On the Desirability of Capital Controls

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Why Capital Controls?

- Imposing capital controls restricts agents' budget sets

- But constraining choices will change equilibrium prices

- Costinot, Lorenzoni & Werning (2014) show that capital controls can move the interest rates in a favorable direction

    - Logic: when borrowing is restricted, borrower countries will pay lower interest rates (same with saving)

- Brunnermeier and Sannikov (2014) argue that capital controls can move terms of trade in a favorable direction
    - Logic: when inflows of capital are restricted, less production of domestic good, better terms of trade

What We Do

- We explore a simple policy of capital controls, but with a more quantitative approach

    - Textbook two-country stochastic growth model (Backus, Kehoe & Kydland), which includes both motives for capital controls

    - Countries use capital and labor to produce and then trade differentiated goods

    - Compare free trade in a bond versus taxes on international borrowing and lending

- Is free capital mobility close to optimal, or should governments intervene to significantly limit international capital flows?

Key Findings

Starting from symmetric initial conditions with zero NFA position, find that:

1. Acting unilaterally, a country would like to tax net foreign saving and foreign borrowing

2. Optimal taxes dampens average NFA position

3. When a country starts with productivity different from the one of its partner, it has a stronger incentive to tax capital flows

4. The Nash equilibrium when both countries set taxes optimally is close to financial autarky (inefficient)

5. Global optimum is typically, but not always, free bond trade, in some cases both countries find it optimal to restrict capital mobility (capital controls are efficient, as they can improve insurance)

Related Literature

- Most closely related papers:

  - Costinot, Lorenzoni and Werning (2014)
  - Brunnermeier and Sannikov (2014)
  - De Paoli and Lipinska (2013)

- Other related papers:

  - Newbery and Stiglitz (1984)
  - Bianchi (2011)
  - Bianchi and Mendoza (2013)
  - Korinek (2010)
  - Martin and Taddei (2012)

Model: BKK (1994)

- Two countries, $i = 1$ and $i = 2$
- Standard preferences and technology

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[\log c_{it} - n_{it}^{1 + \frac{1}{\phi}} \right]$$

$$y_{it} = \exp(z_{it}) k_{it}^{\theta} n_{it}^{1 - \theta}$$

- Country 1 produces a (aluminum), country 2 produces b (bricks)
- Goods a and b are traded, combined to produce final consumption / investment good (houses)

$$
\begin{aligned}
c_{1t} + x_{1t} &= \left[\omega a_{1t}^{\frac{\sigma-1}{\sigma}} + (1 - \omega) b_{1t}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \\
c_{2t} + x_{2t} &= \left[(1 - \omega) a_{2t}^{\frac{\sigma-1}{\sigma}} + \omega b_{2t}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \\
k_{i,t+1} &= (1 - \delta) k_{it} + x_{it}
\end{aligned}
$$

Risk and Asset Markets

- Shocks

$$z_{i,t+1} = \rho z_{it} + \varepsilon_{i,t+1}$$

$$\begin{pmatrix} \varepsilon_{1,t+1} \\ \varepsilon_{2,t+1} \end{pmatrix} \sim N\left(0, \Sigma\right)$$

- Asset Market

  - One period risk free bond in zero net supply
  - Pays 1 unit of c_1 plus 1 unit of c_2

Capital controls

- Tax τ_{it} on interest income received or paid

$$c_{1t}+P_tb_{1,t+1} = w_{1t}n_{1t}+d_{1t}+b_{1,t}\left(1 + rx_t\right)-\tau_{1t}\left[b_{1t}\left(1 + rx_t\right) - P_{t-1}b_{1t}\right]+Tr_{1t}$$

$$\tau_{1t} = \tau_1\frac{B_t}{GDP_t}$$

- When country saves ($B_t > 0$) govt. tax savers and subsidizes borrowers
- When country borrows ($B_t < 0$) govt. tax borrowers, subsidizes savers

Baseline Parameterization

- $\beta = 0.99$, $\phi = 1$

- $\theta = 0.36$, $\delta = 0.015$

- $\rho = 0.95$, $\sigma_\varepsilon = 0.02$, $corr(\varepsilon_1, \varepsilon_2) = 0.3$

