Monetary Union Begets Fiscal Union

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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
- 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

Benefits	Costs
Reduced transactions costs Thicker currency markets ...	Stabilization (Friedman 1953) *due* to: Nominal rigidities (Friedman 1953) Labor immobility (Mundell 1961) Asymmetric shocks (Mundell 1961) Lack of fiscal integration (Kenen 1969)

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Risk-sharing (this paper)	Lack of fiscal integration (Kenen 1969)

Other related literature

- **Limited commitment**
  - Kehoe and Levine (1993), Coate and Ravallion (1993), Kocherlakota (1996), Alvarez and Jermann (2000), Ligon, Thomas and Worrall (2002)
  - Sovereign debt applications: Kletzer and Wright (2000), Kehoe and Perri (2003)
- **Currency unions with nominal rigidities**
  - New Open Economy Macro (Obstfeld and Rogoff 1995,...)
  - Benigno (2004), Gali and Monacelli (2005, 2008)
  - Farhi and Werning (2013)
- **Commitment benefits of monetary unions**
  - Avoiding beggar-thy-neighbor: Fuchs and Lippi (2006)
  - 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

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

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

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

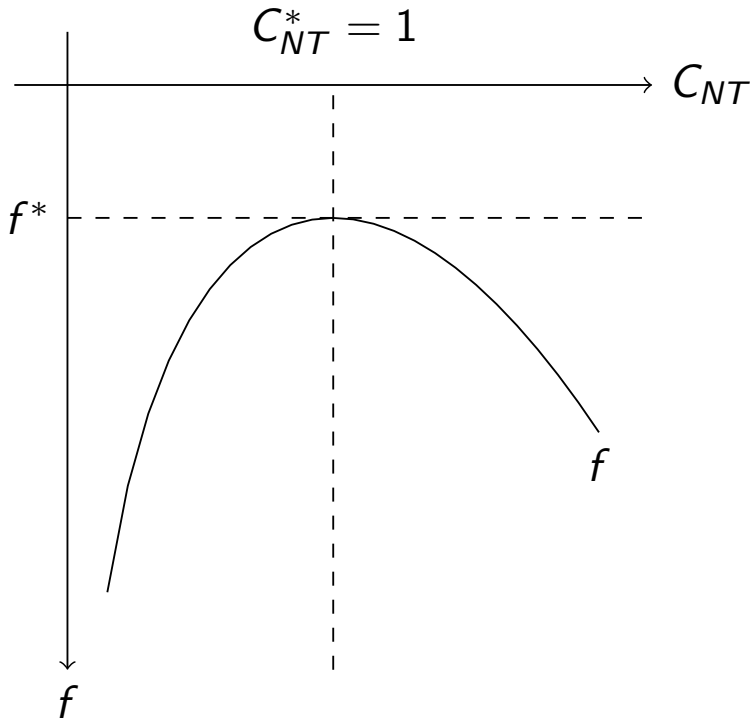
- Nontradables are produced from labor: $Y_{NT}=N$ **(immobility)**
- Tradables: risky endowment $\frac{E_{T}^{1}(s)}{E_{T}^{2}(s)}\neq\frac{E_{T}^{1}(s')}{E_{T}^{2}(s')}$, $s\in\mathbf{S}$ finite
  - $\Rightarrow$ ex-ante benefits from risk-sharing **(asymmetric shocks)**
- External balance: $C_{T}^{1}\left(s\right)+C_{T}^{2}\left(s\right)=E_{T}^{1}\left(s\right)+E_{T}^{2}\left(s\right)\equiv E_{T}\left(s\right)$

Preference assumptions: nontradables

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

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

$\Rightarrow$ efficient amount of nontradable production constant across dates and states:



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

$$\Rightarrow N^* = C^*_{NT} = 1$$

$$f^* \equiv f\left(C^*_{NT}\right)$$

Preference assumptions: homotheticity

Consumption demand is homothetic:

$$C^i_{NT}(s) = \alpha \left(\frac{P^i_{NT}(s)}{P^i_T(s)} \right)^{-1} C^i_T(s) = \alpha \underbrace{\frac{P^i_T(s)}{P^i_{NT}(s)}}_{\text{Real exchange rate}} C^i_T(s)$$

- With *flexible prices:*
  - C^*_{NT} always achieved.
  - Real exchange rate adjusts: appreciates ($\frac{P^i_T(s)}{P^i_{NT}(s)} \downarrow$) when $C^i_T(s) \uparrow$ to ensure rebalancing towards tradables.

