Capital Controls and Free Trade Agreements

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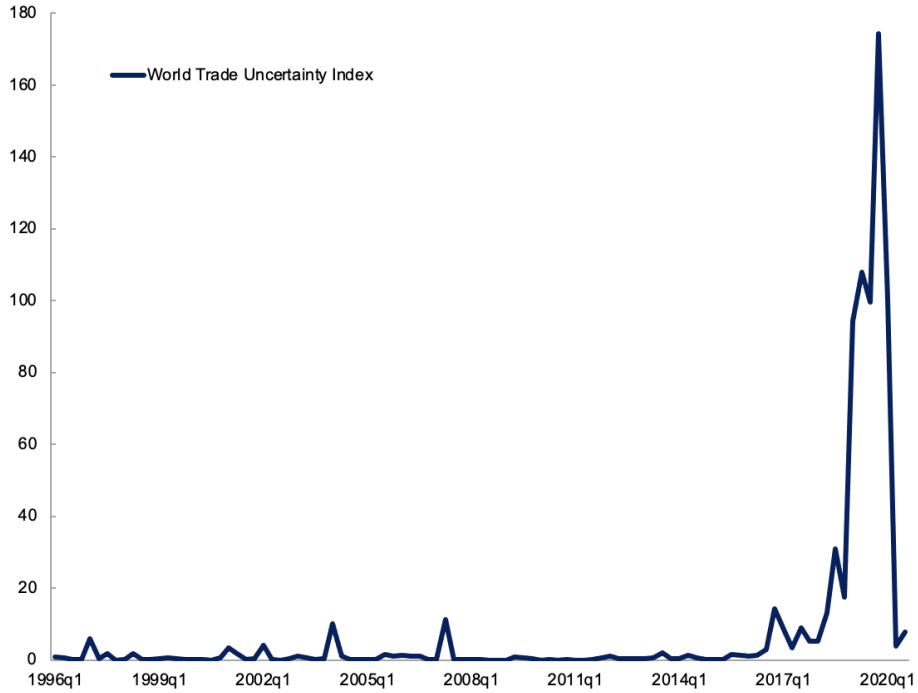
Roadmap

Trade & Financial Openness: Not Always Aligned

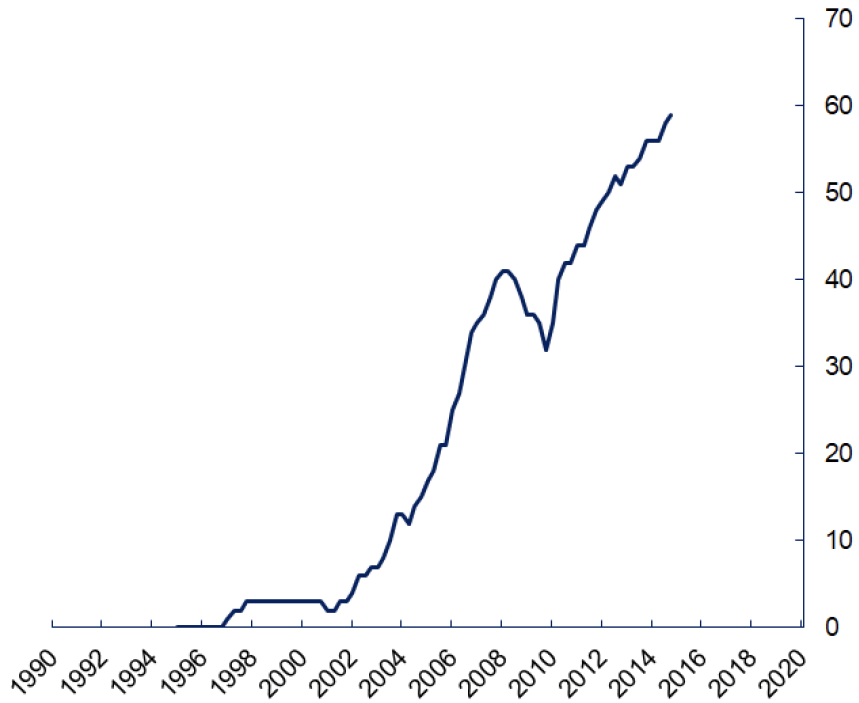
- *Bretton Woods*: Free trade promoted, but capital controls widely used
- *Post-Bretton Woods*: Increased trade and more financial openness
- *Recent Years*:
  - Growing protectionism (China-US trade war; Brexit; export restrictions post-Covid)
  - More sanguine views on capital controls (IMF's Integrated Policy Framework) and increasing 'macroprudential FX regulation'

How does conduct of capital controls change in a world with less free trade?

Trade & Financial Openness: Not Always Aligned



Source: Word Trade Uncertainty Index. Ahir, Bloom and Furceri (2018).



Source: Ahnert, Forbes, Friedrich and Reinhardt (2020).

This Paper: Trade-Finance Nexus

- Two-country endowment economy (Home and Foreign) with **terms-of-trade externalities (ToT)** [Geneakoplos and Polemarchakis, 1986]
  - Ramsey planner (Unilateral & Nash) maximises domestic welfare, manipulating interest rates and relative goods prices using capital flow taxes...

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How does size in financial (goods) markets affect the conduct of trade (financial) policy?

