Fiscal Unions

Emmanuel Farhi, Harvard
Iván Werning, MIT
Currency Unions

- Case for flexible exchange rates...Friedman (53)

- Currency union...single monetary policy...
  - can stabilize symmetric shocks
  - cannot stabilize asymmetric shocks

- How to deal with asymmetric shocks?
Currency Unions

- Optimal Currency Area literature

  - factor mobility...Mundell (61)

  - openness...McKinnon (63)

  - fiscal integration....Kennen (69)

  - financial integration...Mundell (73)
Currency Unions

- Optimal Currency Area literature
- factor mobility...Mundell (61)
- openness...McKinnon (63)
- fiscal integration...Kennen (69)
- financial integration...Mundell (73)
This Paper

- Mechanism design meets Keynesian economics
  - fiscal union as **insurance** in a currency union
  - characterize **optimal** arrangement

- Dual role of transfers
  - risk sharing
  - macroeconomic stabilization
This Paper

- **Key result**: macro externality in insurance decisions

- Within a currency union: social ≠ private

- Fiscal and monetary unions go hand in hand

- Fiscal and financial integration **not** perfect substitutes
Implementation

- Complete markets
  - macro-prudential portfolio taxes

- Incomplete markets
  - fiscal transfers
Implementation

- Complete markets
  - macro-prudential portfolio taxes

- Incomplete markets
  - fiscal transfers
Households

\[ U^i(C^i_{NT}, C^i_T, N^i; s) \]
Households

- Country \( i \) households maximizes

\[
\int U^i(i, C^i_{NT}(s), C^i_T(s), N^i(s); s)\pi(s)ds
\]

subject to

\[
\int D^i(s)Q(s)\pi(s)ds \leq 0
\]

\[
P^i_{NT}C^i_{NT}(s) + P_T(s)C^i_T(s) \leq W^i(s)N^i(s) + P_T(s)E^i_T(s) + \Pi^i(s) + T^i(s) + D^i(s)
\]
Households

- Country i households maximizes
  \[ \int U^i(C^i_{NT}(s), C^i_T(s), N^i(s); s)\pi(s)ds \]
  subject to
  \[ \int D^i(s)Q(s)\pi(s)ds \leq 0 \]
  \[ P^i_{NT}C^i_{NT}(s) + P^i_T(s)C^i_T(s) \leq W^i(s)N^i(s) + P^i_T(s)E^i_T(s) \]
  \[ + \Pi^i(s) + T^i(s) + (1 + \tau^i_D(s)) D^i(s) \]
Households

\[ C_{NT}^i(s) = \left( \int_0^1 C_{NT}^{i,j}(s)^{1 - \frac{1}{\varepsilon}} dz \right)^{\frac{1}{1 - \frac{1}{\varepsilon}}} \]

- Country i households maximizes

\[ \int U^i(C_{NT}^i(s), C_T^i(s), N^i(s); s)\pi(s)ds \]

subject to

\[ \int D^i(s)Q(s)\pi(s)ds \leq 0 \]

\[ P_{NT}^i C_{NT}^i(s) + P_T^i(s)C_T^i(s) \leq W^i(s)N^i(s) + P_T^i(s)E_T^i(s) + \Pi^i(s) + T^i(s) + (1 + \tau_D^i(s))D^i(s) \]
Firms

- Each variety $j$ of NT
  - produced monopolistically
  - technology
    
    \[ Y_{NT}^{i,j}(s) = A^i(s) N^{i,j}(s) \]
  - price set one period in advance
Government

- Government budget constraint

\[ T^i(s) = \tau^i_L W^i(s) N^i(s) - \tau^i_D(s) D^i(s) + \hat{T}^i(s) \]

- Zero net international fiscal transfers

\[ \int \hat{T}^i(s) \, di = 0 \]
Equilibrium

- Household FOCs
- Firm FOC
- Government budget constraint
- Market clearing

\[ C^i_{NT}(s) = A^i(s)N^i(s) \]
\[ \int C^i_T(s)di = \int E^i_T(s)di \]
FOCs

\[
\frac{U^i_{CT}(s)(1 + \tau^i_D(s))}{Q(s)P_T(s)} = \frac{U^i_{CT}(s')(1 + \tau^i_D(s'))}{Q(s')P_T(s')}
\]

\[
\frac{U^i_{CT}(s)}{P_T(s)} = \frac{U^i_{CNT}(s)}{P^i_{NT}}
\]

\[
-\frac{U^i_N(s)}{W^i(s)} = \frac{U^i_{CNT}(s)}{P^i_{NT}}.
\]

