INDUSTRIAL MONETARY POLICY

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1. INTRODUCTION

"Industrial monetary policy" = liquidity support policies (broadly construed)

- through which authorities shape the location and continuation of economic activity on their soil,
- with consequences for banks' international specialization, place of incorporation, charter of affiliates and supervisory regime.

Motivation

(a) Home bias in European banking market
(b) Swap lines
(c) Hegemons

▸ Motivation

Key theoretical ingredients

(1) Countries are eager to attract and maintain economic activity on their soil

(2) Cross-border banks' investment is not one-shot $\Rightarrow$ location decision depends on prospect of receiving liquidity support if needed

(3) Liquidity support hinges on the amount of "leakage" (a country's support in part benefits the other countries).

Leakage and its implications in turn depend on institutional details such as

- *fungibility:* from complete (banks allocate their funds internationally as is optimal for them) to ring-fencing.
- *ability of countries to reach a Coasian bargain* (fund availability, commonality of information).

Main insights (1) *Limited international bank diversification and competition*

- Only equilibria = partial to complete specialization (a bank wants to be the national champion of one country so as to be able to count on its support).
- Banking competition is too weak.

International date-1 coordination of liquidity provision brings two benefits:

- better support for the banks ex post
- increased competition ex ante

Main insights (2) *Industrial monetary policy*

- Conditional form of LOLR enables countries to attract investments onto their soil, while under some conditions an unconditional one is self-defeating
- The model rationalizes central-bank swap lines as attempts by central banks to boost foreign demand for domestic assets by committing to bringing assistance to foreign financial institutions (via foreign central banks) in case of currency shortage.
- Exchange rate appreciations are
  - an unavoidable byproduct of successful industrial monetary policies,
  - a limiting factor for industrial monetary policies by endogenously making them costlier to operate.

Main insights (3) *Branches and subsidiaries*

- ring-fencing impacts liquidity support
- ring-fencing has a benefit and a cost:
  - makes the home country more eager to assume its responsibility
  - creates a misallocation of liquidity within the bank.

Relevant literatures

- International trade
- Dominant currencies/hegemons
  - Complementarities
  - Stores of value and reserve currencies
- Prudential regulation
  - branches vs. subsidiaries
  - regulatory externalities among countries/regulatory competition
- Transmission of shocks in a cross-border banking system.

▸ Related literatures

2. A NEW RATIONALE FOR HOME BIAS

Players :

- *two countries*, A and B
- *one cross-border bank*.

Three dates (players do not discount future). As usual, timing for bank

- date 0: initial investments
- date 1: liquidity needs
- date 2: future.

Timing (for time-consistent policies)

- *Date 0 (client/project acquisition)*: bank picks its number of clients in each country. Increasing cost (e.g. borrowers have lower and lower net worth)
  - The unit cost of customer acquisition in country k is $c(q^k)$,
  - This unit cost function satisfies $c'(q) > 0$ and $\hat{c}(q) \equiv c(q) + qc'(q)$ is increasing (benefit from diversification).

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  Let
  - $q \equiv \sum_k q^k$ stand for bank's overall size
  - $\sigma^k \equiv \frac{q^k}{q}$ denote the relative presence of bank in country k
  - $\sigma \equiv \max_{k \in \{A,B\}} \sigma^k$ is a measure of bank's country specialization. Bank is (fully) diversified if $\sigma = \frac{1}{2}$.

  No store of value at date 0
  No capital constraint at date 0
  } can be easily relaxed.

- *Date 1 (liquidity shocks)*
  - Distribution of the bank's projects' liquidity shocks, $F(\rho) \sim [0, +\infty)$, is the same in both countries. Clients are captive at date 1.
  - Countries face costs of public funds$\{\lambda^k\}$ and simultaneously select liquidity support $\{T^k \geq 0\}$. So the bank receives $T = T^A + T^B$. We will let $\kappa^k \leq q^k$ denote the continuation scales.

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- *Date 2 (continuation values)*
  - Bank enjoys its private benefits, $[\sum_k \kappa^k]b$.
  - Country k receives social benefit $\kappa^k\beta$ (does not necessarily care about bank: countries internalize the continuation of economic activity on their soil. What makes banks "banks" is willingness to bring extensive liquidity support.)

