

Carbon Taxes and Tariffs, Financial Frictions, and International Spillovers

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Motivation

- Ambitious climate policy needed to address climate change
- Climate-policy-induced 'transition risk'
 - Risk of a recession from unanticipated ambitious climate policy
 - Banks exposed to carbon-intensive sectors
 - Growing concern among financial regulators
- Need for an analysis of the international aspects of transition risk
 - Cross-border implications of climate policies
 - Macroprudential policy

Research Questions

- How does ambitious climate policy transmit across borders in presence of financial flows?
- Can macroprudential policy mitigate transition risk?
- Addressed with simulation exercises:
 - Unilateral domestic carbon tax
 - Unilateral domestic carbon tax and border carbon adjustment (BCA)
 - Global carbon tax

Model

- Two countries - Home & Foreign
 - Households consume, save (deposits), supply labor
 - Banks collect deposits, lend to Home & Foreign non-financial firms
 - Non-financial firms
 - Polluting (tradable) T and 'Green' (non-tradable) N
 - Capital producers
 - Government implements climate and macroprudential policies
- Banks
 - Bank i combines net worth $NW_{i,t}$ and deposits $D_{i,t}$ to fund loans to polluting and green firms in Home & Foreign countries $(S_{j,i,t}, S_{j,i,t}^F)_{j \in \{T,N\}}$
 - Agency problem between a bank and its depositors
 - Follows Gertler & Kiyotaki (2010)
 - The bank may divert fraction κ of assets for its personal benefit
 - The depositors will lend as long as a banker does not have incentives to misbehave:

$$\underbrace{V_{i,t}}_{\text{cost}} \geq \kappa \underbrace{\sum_{j \in \{T,N\}} (Q_{j,t} S_{j,i,t} + Q_{j,t}^* S_{j,i,t}^F)}_{\text{benefit}}$$

where $Q_{j,t}(Q_{j,t}^*)$: a unit price of loans to Home (Foreign) firms in sector j

- Exogenous i.i.d. bank exit probability $1 - \pi$
- Bank i chooses $D_{i,t}, (S_{j,i,t}, S_{j,i,t}^F)_{j \in \{T,N\}}$ to maximize the discounted value of the terminal dividends:

$$V_{i,t} = \max E_t \{ (1 - \pi) M_{t,t+1} NW_{i,t+1} + \pi M_{t,t+1} V_{i,t+1} \}$$

subject to the balance sheet constraint, IC, and the evolution of net worth

- Balance sheet constraint:

$$\sum_{j \in \{T,N\}} (Q_{j,t} S_{j,i,t} + Q_{j,t}^* S_{j,i,t}^F) + \Psi_{i,t} = D_{i,t} + NW_{i,t}$$

- Net worth:

$$NW_{i,t} = \sum_{j \in \{T,N\}} [R_{j,t} Q_{j,t-1} S_{j,i,t-1} + R_{j,t}^* Q_{j,t-1}^* S_{j,i,t-1}^F] - R_{t-1} D_{i,t-1}$$

where $R_{j,t}$ and $R_{j,t}^*$: returns on assets; R_{t-1} : interest on deposits

- When banks are financially constrained, $\sum_{j \in \{T,N\}} (Q_{j,t} S_{j,i,t} + Q_{j,t}^* S_{j,i,t}^F) = \frac{\varphi_t}{\kappa} NW_t$ where φ_t is marginal shadow value of net worth
 - Shocks to the economy get amplified through fluctuations in banks' equity capital
- Perfectly competitive non-financial firms
 - Emissions are a by-product of production: $e_{j,t} = g_j Y_{j,t}$, $j \in \{T, N\}$
 - Carbon tax imposed on emissions: $\tau_{e,t} e_{j,t}$, $j \in \{T, N\}$

Results

- Two sets of simulations:
 1. Exogenous carbon tax shock at Home (\$80 per ton of CO₂; with and without financial frictions (FF))
 2. Exogenous carbon tax shock & BCA at Home (BCA: \$10 per ton of CO₂ as import tariff on foreign tradable good; vs. carbon tax only; FF in place)
- Main findings:
 - With FF, domestic transition risk transmits to the foreign country through cross-border bank lending:
 - Global recession
 - Carbon leakage
 - BCA reduces leakage, although makes recession more severe at Home.
 - Macroprudential policies: mitigate the transition risk

