responses to the question: "If someone had a large sum of money that they wanted to invest, would you say that relative to other possible financial investments, buying property in your zip code today is:"

- A very bad investment: 100 responses
- A somewhat bad investment: 200 responses
- Neither good nor bad as an investment: 300 responses
- A somewhat good investment: 400 responses
- A very good investment: 500 responses

- Substantial dispersion in beliefs within the same housing market.
SurveyExpectations\(_{i,t}\) = \(\alpha + \beta Friend\text{HPExp}_{i,t,t-24m} + \gamma X_{i,t} + \epsilon_{i,t}\)
Housing Survey

\[ \text{SurveyExpectations}_{i,t} = \alpha + \beta \text{FriendHPExp}_{i,t,t-24m} + \gamma \mathbf{X}_{i,t} + \epsilon_{i,t} \]

<table>
<thead>
<tr>
<th>All Friend Appreciation 2013-15 (%)</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IV</td>
<td>IV</td>
<td>IV</td>
</tr>
<tr>
<td>All Friend Appreciation 2013-15 (%)</td>
<td>0.040**</td>
<td>0.036*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.017)</td>
<td>(0.019)</td>
<td></td>
</tr>
</tbody>
</table>

Friend Appreciation 2013-15 (%) x Talk with Friend about Housing Investment

<table>
<thead>
<tr>
<th>Talk with Friend about Housing Investment</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>-0.050</td>
<td></td>
</tr>
<tr>
<td>Rarely</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>0.086***</td>
<td></td>
</tr>
<tr>
<td>Often</td>
<td>0.096**</td>
<td></td>
</tr>
<tr>
<td>Demographic Controls</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Zip Code Fixed Effects</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Sample</td>
<td>LA in 2012</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>1,242</td>
<td>1,110</td>
</tr>
</tbody>
</table>

• Larger effect of friends’ experiences when talking more about housing.
Friend Experiences and Housing Market Expectations

Geographically-Distant Friends’ House Price Experiences

Facebook Social Graph + House Price Movements in Friends’ Location

Social Interactions

Beliefs about Local Housing Market Investments

Survey on Facebook, 1,242 Responses
Empirical Strategy and Data

Geographically-Distant Friends’ House Price Experiences

Social Interactions

Beliefs about Local Housing Market Investments

Facebook Social Graph + House Price Movements in Friends’ Location

Individual Housing Market Investments
Empirical Strategy and Data

Geographically-Distant Friends’ House Price Experiences → Social Interactions → Beliefs about Local Housing Market Investments

Facebook Social Graph + House Price Movements in Friends’ Location → Individual Housing Market Investments
Friend Experiences and Housing Market Expectations

Geographically-Distant Friends’ House Price Experiences

Social Interactions

Beliefs about Local Housing Market Investments

1) Show Correlation
2) Argue Effect Through No Other Channel Except Expectations

Individual Housing Market Investments

LA county deeds data, 100,000s of observations
Measures of investment: Extensive Margin

\[ Own_{i,2012} = \alpha + \beta FriendHPExp_{i,2008-10} + \gamma X_{i,2010} + \psi_{zip_{2010},zip_{2012}} + \epsilon_i \]

- Panel of two population snapshots (renters and owners) from Acxiom: 2010 and 2012
- Focus on Los Angeles county
- Controls: Level & change in family size, income, marriage, occupation
- \( \psi_{zip_{2010},zip_{2012}} \): Control for changes in geographic preferences
## Measures of investment: Extensive Margin

<table>
<thead>
<tr>
<th>Dependent Variable: P(Owner in 2012) in %</th>
<th>IV: 2010 Renters</th>
<th>IV: 2010 Owners</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Friend Appreciation 2008-10 (%)</td>
<td>0.608*** (0.042)</td>
<td>0.672*** (0.043)</td>
</tr>
<tr>
<td>Friend Appreciation 2010-12 (%)</td>
<td>0.324*** (0.044)</td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>N</td>
<td>433,836</td>
<td>433,836</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.434</td>
<td>0.463</td>
</tr>
<tr>
<td>Mean Dependent Variable</td>
<td>17.8</td>
<td>17.8</td>
</tr>
</tbody>
</table>

