Monetary Union Begets Fiscal Union

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Workshop on Current Monetary Policy Challenges
European Central Bank
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Ever-closer union?

- Why did Europe form a currency union?
  - Given nominal rigidities, real exchange rate realignments are costly
    - Friedman (1953)
  - Benefits are elusive
  - Problems made worse by lack of fiscal integration (Kenen 1969)

- As evidenced by Brexit and angry German voters:
  - Europe’s fiscal union is only implicit
  - Donor countries often hit their participation constraint
Our argument

- Assume that the costs of monetary union are mitigated by fiscal risk-sharing ("fiscal union")
  - Captures Kenen’s view
  - Starkly true in our benchmark model: “risk-sharing miracle”

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  - It makes real exchange rate realignments impossible in the short-run
  - ... not sharing risks becomes more costly
  - ... transfers are facilitated
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  - Captures Kenen’s view
  - Starkly true in our benchmark model: “risk-sharing miracle”
- Our argument: **monetary union enhances/enables fiscal union**:
  - It makes real exchange rate realignments impossible in the short-run
  - ... *not* sharing risks becomes more costly
  - ... transfers are facilitated
- This doesn’t mean monetary union is Pareto improving overall: tradeoff is
  - risk-sharing benefits vs. stabilization costs
- Moreover: cooperation is facilitated, not guaranteed
## Optimal Currency Areas: review

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Other related literature

▶ Limited commitment

▶ Currency unions with nominal rigidities
  ▶ New Open Economy Macro (Obstfeld and Rogoff 1995,...)
  ▶ Farhi and Werning (2013)

▶ Commitment benefits of monetary unions
  ▶ Loosening borrowing constraints: Arellano and Heathcote (2010)
Outline

1. Model structure and intuitions

2. Risk-sharing benefits

3. Optimal joint policy & other extensions
Preferences, endowments and technologies

- 2 countries, infinite horizon, same preferences

\[
\mathbb{E} \left[ \sum_{t=0}^{\infty} \beta^t u(C_{T,t}, C_{NT,t}, N_t) \right]
\]

- Each period, special case of Farhi-Werning (2013):

\[
u(C_T, C_{NT}, N) = \log C_T + \alpha \left( \log C_{NT} - \frac{1}{1 + \phi} N^{1+\phi} \right)
\]

- Nontradables are produced from labor: \( Y_{NT} = N \) (immobility)

- Tradable: risky endowment \( \frac{E^1_T(s)}{E^2_T(s)} \neq \frac{E^1_T(s')}{E^2_T(s')} \), \( s \in S \) finite

  \( \Rightarrow \) ex-ante benefits from risk-sharing (asymmetric shocks)

- External balance: \( C^1_T(s) + C^2_T(s) = E^1_T(s) + E^2_T(s) \equiv E_T(s) \)
Preference assumptions: nontradables

- Substituting production $Y_{NT} = C_{NT} = N$:

$$
u = \log C_T + \alpha \left( \log C_{NT} - \frac{1}{1 + \phi} C_{NT}^{1+\phi} \right)$$

$f(C_{NT})$

⇒ efficient amount of nontradable production constant across dates and states:

$$\frac{(C_{NT}^*)^\phi}{C_{NT}^*} = 1$$

⇒ $N^* = C_{NT}^* = 1$

$$f^* \equiv f(C_{NT}^*)$$
Preference assumptions: homotheticity

Consumption demand is homothetic:

\[ C_{iNT}^i(s) = \alpha \left( \frac{P_{iNT}(s)}{P_T^i(s)} \right)^{-1} \]
\[ C_T^i(s) = \alpha \begin{pmatrix} \frac{P_T^i(s)}{P_{iNT}(s)} \end{pmatrix} C_T^i(s) \]

Real exchange rate

- With flexible prices:
  - \( C_{NT}^* \) always achieved.
  - Real exchange rate adjusts: appreciates \( \left( \frac{P_T^i(s)}{P_{iNT}(s)} \downarrow \right) \) when \( C_T^i(s) \uparrow \) to ensure rebalancing towards tradables.
Preference assumptions: homotheticity

Consumption demand is homothetic:

\[ C_{NT}^i(s) = \alpha \left( \frac{P_{NT}^i(s)}{P_T^i(s)} \right)^{-1} \quad C_T^i(s) = \alpha \frac{P_T^i(s)}{P_{NT}^i(s)} \]

Real exchange rate

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  - \( C_{NT}^* \) always achieved.
  - Real exchange rate adjusts: appreciates (\( \frac{P_T^i(s)}{P_{NT}^i(s)} \downarrow \)) when \( C_T^i(s) \uparrow \) to ensure rebalancing towards tradables.