Related Literature

Non-Exhaustive

- **Capital Controls**: Costinot, Lorenzoni and Werning (2014); Bianchi (2011); Farhi and Werning (2016); ...
  - Over-borrowing/ under-borrowing, Bianchi and Lorenzoni (2021), due to size externalities

- **Trade Policy**: Lerner (1936); Broda, Limao and Weinstein (2008); Costinot and Werning (2019); Corsetti and Bergin (2020); Caliendo, Feenstra, Romalis and Taylor (2021); ...
  - Optimal trade tariffs usually derived without trade in assets

- **Integrated Policy Analysis**: Ostry et al. (2010); Basu et al. (2020); Auray, Deveraux and Eyquem (2020), Jeanne (2022)

Roadmap

Key Findings

1. **Incentives:** Capital controls and tariffs balance inter- and intra-temporal incentives to manipulate ToT
    * With FTA, capital controls compromise between two margins
    * Absent FTA, planner achieves weakly higher welfare using tariffs in addition to capital controls

Key Findings

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2. **Instruments:** Size of optimal capital controls and tariffs interlinked
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3. **Financial Frictions:** SOE + financial friction $\implies$ *substitutability of capital inflow tax and import tariff*

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5. **Welfare:** Domestic gains from capital controls and tariffs, but more than offset by losses abroad

Roadmap

Model-in-a-Slide

- Countries: Home H and Foreign F $(^*)$. Goods: 1 and 2.
- Time: $t = 0, 1, ..., \infty$. No uncertainty. Zero assets at $t = 0$
- Preferences: $U_0 = \sum_{t=0}^{\infty} \beta^t u(C_t)$, where $\beta \in (0, 1)$, C_t aggregate consumption, and $u(C) = \frac{C^{1-\sigma}-1}{1-\sigma}$ with $\sigma > 0$
- Households consume both goods 1 and 2:

$$C_t \equiv g(\mathbf{c}_t) = \left[\alpha_1^{\frac{1}{\phi}} c_{1,t}^{\frac{\phi-1}{\phi}} + (1-\alpha_1)^{\frac{1}{\phi}} c_{2,t}^{\frac{\phi-1}{\phi}} \right]^{\frac{\phi}{\phi-1}}$$

  where $\mathbf{c}_t = [c_{1,t}, c_{2,t}]$, $\alpha_1 \in (0.5, 1]$, and $\phi > 0$ is 'elasticity of trade'

- *Exogenous* country endowments: $\mathbf{y}_t^{(*)} = [y_{1,t}^{(*)}, y_{2,t}^{(*)}]$

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Alternative Interpretation: Production AL, $L = \overline{L}$ and A fluctuates

Key Friction (Size): Terms of Trade Externality

- Large countries affect prices when making consumption decisions, i.e. $\frac{\mathrm{d}C^*}{\mathrm{d}C} \neq 0$, $\frac{\mathrm{d}c_1^*}{\mathrm{d}c_1} \neq 0$

- Planner has incentive to exercise monopoly/monopsony power in goods markets both statically and dynamically [Costinot, Lorenzoni and Werning, 2014]
  - Inter-temporal: tax capital inflows when borrowing is relatively high $(R_t \downarrow)$
  - Intra-temporal: subsidise c_1 when selling relative more of good 1 $(p_1 \uparrow)$

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+ Terms of trade underpin important frictions in the literature:
  - borrowing constraints [Bianchi, 2011]
  - ZLB and other monetary constraints [Farhi and Werning, 2016]
  - market segmentation and limits to arbitrage [Fanelli and Straub, 2018; Marin, 2020]
  - heterogeneous cons. baskets [Cravino and Levchenko, 2017, Fanelli and Straub, 2018]

Roadmap

Optimal Unilateral Policy: Setup

- Home country sets capital flow taxes to maximise welfare of domestic representative agent
- **Primal Approach**: Home planner chooses $\{\mathbf{c}_t\}$ in order to maximise welfare of representative agent U_0, taking as given:
  1. Foreign consumer maximising U_0^* subject to intertemporal budget constraint

$$\sum_{t=0}^{\infty} \mathbf{p}_t \cdot (\mathbf{c}_t^* - \mathbf{y}_t^*) \leq 0$$

     where $\mathbf{p}_t = [p_{1,t}, p_{2,t}]$ is vector of world prices

     ▸ Foreign Maximisation
  2. Goods market clearing

$$y_{1,t} + y_{1,t}^* = c_{1,t} + c_{1,t}^*, \qquad y_{2,t} + y_{2,t}^* = c_{2,t} + c_{2,t}^*$$

  3. Prevailing trade agreement

     ▸ FTA Problem ▸ nFTA Problem

Optimal Allocations with FTA

With FTA [Costinot, Lorenzoni, Werning, 2014]

- 1 FOC + 1 Instrument

$$\underbrace{\frac{\mathrm{d}\mathcal{L}}{\mathrm{d}C}}_{FOC=0} = \frac{\partial \mathcal{L}}{\partial c_1} \underbrace{c_1'(C)}_{FTA} + \frac{\partial \mathcal{L}}{\partial c_2} \underbrace{c_2'(C)}_{FTA}$$

- $u'(C_t) = \mu \mathcal{MC}_t^{FTA}$
- Choose C given FTA

$\Rightarrow$ Trade off $\frac{\partial \mathcal{L}}{\partial c_1}$ and $\frac{\partial \mathcal{L}}{\partial c_2}$, with c_1 and c_2 constrained by FTA

Optimal Allocations with and without FTA

With FTA [Costinot, Lorenzoni, Werning, 2014]

