Economic Profile of Nevada’s Biotechnology Industry
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Executive Summary

This study completed an analysis of the economic and employment impacts of the biotechnology industry on the economy of the state of Nevada. An executive summary is presented below:

Introduction

- The biotechnology industry is one of the fastest growing industries in Nevada.
- Biotechnology salaries nationally on average are 68 percent higher than the average private sector salary.
- With high salaries and forecasted sectoral output and employment growth greater than the national average, the targeting of biotechnology industries is high on every state economic development authority's list.

Characteristics of the Nevada Biotechnology Industry

- Approximately 85 percent of the industry's output and 75 percent of the industry's employment is generated by the Pharmaceutical Preparation Manufacturing Sector.
- The biotechnology industry is highly concentrated spatially. Approximately 77 percent of total industry employment and 79 percent of total industry output is located in the Las Vegas MSA.

Economic Impact of Nevada's Biotechnology Industry

- Nevada's biotechnology industry directly generates $281 million in value of output, 654 employees, and $58 million in household income.
- With multiplier impacts incorporated, the total output, labor, and household income impacts to the economy of the state of Nevada from activities of the biotechnology industry is $459 million, 1,545 jobs, and $121 million, respectively.
Introduction

Based on research completed by Cortright and Mayer (2002), as well as Biotechnology Industry Organization (2008), the biotechnology industry is one of the fastest growing industries in the nation. Total employment in biotechnology reached 1.3 million jobs in 2006 up from 1.2 million in 2004, led by strong growth in research, testing and medical labs (U.S. Department of Labor, 2008).

Nationally, average biotechnology salaries are 68 percent higher than average private sector salaries. The average wage of a biotechnology employee is $71,000 as compared to private sector average wage of $42,000 (U.S. Department of Labor, 2008). With these high salaries and forecasted sectoral output and employment growth greater than the national average (U.S. Department of Labor, 2008), it is not surprising that many states in the nation have targeted the Biotechnology Sector as a primary state economic goal. Cortright and Mayer (2002) refer to a study which showed that eighty-three percent (83%) of agencies included the Biotechnology Sector as one of their top targeted economic sectors.

The state of Nevada and the Economic Development Authority of Western Nevada have targeted the Biotechnology Sector as an economic sector for future development efforts. However, before there are substantial targeted economic strategies, it would be advantageous to determine the current impacts of the state’s Biotechnology Sector on the economy of the state of Nevada.

Unlike other traditionally defined industries, which are categorized on the basis of a final product or service, the “biotechnology industry” is a collection of businesses that develop, implement and support the use of a common technology. Biotechnology is defined as “any technique that uses living organisms or parts of organisms to make or modify products, to improve plants or animals, or to develop microorganisms for specific uses” (Busch et al., 1991). This report considers businesses and organizations in Nevada that conduct biotechnology-related research and development, produce or use biotechnology products and services, and manufacture specialized equipment and supplies used by biotechnology firms.
Characteristics of the Nevada Biotechnology Industry

Approximately 85 percent of the industry’s total output and 73 percent of the industry’s total employment is generated by the Pharmaceutical Preparation Manufacturing Sector (Table 1 and Figures 1, 2 and 3). The next largest component of Nevada’s biotechnology industry, which makes up 10 percent of output and employment, is the Medicinal and Botanical Manufacturing Sector. A small number of companies, which represent 5 percent of the biotechnology industry output and 17 percent of employment, conduct scientific research and development.

Table 1. Biotechnology Output in Nevada (2007) by Industry Sub-sector.

<table>
<thead>
<tr>
<th>Industry Sub-sector</th>
<th>Output¹</th>
<th>Employment¹</th>
<th>Establishment²'s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicinal and botanical manufacturing</td>
<td>$29,186,000</td>
<td>64</td>
<td>5</td>
</tr>
<tr>
<td>Pharmaceutical preparation manufacturing</td>
<td>$235,888,000</td>
<td>476</td>
<td>16</td>
</tr>
<tr>
<td>In-vitro diagnostic substance manufacturing</td>
<td>$418,000</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Biological product (except diagnostic) manufacturing</td>
<td>$876,000</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Scientific research and development services</td>
<td>$15,449,312</td>
<td>112</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>$281,817,312</td>
<td>654</td>
<td>31</td>
</tr>
</tbody>
</table>

¹Minnesota IMPLAN Group, Inc. 2004.
²Nevada Department of Employment, Training and Rehabilitation.