\[
P^i_{NT} = (1 + \tau^i_L)\frac{\varepsilon}{\varepsilon - 1} \int \frac{Q(s)}{1 + \tau^i_D(s)} \frac{W^i(s)}{A^i(s)} C^i_{NT}(s)\pi(s)ds
\]

\[
= \int \frac{Q(s)}{1 + \tau^i_D(s)} C^i_{NT}(s)\pi(s)ds
\]
FOCs

\[ \frac{U^i_{CT}(s)}{P_T(s)} = \frac{U^i_{CNT}(s)}{P^i_{NT}} \]
FOCs

\[
\frac{U^i_{CT}(s)}{P_T(s)} = \frac{U^i_{CNT}(s)}{P^i_{NT}}
\]

weak separability
+ homothetic

\[
C^i_{NT}(s) = \alpha^i(p^i(s); s) C^i_T(s)
\]

\[
p^i(s) = \frac{P_T(s)}{P^i_{NT}}
\]
Alternative: Incomplete markets

- Household budget constraint
  \[ P_{NT}^i C_{NT}^i(s) + P_T(s) C_T^i(s) \]
  \[ \leq W^i(s) N^i(s) + P_T(s) E_T^i(s) + \Pi^{i,j}(s) + T^i(s) \]

- Government budget constraint
  \[ T^i(s) = \tau^i_L W^i(s) N^i(s) + \hat{T}^i(s) \]

- Same implementability conditions!
Planning Problem

- Constrained Pareto frontier (weights $\lambda$)

$$\max_{P_{NT}^i, P_T(s), C_T^i(s)} \int \int V^i \left( C_T^i(s), \frac{P_T(s)}{P_{NT}^i}; s \right) \lambda^i \pi(s) \, di \, ds$$

$$\int C_T^i(s) \, di = \int E_T^i(s) \, di$$
Planning Problem

\[ U^i \left( \alpha^i(p^i(s); s)C_T^i(s), C_T^i(s), \frac{\alpha^i(p^i(s); s)}{A^i(s)} C_T^i(s); s \right) \]

- Constrained Pareto frontier (weights)

\[ \max_{P^i_{NT}, P_T(s), C_T^i(s)} \int \int V^i \left( C_T^i(s), \frac{P_T(s)}{P^i_{NT}}; s \right) \lambda^i \pi(s) \, di \, ds \]

\[ \int C_T^i(s) \, di = \int E_T^i(s) \, di \]
Proposition (Optimal Price Setting).
Zero average labor wedge across states for each country:

\[ \int \alpha^i_p(s) C^i_T(s) U^i_{CT}(s) \tau^i(s) \pi(s) \, ds = 0 \]

across states for each country

labor wedge

across countries for each state
Optimality Conditions

Proposition (Optimal Price Setting).
Zero average labor wedge across states for each country:

\[ \int \alpha_p^i(s) C_T^i(s) U_C^i(s) \tau^i(s) \pi(s) ds = 0 \]

across states for each country

Proposition (Optimal Monetary Policy).
Zero average labor wedge across countries for each state:

\[ \int \alpha_p^i(s) C_T^i(s) U_C^i(s) \tau^i(s) \lambda^i di = 0 \]
Proposition (Optimal Risk Sharing).

\[
\frac{V_{CT}^i(s)}{V_{CT}'(s)} = \frac{V_{CT}^i(s')}{V_{CT}'(s')}
\]

- Standard risk sharing condition...
- ... but with *social* instead of *private* marginal values
- Fiscal and financial integration not perfect substitutes
Proposition (Optimal Risk Sharing).

\[
\frac{U^i_C(s)}{U'^i_C(s)} \frac{1 + \frac{\alpha^i(s)}{p^i(s)} \tau^i(s)}{1 + \frac{\alpha'^i(s)}{p'^i(s)} \tau'^i(s)} = \frac{U^i_C(s')}{U'^i_C(s')} \frac{1 + \frac{\alpha^i(s')}{p^i(s')} \tau^i(s')}{1 + \frac{\alpha'^i(s')}{p'^i(s')} \tau'^i(s')}
\]

- Standard risk sharing condition...
- ... but with *social* instead of *private* marginal values
- Fiscal and financial integration not perfect substitutes
Two Implementations

- Complete markets + macro-prudential portfolio taxes

\[ \tau_D^i(s) = \frac{\alpha^i(s)}{p^i(s)} \tau^i(s) \]

