Political Economy of Sovereign Debt
A Theory of Cycles of Populism and Austerity

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Introduction

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  - Latin american economies in the 20th century:
    Argentina under Perón, Chile under Allende
  - Typical dynamics:
    - Large redistributive programs, accumulation of foreign debt
    - Eventually country got into trouble
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- Theory of fiscal policy cycles in open economy based on government's:
  - Redistributive motive
  - Lack of commitment

What We Do

- Small open economy
- OLG and heterogenous income/skill
- Government with redistributive motive
  - Redistribution within and across generations
  - Set income taxes, transfers and pensions
    $\rightarrow$ Efficiency-equality trade-off
  - Issues debt: domestically and abroad
- Gov't cannot commit to
  - Repay government debt
  - Future income taxes, transfers and pensions
- Two ways to determine policies:
  - Fictitious planner that cares about current and future generations
  - Outcome of probabilistic voting (Lindbeck and Weibull, 1987)

Main Results

When government highly (external) indebted:

- Overshooting: Drastic adjustment in external indebtedness
  - External debt reduced below its long-run sustainable level
  - Allow for large inequality

If gov't more impatient than foreign lenders (or when people vote):

- Cyclical fiscal policy

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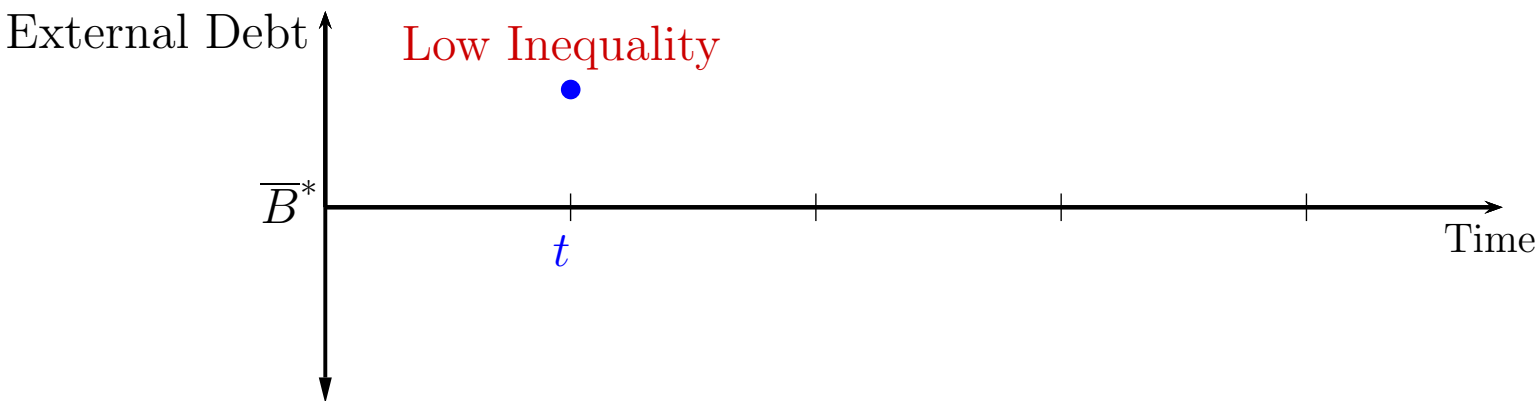

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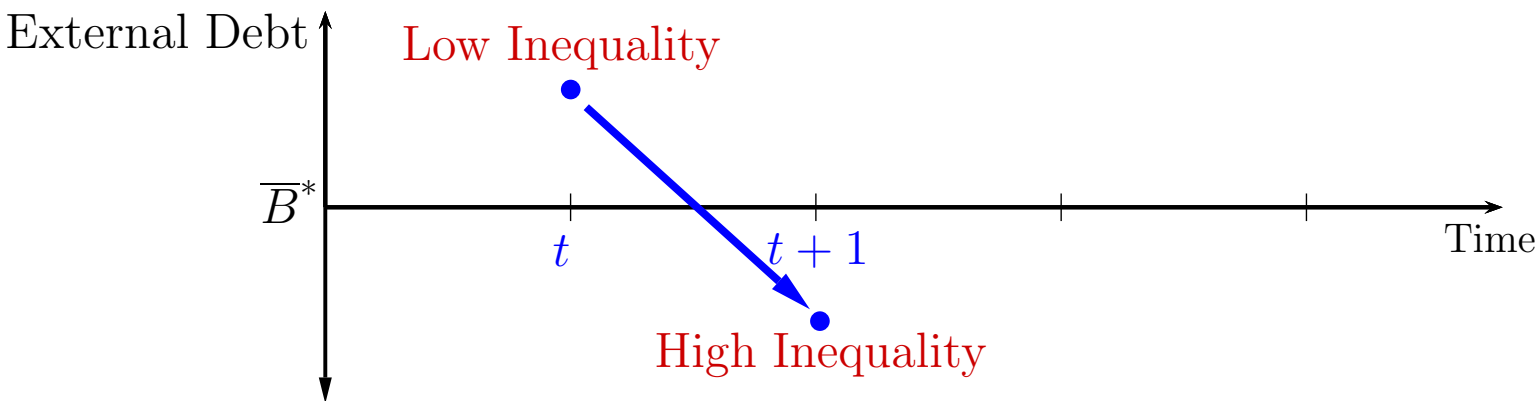

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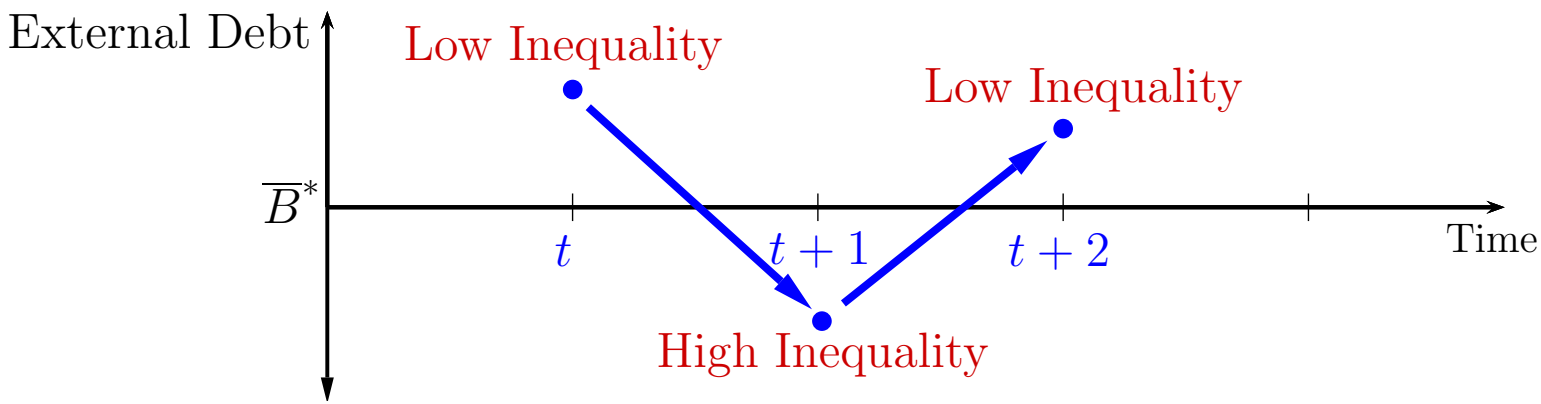

Inequality Overhang

- Trade-off between two incentives to default:
  - Foreign: Reduce payments to foreigners
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  - Current government would like to increase inequality; equality is a normal good
  - Higher current inequality leads to higher inequality in the future - intertemporal smoothing
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  - Stronger motive for future default $\Rightarrow$ Future debt must be reduced

Related Literature

- Optimal Fiscal Policy: Barro (1979), Lucas and Stokey(1983), Werning (2007), Bhandari, Evans, Golosov, and Sargent (2013)

- Optimal Fiscal Policy without Commitment:
  - Open economy: Amador, Aguiar and Gopinath(2009), Aguiar and Amador (2014)
  - Closed economy: Farhi, Sleet, Werning and Yeltekin (2012), D'Erasmo and Mendoza (2014), Scheuer and Wolitzky (2014)

Outline

- Optimal Policy without Commitment in Deterministic Economy
  - Model Setup
  - Overshooting/Repatriation of Government Debt
  - Cyclicality of fiscal policies
- Extensions
  - Economy with shocks
  - Political Economy Model

Environment

Environment

- Time is discrete: $t = 0, 1, 2, \cdots$
- Small open economy
  - International interest rate $1 + r^*$
- OLG structure:
  - Continuum of households; live for two periods
- Government

Households

- Preferences

$$u(c_{t,0}, y_t; \theta) + \beta u(c_{t,1})$$

where $\theta \in \Theta = \left\{\theta^1, \cdots, \theta^N\right\}$ is individual specific labor productivity and $\Pr(\theta = \theta^i) = \mu^i$.

- Analytical results for log-log preferences

$$u(c, y; \theta) = \log c + \psi \log\left(1 - \frac{y}{\theta}\right)$$

$$u(c) = \log c$$

- GDP: $Y_t = \sum_i \mu^i y_t^i$
  - Normalization $\sum_{i=1}^N \mu^i \theta^i = 1$;

Households

- Households have access to complete domestic asset markets; No access to international credit market
  - Without loss of generality: equivalent to households access to int'l credit market + capital control

- Taxes and transfers:
  - Linear tax on labor income: $\tau_{l,t}$
  - Linear tax on assets: $\tau_{a,t+1}$
  - Receive transfers when young and old: T_t and P_{t+1}

- Budget constraint:

$$c^i_{0,t} + q_t a^i_{t+1} \leqslant (1 - \tau_{l,t}) y^i_t + T_t$$

$$c^i_{t,1} \leqslant (1 - \tau_{a,t+1}) a^i_{t+1} + P_{t+1}$$

Government

- Government can issue debt to
  - International lenders: B_t
  - Households: B_t^d

- Government budget constraint

$$\delta_t B_t + (1-\tau_{a,t})B_t^d + T_t + P_t + G_t = \tau_{lt}\sum_i \mu^i y_t^i + q_t^d B_{t+1}^d + q_t B_{t+1}$$

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- Credit market clearing:

$$B_{t+1}^d = \sum_i \mu^i a_{t+1}^i$$

- If $B_{t+1} > 0$ then $q_t = \frac{\delta_{t+1}}{1+r^*}$

Government Preferences

- $\hat{\beta}^t \alpha^i$: Pareto weight of agent of type i in generation t
- Government objective

$$W = \frac{1}{\hat{\beta}} U_{1,-1} + \sum_{t=0}^{\infty} \hat{\beta}^t U_t$$

where

  - $U_{1,-1}$: Aggregate welfare among initial old
  - U_t: Aggregate welfare of generation born at t:

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- Assumption – Inequality aversion: $\alpha^1 \geqslant \alpha^2 \geqslant \cdots \geqslant \alpha^N$
  - Utilitarian: $\alpha^i = \alpha^j$
  - Rawlsian: $\alpha^1 = 1, \alpha^i = 0, i > 1$

- Assumption: $\hat{\beta}(1 + r^*) \leqslant 1$

Characterization of Competitive Equilibrium

- Standard approach: characterize allocations that are CE

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- Lump-sum taxes available: no restrictions on aggregate allocations
- Sufficient to focus on aggregates $(C_{t,0}, C_{t,1}, Y_t)$ that satisfies inter temporal budget constraint
  - determines $\tau_{l,t}, T_t, P_{t+1}$
  - determines distribution of allocations through Negishi weights $\Phi_t = \{\varphi_t^i\}_{i=1}^N$

Characterization of Competitive Equilibrium

- With log-log preferences:

$$\varphi_t^i = 1 + \kappa \frac{\theta^i - 1}{1 - Y_t}$$

  - φ_t^i: the fraction of consumption by individual of type i consumption and wealth inequality
  - As Y_t increases, Φ_t increases in SOSD.
  - Intuition: higher taxes $\Rightarrow$ lower inequality $\Rightarrow$ lower GDP

Government Preferences

- Value for the government as function of C_0, C_1, Y with log-log:

$$\begin{aligned} U^p(C_0, C_1, Y) &= \log C_0 + \psi \log(1 - Y) + \beta \log C_1 \\ &\quad + (1 + \psi + \beta) \sum_i \alpha^i \mu^i \log \varphi^i \\ &= \log C_0 + \psi \log(1 - Y) + \beta \log C_1 \\ &\quad - (1 + \psi + \beta) H(Y) \\ U_1^p(C_1, Y) &= \beta \log C_1 + \beta \sum_i \alpha^i \mu^i \log \varphi^i \\ &= \beta \log C_1 - \beta H(Y) \end{aligned}$$

- $H(Y)$: cost of inequality

Optimal Policy Problem

$$\max_{\text{policy, all'n, prices}} W = \frac{1}{\hat{\beta}} U_{-1,1} + \sum_{t=0}^{\infty} \hat{\beta}^t U_t$$

subject to

- Policy, all'n, prices constitute a competitive equilibrium
  - Given an initial value of external government debt: B_0
  - Given an initial distribution of assets: $\left\{a_0^i\right\}_{i=1,\cdots,I}$
- Lack of commitment

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- Lack of commitment $\rightarrow$ Sustainability constraint

$$\frac{1}{\hat{\beta}} u_{t-1,1} + \sum_{s=t}^{\infty} \hat{\beta}^{s-t} u_s \geqslant \underline{W}$$

Government Value of Default

- $\underline{W}$:
  - The government is in financial autarky forever
  - No saving by households (expect 100% tax on assets)
  - No consumption inequality among the old

- Cost of default: Disruption of asset markets
  - Cannot borrow from foreign to smooth (relevant with shocks)
  - No saving by households $\Rightarrow$ worse efficiency-equality trade-off

- $\underline{W}$: Limit of a finite-horizon equilibrium

▸ Details

Optimal Policy Problem

Government chooses $\{C_{t,0}, C_{t-1,1}, Y_t\}_{t=0}^{\infty}$ to

$$\max \frac{\beta}{\hat{\beta}} \left[\sum_i \mu^i \alpha^i \log(a_0^i + P) \right] + \sum_{t=0}^{\infty} \hat{\beta}^t U^p(C_{t,0}, C_{t,1}, Y_t)$$

subject to

$$B_0 + \sum_{t=0}^{\infty} \frac{1}{(1+r^*)^t} [C_{t-1,1} + C_{t,0} + G_t] \leqslant \sum_{t=0}^{\infty} \frac{1}{(1+r^*)^t} Y_t$$

$$\frac{1}{\hat{\beta}} U_1^p(C_{t-1,1}; Y_{t-1}) + \sum_{s=t}^{\infty} \hat{\beta}^{s-t} U^p(C_{s,0}, C_{s,1}, Y_s) \geqslant \underline{W}$$

