

Comments on:
The Digital Reorganization of Firm Boundaries: IT
Use and Vertical Integration in U.S. Manufacturing
by: Forman and McElheran

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Disclaimer:

This work is unofficial and thus has not undergone the review accorded to official Census Bureau publications. All results have been reviewed to ensure that no confidential information is disclosed. The views expressed in the paper are those of the author and not necessarily those of the U.S. Census Bureau.

Big Picture Questions

- Estimating effects of communication and information technology
- Does ICT affect firm boundaries?
 - ▶ Potential to lower coordination and transaction costs
 - ▶ Disproportionate impact on external transactions?
- Plant and firm-level heterogeneity in adoption and uses of ICT

Main Contributions

- Rich new plant-level data on IT & CT
 - ▶ Different types of technologies
 - ▶ Different uses of these technologies
- Evidence on plant-level ICT use and w/in firm transfers
 - ▶ Decreased share of w/in firm transfers for plants using ICT
 - ▶ Focus on ICT used with **external suppliers and customers**
 - ▶ Interaction effects between customer and supplier ICT
- IV estimates to provide a causal impact
 - ▶ Instrument for a plant's adoption of ICT
 - ▶ New information on determinants of adoption decisions

Empirical approach

- Assertion that ICT lowers information-sharing costs disproportionately more for external suppliers/customers
- Essentially estimate a first difference

$$\Delta WFT_j = \alpha + \beta_{ICT} ICT_j + \beta_X \Delta X_j + \Delta \varepsilon_j$$

- ▶ WFT_j is plant's share of w/in firm shipments
 - ▶ Use changes from 1992 to 1999
 - ▶ $ICT_j=1$ if plant uses external ICT in 1999
- ASM plant-level data from 1992 and 1999
 - ▶ Plants alive in both years
 - ▶ Multi-plant firms
 - ▶ Plants w/downstream plant in firm
 - ▶ Plans with w/in firm transfers > 0 in 1989-1990

Variables related to *use* (not adoption) of ICT

For each of the following items, to whom does this **plant** provide information online (Internet, Intranet, EDI Network, or Extranet)? *Mark all that apply.*

| | Other company units | External customers | External suppliers | None of these |
|------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| a. Design specifications | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| b. Product descriptions or catalog | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| c. Demand projections | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| d. Order status | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| e. Production schedules | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| f. Inventory data | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| g. Logistics or transportation | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

- Aggregate these responses to: internal; customer; supplier IT
- 47% of plants use neither; 27% use both
- 36% use supplier & internal IT; 32% use customer & internal
- Condition on internet use at plant

Correlations of industry-level technology variables

- Industry share of plants using ICT *to share design specs* with:

| | Share of plants using: | | Capital | Skill | Share of | <i>imports</i> |
|---------------------------|------------------------|-------------|-----------|-----------|-------------|----------------|
| | CAD/CAE | ERP systems | intensity | intensity | diff inputs | <i>sales</i> |
| External suppliers | 0.49 | 0.09 | -0.24 | 0.25 | 0.35 | -0.02 |
| | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.70 |
| Othr company units | 0.54 | 0.46 | 0.20 | 0.10 | 0.12 | 0.10 |
| | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.03 |

- Approx 440-465 NAICS industries
- Correlation between external use and othr company units is 0.23

Main results

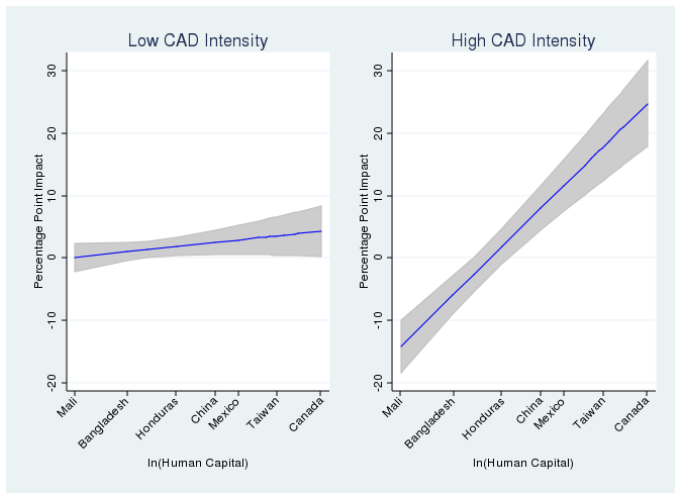
| | (1) | (2) | (3) | (4) | (5) |
|-------------|----------------------|-----------------------|---------------------|--------------------------|--------------------------------------------------|
| | Baseline | Supplier IT | Customer IT | Supplier and Customer IT | Supplier and Customer IT Separately and Together |
| External IT | -0.0291 (0.0123)* | | | | -0.0560 (0.0271)* |
| Supplier IT | | -0.0323 (0.0111)** | | -0.039 (0.0124)** | -0.0201 (0.0145) |
| Customer IT | | | -0.0050 (0.0117) | 0.0144 (0.0130) | 0.0477 (0.0222)* |

- Supplier ICT use seems most important
- But, plants that plan to ship more externally, use external IT
 - ▶ Any shock to external demand leads to ICT adoption/use
 - ▶ Show that external ICT not significant until 1995

IV approaches

- Cost to provide telecom services (terrain & subscriber density)
 - ▶ Subscriber density potentially correlated with demand
- External IT use in plant's industry
 - ▶ Value of plant's use increasing in no. of connected plants
- CAD/CAE adoption in other plants in firm
 - ▶ Predominant software to share design & production specs
 - ▶ Complementarity between CAD & ICT

Impact of CT on probability of offshoring



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 - ▶ Within the same narrow industries
 - ▶ After controlling for size, productivity, etc.
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 - ▶ How does workforce change with ICT adoption?
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- Paper provides some of the first answers on these questions