Optimal Policy for Macro-Financial Stability

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Debate over Policy

- No debate: We need to design policies to deal with financial crises
- Big debate 1: What policy tools should we use?
- Big debate 2: When should policy makers intervene?
  - Popular view: Use capital controls as a preemptive intervention to avoid a crisis
- We develop a framework to study optimal policy in and out of crises
  - Markov-Perfect optimal policy (no commitment) in a model with an endogenous borrowing constraint

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Key Results

- Optimality of prudential policy depends on number of instruments
  - One instrument: Intervene in a prudential manner
    - True whether a tax on capital or exchange rate intervention
  - Two instruments: Intervene when the crisis occurs
  - Limited ability of *ex post* policy to mitigate crisis dictates the use of *ex ante* policies
- *Ex ante* policies and capital controls are not needed to implement two "efficient" allocations:
  - Unconstrained allocation
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Preferences

- Households maximize:

$$U \equiv E_0 \sum_{t=0}^{\infty} \left\{ \beta^t \frac{1}{1-\rho} \left(c_t - \frac{h_t^{\delta}}{\delta} \right)^{1-\rho} \right\},$$

- Consumption basket C is a composite of tradable and nontradable goods:

$$c_t \equiv \left[\omega^{\frac{1}{\kappa}} \left(c_t^T \right)^{\frac{\kappa-1}{\kappa}} + (1-\omega)^{\frac{1}{\kappa}} \left(c_t^N \right)^{\frac{\kappa-1}{\kappa}} \right]^{\frac{\kappa}{\kappa-1}}.$$

- Total labor is sum of tradable and nontradable labor supply:

$$h_t = h_t^T + h_t^N$$

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Constraints

- Access to international capital markets is not only incomplete

$$c_t^T + P_t^N c_t^N + b_{t+1} = \pi_t + W_t h_t + (1+i)\, b_t,$$

- But also imperfect

$$b_{t+1} \geq -\frac{1-\phi}{\phi}\left[\pi_t + W_t h_t\right]$$

- Endogenous prices P_t^N and W_t directly affect constraint, as does individual h_t

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Firms

- Production functions:

$$Y_t^N = A_t^N H_t^{1-\alpha^N}$$

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- Labor demand schedules:

$$W_t = \left(1-\alpha^N\right) P_t^N A_t^N \left(H_t^N\right)^{-\alpha^N}$$

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- Dividends to household are residual:

