Griliches Lecture 2: Firm Heterogeneity (continued)

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May 2009

Helpman, Melitz, and Rubinstein

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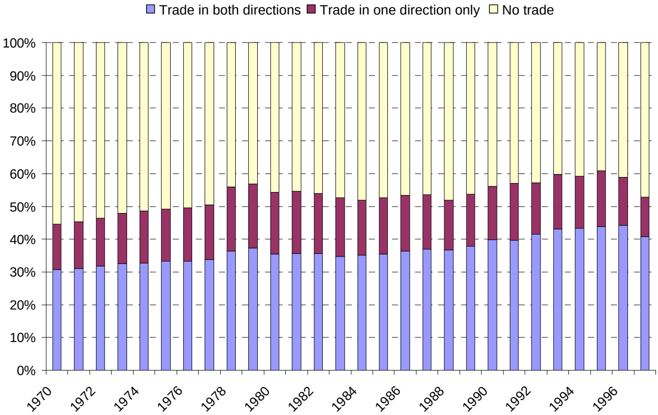

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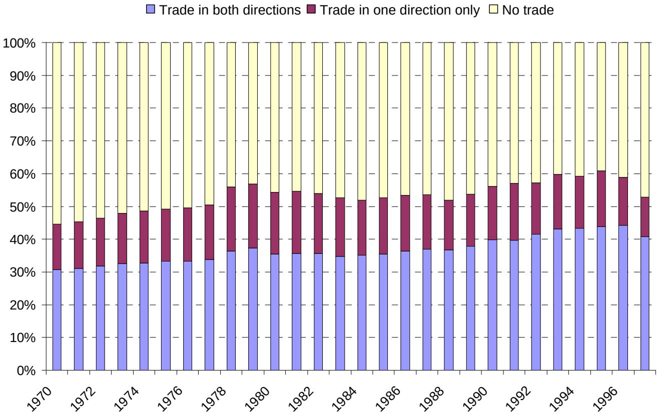

- Standard estimates of the gravity equation discard the zero trade flows; HMR argue that zeros contain useful information.

HMR: Theory

- Let $a = 1/\varphi$ be a measure of a bundle of inputs per unit output; the inverse of productivity. Then

$$\pi_{ij}(a) = (1-\alpha)\left(\frac{\tau_{ij} c_j a}{\alpha P_i}\right)^{1-\varepsilon} Y_i - c_j f_{ij} \ .$$

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- If $a_{ij} > a_L$, then some firms export from j to i.
- But if $a_{ij} < a_L$, then no firm exports from j to i.

Gravity

- Suppose there are N_j firms in j. Then total exports from j to i are $M_{ij} = \left(\frac{c_j \tau_{ij}}{\alpha P_i}\right)^{1-\varepsilon} Y_i N_j V_{ij}$, where $V_{ij} = \max \left\{ \int_{a_L}^{a_{ij}} a^{1-\varepsilon} dG(a) \ , \ 0 \right\}$.

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- If we also impose $Y_j = \sum_i M_{ij}$, then

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- This is a gravity equation that generalizes the Anderson van Wincoop (2003) equation.
    - Note potential asymmetries: by allowing τ_{ij} or V_{ij} to be asymmetric $(V_{ij} \neq V_{ji})$, one can get unbalanced bilateral trade and zero trade flows, which are features of the data.

Estimation

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- Then taking logs, we can express (1) as follows:

$$m_{ij} = \beta_0 + \lambda_j + \chi_i - \gamma d_{ij} + w_{ij} + u_{ij} \tag{2}$$

for $M_{ij} > 0$, where lower case variables are logs of the capitalized ones, and χ_i and λ_i are (potentially asymmetric) importer and exporter fixed effects.

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- Traditional estimates neglect the term w_{ij}, which is unobservable. This creates omitted-variable bias, which typically leads to an overestimate of γ, as well as a sample selection bias, because, although $E\left[u_{ij}\right] = 0$, we have $E\left[u_{ij} \mid M_{ij} > 0\right] \neq 0$.

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  - the bias stemming from firm-level heterogeneity is more important than the Heckman selection bias;
  - there are large differences in w_{ij} (a factor of 3) and the estimates help explaining bilateral trade imbalances.

