International Spillovers and Guidelines for Policy Cooperation[1]

Anton Korinek

Johns Hopkins University and NBER

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Motivation

- In a globalized world, national economic policies frequently create international spillover effects
- Examples: capital flow management, exchange rate stabilization, quantitative easing, devaluation policies, etc.

$\rightarrow$ concerns about "global currency wars"

Main Questions

- *When are spillovers from national economic policymaking inefficient?*
- *Which global "rules of the road" guarantee efficient outcomes?*

Main Contribution

Key Contribution 1: Develop an efficient benchmark:

Spillover effects of unilateral policymaking are efficient as long as:

1. policymakers act competitively
2. policymakers have complete *external* instruments
3. no imperfections in *international* market

→ **Examples of efficient unilateral intervention:**

- current account management in a liquidity trap
- exchange rate intervention to insure the tradable sector
- reserve accumulation to internalize learning externalities

all these policies generate *efficient spillovers*

Main Contribution

Key Contribution 2: Provide guidelines for cooperation

Role for cooperation is limited to deviations from benchmark:

1. ensuring competitive behavior
2. dealing with incomplete/imperfect policy instruments
   - create new/better instruments
   - use existing instruments more efficiently
3. addressing imperfections in international markets
   - correct market imperfections
   - use existing markets more efficiently

Setup of Baseline Model

- Countries $i = 1, ...N$ of mass ω^i with $\sum_i \omega^i = 1$
- Policymaker and unit mass of domestic agents obtain utility

$$U^i(x^i) \quad \text{s.t.} \quad f^i(x^i, X^i, m^i, M^i, \zeta^i, Z^i) \leq 0$$
$$\frac{Q}{1-\tau^i} \cdot m^i \leq T^i$$

- x^i, X^i ... bundle of domestic variables
- m^i, M^i ... bundle of international transactions
  (upper-case variables denote country aggregates)
- ζ^i ... bundle of domestic policies
- Z^i ... bundle of exogenous parameters

- Q ... vector of world market prices of m^i, M^i
- τ^i is full set of tax instruments on intl transactions rebated via T^i

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Examples

Example 1: Canonical open economy macro model:

$$\max_{(c_t^i, b_{t+1}^i)_i} \sum_t \beta^t u(c_t^i) \quad \text{s.t.} \quad c_t^i + (1-\xi_t^i) b_{t+1}^i / R_{t+1} = y_t^i + b_t^i$$

Mapping:

- define net i*m*ports $m_t^i = c_t^i - y_t^i = b_t^i - b_{t+1}^i / R_{t+1}$
- domestic variables $x^i = \{c_t^i\}$
- state variables $Z^i = \{y_t^i\}$, domestic policies $\zeta^i = \emptyset$
- world market prices $Q_t = 1/\Pi_{s=0}^t R_{s+1}$
- external policy instruments $(1-\tau_t^i) = 1/\Pi_{s=1}^t (1-\xi_{s+1}^i)$

$\rightarrow$ utility $U^i(x^i) = \sum_t \beta^t u(c_t^i)$

$\rightarrow$ constraints $f_t^i(\cdot) = c_t^i - y_t^i - m_t^i \leq 0 \; \forall t$

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Examples

Other Examples:

- multiple traded goods: $m^i = (m^i_{t,k})$ with $k = 1...K$
- multiple states of nature: $m^i = (m^i_{t,s})$ with $s \in \mathcal{S}$
- non-traded goods: $x^i = (c^i_{T,t}, c^i_{N,t}, y^i_{N,t})$ and $f^i_{t,2} = y^i_{N,t} - c^i_{N,t}$
- labor: $x^i = (c^i_t, \ell^i_t)$ and $U^i(x^i) = \sum_t \left[u(c^i_t) - d(\ell^i_t)\right]$
- capital: $x^i = (c^i_t, k^i_t)$ and f^i_t includes law of motion
- domestic market imperfections $\rightarrow$ capture in $f^i(\cdot)$
- multiple types of agents, political preferences $\rightarrow$ capture in $U^i(x^i)$

$\rightarrow$ framework nests a wide range of open economy macro models

Solution Step 1

Lemma (Separability)

Given the complete external policy instruments, we can separate the domestic and international optimization problems.