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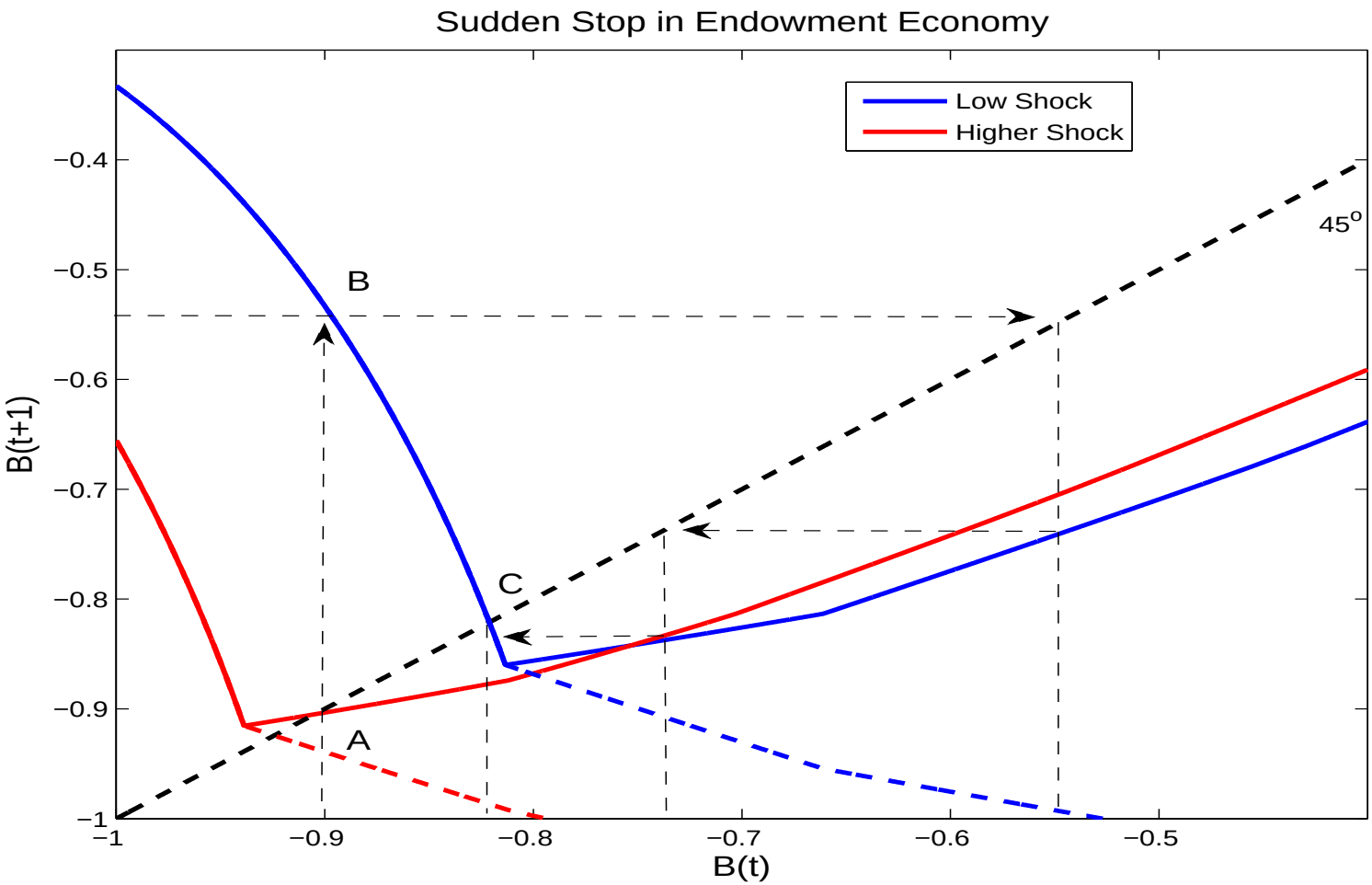
Sudden Stops



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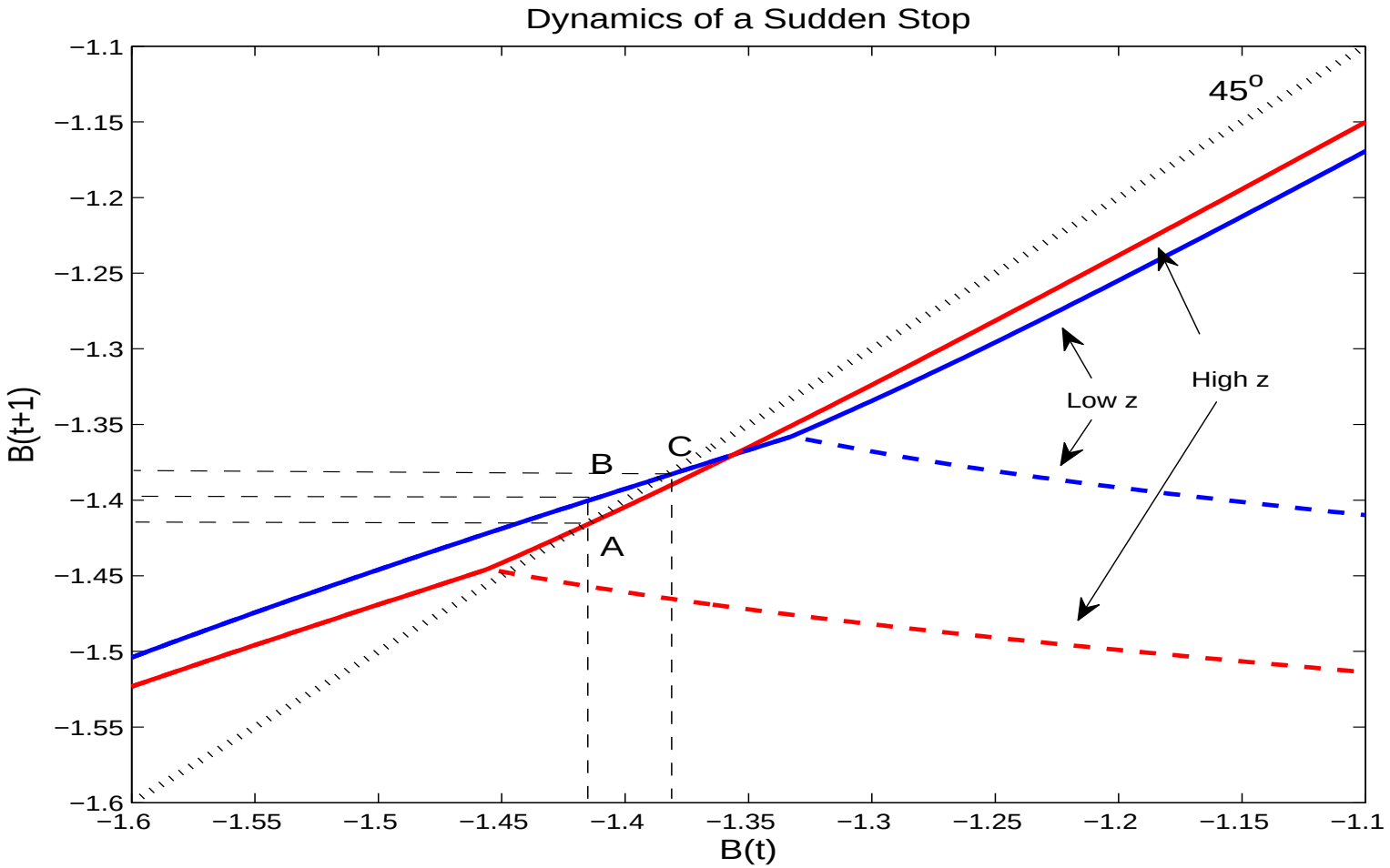