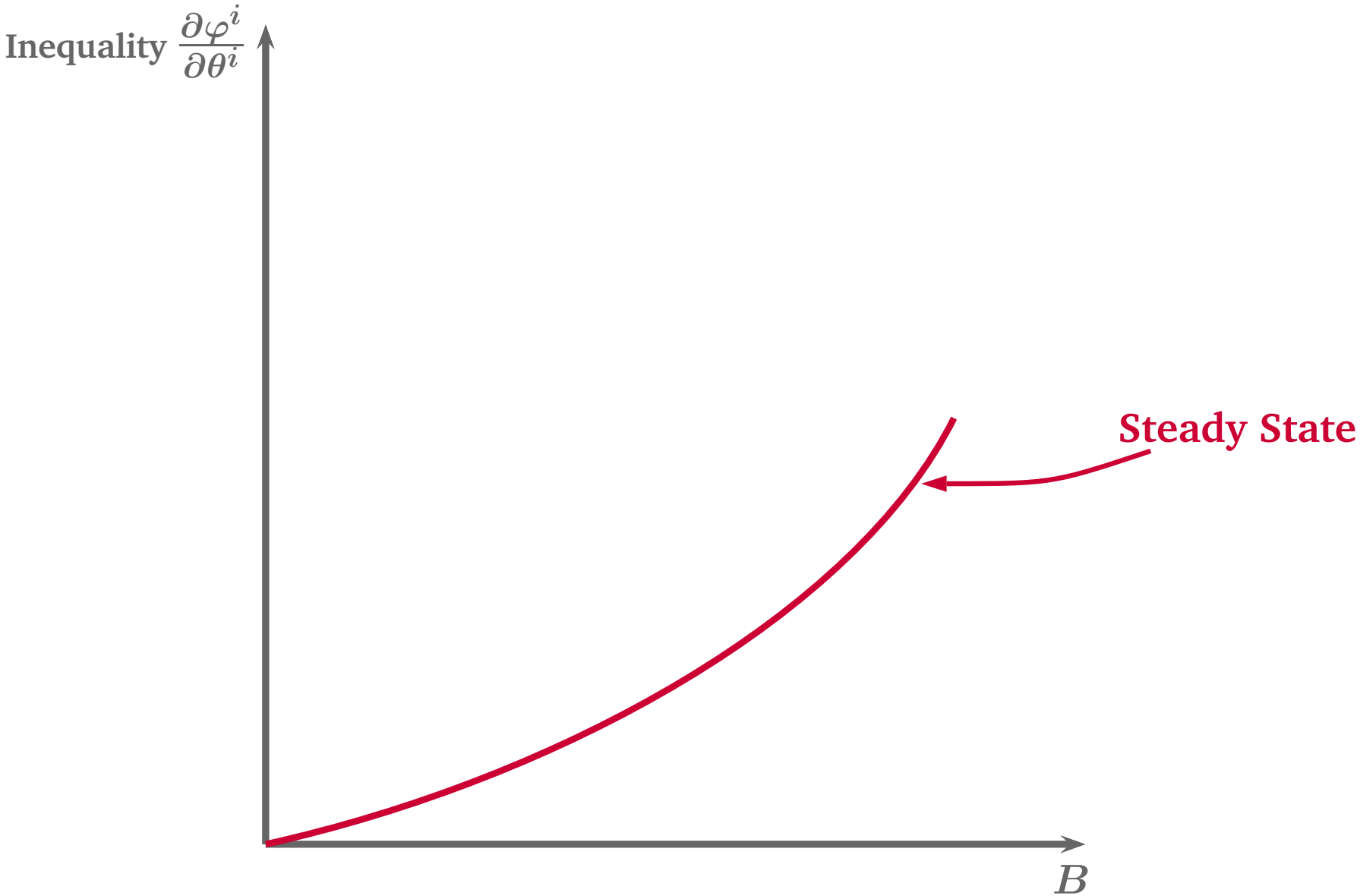
given $\left(B_0, \{a_0^i\}\right)$

Optimal Policy with Commitment

Optimal Policy with Commitment and $\hat{\beta}(1+r^*)=1$

- Constant consumption and output over time
- Constant inequality - except among initial old
- Roll over external debt; no adjustment of debt, $CA_t = \frac{r^*}{1+r^*} B_0$

Optimal Policy with Commitment and $\hat{\beta}(1+r^*)=1$



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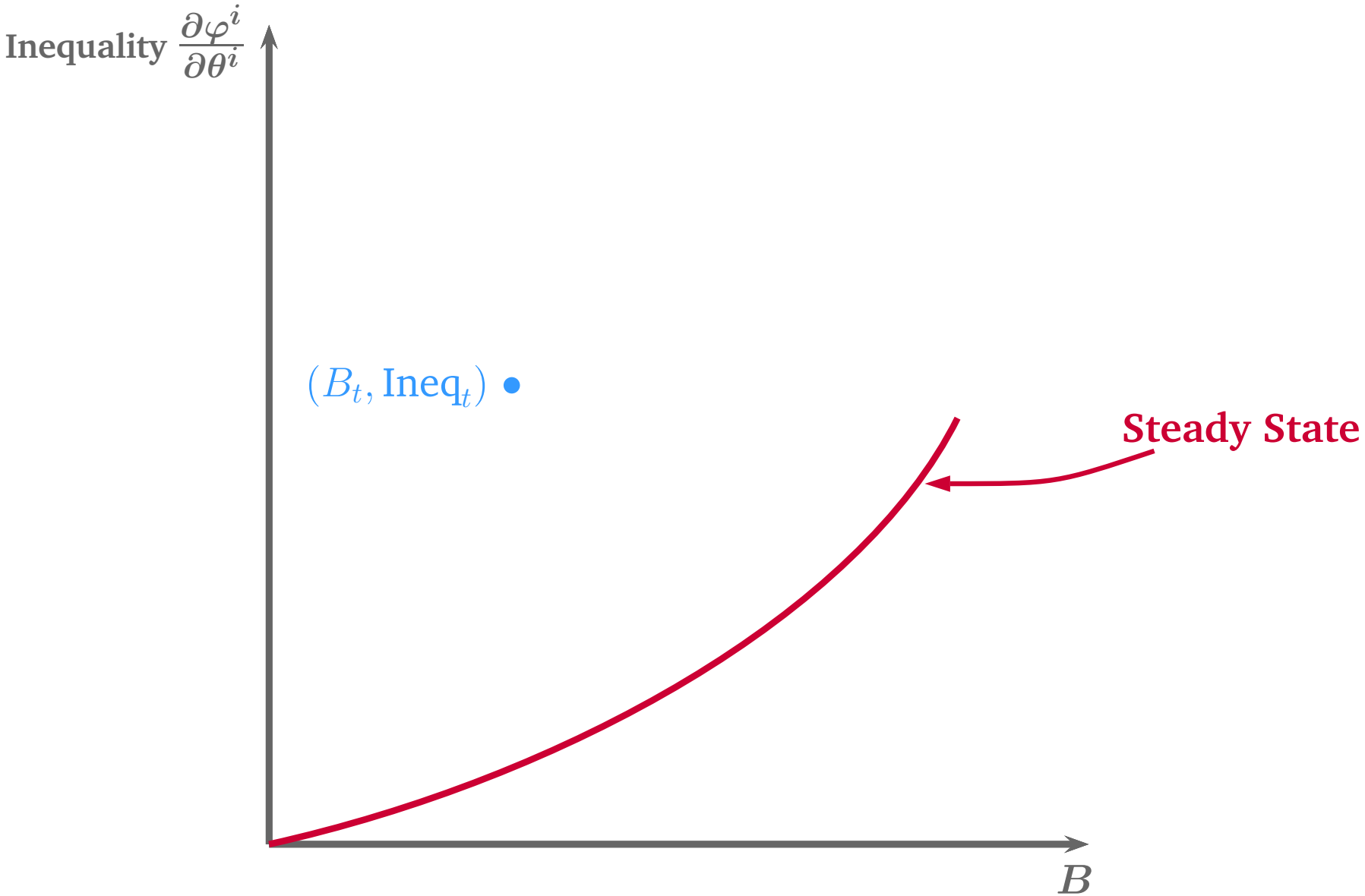

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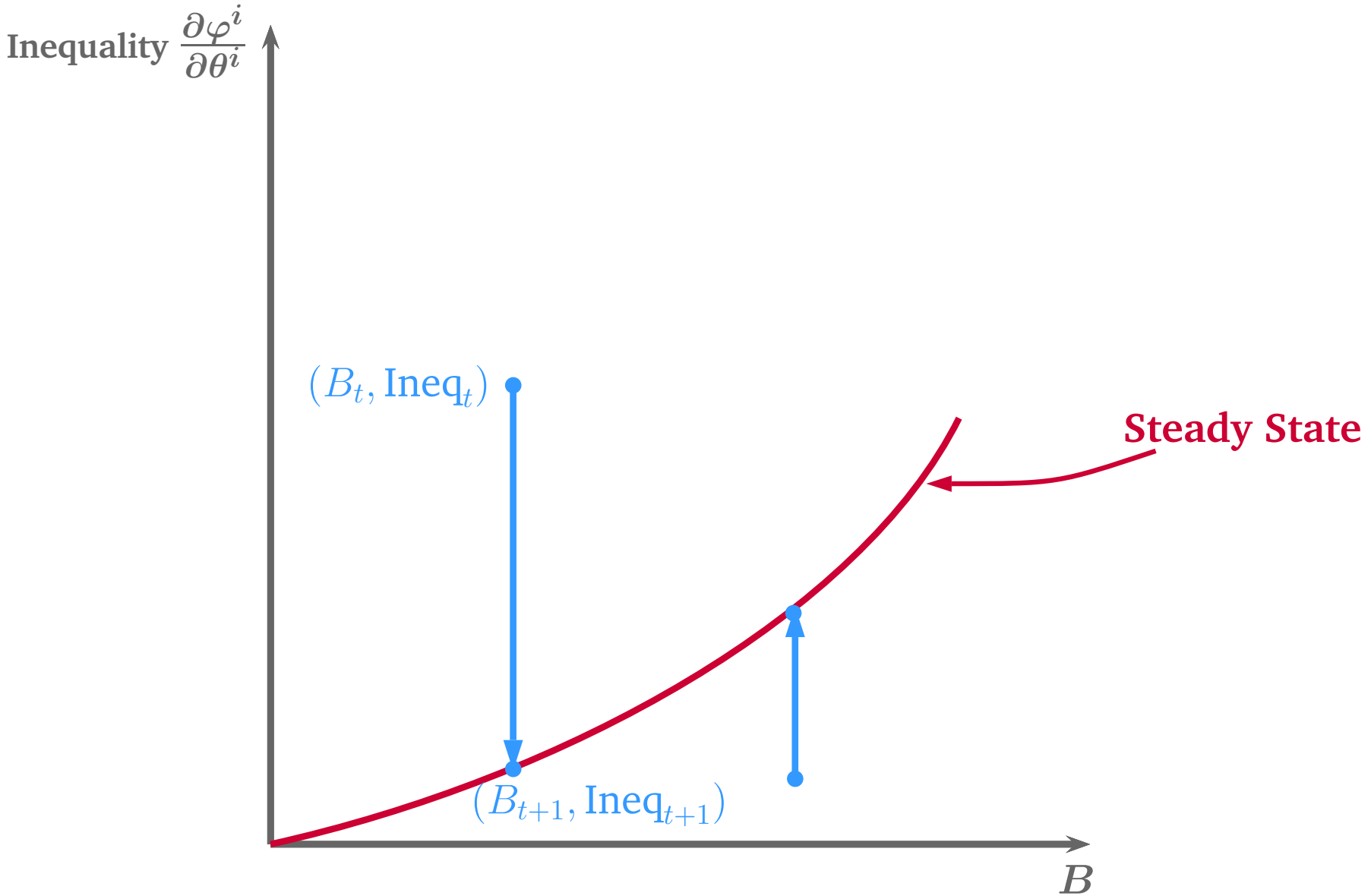

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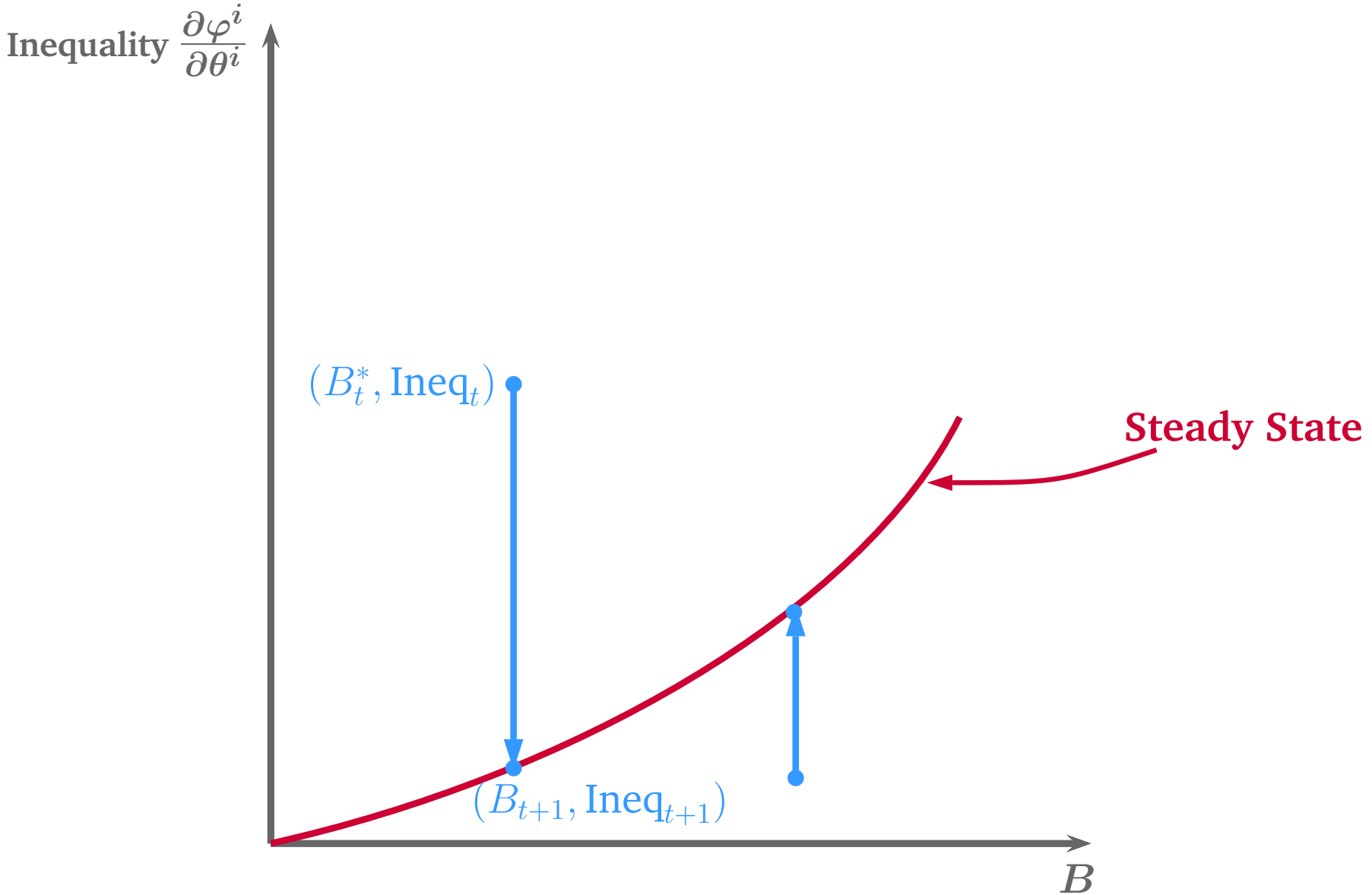

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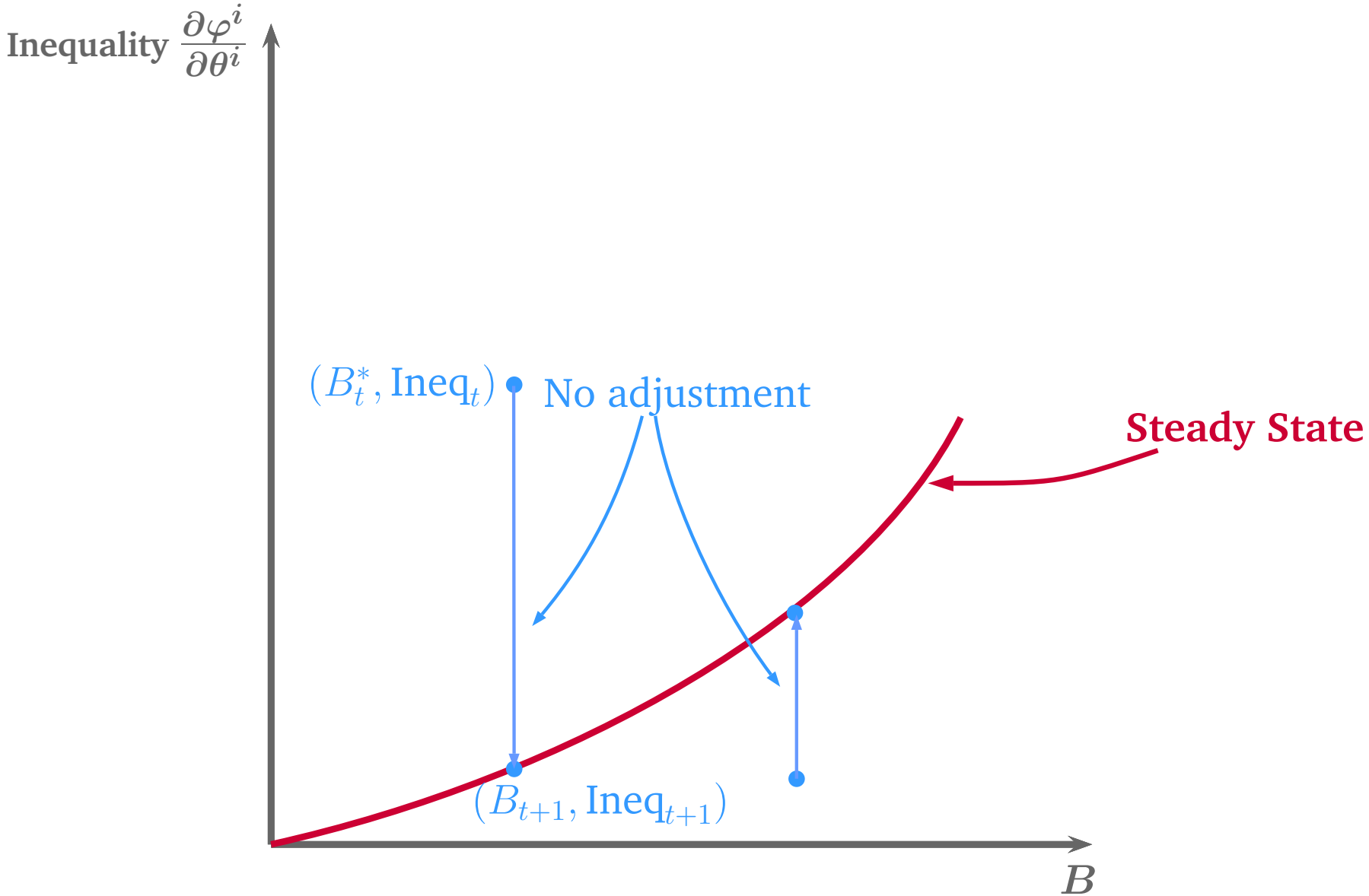