- Introduce nominal rigidities in \( NT: P_{NT}^i \)
  - Prices set before \( s \) is realized (monopolistic competition + labor subsidy + flexible wages)
  - World price for tradables: \( P_T^*(s) = 1 \) in foreign currency
  - Domestic central bank adjusts the nominal exchange rate \( E^i(s) \)
Consequences of nominal rigidities

\[ C_{NT}^i (s) = \alpha \frac{\mathcal{E}_i^i (s)}{P_{NT}^i} C_T^i (s) \]

- **An independent central bank:**
  - can adjust \( \mathcal{E}_i^i (s) \) to recreate efficient ReR variations

- **A union-wide monetary policy**
  - sets a common exchange rate \( \mathcal{E}_i^i (s) = \mathcal{E} (s) \) for \( i = 1, 2 \)
  - in general, is no longer able to stabilize perfectly
  - *indirect utility*

\[
v \left( C_T, \frac{\mathcal{E} (s)}{P_{NT}^i} \right) = \log C_T + f \left( \alpha \frac{\mathcal{E} (s)}{P_{NT}^i} C_T \right)\]
Risk-sharing miracle

- Observe:

\[ C_{NT}^i(s) = \alpha \frac{\mathcal{E}(s)}{P_{NT}^i} C_T^i(s) \quad \Rightarrow \quad \frac{C_{NT}^1(s)}{C_{NT}^2(s)} = \left( \frac{P_{NT}^1}{P_{NT}^2} \right)^{-1} \frac{C_T^1(s)}{C_T^2(s)} \]

- Under *perfect risk-sharing of tradables*: \( C_T^1(s) = \gamma^1 E_T(s) \)

  - Central bank regains ability to stabilize:
  - Price-setting ensures \( \frac{P_{NT}^1}{P_{NT}^2} = \frac{\gamma^1}{1-\gamma^1} \)
  - CB maintains \( \mathcal{E}(s) E_T(s) \) constant at \( \frac{P_{NT}^1}{\alpha \gamma^1} \). Then

\[ C_{NT}^i(s) = \alpha \frac{\mathcal{E}(s) E_T(s)}{P_{NT}^i} \gamma^i = 1 \quad \forall i \]
Risk-sharing miracle

- Observe:

\[ C_{NT}^i(s) = \alpha \frac{E^i(s)}{P_{NT}^i} C_T^i(s) \Rightarrow \frac{C_{NT}^1(s)}{C_{NT}^2(s)} = \left( \frac{P_{NT}^1}{P_{NT}^2} \right)^{-1} \frac{C_T^1(s)}{C_T^2(s)} \]

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- **Risk-sharing miracle**: alignment of fiscal policy allows the central bank to achieve the first-best

- Departures from **fiscal integration** are the source of costs (Kenen)
Commitment assumptions

- Countries cannot commit to tradables risk-sharing
  - Any transfer has to be sustained by a credible promise of future reciprocity (subgame-perfect equilibrium)
  - State-by-state participation constraints:
    
    \[
    \text{loss from making transfer} \leq \beta \cdot (\text{discounted expected benefits from receiving future transfers})
    \]

- We focus on the “best SPEs” in a stationary class

- Countries fully commit to monetary union. One-off decision.
- Under flexible prices or independent MP, the SPEs are characterized in the limited commitment literature
- Under monetary union, aggregate demand effects complicate the problem
Endowment structure and contracts

- Assume that \( \{s^t\} \) is iid symmetric:

\[
\forall s, \exists s': \pi(s') = \pi(s) \text{ and } \left( E^1_T(s'), E^2_T(s') \right) = \left( E^2_T(s), E^1_T(s) \right)
\]

- Group pairs \((s, s')\) \(\equiv\) \(z\). Given \(z\), each country has:
  - 1/2 chance of \(E^L_T(z)\)
  - 1/2 chance of \(E^H_T(z) > E^L_T(z)\)

- Restrict contracts to stationary transfer schemes \(T(z)\) such that

\[
C^L_T(z) = E^L_T(z) + T(z)
\]
\[
C^H_T(z) = E^H_T(z) - T(z)
\]