Optimal Policy without Commitment

- Want to study optimal policy without commitment (realistic, computationally easier)
- Various combinations of taxes:
  - Tax on new debt τ^B (capital control)
  - Tax on nontraded consumption τ^N (exchange rate)
  - Tax on traded consumption τ^T (exchange rate)
  - Tax on labor income τ^L
- τ^N and τ^T are equivalent, τ^B and τ^L are equivalent

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- Government solves

$$V\left(B, A^T\right) = \max_{\psi_p, \psi_g} \left\{ \begin{array}{c} \frac{1}{1-\rho}\left(C - \frac{1}{\delta}\left(H_T + H_N\right)^{\delta}\right)^{1-\rho} + \\ \beta E\left[V\left(B', A^{T\prime}\right) \middle| A^T\right] \end{array} \right\}$$

- Constraints are complete set of equilibrium conditions (including complementary slackness)

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Constraints for Government

- τ_N affects intratemporal allocation between C^T and C^N:

$$(1+\tau_t^N)P_t^N = \frac{(1-\omega)^{\frac{1}{\kappa}}\left(C_t^N\right)^{-\frac{1}{\kappa}}}{\omega^{\frac{1}{\kappa}}\left(C_t^T\right)^{-\frac{1}{\kappa}}}$$

- τ_B affects intertemporal allocation between C^T today and tomorrow:

$$\lambda_t = (1-\tau_t^B)\mu_t - \beta\,(1+i)\,E_t\left[\mu_{t+1}\right]$$

- Because of pecuniary externality taxation can improve welfare
- Presence of μ_{t+1} in constraint set implies potential time inconsistency, so we look for Markov-perfect equilibrium

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Markov-Perfect Equilibrium

A Markov-perfect equilibrium is a value function $V^*\left(B, A^T\right)$, government policy functions $\psi_g^*\left(B, A^T\right)$, and private sector equilibrium functions $\psi_p^*\left(B, A^T\right)$ such that