Optimal Policy without Commitment

Two Incentives to Default

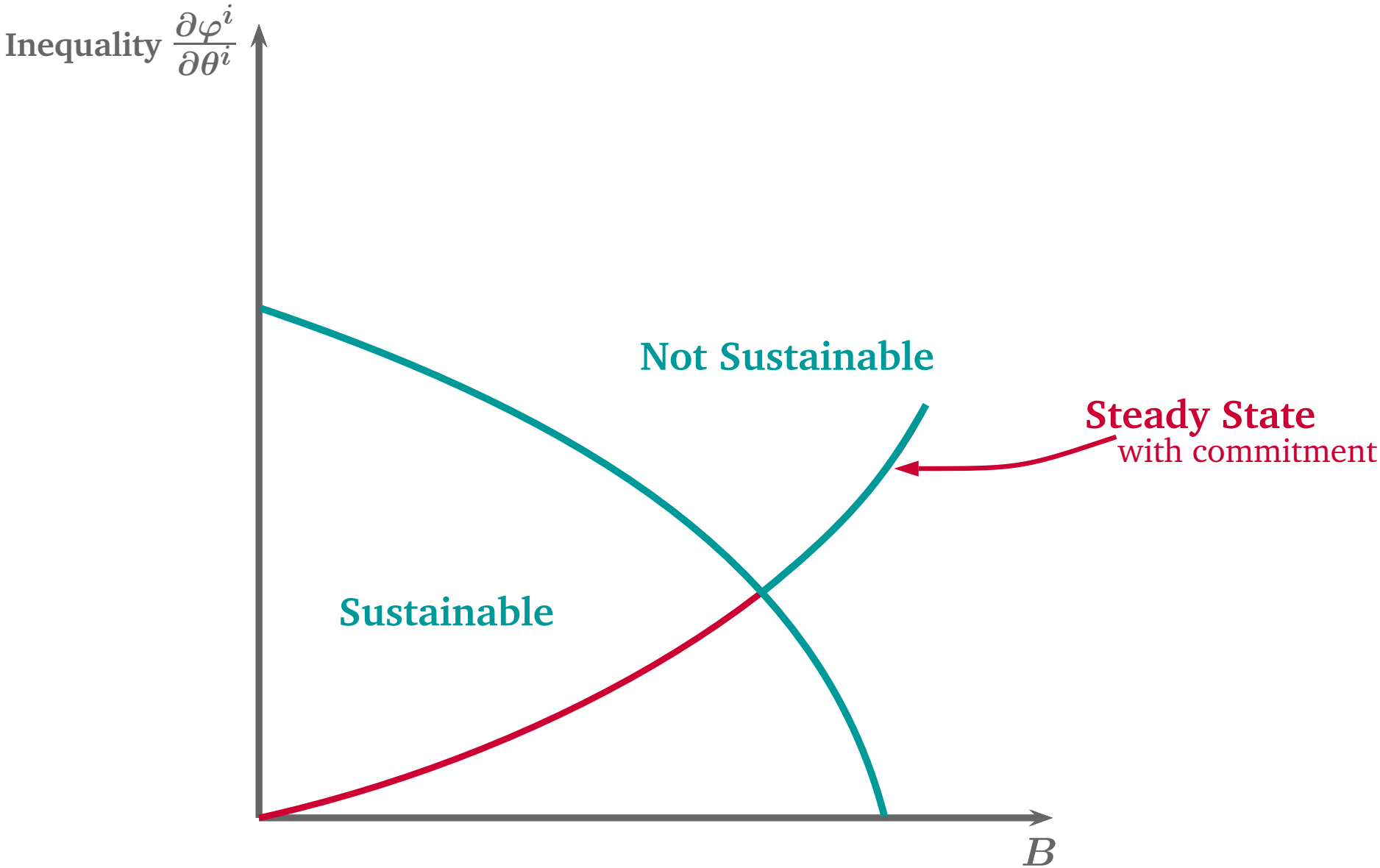
- Foreign: Reduce payments to foreigners
- Domestic: Consumption inequality among the old is undesirable; always desirable 100% tax on assets for the current old and redistribute via pension

Higher incentive to default if:

- High foreign debt
- Wealth inequality is high

$$\frac{\beta}{\hat{\beta}}[\log C_{-1,1}+\sum_i \mu^i \alpha^i \log \varphi^i_{t-1}]+\sum_{t=0}^{\infty} \hat{\beta}^t U^p(C_{0,t}, C_{1,t}, Y_t; \Phi_t) \geqslant \underline{W}$$

Best Sustainable Allocations with $\hat{\beta}(1+r^*)=1$



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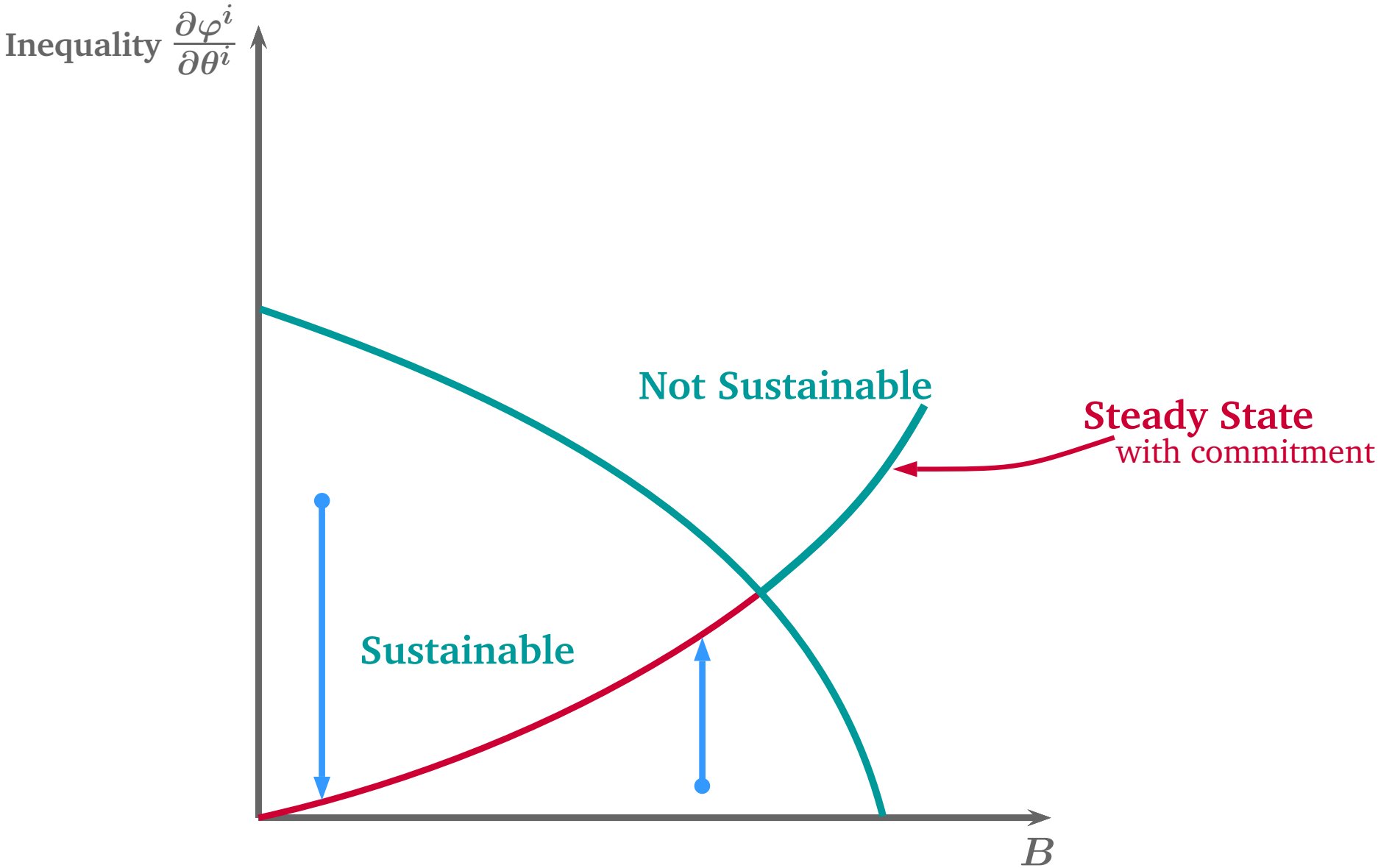

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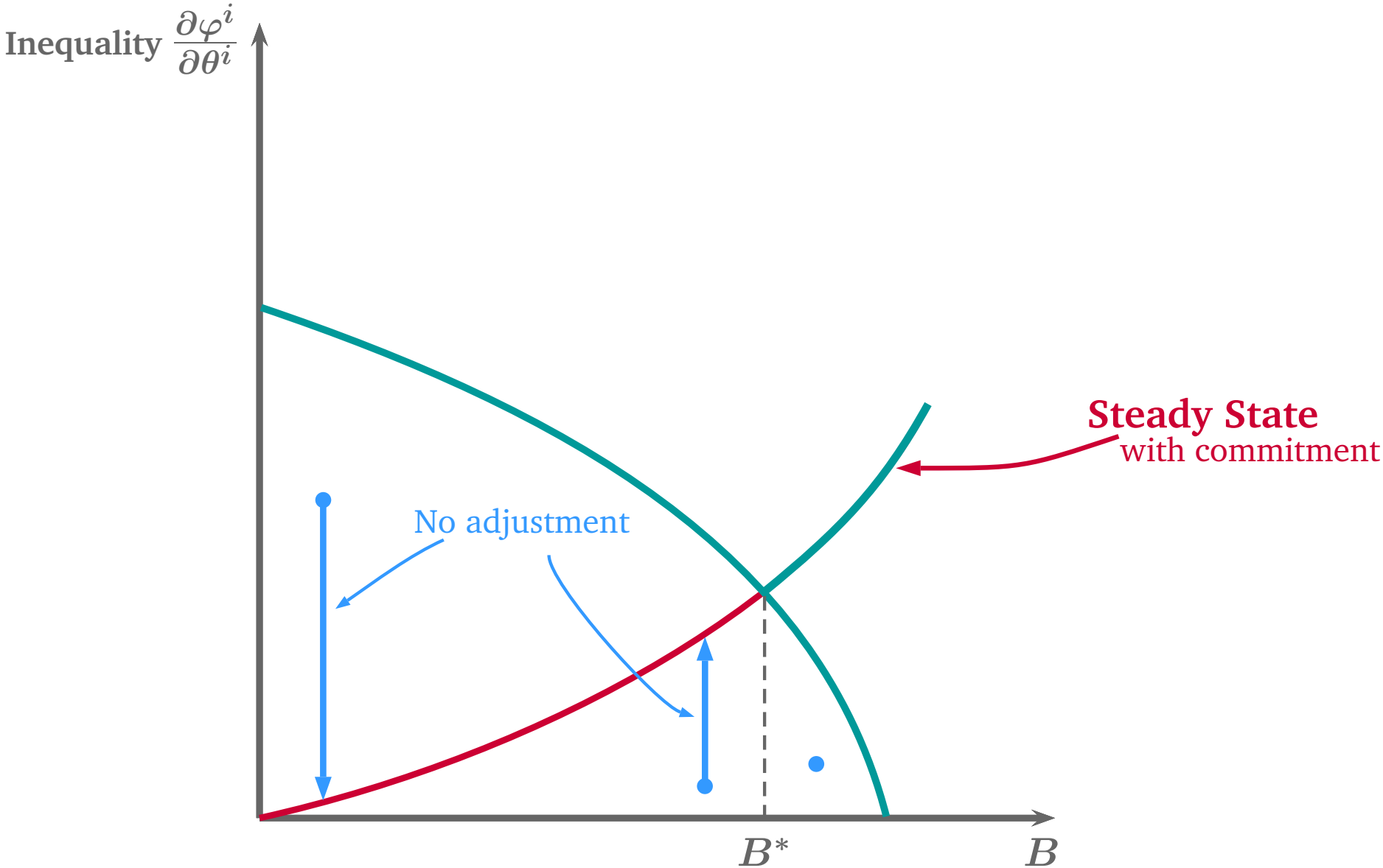

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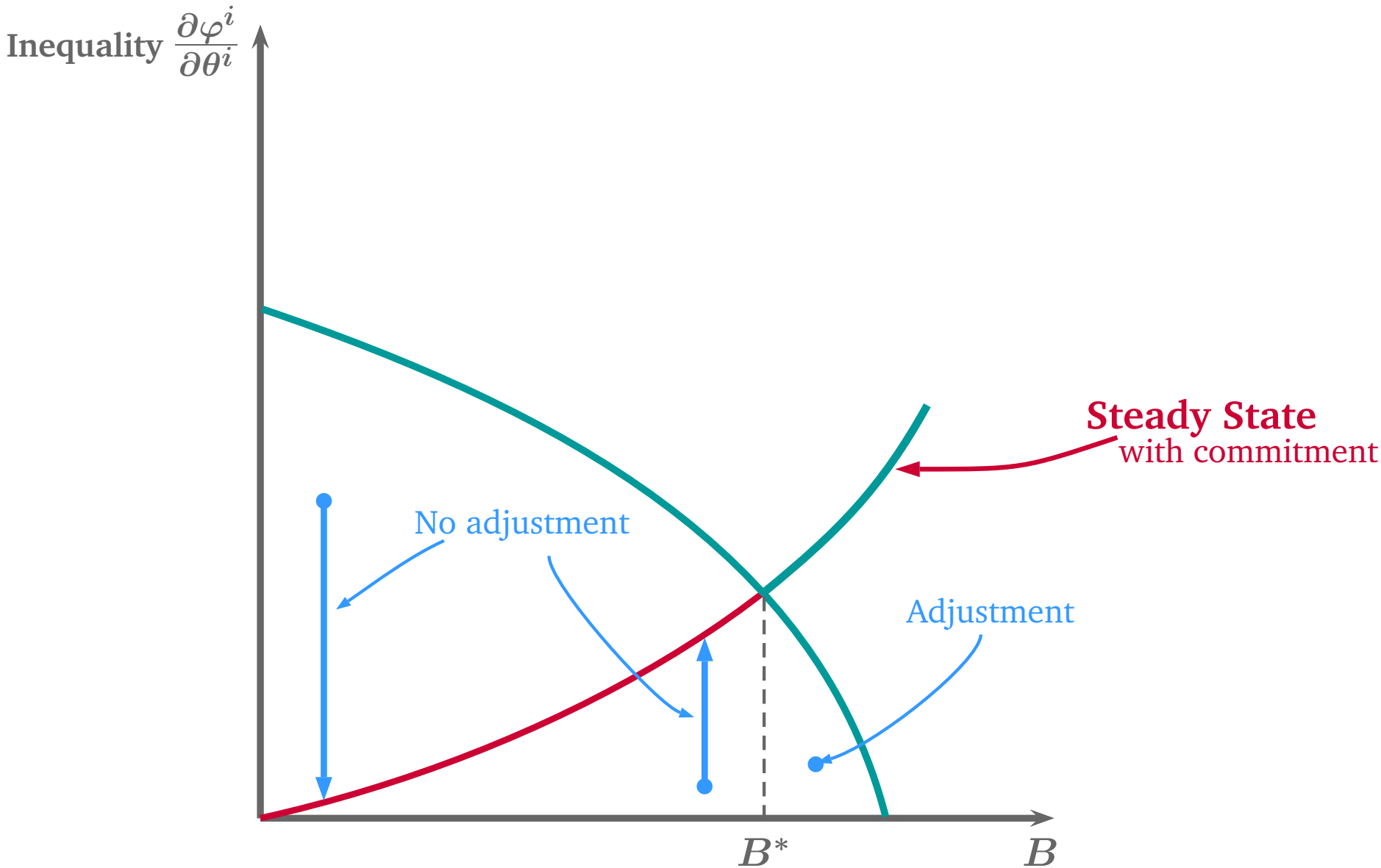