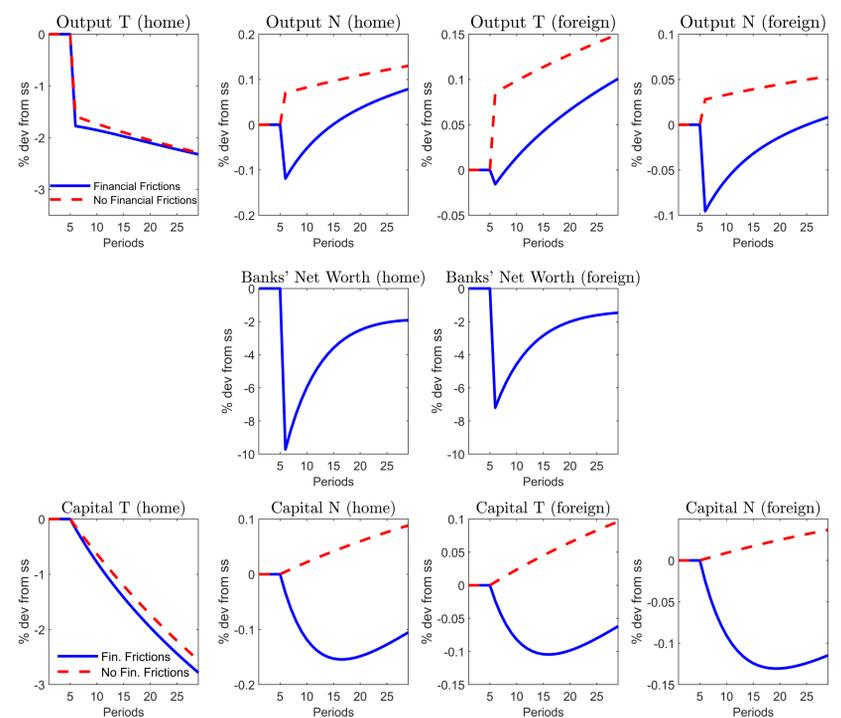


Figure 1. Home carbon tax

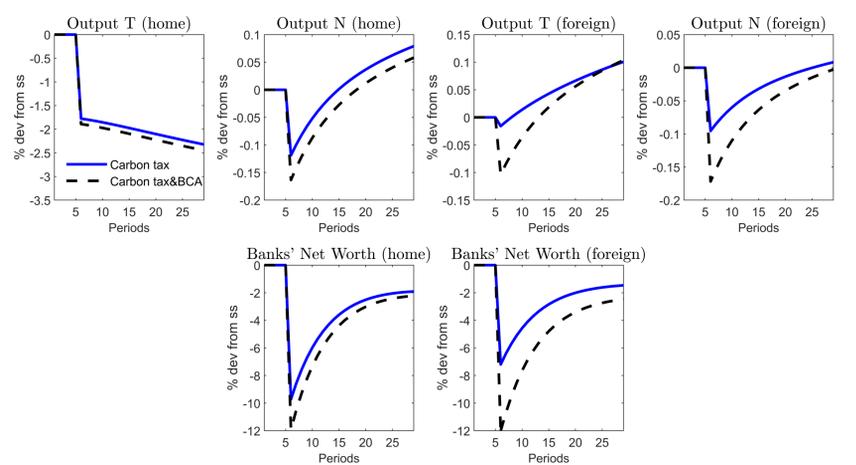


Figure 2. Home carbon tax & BCA

Conclusions

- DSGE model
 - Multi-sector, multi-country,
 - Cross-border financial and trade flows,
 - Climate and macroprudential policies.
- Transition risk has global implications: financial linkages and frictions are important for the propagation of transition risk across sectors and borders.
- BCA can alleviate carbon leakage but make recession deeper.
- Macroprudential policies can mitigate transition risk.

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