1. Given $\widehat{V}\left(B_{t+1}, A_{t+1}^T\right)$ and $\widehat{\psi}_p\left(B_{t+1}, A_{t+1}^T\right)$, $\left(\psi_g^*, \psi_p^*\right)$ solves

$$\left(\psi_g^*, \psi_p^*\right)\left(B_t, A_t^T\right) = \underset{\psi_g, \psi_p}{\operatorname{argmax}} \left\{ \begin{array}{c} u\left(C\left(\psi_p, \psi_g\right), H\left(\psi_p, \psi_g\right)\right) + \\ \beta E\left[\widehat{V}\left(B'\left(\psi_p, \psi_g\right), A_{t+1}^T\right)\right] \end{array} \right\}$$

subject to the equilibrium conditions, and

$$\begin{aligned} V^*\left(B_t, A_t^T\right) &= u\left(C\left(\psi_g^*, \psi_p^*\right), H\left(\psi_g^*, \psi_p^*\right)\right) + \\ &\quad \beta E\left[\widehat{V}\left(B'\left(\psi_g^*, \psi_p^*\right), A_{t+1}^T\right)\right]; \end{aligned}$$

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2 Subgame perfection holds:

$$\begin{aligned}\widehat{V}\left(B_t, A_t^T\right) &= V^*\left(B_t, A_t^T\right) \\ \widehat{\psi}_p\left(B_t, A_t^T\right) &= \psi_p^*\left(B_t, A_t^T\right).\end{aligned}$$

Optimal Policy

- With two instruments, only intervene if constraint is binding

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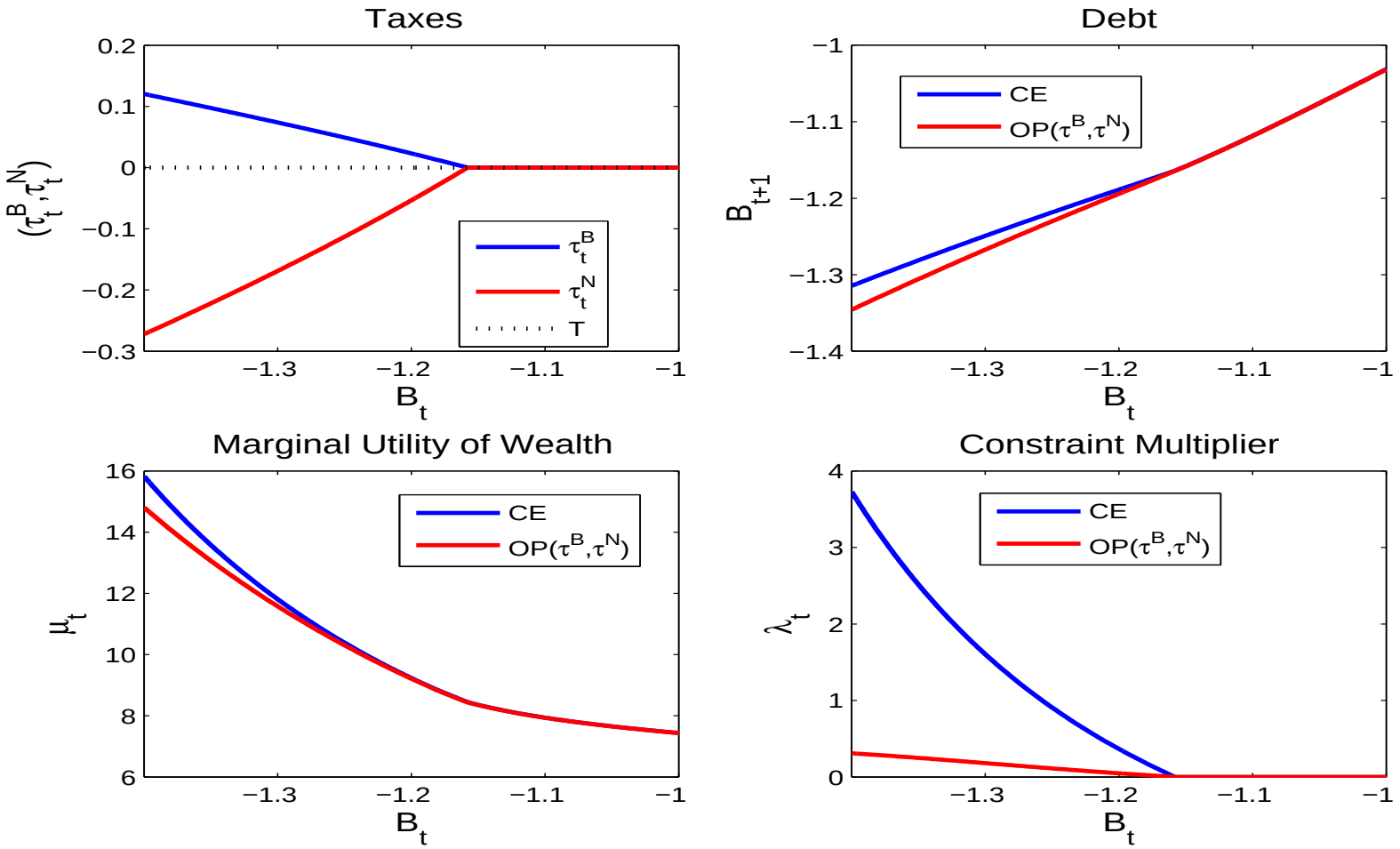

