The Global Firm
Lecture 7

FDI's Impact on Domestic Firms: spillover through backward linkage

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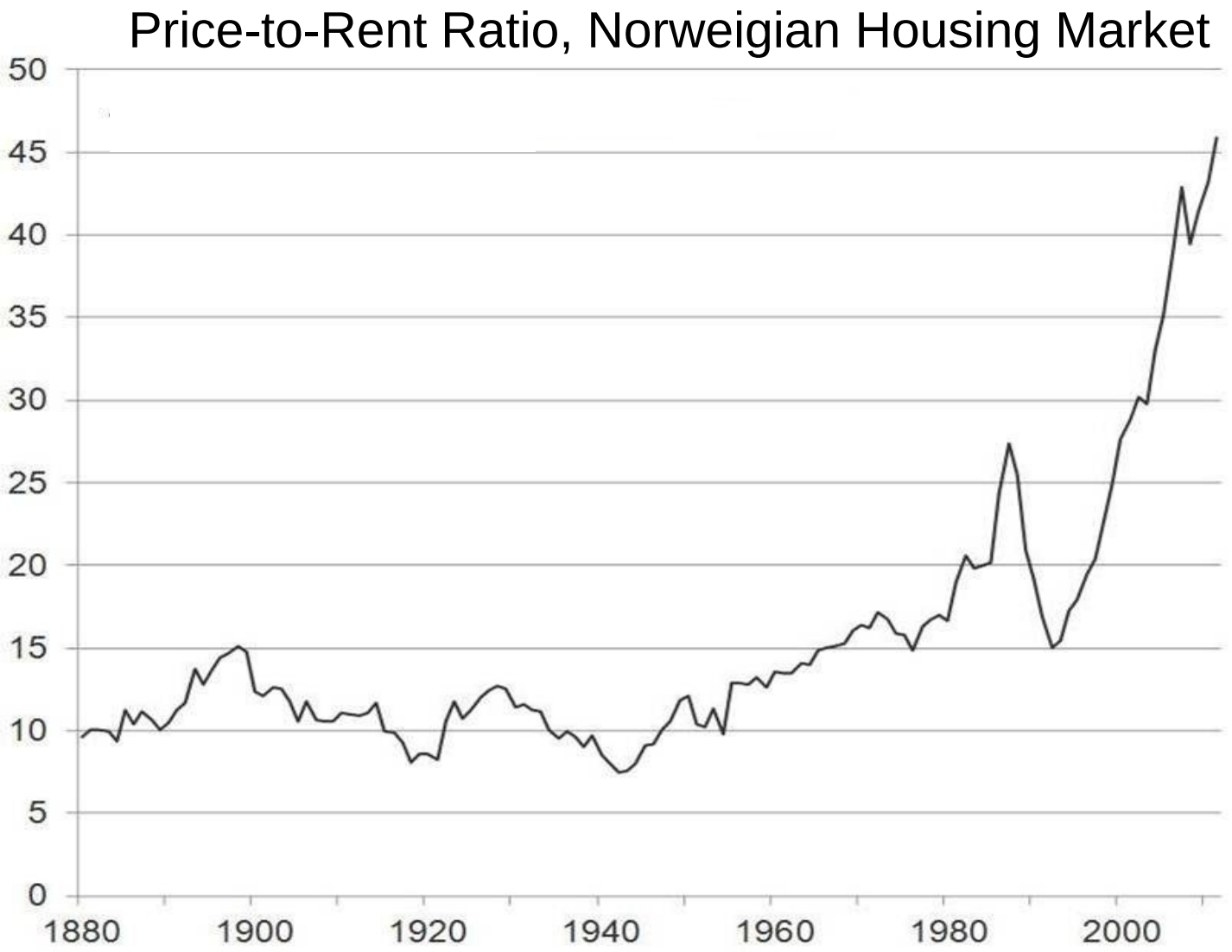
Big Picture