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- Introduce **nominal rigidities** in NT: P^i_{NT}
  - 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 $\mathcal{E}^i(s)$

Consequences of nominal rigidities

$$C^i_{NT}(s) = \alpha \frac{\mathcal{E}^i(s)}{P^i_{NT}} C^i_T(s)$$

- An **independent central bank**:
  - can adjust $\mathcal{E}^i(s)$ to recreate efficient ReR variations
- A **union-wide monetary policy**
  - sets a common exchange rate $\mathcal{E}^i(s) = \mathcal{E}(s)$ for $i = 1, 2$
  - in general, is no longer able to stabilize perfectly
  - *indirect utility*

$$v\left(C_T, \frac{\mathcal{E}(s)}{P^i_{NT}}\right) = \log C_T + f\left(\alpha \frac{\mathcal{E}(s)}{P^i_{NT}} C_T\right)$$

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:

$$C^i_{NT}(s) = \alpha \frac{\mathcal{E}(s)}{P^i_{NT}} C^i_T(s) \quad \Rightarrow \quad \frac{C^1_{NT}(s)}{C^2_{NT}(s)} = \left(\frac{P^1_{NT}}{P^2_{NT}}\right)^{-1} \frac{C^1_T(s)}{C^2_T(s)}$$

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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:

$$\begin{aligned}&\text{loss from making transfer}\\ \leq &\beta \cdot (\text{discounted expected benefits from receiving future transfers})\end{aligned}$$

  - 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:

$$\forall s, \exists s' : \ \pi\left(s'\right) = \pi\left(s\right) \text{ and } \left(E_T^1\left(s'\right), E_T^2\left(s'\right)\right) = \left(E_T^2\left(s\right), E_T^1\left(s\right)\right)$$

- Group pairs $(s, s') \equiv z$. Given z, each country has:
  - $1/2$ chance of $E_T^L(z)$
  - $1/2$ chance of $E_T^H(z) > E_T^L(z)$
- Restrict contracts to stationary transfer schemes $T(z)$ such that

$$C_T^L(z) = E_T^L(z) + T(z)$$
$$C_T^H(z) = E_T^H(z) - T(z)$$

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

$$0 \leq T(z) \leq \frac{E_T^H(z) - E_T^L(z)}{2}$$

implying $E_T^L(z) \leq C_T^L(z) \leq C_T^H(z) \leq E_T^H(z)$

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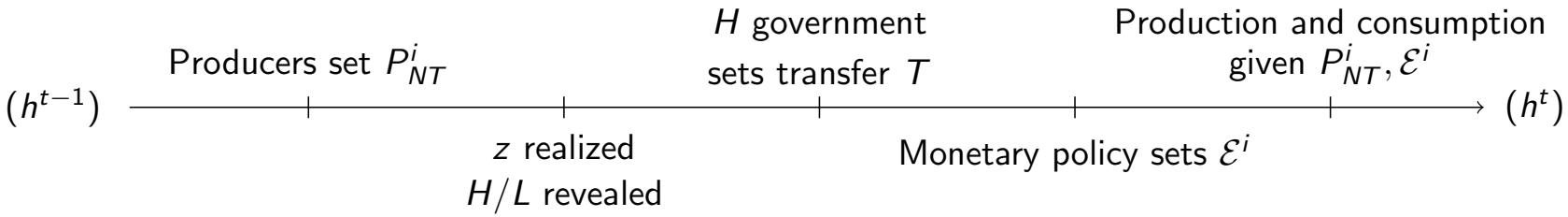
Timing



- Ex-ante symmetry implies identical price-setting in both countries. Normalize:

$$P^L_{NT} = P^H_{NT} = 1$$

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

$$\frac{1}{2} v\left(C^L_T, \mathcal{E}\right) + \frac{1}{2} v\left(C^H_T, \mathcal{E}\right)$$

  - 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

$$C_T^H = E_T^H(z) - T(z)$$
$$C_T^L = E_T(z) - C_T^H$$

- Maximization of its objective leads to a real exchange-rate rule

$$\mathcal{E}_z\left(C_T^H\right) = \frac{1}{\alpha}\left(\frac{1}{2}\left(\frac{1}{C_T^H}\right)^{-(1+\phi)} + \frac{1}{2}\left(\frac{1}{E_T(z) - C_T^H}\right)^{-(1+\phi)}\right)^{-\frac{1}{1+\phi}}$$

