Developing a PPI for Scientific Research & Development
NAICS 5417/ ISIC 7310

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Presentation Overview

- Significance of R&D in US
- Issues related to constructing deflators
- Considerations in developing a USPPI for R&D
  - Industry Output Definition
  - Obtaining new transaction prices
  - Maintaining a constant quality index
  - Sampling
- Summary
Significance of R&D in USA

- NSF: R&D expenditures grew from $288.3 billion in 2003 to $397.6 billion in 2008

- BEA Satellite Account: treat R&D as investment
  - 6.3% of real GDP growth between 1998 and 2007
  - 6.6% between 2002 and 2007
Real GDP vs. Real R&D Investment

Percent change at an annual rate

U.S. Bureau of Economic Analysis

Real GDP Adjusted by Treating R&D as Investment
Real R&D Investment
Sources of Business R&D’s Contribution to Real GDP Growth, 1998-2007

[Pie chart showing the contribution of different industries to Real GDP growth.]

- Biotechnology-related Industries, 44%
- Information-Communications-Technology-Producing Industries, 36%
- Transportation Equipment Industries, 11%
- All Other Industries, 9%

Source: Bureau of Economic Analysis
Challenge: Constructing a Deflator

- Ideal: a PPI that directly measures actual market transactions for R&D output

- BEA current proxies
  - Cost-based aggregate of indexes for inputs
  - Weighted combination of gross output prices of industries investing in R&D
  - Next best alternatives in lieu of actual R&D output prices
Overall Issue: Feasibility

- Is R&D output measurable for the purposes of a true price index?
  - Can we identify a *marketable* output?
  - Are transactions *recurring*?

- BEA has expressed interest in BLS developing PPI for business R&D output

- If funding became available, how would we approach development?
Four Areas of Investigation

- Industry output definition
- Obtaining net transaction prices
- Maintaining a constant quality index
- Sampling
Industry Output Definition

- Concentrate on business purchases of R&D
  - 34% of R&D expenditures for all for-profit industries in 2007

- Focus on NAICS 5417, Scientific R&D Services
  - I/O data indicates output is used by large portion of R&D intensive industries
### Worldwide R&D employment intensity for activities in selected industries: 2008

<table>
<thead>
<tr>
<th>Industry</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>All industries</td>
<td>7.1</td>
</tr>
<tr>
<td><strong>Manufacturing industries</strong></td>
<td></td>
</tr>
<tr>
<td>Pharmaceuticals/medicines</td>
<td>14.1</td>
</tr>
<tr>
<td>Computers/peripheral equipment</td>
<td>11.9</td>
</tr>
<tr>
<td>Communications equipment</td>
<td>26.7</td>
</tr>
<tr>
<td>Semiconductor/other electronic components</td>
<td>19.3</td>
</tr>
<tr>
<td>Navigational/measuring/electromedical/control instruments</td>
<td>10.2</td>
</tr>
<tr>
<td>Motor vehicles/trailers/parts</td>
<td>5.8</td>
</tr>
<tr>
<td>Aerospace products/parts</td>
<td>8.7</td>
</tr>
<tr>
<td><strong>Nonmanufacturing industries</strong></td>
<td>7.3</td>
</tr>
<tr>
<td>Software publishers</td>
<td>17.8</td>
</tr>
<tr>
<td>Computer systems design/related services</td>
<td>24.8</td>
</tr>
<tr>
<td>Scientific R&amp;D services</td>
<td>30.7</td>
</tr>
</tbody>
</table>

**NOTE:** R&D employment intensity is R&D employment divided by total employment.

**SOURCE:** National Science Foundation/Division of Science Resources Statistics, Business R&D and Innovation Survey: 2008
Industry Output
Definition: Questions

- What is the actual service to be measured?
- Is it R&D for a specific product or improvement?
- Is it R&D for a general class of product?
- Is it R&D for a specific industry?
- Does the output consist of the research services provided, the sale of licensing rights or patents, or some combination of both?
Net Transaction Prices

- Challenge: Services tend to be unique and non-recurring
- Model pricing as potential solution
- Model pricing vs. margin prices as an alternative
Net Transaction Prices: Questions

- Is model pricing methodology appropriate?
- Does it matter if the R&D contract results in a patent or license?
- Appropriate to measure licenses and patents separate from the R&D contracts?
- Similar transaction occur often for sale to be repriceable for a monthly index?
Constant Quality

- Advantages of model pricing – allows service delivery process, type of buyer, & contract terms to be held constant
- Importance of directed substitution
Sampling Considerations

- Identification of an appropriate frame
  - Goes back to industry output definition
  - Issues with NAICS definition
- Treatment of own-account R&D
- Representative of industry size
  - 16,654 establishments classified in NAICS 5417 in 2007 Economic Census (preliminary)
Sampling: Questions

- Who provides R&D?
- Are they stand-alone companies?
- Are they subsidiaries or divisions of manufacturing companies who also invest in own-account R&D?
- Would revenue derived from own-account R&D be included when determining relative weight of each frame unit?
Summary

- BEA targets introduction of R&D as investment component in the GDP accounts in 2013
- Likely to continue to use proxies
- Better understand production transformation processes for R&D
- Would a PPI that BLS could develop be useful? How robust and flexible?
- What can be priced periodically and how best to ensure measures of pure price change are captured?
Contact Information

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THANK YOU FOR YOUR INPUT!