

Spillovers in Technology Adoption

Evidence from a Randomized Experiment in Pakistan



In brief

- Spillovers between firms are key to generating economic benefit according to some theories of economic growth.
- It is often thought interventions such as further investment and industrial policy are needed to reach the socially optimum amount of investment and overcome coordination failures. However, empirical evidence for technology spillovers is weak.
- Research by the IGC attempts to provide evidence for the presence or absence of spillovers by looking at soccer ball manufacturing firms in Sialkot, Pakistan.
- A new cutting technology was randomly introduced to a group of treatment firms, which reduced unit costs by about 2% by allowing manufacturers to reduce their raw material usage.
- The research then measured the extent to which this technology was adopted by non-treated firms which are connected to the treated firms.
- This project is still ongoing and thus, policy implications cannot be derived at this time.
- However, preliminary observations suggest that there does appear to be clear evidence of technology spillovers within manufacturing clusters.
- Furthermore, governments can potentially encourage innovation and technology upgrading by devising particular policies, such as providing innovation grants or subsidizing consulting services.

Policy Motivation

“Despite the centrality of technology spillovers among industrial firms in... discussions, the empirical evidence for their existence is weak”

Spillovers between firms, and in particular technology spillovers, play a central role in many theories of economic growth. Such spillovers are thought to be a key mechanism generating increasing returns and they also provide the primary economic rationale for industrial policies to increase investment in innovation. In the presence of spillovers, such interventions may be needed to overcome coordination failures among firms and bring investment closer to socially optimal levels. In the absence of spillovers, such interventions are unnecessary and may generate distortions that may slow growth.

Despite the centrality of technology spillovers among industrial firms in theoretical and policy discussions of the growth process, the empirical evidence for their existence is weak. There are two key challenges that researchers confront when analyzing technology spillovers. First, researchers rarely have direct measures of firms' technology use. Second, if one observes two firms adopting similar technologies, it is difficult to know whether the first firm is having an effect on the second, the second firm is having an effect on the first, or both are being affected by some unobserved factor. Teasing apart these effects requires detailed information on the network links between firms as well as, ideally, experimental variation in which firms initially adopt the technology.

Our research resolve both of these issues and provide rigorous, experimental evidence on the presence (or absence) of technology spillovers between manufacturing firms. We have designed a new cutting technology that enables soccer ball manufacturing firms in Sialkot, Pakistan, to reduce the amount of raw materials required to produce a soccer ball. Our estimates suggest that the technology will save about 2% of the unit costs. We have randomly introduced this new technology to a group of treatment firms, and are measuring the extent to which this technology is adopted by non-treated firms that are connected to the treated firms. We will then explore connections through family relationships, supplier relationships, worker flows, and geographical proximity. The project is still ongoing and should be completed this year.

Policy Impact

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We believe that our results will help shape innovation policy in developing countries. Specifically, we anticipate providing insights on the following three policy questions related to technology spillovers. First, does technology spillover in manufacturing clusters? If so, this provides justification for similar types of interventions by governments to subsidize innovation costs. The presence of externalities implies that the social benefit from an investments in technology exceed the private cost. Second, our research will characterize the channels through which spillovers occur. For example, if spillovers primarily occur through shared suppliers, policymakers may want to target policies towards upstream suppliers in order to maximize spillovers through limited resources. Finally, our research will inform policymakers of the characteristics of firms that are particularly influential in generating spillovers. Again, this further helps policymakers achieve optimal targeting of industrial policy

interventions when faced with limited resources.

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Audience

The findings of this project should be of interest to several stakeholders:

1. Central and State-level Ministries of Commerce and Export Promotion
Agencies who are interested in promoting technological upgrading within their manufacturing sectors
2. Local Chambers of Commerce that specialize in promoting the interests of specific industries and clusters
3. Agencies that promote small- and medium-scale enterprises.

Policy Implications

Since the project is still ongoing, we cannot yet derive any policy implications, but we intend to have the following messages:

- We find clear evidence of technology spillovers within manufacturing clusters.
- We identify the channels through which technology spillovers occur.
- Governments can potentially encourage innovation and technology upgrading by devising particular policies, such as providing matching innovation grants to particularly firms or subsidizing consulting services to help streamline manufacturing costs.

About the authors

David Atkin is an Assistant Professor at UCLA. David's research focuses on evaluating the impacts of trade liberalization on the poor in the developing world. His recent work has studied the role of regional taste differences in altering the impacts of trade reforms in India, and educational responses to the rise of export oriented manufacturing in Mexico.

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