- ω s.t. import share is 30%

- $\sigma = 1.5$

Unilateral Capital Controls

- Assumptions

    1. $\tau_2 = 0$

    2. State of the economy is non-stochastic steady state:
       $e^{z_1} = e^{z_2} = 1$, $k_1 = k_2 = k^*$, $B = 0$

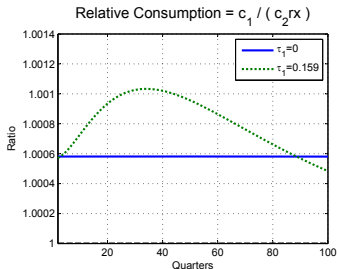   3. Govt. in country 1 chooses τ_1 once and for all
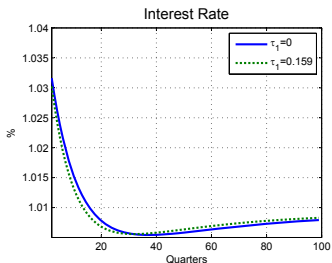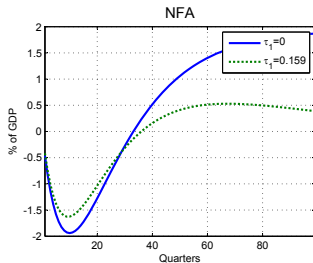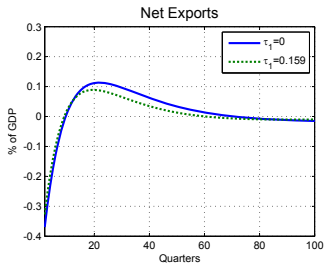
- Questions

    1. What τ_1 maximizes welfare for country 1?

    2. What are the welfare effects for both countries?

    3. How different are NFA dynamics relative to free capital mobility?

Welfare Gains from Unilateral Capital Controls
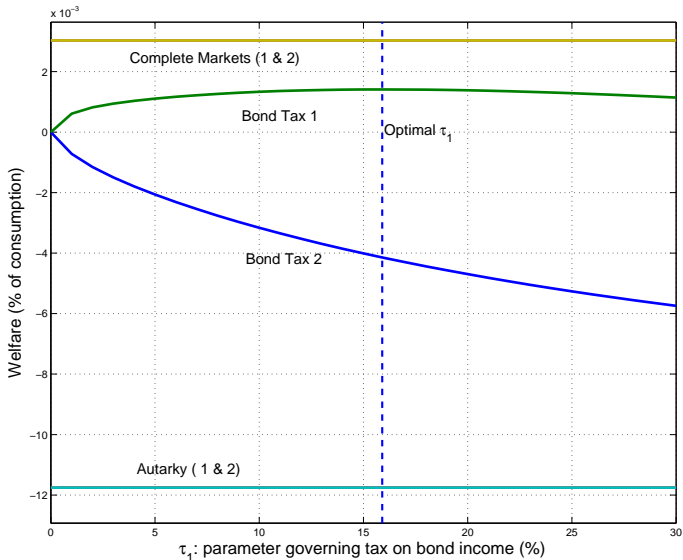
Impulse Responses with and without taxes

Unilateral Taxes

- Welfare maximizing tax parameter: $\tau_1 = 0.159$

- Welfare gain (rel. to zero tax) 0.0014% of cons.

    - Small, but equal to half welfare gain of completing markets

- Impact on average absolute NFA position significant:

    - $\tau_1 = 0.000 \Rightarrow E[\frac{|B|}{GDP}] = 45.2\%$

    - $\tau_1 = 0.159 \Rightarrow E[\frac{|B|}{GDP}] = 15.0\%$

   - (averages over 50 simulations, each of 400 periods)