Solution

- Problem has many dimensional states $\left(B, \{a^i\}\right)$
- For $t \geqslant 1$, aggregates and inequality for generations born at $s \geqslant t$ are recursive in B
- Problem at $t = 0$ choses aggregates for $t = 0$, foreign debt and inequality for current generation given $\left(B_0, \{a_0^i\}\right)$

Recursive Problem

- State variable: Value of foreign debt B

$$V(B) = \max_{C_0, C_1, Y, V'} \quad \frac{\beta}{\hat{\beta}} \log C_1 + \log C_0 + \psi \log(1 - Y) \\ -(1 + \psi + \beta) H(Y) + \hat{\beta} V(B')$$

subject to

$$C_0 + C_1 + G + B \leqslant Y + \frac{1}{1 + r^*} B'$$

$$V(B') - \frac{\beta}{\hat{\beta}} H(Y) \geqslant \underline{W}$$

- Value for current gov't is

$$W(B, Y_-) = V(B) - \frac{\beta}{\hat{\beta}} H(Y_-)$$

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subject to

$$C + G + B \leqslant Y + \frac{1}{1+r^*}B'$$

$$-\frac{\hat{\beta}}{\beta}H(Y) + V(B') \geqslant \underline{W}$$

Recursive Problem

- Rewrite the recursive problem as

$$V(B^*) = \max_{Y,B'} \quad v(Y + \frac{1}{1+r^*}B' - B - G, Y) + \hat{\beta}W(Y, B')$$

subject to

$$W(Y, B') \quad \geqslant \quad \underline{W}$$

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subject to

$$W(Y, B') \quad \geqslant \quad \underline{W}$$

- Optimality requires:

$$MRS^{\text{current gov't}}_{Y,B'} = \frac{\frac{\partial}{\partial Y}v}{\frac{\partial}{\partial B'}v} = \frac{\frac{\partial}{\partial Y}W}{\frac{\partial}{\partial B'}W} = MRS^{\text{future gov't}}_{Y,B'}$$

Downward adjustment of Debt

- Effect of current debt on trade-off between debt and inequality

$$0 < \frac{\partial}{\partial B} \frac{\frac{\partial}{\partial Y} v}{\frac{\partial}{\partial B'} v}$$

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$\frac{\partial}{\partial Y} W$: cost of increasing inequality for the future government
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- Increasing current debt leads to higher cost of inequality relative to debt $\Rightarrow$ higher inequality and lower debt

Main Result: Policy function is hump-shaped

Theorem

There exists B^* *such that:*

- *for all* $\mathsf{B} < \mathsf{B}^*$, $\mathsf{B}'(\mathsf{B})$ *is increasing in* B *and the sustainability constraint is slack*
- *for all* $\mathsf{B} > \mathsf{B}^*$, $\mathsf{B}'(\mathsf{B})$ *is decreasing in* B *and the sustainability constraint is binding*

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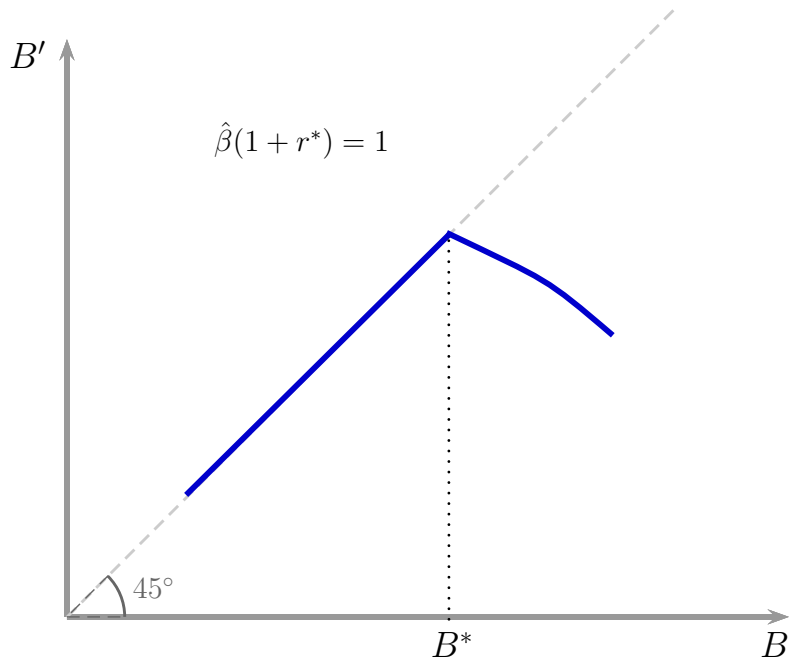

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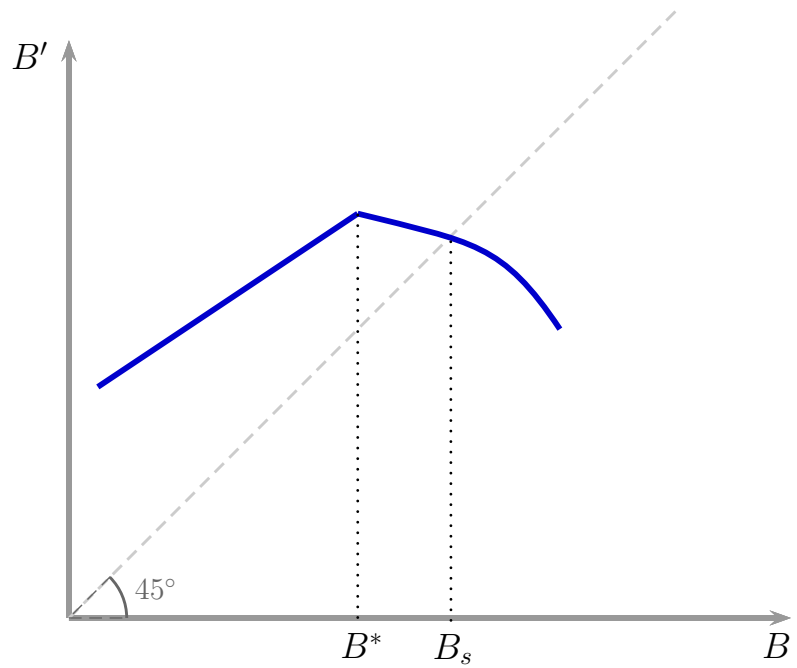
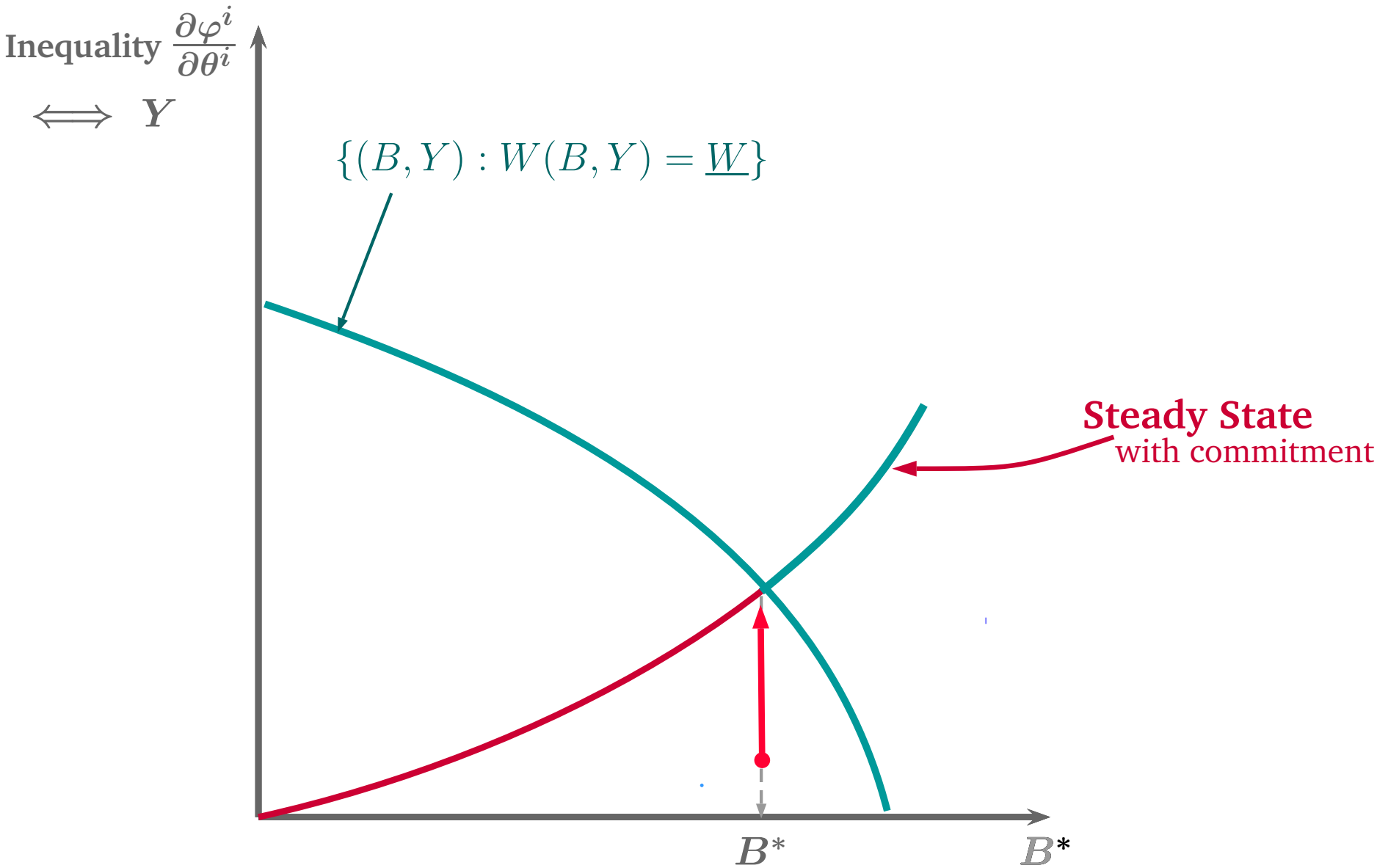


Intuition: downward sloping policy function

- Current government's perspective: higher debt leads to a higher desired level of inequality

- Higher inequality has to be accompanied by lower debt in the future

Large Repayment/Austerity



Why gradual adjustment is not optimal?

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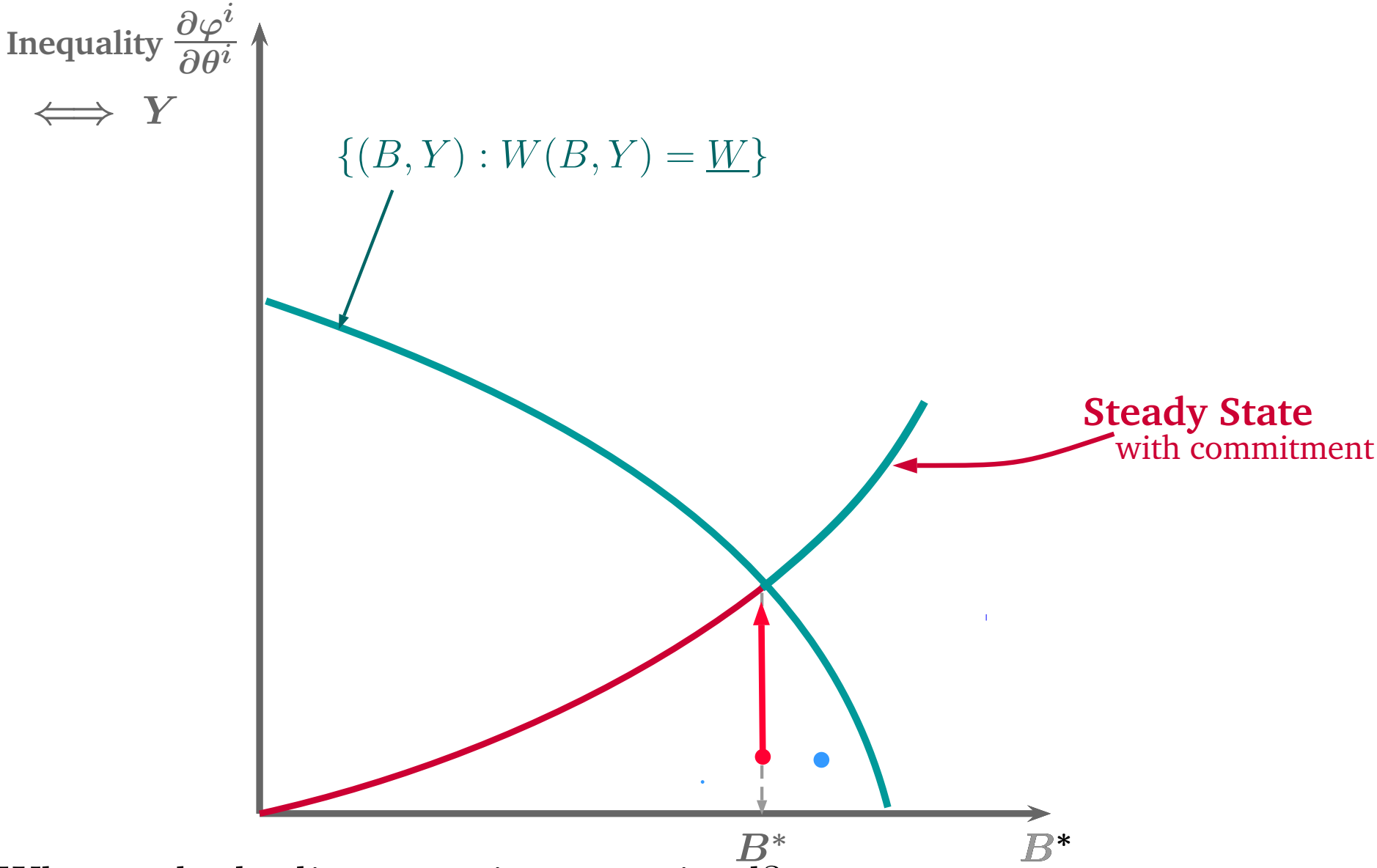

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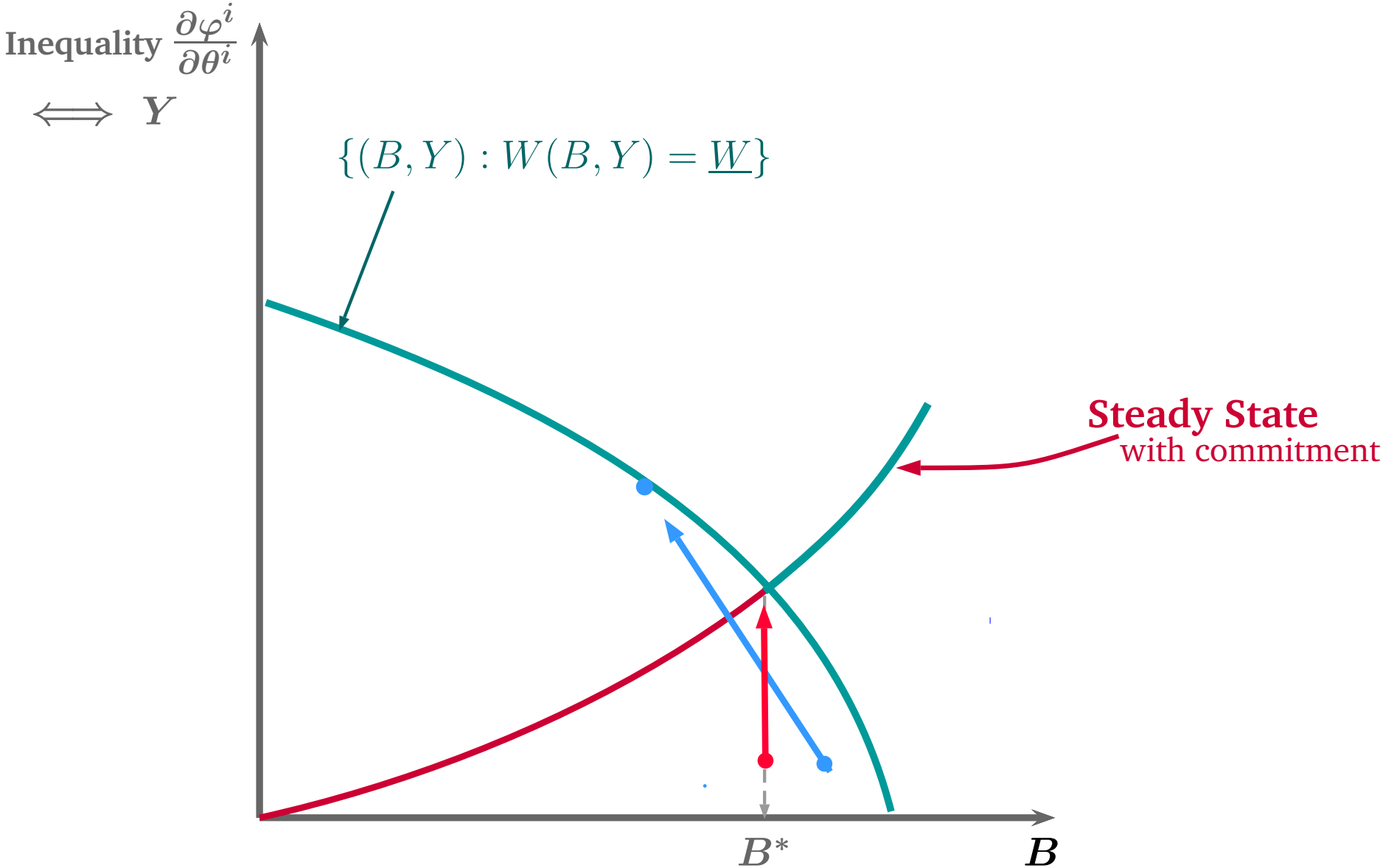

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Gradual Adjustment - what goes wrong?

