Analyzing regional advantage by means of patent co-inventor network: A case study
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Studies about regional advantage have shown that the divergence in the performance of the world’s two major regional economies in 1980s was attributable to the differences in the organizational structure of the firms in these two regions (i.e., California’s Silicon Valley and Boston’s Route 128 area). This paper, to the best of our knowledge, is the first study that uses patent co-inventor network to quantitatively demonstrate the regional differences in internal firm organization, including the degree of hierarchical or horizontal coordination, centralization or decentralization within a firm. We compare the characteristics of co-inventor networks of Intel in Silicon Valley and Digital Equipment Corporation (DEC) in Route 128, based on their patents granted between 1980 and 1989. Intel’s co-inventor network has a larger network density than DEC, and is more balanced in node degrees (smaller variance in degree distribution). The clustering coefficient of the Intel network is significantly smaller and the average shortest path between node pairs in the giant component of the Intel network is significantly smaller and more balanced (with a smaller variance), suggesting that inventors in different groups in Intel were more likely to work together, which is similar to the effect of random connection in a small world network. Furthermore, we found the DEC network to be less balanced in nodes’ betweenness centrality (with a greater variance). Certain inventors in DEC had both very high degrees and high betweenness centrality. All these results suggest that Intel had a more horizontal and decentralized inventor structure whereas DEC’s system had a more hierarchical and centralized inventor structure.