Objective functions

Bank

- allocates available money within a given country to those projects that require the smallest reinvestment $\Rightarrow$ cutoff ρ^k in country k and continuation scale $\kappa^k = F(\rho^k)q^k$. Bank's utility:

$$U = \Big[\sum_k F(\rho^k)q^k\Big]b - \Big[\sum_k c(q^k)q^k\Big]$$

Country k

- internalizes rents S^k of its date-0 project owners/entrepreneurs:

$$S^k(q^k) = q^k c(q^k) - \int_0^{q^k} c(x)dx = \int_0^{q^k} xc'(x)dx.$$

Intertemporal welfare of country k:

$$W^k = S^k(q^k) + [F(\rho^k)q^k\beta - \lambda^k T^k]$$

- Many extensions possible (date-0 credit rationing, date-1 revenue, date-2 pledgeable income, macroeconomic/correlation of shocks, stores of value, asymmetric shocks, etc.)
- Broader interpretation: Date-1 support = any policy that
  - incentivizes bank to invest in country
  - benefits country at date 1 (at some cost)

"Project"/"client" $\longrightarrow$ "asset" (price support prevents fire sales).

Bank's use of liquidity

We here assume that money is *fungible* $\Rightarrow$ banks allocate funds as they see optimal:

$$\rho^A = \rho^B = \rho^*$$

At date 1, bank receives $T \equiv T^A + T^B$. Efficient allocation of this liquidity to the least-continuation-cost projects, under date-1 budget constraint

$$\left[\int_0^{\rho^*} \rho dF(\rho)\right](q^A + q^B) = T^A + T^B$$

Date-1 liquidity provision equilibrium

Countries' incentives

Assume for the moment identical costs of public funds: for all k, $\lambda^k = \lambda$.
Country k solves

$$\max_{T^k \geq 0} \{\beta F(\rho^*) q^k - \lambda T^k\}$$

Let $\hat{\beta} \equiv \beta/\lambda$ denote country's rescaled benefit from continuation.

Proposition (national champion)

(i) Only country k such that $\sigma^k \equiv \sigma > 1/2^*$ brings liquidity to the bank. Cutoff:

$$\rho^* = \hat{\beta}\sigma$$

(ii) Continuation scale, $F(\hat{\beta}\sigma)$, higher, the lower the leakage (leakage measured by $1 - \sigma$)

* ρ^* continuous at $1/2$: If $\sigma = 1/2$, $\rho^* = \hat{\beta}/2$. Many equilibria yielding this outcome (including one in which each country contributes for half of the liquidity provision).

Optimal size and diversification

Bank chooses total size q and specialization $\sigma \in [1/2, 1]$:

$$\max_{\{q,\sigma\}} [F(\hat{\beta}\sigma)q]b - c(\sigma q)\sigma q - c((1-\sigma)q)(1-\sigma)q.$$

Proposition (specialization)

(i) At date 0, the bank chooses to specialize partly or fully ($\sigma \in (\frac{1}{2}, 1]$).
A sufficient condition (necessary and sufficient if $\hat{c}(0) = 0$ as in the linear cost case) for full specialization is that the elasticity of F at $\rho = \hat{\beta}$, $f(\hat{\beta})\hat{\beta}/F(\hat{\beta})$, exceed 1.

(ii) More turbulent times (a uniform shift θ toward higher shocks: $F(\rho - \theta)$) lead to more specialization, as the bank is keen on securing liquidity from the home country.

Corollary: supervision by the high-presence country

Add date-1 revenue (rq) or date-2 pledgeable income and possibility for bank to abscond with it if left unsupervised.

Proposition (supervision by the high-presence country).

Suppose that the bank specializes in country A $(q^A > q^B)$ and that, if left unmonitored, it diverts cash to its own benefit. Then country B does not monitor the bank. More generally, it is optimal that prudential supervision be performed by the high-presence country.

More generally: supervision of liquidity coverage ratio.

Coasian bargains and their breakdowns

Date-1 cross-country deals

- solve the free-rider problem: joint provision of a level of support to bank: $\rho^* = \hat{\beta}$
- encourage date-0 investment

Breakdowns of Coasian bargain

Coasian bargains require

- *informational commonality* (say, about the willingness of each country, $\hat{\beta}^k$, to rescue the banks or about domestic cash needs)
- *availability of public funds in both countries.* Suggests benefits from prearranged swaps.

