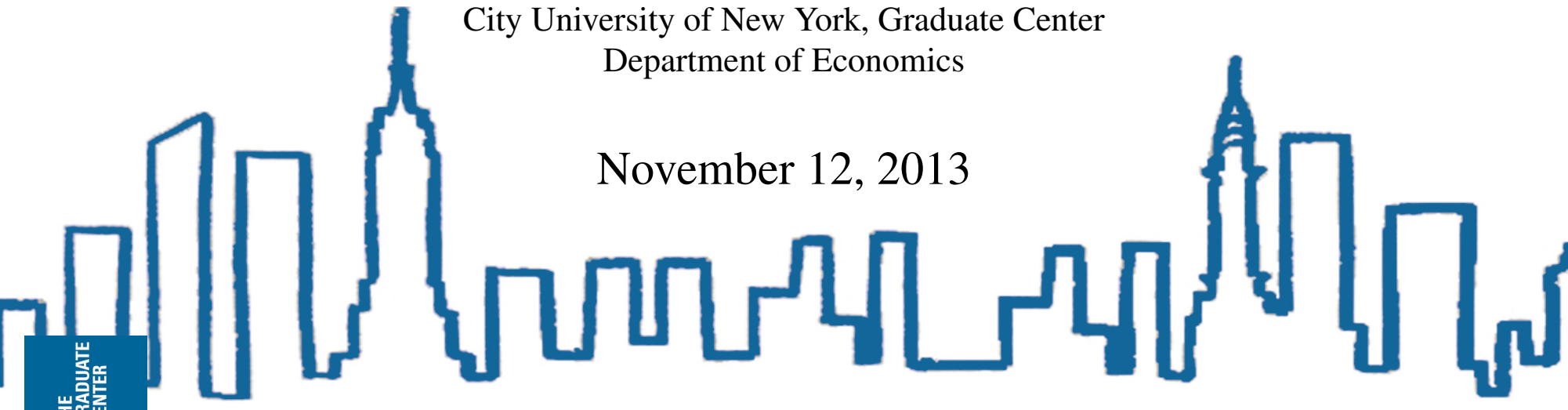
Friederike Niepmann (2013) "Banking across Borders with Heterogeneous Banks"

Econ86100 Presentation

Thomas Hauner & Paloma Lopez de Mesa

City University of New York, Graduate Center
Department of Economics

November 12, 2013



Introduction

- Differences in extensive and intensive margins of heterogeneous banks explained by general equilibrium model of bilateral trade
- Heterogeneity of banks based on Ricardian technology differences (i.e. banking efficiency)
- Factor endowment differences, as in Hecksher-Ohlin
- Banks face fixed and variable ("iceberg") costs to operate abroad, similar to Melitz
- Unlike Melitz, banks provide homogeneous *services* across borders, not heterogeneous goods
- Paper contributes to service trade literature in addition to general trade and investment literature on heterogeneous firms
- Unlike literature, banking across borders driven by Ricardian and Hecksher-Ohlin differences, not portfolio theory

Setup

- Continuum of capitalists K (bankers or depositors) and laborers L
- Capitalists endowed with 1 unit of capital, laborers provide inelastic labor supply ($l = 1$)
- Continuum of entrepreneurs N run perfectively competitive firms, producing single consumption good with production function $F(l, z)$, where z fixed and normalized to 1 in equilibrium
- Assume two periods:
  1. In the first, capitalists draw banking efficiency type γ from continuous distribution $g(\gamma)$ and investments are made
  2. In the second, firms produce and capitalists and laborers consume

Autarky

- $R = (1 + F_z(l, z)) = (1 + F_K(1, \frac{K}{L}))$, where $F_K(1, \frac{K}{L}) = MPK$
- Capitalists randomly draw type $\gamma \in [\underline{\gamma}, \overline{\gamma}]$ and choose to become Banker or Depositor (efficiency decreasing in γ)
- Depositors invest endowment with Bankers, earn R^D
- Bankers:
  - (a) Allocate capital from Depositors to firms
  - (b) Monitor firms at cost γ and earn R. Monitoring induces firms to exert effort and succeed with Pr. λ, instead of shirking and succeeding with Pr. λ_L where $\lambda_L R < 1 < \lambda R$
- Banker type γ observed by Depositors, and Banker must invest equity v in firms it lends to and must therefore monitor

Autarky

Cont...