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

- Define indirect utility to reflect this monetary policy response

$$\tilde{v}_z(C_T) \equiv \log C_T + f(\alpha \mathcal{E}_z(C_T) C_T)$$

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

Risk-sharing benefit of monetary union

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

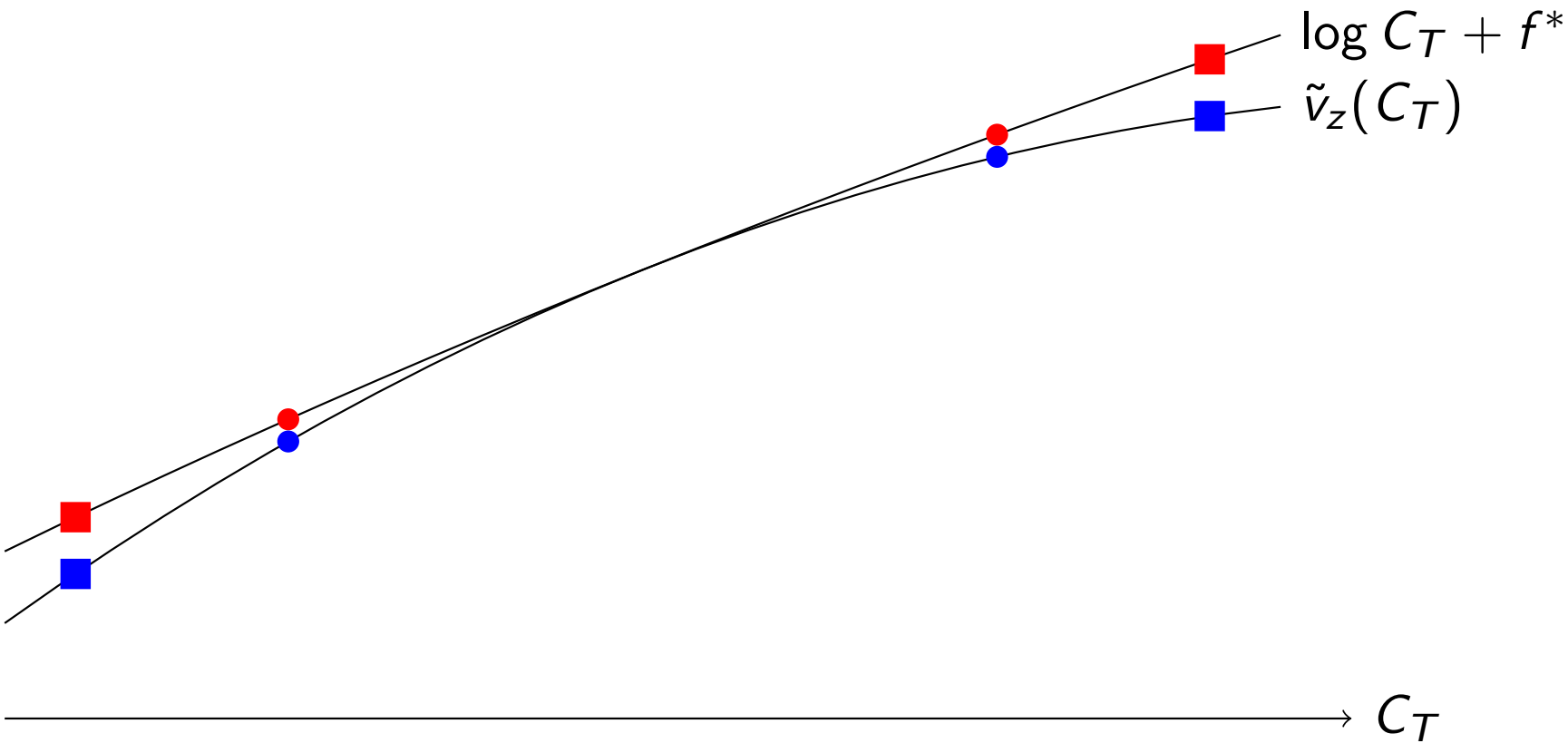
- If $\{T(z)\}$ is achievable under independent monetary policy, it must satisfy H's participation constraint at each z