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Without FTA

- 2 FOCs + 2 Instruments

$$\frac{\mathrm{d}\mathcal{L}}{\mathrm{d}C} = \underbrace{\frac{\partial \mathcal{L}}{\partial c_1}}_{FOC=0} c_1'(C) + \underbrace{\frac{\partial \mathcal{L}}{\partial c_2}}_{FOC=0} c_2'(C)$$

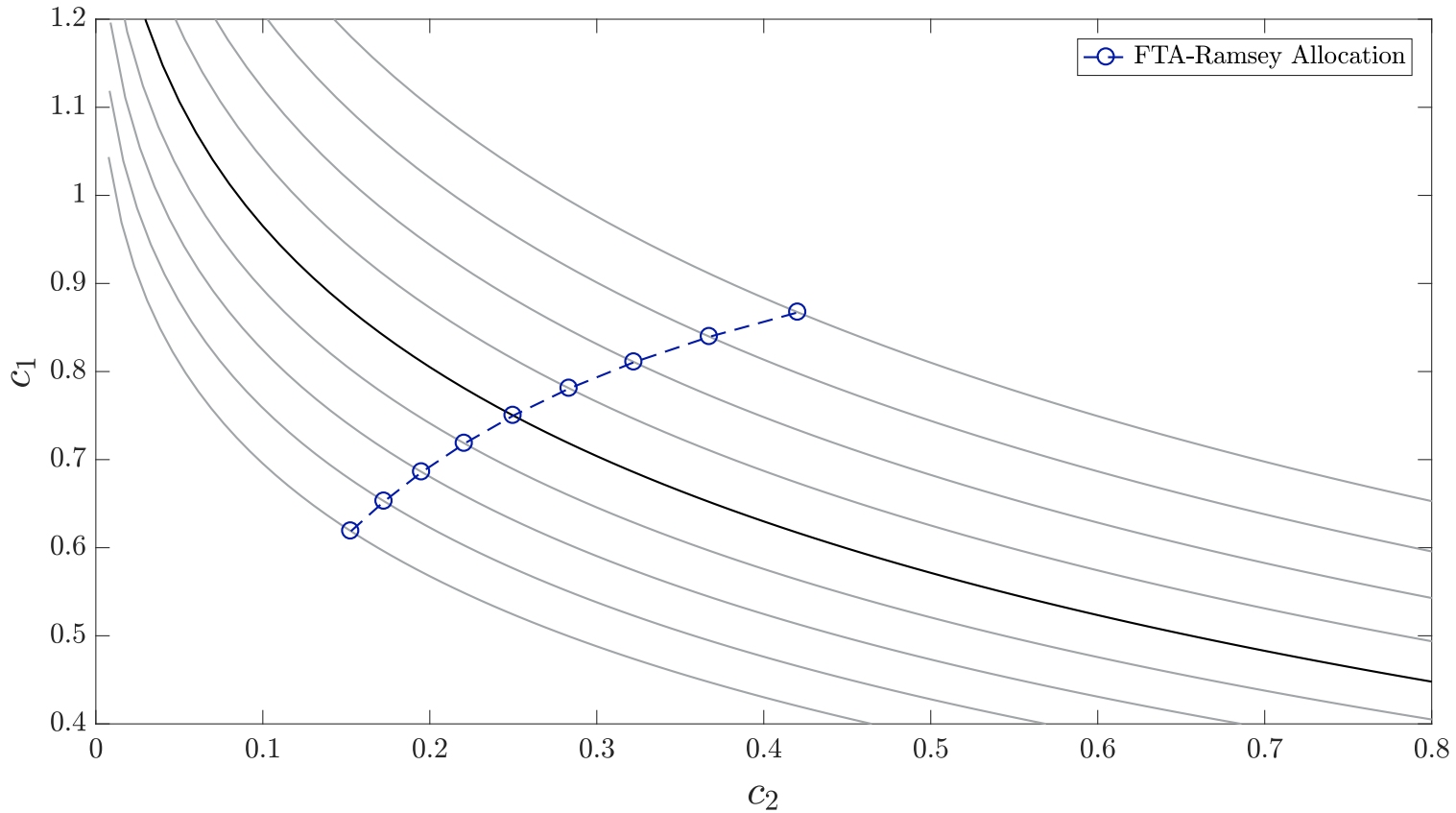
- $u'(c_{i,t}) = \mu \mathcal{MC}_{i,t}^{nFTA}$ for $i = 1, 2$
- Choose c_1 and c_2, given $C = g(\mathbf{c})$

$\Rightarrow$ C optimal for Home planner and can violate FTA constraint

Allocations with a Free Trade Agreement

Feasible combinations of $\{c_1, c_2\}$ given F

FTA $\Rightarrow$ H cannot impose good-specific taxes $\Rightarrow$ $(\mathbf{c}_t, \mathbf{c}_t^*)$ is Pareto efficient

