Towards a Theory of Global Bank Risk Taking and Competition

Ester Faia* and Gianmarco Ottaviano**

*Goethe University Frankfurt, CEPR and CFS,
**London School of Economics and CEPR

MACFINROBODS conference, Paris 15-16 June 2015

Motivation

- Banks' decision to globalize: benefits of competition versus costs of risk taking
- Local competition in retail banking:

1. Competition in deposits: appetite for short term funding triggers risk taking
2. Competition in loans' markets reduces firms' incentives toward risk-shifting (limited liability)

- Rajan 2005: risks of finance globalization
- IMF report 2015: cross-border lending (prior to 2007) increased risk taking, opening branches and subsidiaries reduces risk taking

Past literature

- Allen and Gale (2004) (static Cournot game): higher banks' competition (deposits)→higher risk
- Boyd and De Nicolo (2005): lower rents' extraction (reduce loan rates) mitigates firms' to risk shifting
- Models of industry dynamic: mostly firms' industry:

1. Hopenhayn, (1992)
2. Ericson and Pakes (1995)→endogenous risk choice

- International banking: Bruno and Shin (2015)
- Risk Taking: Angeloni and Faia (2013) and Abbate and Thaler (2015)

Our model

- A model of banking industry dynamics with foreign destination markets
- Firms choose risk endogenously: incentives to risk-shifting due to limited liability and moral hazard
- Extend a static Cournot game to include endogenous entry and monitoring costs in foreign destination markets
- Extend the static model to a dynamic context: role of expectations of future rents' extraction

Main Channels: Long Run and Short Run

- Long run adjustment (regional destination markets):

1. Banks oligopsonist in deposit market: deposit rate is below perfectly competitive level
   - Banks' entrance in foreign markets raises deposit rates→raises loan rates and firms' risk taking
2. Oligopolist in loan markets: loan rates are above perfectly competitive level
   - Banks' entrance lowers loan rates→lowers firms' risk-taking (firms' risk-shifting due to limited liability)
3. Second effect tends to prevail

Dynamics and Expectations

- Role of expectations of future rents' extractions
- Consider exuberant states (risk shifts out of the tails):

1. Banks expects higher future profits (enter more)
2. Increase banks' appetite for short-term funding
3. Raise deposits (and loans) rates→firms risk-taking increases

- Expectations increase the role of competition in deposits markets

Moral Hazard in Foreign

- Monitoring costs in foreign destination markets:

1. Banks' expect to lower margins (enter less)
2. Lower deposit rates and loan rates
3. Discipline device→reduce risk taking

Our model

Assessing analytically and numerically impact on entry decisions and risk taking of:

1. Changes in sunk and/or monitoring costs
2. Changes in aggregate shock
3. Changes in dispersion of the distribution of firms' investment outcomes (through mean preserving spreads)

Firms

Choose $r_t^{l,s}$ to (where $p^s(r_t^{l,s}, a_t^s)$ raises with $r_t^{l,s}$):

$$p^s(r_t^{l,s}, a_t^s)(a_t^s r_t^{l,s} - r_t^{L,s})$$

Rearranging FOC and substituting for loans and deposits demand:

$$\frac{p^s(r_t^{l,s}, a_t^s)a_t^s}{\frac{\partial p^s(r_t^{l,s}, a_t^s)}{\partial r_t^{l,s}}} + a_t^s r_t^{l,s} = r_t^{L,s}(\sum_{r=1}^{N_t^s} D_{r,t}^s)$$

As loan rates raise (due to increased rent extraction) firms' incentives toward risk shifting increase, endogenously choose riskier projects.

Banks

$$Max_{D_t^s} p^s(r_t^{l,s}, a_t^s)\left[(1+r_t^{L,s}(\sum_{r=1}^{N_t^s} D_{r,t}^s))D_t^s - (1+r_t^{D,s}(\sum_{r=1}^{N_t^s} D_{r,t}^s))D_t^s - \xi D_t^s\right]$$

subject to:

$$E_t\left\{\frac{p^s(r_t^{l,s}, a_t^s)a_t^s}{\frac{\partial p^s(r_t^{l,s}, a_t^s)}{\partial r_t^{l,s}}} + r_t^{L,s}(\sum_{r=1}^{N_t^s} D_{r,t}^s)\right\} = E_t\left\{a_t^s r_t^{l,s}(\sum_{r=1}^{N_t^s} D_{r,t}^s)\right\}$$

and subject to loans and deposits demand.