Figure 1. Biotechnology Output in Nevada (2007) by Industry Sub-sector.
Figure 2. Biotechnology Employment in Nevada (2009) by Industry Sub-sector.

- Pharmaceutical preparation manufacturing: 73%
- Scientific research and development services: 17%
- Medicinal and botanical manufacturing: 10%
- Biological product (except diagnostic) manufacturing: 0%
- In-vitro diagnostic substance manufacturing: 0%

Figure 3. Biotechnology Establishments (2007) by Industry Sub-Sector.

- Pharmaceutical preparation manufacturing: 52%
- Scientific research and development services: 26%
- Medicinal and botanical manufacturing: 16%
- Biological product (except diagnostic) manufacturing: 3%
- In-vitro diagnostic substance manufacturing: 3%
The biotechnology industry is highly geographically concentrated in both the Las Vegas MSA and the Reno-Sparks MSA (see Table 2, Figures 4, 5 and 6, Maps 1 and 2). The Las Vegas MSA accounts for 77 percent of the total employment in the biotechnology industry in Nevada and 79 percent of the total industry output in the biotechnology industry in the state of Nevada. The Reno-Sparks MSA accounts for 13 percent of the total employment in the biotechnology industry in Nevada and 12 percent of the total industry output in the biotechnology industry in Nevada. Nevada is a sparsely populated state; the two major economically developed areas are the Las Vegas MSA and the Reno-Sparks MSA. In 2008, the Las Vegas MSA population represented 71 percent of the total Nevada population. Population in the Reno-Sparks MSA represented 15 percent of the total Nevada population (State of Nevada Demographer, 2009). The biotechnology firms of Nevada are primarily located in the populated metropolitan counties of Nevada. This is a trend seen nationally.

Table 2. Indicators of Biotechnology Activity in Nevada (2007) by MSA.

<table>
<thead>
<tr>
<th>MSA</th>
<th>Output $</th>
<th>Employment¹ ²</th>
<th>Establishments²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carson City</td>
<td>$1,391,829</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Las Vegas</td>
<td>$222,395,005</td>
<td>503</td>
<td>20</td>
</tr>
<tr>
<td>Reno- Sparks</td>
<td>$33,879,476</td>
<td>85</td>
<td>8</td>
</tr>
<tr>
<td>Balance of State</td>
<td>$24,151,000</td>
<td>56</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>$281,817,312</td>
<td>654</td>
<td>31</td>
</tr>
</tbody>
</table>

¹Minnesota IMPLAN Group, Inc. 2004.
²Nevada Department of Employment, Training and Rehabilitation.

Figure 4. Biotechnology Output in Nevada (2007) by MSA.

Some Basic Concepts of State Economics and Income and Employment Multipliers

Figure 7 illustrates the major dollar flows of goods and services in any economy. The foundation of a state’s economy is those businesses which sell some or all of their goods and services to buyers outside of the state. Such a business is a basic industry. The flow of products out of and dollars into a state is represented by the two arrows in the upper right portion of Figure 7. To produce these goods and services for “export” outside the state, the basic industry purchases inputs from outside of the state (upper left portion of Figure 7), labor from the residents or “households” of the state (left side of Figure 7), and inputs from service industries located within the state (right side of Figure 7), and inputs from service industries located within the state (right side of Figure 7). The flow of labor, goods and services in the state is completed by households using their earnings to purchased goods and services from the state’s service industries (bottom of Figure 7). It is evident from the interrelationships illustrated in Figure 7 that a change in any one segment of a state’s economy will have reverberations throughout the entire economic system of the state.

Figure 7. Overview of State Economic System.
Consider, for instance, the Biotechnology Sector, and its impacts on the state economy. The Biotechnology Sector’s activities can be considered a basic industry as it draws dollars from outside the state. These dollars may hire a few people from the household sector such as laborers to work in the industry. However, most of the state economic linkages are from the Biotechnology Sector’s purchasing goods from service sectors. These include businesses such as restaurants, gas stations, hotels, and other retail businesses. As earnings increase in these businesses, they will hire additional people and buy more inputs from other businesses. Thus the change in the economic base works its way throughout the entire economy.

