GOVERNMENT ROLES IN EVALUATION AND ARRANGEMENT OF R&D CONSORTIA

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OVERVIEW

• Purpose:
  to examine the role of government in formation and coordination of R&D consortia by modeling the process from an evolutionary perspective

• Government-coordinated R&D consortia?
  Vs. Government-sponsored
  Vs. Natural evolution process (Variation-Selection- Retention, VSR)

• The two main aspects of government involvement explored;
  1) the form that these consortia take
     Pyramid vs. Inverse-pyramid
  2) the timing of evaluation of participating firms in a consortium
     Early evaluation vs. Continuous Evaluation
DISCUSSION 1

- 우리나라의 정부 주도 R&D 컨소시엄은 주로 어떤 형태인가?

- 나라별, 산업별로 다른 형태를 보인다면 이유는?

Consortia objective

- Catching up with overseas competitors?
- Entering new business?
### Model

**Genetic Algorithm (GA):** a type of computational modeling approach well-suited for modeling of innovation process.

<table>
<thead>
<tr>
<th>Definition</th>
<th>Assumptions &amp; Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R</strong></td>
<td>The reality, The objective of firms is to match the “reality”</td>
</tr>
<tr>
<td><strong>G</strong></td>
<td>sequential generations to complete an innovation process.</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>the potential number of participating firms</td>
</tr>
<tr>
<td><strong>X</strong></td>
<td>Firms, represented according to their knowledge about the reality. X(_{ij}) represents the firm in the ( j^{th} ) position in the ( i^{th} ) generation</td>
</tr>
<tr>
<td><strong>P(Xij)</strong></td>
<td>performance of the ( j^{th} ) firm in the ( i^{th} ) generation with knowledge</td>
</tr>
<tr>
<td><strong>Φ(Xij)</strong></td>
<td>perceived performance</td>
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</table>

\[
\Phi(X_{ij}) = \sum_{k=1}^{m} \delta_k \\
\text{when } s > 1 \\
\Phi(X_{ij}) = \prod_{k=1}^{s} \delta_k \prod_{k=2}^{s+1} \delta_k + \sum_{k=1}^{s} \left( \prod_{k=1}^{m} \delta_k \prod_{k=1}^{s} \delta_k \right)
\]

As \( s \) increases, receiving an accurate feedback for a correct bit becomes increasingly difficult.

When \( s = m \), it is extremely difficult to receive a positive feedback even if only one out of \( m \) dimensions is wrong.
RESULTS

<table>
<thead>
<tr>
<th></th>
<th>Random</th>
<th>Early</th>
<th>Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>S=1</td>
<td><img src="image1" alt="Graph 1" /></td>
<td><img src="image2" alt="Graph 2" /></td>
<td><img src="image3" alt="Graph 3" /></td>
</tr>
<tr>
<td>S=10</td>
<td><img src="image4" alt="Graph 4" /></td>
<td><img src="image5" alt="Graph 5" /></td>
<td><img src="image6" alt="Graph 6" /></td>
</tr>
</tbody>
</table>

Y axis: Maximum performance, X axis: generations
DIVERSITY EFFECT & SELECTION EFFECT

Diversity effect: The greater n, the higher performance /marginally decrease
Selection effect: The greater n, the lower performance
( low-performing firms are included)

<table>
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<tr>
<th>Evaluation</th>
<th>Arrangement</th>
<th>Dominant force</th>
<th>Under uncertainty (S=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random</td>
<td>Pyramid &amp; Inverse</td>
<td>Diversity</td>
<td>Unchanged</td>
</tr>
</tbody>
</table>
| Early      | Pyramid     | Diversity and Selection | Same as Random evaluation  
|            | Inverse     | Diversity and Selection | -> Only Diversity effect |
| Continuous | Pyramid     | Diversity and Selection | Early stage feedback inaccuracy  
|            | Inverse     | Selection        | impacts benefit of selection |
| Continuous | Inverse     | Selection        | Similar                  |
DISCUSSION 2

- continuous evaluation & inverse pyramid가 최선인가?

- 현실에서는 continuous & Inverse pyramid를 쉽게 관찰 할 수 없는 이유는 무엇일까?

(= 모델에 어떤 변수들을 추가하면 현실과의 차이를 설명 할 수 있을 까?)
DISCUSSION 3

기타 model에 추가하고 싶은, 추가 할 수 있을 것 같은 요소들이 있는지?
- 예를 들면,,,
> 참여한 Firm의 특성차이

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THE DIVERSITY OF R&D CONSORTIA AND FIRM BEHAVIOR: EVIDENCE FROM JAPANESE DATA

Mariko Sakakibara†

Diversity of R&D Consortia

Spillover effect
Learning effect
Project competition effect

R&D Efforts of Participants (R&D Expenditure)
DISCUSSION 4

기업의 R&D와 정부 주도 R&D Consortium이 다른 점은?

이 모델을 기업 전략에 적용하는 데에 문제는 무엇인가?

모델을 기업 전략 관점으로 해석해 볼 수 있다면,
Continuous & Inverse pyramid는 open innovation으로 해석할 수 있을 까?