International Spillovers and Guidelines for Policy Cooperation

Anton Korinek

Johns Hopkins University and NBER

Presentation at the IMF 15th Jacques Polak Annual Research Conference

November 2014

1 Financial support from the IMF Research Fellowship and INET/CIGI are gratefully acknowledged.
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.

→ 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
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 $i = 1, \ldots, N$ of mass $\omega^i$ 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)
- $\zeta^i$ ... bundle of domestic policies
- $Z^i$ ... bundle of exogenous parameters
- $Q$ ... vector of world market prices of $m^i, M^i$
- $\tau^i$ is full set of tax instruments on intl transactions rebated via $T^i$
Setup of Baseline Model

- Countries \( i = 1, \ldots, N \) of mass \( \omega^i \) 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)
- \( \zeta^i \) ... bundle of domestic policies
- \( Z^i \) ... bundle of exogenous parameters
- \( Q \) ... vector of world market prices of \( m^i, M^i \)
- \( \tau^i \) is full set of tax instruments on intl transactions rebated via \( T^i \)
Example 1: Canonical open economy macro model:

$$\max_{(c^i_t, b^i_{t+1})} \sum_t \beta^t u(c^i_t) \quad \text{s.t.} \quad c^i_t + (1 - \xi^i_t)b^i_{t+1}/R_{t+1} = y^i_t + b^i_t$$

Mapping:
- define net imports $m^i_t = c^i_t - y^i_t = b^i_t - b^i_{t+1}/R_{t+1}$
- domestic variables $x^i = \{c^i_t\}$
- state variables $Z^i = \{y^i_t\}$, domestic policies $\zeta^i = \emptyset$
- world market prices $Q_t = 1/\prod_{s=0}^t R_{s+1}$
- external policy instruments $(1 - \tau^i_t) = 1/\prod_{s=1}^t (1 - \xi^i_{s+1})$

$\rightarrow$ utility $U^i(x^i) = \sum_t \beta^t u(c^i_t)$
$\rightarrow$ constraints $f^i_t(\cdot) = c^i_t - y^i_t - m^i_t \leq 0 \ \forall t$
Example 1: Canonical open economy macro model:

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

Mapping:

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

\[\rightarrow \text{utility} \ U^i(x^i) = \sum_t \beta^t u(c_t^i)\]

\[\rightarrow \text{constraints} \ f_t^i(\cdot) = c_t^i - y_t^i - m_t^i \leq 0 \ \forall t\]
Other Examples:

- multiple traded goods: \( m^i = (m_{t,k}^i) \) with \( k = 1 \ldots K \)
- multiple states of nature: \( m^i = (m_{t,s}^i) \) with \( s \in S \)
- non-traded goods: \( x^i = (c_{T,t}^i, c_{N,t}^i, y_{N,t}^i) \) and \( f_{t,2}^i = y_{N,t}^i - c_{N,t}^i \)
- labor: \( x^i = (c_t^i, \ell_t^i) \) and \( U^i(x^i) = \sum_t \left[ u(c_t^i) - d(\ell_t^i) \right] \)
- capital: \( x^i = (c_t^i, k_t^i) \) and \( f_t^i \) 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
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

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

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

→ determines global competitive equilibrium

Key Question

Is the Nash equilibrium among national planners efficient?
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

→ determines global competitive equilibrium

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 $(\zeta^i, \tau^i)$ may entail spillover effects
- BUT: spillover effects are mediated through global prices $Q$
  → first welfare theorem applies at the level of planners
  → global reallocation of capital/goods is efficient market response
Spillovers from Policy Intervention

Equilibrium in World Capital Markets: Baseline

\[ R^* = b^*(R) \]

\[ S^A = b^A(R) \]

\[ D^B = -b^B(R) \]
Spillovers from Policy Intervention

Equilibrium in World Capital Markets: Externalities

The diagram illustrates the equilibrium in world capital markets with externalities. The axes are labeled as $R$ for return and $b$ for some other variable, likely related to capital inflows or outflows. The diagram includes the supply ($S^A$) and demand ($D^B, D^{B*}$) curves, representing the interaction between different economies.