- Suppose $\hat{\beta}(1 + r^*) = 1$ and $B > B^*$.

Gradual Adjustment - what goes wrong?

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- At this point, the current government is very poor $\rightarrow$ can tolerate more inequality
- lowering taxes/transfers and having the same interest payment makes the current government better off
- current government is willing to tolerate even less consumption by paying out $\rightarrow$ ensures there is no default in the future

Recap

When gov't has high external debt (and low inequality so no default)

- Debt cannot be rolled over so reduction needed
- Gov't better off by
  - Allowing for larger inequality (and so increase output)
  - Reducing further foreign debt (to ensure credibility of plan)
  - Reducing distortions and allow for high inequality better instrument than debt to increase resources available today

Who is Paying for the Adjustment?

- Burden of adjustment is on current generations:
  - Old receive low pensions
  - Young receive low consumption, high income inequality

- Compensated by higher future values:
  - Young promised high pension payments
  - Low income inequality for future generations
  - Front-loading of consumption if $\hat{\beta}(1 + r^*) < 1$
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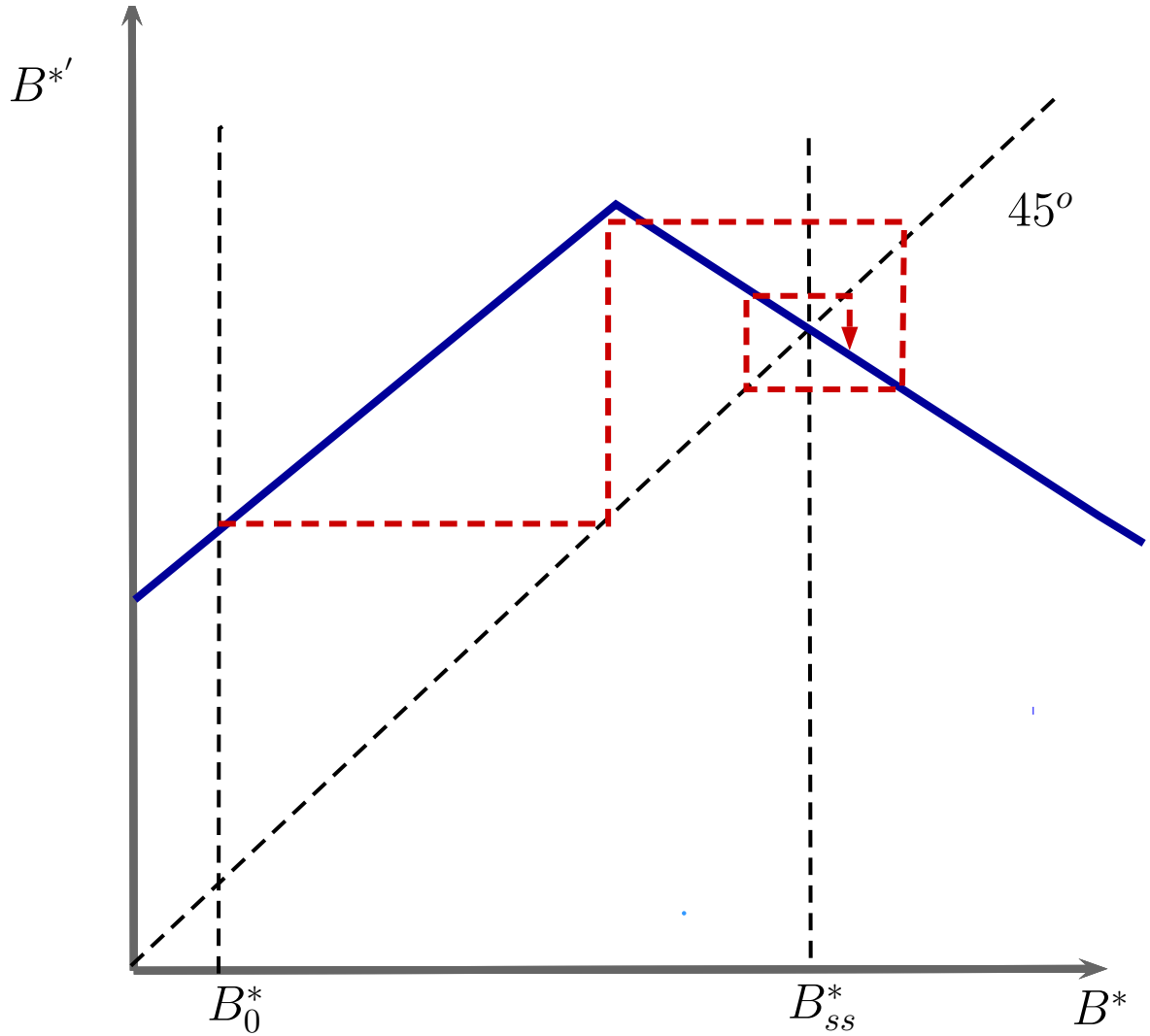
    $\Rightarrow$ This gives rise to cycles

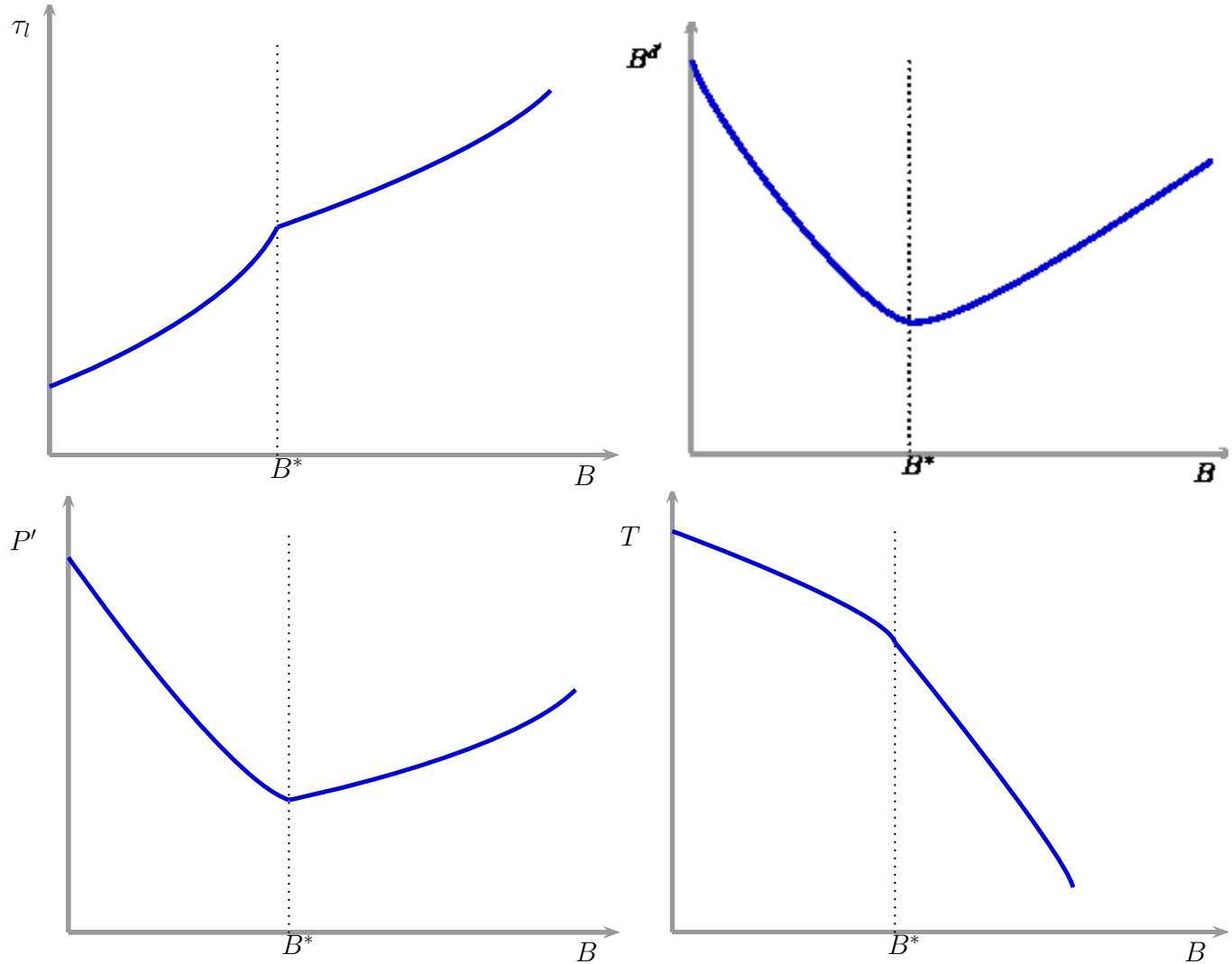
Cycles when $\hat{\beta}(1+r^*) < 1$



Policies Over the Cycle

- Transfers and pensions are decreasing in external debt
- Taxes are increasing in external debt
- Output and inequality are increasing in external debt
- Domestic debt increases with external debt

Policies Over the Cycle



Policy Functions

Summing-up

In the best outcome when government cannot commit and has redistributive motives, fiscal consolidations are characterized by

- Large adjustment in foreign debt position
- Increase in inequality
- Repatriation of gov't debt
- Burden on current generation (even if $\hat{\beta}(1+r^*) < 1$)
- Cyclical policy is optimal if $\hat{\beta}(1+r^*) < 1$

Assumptions

- Imperfect redistribution ▸ Details
  - Absence of type-specific transfers critical

- OLG structure and market incompleteness
  - Infinite horizon + heterogenous agents + complete markets economy behaves like representative agent economy
    - tax and inequality smoothing

- Preferences
  - Results robust to different preferences
  - Analytical results for GHH ▸ GHH
  - Numerical results for BGP preferences

Extensions

- Economy with shocks ▸ Details
  - Same logic
  - Justification for $\hat{\beta}(1+r^*) < 1$
  - Difference wrt RA economy a la Thomas-Worrall: Repayment can happen also in bad fiscal time