Price-to-Rent Ratio, Norweigian Housing Market
50
45
40
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25
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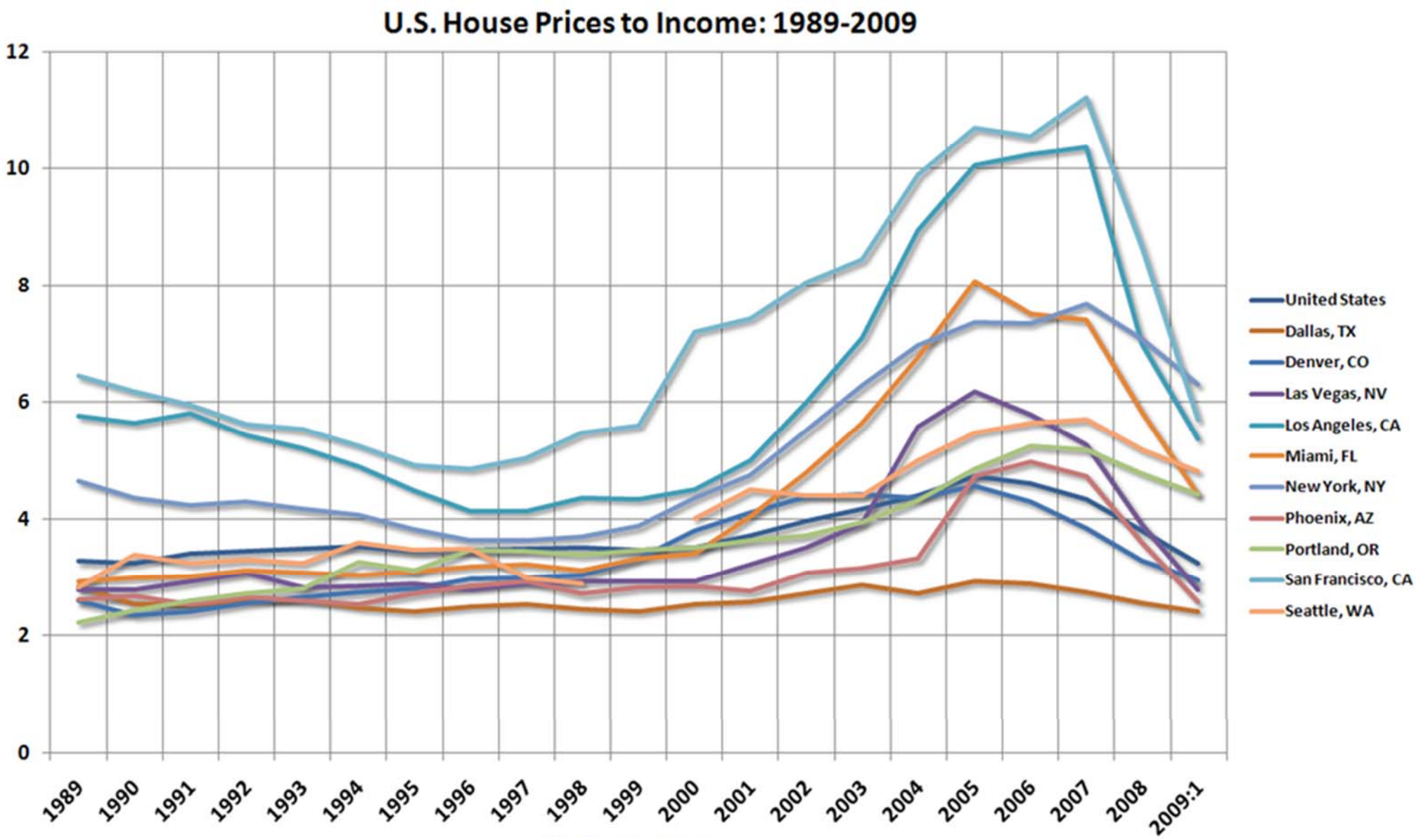
5
0
1880
1900
1920
1940
1960
1980
2000



Also check Economist's Housing Price Interactive Chart at:
http://www.economist.com/node/21009954

The Impact of FDI on Host Countries

- MNEs are the most productive firms in their home countries – why they come from
- Similarly, MNEs, most of the time, are more productive than firms in host countries…especially true when host country is a developing one
- Alos, most MNEs are skill-intensive, knowledge-intensive, and invest heavily in R&D
- Naturally, one big incentive for host country to attract FDI is because it may benefit from MNEs' presence, through their technology or knowledge spillovers, or just better management practices

The Impact of FDI on Host Countries

- The spillover effect could be **positive**, because
  - personnel (both workers and executives) trained at MNEs are more skilled, and later they may open their firms, or hop to other domestic firms
  - Technology may leak to domestic firms, through domestic firms' interactions with MNEs
  - There are other more sophiscated spillover channels, the mechanism of which economists are still trying to untangle – to be discussed later