Benchmark Estimates

	1986 Reduced Sample					
		m_{ij}				
	(Probit)				Indicator Variables	
Variables	T_{ij}	Benchmark	NLS	Polynomial	50 Bins	100 Bins
Distance	-0.213**	-1.167**	-0.813**	-0.847**	-0.755**	-0.789**
	(0.016)	(0.040)	(0.049)	(0.052)	(0.070)	(0.088)
Land border	-0.087	0.627**	0.871**	0.845**	0.892**	0.863**
	(0.072)	(0.165)	(0.170)	(0.166)	(0.170)	(0.170)
Island	-0.173*	-0.553*	-0.203	-0.218	-0.161	-0.197
	(0.078)	(0.269)	(0.290)	(0.258)	(0.259)	(0.258)
Landlock	-0.053	-0.432*	-0.347*	-0.362+	-0.352+	-0.353+
	(0.050)	(0.189)	(0.175)	(0.187)	(0.187)	(0.187)
Legal	0.049**	0.535**	0.431**	0.434**	0.407**	0.418**
	(0.019)	(0.064)	(0.065)	(0.064)	(0.065)	(0.065)
Language	0.101**	0.147+	-0.030	-0.017	-0.061	-0.036
	(0.021)	(0.075)	(0.087)	(0.077)	(0.079)	(0.083)
Colonial Ties	-0.009	0.909**	0.847**	0.848**	0.853**	0.838**
	(0.130)	(0.158)	(0.257)	(0.148)	(0.152)	(0.153)
Currency Union	0.216**	1.534**	1.077**	1.150**	1.045**	1.107**
	(0.038)	(0.334)	(0.360)	(0.333)	(0.337)	(0.346)
FTA	0.343**	0.976**	0.124	0.241	-0.141	0.065
	(0.009)	(0.247)	(0.227)	(0.197)	(0.250)	(0.348)
Religion	0.141**	0.281*	0.120	0.139	0.073	0.100
	(0.034)	(0.120)	(0.136)	(0.120)	(0.124)	(0.128)
Regulation Costs	-0.108**	-0.146				
	(0.036)	(0.100)				
R. Costs (Days & Proc.)	-0.061*	-0.216+				
	(0.031)	(0.124)				
δ (from $\hat{\bar{w}}_{ij}^*$)			0.840**			
			(0.043)			
$\hat{\bar{\eta}}_{ij}^*$			0.240*	0.882**		
			(0.099)	(0.209)		
$\hat{\bar{z}}_{ij}^*$				3.261**		
				(0.540)		
$\hat{\bar{z}}_{ij}^{*2}$				-0.712**		
				(0.170)		
$\hat{\bar{z}}_{ij}^{*3}$				0.060**		
				(0.017)		
Observations	12,198	6,602	6,602	6,602	6,602	6,602
R-Squared	0.573	0.693		0.701	0.704	0.706

Notes:
Exporter and Importer fixed effects
Marginal effects at sample means and pseudo R-squared reported for Probit
Regulation costs are exlcuded variables in all second stage specifications
Bootstrapped standard errors for NLS; Robust standard errors (clustering by country pair) elsewhere
+ significant at 10%; * significant at 5%; ** significant at 1%

Decomposing the Bias

	1986 Full Sample			
Variables	Benchmark	NLS	Firm Heterogeneity	Heckman Selection
Distance	-1.176**	-0.798**	-0.769**	-1.214**
	(0.031)	(0.039)	(0.038)	(0.031)
Land border	0.458**	0.834**	0.855**	0.436**
	(0.147)	(0.132)	(0.142)	(0.149)
Island	-0.391**	-0.169	-0.164	-0.425**
	(0.121)	(0.120)	(0.118)	(0.120)
Landlock	-0.561**	-0.447**	-0.433*	-0.565**
	(0.188)	(0.172)	(0.187)	(0.187)
Legal	0.486**	0.387**	0.381**	0.488**
	(0.050)	(0.048)	(0.049)	(0.050)
Language	0.176**	0.023	0.023	0.223**
	(0.061)	(0.062)	(0.060)	(0.061)
Colonial Ties	1.299**	1.001**	0.979**	1.311**
	(0.120)	(0.204)	(0.119)	(0.123)
Currency Union	1.364**	1.023**	0.996**	1.391**
	(0.255)	(0.273)	(0.260)	(0.257)
FTA	0.759**	0.380*	0.314+	0.737**
	(0.222)	(0.182)	(0.168)	(0.235)
Religion	0.102			
	(0.096)			
δ (from $\hat{\bar{w}}^*_{ij}$)		0.871**		
		(0.028)		
$\hat{\bar{\eta}}^*_{ij}$		0.372**		0.265**
		(0.069)		(0.070)
$\hat{\bar{z}}^*_{ij}$			0.892**	
			(0.051)	
Observations	11,146	11,146	11,146	11,146
R-Squared	0.709		0.716	0.710

Notes:
m_{ij} is dependent variable throughout
Exporter and Importer fixed effects
Religion is exlcuded variable in all second stage specifications
Bootstrapped standard errors for NLS; Robust standard errors (clustering by country pa
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  4. High levels of product differentiation and advertising.
  5. Large size/productivity and large size/productivity dispersion (at industry level).

