Outcomes related to combinatorial innovation in government programs: Impact on member composition

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Overview

- Research Objective 1
- RQ1: Participation
  - Methods and Sample
  - Findings on participation
- RQ2: Type of participant
  - Methods and Sample
  - Findings on type of participant
- RQ3: Predicting SBIRs in I/UCRCs
  - Methods and Sample
  - Predictive findings
Research Objective 1

• What is the impact of the SBIR/STTR supplement on I/UCRC membership composition?
  – 1. Has the supplement increased the rate of small business participation in I/UCRCs?
  – 2. Has the supplement impacted the type of small businesses participating in I/UCRCs?
  – 3. Does the rate of SBIR/STTR participation differ across centers? What center characteristics predict these differences?
Methods: Impact on rate of SB participation

• Sample: All I/UCRC memberships between 2008 and 2013, concurrent with the supplement period
  (N of unique members = 1491; N of memberships/years = 5610)

• Method: I/UCRC membership database; Used NSF database of SBIR/STTR supplement recipients to code IUCRC master member list

• Analyses: Frequency/Percent for member types
IUCRC Member Composition 2005-2013: Percentage of All Members

Categories comprising Others include: non-profit, non-US government, and other organization
IUCRC Member Composition 2005-2013: Small & SBIR/STTR Only

Aside: Percentage of eligible SBIR/STTR awardees taking membership supplement: ~14%
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Methods: Impact on type of SB members participating in IUCRCs

- Sample: All SBIR/STTR IUCRC members (N = 60) compared with a matched random sample of small business IUCRC members (N= 60)
  - Center, member start year
- Procedure: extracted descriptive data on SB and SBIR/STTR members from Hoover’s, supplemented with other publically available sources as needed
  - For Winter 2013, Spring 2014
- Analyses: t-tests for continuous variables and chi-square analysis for categorical variables.

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Founding year</td>
<td>The year that the operations undertaken by the business were first started. Not necessarily the date that the business was registered/incorporated.</td>
</tr>
<tr>
<td>N of employees</td>
<td>Total number of employees corporate wide. The headquarters record of a multi-establishment firm contains the total number of employees for the entire organization.</td>
</tr>
<tr>
<td>Annual Sales</td>
<td>The total revenue in U.S. Dollars attributable to products and services sold by an organization annually. May be derived from sales, gross revenue, commissions, or billings.</td>
</tr>
<tr>
<td>Minority/ Women owned</td>
<td>Indicates if the business is owned by a) a person of an ethnic background considered to be a minority in the country where the business entity is located, or b) a woman owns the majority of the establishment. This information is collected via voluntary filings with the SBA, 3rd Party Sources, internal D&amp;B investigations, and through the use of D&amp;B algorithms designed to identify proprietorships that have a female CEO name.</td>
</tr>
<tr>
<td>Location Type</td>
<td>Indicates whether the company a) owns other companies or has branches in other places or b) is a single location.</td>
</tr>
<tr>
<td>Industrial Sector</td>
<td>The North American Industry Classification System (NAICS) is a classification system of six-digit codes developed jointly by Canada, Mexico and the US to identify the industry sector(s) in which a business operates. The system was designed to replace the older, outdated SIC (Standard Industrial Code) system.</td>
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Variable definitions are from the Hoover’s (2013) glossary.
Comparing SBIR vs SB Members

<table>
<thead>
<tr>
<th></th>
<th>SBIR/STTR</th>
<th>Small Business</th>
<th>t/X²</th>
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<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>2013 Annual Sales</td>
<td>$3.1M</td>
<td>$7.5M</td>
<td>$10.8M</td>
</tr>
<tr>
<td>2013 N of Employees</td>
<td>21.9</td>
<td>40.7</td>
<td>62.9</td>
</tr>
<tr>
<td>Year Founded</td>
<td>1999</td>
<td>9.7</td>
<td>1993</td>
</tr>
<tr>
<td>Women/Minority Owned</td>
<td>19(29.8%)</td>
<td></td>
<td>9(15.0%)</td>
</tr>
<tr>
<td>Headquarters vs. Single Site</td>
<td>Headquarters = 5(8.5%)</td>
<td></td>
<td>Headquarters = 15(25.0%)</td>
</tr>
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</table>

* p < .05, ^ p < .1

- SBIR/STTR supplement had a significant impact on type of small firms: smaller, younger = start-ups, micro-enterprises, minority owned, single site
  - Caution: Data reflect current status not status when SBIR or supplement awarded
  - Caution: SBIR/STTRs look much larger than the typical awardee!
SBIR/STTR Annual Sales Distribution for 2013

Mean = $3.1M
Median = $545K
SBIR/STTR N of Employees Distribution for 2013

Mean = 22
Median = 8
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Methods: Center differences in rate of SBIR/STTR participation

- **Sample:** All IUCRCs supported between 2008 and 2013 (N = 60)
- **Data source:** 2013 IUCRC Structural Database and publically available on the lead university site
  - DV: Does/Does not have SBIR/STTR members
- **Procedure:** Grouped centers by N of SBIR/STTR members over the course of the supplement
- **Analysis:** empirical variable trimming, Logistic regression

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<th>Variable Name</th>
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<tr>
<td>Center age</td>
<td>The year in which the center was initially funded under an I/UCRC grant</td>
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<tr>
<td>N of members</td>
<td>Total number of current memberships in a center for the most recently completed reporting period</td>
</tr>
<tr>
<td>Total budget</td>
<td>Total cash support for the center from all sources for the most recently completed reporting period</td>
</tr>
<tr>
<td>N of sites</td>
<td>Total number of university sites for the center for the most recently completed reporting period</td>
</tr>
<tr>
<td>N of students hired</td>
<td>Total number of undergraduate, MS, and PhD students hired by center members for the most recently completed reporting period</td>
</tr>
<tr>
<td>primary fee level</td>
<td>The primary fee level paid by members of a given center for the most recently completed reporting period</td>
</tr>
<tr>
<td>IP sum score</td>
<td>A count of the total number of invention disclosures, patent applications, patents granted, licensing agreements, software copyrights, and royalties realized by a given center for the most recently completed reporting period</td>
</tr>
<tr>
<td>Fidelity score</td>
<td>The sum score ranging from 0 to 3, based on whether a given center makes decisions at the center level, projects are selected by consensus, and results are shared by all members</td>
</tr>
<tr>
<td>Lead Univ. R&amp;D Expenditures in S&amp;E fields</td>
<td>Total expenditures on R&amp;D in science and engineering fields at a given university during the 2012 calendar year</td>
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Percentage of Centers with SBIR members

- No SBIRs: 66.67%
- One SBIR: 11.11%
- Multiple SBIRs: 22.22%

Percentage (N=60)
Predicting center differences in SBIR/STTR participation

• Trimming approach: bivariate correlation (9) and multicolinearity analysis to reduce predictors entered in the full model

• Logistic Regression: Model $\chi^2(1) = 3.2, p = .06$

• The odds of having SBIR/STTR members increased by 9.6% for each additional IP event.

• The model accounted for 7.7% of the total variance in probability of having SBIR/STTR members.
Summary & Conclusions

• The Supplement had a small impact on the rate of small business participation in IUCRCs
  – But remember it was an experiment!
• SBIR/STTR members differ from typical IUCRC small business members; they are characteristic of start-ups, micro-enterprises and more likely to be women or minority owned
  – Adds diversity to the IUCRC program and network
• Some centers have more SBIR/STTR members than others. Centers with a greater track record of IP events are better at attracting SBIR/STTR members
  – SBIR/STTRs are commercialization-oriented when they make the membership decision