Outsourcing and Firm Productivity

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What do I do?

- *G*ive a theoretical framework in which outsourcing can influence productivity at the level of the firm

- *E*xplain my empirical methodologies

- *L*ook at the effect that the international outsourcing of materials has on the productivity of firms in Ireland

Definitions

- **Outsourcing**
  The contracting out of business activities to providers outside the boundaries of the firm, regardless of the provider's location.

- **Offshoring**
  The relocation of a business activity to a location beyond the border of the firm's home nation, which can occur within the boundaries of the firm(FDI) or outside (Offshore Outsourcing)

- **Offshore Outsourcing**
  The relocation of a business activity to a location beyond the border of the home nation, AND to a provider outside the boundary of the firm.

- Similar definitions given in Olsen (2006) and Amiti and Wei (2004).

Why has it occurred?

- Globalization

o Plummeting transport costs

o Plummeting trade costs

- Competitive Pressures

- Comms/IT Revolution

- Improvement in institutions and contract environment in previously "risky" countries

Theoretical Framework

- ▶ How does Outsourcing increase firm productivity:
- o **Agency Theory**: by outsourcing activities, the firm removes the risk of employees engaging in self serving behaviour and can control output and quality through an OS contract
- o **Transaction Cost Theory**: OS is preferable if the costs associated with OS (contract incompleteness, search costs etc) are outweighed by the savings from specialization.
- o **Smithian idea**: let someone else focus on more basic, mechanical processes, which they will do either more cheaply, or to a better quality (or both), and let our firm concentrate on its comparative advantage activities.
- o **Aggregate Level**: reallocation of resources, creative destruction.

Theoretical Framework (cont.)

- ▶ *How about International Outsourcing?*
- o Increased input variety/quality
- o Workers' productivity increases through access to new technologies/practices
- o In certain cases, the inputs are exceptionally cheap. (China, India etc...)
- o Provenance of Irish material imports 2001-2005: UK 47%, USA 11%, Eurozone 12%, Rest EU 16%, RofW 12%

Theoretical Framework (cont.)

- ▶ Production Function
  $$Y_{it} = A_{it}F(K_{it}, L_{it}, M_{it}, S_{it})$$

- ▶ Logs, Per Employee
  $$y_{it} - l_{it} = a_{it} + \beta_1(k_{it} - l_{it}) + \beta_2(m_{it} - l_{it}) + \beta_3(s_{it} - l_{it})$$

- ▶ Include outsourcing and other firm characteristics in this PF framework, as affecting the technology parameter.

- ○ $A_{it}(OS_{it}, X_{it})$

- ○ $a_{it} = \alpha_0 + \alpha_1 OS_{it} + \alpha_2 X_{it}$ (Specs 1-4)

- ▶ Leads to the following estimable equation (with dynamic element included):
  $$y_{it} - l_{it} = \alpha_0 + \alpha_1 OS_{it} + \alpha_2 X_{it} + \beta_1(k_{it} - l_{it}) + \beta_2(m_{it} - l_{it}) + \beta_3(s_{it} - l_{it}) + \beta_4(y_{i,t-1} - l_{i,t-1}) + \omega_i + \epsilon_{it} \ (1)$$

- ▶ ω_i is firm-specific.

- ▶ The ϵ_{it} is the stochastic error.

- ▶ Heterogeneous firms, as in Helpman, Melitz and Yeaple (2004) - expect a different effect for indigenous non-exporters, indigenous exporters, and multinational firms.

Irish Data

- CSO Census of Industrial Production
- Compulsory survey for all manufacturing firms with three or more persons engaged
- Around 5,000 manufacturing firms per year from 1991-2005

- Materials Outsourcing definition:
  Raw Materials, Materials for repairs, Materials purchased for the production of capital goods by your enterprise for your own use, Packaging, Office supplies

- Services Outsourcing definition
  work done on commission or contract, amounts paid for repairs and maintenance, etc

- The outsourcing intensity variable is calculated for both as the figure for outsourcing in Euros divided by the total wage bill

Descriptive Statistics

Table 2: International Orientation		
	Irl	For
Domestic	49.9%	10.1%
Exporter	50.1%	89.9%

Table 3: Summary Firm Characteristics			
	Dom	Ex	For
Dom Mat OS	3.181	3.1	1.436
For Mat OS	0.7815	1.5962	3.1489
Serv OS	0.177	0.143	0.1668
logprod	10.94	11.0698	11.6855
firm size	23	43	161
l	2.508	2.857	4.216
k	6.872	6.918	7.267

Who Outsources?

Category	ForOSint	
Foreign vs Irish	3.14	1.19
Export vs Domestic	1.97	0.81
Skill Intensive	1.945	1.24
Wage	1.66	1.34
Size	2.15	1.28

Table 4: Mean Foreign Outsourcing Intensity by Category

Empirical Methods

- ▶ *P*anel data. Problems with traditional panel data methods:
- o Productivity is serially correlated.
- o Possible simultaneity of input choices.
- o The Melitz (2003) idea for offshore outsourcing.