- Incomplete markets + fiscal transfers

\[ \hat{T}^i(s) = P_T(s)(C_T^i(s) - E^i(s)) \]
Two Implementations

- Complete markets + macro-prudential portfolio taxes
  \[
  \tau_D^i(s) = \frac{\alpha^i(s)}{p^i(s)} \tau^i(s)
  \]

- Incomplete markets + fiscal transfers
  \[
  \hat{T}^i(s) = P_T(s)(C_T^i(s) - E^i(s))
  \]
Non-Members

- Outside currency union, same conditions, but...
  - zero labor wedges
  - privately and socially optimal risk sharing coincide
  - no need for macro-prudential portfolio taxes
  - fiscal unions replicate complete markets

- Fiscal unions and currency unions go hand in hand
Moral Hazard

- Up to now, no incentive issues
- Introduce to capture concerns for moral hazard
- Tradeoff insurance vs. incentives
- More insurance in currency union (social vs. private)
Dynamic Model

- Dynamic model
  - Calvo price setting
  - all goods traded
  - openness: home bias in preferences
  - fraction of HtM consumers with high MPCs (financially constrained)
Impulse Response (No HtM)

- 5% productivity shock
Optimal Transfers (No HtM)

- NPV transfers / GDP: half-life of shock and openness
- 5% productivity shock
Stabilization (No HtM)

- Stabilization: half-life of shock and openness
Impulse Response (HtM)

- 5% productivity shock
Stabilization (HtM)

- Stabilization: half-life of shock and openness
Optimal Transfers

- NPV transfers / GDP: half-life of shock and openness
- 5% productivity shock
## Transfers vs. Other Instruments

### Transitory

<table>
<thead>
<tr>
<th>NOMINAL RIGIDITIES</th>
<th>OPENNESS</th>
<th>No HtM agents</th>
<th>HtM agents</th>
<th>No policy</th>
<th>Transfers</th>
<th>Capital controls</th>
<th>Gov. spending</th>
<th>Redist.</th>
<th>Deficits</th>
<th>Joint fiscal policy</th>
<th>No policy</th>
<th>Transfers</th>
<th>Capital controls</th>
<th>Gov. spending</th>
<th>Redist.</th>
<th>Deficits</th>
<th>Joint fiscal policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>More flexible</td>
<td>Open</td>
<td>0%</td>
<td>21%</td>
<td>83%</td>
<td>47%</td>
<td>0%</td>
<td>0%</td>
<td>47%</td>
<td>0%</td>
<td>76%</td>
<td>0%</td>
<td>76%</td>
<td>82%</td>
<td>47%</td>
<td>73%</td>
<td>73%</td>
<td>78%</td>
</tr>
<tr>
<td></td>
<td>Closed</td>
<td>0%</td>
<td>57%</td>
<td>96%</td>
<td>47%</td>
<td>0%</td>
<td>0%</td>
<td>47%</td>
<td>0%</td>
<td>91%</td>
<td>0%</td>
<td>91%</td>
<td>96%</td>
<td>47%</td>
<td>88%</td>
<td>88%</td>
<td>89%</td>
</tr>
<tr>
<td>Sticky</td>
<td>Open</td>
<td>0%</td>
<td>29%</td>
<td>84%</td>
<td>49%</td>
<td>0%</td>
<td>0%</td>
<td>49%</td>
<td>0%</td>
<td>78%</td>
<td>0%</td>
<td>78%</td>
<td>83%</td>
<td>49%</td>
<td>75%</td>
<td>75%</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td>Closed</td>
<td>0%</td>
<td>58%</td>
<td>97%</td>
<td>49%</td>
<td>0%</td>
<td>0%</td>
<td>49%</td>
<td>0%</td>
<td>92%</td>
<td>0%</td>
<td>92%</td>
<td>97%</td>
<td>49%</td>
<td>89%</td>
<td>89%</td>
<td>90%</td>
</tr>
<tr>
<td>Rigid</td>
<td>Open</td>
<td>0%</td>
<td>10%</td>
<td>56%</td>
<td>26%</td>
<td>0%</td>
<td>0%</td>
<td>26%</td>
<td>0%</td>
<td>53%</td>
<td>0%</td>
<td>53%</td>
<td>54%</td>
<td>26%</td>
<td>43%</td>
<td>43%</td>
<td>53%</td>
</tr>
<tr>
<td></td>
<td>Closed</td>
<td>0%</td>
<td>14%</td>
<td>79%</td>
<td>26%</td>
<td>0%</td>
<td>0%</td>
<td>26%</td>
<td>0%</td>
<td>81%</td>
<td>0%</td>
<td>81%</td>
<td>79%</td>
<td>26%</td>
<td>67%</td>
<td>67%</td>
<td>72%</td>
</tr>
</tbody>
</table>