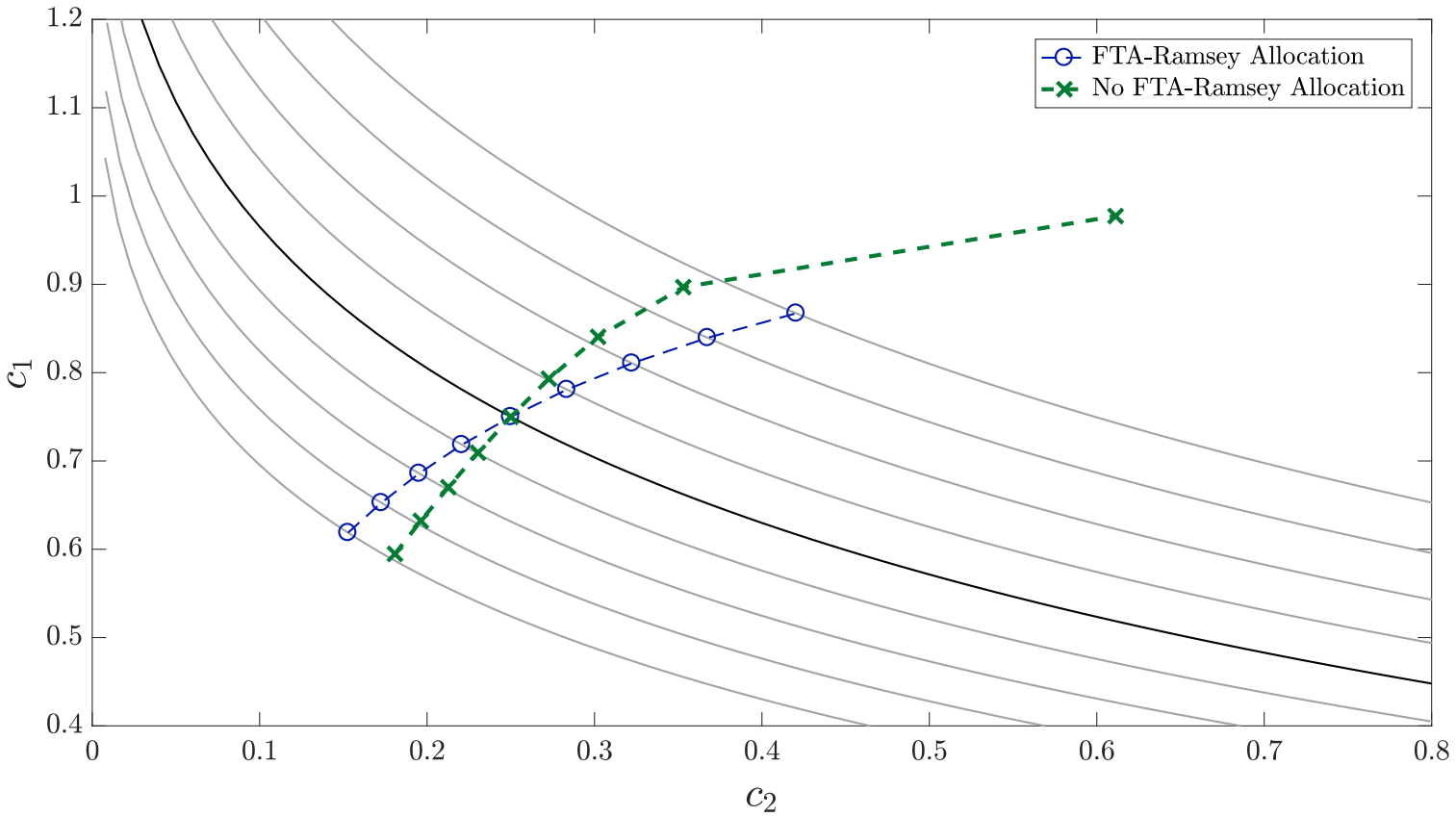


Note: $\phi = 1.5$, $\alpha_1 = \alpha_2^* = 0.75$, $y_1 = \alpha_1 \pm 0.25$, $y_2 = \alpha_2$, $y_i^* = 1 - y_i$ for $i = 1, 2$.

Relaxing the Free Trade Agreement

Feasible combinations of $\{c_1, c_2\}$ given F

No FTA $\Rightarrow$ H sets optimal import tariffs $\Rightarrow$ unconstrained by Pareto frontier



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Relaxing the FTA can Increase Home Welfare

Proposition

Suppose goods preferences are symmetric, $\alpha_1 = \alpha_2^*$ and $\alpha_2 = \alpha_1^*$:

(i) In general: $C^{nFTA} \geq C^{FTA}$

(ii) When $C^{nFTA} > C^{FTA}$: optimal nFTA allocation violates Pareto frontier

(iii) $C^{nFTA} = C^{FTA}$ when endowments are proportional to preferences, i.e. $y_1 \propto \alpha_1$, $y_2 \propto \alpha_2$, $y_1^* \propto \alpha_1^*$ and $y_2^* \propto \alpha_2^*$

▸ Graph

Inspecting the FOC

$$\mathcal{MC}_t^{FTA} \equiv \underbrace{u^{*\prime}(C_t^*)\nabla g^*(\mathbf{c}_t^*(C_t)) \cdot \mathbf{c}'(C_t)}_{\text{price}} + \underbrace{u^{*\prime\prime}(C_t^*)C^{*\prime}(C_t^*)\nabla g^*(\mathbf{c}_t^*(C_t)) \cdot [\mathbf{c}_t - \mathbf{y}_t]}_{\text{inter-temporal margin}}$$

$$+ \underbrace{u^{*\prime}(C_t^*)\frac{\partial \nabla g^*(\mathbf{c}_t(C_t))}{\partial C_t} \cdot [\mathbf{c}_t - \mathbf{y}_t]}_{\text{intra-temporal}}$$