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

  - 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

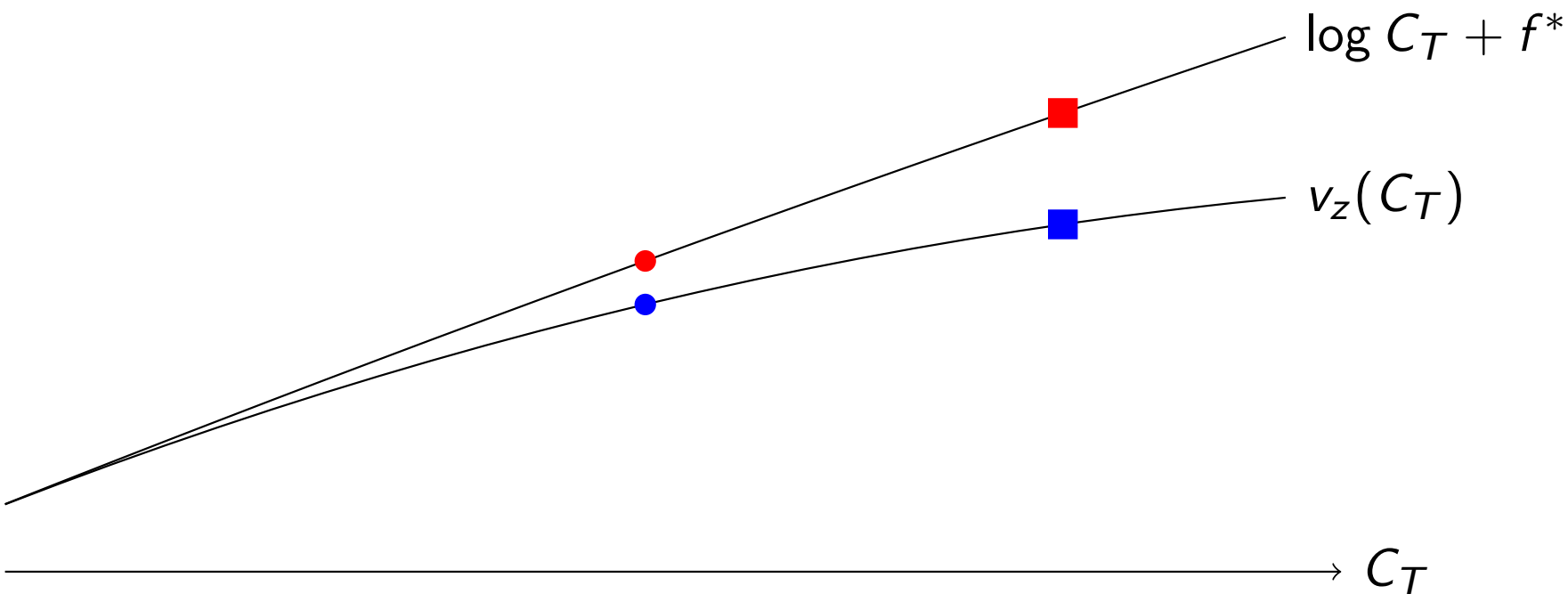
Proof of theorem

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



Proof of theorem

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



- 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

$$\beta \geq \underline{\beta}^{indep} = 2(1 - e)$$

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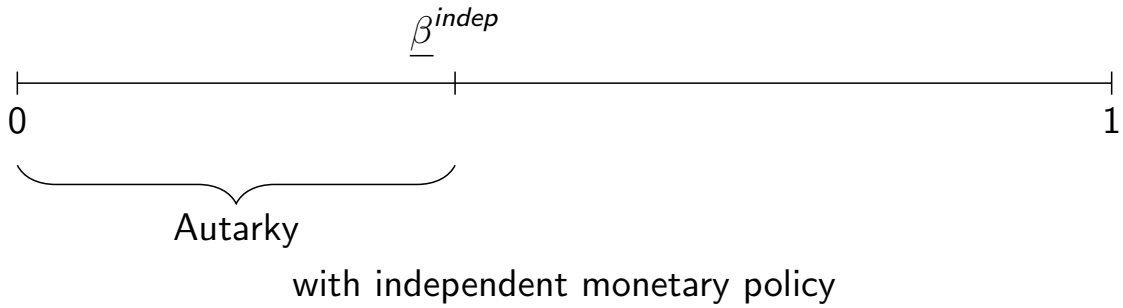

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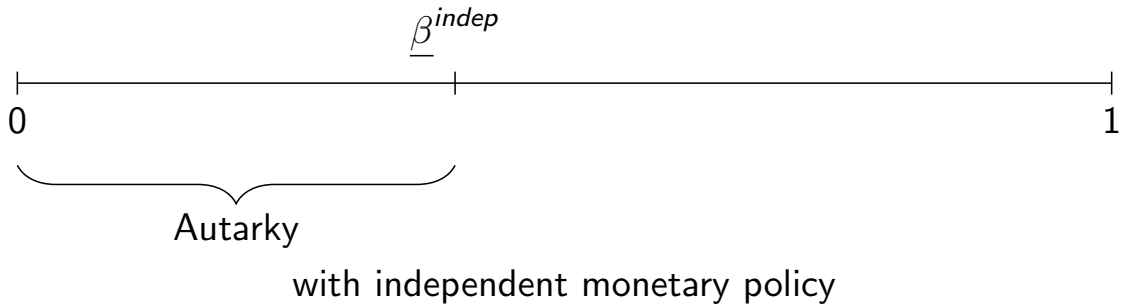