Step 1: optimal domestic allocation *for given external* (m^i, M^i)

- representative agent optimizes
- domestic policymaker optimizes

$\rightarrow$ defines reduced-form utility function $V^i(m^i, M^i)$

Example (baseline model): $V^i(m^i, M^i) = \sum_t \beta^t u(y_t^i + m_t^i)$

Solution Step 2

Step 2: determine optimal external allocations M^i in country i:

- planner solves for optimal external allocation M^i,

$$\max_{M^i} V^i(M^i, M^i) \quad \text{s.t.} \quad Q \cdot M^i \leq 0$$

  while internalizing any externalities from flows

$\rightarrow$ determines global competitive equilibrium

Key Question

Is the Nash equilibrium among national planners efficient?

Solution Step 2

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Key Question

Is the Nash equilibrium among national planners efficient?

Global Planning Problem

Global planner's equilibrium: can be expressed using $V^i(m^i, M^i)$:

$$\max_{\{M^i\}} \sum_i \phi^i \omega^i V^i(M^i, M^i) \quad \text{s.t.} \quad \sum_i \omega^i M^i \leq 0$$

Proposition (1st FWT for National Economic Policymaking)

The Nash equilibrium among national planners is Pareto efficient.

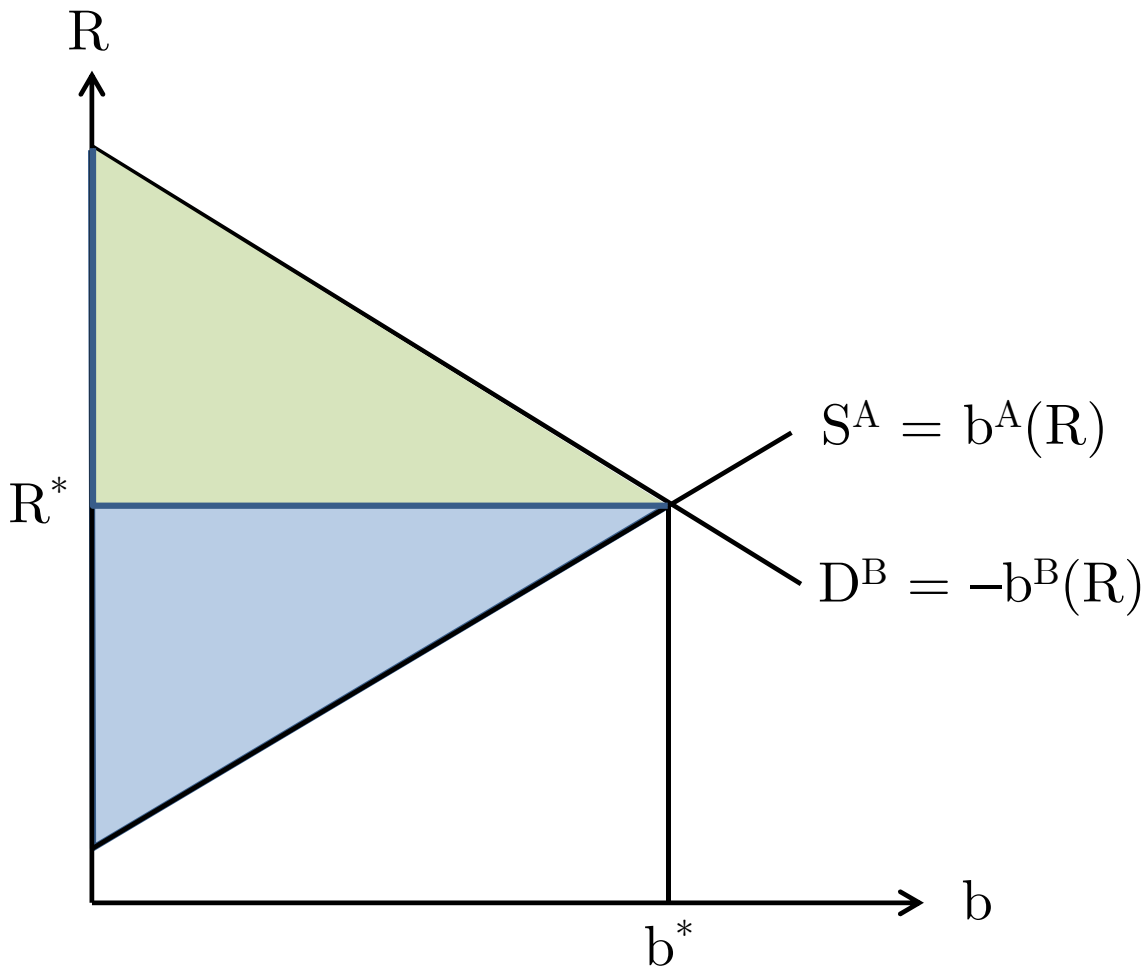
Intuition:

- policy interventions (ζ^i, τ^i) may entail spillover effects
- BUT: spillover effects are mediated through global prices Q

$\rightarrow$ first welfare theorem applies at the level of planners

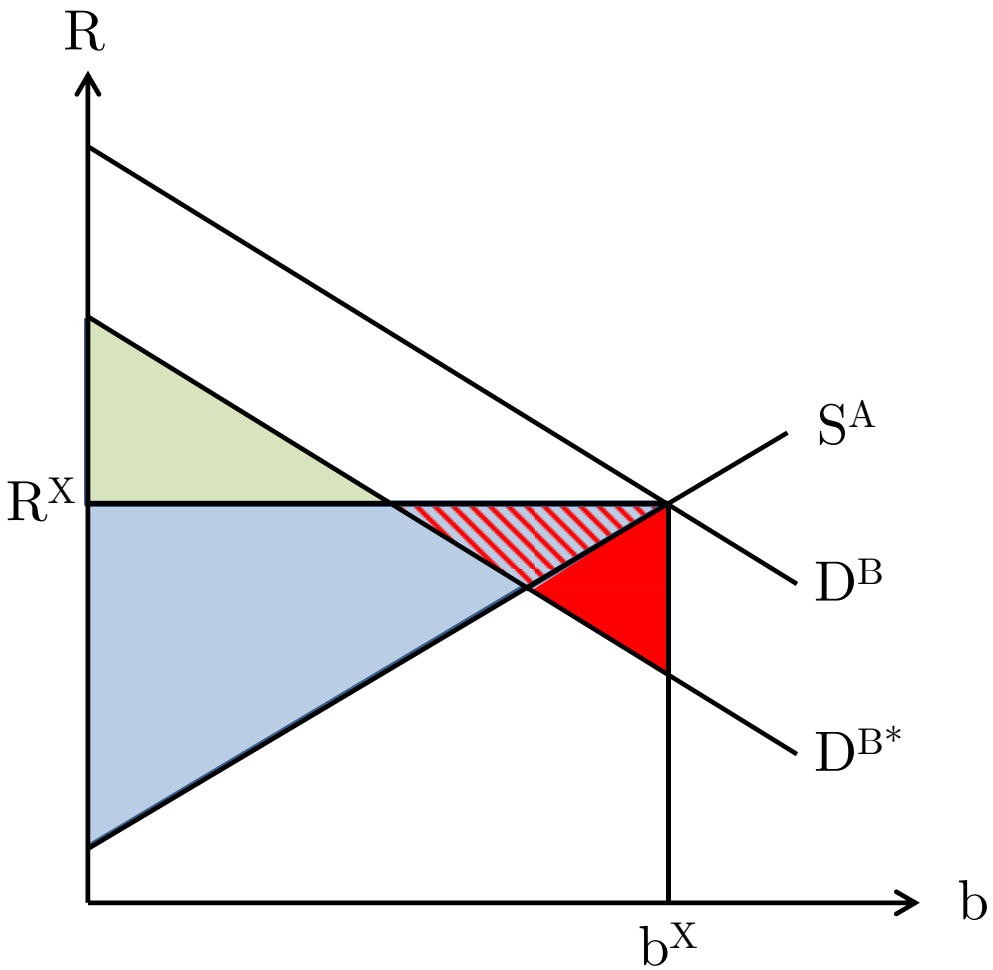
$\rightarrow$ global reallocation of capital/goods is efficient market response