- ▶ *S*olution: Dynamic Panel Data, System GMM
- ▶ Blundell and Bond (1998)
- ▶ Essentially an IV approach.
- ▶ Deals with Fixed Effects by differencing, as in Arellano-Bond.
- ▶ Lags of levels, $x_{i,t-1}$ as instruments for transformed equations Δx_{it} (as in Arellano-Bond). Often not satisfactory on their own, particularly if variables are close to a random walk.
- ▶ Lags of differences $\Delta x_{it,t-1}$, as instruments for level equations x_{it} (new feature). Must be orthogonal to the Fixed Effects
- ▶ If there is endogeneity, $x_{i,t-1}$ will be correlated with $v_{i,t-1}$ in the term Δv_{it}. Hence starting with second lags of the levels as instruments for the differenced equations is standard treatment for endogenous variables
- ▶ If there is an AR(1) process, the second lag will be correlated with $v_{i,t-1}$. Then we have to start at 3rd lagged levels as instruments

Preliminary Results

- *Estimation of Equation (1)*
- $a_{it} = \alpha_0 + \alpha_1 OS_{it} + \alpha_2 X_{it}$

Dependent variable: log of labour productivity				
	(1)	(2)	(3)	(4)
Subsample	Full	For	Exp	Dom
L1.Logprod	.6295	.588	.4195	.3266
L2.logprod	-.0626	.0783	.04344	.11987
k	.0395	.0394	.0752	.0828
m	.2543	.2021	.3081	.2789
export	**-.00001**	**.0241**	n/a	n/a
ctry	.0628	n/a	n/a	n/a
ForMatOS	.00257	.00736	.00232	**.00205**
laglimits	3	3	3	4
A-B stat	**0.00**	.413	.154	**0.00**
Obs	47,092	6,602	15,339	15,760

- time and industry dummies included as regressors

Preliminary Results (cont.)

- *Estimation of Equation 2*
- $a_{it} = \alpha_0 + \alpha_1 FOS_{it} + \alpha_2 DOS_{it} + \alpha_3 SOS_{it} + \alpha_4 X_{it}$

Dependent variable: log of labour productivity				
	(5)	(6)	(7)	(8)
Subsample	For	Exp	Dom	Full
L1.Logprod	.599	.3189	.3783	.6202
L2.logprod	.0792	.0833	.0784	-.0466
k	.0494	.0737	.1086	.0379
m	.1999	.34	.3034	.2622
export	**.0309**	n/a	n/a	**-.013**
ctry	n/a	n/a	n/a	.049
ForMatOS	.0069	.0029	.-**.0016**	.0044
DomMatOS	**.0037**	.0055	-**.0005**	-.0018
ServOS	.0295	**-0.024**	**.0197**	.0338
laglimits	3	3	4	3
A-B stat	.543	.251	**0.00**	**0.00**
Obs	6,602	15,339	15,760	47029

Peneder (2002) Classification

- ▶ Uses statistical cluster analysis to break NACE 3 digit industries down into 5 groups:
- ○ Mainstream Manufacturing
- ○ Labour Intensive
- ○ Capital Intensive
- ○ Marketing Driven
- ○ Technology Driven

Results of HMY/Peneder breakdown

Dependent variable: log of labour productivity							
Subgroup							
HMY	Peneder	For	Dom	Ser	A-B	Hansen	Obs
Dom	Manuf	.0027	.0105	.0213	.315	.659	4,654
Dom	Labour	.0112	-.0055	.384***	.174	.893	7,135
Dom	Capital	.0072**	-.0088**	.1647**	.725	.08	481
Dom	Marketing	.0067	.0055***	-.1064***	.327	.411	6,454
Dom	Technology	.0345	.0027	.1278**	.837	.249	658
Exp	Manuf.	-.0131	-.0183	-.0237	.057	.815	5,436
Exp	Labour	.024**	-.0033	.1729**	.133	.347	5,363
Exp	Capital	.0089**	.0077	.165**	.115	.092	645
Exp	Marketing	0	-.002	.0127	.18	.245	6,247
Exp	Technology	.015[20]	−.0157[20]	.318[20]	**.031**	.288	1,402
For	Manuf.	.0243***	.0243***	.0884	**.032**	**0**	2,131
For	Labour	.007*	-.042**	.0629***	.858	1	725
For	Capital	.0069[20]	.0187	-.0189	.333	1	584
For	Marketing	.0484*	.0124[20]	.0163**	.851	.742	1,364
For	Technology	.0094***	.0133[20]	.1094[20]	.043	.565	2,151

What can we conclude?

- ▶ International outsourcing leads to productivity benefits, even in a specification controlling for all possible endogeneity and serial correlation.

- ▶ When we look in more detail, we see that international orientation matters

- ▶ At a further disaggregation, the type of industry matters. More exporting groups benefit from international outsourcing than domestic groups.

- ▶ Very few Irish owned firms gain from either domestic or international material outsourcing

- ▶ Subgroups within each firm type benefit from service outsourcing

- ▶ Policy side: Vertical linkages to FDI?