Importance of Initial Conditions

- When countries start from different initial conditions, taxes are a tool for dynamic terms of trade manipulation
- Small taxes can yield larger gain

z_1 ($z_2 = 0$)	τ_1^* (%)	Welfare Gain (%)
$-2 \times \sigma_\varepsilon$	6.7	0.0032
$-\sigma_\varepsilon$	8.3	0.0022
0	15.9	0.0014
σ_ε	37.5	0.0013
$2 \times \sigma_\varepsilon$	77.6	0.0022

Dynamic terms of trade manipulation with pos. prod

- More productive country borrows to invest
- Sizeable bond tax reduces borrowing, investment, and future output, improves medium run ToT


Terms of Trade Response to a positive prod shock
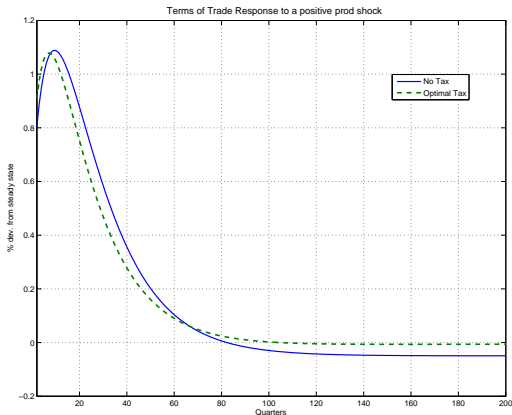
Example: Spain and Germany

- Spain has highly productive tourism business
- Developers build hotels, borrowing from Germany
- Over time supply of Spanish hotels increases $\Rightarrow$ price of Spanish vacations falls, detrimental for Spain
    - Requires Spanish and German vacations imperfect substitutes

- Pecuniary externality: Individual developers do not internalize price effect and thus overbuild

- Might shed light on why fast-growing countries often do not borrow from abroad (Gourinchas and Jeanne, 2013)

Dynamic terms of trade manipulation with neg. prod

- No tax: less productive country ends up poorer, working harder, producing more, hence worst terms of trade
- Small bond tax does little to short and medium run ToT, but reducing long run imbalances,improves long run ToT
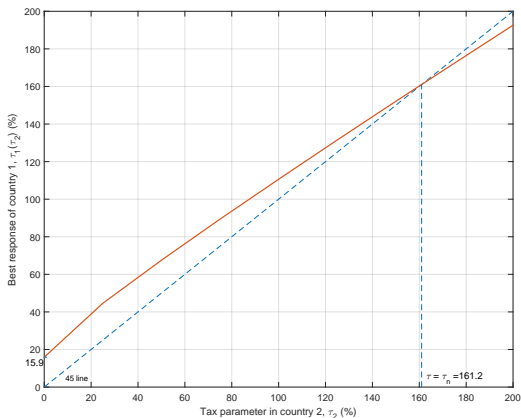

Terms of Trade Response to a negative shock
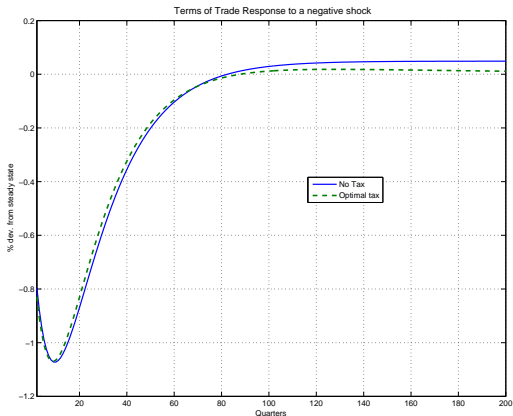
Capital Controls: Cooperation

- What common global tax rate maximizes expected welfare?
  - Baseline calibration: $\tau_1 = \tau_2 = 0$
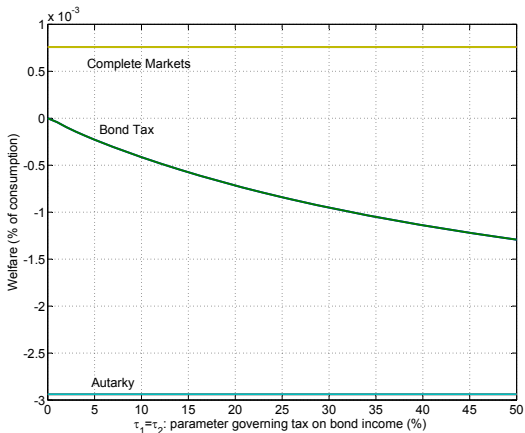
Capital Controls: Competition

- What tax rate emerges if both countries play Nash?

