Impact of IT on Organizations

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Fiona Scott Morton
Yale School of Management

What does IT allow a firm to do?

- Some activities previously not possible
  - Computational speed
  - Sales of digital copies or information goods online
  - Delivery people communicate with headquarters
- Some activities now higher quality, speedier, or use fewer resources
  - Sell old inventory to geographically dispersed bidders
  - Provide directions with map, opening hours, sale info, 24/7 on web
  - Phone software & voice recognition provide customer service
  - Link supplier with manufacturer in real-time to reduce inventory
- Will generate temporary profits until imitation.

How is an organization's response to IT interesting?

An organization changes shape, workers, incentives, or rules due to adoption of IT

For example,

- *Monitoring/incentives*: incentives or penalties can be stronger because IT removes noise in principal's information.
- *Information*: IT can bring information to more agents in the firm. Decisions can be made more efficiently by worker with customer contact, incentive, production skill, etc.
- *Speed*: IT can increase the speed at which information and communications flow, causing change in how decisions are made, or who makes them, and the nature of contracts with suppliers.
- *Cost*: Lower transactions or coordination costs due to IT may alter the vertical integration decision of the firm

Implications

- This is all very intellectually interesting to speculate about
- What are some of the changes we observe?
  - Productivity increases
  - Changes in demand for workers with particular skills
  - Change in shape of organizations?
    - Lots of theories that pre-date IT shocks from the theory of organizations literature and from traditional IO literature
- What evidence has been assembled to date on these, but particularly the latter, point and what more would we like to see?

First type: bird's eye view

- Set of studies that examine a large swathe of the economy, e.g.Bresnahan, Brynjolfsson and Hitt (2002)
  - Using a large sample of large firms in different industries: 300
  - Survey of organizational practices and labor force characteristics, IT capital, inputs and outputs
  - Find complementarities among these three: firms with more IT also have more worker empowerment and more valuable output
- Labor demand work, e.g. Machin and Van Reenen.
  - Examine skill structure of wage bills and employment in 7 OECD countries and see if technical change is correlated with increasing demand for more highly-skilled workers.
- Follow on, Caroli and Van Reenen (2001) "Skill biased organizational change"
  - Across big sample of firms, they find that more authority (less heirarchy?) associated with demand for higher skills and productivity increases

This literature is very interesting and informative. Creates a bridge to labor, policy, macro economics, and, of course, productivity.

Not quite so satisfying for a person who studies firms or a manager, since we aren't up close and don't know exactly what these firms are doing

- how labor practices are implemented across different jobs or divisions
- what exact IT the firm has
- who in the organization uses it, etc.

More fundamentally, not documenting change in organization. Documenting two types of organizations. (Though econometrics do good job of convincing the reader of change)

Second type: super micro-level

- Brynjolfsson and Van Alstyne (2005) "Information worker productivity: evidence from worker output, compensation, and email traffic data"
- Gandal and Van Alstyne (2005)
- Ask what exactly are white collar (knowledge) workers doing with IT that is changing their jobs and their productivity?
  - Survey workers, find out where they sit, who they email, measure IT, measure output
- Extremely cool results. Find networking, connectedness, and multitasking are correlated with productivity gains

- Super-micro approach has been used in blue-collar industries also, e.g.: Bartel, Ichniowski, and Shaw (2003, 2004). Valve industry.
- Idea is to measure technology and organization at the plant level within a narrowly defined industry, then measure impact of IT on HRM practices, productivity, and skill demand
- In this industry, IT adoption involves changing strategy (low cost to differentiated, roughly)
  - Who adopts? (plants that make specialty products)
  - Does adoption change demand for worker skills? Yes, need higher skills
  - Do skills require new HRM practices? yes

These papers answer important questions about how either information workers, or blue collar workers, use IT to become more productive. They document very specific answer to longstanding puzzle in productivity.

Note that this approach is not asking about organizational change in the structural (scope of the firm) sense. Some focus on complementary changes in job design.

These papers ask a different, and very interesting, question about IT use and how it aids productivity.

The organization is not changing in response to technology (although different HRM practices might be adopted). Organizational form is held largely fixed while the authors exploit differences across workers in how they use IT, or plants in whether they adopt IT.

Third choice is in between: Industry level

- Example of work on multiple firms in specific industry is series of papers of Baker & Hubbard
- Identify discrete IT change, on-board computers in trucking, and observe adoption
  - First IT innovation monitors location and all aspects of truck actions
  - Second IT innovation allows for real-time communication with dispatcher and location data
- Infer where IT is most valuable by analyzing who adopts early and who doesn't
- Observe changes in vertical integration with adoption on two margins
  - Vertical integration of trucks and trucking firms
  - Vertical integration of mfr and trucking services

- Find this kind of work interesting because it tells us how firms in a particular industry are re-organizing themselves in response to (an exogenous) IT shock
  - Vertical integration choice changes
  - Does a manufacturer own its own trucking division once coordination costs have fallen hugely? => no
  - Does a trucking firm own its own trucks once it can monitor company drivers? => yes
- Note that there are other great questions which they can, and in some cases do, ask and find evidence about:
  - Labor demand: different types drivers, different types dispatchers after IT (Don't do this, but others do, such as Shaw et al)
  - Capacity utilization: rises 3% due to ability to coordinate remotely
  - Fuel efficiency: rises for previously unmonitored drivers
- Results are specific to setting (as is true with super micro also), which is good and allows for convincing identification.

More industry studies

Research at the level of an industry where one can study variation across firms, and variation in response to IT shock seems valuable. Why?

- Attracted by apples to apples comparison, yet many firms in an industry so can exploit heterogeneity in starting conditions.
- IT shock treated as exogenous, adoptions as endogenous.
- Managerially relevant.

How to do more of it?

- Need data on many firms plus discrete technology advance that changes something important about information, monitoring, coordination. (rare!)
- Many firms, one technological shock, variation in adoption => see how organizational structure changes

Possible setting

- New car dealers in the US can adopt a hosted ERP system with different modules
  - Consumers can schedule repairs, order parts online
  - Software handles and tracks sales leads: gather information on prospective customer, steps to follow up and sell, reminders (procedure for web-based leads versus walk-ins)
  - Dealer web page structure and functionality: schedule test drive, search inventory, browse vehicles, get quote
- Some nameplates require dealers to adopt this ERP product
- Some nameplates endorse the product for their dealerships to use, but dealers not required to adopt
- => many firms, one technological shock, variation in adoption (some exogenous, some endogenous)

Questions

- What are the characteristics of dealerships who adopt relative to those who don't?
- After adopting, what changes occur to the organization?
  - Hire different types of skills in salespeople or managers
  - Change incentive schemes for salespeople
  - Change ownership pattern of dealerships: number of franchises one person can run?
  - Non-organizational changes could also be tracked: prices, quantities, inventories…