The Impact of FDI on Host Countries

- The spillover effect can also be **neutral or even negative:**
  - MNEs' incentives to protect technology from leaking in order to maintain their lead in innovation put a brake on technology transfer
  - MNE's entry into domestic industry may out-compete domestic firms, grabbing domestic market share and forcing domestic firms to shut down or exit from the market

How spillover is related to FDI types

- Horizontal spillovers – related to horizontal FDI
  - Spillover from MNEs to domestic firms within the same industry

- Vertical spillovers – related to vertical FDI
  - Backward linkage
    - spillover from downstream firms to upstream firms
    - For example: the presence of foreign firms (customers) in the downstream may have positive effect on the domestic suppliers (in the upstream)

      → *The focus of this paper*

  - Forward linkage
    - spillover from foreign upstream firms to domestic downstream firms
    - e.g., foreign microchip producer (in the upstream) + domestic PC maker (in the downstream)

Javorcik (2004), FDI and Its Spillover Effect

- Research question:
  - Through what channel FDI increase doemstic firms' productivity?
  - How the productivity spillover is related to the extent of foreign ownership?

- Javorcik investigated FDI's spillover through the following channels or linkages:
  - Horizontal, i.e., spillover within the same industry
  - Backward, i.e., spillove from downstream industry to upstream industry
  - Forward, i.e., spillove from upstream to downstream industry

- The author argues that spillovers from FDI are more likely to be vertical than horizontal. What's the story?

Javorcik (2004), Data Description

- Lithuanian firm-level data, with the whole sample covering 85% of the country's total output
- This paper only focuses on manufacturing firms, in over 20 industries
- Unbalanced panel data from 1996 to 2000 (t=5), each year around 2,000 to 2,700 firms (after data cleaning)

