

## An Analysis of Small Business Patents by Industry and Firm Size

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### Background

This study is the third in a series that examines small business patent activity. The authors created a database of 1,293 technology firms with 15 or more patents issued between 2002 and 2006. These firms are designated as innovative firms because of their high level of patent activity. Using this database, the authors analyze the relative strengths of small and large technology businesses, including information such as the industry and technology within which the firm patents and the importance of the patent. The results demonstrate that small businesses that innovate are indeed special and that the technology they create helps define the cutting edge in a number of industries. The report presents a convincing case that small firms in emerging industries are one of the greatest engines of American economic growth.

### Overall Findings

Small firms are a significant source of innovation and patent activity. Small businesses develop more patents per employee than larger businesses, with the smallest firms, those with fewer than 25 employees, producing the greatest number of patents per employee. Furthermore, small firm patents tend to be more significant than large firm patents, outperforming them in a number of categories including growth, citation impact, and originality. Finally, small firms tend to specialize in high tech, high growth industries, such as biotechnology, pharmaceuticals, information technology, and semiconductors.

### Highlights

- Of the 1,293 firms reviewed in this study, 504 had 500 or fewer employees, 760 had more than 500 employees, and no size information could be obtained for 29 firms. That is, 40 percent of the firms with 15+ patents in the period are small firms. This compares favorably with the 33 percent figure from a previous study by the authors in 2003, and is just slightly below the 41 percent figure from a study by the authors in 2004.
- Small firms obtain many more patents per employee than do large firms. This result is quantified to show that this is not a small-firm large-firm phenomenon, but is actually a firm size issue at all levels. In particular, even within the small firm domain, companies with fewer than 25 employees will have a higher patent-to-employee ratio on average than firms with 50 employees, which will in turn have a higher patent-to-employee ratio than firms with 100 employees, and so on.
- Small firm patents outperform large firm patents on a number of impact metrics including growth, citation impact, patent originality, and patent generality. These metrics have been used for decades to measure the innovativeness of firms, labs, and agencies. The metrics have been validated and shown to correlate with increases in sales, profits, stock prices, inventor awards, and other positive outcomes. This suggests that the patents of small firms in general are likely to be more technologically important than those of large firms.
- Although small firms make up only 6.5 percent of all the patents in the database, they patent at

a higher rate in some technologies, particularly health-related. Ranked by broad technology areas, most small firms fall in health-related technologies (biotechnology, pharmaceutical, and medical devices) and information technology categories (communications/telecommunications, semiconductors, computer hardware and software).

## Scope and Methodology

This project created a detailed database of 1,293 small and large technology firms, as well as more than 1 million patent records from these firms. The database was used to highlight differences between the patent activity of small and large firms, and also to test several hypotheses about emerging technologies and industries.

This report was peer reviewed consistent with the Office of Advocacy's data quality guidelines. More information on this process can be obtained by contacting the director of economic research at [advocacy@sba.gov](mailto:advocacy@sba.gov) or (202) 205-6533.

## References

This study is the third in a series that examines small business patent activity. The other are

- *Small Firms and Technology: Acquisitions, Inventor Movement, and Technology Transfer*  
<http://www.sba.gov/advo/research/rs233tot.pdf>
- *Small Serial Innovators: The Small Firm Contribution to Technical Change*  
<http://www.sba.gov/advo/research/rs225tot.pdf>

## Ordering Information

The full text of this report and summaries of other studies performed under contract with the U.S. Small Business Administration's Office of Advocacy are available on the Internet at [www.sba.gov/advo/research](http://www.sba.gov/advo/research). Copies are available for purchase from:

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