### Permanent

<table>
<thead>
<tr>
<th>NOMINAL RIGIDITIES</th>
<th>OPENNESS</th>
<th>No HtM agents</th>
<th>HtM agents</th>
<th>No policy</th>
<th>Transfers</th>
<th>Capital controls</th>
<th>Gov. spending</th>
<th>Redist.</th>
<th>Deficits</th>
<th>Joint fiscal policy</th>
<th>No policy</th>
<th>Transfers</th>
<th>Capital controls</th>
<th>Gov. spending</th>
<th>Redist.</th>
<th>Deficits</th>
<th>Joint fiscal policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>More flexible</td>
<td>Open</td>
<td>0%</td>
<td>25%</td>
<td>67%</td>
<td>36%</td>
<td>0%</td>
<td>0%</td>
<td>36%</td>
<td>0%</td>
<td>63%</td>
<td>0%</td>
<td>63%</td>
<td>66%</td>
<td>36%</td>
<td>58%</td>
<td>58%</td>
<td>62%</td>
</tr>
<tr>
<td></td>
<td>Closed</td>
<td>0%</td>
<td>68%</td>
<td>85%</td>
<td>36%</td>
<td>0%</td>
<td>0%</td>
<td>36%</td>
<td>0%</td>
<td>83%</td>
<td>0%</td>
<td>83%</td>
<td>85%</td>
<td>36%</td>
<td>73%</td>
<td>73%</td>
<td>74%</td>
</tr>
<tr>
<td>Sticky</td>
<td>Open</td>
<td>0%</td>
<td>41%</td>
<td>65%</td>
<td>36%</td>
<td>0%</td>
<td>0%</td>
<td>36%</td>
<td>0%</td>
<td>66%</td>
<td>0%</td>
<td>66%</td>
<td>64%</td>
<td>36%</td>
<td>55%</td>
<td>55%</td>
<td>61%</td>
</tr>
<tr>
<td></td>
<td>Closed</td>
<td>0%</td>
<td>81%</td>
<td>82%</td>
<td>36%</td>
<td>0%</td>
<td>0%</td>
<td>36%</td>
<td>0%</td>
<td>87%</td>
<td>0%</td>
<td>87%</td>
<td>82%</td>
<td>36%</td>
<td>71%</td>
<td>71%</td>
<td>72%</td>
</tr>
<tr>
<td>Rigid</td>
<td>Open</td>
<td>0%</td>
<td>66%</td>
<td>0%</td>
<td>26%</td>
<td>0%</td>
<td>0%</td>
<td>26%</td>
<td>0%</td>
<td>66%</td>
<td>0%</td>
<td>66%</td>
<td>0%</td>
<td>26%</td>
<td>0%</td>
<td>0%</td>
<td>26%</td>
</tr>
<tr>
<td></td>
<td>Closed</td>
<td>0%</td>
<td>94%</td>
<td>0%</td>
<td>26%</td>
<td>0%</td>
<td>0%</td>
<td>26%</td>
<td>0%</td>
<td>94%</td>
<td>0%</td>
<td>94%</td>
<td>0%</td>
<td>26%</td>
<td>0%</td>
<td>0%</td>
<td>26%</td>
</tr>
</tbody>
</table>
## Transfers vs. Other Instruments

<table>
<thead>
<tr>
<th>NOMINAL RIGIDITIES</th>
<th>OPENNESS</th>
<th>No HtM agents</th>
<th>HtM agents</th>
<th>Deficits</th>
<th>Joint fiscal policy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Transfers</td>
<td>Capital controls</td>
<td>Gov. spending</td>
<td>Redistribution</td>
</tr>
<tr>
<td>More flexible</td>
<td>Open</td>
<td>0%</td>
<td>21%</td>
<td>83%</td>
<td>47%</td>
</tr>
<tr>
<td></td>
<td>Closed</td>
<td>0%</td>
<td>57%</td>
<td>96%</td>
<td>47%</td>
</tr>
<tr>
<td>Sticky</td>
<td>Open</td>
<td>0%</td>
<td>29%</td>
<td>84%</td>
<td>49%</td>
</tr>
<tr>
<td></td>
<td>Closed</td>
<td>0%</td>
<td>58%</td>
<td>97%</td>
<td>49%</td>
</tr>
<tr>
<td>Rigid</td>
<td>Open</td>
<td>0%</td>
<td>10%</td>
<td>56%</td>
<td>26%</td>
</tr>
<tr>
<td></td>
<td>Closed</td>
<td>0%</td>
<td>14%</td>
<td>79%</td>
<td>26%</td>
</tr>
</tbody>
</table>