- When risk-sharing is **perfect**, $T = \frac{1}{2} - e$, both countries are at first-best
- Under independent monetary policy, this is sustained if

$$\underbrace{\log(e) - \log\left(\frac{1}{2}\right)}_{\text{One-shot gain from defaulting}} \leq \frac{\beta}{1-\beta}\frac{1}{2} \underbrace{\left(2\log\frac{1}{2} - \log(e) - \log(1-e)\right)}_{\text{Expected loss from lack of future risk-sharing}}$$

yielding $\beta \geq \overline{\beta}^{indep} \geq \underline{\beta}^{indep}$

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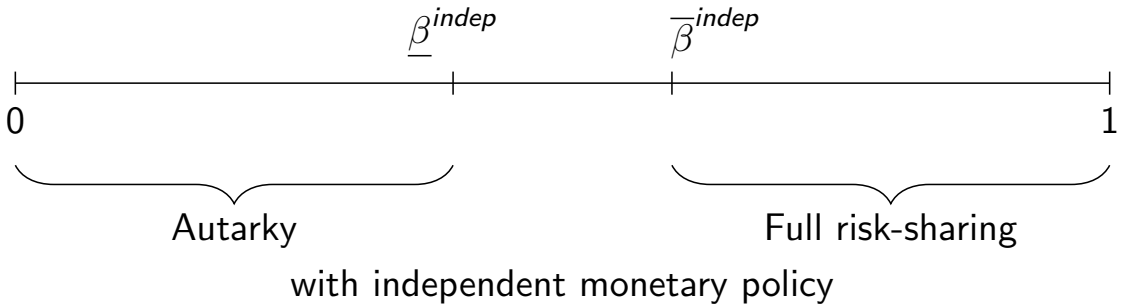

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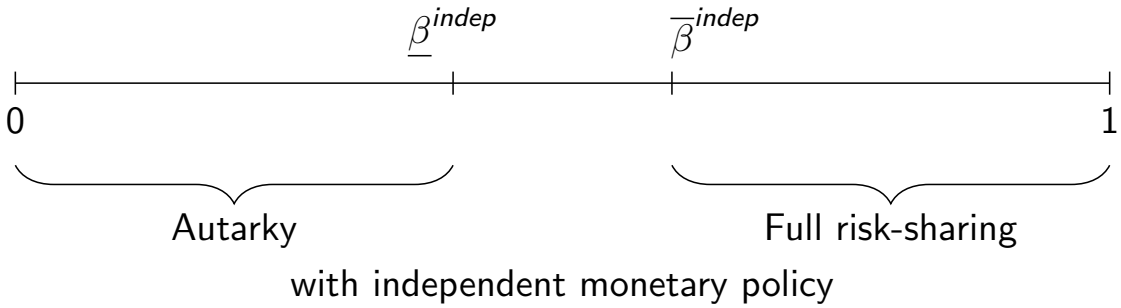

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- Under monetary union, sustained with $\beta \geq \overline{\beta}^{union}(\alpha, \phi, e)$, stricly declining in α

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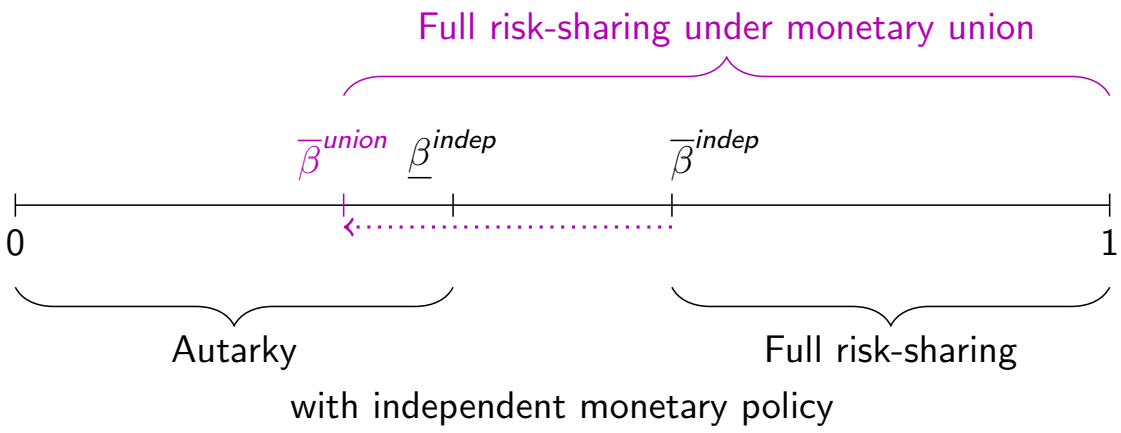