Banks' FOC

$$
\begin{aligned}
0 \;=\;& p^s(r_t^{l,s}, a_t^s)\left[(1 + r_t^{L,s}(\sum_{r=1}^{N_t^s} D_{r,t}^s)) - (1 + r_t^{D,s}(\sum_{r=1}^{N_t^s} D_{r,t}^s)) - \xi\right] + \\
&+ p^s(r_t^{l,s}, a_t^s)\left[D_t^s \frac{\partial r_t^{L,s}}{\partial L_t^s}\frac{\partial L_t^s}{\partial D_t^s} - D_t^s \frac{\partial r_t^{D,s}}{\partial D_t^s}\right] + \\
&+ \frac{\partial p^s(r_t^{l,s}, a_t^s)}{\partial r_t^{l,s}}\frac{\partial r_t^{l,s}}{\partial D_t^s}\left[\begin{array}{c}(1 + r_t^{L,s}(\sum_{r=1}^{N_t^s} D_{r,t}^s)) \\ -(1 + r_t^{D,s}(\sum_{r=1}^{N_t^s} D_{r,t}^s)) - \xi\end{array}\right] D_{r,t}^s
\end{aligned}
$$

Banks' Entry

$$\kappa = \left(\left[p^s(r_t^{l,s}, a_t^s)((1 + r_t^{L,s}(\sum_{r=1}^{N_t^s} D_{r,t}^s))D_t^s - (1 + r_t^{D,s}(\sum_{r=1}^{N_t^s} D_{r,t}^s))D_t^s - \xi D_t^s) \right]\right.$$

Banks' evolution:

$$N_{t+1}^s = (1 - \varrho)(N_t^s + N_{e,t}^s)$$

Banks: Foreign Destination Markets

Assume monitoring costs, μ, in foreign destination market:

$$0 = p^s(r_t^{l,s}, a_t^s)\left[\begin{array}{c}(1 + r_t^{L,s}(N_t^s D_{r,t}^s + N_t^s D_{r,t}^{*,s})) \\ -(1 + r_t^{D,s}(N_t^s D_{r,t}^s + N_t^s D_{r,t}^{*,s})) - \xi - \mu\end{array}\right] +$$

$$+p^s(r_t^{l,s}, a_t^s)\left[D_t^{*,s}\frac{\partial r_t^{L,s}}{\partial L_t^{*,s}}\frac{\partial L_t^{*,s}}{\partial D_t^{*,s}} - D_t^{*,s}\frac{\partial r_t^{D,s}}{\partial D_t^{*,s}}\right] +$$

$$+\frac{\partial p^s(r_t^{l,s}, a_t^s)}{\partial r_t^{l,s}}\frac{\partial r_t^{l,s}}{\partial D_t^{*,s}}\left[\begin{array}{c}(1 + r_t^{L,s}(N_t^s D_{r,t}^s + N_t^s D_{r,t}^{*,s}) \\ -(1 + r_t^{D,s}(N_t^s D_{r,t}^s + N_t^s D_{r,t}^{*,s})) - \xi - \mu\end{array}\right] D_{r,t}^{*,s}$$

Banks' Entry: Foreign Destination Markets

$$V_t^{*,s} = \pi^{*,s}(a_t^s, N_t^{*,s}) + \beta(1-\varrho)E_t\left\{V_{t+1}^{*,s}\right\}$$

where foreign profits include the monitoring costs. The entry condition:

$$V_t^{*,s} = E_t\left\{V_{t+1}^{*,s}\right\} = \kappa$$

Banks' evolution:

$$N_{t+1}^s = (1-\varrho)(N_t^s + N_{e,t}^s);\, N_{t+1}^{*,s} = (1-\varrho)(N_t^{*,s} + N_{e,t}^{*,s})$$

Long run Effects of Sunk Costs

Lemma 1. *Higher insurance costs, ξ, reduce the number of banks (raise deposit rates), which in turn increases risk taking:*

$$\frac{dN}{d\xi} = -\frac{\frac{\partial\left(\frac{\beta_1(1-\alpha\xi)^3}{2\alpha^2(\gamma+\beta_1)^2}\frac{(N+1)^2}{N(N+2)^3}\right)}{\partial\xi}}{\frac{\partial\left(\frac{\beta_1(1-\alpha\xi)^3}{2\alpha^2(\gamma+\beta_1)^2}\frac{(N+1)^2}{N(N+2)^3}\right)}{\partial N}} = -\frac{3}{2}\alpha N(N+1)\frac{N+2}{(1-\alpha\xi)(N+N^2+1)} < 0$$

