

Economic Impact *of the* **Massachusetts Biomedical Industry**

Executive Summary

“Economic Impact of the Massachusetts Biomedical Industry” is an in depth study of the biomedical industry done on behalf of Massachusetts Biomedical Initiatives (MBI). MBI is a biomedical incubator located in Worcester, Massachusetts. It provides laboratory space, shared equipment, and offers services to startup biomedical companies as well as established companies wishing to start up a new science research endeavors. It is MBI’s mission to help these companies develop to a level where they can safely enter the market without a high risk of failure. By doing this, they hope to increase the number of jobs and economic contribution within the Massachusetts biomedical industry and consequently help foster its growth and development.

Massachusetts is one of the largest and most successful biomedical clusters in the world. Arguably, Massachusetts is second only to California and has been growing rapidly since its birth with Cambridge as its main hub. Other than Cambridge, Central Massachusetts has been one of the largest and fastest growing clusters in Massachusetts. The number of biomedical companies and employees in Central Massachusetts is getting close to the numbers in the Cambridge area, and is continuing to grow. Despite the success of these biomedical clusters and the Massachusetts biomedical industry as a whole, there are obstacles that threaten their continued growth. Many of these obstacles stem from the problems that the United States biomedical industry is currently facing. The United States has been the largest and strongest biomedical industry in the world but like Massachusetts, certain obstacles are threatening its

continued growth and ranking within the global industry. By transference, Massachusetts and its clusters are feeling the effects of these obstacles as well as others unique to its own industry.

This project has several goals that address the above-mentioned issues. Its main goal was to determine the economic impact of the Central Massachusetts biomedical industry. Our sponsor, Kevin O'Sullivan and MBI, established this as the central theme. From there we determined the economic impact of what we refer to as the Boston to Worcester Biomedical Corridor and made comparisons between the clusters in which the corridor is made up. The next goal was to benchmark the United States biomedical industry and finally, to forecast these industries based on their specific metrics. With these goals accomplished, we were able to determine the status of these industries, how well they will do in the future in face of their impeding obstacles, and what can be done to overcome or prevent these obstacles from deterring the Central Massachusetts and overall Massachusetts biomedical industry's growth.

MBI plans to use this information as a tool to help foster the growth and development of the Massachusetts biomedical industry. They will present our findings to government officials and organizations, the media, colleges and universities, and organizations such as the Massachusetts Biotechnology Council (MBC) and Massachusetts Medical Device Industry Council (MassMEDIC) in hopes that it will inspire them to invest more in the industry. Also by doing this, they hope to attract more biomedical companies to Massachusetts and inspire students to do their studies in related fields here in-state and eventually join the industry. With increased amounts of funding, companies, jobs, and labor, the Massachusetts biomedical industry will hopefully be able to overcome many of its challenge and grow to a level that can effectively compete with the largest biomedical industries in the world.

To determine the economic impact of the Central Massachusetts biomedical industry we first had to define the area it occupies in Massachusetts. A previous study was conducted in 2004 by another MQP team here at WPI. They had defined Central Massachusetts as Worcester County. In order to keep the data consistent and to make comparisons, we used the same definition. Using Worcester County as a basis, we made a list of the companies using sources such as the Mass High Tech Journal, MBC, MassMEDIC and MacRae's Bluebook. We contacted these companies to find the number of employees and what the 2004 team called their FTE costs. FTE costs are the costs associated with one full time employee (e.g. salary, benefits, overhead, etc.). To find the economic impact of Worcester County we took the average FTE cost and multiplied it by the total number of employees in the region. This is once again based on the 2004 methodology.

Based on the definition we received, we defined the Boston – Worcester Corridor as Boston, Cambridge, Greater Boston, Worcester County, and other areas between route 2, 9, and 90. Using the same methodology as before, we found the economic impact of these different regions and added them together to get the economic impact of the corridor. We then did regional comparisons to determine the areas with the highest number of companies and employees in the biomedical industry. We also compared their economic impacts. We did this to determine the makeup of the Massachusetts biomedical industry. It was not done with the intent of showing that these regions are in competition with each other. We actually promote unity amongst the regions as opposed to creating competition within this industry competing in a global economy.

To benchmark the United States biomedical industry, we organized our data using Porter's Competitive advantages. This was done in order to effectively see the strengths and weaknesses of the different industries. We compared the United States with Europe and the Asia

Pacific industries. We focused only on China and India for the Asia Pacific industry because those are the largest and fastest growing industries in that region. A lot of the information came from a report done by Ernst & Young which is a trusted source for market and industry data. The rest of the data came from individual case studies on the different regions.

To forecast the Central Massachusetts biomedical industry, we used a simple linear equation along with compounding. We found the average growth rate for the number of companies, employees, and economic impact, and extended it to five years using a compounding equation. We did the same for the Massachusetts industry. Knowing that this process is highly unreliable and produces inaccurate projections, we incorporated qualitative data and adjusted the growth rates based on it. The qualitative data came from case studies and expert opinions which we obtained through interviews. We also did a SWOT analysis of the individual industries to help determine their actual projected growth.

Due to a lack of information, we did not forecast the United States biomedical industry in the same manner. We used all qualitative data as opposed to quantitative in order to forecast the United States industry. We did however use the SWOT analysis in the same manner as before. We did a SWOT analysis for the United States, Europe, and the Asia Pacific region to help determine the future of the United States biomedical industry.

The Central Massachusetts biomedical industry in 2008 has a direct economic impact of \$2.2 billion and has grown 136 percent since 2004. We expect it to grow to \$6.1 billion by 2012, which is a 182 percent increase. It has a total of 162 companies and 16,441 employees and is expected to grow to 270 companies and 47,743 employees in 2012. That is a 67 percent and 159 percent increase in growth respectively. Massachusetts has approximately 1,150 biomedical companies and 102,586 employees. We could not accurately predict the number of companies in

Massachusetts for 2012 because the original growth rate was negative. We do however believe that the number will increase substantially. The number of employees will increase to about 210,446 in 2012, which is a growth of 105 percent.

The United States biomedical industry continues to be the largest and strongest in the world. Based on Porter's Competitive Advantages and the SWOT analysis, their dominant presence in the global industry may not continue. With several governmental policies hindering growth in the United States biomedical industry and creating rapid growth in both China and India, it would not be surprising to see transference in power in the near future. Due to China's new governmental policies in funding, patent laws, drug development, trade, and tax incentives; it has seen substantial growth and in fact has the highest growth rate in the biomedical industry. The United States policies in these areas have done just the opposite and if they are not addressed in the near future, there is a possibility of China becoming the largest biomedical industry.

As mentioned before, the majority of the problems Massachusetts and Central Massachusetts are facing today stem from the problems of the United States biomedical industry. In order to create more growth and maintain its dominance within the global industry, the United States needs to change several of its policies. It needs to increase its funding through programs such as NIH grants. It needs to create more appealing tax and trade incentives. It needs to increase funding to education especially for K-12 math and science education. Patent laws need to become more lenient and quicker to market in order to encourage the development of new drugs and products. Also, the government needs to take a more hands off stance on regulating drug and biomedical device prices.