- Renters: ↑ 5 ppt FriendHPEExp\(_i,2008–10\) → ↑ 3.0 ppt P(Owner\(_i,2012\))
- More than 50% of the effect size of adding family member.
Measures of investment: Intensive Margin + Price Paid

- Match friend experience data to buyers in ca. 520,000 transactions since 1994:

1. Intensive Margin:

   \[ \log(PropSize_{i,t}) = \alpha + \beta\text{FriendHPExp}_{i,t,t-24m} + \gamma X_i + \psi_t + \epsilon_{i,t} \]

- Control for transaction quarter and buyer characteristics.
## Measures of investment: Intensive Margin + Price Paid

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<td>IV: log(Prop Size)</td>
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<tr>
<td>Buyer Friend Appreciation</td>
<td>0.310***</td>
</tr>
<tr>
<td>Last 24 Months (%)</td>
<td>(0.053)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Seller Friend Appreciation</td>
<td></td>
</tr>
<tr>
<td>Last 24 Months (%)</td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>Y</td>
</tr>
<tr>
<td>Other Fixed Effects</td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>526,594</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.194</td>
</tr>
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- ↑ 5 ppt $\text{FriendHPExp}_{i,t,t-24m} \rightarrow \uparrow 1.6\% \text{ SQFT}$
Measures of investment: Intensive Margin + Price Paid

• Match friend experience data to buyers in ca. 520,000 transactions since 1994:

1. **Intensive Margin:**

\[
\log(\text{PropSize}_{i,t}) = \alpha + \beta \text{FriendHPExp}_{i,t,t-24m} + \gamma \mathbf{X}_i + \psi_t + \epsilon_{i,t}
\]

• Control for transaction quarter and buyer characteristics.

2. **Transaction Price:**

\[
\log(\text{Price}_{i,t}) = \alpha + \beta \text{FriendHPExp}_{i,t,t-24m} + \gamma \mathbf{X}_i + \phi_{zip} + \psi_t + \epsilon_{i,t}
\]

• Control for property and buyer characteristics, transaction quarter, and zip code.
### Measures of investment: Intensive Margin + Price Paid

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<th>IV: log(Price)</th>
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<td>0.808</td>
</tr>
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• ↑ 5 ppt $\text{FriendHPExp}_{i,t,t-24m} \rightarrow ↑ 2.26\%$ transaction price
Empirical Approach & Identification

\[ HousingInvestment_{i,t} = \alpha + \beta \text{FriendHPExp}_{i,t,t-24m} + \gamma X_{i,t} + \psi_{t2} + \epsilon_{i,t} \]

- Want to argue that $\beta$ due to effect of "social interactions" on beliefs.
Empirical Approach & Identification

\[ HousingInvestment_{i,t} = \alpha + \beta \text{FriendHPExp}_{i,t,t-24m} + \gamma X_{i,t} + \psi_{t2} + \epsilon_{i,t} \]

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  - Geographic distribution of social network not random
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- Want to argue that \( \beta \) due to effect of "social interactions" on beliefs.
- Challenges:
  
  1. Geographic distribution of social network not random
     
     - \( FriendHPExp_{i,t1,t2} \) essentially uncorrelated with \( X_{i,t2} \).
     
     - Within-individual variation in \( FriendHPExp_{i,t1,t2} \).
Empirical Approach & Identification

\[ \text{HousingInvestment}_{i,t} = \alpha + \beta \text{FriendHPExp}_{i,t,t-24m} + \gamma \mathbf{X}_{i,t} + \psi_{t_2} + \epsilon_{i,t} \]

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  2. Common shocks to individual and her friends
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• Challenges:

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  2. Common shocks to individual and her friends

  • \( \text{FriendHPExp}_{i,t_1,t_2} \) does not depend on behavior of friends.
  • Robust to only looking at non-geographically clustered professions (teachers, doctors, etc.)
  • Directly control for economic conditions in social network.
Empirical Approach & Identification

\[ \text{HousingInvestment}_{i,t} = \alpha + \beta \text{FriendHPExp}_{i,t,t-24m} + \gamma \mathbf{X}_{i,t} + \psi_t + \epsilon_{i,t} \]