Equilibrium in World Capital Markets: Baseline



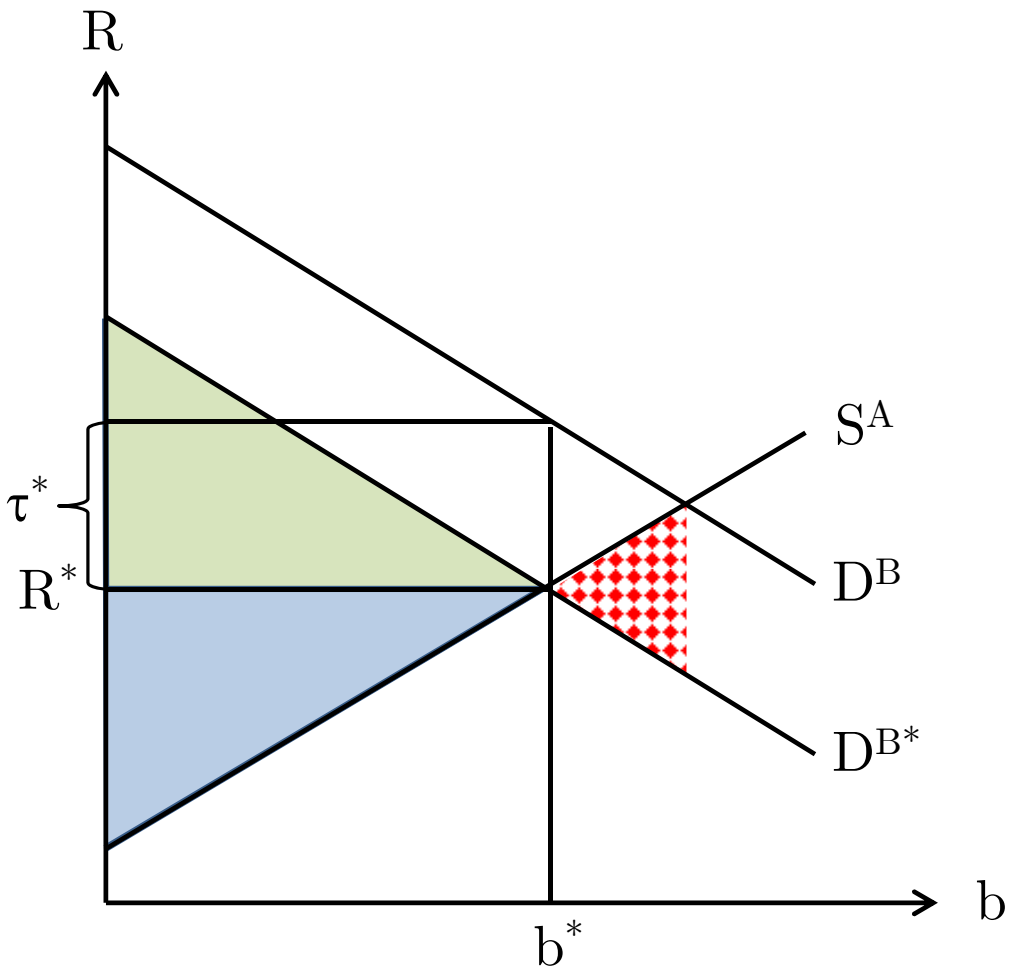
Spillovers from Policy Intervention

Equilibrium in World Capital Markets: Externalities



Spillovers from Policy Intervention

Equilibrium in World Capital Markets: Efficient Intervention



Examples and Applications I

Baseline model: $V_M^i = 0 \;\rightarrow$ no externalities

Example of learning externalities:

- learning-by-exporting externalities: $\Delta Y_{t+1}^i = \varphi(M_t^i)$

$$f^i(\cdot) = Y_{t+1}^i - Y_t^i - \varphi(M_t^i) \leq 0$$

- learning-by-doing externalities: $Y_t^i = A_t^i L_t^i$ and $\Delta A_{t+1}^i = \psi(L_t^i)$

$$f_1^i(\cdot) = A_{t+1}^i - A_t^i - \psi(L_t^i) \leq 0$$
$$f_2^i(\cdot) = A_t^i u'(C_t^i) - d'(L_t^i) \leq 0 \quad \text{(no labor subsidy)}$$

Optimal policy for economy i = inflow controls = globally optimal!

