**The Impact of Offshoring on the Innovation Trajectories of Firms and Individuals**

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After the burst of the telecommunications bubble in March 2000, the majority of U.S. optoelectronic component firms moved manufacturing offshore. Mainstream economists have claimed that offshoring will benefit firms and their home countries by freeing up resources to put into higher value-added activities (Agrawal & Farrell, 2003; Baily & Farrell, 2004). However, other intellectuals have argued that offshoring can hurt firm and national innovation (Dewey & LeBoeuf, 2009; Fifarek, Veloso, & Davidson, 2008; Tassey, 2010). Recently, Fuchs et al have added a new mechanism by which offshoring may hurt firm and national innovation. Specifically, in both the automotive and optoelectronic industries, they find that differences in the organization of production offshore may reduce the economic viability of emerging designs (Fuchs 2010, Fuchs forthcoming). In the case of the optoelectronics industry, these emerging technologies are “monolithic integration” – a capability critical not only to the future of telecommunications (the locus of innovation at the time of the study) but also to advance in energy, health, computing, and military applications. Following up on Fuchs et al.’s findings in optoelectronics, this research explores (1) whether due to the different offshore production economics, optoelectronic firms who move manufacturing offshore stop or slow U.S.‐ based R&D activities in emerging “integrated” technologies necessary to access larger markets and (2) whether inventors originally within these offshoring firms, leave, and continue to innovate in emerging “integrated” technologies at different institutions.

We focus on the 28 leading small‐ or medium‐sized U.S. firms that manufacture optoelectronic components for telecommunications (18 offshore, 10 not) and the 81 inventors who have three or more integrated patents at these firms. Our firm scope includes all firms that have strong market presence or strong innovation activities (defined as four or more integrated patents) in integrated active optoelectronic components. We triangulate USPTO patents, firm SEC filings, inventor CVs, and survey data we collect from the firms. To quantify firms’ innovation activities, we use USPTO patent activities in integrated versus non‐integrated designs. Due to there being multiple types of integration within the USPTO integration class, we hand-classify the integration patents by hand to separate out monolithic integration patents. To quantify firms’ extent of offshoring, we collect data on the date a firm first moves offshore and which type (fabrication or assembly) of manufacturing a firm move offshore from a combination of SEC filings (for public firms) and firm surveys. To understand the individual firm and industry environment within which the firms are operating, we collect annual firm revenues, profits, R&D expenditures from SEC filings and firm surveys. To track innovators’ career trajectories and their locus of innovation, we track their patent activities from the USPTO database and collect the professional resumes of the 81 focus inventors. We explore the relationship between firms’ extent of offshoring and firms’ innovation activities using negative binomial regression models. Finally, due to the limited nature of the regression data, we leverage the archival data from the firm surveys and SEC filings to look in greater depth into the context and story behind each firm.

Our regression results show that while offshoring is not associated with statistically significant change in integrated patents, offshoring is associated with an increase in non‐integrated patenting. Our in‐depth case studies of these firms however suggest that there may, indeed, be a relationship between firms’ resources, offshoring strategies and their type of integrated innovation. One firm, Infinera, stays onshore and dominates in the most advanced (monolithic) integrated technologies, while the firms that move offshore either from the start lack or move out of the most advanced (monolithic) integrated technologies. The exception is the large‐resource firms with split production strategies (fabrication in the U.S., assembly offshore), for whom it remains to be seen how their advanced (monolithic) integration activities will fare in the long term. In the case of the inventors, we observe that the majority of inventors who ever worked at offshoring firms eventually leave. Our observations show that inventors who leave offshoring firms for on‐shore firms patent in integration after they leave the offshoring firms; in contrast, people who leave offshoring firms for assignees outside of our 28 focus firms tend to stopped integration patenting. Notably, 90% of those who left offshoring firms to non‐offshoring firms go to Infinera, which during the same period as the offshoring waves of other firms, shifts to focus on and become a powerhouse in monolithic integration. Inventors who leave for Infinera one to three years after their previous firm goes offshore, and, in the case of JDSU, appear to follow one of Infinera’s founders.

Our findings from the regressions at first appear to support mainstream economic theory that firms may, by saving money, be able to increase innovation activities when they go offshore. Our case studies, however, tell a different story – in particular, that while patenting overall may increase, patenting in the most advanced technologies may diminish. Here, our case studies suggest that what really may matter for the development of monolithic integrated technologies is whether or not a firm moves its fabrication facilities overseas. These observations broadly match the technology economics shown by Fuchs and Kirchain for the optoelectronics industry (Fuchs & Kirchain, 2010). However, Fuchs and Kirchain suggest that large‐resource firms who keep fabrication on‐ shore and move assembly offshore may not be able to sustain a split strategy, while our results suggest that this split strategy is, indeed, being sustained, and by one of the more successful large-resource firms. Our observation at inventors level (the case of JDSU) in part supports spin‐off theories that employees can leave in groups to found their own firms when a large disagreement exists within the old firm, such as when the old firm is acquired or, here, chooses a strategy of moving offshore (Klepper, 2009).

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