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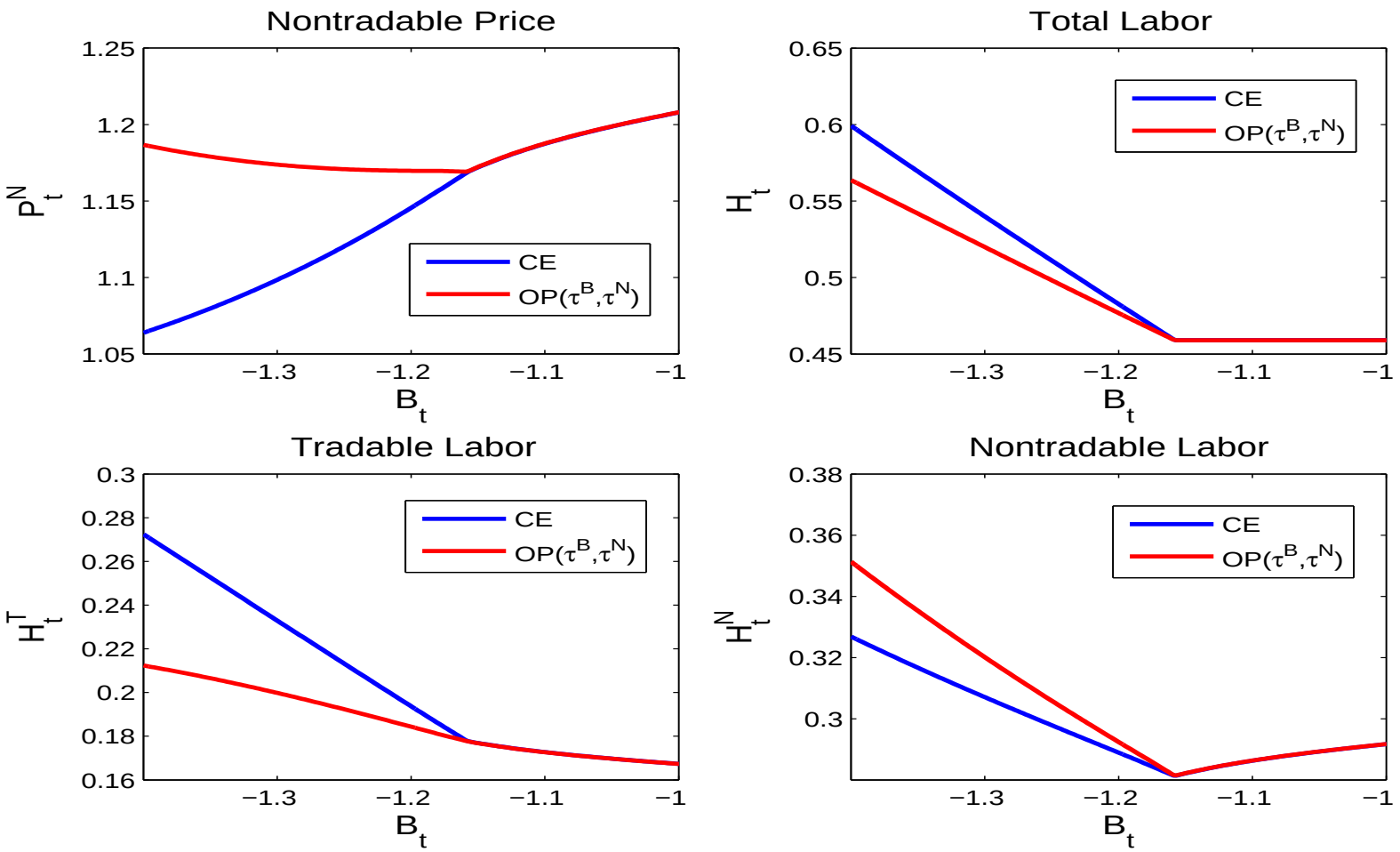