- Analogous FOCs for nFTA- cost of c_1 and c_2 instead of C

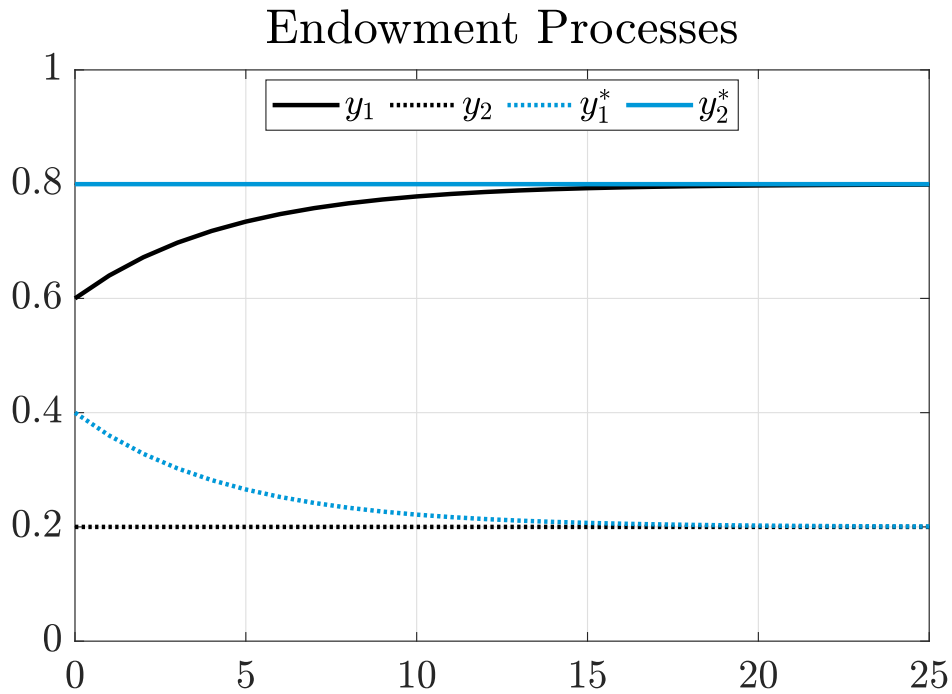
What Drives Optimal Policy?

Simulation: Growing Endowment of Home-Bias Good

Non-linear model simulation with AR(1) endowments (persistence ρ)

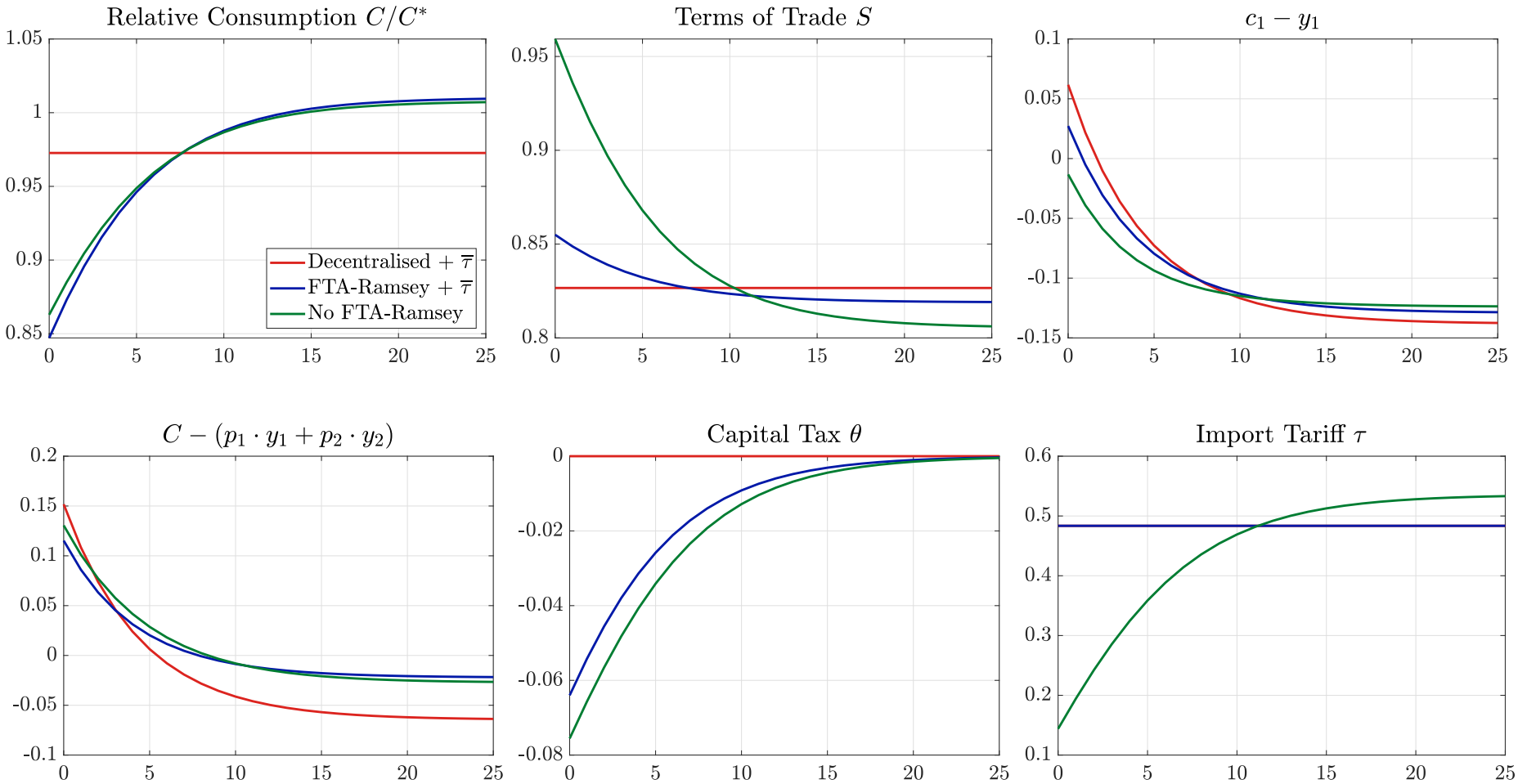
Implement allocation with **capital inflow tax** ($\theta_t < 0$) and **import tariff** ($\tau_t > 0$)