A Snapshot of FDI in Lithuania

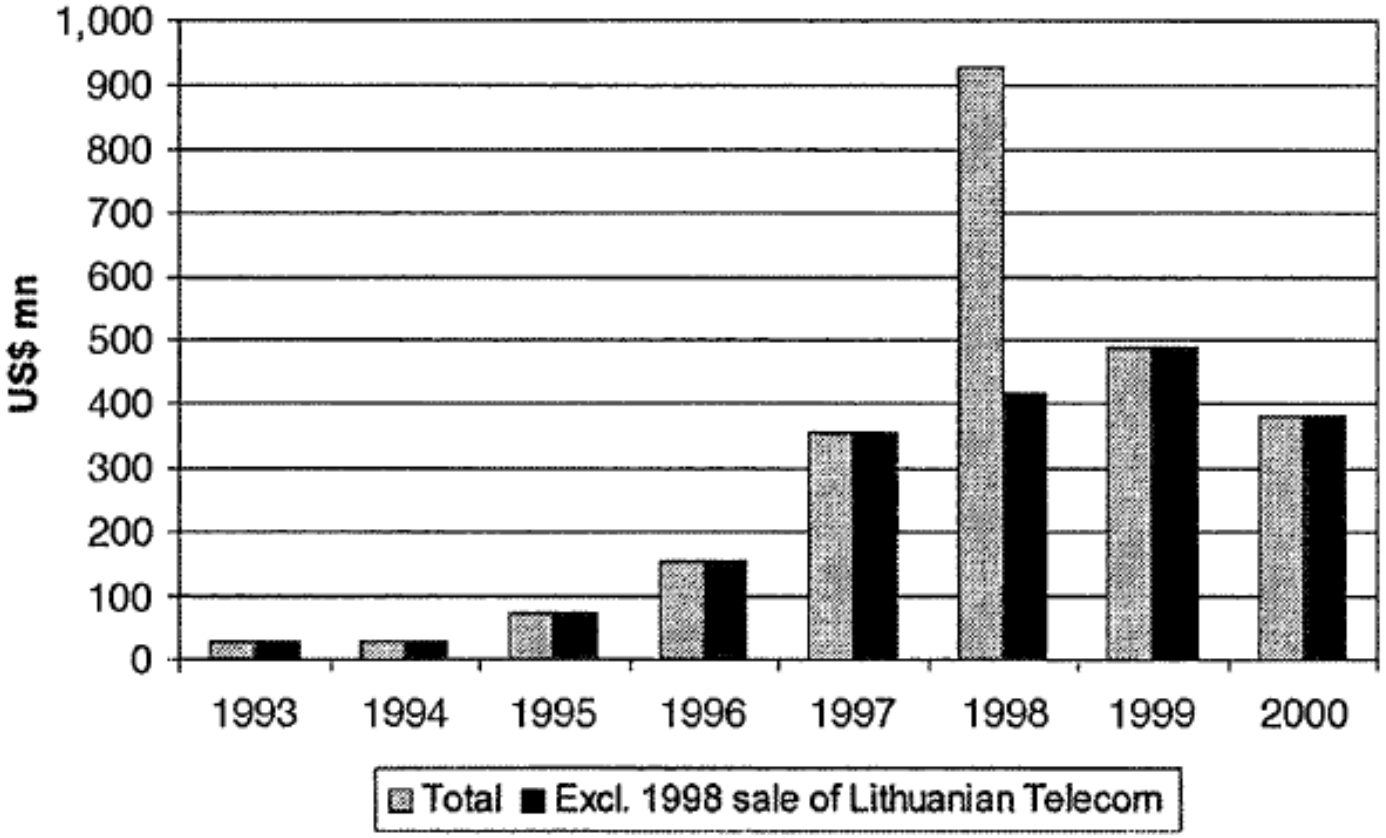


FIGURE 1. NET FDI INFLOWS INTO LITHUANIA

Javorcik (2004), Estimation Strategy

Eq. (1)

$$\ln Y_{ijrt} = \alpha + \beta_1 \ln K_{ijrt} + \beta_2 \ln L_{ijrt} + \beta_3 \ln M_{ijrt}$$
$$+ \beta_4 \, Foreign\ Share_{ijrt} + \beta_5 \, Horizontal_{jt}$$
$$+ \beta_6 \, Backward_{jt} + \beta_7 \, Forward_{jt}$$
$$+ \alpha_t + \alpha_r + \alpha_j + \varepsilon_{ijrt}.$$

time effect

regional effect

Industry effect

i: firm j: industry r: region t: year

Note that the first 4 variables are indexed at firm i level, while the rest 3 variables are indexed at industry level

Also note firm-level fixed effect is not controlled in this regression equation

How might the linkages work through?

- Horizontal linkages
  - Knowledge spillover through personnel turnover
  - Competition effect – could be either negative and positive? Mostly depends on industry structure
  - Strictly speaking, competition effect is not spillover effect

- Vertical linkages
  - Backward linkage
    - Selection effect (via higher quality standards, and better monitoring)
    - Scale of economy effect (foreign firm in downstream increases the market for domestic suppliers in upstream)
  - Forward linkage
    - Competition effect – more efficient production (cheaper inputs) for the next production stage

Javorcik (2004), Linkage Measures

Pay special attention to how she measures various linkages:

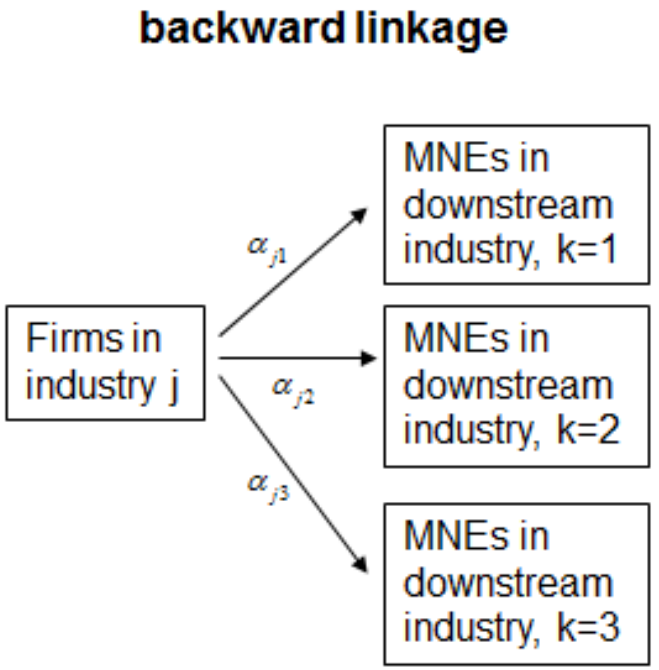
(2) $Horizontal_{jt}$

$$= \left[\sum_{i \text{ for all } i \in j} Foreign\ Share_{it} * Y_{it} \right] \Big/ \sum_{i \text{ for all } i \in j} Y_{it}.$$

(3) $$Backward_{jt} = \sum_{k \text{ if } k \neq j} \alpha_{jk}\ Horizontal_{kt}$$

α_{jk} is the proportion of sector j's output that goes into downstream industry k as intermediate inputs, $k \neq j$ (it means across industries only)