- Banker Monitoring Participation Constraint:

$$\lambda Rz - \lambda R^D(z-v) - \gamma z \geq \lambda_L Rz - \lambda_L R^D(z-v) \tag{1}$$

Assume: a) free entry into Banking and b) market for financial intermediation clears

- Marginal capitalist indifferent between Banking and Depositing:

$$\pi(\gamma^*) = \frac{1}{1 - \frac{R}{R^D} + \frac{\gamma^*}{(\lambda-\lambda_L)R^D}} \frac{\gamma^* \lambda_L}{\lambda - \lambda_L} = \lambda R^D \tag{6}$$

- Market clearing condition:

$$K \int_{\underline{\gamma}}^{\gamma^*} n(\gamma) g(\gamma) d\gamma = K \tag{7}$$

Autarky Equilibrium

- We solve the system of two equations, (6) & (7), for two unknowns $\{R^D, \gamma^*\}$

$$R^D = R - \frac{\gamma^*}{\lambda} = (1 + F_K(1, \frac{K}{L})) - \frac{\gamma^*}{\lambda} \tag{8}$$

$$1 = \int_{\underline{\gamma}}^{\gamma^*} \frac{(R - \frac{\gamma^*}{\lambda})(\lambda - \lambda_L)}{\gamma - (\lambda - \lambda_L)\frac{\gamma^*}{\lambda}} g(\gamma) d\gamma \tag{9}$$

- γ^* represents **aggregate banking sector efficiency**
- As γ^* decreases, fewer banks are needed to intermediate capital
- *Ceteris paribus*, the banking cutoff, γ^*, increases in $\underline{\gamma}$

Open Economy

- Two countries $j \in \{1, 2\}$ differ by:
  (a) Factor endowments
  (b) γ^*, banking sector efficiency
  (c) Note: R, R^D may vary across as well
- Assume: depositors, workers, entrepreneurs are immobile
- Bankers choose between raising deposits (lending) at home and/or abroad
- **Fixed costs** of operating in foreign country:
  (a) $f_{ij}^F > f_{ij}^B > f_{ij}^L > 0$ (from j to i), where F is FDI, B is borrowing, L is lending.
- **Variable costs** of operating in foreign country ("iceberg" costs):
  (a) τR_i where $\tau < 1$
  (b) ϕR_i^D where $\phi > 1$
- Banks who open affiliate abroad (FDI) have $\tau = \phi = 1$

Open Economy

Bank Profits

- Cross-Border Lending Bank j, gets deposits from j, lends in i:

$$\pi_{ij}^{X,j}(\gamma_j) = n(\gamma_j, \tau R_i, R_j^D)\frac{\gamma_j \lambda_L}{\lambda - \lambda_L} - f_{ij}^L = \frac{1}{1 + \frac{1}{R_j^D}(\frac{\gamma}{\lambda - \lambda_L} - \tau R_i)}(\frac{\gamma_j \lambda_L}{\lambda - \lambda_L}) - f_{ij}^L$$

- Cross-Border Borrowing Bank j, gets deposits from i, lends in j:

$$\pi_{ji}^{X,j}(\gamma_j) = n(\gamma_j, R_j, \phi R_i^D)\frac{\gamma_j \lambda_L}{\lambda - \lambda_L} - f_{ij}^B = \frac{1}{1 + \frac{1}{\phi R_i^D}(\frac{\gamma}{\lambda - \lambda_L} - R_j)}(\frac{\gamma_j \lambda_L}{\lambda - \lambda_L}) - f_{ij}^B$$

- Local Intermediation Bank j, gets deposits and lends abroad (in i)
- Note: $n(\gamma)$ is number of firms Bank monitors (or total amount of intermediated capital)

Open Economy

- There exist 7 possible Bank operations:

$$\{\pi_{jj}^{j}, \pi_{ij}^{X,j}, \pi_{ii}^{X,j}, \pi_{ji}^{X,j}, \pi_{ij}^{F,j}, \pi_{ii}^{F,j}, \pi_{ji}^{F,j}\}$$

- If Banks operate abroad, **capital flows** across border are:

$$K_{ij} = K_{ij}^{i} + K_{ij}^{j}$$

- Therefore R_i changes to $R_i = 1 + F_K(1, \frac{K_i + K_{ij}}{L_i})$
- **Bank Sorting**: by type γ_j
  - (a) $\gamma_j < \gamma_j^F < \gamma_j^B < \gamma_j^L < \gamma_j^*$ (cutoffs between operations)
  - (b) As γ_j decreases, **extensive and intensive margins increase** because Banks more willing to pay f_{ij}

Open Economy Equilibrium

Defined by $\{\gamma_j^*, \gamma_j^L, \gamma_j^B, \gamma_j^F, R_j^D, R_j\} \forall i \in \{1,2\}, j \in \{1,2\}$, with optimality and market clearing conditions holding.