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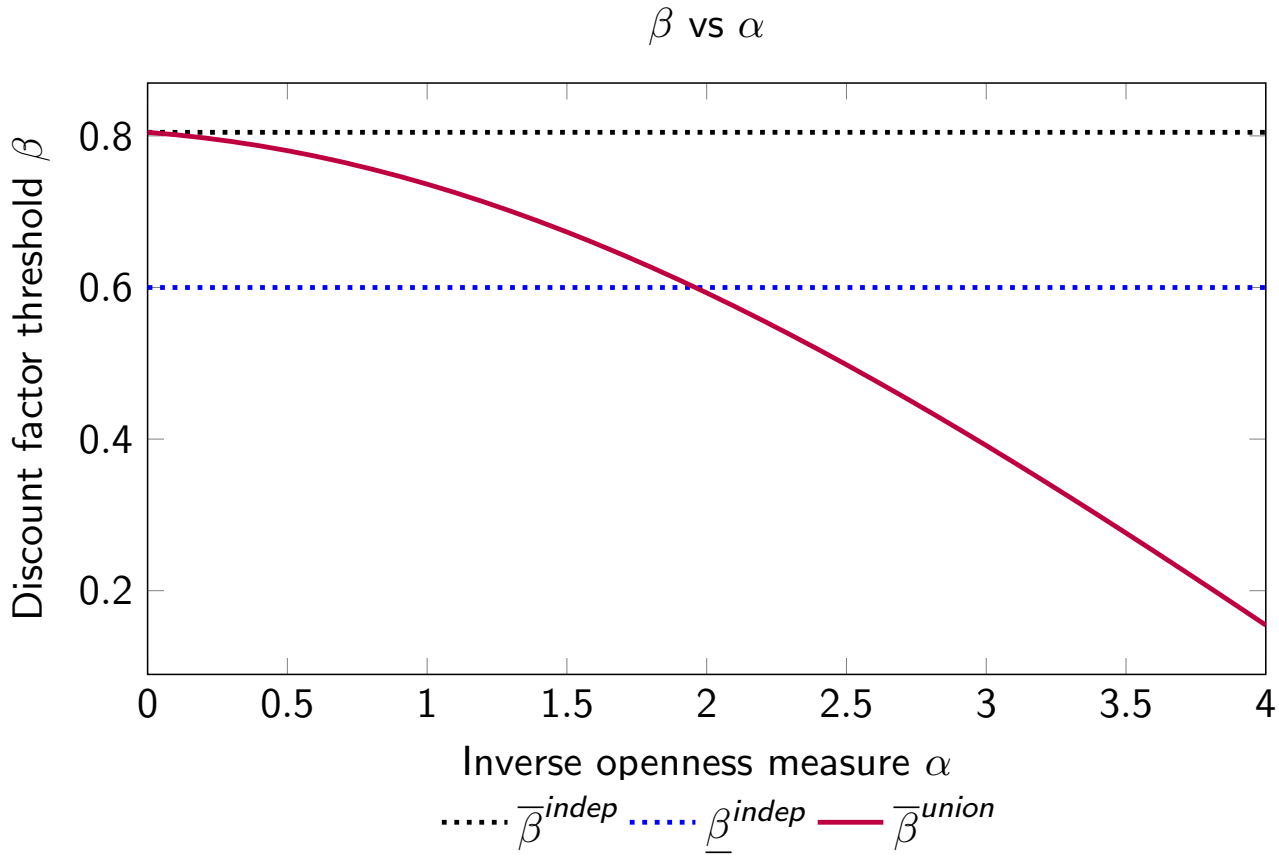
Parametrization: $e = 0.7$, $\phi = 1$

- For countries with $\overline{\beta}^{union} \leq \beta \leq \underline{\beta}^{indep}$, 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.
  - $\beta \leq \underline{\beta}^{union} \Rightarrow$ 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
  - $\overline{\beta}^{union} \leq \beta \leq \overline{\beta}^{indep} \Rightarrow$ 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

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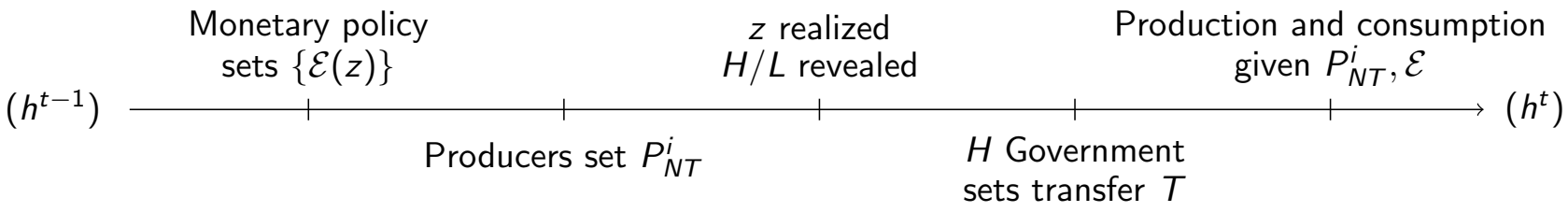
Extensions