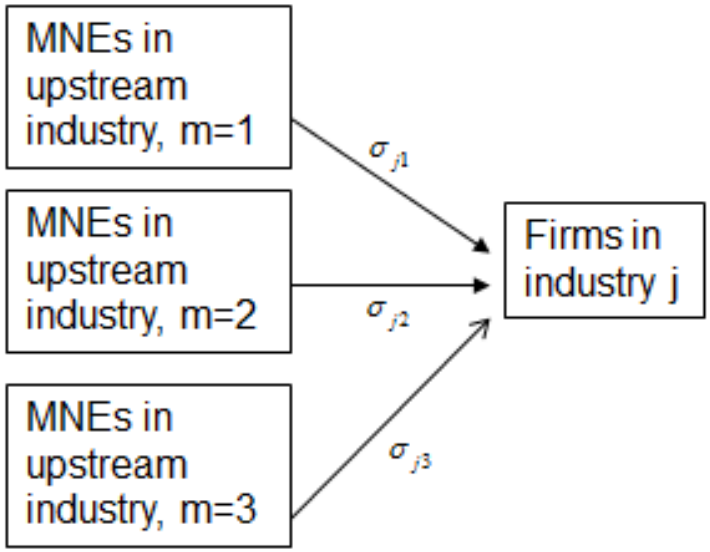
α_{jk} can be obtained from the input-output matrix, see p.612 of the paper.



Javorcik (2004), Linkage Measures

$$(4)\quad Forward_{jt} = \sum_{m \text{ if } m \neq j} \sigma_{jm} \left[\left[\sum_{i \text{ for all } i \in m} Foreign\ Share_{it} * (Y_{it} - X_{it}) \right] \Big/ \left[\sum_{i \text{ for all } i \in m} (Y_{it} - X_{it}) \right] \right]$$

forward linkage



σ_{jm} is the share of inputs purchased by industry j from industry m

X is export by MNE, and was excluded from calculation

σ_{jm} can be obtained from input-output matrix, see p.613 for details.

Spillover Linkages

TABLE 4—ADDITIONAL SUMMARY STATISTICS FOR SPILLOVER VARIABLES

		Horizontal		*Backward*		*Forward*	
Year	Number of industries	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
1996	20	11.85	12.92	3.62	3.05	3.29	2.42
1997	20	17.32	15.70	5.17	4.03	4.27	2.83
1998	20	21.95	15.58	6.02	4.59	6.16	3.14
1999	20	28.93	19.93	7.72	4.93	8.81	4.27
2000	20	31.46	19.20	8.13	5.00	13.08	6.70

Javorcik (2004), Estimation Results

TABLE 5—OLS WITH LAGGED AND CONTEMPORANEOUS SPILLOVER VARIABLES

	All firms	Domestic	All firms	Domestic
Foreign share	0.0025***		0.0025***	
	(0.0002)		(0.0003)	
Backward	0.0105**	0.0086*		
	(0.0048)	(0.0051)		
Backward lagged			0.0173***	0.0177***
			(0.0060)	(0.0066)
Forward	−0.0030	0.0001		
	(0.0024)	(0.0027)		
Forward lagged			−0.0029	−0.0007
			(0.0040)	(0.0044)
Horizontal	0.0029**	0.0040***		
	(0.0013)	(0.0014)		
Horizontal lagged			0.0038*	0.0046**
			(0.0021)	(0.0023)
Intercept	5.2323***	5.2082***	5.1599***	5.1582***
	(0.0805)	(0.0876)	(0.1007)	(0.1108)
Number of observations	11,630	10,216	8,214	7,118
R^2	0.93	0.92	0.93	0.92

Fixed Effect with Difference Estimator

$$(5)\quad \Delta \ln Y_{ijrt} = \delta_1 \Delta \ln K_{ijrt} + \delta_2 \Delta \ln L_{ijrt} + \delta_3 \Delta \ln M_{ijrt} + \delta_4 \Delta \textit{Foreign Share}_{ijrt} + \delta_5 \Delta \textit{Horizontal}_{jt} + \delta_6 \Delta \textit{Backward}_{jt} + \delta_7 \Delta \textit{Forward}_{jt} + \delta_8 \Delta H4_{jt} + \delta_9 \Delta \ln \textit{Demand}_{jt} + \alpha_t + \alpha_r + \alpha_j + \varepsilon_{ijrt}.$$

Eq (5) includes additional controls:

- H4 measures industry concentration;
- Demand controls for scale of economy effect.