- Paper examines one equilibrium case in which Banks in j invest domestic capital abroad (i), and Banks in i raise capital from abroad (j) for investment at home
- Assume: factor endowments such that $\gamma_i^* < \gamma_j^*$ given $\underline{\gamma_i} < \underline{\gamma_j}$ (therefore $R_i^D > R_j^D$)
- Equilibrium sorting:

	country j	country i
Domestic Banks	$\gamma_j^L < \gamma_j \leq \gamma_j^*$	$\gamma_i^B < \gamma_i \leq \gamma_i^*$
Cross-Border	$\gamma_j^F < \gamma_j \leq \gamma_j^L$	$\gamma_i^F < \gamma_i \leq \gamma_i^B$
FDI	$\underline{\gamma_j} < \gamma_j \leq \gamma_j^F$	$\underline{\gamma_i} < \gamma_i \leq \gamma_i^F$

Open Economy Equilibrium

Cont...

- Capital Market clearing in j:

$$K_j - K_{ij}^i = K_j \underbrace{\int_{\underline{\gamma_j}}^{\gamma_j^F} n(\gamma_j, R_i, R_j^D) g_j(\gamma_j) d\gamma_j}_{\text{FDI Banks in } j} + K_j \underbrace{\int_{\gamma_j^F}^{\gamma_j^L} n(\gamma_j, \tau R_i, R_j^D) g_j(\gamma_j) d\gamma_j}_{\text{X-lending only Banks in } j}$$

$$+ K_j \underbrace{\int_{\gamma_j^L}^{\gamma_j^*} n(\gamma_j, R_j, R_j^D) g_j(\gamma_j) d\gamma_j}_{\text{Domestic Banks in } j} \qquad (21)$$

Open Economy Equilibrium

Profits by Type Cutoff

- Free entry: $$\pi_{kk}^{k}(\gamma_k^*) = \lambda R_k^D \quad \forall k \in \{1,2\} \tag{22}$$
- Lending cutoff j: $$\pi_{ij}^{L,j}(\gamma_j^L) = \pi_{jj}^{j}(\gamma_j^L) \text{ if } \gamma_j^L > \underline{\gamma_j} \tag{23}$$
- Borrowing cutoff i: $$\pi_{ij}^{B,i}(\gamma_i^B) = \pi_{ii}^{i}(\gamma_i^B) \text{ if } \gamma_i^B > \underline{\gamma_i} \tag{24}$$
- FDI cutoff j: $$\pi_{ij}^{F,j}(\gamma_j^F) = \pi_{jj}^{L,j}(\gamma_j^F) \text{ if } \gamma_j^F > \underline{\gamma_j} \tag{25}$$
- FDI cutoff i: $$\pi_{ij}^{F,i}(\gamma_i^F) = \pi_{ii}^{B,i}(\gamma_i^F) \text{ if } \gamma_i^F > \underline{\gamma_i} \tag{26}$$
- Equilibrium solves system of 12 equations for 12 unknowns $\{\gamma_j^*, \gamma_j^L, \gamma_j^B, \gamma_j^F, R_j^D, R_j\}$ (for both countries)