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 Go

Alternative timing



- Central bank can now internalize the constraints facing the fiscal union
- Sets $\{\mathcal{E}(z)\}$ to maximize:

$$\sum \pi(z) \left\{ \frac{1}{2} v\left(C_T^L(z), \mathcal{E}(z)\right) + \frac{1}{2} v\left(C_T^H(z), \mathcal{E}(z)\right) \right\}$$

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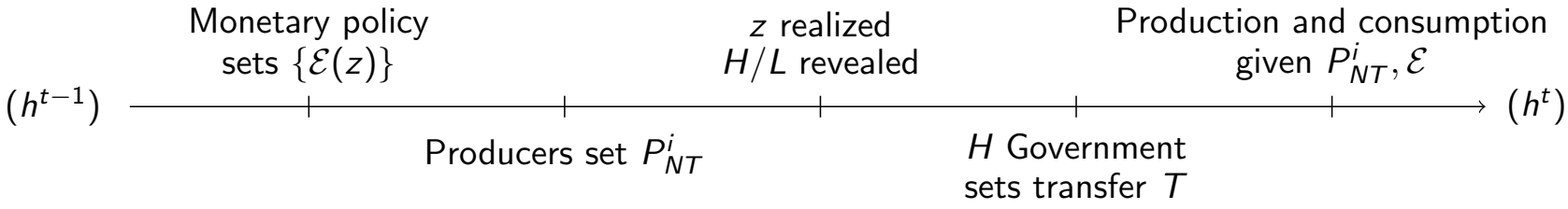

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- **Result**: in best SPE, the average labor wedge in state z—a measure of economic slack across the union—is strictly decreasing in the dispersion $\frac{E^H(z)}{E^L(z)}$ between endowments (unless countries fully share risks)
  - Contrasts with usual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

Active monetary policy, comments

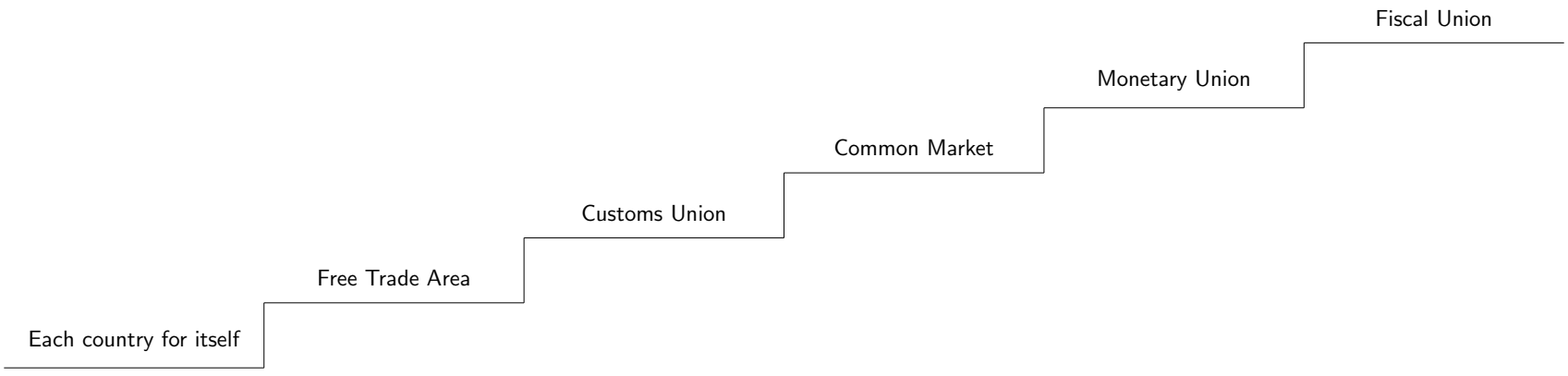
- Monetary policy can proactively slant policy in order to encourage fiscal union.
  - Aggregate stabilization is not always the right objective.
- Should have a "counter-dispersion" policy, creating booms in states where there is high dispersion of endowments and better-endowed countries are reluctant 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, 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!