- Political economy model ▸ Details

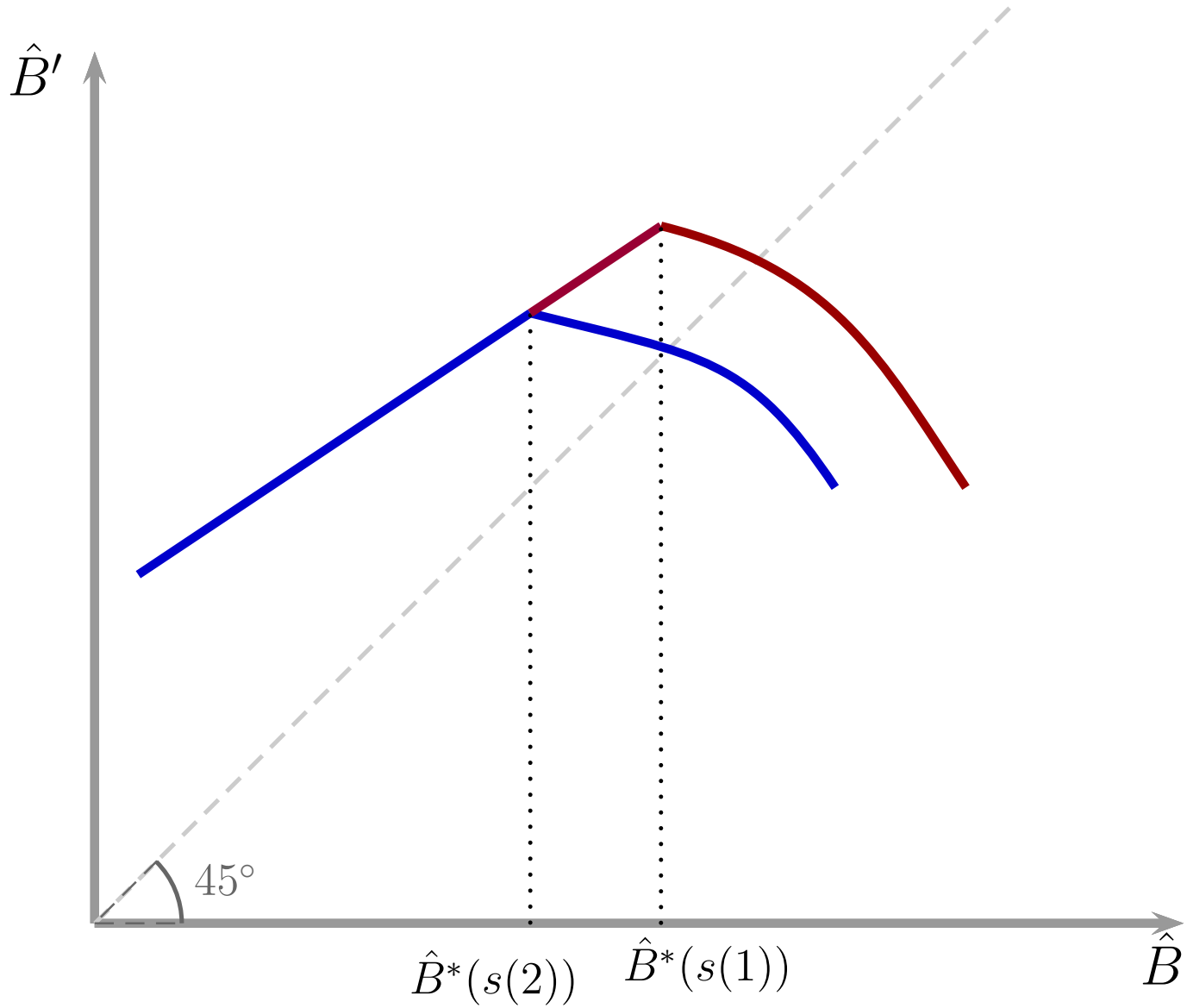
▸ Skip

Stochastic Economy

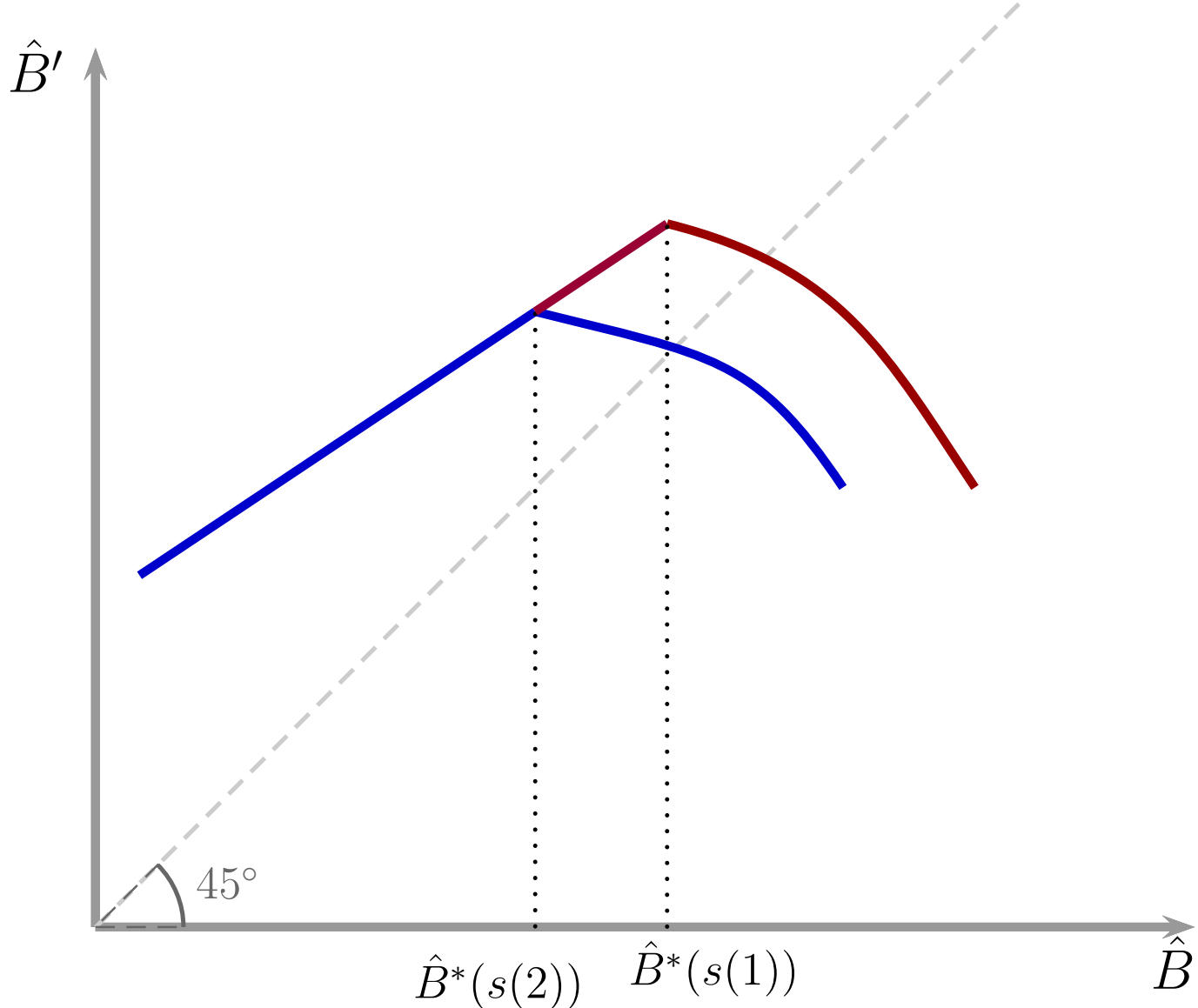
Shocks

- Suppose G_t: i.i.d. where $G_t \in \{G_L < G_H\}$
- Worst equilibrium is the same as before: $\underline{W}_L > \underline{W}_H$.
- Complete market for households and government
- Assumption: $\hat{\beta}(1 + r^*) < 1$
- Why impatience?
  - Continuum of identical countries
  - Lack of commitment in each country
  - Market clearing interest rate is low:
    - Countries oversave to avoid default/reneging on tax policies
    - Alvarez and Jermann (2000), Aiyagari(1994)

Hump-shaped Policy Function

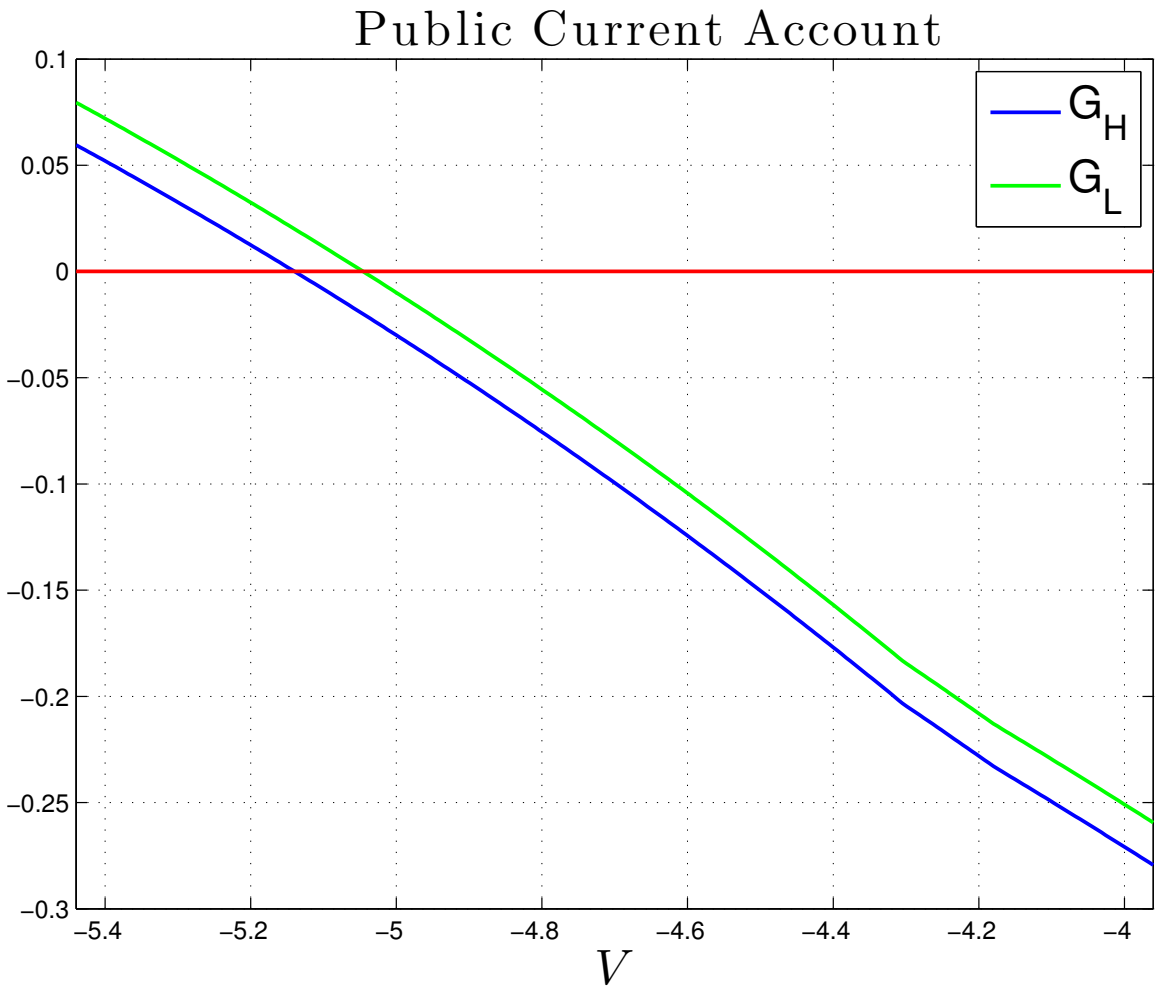


Overshooting More Pronounced When G Low



In general equilibrium: Transition from highest value of external debt to *negative* external debt

Net Repayment Also When G High



When government is highly indebted: Positive public current account also when G is high Back

Political Economy Model

Political Economy Model

- So far policies are set by fictitious gov't that attaches weights to *future generations*

- Results survive if policies are set in best interest of generations currently alive only
  - Burden of adjustment on current young
    - Even if current gov't attaches zero weight on future generations
  - Total debt is cyclical
  - Foreign debt is cyclical (sufficient condition)

Political Economy Model

- Policies outcome of political game between two short lived parties: Probabilistic Voting a la Lindbeck and Weinbull (1987)
  - Stage 1: Each party proposes a policy: default, taxes, transfers, pensions
  - Stage 2: households receive ideological bias shock and vote. winner: majority of votes
  - Stage 3: Policies are implemented

Political Equilibrium

- Utility of agent i from policy by party j: $u^i_{t,j} + \epsilon^i_{t,j}$
  $\epsilon^i_{t,j}$ uniform

- Probability of winning for party j:

$$\sum_i \mu^i F^i_o(u^i_{t-1,1,j} - u^i_{t-1,1,-j}) + \sum_i \mu^i F^i_y(u^i_{t,j} - u^i_{t,-j})$$

- Symmetric equilibrium + uniformity assumption: Government maximizes:

$$\omega \sum_i \alpha^i \mu^i u^i_{t-1,1} + \sum_i \alpha^i \mu^i u^i_t$$

- Strategic interaction: pensions chosen by government at $t+1$ affect government's choice at t

Subgame Perfect Equilibrium Outcomes

- Everything the same as before except sustainability constraint:

$$\omega U_1^p(C_{t,1}, Y_t) + v_{t+1} \geqslant \underline{v}$$

where

$$v_t = U^p(C_{t,0}, C_{t,1}, Y_t)$$

and $\underline{v}$ is the value of worst equilibrium for current government

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- Consider two SPE outcomes:
  - Selection in spirit of Eaton-Gersovitz
    - If gov't reneges on debt or pension payments reversion to worst equilibrium
  - Best SPE

Eaton-Gersovitz Equilibrium

- State: $(\mathbb{B}, z)$ where $\mathbb{B} = (B, \{a^i\}, P^e)$, z indicator of past default
- If $z = 1$: value for the current government is $\underline{V}$
- If $z = 0$: $V(\mathbb{B}, 0) = \max\{v(\mathbb{B}), \underline{V}\}$ where

$$v(\mathbb{B}) = \max_{(P, C_0, Y, \mathbb{B}')} \omega \sum_i \mu^i \alpha^i \log\left(a^i + P\right) + U^p(C_0, C_1, Y)$$

subject to

$$\sum_i \mu^i \left(a^i + P\right) + C_0 + B + G \leqslant Y + \frac{1}{1 + r^*} B'$$

$$\bar{v}\left(\mathbb{B}'\right) \geqslant \underline{V}, \qquad P \geqslant P^e$$

$$C_1 = \left(\sum_i \mu^i a^{i\prime} + \bar{P}\left(\mathbb{B}'\right)\right), \qquad a^{i\prime} + \bar{P}\left(\mathbb{B}'\right) = \varphi^i(Y)\, C_1$$

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For $t \geqslant 1$ outcomes recursive in "total debt": $\hat{B} = B + \sum_i \mu^i a^i + P^e$

Auxiliary Problem

- For $t \geqslant 1$

$$w\left(\hat{B}\right) = \max_{C_0, Y, C_1', B'} U^p(C_0, C_1, Y)$$

subject to

$$\begin{aligned} \hat{B} + C_0 + G &\leqslant Y + \frac{B'}{1+r^*} \\ \omega\left[H(Y) + \log\left(C_1'\right)\right] + w\left(B' + C_1'\right) &\geqslant \underline{V} \end{aligned}$$

- At $t = 0$

$$v(\mathbb{B}) = \max_{P \geqslant P^e} \omega \sum_i \mu^i \alpha^i \log\left(a^i + P\right) + w(B + \sum_i \mu^i a^i + P)$$

- Sustainability constraint similar to normative benchmark

Main Result: Overshooting and Cycles

Theorem
$\hat{\mathsf{B}}'(\hat{\mathsf{B}})$ *is decreasing.*

The theorem implies that:

- Inherited and issued debt are substitutes
- Burden of adjustment on current young
  - Even if current gov't attaches zero weight on future generations
- Total debt is cyclical
- Foreign debt is cyclical when ω is large enough

Similar result can be proven for best SPE ▸ Details ▸ Back

Conclusion

- Fiscal and Redistributive policies when gov't lacks commitment
  - Interaction between domestic and foreign motive to default
- Optimal fiscal consolidation involves cyclical behavior of external debt and austerity type adjustments
- Consistent with
  - Populist cycles in Latin America/large low-frequency swings in NFA
  - Recent experience of Southern Europe

Extra Slides

Government Value of Default

$$(1-\hat{\beta})\underline{W} = \max_{\text{policy, all'n, prices}} \frac{1}{\hat{\beta}} \sum_i \alpha^i \mu^i \beta u(c_1^i) + \sum_i \alpha^i \mu^i u(c_0^i, y^i; \theta^i)$$

subject to

- Policy, all'n, prices constitute a competitive equilibrium with no assets trade:
  - Default on government debt: $B_0^* = 0$, $a_0^i = 0 \Rightarrow c_1^i = P$ for all i
  - Young households do not save anticipating default next period: $a_1^i = 0$

Back

Government Value of Default

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subject to

$$c_1^i = P$$

the static implementability constraint:

$$u_c^i c_0^i + u_y^i y^i = T$$

and the resource constraint

$$\sum_i \mu^i c_1^i + \sum_i \mu^i c_0^i + G \leqslant \sum_i y^i$$

Back

Period-0 Problem

$$W_0(B_0^*, \{a_0^i\}) = \max \frac{\beta}{\hat{\beta}} \sum_i \mu^i \alpha^i \log((1-\tau_a) a_0^i + P) + V$$

subject to

$$\frac{1}{\hat{\beta}} U_1^p(C_{1,-}; \Phi_{-1}) + V \geqslant \underline{W}$$

$$\hat{B}(V) - P - (1-\tau_a) \sum_i \mu^i a_0^i = B_0^*$$

- Initial external Gov't Debt: B_0^* Back

Role of Imperfect Redistribution

- Inability to perfectly redistribute resources across households critical
- Suppose gov't had access to type-dependent transfers $\{T^i\}$
- In this case $\alpha^i u_c^i = \alpha^j u_c^j \to \{\varphi^{i*}\}$
- Sustainability constraint is

$$\frac{\beta}{\hat{\beta}}[\log C_1 + \sum_i \mu^i \alpha^i \log \varphi^{i*}] + V' \geqslant \underline{W}$$

$\to$ once sustainability binds C_1 and V' independent of state (as in Thomas-Worrall, 1998)

Back

Role of Preferences

- With log-log preferences:
  - Wealth effect: $Y(V)$ is decreasing in V
  - Key factor: inequality is decreasing in V

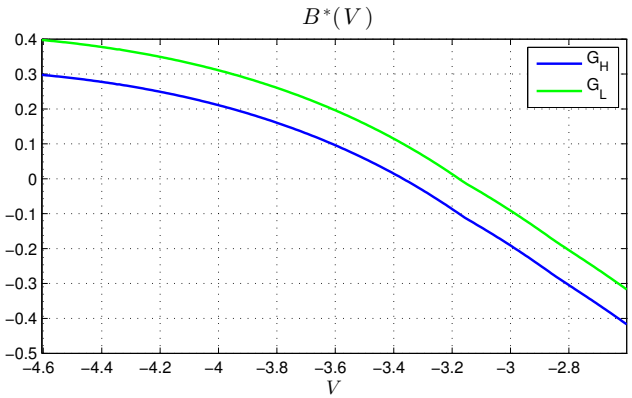
- Can prove the same result for GHH:

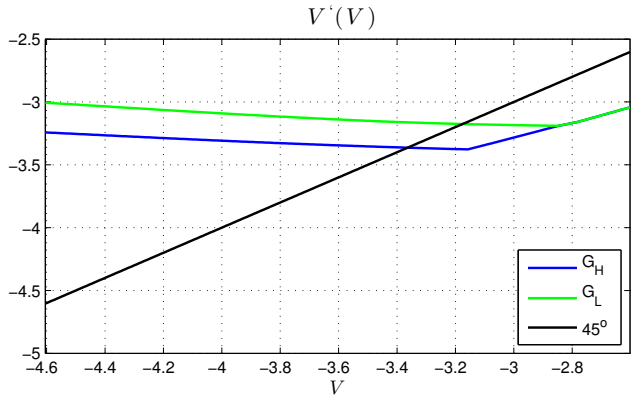
$$\log\left(c_0 - \nu\left(\frac{y}{\theta}\right)\right) + \beta \log c_1$$