- **Definition:** \(T\) features some risk sharing if \(\forall z\)

\[
0 \leq T(z) \leq \frac{E^H_T(z) - E^L_T(z)}{2}
\]

implying \(E^L_T(z) \leq C^L_T(z) \leq C^H_T(z) \leq E^H_T(z)\)
Outline

1. Model structure and intuitions

2. Risk-sharing benefits

3. Optimal joint policy & other extensions
Ex-ante symmetry implies identical price-setting in both countries. Normalize:

\[ P_{NT}^L = P_{NT}^H = 1 \]

In monetary union: central bank sets \( \mathcal{E}^i = \mathcal{E} \) to maximise

\[
\frac{1}{2} \nu (C_L, \mathcal{E}) + \frac{1}{2} \nu (C_H, \mathcal{E})
\]

- Takes into account the aggregate demand externalities
- Look for transfers \( \{ T(z) \} \) that form an SPE
  - Worst punishment is autarky, \( T = 0 \)
  - Best SPE can be sustained by threat of \( T = 0 \) reversion
Two results

- Consider an implicit fiscal union without monetary union, with transfers $\{ T(z) \}$. We show:

  1. After joining the monetary union, holding fixed the limited commitment friction, the same $\{ T(z) \}$ is still achievable: risk-sharing in tradables is always weakly better in the monetary union

  2. In an example, the improvement is so powerful that countries go all the way from autarky to first-best.
Central bank problem, continued

- Given $z$, $T$, the central bank knows that
  
  $$C^H_T = E^H_T(z) - T(z)$$
  $$C^L_T = E_T(z) - C^H_T$$

- Maximization of its objective leads to a real exchange-rate rule
  
  $$\mathcal{E}_z(C^H_T) = \frac{1}{\alpha} \left( \frac{1}{2} \left( \frac{1}{C^H_T} \right)^{-(1+\phi)} + \frac{1}{2} \left( \frac{1}{E_T(z) - C^H_T} \right)^{-(1+\phi)} \right)^{-\frac{1}{1+\phi}}$$

- Puts $H$ in a boom and $L$ in a bust, unless $C^H_T = \frac{E_T(z)}{2}$ (RS miracle)

- Define indirect utility to reflect this monetary policy response
  
  $$\tilde{\nu}_z(C_T) \equiv \log C_T + f(\alpha \mathcal{E}_z(C_T) C_T)$$

- Compares with $\log C_T + f^*$ under independent monetary policy.
Theorem

Any state-contingent \( \{T(z)\} \) plan with some risk sharing that is achievable in SPE under independent monetary policy is achievable under currency union.

- This is the precise sense in which currency union allows us to do (weakly) better with risk sharing.
- Any transfer arrangement that was achievable and desirable without currency union is still achievable with it, but there may be additional options.
Proof of theorem

- If \( \{ T(z) \} \) is achievable under independent monetary policy, it must satisfy \( H \)'s participation constraint at each \( z \)

\[
\log \left( E_T^H (z) \right) - \log \left( C_T^H (z) \right) \leq \frac{\beta}{1 - \beta} \sum_z \frac{\pi (z')}{2} \left[ \log \left( \frac{C_T^L (z')}{E_T^L (z')} \right) - \log \left( \frac{E_T^H (z')}{C_T^H (z')} \right) \right]
\]

- Left is one-shot gain from defaulting, right is expected gain from future risk sharing.

- Under currency union, same participation constraint...
  - ... with \( \tilde{v}_z(\cdot) \) instead of log
Proof of theorem

- This change slackens both sides of the inequality.
- On the right, there are greater expected gains from risk-sharing.

\[ \log C_T + f^* \]
\[ \tilde{\nu}_z(C_T) \]
Proof of theorem

- On the left, the temptation to leave the arrangement is less due to the boom.

\[
\log C_T + f^* \\
\nu_z(C_T)
\]

- Current boom: ReR is not appreciated enough as a result of monetary union membership

- Refusing to make transfer $\Rightarrow$ ReR is further away from its optimal level $\Rightarrow$ worse inflationary pressures
An example of powerful improvement

