Motivation

• Health IT is believed to be one of the most promising tools to improving the costs and quality of health care today.
• A functional and robust infrastructure for electronic health information exchange (HIE) is critical to realizing the full potential of health IT
• Network effects
• Competitive effects.
• The federal government passed the HITECH Act, and a culminating goal of HITECH is developing a national health information network.
Research Objective

- We study the impact of two effects - a competitive effect and a network effect - on RHIO participation.
- We develop a theoretical framework to illustrate how these two opposing effects can affect participation in RHIO.
- We construct a unique data set to test for existence of such behavior among physician practices.
Prior Work

- Anecdotal evidence of such protection of market share
- Miller and Tucker, 2014 find evidence of such "lock-in" behavior among larger health systems
- Network economics literature
  - Shapiro and Varian, 1999 discuss the various types of lock-in and associated switching costs
  - Katz and Shapiro, 1985 show that firms' incentives to adopt compatible technologies can be at odds with the consumers

- Our model differs from the classic network/standards frameworks in a couple ways
Model set up

- Initially, patients are randomly allocated between practices in a market.
- Following first encounter, patients learn their practice preferences perfectly.
- Patients face a switching cost which is reduced if their incumbent provider joins HIE.
- Practices deciding whether or not to join an HIE face a tradeoff:
  - Benefits of joining (realized through lower marginal cost) - increasing with network benefits.
  - Loss of market share from reduced patient switching costs.
Model predictions

- Practices that can receive greater network benefits from HIE are more likely to enter.
- Practices in more competitive markets are less likely to enter.
- Model prediction on firm size is ambiguous (Tucker and Miller, 2014 find negative effect of size on HIE).
Empirical Setting

- New York is an ideal setting for our empirical analysis
  - Relatively advanced in developing an HIE infrastructure with ten RHIOs
  - Every provider in NY is eligible for at least one RHIO
  - Availability of recent data on RHIO participation (post HITECH implementation start)
  - Large state with heterogeneity in market structure
- Sample: practices with at least one primary care physician
## Data

<table>
<thead>
<tr>
<th>Variables</th>
<th>Data Set</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physician RHIO Participation</td>
<td>RHIO websites</td>
<td>2013</td>
</tr>
<tr>
<td>Physicians and characteristics</td>
<td>SK&amp;A</td>
<td>2012</td>
</tr>
<tr>
<td>Market competition</td>
<td>Medicare Provider Utilization &amp; Services</td>
<td>2012</td>
</tr>
<tr>
<td>Physician health IT capability</td>
<td>Medicare Meaningful Use data</td>
<td>2011-2013</td>
</tr>
<tr>
<td>Hospital RHIO participation</td>
<td>AHA IT Supplement</td>
<td>2012</td>
</tr>
<tr>
<td>Market characteristics</td>
<td>ARF</td>
<td>2012</td>
</tr>
</tbody>
</table>
Motivation Theory Empirical Framework Conclusion

Measuring competitive and network effects

- Competitive effect: Hirschmann-Herfindahl Index (beneficiary level)
  - Model prediction: As market HHI increases, practices should be more likely to enter RHIO
- Network Effect: hospital participation rate and multi specialty practice
  - Model prediction: Practices in markets with higher hospital participation rate are more likely to participate.
  - Model prediction: Multi specialty practices are more likely to enter RHIO
- Firm size: number of physicians
Empirical model

Sample: 4,500 practices with at least one primary care physician

\[
\text{HIE} = \Phi(\beta_1 \text{HHI} + \beta_2 \text{Hospital HIE participation} + \beta_3 \text{Multi specialty} \\
+ \beta_4 \text{Firm size} + \beta_5 \text{Hospital owned} + \beta_6 \text{EHR capabilities} \\
+ \beta_7 \% \text{Population eligible for Medicaid} + \beta_8 \text{Population size} \\
+ \sum_{i=9}^{18} \beta_i \text{Eligible RHIO} + \epsilon)
\]

- \(\beta_1\): competitive effect (+)
- \(\beta_2\) and \(\beta_3\): network effect (+)
Physician Participation Rate by RHIO

- HEALTHeLINK: 50.5%
- Rochester RHIO: 20.6%
- Hixny: 13.3%
- Interboro RHIO: 13.3%
- Bronx RHIO: 7.6%
- HealtheConnections: 5.8%
- Healthix: 5.3%
- Southern Tier HealthLink: 1.7%
- Taconic HIN: 0.2%
- eHealth Network of Long Island: 0.2%
Competition by County
## Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm size</td>
<td>3.066</td>
<td>6.222</td>
</tr>
<tr>
<td>Multispecialty practice</td>
<td>0.201</td>
<td>0.401</td>
</tr>
<tr>
<td>Hospital participation</td>
<td>0.494</td>
<td>0.101</td>
</tr>
<tr>
<td>Average MU payment</td>
<td>$3,413</td>
<td>$7,453</td>
</tr>
<tr>
<td>Hospital ownership</td>
<td>0.081</td>
<td>0.272</td>
</tr>
</tbody>
</table>
## Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>(Std. Err.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHI</td>
<td>0.269*</td>
<td>(0.106)</td>
</tr>
<tr>
<td>Multi-specialty practice</td>
<td>0.112**</td>
<td>(0.023)</td>
</tr>
<tr>
<td>Hospital RHIO participation</td>
<td>0.116</td>
<td>(0.103)</td>
</tr>
<tr>
<td>Firm size</td>
<td>0.009**</td>
<td>(0.002)</td>
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<tr>
<td>Meaningful use payment</td>
<td>0.209**</td>
<td>(0.070)</td>
</tr>
<tr>
<td>Hospital system owned</td>
<td>0.046*</td>
<td>(0.021)</td>
</tr>
</tbody>
</table>

Note: Controlling for FIPS population, Medicaid eligible population, and eligible RHIO

* significant at 5% level
** significant at 1% level
† significant at 10% level
Conclusion

• We find some evidence that competition could be hindering entry, but providers may be entering for network benefits.

• Work in progress
  ○ Examine implications for optimal policies and network technologies
  ○ Measure RHIO network effects
Thank you!