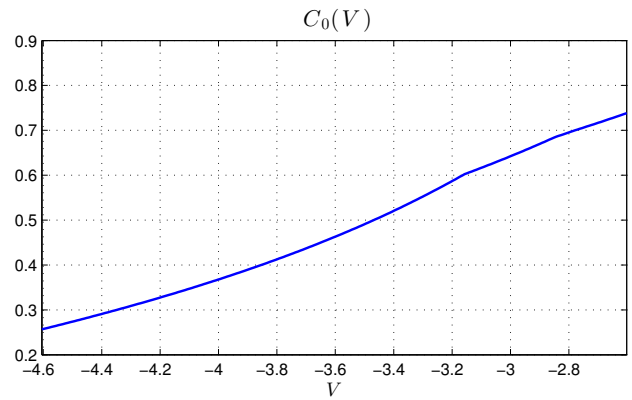
  - $Y(V)$ is increasing in V
  - Key factor: inequality is decreasing in V

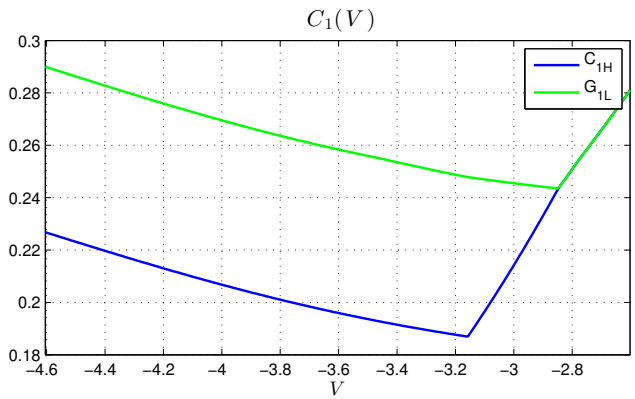
▸ Policies ▸ Back

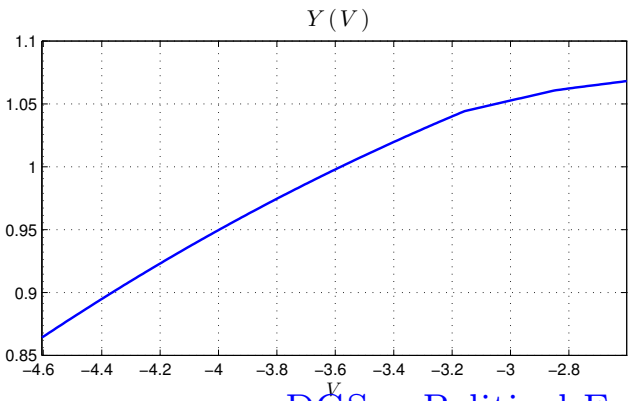
Numerical Example with GHH: Allocations

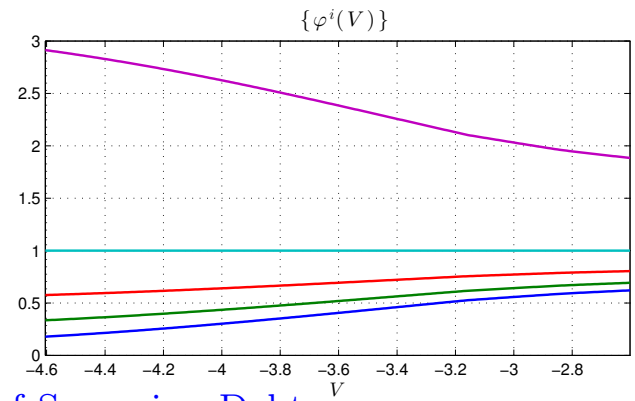




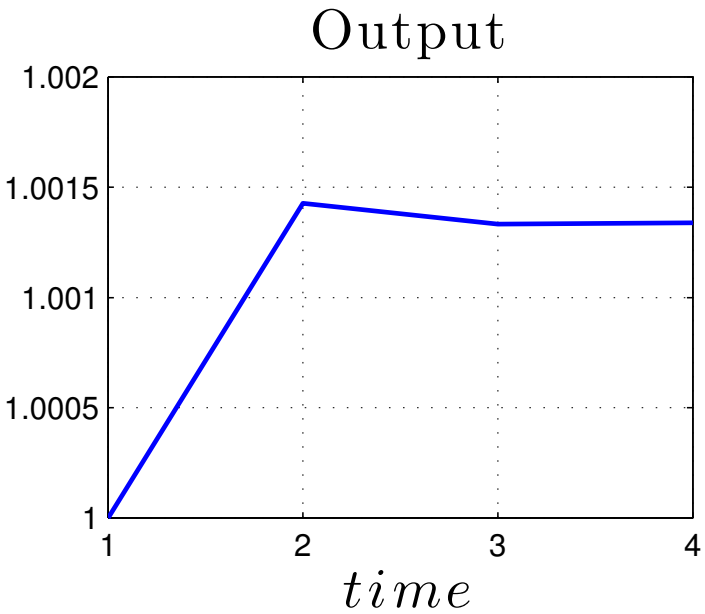


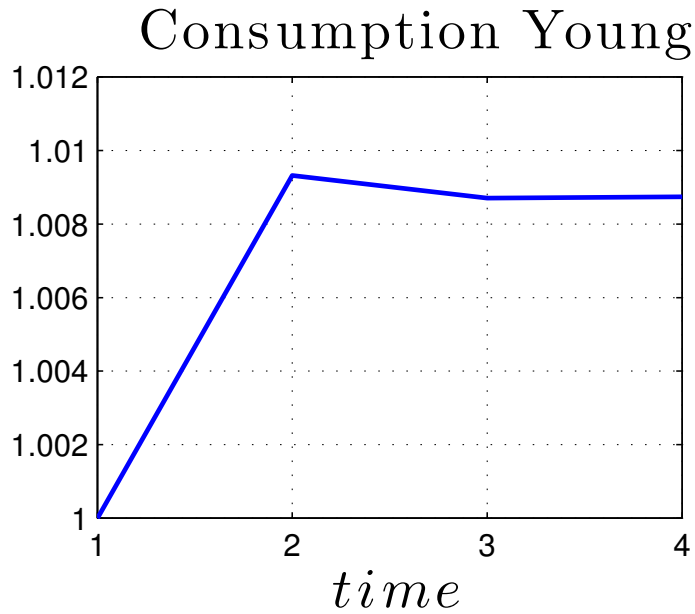


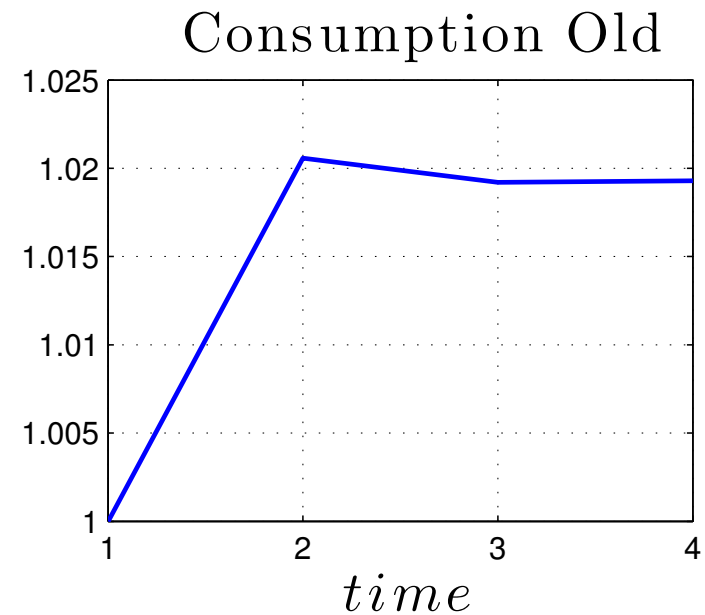


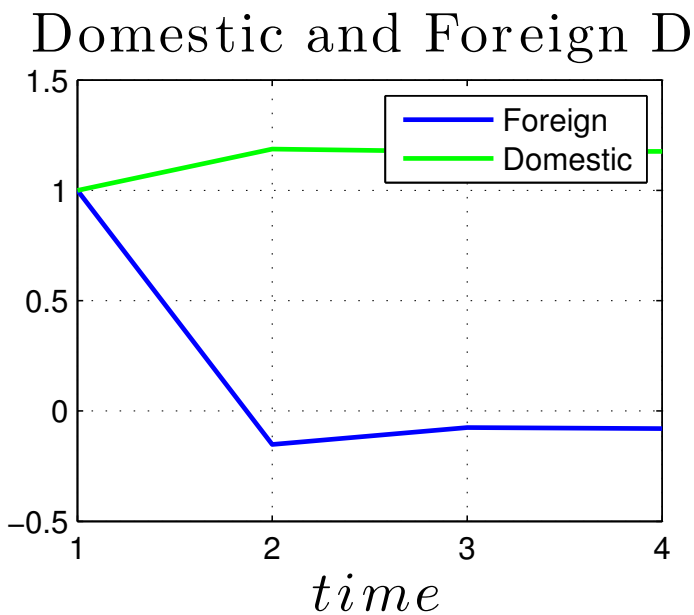


Fiscal Consolidation Dynamics with GHH

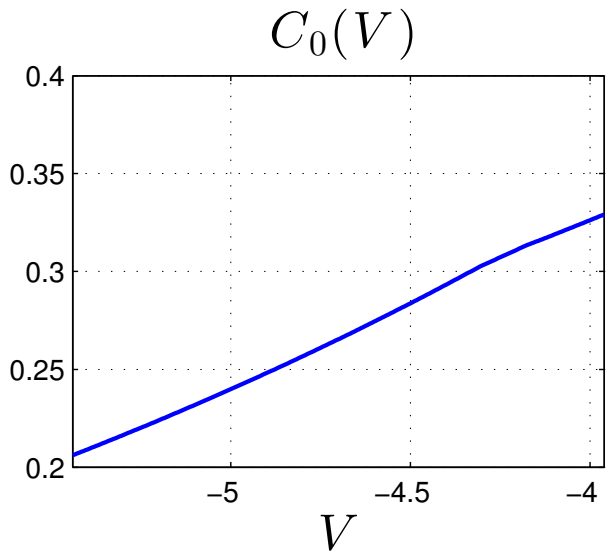


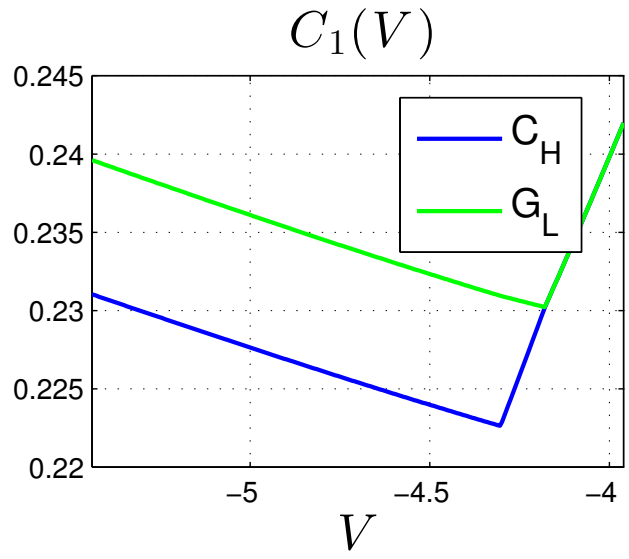


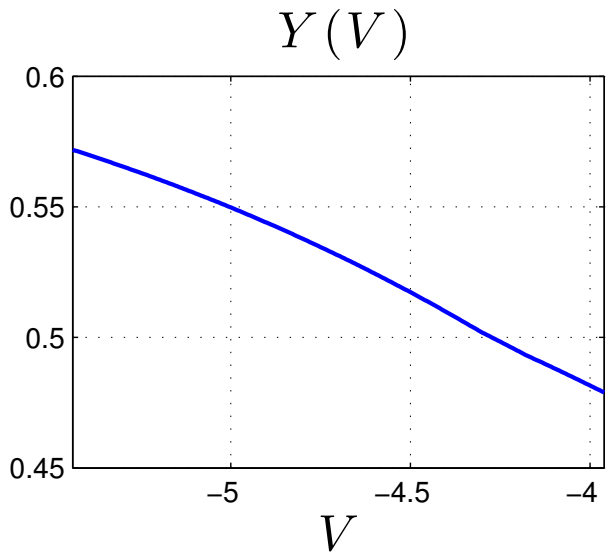


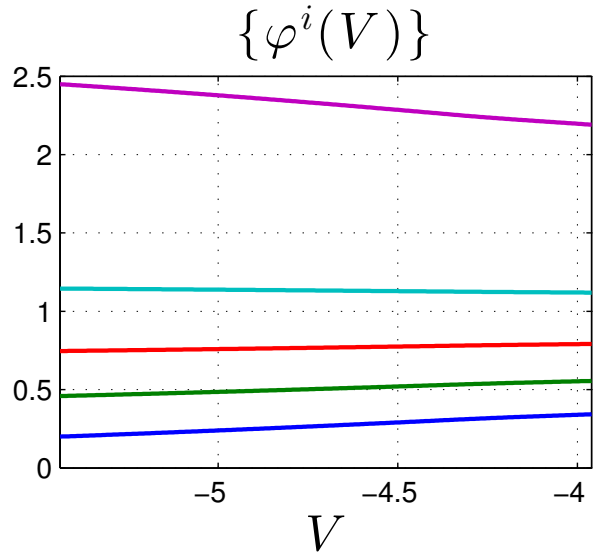


Allocations with Log-Log

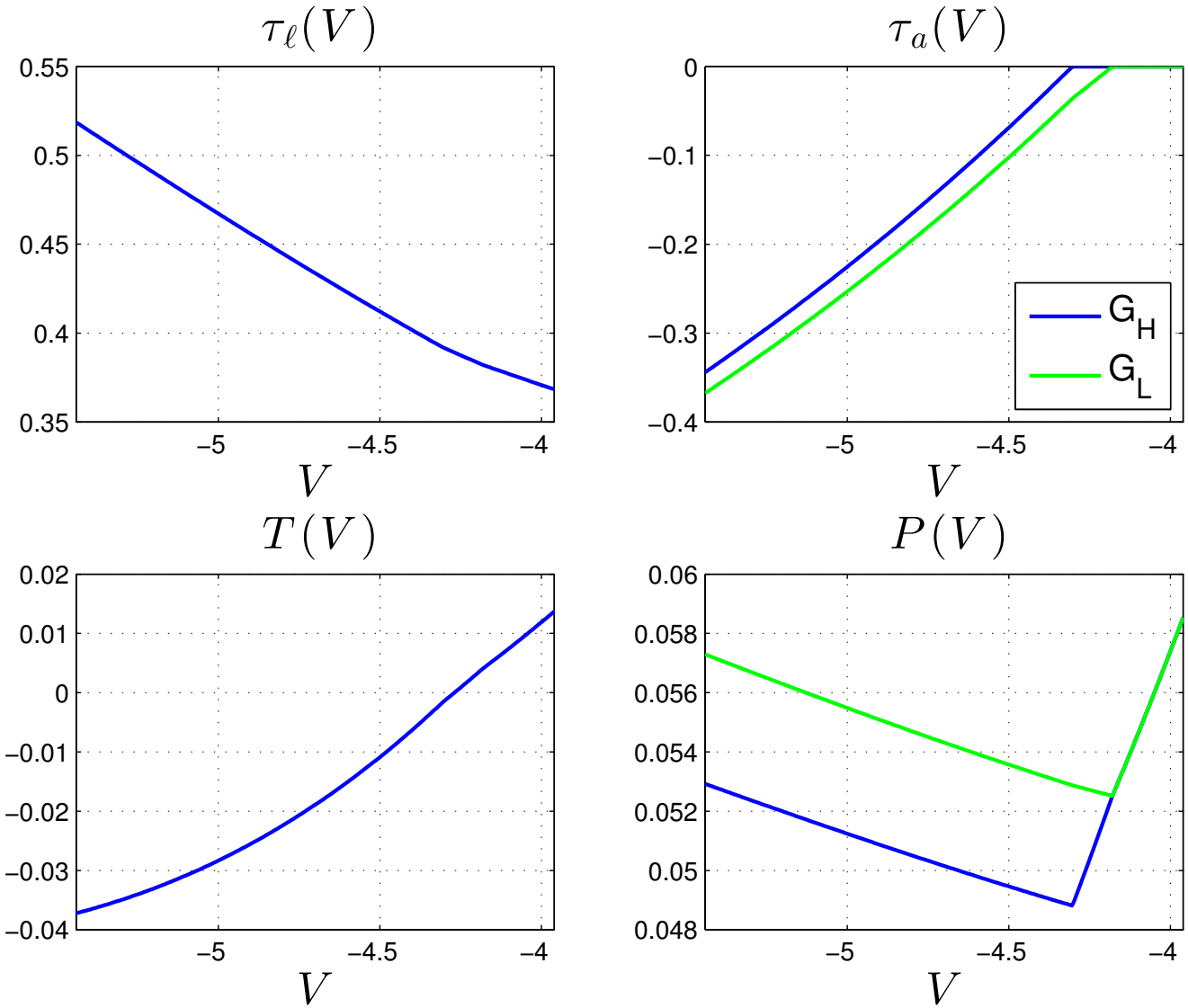




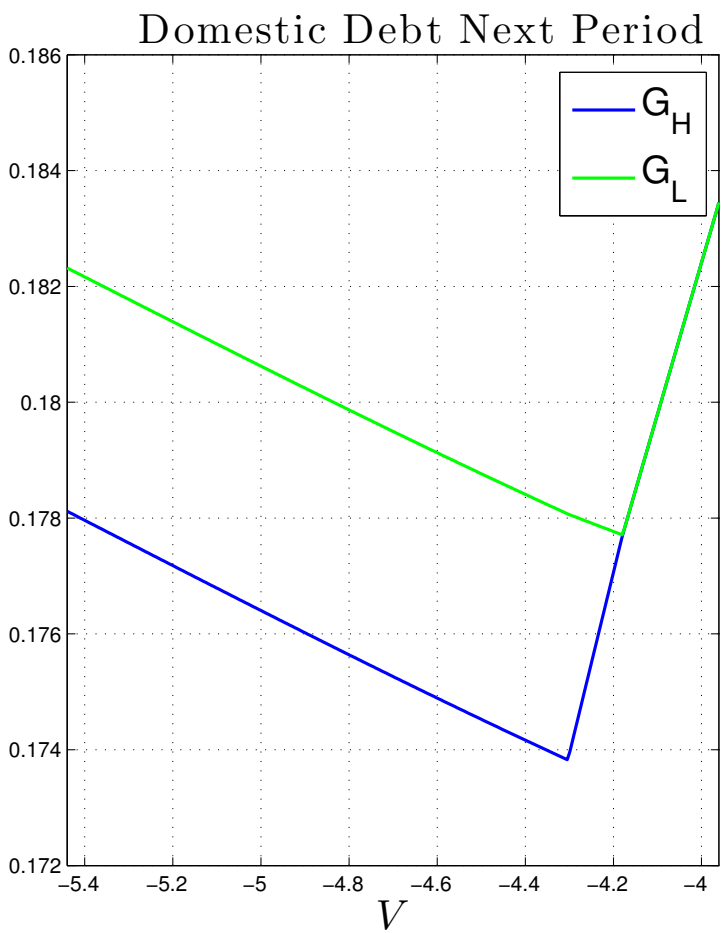


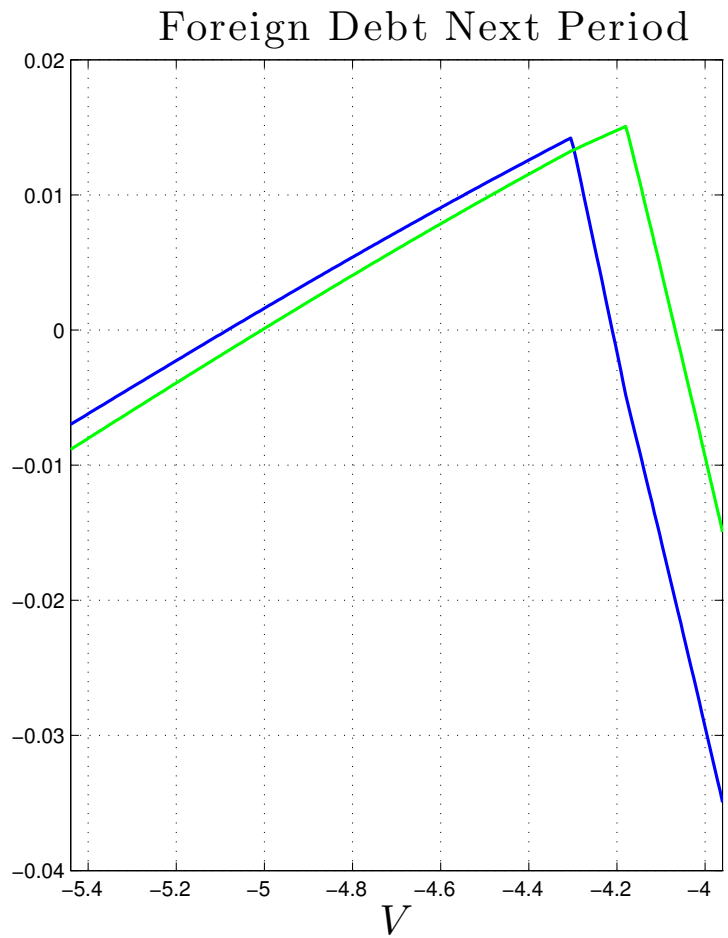


Policies with Log-Log



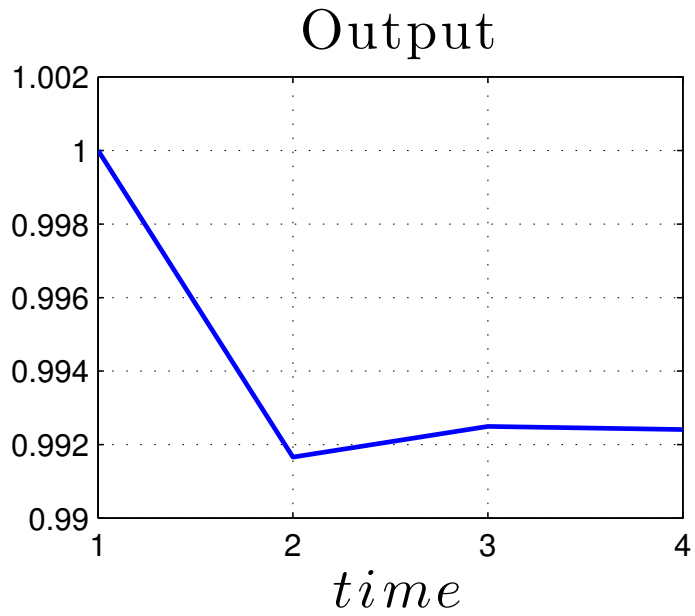
Repatriation of Government Debt

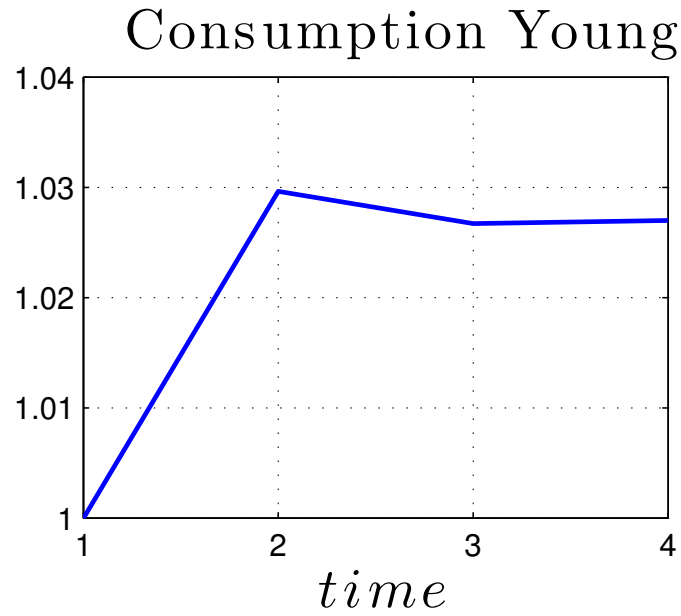


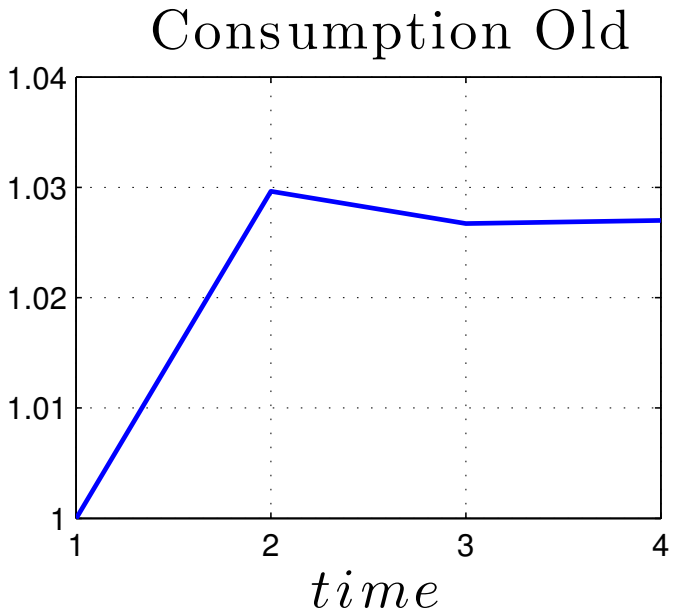


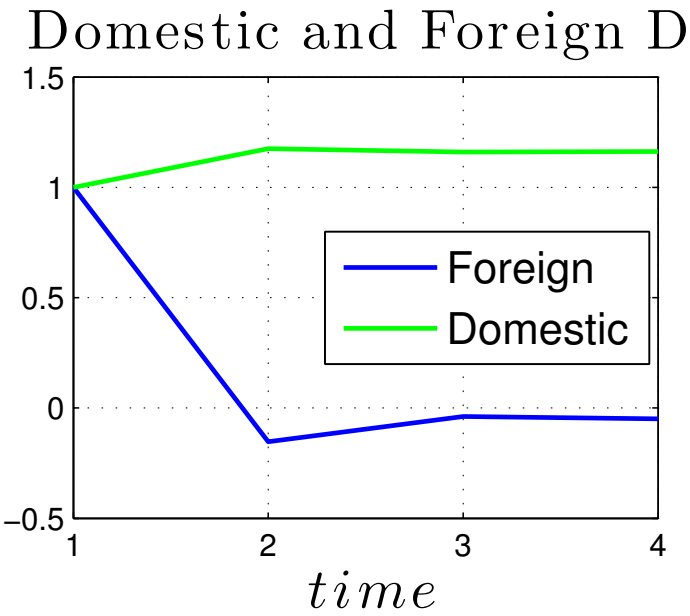
▸ Total Debt and Shares ▸ Details

Fiscal Consolidation Dynamics

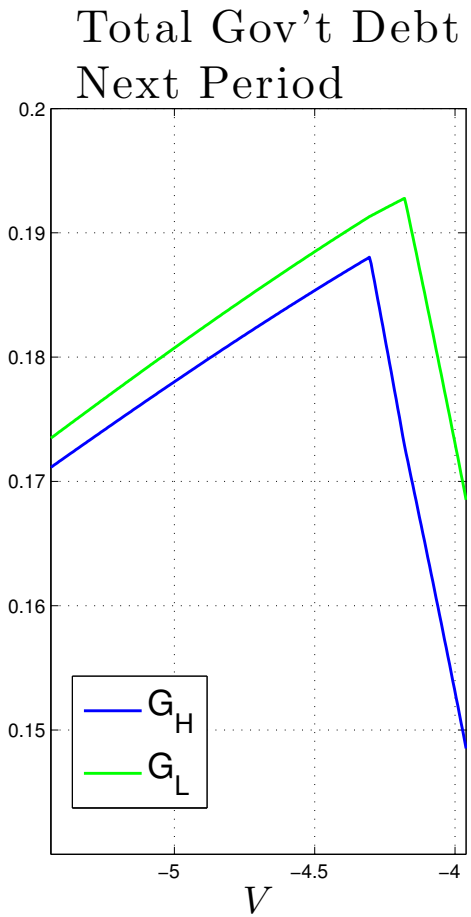


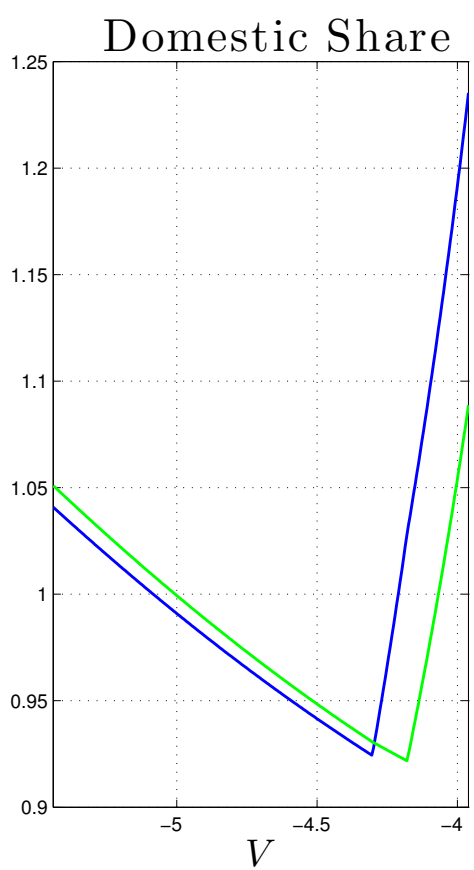


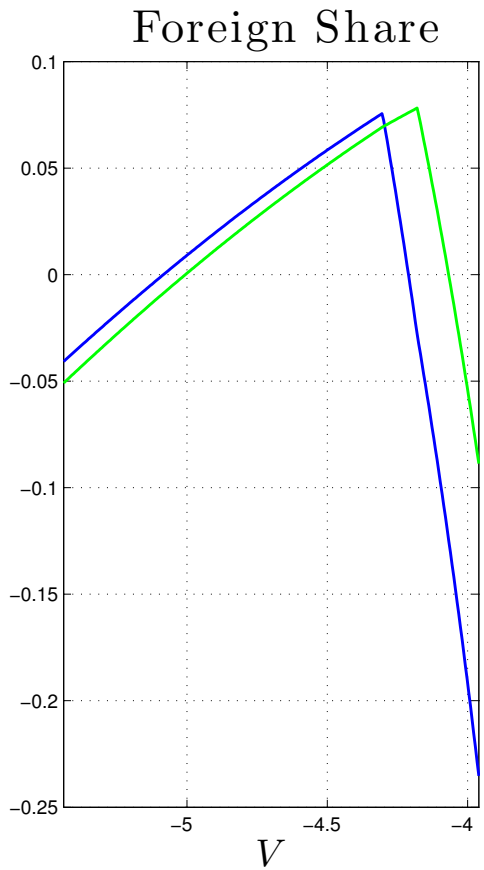




Repatriation of Government Debt







Back

Repatriation of Government Debt

When there is repayment:

- Gov't debt held by foreign investors goes from high to low

- Gov't debt held domestically goes from low to high
  - Under our preferred decentralization:

$$\begin{aligned} B(V,G) &= \sum_i \mu^i a^i(V,G) = \sum_i \mu^i [c^i(V,G) - P(V,G)] \\ &= C_1(V,G) - c_1^1(V,G) = [1-\varphi^1(V,G)]C_1(V,G) \end{aligned}$$

  - $C_1 \uparrow$ and $\varphi^1 \downarrow \Rightarrow B \uparrow$

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Best SPE

$$\max \frac{1}{\hat{\beta}} U_1^p(C_{1,-1}, \Phi_{-1}) + \sum_{t=0}^{\infty} \hat{\beta}^t U^p(C_{t,0}, C_{t,1}, Y_t)$$

subject to

$$B_0^* + \sum_{t=0}^{\infty} \frac{1}{(1+r^*)^t} [C_{t-1,1} + C_{t,0} + G_t] \leqslant \sum_{t=0}^{\infty} \frac{1}{(1+r^*)^t} Z Y_t$$

$$\omega U_1^p(C_{t-1,1}, Y_{t-1}) + U^p(C_{t,0}, C_{t,1}, Y_t) \geqslant \underline{v}$$

given Φ_{-1}, B_0^*

Main Result

- Problem is recursive in ν_t

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- Problem is recursive in ν_t

Theorem

Suppose that $\hat{\beta}(1+r^*) \leqslant 1$. *Then there exists* ν^*

1. *When* $\nu > \nu^*$, $\nu'(\nu)$ *is increasing*
2. *When* $\nu < \nu^*$, $\nu'(\nu)$ *is decreasing*

- Total debt is cyclical in ν
- Foreign debt is cyclical only when ω is large enough
- Similar property holds for a class of Markov equilibria:
  - Assumption: future governments cannot renege on pensions (triggers punishment)

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