  - Baseline calibration: $\tau_1 = \tau_2 = 161\%$
    $\Rightarrow$ Very large reduction in inter-temporal trade

Interest Rates vs. Exchange Rates

- Does the logic for capital taxes hinge on countries being big enough to influence world interest rate?

  - Yes in a 1-good model
  - No in a 2-good model

- Illustrate this by setting risk aversion close to zero

  - 1-good model: cannot move interest rate
  - 2-good model with home-bias in preferences:

    taxes change inter-temporal demand
    $\Rightarrow$ changes path for real exchange rate
    $\Rightarrow$ changes domestic interest rate

Interest Rates vs. Exchange Rates

| Risk aversion γ	Elast. of subs. σ	τ_1^* (%)	Welfare Gain (%)
1	1.5	15.9	0.0014
0.0001	1.5	0.3	0.0185
0.0001	10	0.1	0.0029
0.0001	50	0.0	0.0

- Suppose risk-neutral + bonds denominated in foreign consumption $\Rightarrow$ foreign interest rate fixed
- If borrowing, want high RER today, low RER tomorrow (low domestic interest rate)
- If lending, want low RER today, high RER tomorrow (high domestic interest rate)
- If a country has some monopoly power in a good it produces, capital controls, by altering the timing of real exchange rate, can improve inter-temporal terms of trade even if world interest rate is fixed.

Pareto Improving Capital Controls

- Asset market structure changes ToT dynamics

- With complete markets, prices induce efficient allocations
  $\Rightarrow$ messing with prices cannot be Pareto-improving

- But our baseline model has a friction: absence of insurance against shocks to relative permanent income

- ToT moves inversely with relative quantities, dampens fluctuations in relative permanent income, provides automatic insurance against country-specific shocks

  - Cole and Obstfeld, 1991

- Capital controls might improve or worsen this terms of trade insurance

Welfare, Global Capital Controls

1. Low elasticity of substitution $\sigma = 0.5$
2. High import share, 75%
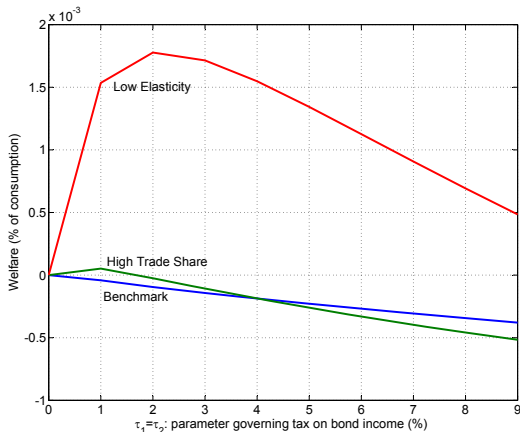
Interpretation

- Consider a positive productivity shock in country 1

- Low elasticity case:
  - Large terms of trade response
    $\Rightarrow$ 1 relatively worse off
    $\Rightarrow$ Capital controls, by restricting investment in 1 improve ToT for 1
    $\Rightarrow$ Improve ex-ante insurance

- High trade share case:
  - Small terms of trade response
    $\Rightarrow$ 1 relatively better off
    $\Rightarrow$ Because high trade share, 1 runs impact surplus (most domestic good used abroad)
    $\Rightarrow$ Capital controls restrict outflows and foreign investment, tilt ToT against country 1
    $\Rightarrow$ Improve ex-ante insurance

Conclusions

- Capital controls typically welfare improving for one country at the expense of its trading partner

- Capital control competition leads to large taxes on capital flows

- Capital control coordination leads to smaller taxes $\Rightarrow$ role for institutions to promote coordination

- But taxes on capital flows are sometimes Pareto-improving relative to perfect capital mobility