- Initial H endowments:
  $y_{1,0} = 0.75\overline{y}_1$, and $y_{2,0} = \overline{y}_2$
- No aggregate uncertainty:
  $y^*_{i,t} = 1 - y_{i,t}\ \forall i, t$
- $\sigma = 2$, $\beta = 0.96$, $\phi = 1.5$, $\rho = 0.8$
- $\alpha_1 = \alpha^*_2 = 0.6$ and $\overline{y}_1 = \overline{y}^*_2 = 0.8$



Equalise model steady states (via exogenous tax) to focus on welfare gains along transition path

Growing Endowment of Home-Bias Good



Roadmap

Implementation

- ⋆ **Capital taxation:**

$$\frac{u'(C_{t+1})}{u'(C_t)}(1-\theta_t) = \frac{u'(C^*_{t+1})}{u'(C^*_t)} \frac{Q_t}{Q_{t+1}}$$

$\theta_t < 0$ denotes a tax on current consumption relative to future consumption, or tax on capital inflows

- ⋆ **Goods tax**:

$$\frac{c_{1,t}}{c_{2,t}} = \frac{\alpha}{1-\alpha}\left(\frac{1}{S_t(1+\tau_t)}\right)^{-\phi}$$

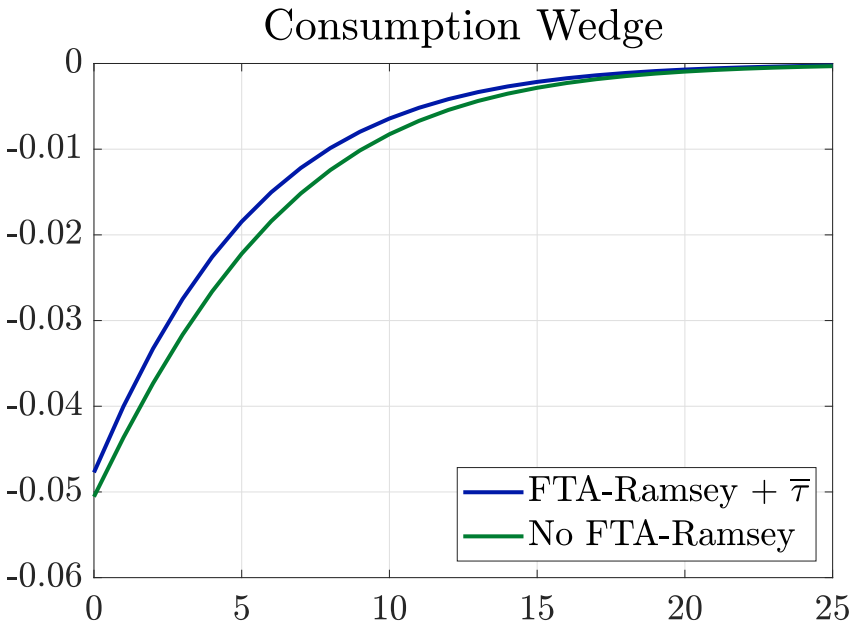
where $\tau_t > 0$ denotes Home-good subsidy $\Leftrightarrow$ an import tariff

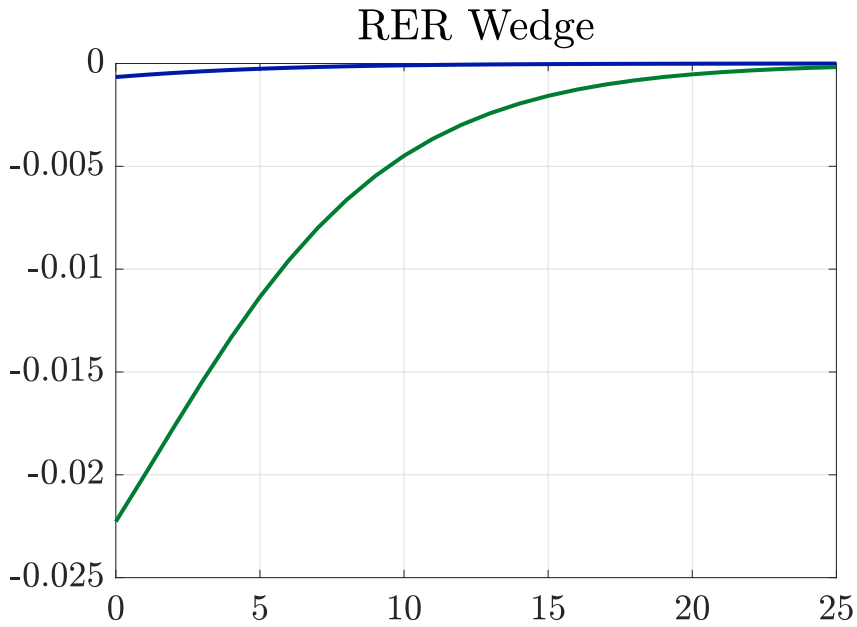
- Implementation not unique [Chari and Kehoe, 1999], but policy-relevant

Experiment #1: Capital Tax Decomposition

Why is the capital tax higher absent FTA?