The total impact of a change in the economy consists of direct, indirect and induced impacts. Direct impacts are the changes in the activities of the impacting industry, such as the expansion of operations by the Biotechnology Sector. The impacting business, such as the Biotechnology Sector, changes its purchases of inputs as a result of the direct impact. This produces an indirect impact in the business sectors. Both the direct and indirect impacts change the flow of dollars to the state’s households. The state’s households alter their consumption accordingly. The effect of this change in state household consumption upon businesses in a state is referred to as an induced impact.

A measure is needed that yields the effects created by an increase or decrease in economic activity. In economics, this measure is called the multiplier effect.

**Economic Impact of Nevada’s Biotechnology Industry**

Nevada’s biotechnology businesses and institutions generate $281 million in annual output and sales. The Nevada biotechnology industry employs 654 workers and has an aggregate payroll of $58 million. This output, employment and income constitute the industry’s “direct” contribution to the state economy. Along with the direct impact, biotechnology businesses and institutions “indirectly” contribute to overall economic activity in Nevada through purchases made from other Nevada businesses. The economic impacts of incomes paid to households by the biotechnology industry are designated as induced impacts. Induced impacts are personal expenditures made by employees in the biotechnology industry. These indirect and induced impacts are referred to in this paper as an industry’s “multiplier effect.” Indirect and induced impacts are estimated using an input-output (Minnesota IMPLAN Group Inc., 2004) model for the state economy.
When the multiplier effects are included, the total contribution of the biotechnology industry to the economic output in Nevada is $460 million (Table 3). Through its direct, indirect and induced activity, the biotechnology industry supports 1,545 jobs that provide $121 million of income to workers in the state.

<table>
<thead>
<tr>
<th>Table 3. Economic Impact of the Nevada Biotechnology (2007).</th>
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<tbody>
<tr>
<td><strong>Direct Impacts</strong></td>
</tr>
<tr>
<td>Output</td>
</tr>
<tr>
<td>Income</td>
</tr>
<tr>
<td>Employment</td>
</tr>
</tbody>
</table>

Selected results from the economic impact analysis are summarized below:

- The Reno-Sparks MSA biotechnology industry contributes $55 million in economic output, including multiplier effects. The Washoe County biotechnology industry accounts for 219 jobs (direct, indirect and induced), which provides $14 million in labor income to Nevadans.

- The Clark County biotechnology industry contributes $357 million in economic output, including multiplier effects. The Clark County biotechnology industry accounts for 1,307 jobs (direct, indirect and induced), which provides $96 million in labor income to Nevadans.

- The Pharmaceutical Preparation Manufacturing Sector in Nevada contributes $385 million in economic output, including multiplier effects. The Pharmaceutical Preparation Manufacturing Sector in Nevada accounts for 1,342 jobs (direct, indirect and induced employment), which provides $96 million in labor income to Nevadans.

- The Medicinal and Botanical Manufacturing Sector in Nevada contributes $48 million in economic output, including multiplier effects. The Medicinal and Botanical Manufacturing Sector in Nevada accounts for 169 jobs (direct, indirect and induced employment), which provides $12 million in labor income to Nevadans.

- The Scientific Research and Development Services Sector in Nevada contributes $25 million in economic output, including multiplier effects. The Scientific Research and Development Services Sector in Nevada accounts for 27 jobs (direct, indirect and induced employment), which provides $13 million in labor income to Nevadans.

**Conclusion**

With the biotechnology industry average wages 68 percent higher than average private sector wages, biotechnology firms have become a favorite industry target of state and local economic development agencies. This paper has presented a synopsis of the current biotechnology industry in the state of Nevada. Also, given the economic, employment and household linkages of Nevada’s biotechnology industry, the Nevada biotechnology industry generates total output, employment and household income impacts of $459 million, 1,545 jobs, and $121 million, respectively.
References


Minnesota IMPLAN Group, Inc. 2004. IMPLAN Professional, version 2.0, social Accounting and Impact analysis Software. Stillwater, Minnesota: Minnesota IMPLAN Group, Inc.

Nevada Department of Employment, Training and Rehabilitation. (On-line database, available at http://detr.state.nv.us/).