- Example: \( z = 1 \): 2 states, endowments \((e_L, e_H) = (1 - e, e), e > \frac{1}{2}\)
- An improvement is \((c_L, c_H) = (1 - e + T, e - T), 0 < T \leq \frac{1}{2} - e\)
- Suppose countries run their **independent monetary policy**. The value of being in the high state under the contract is
  \[
  V^H(T) = \log(e - T) + \frac{\beta}{1 - \beta} \left( \frac{1}{2} \log(e - T) + \frac{1}{2} \log(1 - e + T) \right) + \frac{f^*}{1 - \beta}
  \]
- The participation constraint states that \( V^H(T) \geq V^H(0) \) implying
  \[
  \left. \frac{dV^H}{dT} \right|_{T=0} = -\frac{1}{e} + \frac{\beta}{1 - \beta} \frac{1}{2} \left( -\frac{1}{e} + \frac{1}{1 - e} \right) \geq 0
  \]
- Better-than-autarky risk-sharing can be sustained if and only if
  \[
  \beta \geq \beta^{indep} = 2 \left( 1 - e \right)
  \]
An example of powerful improvement

- **Autarky** with independent monetary policy

- Full risk-sharing under monetary union

- When risk-sharing is perfect, $T = 1 - e^{\beta}$, both countries are at first-best.

- Under independent monetary policy, this is sustained if $\log(e) - \log(\frac{1}{2}) \geq \beta \geq \beta_{indep}$, strictly declining in $\alpha$

- One-shot gain from defaulting $\leq \beta - \beta_{indep} \geq \beta_{indep}$

- Expected loss from lack of future risk-sharing yielding $\beta \geq \beta_{indep}$

- Under monetary union, sustained with $\beta \geq \beta_{union}(\alpha, \phi, e)$.
An example of powerful improvement

- When risk-sharing is **perfect**, $T = \frac{1}{2} - e$, both countries are at first-best.
- Under independent monetary policy, this is sustained if

\[
\log(e) - \log\left(\frac{1}{2}\right) \leq \frac{\beta}{1 - \beta} \frac{1}{2} \left(2 \log \frac{1}{2} - \log(e) - \log(1 - e)\right)
\]

One-shot gain from defaulting

Expected loss from lack of future risk-sharing

yielding $\beta \geq \bar{\beta^{\text{indep}}} \geq \underline{\beta^{\text{indep}}}$
An example of powerful improvement

When risk-sharing is perfect, \( T = \frac{1}{2} - e \), both countries are at first-best.

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One-shot gain from defaulting

Expected loss from lack of future risk-sharing

yielding \( \beta \geq \beta^{\text{indep}} \geq \beta^{\text{indep}} \)
An example of powerful improvement

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Autarky

Full risk-sharing

with independent monetary policy

- When risk-sharing is **perfect**, $T = \frac{1}{2} - e$, both countries are at first-best
- Under independent monetary policy, this is sustained if

$$\log (e) - \log \left( \frac{1}{2} \right) \leq \frac{\beta}{1 - \beta} \left( 2 \log \frac{1}{2} - \log (e) - \log (1 - e) \right)$$

One-shot gain from defaulting

Expected loss from lack of future risk-sharing

yielding $\beta \geq \beta^{\text{indep}} \geq \beta^{\text{indep}}$

- Under monetary union, sustained with $\beta \geq \beta^{\text{union}} (\alpha, \phi, e)$, strictly declining in $\alpha$
An example of powerful improvement

When risk-sharing is **perfect**, \( T = \frac{1}{2} - e \), both countries are at first-best.

Under independent monetary policy, this is sustained if

\[
\log(e) - \log\left(\frac{1}{2}\right) \leq \frac{\beta}{1 - \beta} \left(2 \log \frac{1}{2} - \log(e) - \log(1 - e)\right)
\]

One-shot gain from defaulting

Expected loss from lack of future risk-sharing

yielding \( \beta \geq \overline{\beta}^{\text{indep}} \geq \overline{\beta}^{\text{indep}} \)

Under monetary union, sustained with \( \beta \geq \overline{\beta}^{\text{union}}(\alpha, \phi, e) \), strictly declining in \( \alpha \)
Parametrization: $e = 0.7, \phi = 1$

- For countries with $\beta^{\text{union}} \leq \beta \leq \beta^{\text{indep}}$, the risk-sharing benefit of monetary union is so powerful that countries can move from autarky to first-best.
Recap on costs and benefits

- **Stabilization costs of monetary union:**
  - *Recall:* Conditional on tradable consumption, utility is always weakly lower under a monetary union than under independent policy.
  - $\beta \leq \beta_{\text{union}} \Rightarrow$ independent monetary policy Pareto-dominates monetary union

