

# INNOVATION AND TECHNOLOGICAL UPGRADATION IN THE SIALKOT MANUFACTURING SECTOR

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[Based on joint work with David Atkin (MIT), Shamyla Chaudry  
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# INTRODUCTION

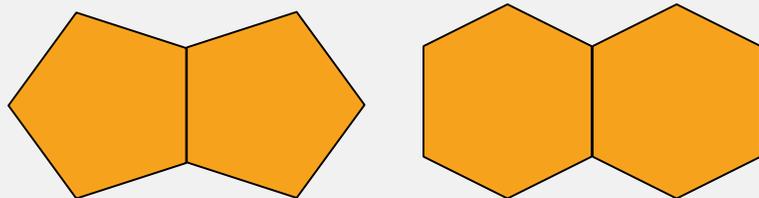
- Industry in Punjab has greater potential:
  - investment, productivity, and innovation lower than they should be.
  - ‘innovation’ includes product, process, management and marketing innovations.
- Some firms fear ideas spreading quickly to competitors, which means that individual firms do not capture the full benefit of innovation.
- In addition there are management challenges to adoption of new technologies as our Sialkot soccer ball project has shown.
- Firms need to invest more in productivity and innovation to take advantage of opportunities
- Greater investment and innovation will spur job creation

## THE SIALKOT SOCCER BALL TECHNOLOGY PROJECT

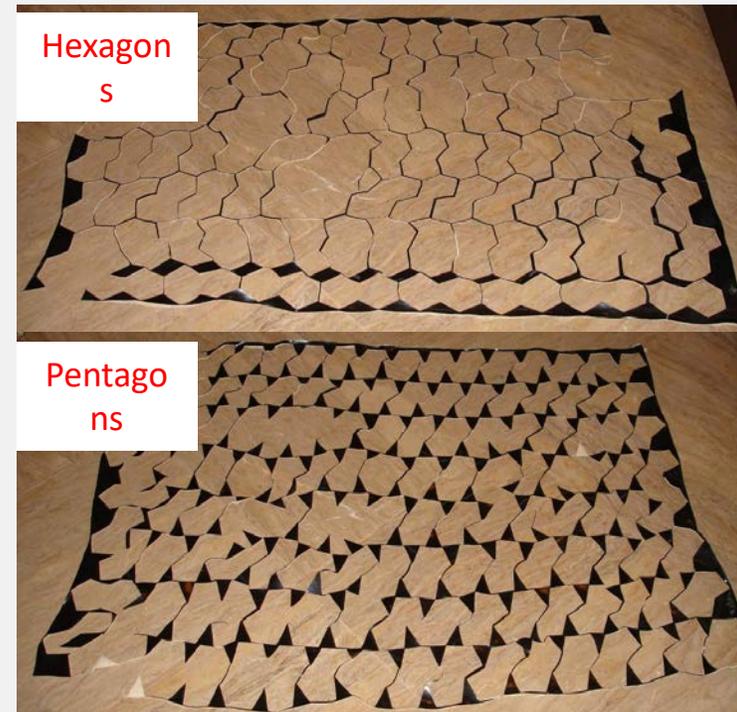
- Researcher team included myself and Shamyla Chaudry (Lahore School of Economics), Eric Verhoogen and Amit Khandelwal (Columbia University) and David Atkin (MIT).
- The project studied adoption among soccer-ball producers in Sialkot, Pakistan.
- Introduced technology to a random subset of firms.
- Take-up has been sufficient to indicate (to us) that our technology is working, but still puzzlingly low.