Reminder:

$y_{it} = \beta_0 + \beta_1 x_{it} + \varepsilon_{it}$

$\varepsilon_{it} = a_i + \mu_{it}$, where a_i is firm (individual) fixed effect

since $cov(x_{it}, a_i) \neq 0$ so $cov(x_{it}, \varepsilon_{it}) \neq 0$

$\Rightarrow$estimator will be biased

To eliminate fixed effect, we use first differencing,

$y_{it} = \beta_0 + \beta x_{it} + a_i + \mu_{it}$

$y_{it-1} = \beta_0 + \beta x_{it-1} + a_i + \mu_{it-1}$

$\Rightarrow \triangle y_i = \beta \triangle x_i + \triangle \mu_i$

We could also use n-differencing...

Estimation Results with Fixed Effects

TABLE 7—RESULTS FROM OLS AND OLLEY-PAKES REGRESSIONS

Panel A—Regressions in First Differences

			Olley-Pakes method	
	All	Domestic	All	Domestic
Foreign share	0.0006		0.0009	
	(0.0007)		(0.0007)	
Backward	0.0382***	0.0360***	0.0407**	0.0347*
	(0.0101)	(0.0103)	(0.0163)	(0.0193)
Forward	−0.0050	−0.0073**	−0.0060	−0.0118*
	(0.0033)	(0.0034)	(0.0055)	(0.0063)
Horizontal	−0.0003	−0.0006	−0.0019	−0.0022
	(0.0013)	(0.0013)	(0.0025)	(0.0024)
H4	0.0000	0.0000	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Demand	0.6103***	0.6752***	0.3699	0.5341*
	(0.1945)	(0.1929)	(0.2934)	(0.2806)
Number of observations	6,853	5,916	3,765	3,084
R^2	0.49	0.49	0.08	0.08

Note: 2nd and 4th difference regressions show backward linkage is most robust, refer to p. 620 for details.

Foreign Ownership and Backward Linkage

TABLE 8—SHARE OF FOREIGN OWNERSHIP AND PRODUCTIVITY SPILLOVERS

	Regressions in first differences			
			Olley-Pakes Method	
	All	Domestic	All	Domestic
Foreign share	0.0006		0.0010	
	(0.0007)		(0.0007)	
Backward (Partial Ownership)	0.0444***	0.0394***	0.0499***	0.0401**
	(0.0085)	(0.0096)	(0.0146)	(0.0190)
Backward (Full Ownership)	0.0040	0.0154	0.0020	0.0090
	(0.0110)	(0.0133)	(0.0171)	(0.0223)
Forward	−0.0053*	−0.0074**	−0.0066	−0.0121*
	(0.0030)	(0.0032)	(0.0053)	(0.0062)
Horizontal	−0.0009	−0.0009	−0.0025	−0.0026
	(0.0012)	(0.0012)	(0.0024)	(0.0023)
H4	0.0000	0.0000	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Demand	0.6181***	0.6817***	0.3794	0.5427**
	(0.1778)	(0.1825)	(0.2810)	(0.2698)
Number of observations	6,853	5,916	3,765	3,084
R^2	0.49	0.49	0.08	0.08
F-stat ($BKFO = BKPO$)	12.01	2.91	6.41	1.68
Prob $F > 0$	0.00	0.09	0.01	0.20

Summary of Main Findings

- *Backward linkage* is the main spillover channel, and the result is quite robust to various specifications
- Evidence for *forward and horizontal linkages* is not as robust as backward linkage
- Backward linkage seems to work best when foreign and local firms partner together , i.e., through joint ventures
  - What's story?
  - This has important policy implication for host countries
  - For further discussion on the matter, refer to Javorcik and Spatareanu (JDE 2008)

Some Further Thoughts

- The specific mechanisms through which backward linkage operates are still not very clear
- This paper offered a test, but it could be explained by many plausible stories
- Does backward linkage operate through a *selection effect* by MNEs?
  - Higher quaility control?
  - Picking more productive suppliers?
  - Competition among suppliers (in winning MNE's contract) lead to more efficient production?
- Economists are still trying to figure out…much depends on data availability

Next Time…

- Our last class; After that, Niels will take over.
- Read Harrison (AER 1999), ”Do Domestic Firms Benefit from FDI.”
- Our last group presentation
- One note for term paper: I’ll stay around until April 10, then I’ll be off for paternity leave. You’re encouraged to talk to me about your term paper before the date; After that, I can only be reached by email.