- **Risk-sharing benefits**
  - *Recall* the risk-sharing miracle: any allocation that achieves FB risk sharing in tradables enables monetary union to attain the overall first-best
  - $\beta_{\text{union}} \leq \beta \leq \beta_{\text{indep}} \Rightarrow$ monetary union Pareto-dominates independent monetary policy *conditional* on maximal collaboration

- In general there is a tradeoff
- EU may not have realized the potential for improved risk-sharing
Outline

1. Model structure and intuitions

2. Risk-sharing benefits

3. Optimal joint policy & other extensions
Extensions

1. Alternative timing with more commitment for monetary policy
   - Optimal joint monetary and fiscal policy
2. Shocks to nontradables
3. Exploring the full frontier of contracts
Alternative timing

Central bank can now internalize the constraints facing the fiscal union

- Sets \( \{\mathcal{E}(z)\} \) to maximize:

\[
\sum \pi(z) \left\{ \frac{1}{2} \nu \left( C^L_T(z), \mathcal{E}(z) \right) + \frac{1}{2} \nu \left( C^H_T(z), \mathcal{E}(z) \right) \right\}
\]

\( \mathcal{E}(z) \) is a measure of economic slack across the union.
Alternative timing

- Central bank can now internalize the constraints facing the fiscal union
- Sets \( \{ \mathcal{E}(z) \} \) to maximize:
  \[
  \sum \pi(z) \left\{ \frac{1}{2} v \left( C_T^L(z), \mathcal{E}(z) \right) + \frac{1}{2} v \left( C_T^H(z), \mathcal{E}(z) \right) \right\}
  \]

- **Result**: in best SPE, the average labor wedge in state \( z \)—a measure of economic slack across the union—is strictly decreasing in the dispersion \( \frac{E^H(z)}{E^L(z)} \) between endowments (unless countries fully share risks)
  - Contrasts with usual results in optimal monetary policy in currency union, where the average labor wedge is always zero.
Active monetary policy, comments

- Monetary policy can proactively slant policy in order to encourage fiscal union.
  - Aggregate stabilization is not always the right objective.
- Should have a “counter-dispersion” policy, creating booms in states where there is high dispersion of endowments and better-endowed countries are reluctant to make transfers.
- Without proactive monetary policy, fiscal union will not live up to its full potential.
Shocks to nontradable side

- Shocks to the nontradable side of the economy break the “risk-sharing miracle”.
  - Perfect risk sharing of tradables is no longer sufficient for first-best nontradable consumption.
  - Instead, it is optimal to move away from first-best tradable risk sharing in order to partly offset nontradable shocks.

- When nontradable shocks are relatively more important, the balance of costs and benefits generally shifts against monetary union.
  - Less benefit from encouraging risk sharing of tradable shocks.
  - Fiscal union can help offset nontradable shocks, but this problem wouldn’t even exist with independent monetary policy.
  - In extreme case of only nontradable shocks, can achieve first-best without monetary union, and it can only hurt.

- In practice, nontradable shocks (e.g. housing sector) are big contributors to economic instability in Europe.
Conclusion

- ... it is worth recalling that most of Europe regards the single-currency project as primarily political. Many countries see EMU as a big step towards the goal of ‘ever closer union’... (The Economist, April 1998)
- Balassa’s integration staircase (1962, “The theory of economic integration”)

- We provide a sense in which monetary union is a step towards fiscal union: risk-sharing benefit adds to this side of the ledger for monetary unions
- To balance against stabilization costs, especially with $NT$ shocks when the risk-sharing miracle breaks down
- Proactive monetary policy can help the fiscal union
Thank you!
Dynamics: iid stationary case

- Endowments: ex-ante symmetric iid 3-state:

\[(e_L, e_M, e_H) = \left(1 - e, \frac{1}{2}, e\right)\]

\[(\pi_L, \pi_M, \pi_H) = (\pi, 1 - 2\pi, \pi)\]

- Consider the best contract from section 2: maximal sustainable \(\bar{T}\) such that

\[(c_L, c_M, c_H) = \left(1 - e + \bar{T}, \frac{1}{2}, e - \bar{T}\right)\]
Dynamics: improved contract

- We can give more to country 1 in $L$:

These more complex dynamics prevent us from being as clear about the nature of the risk-sharing improvement of monetary unions as in the stationary case.

- (They have independent interest since the stationary distribution is more complex than in the “traditional” limited commitment literature)