# THE EXISTING SOCCER BALL CUTTING TECHNOLOGY

- Balls use a “buckyball” design: 20 hexagons, 12 pentagons
- Panels cut from the sheets, which are 55% of total input costs
- Cutters use hydraulic press and two-piece metal die to cut sheets

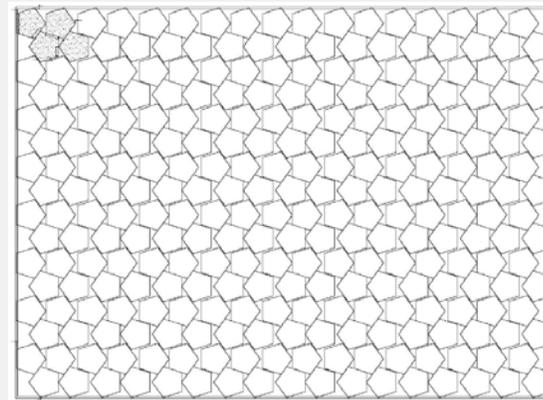


- Hexagons tessellate (8% wasted)
- Pentagons don't (23% wasted)



## NEW CUTTING TECHNOLOGY

- We developed blueprint for a 4-pentagon die to implement optimal packing



- Previous technology cuts 250-256 pentagons from a standard sheet
  - Ours cuts 272-280
- Conservative cost-benefit analysis indicates that median firm can recover fixed costs of adoption after 3 weeks

## THE SIALKOT SOCCER BALL TECHNOLOGY PROJECT

- But we were puzzled by the lack of adoption.
- Consistent with qualitative evidence, we hypothesized that a key problem is misalignment of incentives:
  - Cost savings accrue to owner.
  - Most employees paid piece-rate and new technology slows them down, at least initially.
  - In absence of changes to labor contract, effective wage falls.
  - Employees seek to block adoption, including by misinforming owner about value of technology.

# THE SIALKOT SOCCER BALL TECHNOLOGY PROJECT

- Experiment 2:
  - Among original tech-drop firms, we randomly offered a one-time incentive payment to employees.
  - Payment was conditional on the employee demonstrating competence with new technology in front of owner.
  - Incentive-payment intervention had significant positive effect on adoption.
- Lessons:
  - The adoption of technology and spillovers didn't happen automatically,
  - It took an additional incentive for adoption to take place
  - So technology adoption requires both technology and training.

## SECOND STAGE OF SIALKOT SOCCER BALL PROJECT

- We also wanted to test to see *high costs of high-quality inputs* are a barrier to upgradation.
- So we developed an experiment that offered subsidies for high-quality rexine to a random subset of firms and examine if this subsidy spurs upgrading.
- There are 2 potential responses by firms:
  - The subsidy may induce firms to purchase complementary high-quality inputs and produce higher-quality footballs, using their existing technologies and production processes.
  - The subsidy may also stimulate learning and spur technological improvements in the production process.
- The subsidy was offered to 30 firms and there was 70% take-up by firms.
- The experiment is still ongoing.

## SIALKOT SURGICAL GOODS PROJECT

- The research team are in the process of investigating the extent to which *fixed costs of innovation* are a barrier to upgrading in the surgical-goods sector in Sialkot.
- If there are externalities in the process of innovation, there may be an important role for governments in subsidizing the costs of innovation.
- The team is developing an idea for providing grants for innovations by the surgical goods manufacturers which has the potential to increase exports.

## PUNJAB INNOVATION AND DEVELOPMENT FUND

- In Jan. 2013, the Government of Punjab took the very promising step of creating an Innovation Development Fund (IDF) and collecting proposals for projects to implement new technologies or products.
- To our knowledge, the process did not advance to the grant-giving stage and the current status of the Fund is unclear.
- We are proposing a fund that is different from the previous IDF in its focus on SMEs and in its geographic and industry focus.

## POLICY RECOMMENDATIONS

- The Government of Punjab can support the creation of an **Innovation and Technology Upgradation Fund for Enterprises (ITUFE)**.
- This fund aims to raise the overall rate of innovation in Punjab by subsidizing the costs of technology upgradation and innovation for Small and Medium Enterprises (SMEs).
- Rather than trying to directly identify the new innovations itself, the Fund instead creates the correct incentives for firms to undertake investments in new technologies.
- It effectively lowers the costs of investment helping to ensure that innovating firms earn a positive return on the investment.
- With these new incentives in place, firms will innovate more.
- But the gains will still be shared broadly as the innovations diffuse across the entire industry.