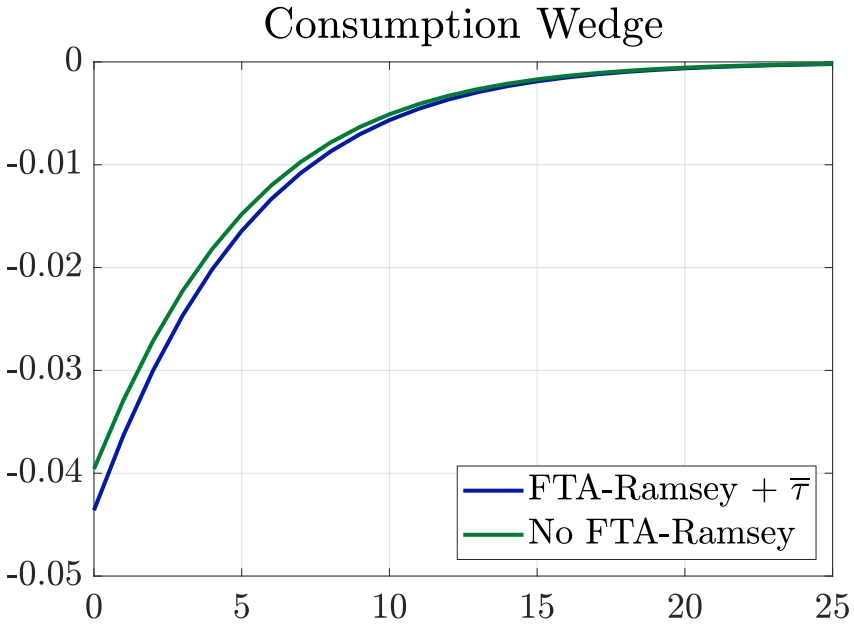
$$-\ln(\theta_t) = \underbrace{-\sigma\left(\tilde{C}_t - \tilde{C}_{t+1} + \tilde{C}^*_{t+1} - \tilde{C}^*_t\right)}_{\text{Consumption Wedge}} + \underbrace{\left(\tilde{Q}_t - \tilde{Q}_{t+1}\right)}_{\text{RER Wedge}}$$

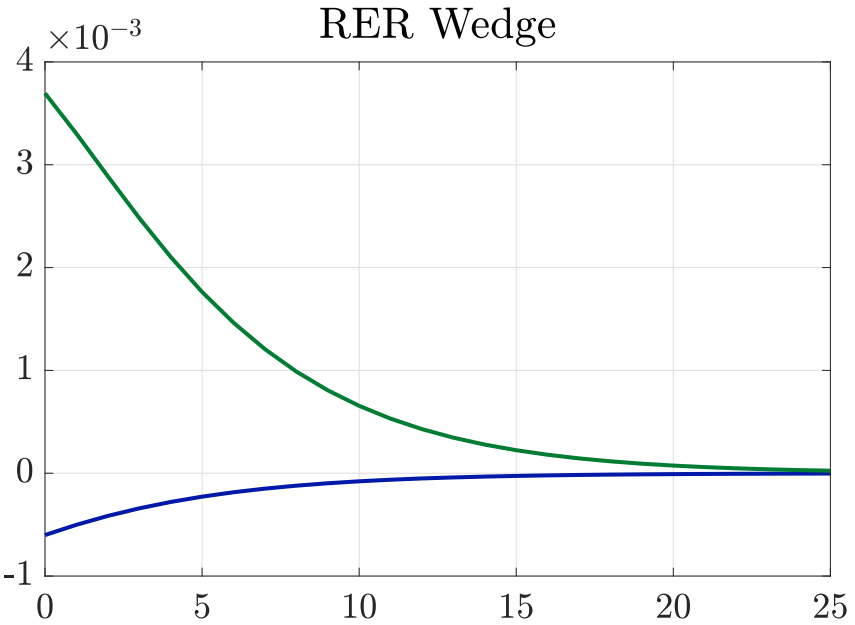




Mechanism: Tariffs $\Rightarrow$ RER Misalignment $\Rightarrow$ Capital Controls

Experiment #2: Capital Tax Decomposition





- ⋆ Real exchange rate moves in opposite direction, lower capital controls needed
- ⋆ Trade policy disentagles C growth and Q growth

Mechanism: Capital Controls and Tariffs

1. Experiment 1 ($y_1 < y_1'$)
   - Capital inflows $P(C - Y) \uparrow$ and sell less home good abroad $(c_1 - y_1) \uparrow$
   - Capital flows tax drives down R and p_1 (incentives aligned)

   When incentives aligned , tariff $\implies$ $Q > Q'$ $\implies$ over-borrowing and capital tax $\uparrow$