Examples and Applications II

Example of aggregate demand externalities at the ZLB:

- consider zero lower bound on the nominal interest rate:

$$\iota^i_{t+1} \geq 0$$

- output is demand-determined: $\tilde{Y}^i_t = C^i_t - M^i_t$
  with the usual (New) Keynesian frictions in the background
- if world interest rate high enough: $\frac{1+r_{t+1}}{1+\pi^i_{t+1}} - 1 > 0 \rightarrow$ no problem
- if world interest rate too low: $\frac{1+r_{t+1}}{1+\pi^i_{t+1}} - 1 = 0$

  $\rightarrow$ imports M^i_t eat into domestic aggregate demand

Optimal policy for economy i = inflow controls = globally optimal!

Examples and Applications III

Example of exchange rate stabilization:

- consider a developing economy with two types of agents:
  - financial elite: have access to international capital market
  - workers: live hand-to-mouth: no access to capital markets
    work either in traded or non-traded sector
- all agents value consumption:

$$U^i = \sum \beta^t u(c^i_{T,t}, c^i_{N,t})$$

- under autarky and no shocks: income of workers is stable
  $\rightarrow$ consumption smooth
- under open capital accounts: fluctuations in world interest rate lead to inflows/outflows
  $\rightarrow$ workers suffer positive/negative income shocks

Optimal policy = smoothing capital account = globally optimal!

Robustness

Robustness: efficiency result holds under all discussed extensions:

- labor, capital, multiple goods, uncertainty, ...
- any domestic market imperfections
- heterogeneous agents, political preferences, ...

$\rightarrow$ all these affect optimal *level* but *not efficiency* of intervention

Sufficient Conditions for Efficiency:

1. domestic planners are competitive (price-takers)
2. planners have sufficient instruments to determine M^i
3. no international market imperfections

Case I for Cooperation: Monopolistic Policymakers

Monopolistic policymakers: internalize market power over Q

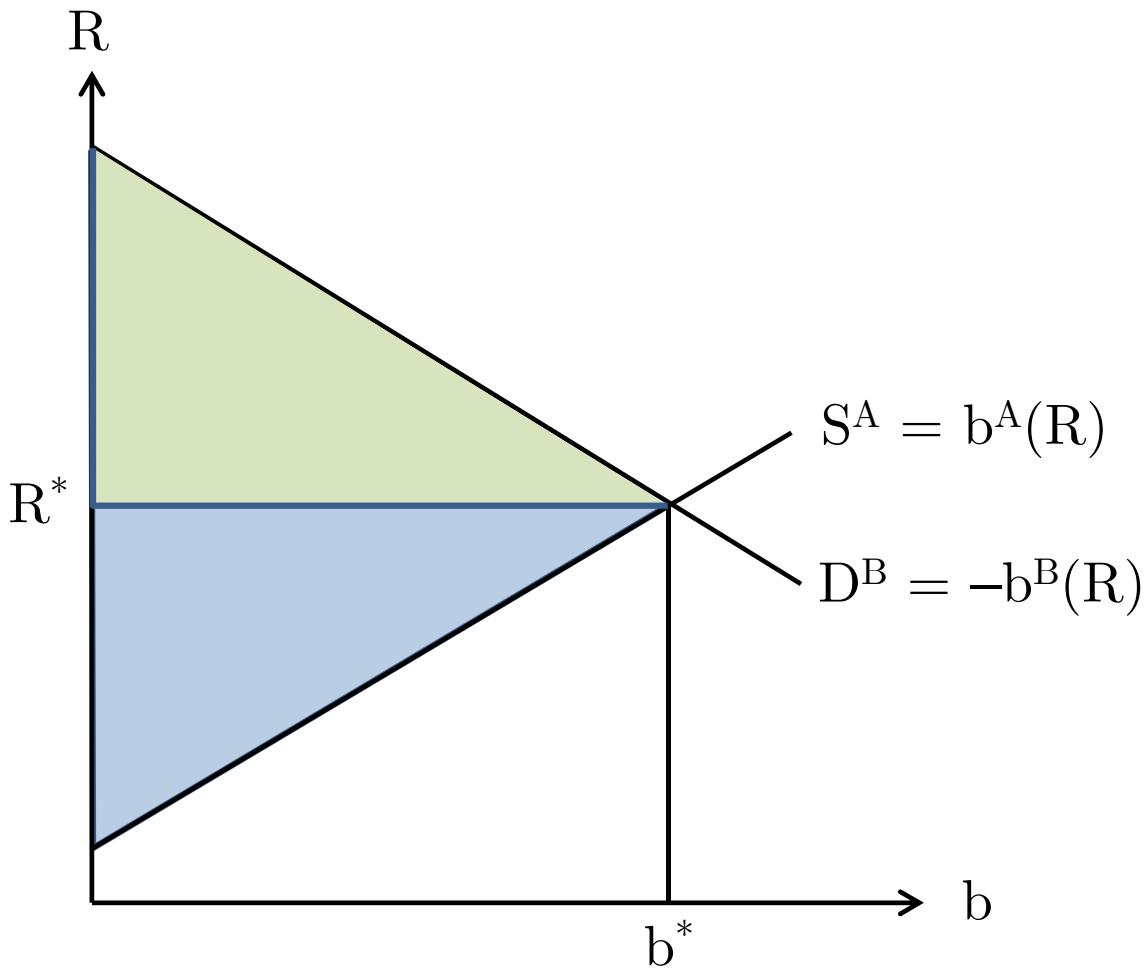
- monopolistic planner internalizes ROW inv. demand $Q^{-i}(-\omega^i M^i)$