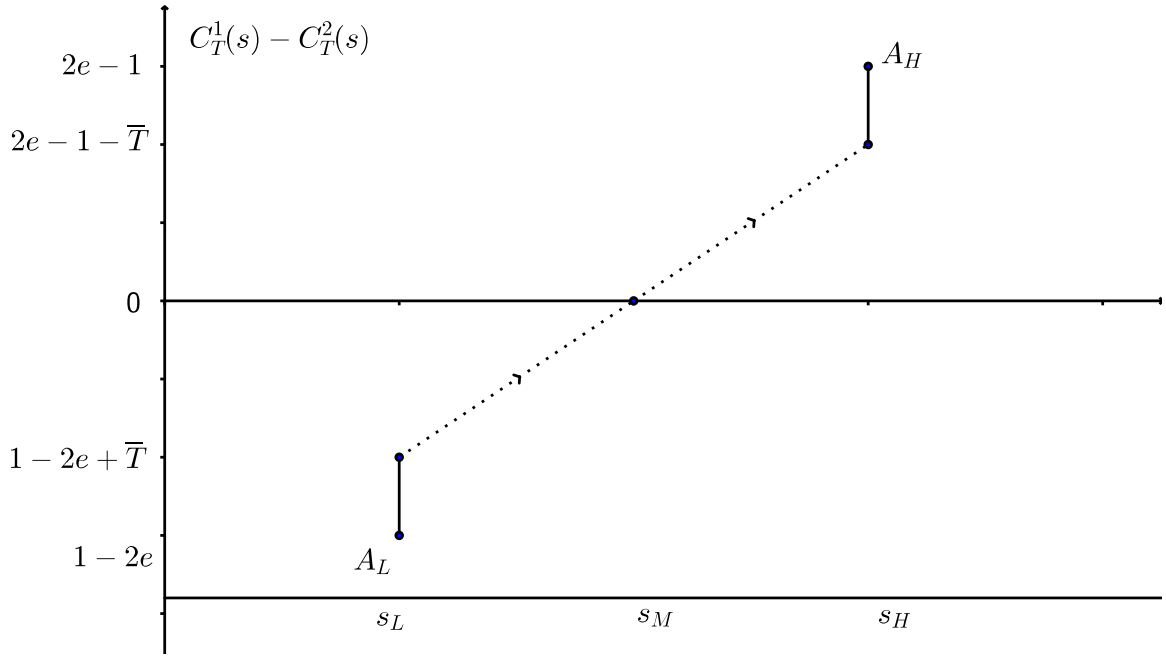
Dynamics: iid stationary case

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

$$(e_L, e_M, e_H) = \left(1 - e, \frac{1}{2}, e\right) \quad (\pi_L, \pi_M, \pi_H) = (\pi, 1 - 2\pi, \pi)$$

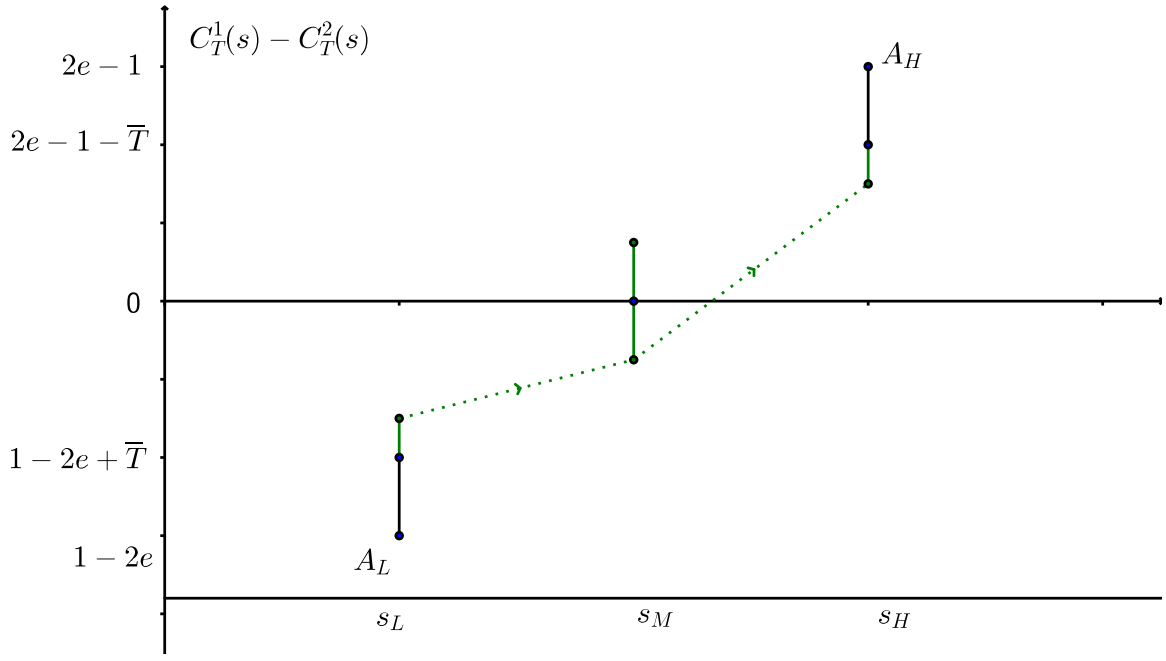
- Consider the best contract from section 2: maximal sustainable $\overline{T}$ such that

$$(c_L, c_M, c_H) = \left(1 - e + \overline{T}, \frac{1}{2}, e - \overline{T}\right)$$



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) Go back