

## Regional Dynamics of Innovation and Entrepreneurship in the Optics and Photonics Industry

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**Abstract :** The economic entities in innovation ecosystems form various industry clusters, in which they compete and cooperate to survive and grow. Within a successful and stable industry cluster, the entities acquire different roles that complement each other in the system. The universities and research centers have been accepted to have a critical role in these systems for the creation and development of innovations. However, the real effect of research institutions on regional economic growth is difficult to assess. In this paper, we present our approach for the identification of the impact of research activities on the regional entrepreneurship for a specific high-tech industry: optics and photonics. The optics and photonics has been defined as an enabling industry, which combines the high-tech photonics technology with the developing optics industry. The recent literature suggests that the growth of optics and photonics firms depends on three important factors: the embedded regional specializations in the labor market, the research and development infrastructure, and a dynamic small firm network capable of absorbing new technologies, products and processes. Therefore, the role of each factor and the dynamics among them must be understood to identify the requirements of the entrepreneurship activities in optics and photonics industry. There are three main contributions of our approach. The recent studies show that the innovation in optics and photonics industry is mostly located around metropolitan areas. There are also studies mentioning the importance of research center locations and universities in the regional development of optics and photonics industry. These studies are mostly limited with the number of patents received within a short period of time or some limited survey results. Therefore the first contribution of our approach is conducting a comprehensive analysis for the state and recent history of the photonics and optics research in the US. For this purpose, both the research centers specialized in optics and photonics and the related research groups in various departments of institutions (e.g. Electrical Engineering, Materials Science) are identified and a geographical study of their locations is presented. The second contribution of the paper is the analysis of regional entrepreneurship activities in optics and photonics in recent years. We use the membership data of the International Society for Optics and Photonics (SPIE) and the regional photonics clusters to identify the optics and photonics companies in the US. Then the profiles and activities of these companies are gathered by extracting and integrating the related data from the National Establishment Time Series (NETS) database, ES-202 database and the data sets from the regional photonics clusters. The number of start-ups, their employee numbers and sales are some examples of the extracted data for the industry. Our third contribution is the utilization of collected data to investigate the impact of research institutions on the regional optics and photonics industry growth and entrepreneurship. In this analysis, the regional and periodical conditions of the overall market are taken into consideration while discovering and quantifying the statistical correlations.

**Keywords :** entrepreneurship, industrial clusters, optics, photonics, emerging industries, research centers

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