Horizontal FDI: Proximity-Concentration Tradeoff

Markusen (1984), Brainard (1997).

- Consider a sector that produces differentiated products, yielding the demand function:

$$x^k(v) = A^k p(v)^{-\varepsilon}, \quad k = H, F \tag{3}$$

for variety v. Let the wage rate be $w^k = 1$ (there are no other inputs).

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- Exported goods subject to iceberg *transport costs* $\tau > 1$.

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- But the demand level B^ℓ is an endogenous variable, which requires to solve for industry equilibrium (see Brainard, 1997).

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- Brainard's data is from 1989 and she can exploit both the cross-industry and the cross-country variation.
- Her results lend support to the proximity-concentration tradeoff and she finds little impact of factor endowments.

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- Goods that are exported are subjected to iceberg costs $\tau^{ij} > 1$.

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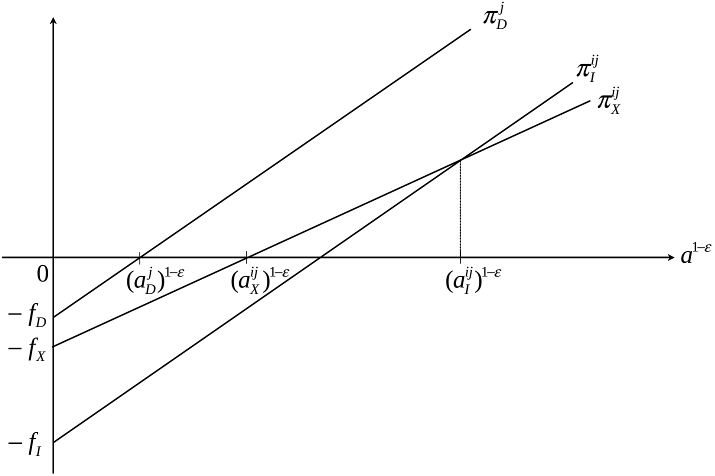
HMY (2004): Sorting into Exporting and FDI

Profit levels are depicted in the figure for the case in which $B^i = B^j$.



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- HMY discuss comparative statics that hold regardless of a particular choice of a functional form for $G(a)$. In particular, they show that s_X^{ij}/s_I^{ij} is increasing in f_I and decreasing in f_X and τ, which is a reformulation of the proximity-concentration hypothesis.

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  - decreasing in productivity dispersion, as parametrized by (the inverse of) k.
- The third point is new. One should expect more FDI relative to exports in industries with a more dispersed distribution of sales.

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  - This measure is computed for both U.S. and European firms using data from the U.S. Census of Manufactures and the Amadeus database.
- In order to control for omitted industry characteristics, they include measures of capital intensity and R&D intensity.

Results

TABLE 1—PRODUCTIVITY ADVANTAGE OF MULTINATIONALS AND EXPORTERS

Multinational	0.537
	(14.432)
Nonmultinational exporter	0.388
	(9.535)
Coefficient difference	0.150
	(3.694)
Number of firms	3,202

Notes: T-statistics are in parentheses (calculated on the basis of White standard errors). Coefficients for capital intensity controls and industry effects are suppressed.

Results (continued)

TABLE 4—"BETA" COEFFICIENTS: NARROW SAMPLE WITH CONTROLS

	Mean	Standard deviation	"Beta" coefficient
Dependent variable	−0.595	2.375	
FREIGHT	1.863	0.653	−0.271
TARIFF	2.015	1.020	−0.205
FP	3.321	0.785	0.325
U.S. s.d.	1.749	0.316	−0.312
Europe s.d.	1.198	0.276	−0.250
France s.d.	1.224	0.375	−0.325
Europe reg.	1.260	0.333	−0.210
France reg.	1.257	0.336	−0.211