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**“State Level Locational Determinants and Interdependencies for
Biotechnology Firms”**

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ABSTRACT

The biotechnology industry has grown rapidly, doubling in size from 1993 (\$8 billion in revenue) to 1999 (\$20 billion) (Ernst and Young LLP, 2001). Given the rapid growth of the biotechnology industry, this sector has been the focus of numerous state economic development strategies.

However, the location of biotechnology firms has not been evenly dispersed in the U.S. The Ernst and Young LLP report (2001) shows that the state of California has approximately 42 percent of the nation's biotechnology firms in 2001. However, the state of Nevada has barely one percent of the nation's biotechnology firms. It seems that agglomeration may impact the location of biotechnology firms and therefore interdependencies between biotechnology firms may impact these location decisions. Therefore the primary objective of this

proposal is to estimate factors and potential interdependencies that influence the location of biotechnology firms.

For this paper, four locational variables that generally influence industry location will be analyzed. These traditional locational factors are taxes, public services provided, business-failure rates, and manufacturing wages (Coughlin, et.al, 1991). Also, other locational variables hypothesized to influence location by a biotechnology firm will be used. Acs, et al. (1992) identified three key requirements for the success of biotechnology firms: venture capital, research and development infrastructure, and technology transfer. Capital is required “as [firms] struggle to transform their research into a commercial product and bring that product to market” (Acs, et al., 1992). Proximity to R&D facilities is important not only for generating research, results of which may be transformed into commercial products, but also for attracting federal funds.

Additionally, it is hypothesized that biotechnology firms locate where a strong preference for educational attainment is evident. First, the biotechnology industry is education intensive in that it requires a proportionally more skilled work force than the average industry. The supply of skilled workers is higher in states where education is highly valued. The second argument assumes that the quality of the educational system is an amenity or a measure of the quality of life. In addition, biotechnology firms are likely to seek out states or neighboring states that award a high number of doctoral degrees per capita so as to ensure a supply of skilled labor. Finally, biotechnology firms tend to locate company headquarters in states with major research universities to capture agglomeration economies, although they may maintain research field sites elsewhere.

Biotechnology firms are assumed comparable to firm counts. Count data procedures have been embraced as appropriate statistical approach for both time series (Shonkwiler and Harris, 1993) and cross sectional data (Harris and Shonkwiler, 1993). Employing procedures outlined by Dey and Chung (1992) interdependencies among and between biotechnology firms and sectors can be derived.

Previous studies as to biotechnology location (Goetz and Morgan, 1995; Acs et al., 1992) have completed their location analysis where biotechnology sectors were assumed independent. This study will show the sensitivity of biotechnology sectors interdependencies and how the presence or absence of certain biotechnology sectors impact the location biotechnology firms.

REFERENCES:

Acs, Z., L. Herron, and H. Sapienza. “Financing Maryland Biotechnology”. **Economic Development Quarterly**, 6(1992): 1931-1964.

Coughlin, J., V. Terza, and V. Arromdee. “State Characteristics and Location of Foreign Direct Investment within the United states”. **Review of Economics and Statistics**, 73(1991): 675-683.

Ernst and Young LLP. **Focus on Fundamentals: The Biotechnology Report**. Ernst and Young Global and America, Health Sciences Industry: New York, 2001.

Harris, T. and J.S. Shonkwiler. “Application of Count Data Procedures to Estimate Thresholds for Rural Commercial Sectors”. **Proceedings of the Western Agricultural Economics Association**, (1993):410-415.

Shonkwiler, J.S. and T. Harris. “A Non-Gaussian Tie Series Analysis of Rural Retail Business Counts”, **Journal of Regional Science**, 33(1993):37-48.

Dey, D and Y. Chung. “Compound Poisson Distributions: Properties and Estimation “, **Communications in Statistics—Theory and Methods**, 21(1992):3097-3121.