## PERMANENT

<table>
<thead>
<tr>
<th>NOMINAL RIGIDITIES</th>
<th>OPENNESS</th>
<th>No HtM agents</th>
<th>HtM agents</th>
<th>Deficits</th>
<th>Joint fiscal policy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Transfers</td>
<td>Capital controls</td>
<td>Gov. spending</td>
<td>Redistribution</td>
</tr>
<tr>
<td>More flexible</td>
<td>Open</td>
<td>0%</td>
<td>25%</td>
<td>67%</td>
<td>36%</td>
</tr>
<tr>
<td></td>
<td>Closed</td>
<td>0%</td>
<td>68%</td>
<td>85%</td>
<td>36%</td>
</tr>
<tr>
<td>Sticky</td>
<td>Open</td>
<td>0%</td>
<td>41%</td>
<td>65%</td>
<td>36%</td>
</tr>
<tr>
<td></td>
<td>Closed</td>
<td>0%</td>
<td>81%</td>
<td>82%</td>
<td>36%</td>
</tr>
<tr>
<td>Rigid</td>
<td>Open</td>
<td>0%</td>
<td>66%</td>
<td>0%</td>
<td>26%</td>
</tr>
<tr>
<td></td>
<td>Closed</td>
<td>0%</td>
<td>94%</td>
<td>0%</td>
<td>26%</td>
</tr>
</tbody>
</table>
### Transfers vs. Other Instruments

#### Transitory

<table>
<thead>
<tr>
<th>NOMINAL RIGIDITIES</th>
<th>OPENNESS</th>
<th>No HtM agents</th>
<th>HtM agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transfers</td>
<td>Capital controls</td>
<td>Gov. spending</td>
</tr>
<tr>
<td>More flexible Open</td>
<td>0%</td>
<td>21%</td>
<td>83%</td>
</tr>
<tr>
<td>Closed</td>
<td>0%</td>
<td>57%</td>
<td>96%</td>
</tr>
<tr>
<td>Sticky</td>
<td>Open</td>
<td>0%</td>
<td>29%</td>
</tr>
<tr>
<td>Closed</td>
<td>0%</td>
<td>58%</td>
<td>97%</td>
</tr>
<tr>
<td>Rigid</td>
<td>Open</td>
<td>0%</td>
<td>10%</td>
</tr>
<tr>
<td>Closed</td>
<td>0%</td>
<td>14%</td>
<td>79%</td>
</tr>
</tbody>
</table>

#### Permanent

<table>
<thead>
<tr>
<th>NOMINAL RIGIDITIES</th>
<th>OPENNESS</th>
<th>No HtM agents</th>
<th>HtM agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transfers</td>
<td>Capital controls</td>
<td>Gov. spending</td>
</tr>
<tr>
<td>More flexible Open</td>
<td>0%</td>
<td>25%</td>
<td>67%</td>
</tr>
<tr>
<td>Closed</td>
<td>0%</td>
<td>68%</td>
<td>85%</td>
</tr>
<tr>
<td>Sticky</td>
<td>Open</td>
<td>0%</td>
<td>41%</td>
</tr>
<tr>
<td>Closed</td>
<td>0%</td>
<td>81%</td>
<td>82%</td>
</tr>
<tr>
<td>Rigid</td>
<td>Open</td>
<td>0%</td>
<td>66%</td>
</tr>
<tr>
<td>Closed</td>
<td>0%</td>
<td>94%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Transfers vs. Other Instruments

- Transfers: better for more persistent shocks, more closed economies, more sticky prices, fraction of HtM improves for more transitory shocks and more flexible prices

- Capital controls: better for more transitory shock, more closed economies, more flexible prices

- Government spending: less sensitive to persistence, openness, stickiness, HtM

- Redistribution and deficits: only with fraction of HtM, better for more transitory shocks, more closed economies, more flexible prices

- Baseline calibration: transfers dominate all other instruments
Conclusion

- Special argument for fiscal unions in currency unions

- Key determinants of optimal insurance arrangement
  - asymmetry
  - persistence
  - openness
  - financial constraints (HtM)

- Baseline calibration: transfers dominate domestic fiscal policy and capital controls