2. Experiment 2 ($y_2 < y_2'$)
   - Capital inflows $P(C - Y) \uparrow$ *but* sell more home good abroad $(c_1 - y_1) \downarrow$
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Sufficient statistic: $cov_t \left(\frac{\partial \rho_t^{inter}}{\partial C_t}, \frac{d\rho_t^{intra}}{\partial C_t} \right) \lessgtr 0$

Roadmap

Spillovers Dwarf Domestic Gains, esp. with Tariffs

Proposition

- ⋆ *Global Cooperative Optimum*: no intervention
- ⋆ *Unilateral*: Welfare gain in H small relative to loss in F, esp. without FTA
- ⋆ *Nash*: Larger aggregate losses from policy wars

  $\Rightarrow$ **more so with capital control and tariff wars**

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Table: Welfare and Spillovers. Welfare expressed in terms of $\%$ consumption equivalent variation ($-ve$ implies welfare gain).

Experiment 1	H	F	Global $\sum_{H,F}$
FTA (Unilateral)	-0.13	0.23	0.050
without FTA (Unilateral)	-0.22	0.27	0.025
with FTA (Nash)	0.068	0.067	0.068
without FTA (Nash)	1.71	1.58	1.65

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$$\mathbf{p}(s) \cdot [\mathbf{c}(s) - \mathbf{y}(s)] \leq \mathbf{p}(s) \cdot \mathbf{a}(s) \qquad \text{(ex-post)}$$

* $\phi_a > 0, \ \phi_Q > 0$ [Bianchi, 2011]
* $\frac{d\mathbf{a}(s)}{dC(s)} > 0$ but $\frac{dQ(s)}{dC(s)} < 0$

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- $\frac{d\mathbf{a}(s)}{dC(s)} > 0$ but $\frac{dQ(s)}{dC(s)} < 0$

Key result: Financial cost lower if **either** borrowing lower ($C \downarrow$) or appreciation ($c_1 \uparrow$) $\implies$ **import tariff can substitute for capital inflow tax**

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Conclusion

Cannot separate discussions of capital controls and trade protectionism.

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  - Interaction between capital controls and tariffs stems from over/under-borrowing due to real exchange rate movements attr. to tariffs

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E2. When inter/intra incentives **mis**-aligned capital inflow tax and tariff substitutes

Conclusion

Cannot separate discussions of capital controls and trade protectionism.

- Policy prescriptions around trade and financial openness interlinked.
  - ∗ Interaction between capital controls and tariffs stems from over/ under-borrowing due to real exchange rate movements attr. to tariffs
  - E1. When inter/intra-temporal incentives aligned (specialization), capital inflow tax and tariff complementary
  - E2. When inter/intra incentives **mis**-aligned capital inflow tax and tariff substitutes
- In SOE with financial frictions, tariffs are a **substitute** for capital inflow taxes
- Domestic gains from capital controls and tariffs are small, but spillovers are larg

Foreign Consumer Maximisation

- Representative Foreign consumer problem:

$$\max_{\{\mathbf{c}_t^*\}} \quad U_0^* = \sum_{t=0}^{\infty} \beta^t U^*(C_t^*) \quad \text{s.t.} \quad \sum_{t=0}^{\infty} \mathbf{p}_t \cdot (\mathbf{c}_t^* - \mathbf{y}_t^*) \leq 0$$

$\Rightarrow$ Optimality conditions:

$$\beta^t U^{*\prime}(C_t^*) \nabla g_c^*(\mathbf{c}_t^*) = \lambda^* \mathbf{p}_t$$

$$\sum_{t=0}^{\infty} \mathbf{p}_t \cdot (\mathbf{c}_t^* - \mathbf{y}_t^*) = 0$$

where $\nabla g_c^*(\mathbf{c}_t) = \left[\frac{\partial g^*(\mathbf{c}_t^*)}{\partial c_{1,t}^*}, \frac{\partial g^*(\mathbf{c}_t^*)}{\partial c_{2,t}^*} \right]$

Back

Unilateral Home Planning Problem

With FTA [Costinot, Lorenzoni & Werning, 2014]

$$\max_{\{C_t\}} \quad \sum_{t=0}^{\infty} \beta^t u(C_t) \tag{P-FTA}$$

$$\text{s.t.} \quad \sum_{t=0}^{\infty} \boldsymbol{\rho}(C_t) \cdot [\mathbf{c}_t - \mathbf{y}_t] = 0 \tag{IC}$$

$$\mathbf{c}_t = \mathbf{c}_t(C_t), \quad \mathbf{c}_t^* = \mathbf{c}_t^*(C_t) \tag{FTA}$$

where $\boldsymbol{\rho}(C_t) \equiv \beta^t u^{*\prime}(C_t^*) \nabla g_c^*(\mathbf{c}_t^*(C_t))$

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Unilateral Home Planning Problem

Without FTA

$$\max_{\{\mathbf{c}_t\}} \quad \sum_{t=0}^{\infty} \beta^t u(C_t) \qquad \text{(P-nFTA)}$$

$$\text{s.t.} \quad \sum_{t=0}^{\infty} \boldsymbol{\rho}(C_t) \cdot [\mathbf{c}_t - \mathbf{y}_t] = 0 \qquad \text{(IC)}$$

$$C_t = g(\mathbf{c}_t) \qquad \text{(nFTA)}$$

where $\boldsymbol{\rho}(C_t) \equiv \beta^t u^{*\prime}(C_t^*) \nabla g_c^*(\mathbf{c}_t^*(C_t))$

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