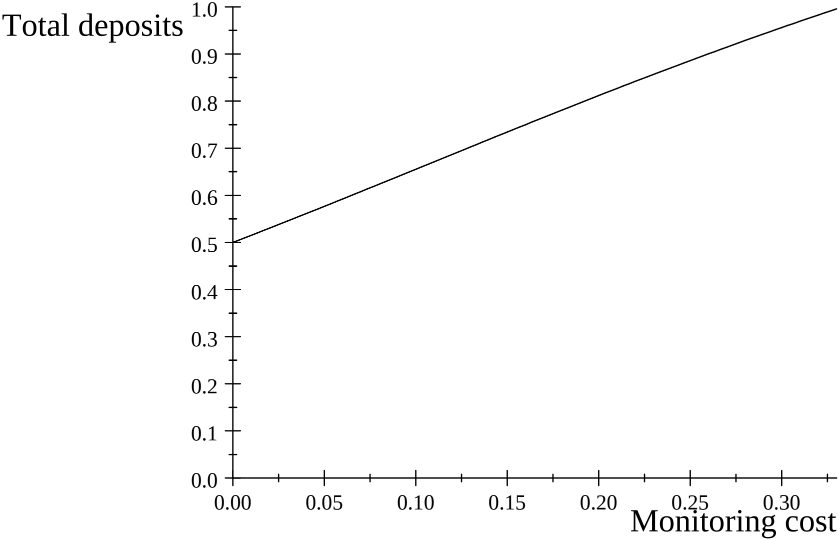
Long run Effects of Shifts in Projects' Distribution

Lemma 3. *An increase in the probability of projects' tail risk reduces the number of active banks, thereby reduces deposits competition and risk taking.*

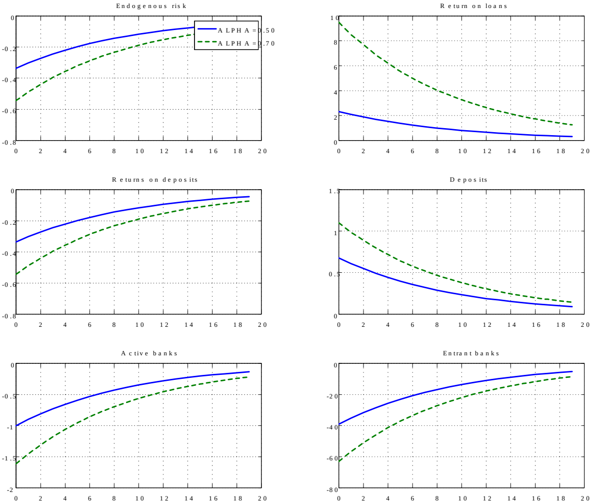
$$\frac{dN}{d\alpha} = -\frac{\frac{d\left(\frac{\beta_1(1-\alpha\xi)^3}{2\alpha^2(\gamma+\beta_1)^2}\frac{(N+1)^2}{N(N+2)^3}\right)}{d\alpha}}{\frac{d\left(\frac{\beta_1(1-\alpha\xi)^3}{2\alpha^2(\gamma+\beta_1)^2}\frac{(N+1)^2}{N(N+2)^3}\right)}{dN}} = -\frac{1}{2}\frac{(2+\alpha\xi)}{\alpha(1-\alpha\xi)}\frac{N(N+1)(N+2)}{N+N^2+1} < 0$$

$$\frac{dp(S)}{d\alpha} = -\frac{\xi}{2}\frac{\beta_1}{\beta_1+\gamma}\frac{N+1}{N+2} + \frac{1-\alpha\xi}{2}\frac{\beta_1}{\beta_1+\gamma}\frac{1}{(N+2)^2}\frac{dN}{d\alpha} < 0$$

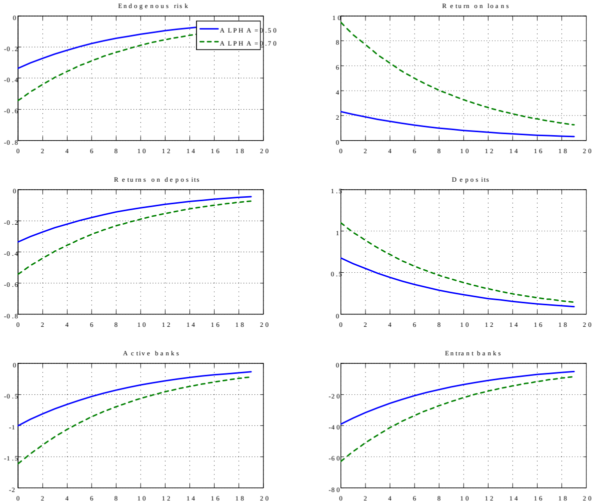
$$Z_1 = \frac{\beta_0}{\gamma+\beta_1}\frac{1+\frac{1}{s_{11}}}{2+\frac{1}{s_{11}}} = \frac{\beta_0}{\gamma+\beta_1}\frac{4\mu+\frac{1}{-(2\beta_0-3\mu)+\sqrt{(2\beta_0-3\mu)^2+8\mu(\beta_0+2\mu)}}}{8\mu+\frac{1}{-(2\beta_0-3\mu)+\sqrt{(2\beta_0-3\mu)^2+8\mu(\beta_0+2\mu)}}}$$