- $S^A$: Supply curve for country A
- $D^B$: Demand curve for country B
- $D^{B*}$: Alternative demand curve for country B

The diagram shows the intersection points where supply and demand curves meet, indicating equilibrium rates. The shaded areas represent the market outcomes under different policies or external conditions.
Equilibrium in World Capital Markets: Efficient Intervention
Baseline model: $V_M^i = 0 \rightarrow$ no externalities

Example of learning externalities:

- learning-by-exporting externalities: $\Delta Y^i_{t+1} = \varphi(M^i_t)$
  
  $$f^i(\cdot) = Y^i_{t+1} - Y^i_t - \varphi(M^i_t) \leq 0$$

- learning-by-doing externalities: $Y^i_t = A_t^i L_t^i$ and $\Delta A^i_{t+1} = \psi(L^i_t)$
  
  $$f^i_1(\cdot) = A^i_{t+1} - A_t^i - \psi(L^i_t) \leq 0$$
  
  $$f^i_2(\cdot) = A_t^i u'(C^i_t) - d'(L^i_t) \leq 0 \quad \text{(no labor subsidy)}$$

Optimal policy for economy $i =$ inflow controls $= \text{globally optimal!}$
Example of aggregate demand externalities at the ZLB:

- consider zero lower bound on the nominal interest rate:
  \[ \nu_{t+1}^i \geq 0 \]
- output is demand-determined: \( \tilde{Y}_t^i = C_t^i - M_t^i \)
  with the usual (New) Keynesian frictions in the background
- if world interest rate high enough: \( \frac{1 + r_{t+1}^i}{1 + \pi_{t+1}^i} - 1 > 0 \rightarrow \) no problem
- if world interest rate too low: \( \frac{1 + r_{t+1}^i}{1 + \pi_{t+1}^i} - 1 = 0 \rightarrow \) imports \( M_t^i \) eat into domestic aggregate demand

Optimal policy for economy \( i = \) inflow controls = globally optimal!
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
  \[ \rightarrow \text{consumption smooth} \]

- Under open capital accounts: fluctuations in world interest rate lead to inflows/outflows
  \[ \rightarrow \text{workers suffer positive/negative income shocks} \]

*Optimal policy = smoothing capital account = globally optimal!*
Robustness: efficiency result holds under all discussed extensions:

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

→ 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
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.
Spillovers from Policy Intervention

Equilibrium in World Capital Markets: Baseline

\[ S^A = b^A(R) \]
\[ D^B = -b^B(R) \]
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 $Q^i_M = 0$ → no market power over $Q$
- countries with little cross-country trade have $M^i \approx 0$ → no welfare benefit to manipulating price so $\mathcal{E}^i_{Q,M} \approx 0$
- sign of intervention $\hat{\tau}^i = \text{sign of trade position } M^i_{t,k,s}$:
  - 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
If external policy instruments \((\tau^i)\) are available, a planner will never distort domestic policies \(\zeta^i\) to exert market power.

If external policy instruments \((\tau^i)\) 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 \((\tau^i)\)
- 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 \(C^i(\tau^i) = \gamma^i \sum (\tau^i_t)^2 / 2\)
  - non-existing instruments if \(\gamma^i \to \infty\)
  - restrictions on instruments \(C^i(\tau^i) = \gamma^i \sum (\tau^i_{t,s} - \tau^i_{t,0})^2 / 2\) 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

\[ \sum \omega_i C_i'(\tau_i)(1 - \tau_i) = 0 \]

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 $\tau^i = 0 \forall i$
Example of Sharing the Regulatory Burden:

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

$$d\tau^1_0 = \frac{\gamma^2 d\eta}{2 (\gamma^1 + \gamma^2)} = -d\tau^1_1 \quad \text{and} \quad d\tau^2_0 = -\frac{\gamma^1 d\eta}{2 (\gamma^1 + \gamma^2)} = -d\tau^2_1$$

- extreme cases: $\gamma^1 = 0$ or $\gamma^1 \to \infty$
If set of *external* policy instruments is not effectively complete, it is optimal to distort *domestic* policies to target external transactions

→ 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
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

→ Benchmark result to channel discussion on “global cooperation”