$$\max_{M^i} V^i(M^i, M^i) \quad \text{s.t.} \quad Q^{-i}(-\omega^i M^i) \cdot M^i \leq 0$$

Proposition (Monopolistic Policy Intervention)

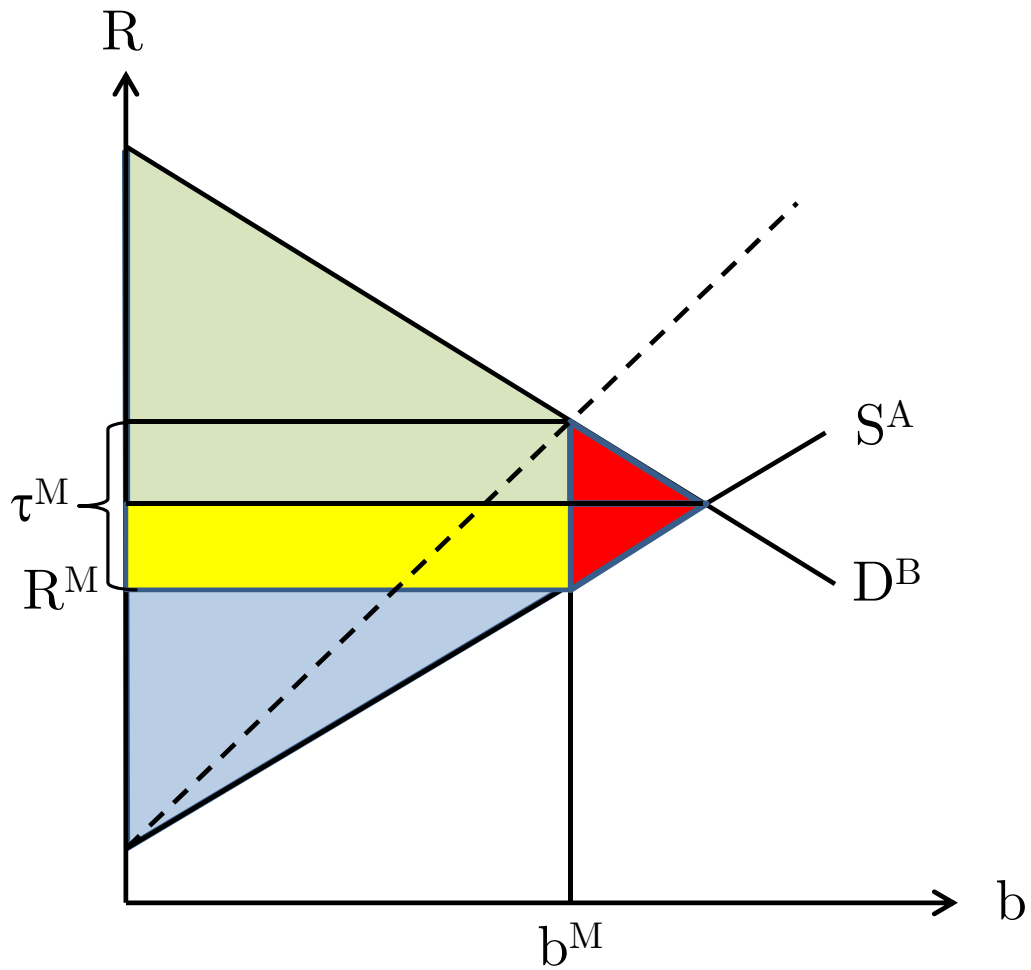
Monopolistic policy interventions that are designed to distort world prices/interest rates are inefficient.