Open Economy vs. Autarky

Simulation

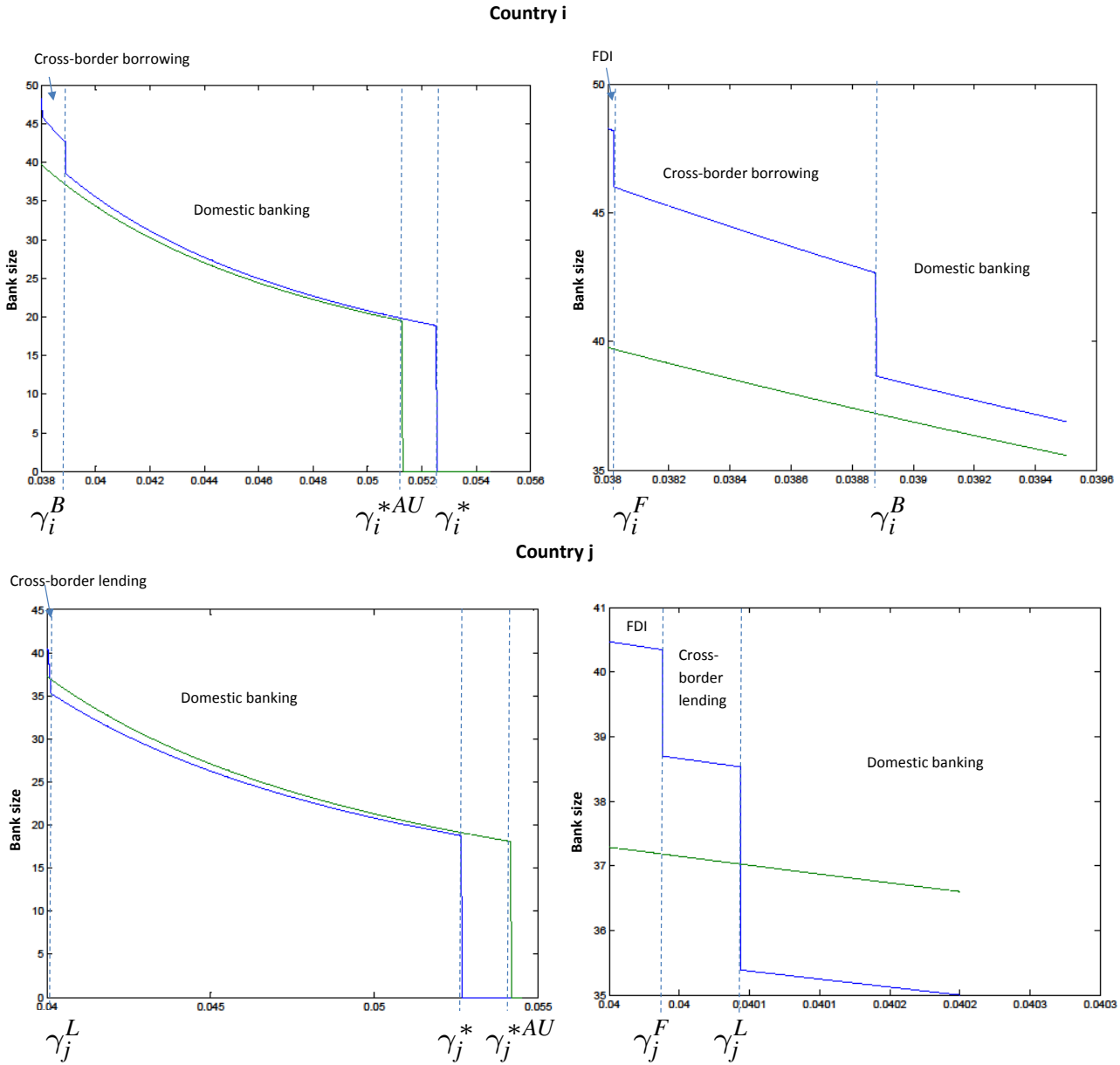
Solution

Endogeneous parameters	Autarky value	Equilibrium value
Entry cutoff γ_j^*	0.054175	0.052671
Cross-border lending cutoff γ_j^L	-	0.04009
FDI cutoff γ_j^F	-	0.040038
Entry cutoff γ_i^*	0.051288	0.052543
Cross-border borrowing cutoff γ_i^B	-	0.038877
FDI cutoff γ_i^F	-	0.0380189
Capital flow through banks in j K_{ij}^j	0	0.2050368
Capital flow through banks in i K_{ij}^i	0	2.099895
Gross return to capital R_j	1.0795	1.0866183
Gross return to capital R_i	1.09724	1.0900913
Deposit rate R_j^D	1.0245	1.033145
Deposit rate R_i^D	1.04517	1.036748

Under trade liberalization:

- γ_j^* decreases, and γ_i^* increases
- R_i^D decreases since γ_i^* increased, therefore most efficient Banks grow in size
- $K_{ij}^i \gg K_{ij}^j$ and thus distribution of banks more unequal

Open Economy vs. Autarky: Fig.1



Comparative Statics:

Effect of Host Country (i) Characteristics on Cross-Border Lending Cutoff γ_j^L

- increasing in $\underline{\gamma_i}$
- decreasing in capital abundance of host country i ($\frac{K_i}{L_i} \uparrow$)
- increasing in transport costs (τ)
- decreasing in fixed costs of cross-border lending (f_{ij}^L) and increasing in fixed costs of FDI (f_{ij}^F)

Comparative Statics

Effect of Host Country (j) Characteristics on Cross-Border Borrowing Cutoff γ_i^B

- increasing in $\underline{\gamma_j}$
- increasing in capital abundance of host country j ($\frac{K_j}{L_j} \uparrow$)
- decreasing in transport costs (ϕ)
- decreasing in fixed costs of cross-border borrowing (f_{ji}^B) and increasing in fixed costs of FDI (f_{ji}^F)

Comparative Statics

Effect of Host Country Characteristics on FDI Cutoff γ_i^F (γ_j^F)

- increasing in $\underline{\gamma_i}$ ($\underline{\gamma_j}$)
- ambiguous in relative factor endowment changes because both lending and borrowing are operations of FDI (thus R and R^D are both affected)
- decreasing in transport costs τ (increasing in ϕ)
- increasing in fixed costs of cross-border lending f_{ij}^L (cross-border borrowing f_{ji}^B)
- increasing in fixed costs of FDI f_{ij}^F (f_{ji}^F)

Empirical Evidence from German Banks

- Correlations of three proxy variables for Bank efficiency

	$\log(\text{overhead costs}_k)$	$\log(\text{size}_k)$	$\log(\text{labor productivity}_k)$
$\log(\text{overhead costs}_k)$	1.0000		
$\log(\text{size}_k)$	-0.5476	1.0000	
$\log(\text{labor productivity}_k)$	-0.9264	0.5344	1.0000

- Effect of size and efficiency on extensive and intensive margins

	Extensive Margin: Logit Model			Intensive Margin: OLS			
	cr. assets (1)	cr. liabilities (2)	FDI (3)	cr. assets (4)	local assets (5)	cr. liabilities (6)	local liabilities (7)
$\log(\text{size}_k)$	1.023***	1.147***	1.277***	0.794***	0.443***	0.869***	0.877***
	(0.0275)	(0.0315)	(0.130)	(0.0395)	(0.136)	(0.0331)	(0.195)
Observations	342,130	344,074	112,056	36598	258	60623	248
(Pseudo) R^2	0.570	0.494	0.667	0.447	0.603	0.392	0.568
$\log(\text{overhead costs}_k)$	-0.807***	-0.850***	-0.922***	-1.682***	-0.386	-1.347***	0.00515
	(0.135)	(0.126)	(0.253)	(0.232)	(0.390)	(0.232)	(0.889)
Observations	337,705	339,624	110,606	35758	251	59259	241
(Pseudo) R^2	0.483	0.375	0.458	0.408	0.571	0.271	0.476

Clustered standard errors in parentheses.
Regressions include country-fixed effects and dummies for bank type.
*** p<0.01, ** p<0.05, * p<0.1.

Empirical Evidence from German Banks

Effects of host country characteristics on cross-border lending cutoff

	log(max overhead) (1)	log(min size) (2)	log(min lab. prod.) (3)	log(# banks) (4)
log(return to capital$_i$)	0.0154	0.239	0.0501	-0.236
	(0.120)	(0.161)	(0.105)	(0.143)
log(overhead costs$_i$)	0.190**	-0.484***	-0.319***	0.325***
	(0.0846)	(0.116)	(0.0819)	(0.101)
log(distance$_{ij}$)	-0.262***	0.285***	0.248***	-0.376***
	(0.0749)	(0.0907)	(0.0813)	(0.0678)
financial freedom$_i$	0.00625**	-0.00450	-0.00758***	0.00788**
	(0.00296)	(0.00420)	(0.00264)	(0.00305)
bureaucratic quality$_i$	0.150**	-0.470***	-0.168***	0.377***
	(0.0686)	(0.118)	(0.0592)	(0.0839)
log(GDP$_i$)	0.208***	-0.244***	-0.181***	0.412***
	(0.0444)	(0.0617)	(0.0435)	(0.0437)
log(GDP per capita$_i$)	-0.0465	0.135	0.0287	-0.130
	(0.0950)	(0.149)	(0.0824)	(0.122)
Constant	1.924	15.62***	9.810***	-3.604***
	(1.222)	(1.621)	(1.201)	(1.167)
Observations	86	86	86	86
R^2	0.651	0.724	0.695	0.869

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.