Presentation on Measuring the Economic Impact of R&D Investments

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Background

Practitioner's Perspective on Economic Impact of Research

– Director of Economic Research at the Jacob France Institute

– Consulting Economic Analyst – Battelle Memorial Institute – Technology Partnership Practice
  • Work for Families USA on the Economic Impact of NIH Research (Gates Foundation)
  • Work with State’s, Cities and Counties on Measuring and Capturing the Benefits of Federal and State R&D
Measuring the Economic Impact of Investments in Research/Technology

1. What is Economic Impact Analysis;
2. Economic Impact Models;
3. Project Experience
   a) Work Conducted for Families USA
      – In Your Own Backyard: How NIH Funding Helps Your State’s Economy
      – Model Used, Data Used, Findings
   b) Battelle Research that Pays Off: The Economic Benefits of Federally Funded R&D: The Human Genome Project
4. Role of Economic Impact Analysis
What is Economic Impact Analysis

Economic Impact Analysis: Estimates the Impact on a Regional Economy of the Introduction of a Source of Economic Activity

Typically Uses a Model

- Most Often an Input-Output / I-O Model
- Model Analyzes Transactions Between Sectors
- The Impact of an Activity is Larger than the Simple Spending Associated with that Activity – Because of Local Purchases of Inputs – Most Importantly Raw Materials and Labor
- Model Uses Multipliers – Which Capture The Impact of a Source of Economic Activity
What is Economic Impact Analysis

**Types of Impacts**
- **Direct** = The Event Being Studied
- **Indirect** = Inter-Industry Transactions – i.e. Purchases of Inputs
- **Induced** = Change in Household Incomes – i.e. Purchases of Labor
- **Total** = Direct + Indirect + Induced

**Types of Impacts Measured**
- **Output or Business Activity** = the increased output of goods and services in the economy;
- **Employment** = jobs created and supported
- **Earnings** = the additional earnings associated with the new jobs.
Economic Impact Models

Three Major Models Used

1. RIMS II – Bureau of Economic Analysis
   • Spreadsheets Containing Multipliers
   • Inexpensive and Easy to Use

2. IMPLAN – Minnesota IMPLAN Group
   • Flexible / Adjustable
   • User Friendly Approach
   • Variety of Inputs
   • Fiscal Impacts Included

3. REMI – Regional Economic Models Inc
Work Conducted for In Your Own Backyard: How NIH Funding Helps Your State’s Economy

1. Model Used = RIMS II
   - Multiplier Report for 50 States
   - Spending Adjusted to reflect the difference in purchasing power using the Biomedical Research and Development Price Index (BRDPI)
     • http://officeofbudget.od.nih.gov/gbiPriceIndexes.html

2. Data Used
   - 2007 NIH Extramural Research awards made to each state.
     • http://report.nih.gov/award/trends/State_Congressional/StateOverview.cfm
   - Understates the Economic Impact of NIH on Maryland/The Capital Region
     • Extramural Research = 83% of Research Funding – 10% is Intramural – Mostly at NIH Campus in Maryland – Over $3 Billion
Work Conducted for In Your Own Backyard: How NIH Funding Helps Your State’s Economy

Findings

• NIH made $22.8 billion in grants and contracts to universities and other research institutions in the 50 states in FY 2007.

• NIH extramural research generated a total of $50.5 billion in new state business activity.

• NIH grants and contracts created and supported more than 350,000 jobs that generated wages in excess of $18 billion in the 50 states. The average wage associated with the jobs created was $52,000.

• Overall multiplier over 2.0
  – Business activity generated per dollar of NIH funding ranged from $2.49 (Texas) to $1.66 (South Dakota).
  – The 10 states that generated the most economic activity per dollar of NIH funding were Texas ($2.49), Illinois ($2.43), California ($2.40), Georgia ($2.36), Colorado ($2.34), Pennsylvania ($2.32), Tennessee ($2.32), Utah ($2.30) Ohio ($2.29), and New Jersey ($2.26)
Battelle Approach: Research that Pays Off: The Economic Benefits of Federally Funded R&D: The Human Genome Project

- Scientific knowledge expansion and launching pad for further scientific progress
- Technological underpinning for future innovations and technologies
- Knowledge and technology advancing human health care (prevention, diagnostics and therapeutics)
- Knowledge and technology applied to multiple fields (e.g. veterinary medicine; industrial biotechnology; agricultural bioscience; environmental sustainability, etc.)
- Education and advanced education benefits
- Forensic science applications
- Additional functional impacts...
In 2010 alone, genomics and associated research and industry activity directly and indirectly generated:

- $67 billion in U.S. economic output
- $20 billion in personal income for Americans
- 310 thousand jobs.

### Impact of Genomics and Genomics-Enabled Industry Activity 2010

(in Millions, 2010 $)

<table>
<thead>
<tr>
<th>Impact</th>
<th>Employment (Jobs)</th>
<th>Personal Income</th>
<th>Output</th>
<th>State/Local Tax Revenue</th>
<th>Federal Tax Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Effect</td>
<td>51,655</td>
<td>5,577.2</td>
<td>22,627.5</td>
<td>212.3</td>
<td>952.2</td>
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<tr>
<td>Indirect Impacts</td>
<td>109,520</td>
<td>7,593.1</td>
<td>22,725.9</td>
<td>922.5</td>
<td>1,522.8</td>
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<tr>
<td>Induced Impacts</td>
<td>149,185</td>
<td>6,835.7</td>
<td>21,792.6</td>
<td>1,244.0</td>
<td>1,468.4</td>
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<tr>
<td>Total Impact</td>
<td>310,360</td>
<td>20,006.1</td>
<td>67,146.0</td>
<td>2,378.8</td>
<td>3,943.4</td>
</tr>
<tr>
<td>Impact Multiplier</td>
<td>6.01</td>
<td>3.59</td>
<td>2.97</td>
<td>11.21</td>
<td>4.14</td>
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</tbody>
</table>
The Functional Impacts of Genomics

Genetics and Genomics Tools, Technologies, Techniques and Services

Fields of Application

- Human Health
- Agriculture and Food
- Environment
- Veterinary Medicine
- Industrial Biotech
- Forensics, Justice and Security

Impacts

- Knowledge & Education
- Economic Development
- Human Health
- Environmental Sustainability
- Food Security and Safety
- National Security
- Justice
Role of Economic Impact Analysis

National Level

- Demonstrate / Measure the Impact, Importance and Economic Contribution of Industries, Programs, and/or Policies
  - Examples: Economic Impact of NIH / Economic Impact of Medicaid
  - Economic Impact of the HGP
  - Industry Studies – BIO, PhRMA, IT - Apple

State/Local Level

- Analyze the Economic Impact of Developments, Industries, Policies and/or Projects
  - Industry Studies
    - Economic Impact of the Biosciences on the Arizona Economy
  - Project Analyses
    - Economic Impact of the UMB BioPark on the Baltimore City Economy
  - University Studies
    - University System of Maryland, ISU, FSU.
Role of Economic Impact Analysis

Drawbacks

• In the Case of Research/Science and Technology Related Activities – Only Captures Spending Related Impacts – Misses Spillover Effects

• In the Case of Nanotechnology or Even Biotechnology (still) – Multipliers are Based on Average Industry Relationships – Not the Specific Industry-Relationships