Equilibrium in World Capital Markets: Baseline



Spillovers from Policy Intervention

Equilibrium in World Capital Markets: Monopolistic Behavior



Monopolistic Policy Intervention

Difficulty: How do we distinguish monopolistic behavior from correcting externalities?

Theory offers a few guidelines:

- small economies in the world market have $Q^i_M = 0$
  $\rightarrow$ no market power over Q
- countries with little cross-country trade have $M^i \approx 0$
  $\rightarrow$ no welfare benefit to manipulating price so $\mathcal{E}^i_{Q,M} \approx 0$
- sign of intervention $\hat{\tau}^i$ = sign of trade position $M^i_{t,k,s}$:
  - country with net inflows will restrict inflows and vice versa
  - with multiple goods, tax imports and restrict exports
  - under uncertainty, reduce insurance because each country has net long position in idiosyncratic risk

Further Results on Monopolistic Behavior

1. If external policy instruments (τ^i) are available, a planner will never distort domestic policies ζ^i to exert market power
2. If external policy instruments (τ^i) are incomplete, then domestic policies will also be distorted to exert market power

Case II: Imperfect External Policy Instruments

Baseline model:

- complete set of external instruments (τ^i)
- allowed planner to implement desired external allocation (critical for argument of the first welfare theorem)

Incomplete Policy Instruments:

- can be captured by a cost function $C^i(\tau^i) \geq 0$
- interpretations:
  - direct implementation cost $C^i(\tau^i) = \gamma^i \sum(\tau_t^i)^2/2$
  - non-existing instruments if $\gamma^i \to \infty$
  - restrictions on instruments $C^i(\tau^i) = \gamma^i \sum(\tau_{t,s}^i - \tau_{t,0}^i)^2/2$ with $\gamma^i \to \infty$

Imperfect External Policy Instruments

Proposition (Effectively Incomplete Policy Instruments)

1. *The Nash equilibrium among national planners is inefficient if at least one country does not possess an effectively complete set of instruments.*

2. *Constrained efficiency under incomplete policy instruments requires*

$$\sum \omega^i C^{i\prime}(\tau^i)(1-\tau^i) = 0$$

Intuition:

- setting average marginal distortion to zero minimizes total implementation costs

Examples: Costly Policy Instruments

Example of Wasteful Competitive Intervention:

- consider N identical countries with externalities $V_M^i < 0$
- each country intervenes $\tau^i > 0$ at cost $C^i(\tau^i) > 0$
- intervention is completely wasteful:
  same allocation but lower cost with $\tau^i = 0 \; \forall i$

Examples: Costly Policy Instruments

Example of Sharing the Regulatory Burden:

- consider 2 identical countries with cost $C^i(\tau^i) = \gamma^i \sum(\tau_t^i)^2/2$
- assume asymmetric change in externalities that calls for $d\tau^1 > 0$
- in national planning equilibrium, unilateral intervention
- under global coordination,

$$d\tau_0^1 = \frac{\gamma^2 d\eta}{2\left(\gamma^1+\gamma^2\right)} = -d\tau_1^1 \quad \text{and} \quad d\tau_0^2 = -\frac{\gamma^1 d\eta}{2\left(\gamma^1+\gamma^2\right)} = -d\tau_1^2$$

- extreme cases: $\gamma^1 = 0$ or $\gamma^1 \to \infty$

Further Results on Imperfect Policy Instruments

- If set of *external* policy instruments is not effectively complete, it is optimal to distort *domestic* policies to target external transactions

$\rightarrow$ global coordination needs to also involve domestic policies

Case III: Imperfections in International Markets

- Limited risk markets
- Financial constraints
- Price rigidities and AD externalities
- Cross-border externalities

Conclusions

- Spillover effects from national economic policymaking are efficient if
  1. policymakers act competitively
  2. have complete set of instruments

     – and –
  3. international markets are free of imperfections

$\rightarrow$ Benchmark result to channel discussion on “global cooperation”