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  3. Consumption externalities - “Keeping up with the Joneses”
Empirical Approach & Identification

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• Challenges:

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  3. Consumption externalities - “Keeping up with the Joneses”

  • Directly control for housing turnover in geography social network.
  • Robust to only looking at experience of friends that are renters.
Empirical Approach & Identification

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- Challenges:
  1. Geographic distribution of social network not random
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  4. Bequest and wealth effects

Restrict to people with LA hometown or out-of-US hometown.
Restrict to non-family friends (e.g., college, work colleagues)
Cannot explain many results (e.g., sellers' friends' experience and price).
Empirical Approach & Identification

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Rational Behavior?

- For the message of the paper it doesn’t matter. We show that:
  - Social interactions affect housing market expectations.
  - Through affecting expectations, social interactions affect investments.
Rational Behavior?

• For the message of the paper it doesn’t matter. We show that:
  • Social interactions affect housing market expectations.
  • Through affecting expectations, social interactions affect investments.

• Hard to rule out fully rational expectations, but four thoughts:
  1. Effect is (weakly) declining in education levels.
  2. Effect is independent of the true informativeness of network house price experience for future LA house prices.
  3. Effect is independent of how many counties the friend experience is based on.
  4. House prices across the country available for free and in real time.
Story I hope to have convinced you of

1. Individuals discuss property investments with friends, and adjust their expectations based on house price experiences within social network.

2. By influencing expectations, social interactions have a large effect on individual-level housing investment decisions:
   - Extensive & intensive margin
   - Willingness to pay

→ Empirical support for models of expectation heterogeneity
→ New methodology to analyze role of expectations in housing markets
Contribution

• How do individuals form expectations in financial markets?

• Existing evidence that individuals extrapolate from own past experience:
  Vissing-Jorgensen, 2003; Kaustia & Knuepfer, 2008; Greenwood & Shleifer, 2014;
  Malmendier & Nagel, 2015; Kuchler & Zafar, 2015

• Our Contribution: Individuals’ expectations are also affected by the recent experiences in their social networks.
  • Can induce expectation heterogeneity within a market.

• View that social dynamics might influence financial decisions not new:
  Burnside, Eichenbaum & Rebelo, 2015
  Empirics: Hong, Kubik & Stein, 2004; Hirshleifer & Teoh, 2009; Heimer & Simon,
  2012; Beshears, Choi, Laibson, Madrian & Milkman, 2015

• Our Contribution: Empirical evidence for the quantitative importance of social dynamics in housing markets.
Contribution

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• Existing evidence that individuals extrapolate from own past experience:
  Vissing-Jorgensen, 2003; Kaustia & Knuepfer, 2008; Greenwood & Shleifer, 2014;
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  2012; Beshears, Choi, Laibson, Madrian & Milkman, 2015

• **Our Contribution**: Empirical evidence for the quantitative importance of
  social dynamics in housing markets.
Contribution

- **New methodology** to analyze role of expectations in housing markets
  - Use house price experiences in individuals’ social networks as plausibly exogenous shifters of their expectations
  - Can be calculated at arbitrary frequency, only need geographic distribution of friendship networks.

- Empirical support for models in which expectation heterogeneity influences asset valuation and motivates individuals to trade.

- General Theories:

- Applied to Housing Markets:
Contribution

- **New methodology** to analyze role of expectations in housing markets
  - Use house price experiences in individuals’ social networks as plausibly exogenous shifters of their expectations
  - Can be calculated at arbitrary frequency, only need geographic distribution of friendship networks.

- **Empirical support for models** in which expectation heterogeneity influences asset valuation and motivates individuals to trade.
  - **General Theories:** Miller, 1977; Harrison & Kreps, 1978; Varian, 1989; Hong & Stein, 1999, 2007; Scheinkman & Xiong, 2003; Geanakoplos, 2009; Simsek, 2013a,b; Brunnermeier, Simsek & Xiong, 2014; Barberis, Greenwood, Jin & Shleifer, 2015