Innovation, Adoption, Ownership, and Productivity: Evidence from Ukraine

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Motivation

- Much research exists on
  - Variation in firm performance by ownership types
  - Productivity returns to different types of investments
- Little research on how returns to different investment types vary with ownership
  - Can differences in investment returns help explain variation in firm performance?

How might investment influence performance variation by ownership type?

- Investment volume
  - Access to financing and to technologies varies with ownership types
  - Investment volume varies by ownership types
  - Ownership types with more investment may exhibit lower returns
- Owner monitoring
  - Some owner types are better monitors
  - Monitoring influences investment returns
  - Particularly important for intangible investment
- Organizational capital
  - Some owner types implement complementary organizational changes, bring organizational knowledge and experience
  - This improves returns to IT investment

The Setting: Ukraine in 2000-2007

- Soviet Union invested heavily in R&D, but with low effectiveness
  - Technology transfers from West were associated with higher manning levels and lower output than comparable transfers to developed market economies
  - R&D departments had little incentive to produce innovations useful to the firm
  - Development work needed to move idea from drawing board to production process underemphasized
  - Managers had little incentive to adopt new technology

The Setting: Ukraine in 2000-2007

- Ukraine implemented market reform during the 1990's
  - Privatization
  - Liberalization – new private firm entry
  - Foreign investment
- We estimate investment returns separately for domestic private, foreign, and new private firms in comparison to state firms

Data and Specifications

- Ukrainian State Statistical Office registry of all Ukrainian industrial firms in 2000-2007
- Estimate Tobit regressions for investment intensity
- Include different investment intensity variables
  - Non-technological investment expenditures/output
  - R&D expenditures/output
  - IT investment expenditures/output
  - IT software investment expenditures/output
  - IT hardware investment expenditures/output

Data and Specifications

- Include dummies for
  - DO (majority private, majority of private share is domestically owned)
  - FO (majority private, majority of private share is foreign owned)
  - New private
- Include industry-year dummies (25 industries), 27 region dummies

Data and Specifications

- Estimate production functions in first differences for output, labor, pre-existing capital stock, and materials
- Include industry-year dummies (25 industries)
- Interact labor, capital stock, and materials with industry dummies
- Interact DO, FO, and New private with investment intensities
- In some specifications, interact investment intensities with industry dummies

Hypothesis Testing

- Movement along investment demand schedule
  - Access to finance, lower costs of investing
    - Ownership types with better access to financing should have higher volumes, but have similar or lower returns
  - Expect foreign firms to have lower costs and new firms to have higher costs

Hypothesis Testing

- Shift in investment demand schedule
  - Monitoring
    - Ownership types with better monitoring should have higher returns to investment, especially intangible (R&D, IT software)
  - Organizational capital
    - Ownership types with better organizational capital should have higher returns to IT investment
  - Expect foreign firms to have better monitoring and organizational capital
  - New firms may start up with better organizational capital

Determinants of Investment

	Non-Tech	R&D	IT	IT Software	IT Hardware
Domestic	0.013***	0.005**	0.001**	0.002***	0.001
Foreign	0.017***	-0.001	0.002***	0.003***	0.002***
New Private	0.047***	-0.016***	0.003***	0.002***	0.003***
3-digit-industry market share	-0.364***	0.209***	0.034***	0.033***	0.037***
3-digit-industry mktsh sq	0.433***	-0.215***	-0.060***	-0.046***	-0.062***
Exporting firm	0.026***	0.030***	0.007***	0.003***	0.007***
Log Capital	0.034***	0.019***	0.004***	0.002***	0.004***

Productivity Returns to Investment

	OLS	FE
Non-Tech Invest.	0.149***	0.168***
R&D	0.106***	0.086
IT	0.942***	0.977***
Domestic	-0.004	0.046**
Foreign	0.001	0.023
New Private	0.008***	

Ownership-Investment Interactions

	OLS	FE	OLS	FE
Non-Tech*Domestic	0.114**	0.050	0.047	-0.017
Non-Tech*Foreign	0.136**	0.083	0.083	0.026
Non-Tech*New	-0.048	-0.058	-0.048	-0.054
R&D*Domestic	0.086	0.046	0.111	0.084
R&D*Foreign	0.272	0.135	0.287	0.172
R&D*New	-0.075	-0.007	-0.035	0.014
IT*Domestic	2.594***	2.858***	2.322**	2.613***
IT*Foreign	5.084***	5.424***	3.364***	3.004**
IT*New	-1.786*	-1.946*	-1.684*	-1.894*

Productivity Returns to Disaggregated IT Investment

	OLS	FE
Non-Tech Invest.	0.149***	0.169***
R&D	0.110***	0.088*
IT Software	0.102	0.233
IT Hardware	1.052***	1.072***

Ownership-IT Investment Interactions

	OLS	FE	OLS	FE
IT Software*Domestic	5.744***	5.199***	3.827**	3.397*
IT Software*Foreign	6.598***	5.879***	6.174***	5.400***
IT Software*New	-4.471***	-3.907***	-3.135*	-2.172
IT Hardware*Domestic	2.024*	2.450**	1.891*	2.209**
IT Hardware*Foreign	5.328**	5.909**	2.985	2.084
IT Hardware*New	-1.370	-1.682	-1.422	-1.724*

Conclusions

- New private firms' productivity advantage appears to be due to higher volume of IT investment, not to monitoring or organizational capital – suggests they operate further down their IT investment demand schedule
- Privatized firms (especially to foreign owners) distinguish themselves via higher volumes and returns to IT investment – their IT investment demand schedule is shifted to the right
- Privatized firms' returns to IT hardware and software are similarly higher than those of state firms, while returns to R&D are not significantly different
  - Supports organizational capital hypothesis, less consistent with monitoring hypothesis