3. INDUSTRIAL MONETARY POLICY

- Liquidity support interventions studied so far have been *ex-post* (i.e. time-consistent)
- Countries can try to attract bank at date 0 by promising "domestic" LOLR services.
  - Add a prior stage ("stage -1") at which countries may commit to liquidity support.
  - Conditionally (contingent on the absolute or relative presence in the country) or unconditionally?
  - Countries may charge bank for access to LOLR services (at date 0, utility is transferable between bank and the countries; not so if introduces credit rationing).

3.1 IMP: an illustration

- Only country A is strong & resilient and has cash to bring liquidity (country A is an "Hegemon": $\lambda^A = \lambda$ and $\lambda^B = +\infty$)
- Binary shock structure $\begin{cases} \text{fraction } x \text{ of projects face shock } \rho \\ \text{fraction } 1-x \text{ face shock } 0 \end{cases}$
  - $\hat{\beta}/2 < \rho < \hat{\beta}$ so that the bank will have to downsize at date 1 if it fully diversifies
  - Let $\sigma > \frac{1}{2}$ be defined by $\sigma\hat{\beta} = \rho$.
- Linear cost structure $(c(q) = q)$.

Suppose bank wants to diversify in absence of IMP. ▸ Conditions

Unconditional liquidity support

- Suppose first that country A commits to liquidity support T . The bank then keeps diversifying.

- Such interventions benefit only the bank
- LOLR interventions that reduce date-1 downsizing without attracting more activity could be performed at date 1 and so reduce welfare.

Optimal intervention

Contract between country A and the bank specifying in the two countries

- a liquidity support T^A, conditioned on:
- a presence $\{q^k\}_{k\in\{A,B\}}$
- a continuation scale $\{\xi^k\}_{k\in\{A,B\}} \in [1-x, 1]$ ($\xi^A = \xi^B$ if fungibility)

[• a date-0 transfer between the bank and country A.]

Proposition (Hegemon's optimal policy).

Output is greater in the Hegemon ($q^A > q^B$) for several reasons:

(i) country A values investment on its soil ($\beta > 0$);

(ii) country A values inframarginal rents on its soil ($c(q) < c(q) + c'(q)q$);

(iii) (under ringfencing) if $b + \beta > \rho > b$, investment in country A is more valuable than investment in country B, as it is optimal to continue it fully in country A but not in country B ($\xi^A = 1 > \xi^B = 1 - x$).

3.2 Exchange rate appreciation

Proposition (exchange rate appreciation)

Introduce two goods (home, foreign) and so a date-1 exchange rate. We show that exchange rate appreciations

- are an unavoidable byproduct of successful industrial monetary policies: Desire of country A to expand bank activities in country A + more liquidity injections in country A at date 1 $\Rightarrow$ increases the demand for country A's currency.
- are a limiting factor for industrial monetary policies by endogenously making them costlier to operate.

▸ Exchange rate appreciation

Support may take the form of swap lines to other CBs rather than direct support to banks.

4. BANKING COMPETITION

Unit cost of acquisition in country k becomes $c(\Sigma_i q_i^k)$ where $q_i^k =$ bank i's investment in country k. Again we have

$$\rho_i^* = \hat{\beta}\sigma_i.$$

Proposition (banking competition).

Consider an ex-ante symmetric duopoly

(i) Banks specialize and they do so in different countries.

(ii) An increase in competition (# banks/ # countries ratio) $\Rightarrow$ more specialization. Always full specialization if ratio is high.

(iii) More turbulent times lead to banking renationalization.

(iv) A Coasian bargain increases competition by reducing specialization.

5. FUTURE RESEARCH

- *Subsidiaries and branches* ▸ Impact of ring-fencing
- *Retail deposits*: add cheap deposits
  - Theory: shadow banking paper
  - Practice: Often motivates subsidiary & host country supervision
- *Multiple hegemon wannabes and currency wars* (US-China).
- *Other policies and their limits*
  - stores of value
  - fiscal subsidies to investment
  - regulatory leniency.

SUPPLEMENTARY SLIDES

Motivation

(a) European banking market

- Strong home bias of the banks, even of the biggest ones
  - inertia partly accounts for this strong country specialization
  - paper focuses on another source of specialization: the greater ability to access public liquidity when specializing.
- Plans to facilitate banks' recovery and resolution

(b) Swap lines

- extended by Fed in 2008
- more formal arrangements offered by China to boost the renminbi.