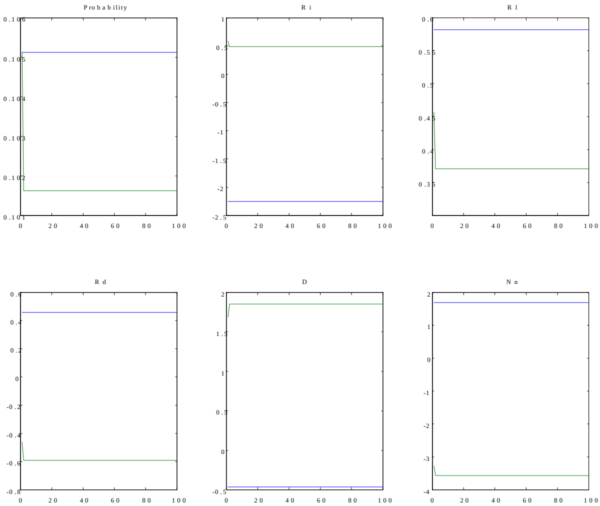
Short Run Dynamics: Increases in a



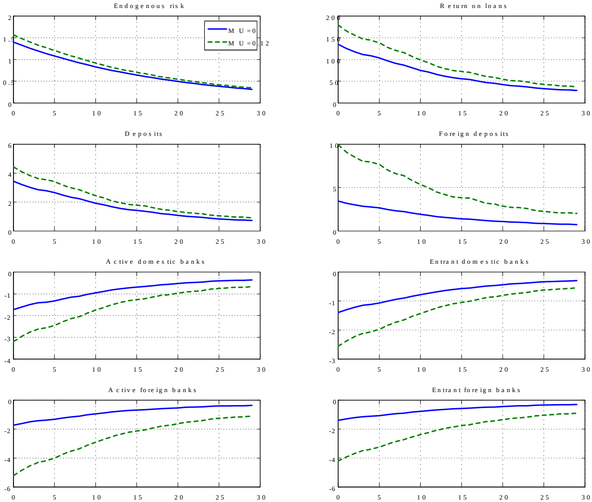
Short Run Dynamics: Increases in sunk costs



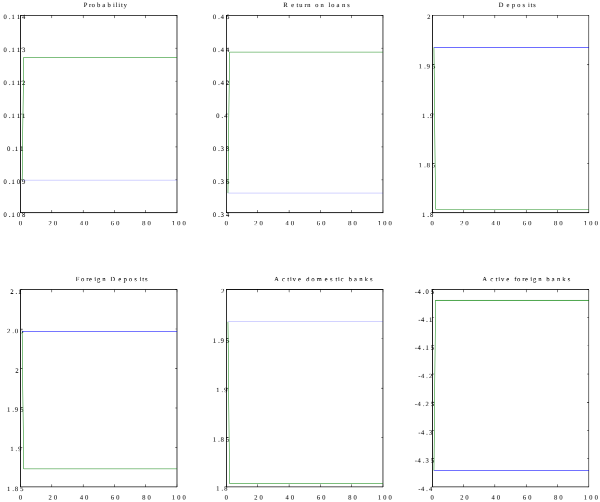
Transitional Dynamics. Risk on the Tails



Foreign Destination Markets. Increases in a



Transitional Dynamic: Risk on Tails. Foreign Market



Conclusions

- Model of banks' industry dynamic with endogenous entry decisions and endogenous risk-taking
- Assess the complex dimension of banks' globalization to risk shifts, aggregate shocks and falls in sunk costs
- Extensions:

1. Search frictions in local markets to exploit sluggish dynamics
2. Numerically: transitional dynamics to risky steady state

- Empirical analysis: large dataset (also historical development of global banking groups), probit estimation on determinants of banks' globalization