(c) $ dominance

- FX reserves, bond holdings, deposits
- peg to $, borrow in $
- $ main currency of invoice

Complementarities (Gopinath-Stein *QJE* 2021)

Exorbitant privilege comes with duties (if country doesn't accept latter, fragility)

Euro has not yet succeeded in competing with dollar (Eurozone crisis, no swap lines, few safe assets), let alone Yuan.

return

Time-consistent liquidity support

Let U^I (for "insured") and U^D (for "diversified") denote the bank's utility when it chooses to specialize to $\sigma = \frac{\rho}{\hat{\beta}}$ and to diversify fully at $\sigma = \frac{1}{2}$:

$$U^I = \max_q \left\{ bq - c\left(\frac{\rho}{\hat{\beta}}q\right)\frac{\rho}{\hat{\beta}}q - c\left(\left(1-\frac{\rho}{\hat{\beta}}\right)q\right)\left(1-\frac{\rho}{\hat{\beta}}\right)q \right\}$$

and

$$U^D = \max_q \{2[(1-x)b\frac{q}{2} - c(\frac{q}{2})\frac{q}{2}]\}.$$

In the linear cost case ($c(q) = q$),

$$q^I = \frac{b}{2[(\frac{\rho}{\hat{\beta}})^2 + (1-\frac{\rho}{\hat{\beta}})^2]}$$

and

$$q^D = (1-x)b.$$

Suppose that the bank would want to diversify in the absence of LOLR ($U^D > U^I$) if low probability of shock and extensive required specialization:

$$(1-x)^2 > \frac{1}{2\left[\left(\frac{\rho}{\hat{\beta}}\right)^2 + \left(1-\frac{\rho}{\hat{\beta}}\right)^2\right]}.$$

Country A's welfare is then equal to $S(\frac{q^D}{2}) + \beta(1-x)\frac{q^D}{2}$.
Will country A want to grant LOLR to the bank?

return

Exchange rate appreciation

- Consumers in each country k have identical preferences
  $E[c_0^{k,A} + c_0^{k,B} + u(c_1^{k,A}, c_1^{k,B}) + c_2^{k,A} + c_2^{k,B}]$
  Cobb-Douglas preferences $u(c_1^{k,A}, c_1^{k,B}) = 2(c_1^{k,A} c_1^{k,B})^{\frac{1}{2}}$
- Investment in country i requires reinvestment in the goods produced in this country
- ω = endowment of goods in country i, owned by consumers of country i
- Exchange rate e of country A at date 1 is the relative price of good B vs. good A.

The exchange rate of country A is more appreciated (e lower)

- the higher is q^A
- the lower is q^B
- the higher is ξ^A
- and the lower is ξ^B.

return

SUPERVISION, SUBSIDIARIES AND BRANCHES

Back to single bank, for simplicity. Caricatures of reality:

- *Branch*: the home supervisor can direct more than a fair fraction of liquidity to the supervisor's country. When country k regulates the bank, the fraction of bank's total liquidity T that is used by the bank in country k is given by the following reinvestment function:

$$L^k = [\sigma^k + \alpha(1 - \sigma^k)]T \equiv s^k T$$

  α in [0,1] is a ring-fencing parameter; $\alpha = 0$ corresponds to perfect fungibility, $\alpha = 1$ describes perfect ring-fencing.

- *Subsidiary*: each country can ring-fence its liquidity support (and -if any- the date-1 revenue earned in the country).

Branch

Suppose that the home country k (and only country k) brings liquidity to the bank. Its ex-post utility is then $\hat{\beta}F(\rho^k)q^k - T^k$

$$\rho^k = \hat{\beta}s^k.$$

Ring-fencing has two opposite consequences:

- *misallocation of the bank's resources* among the projects in the two countries;
- *ring-fencing alters liquidity support*
  - increases liquidity support if regulation takes place in the country with the highest bank presence
  - tends to reduce liquidity support if regulation takes place in the low-presence country, unless the establishments in the two countries have similar sizes.

Location of supervisor

- In practice, both the bank and countries have an impact on the location of supervision.
  - Bank chooses where to incorporate, thereby designating a "home supervisor".
  - But the host country may decide to also supervise its local operations.
- Ignore the latter and focus on the bank's choice of incorporation.

Conjecture: bank wants to incorporate in country where it is more active. Intuition: supervision in the country with the larger establishment size brings about a higher liquidity support.

return