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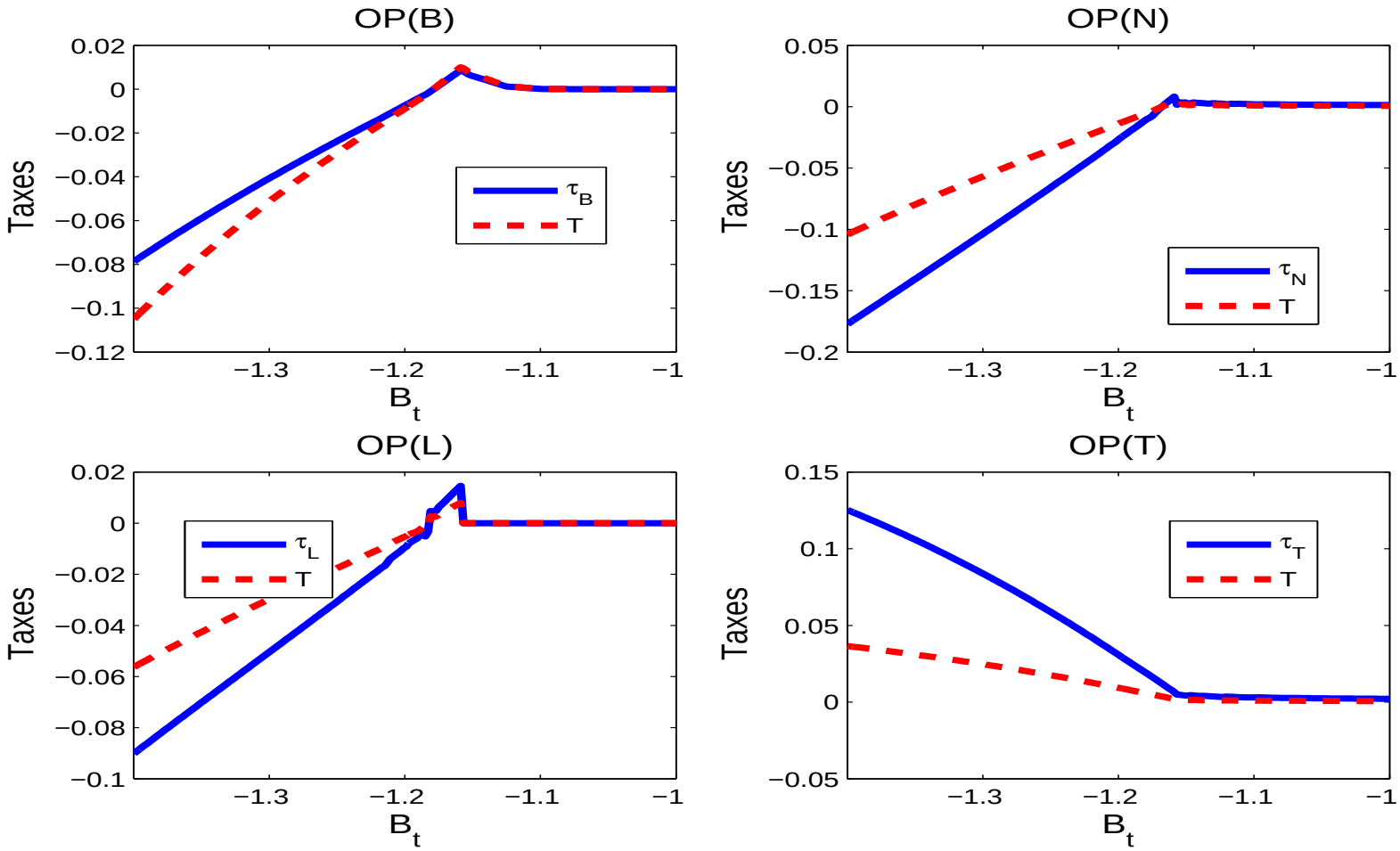

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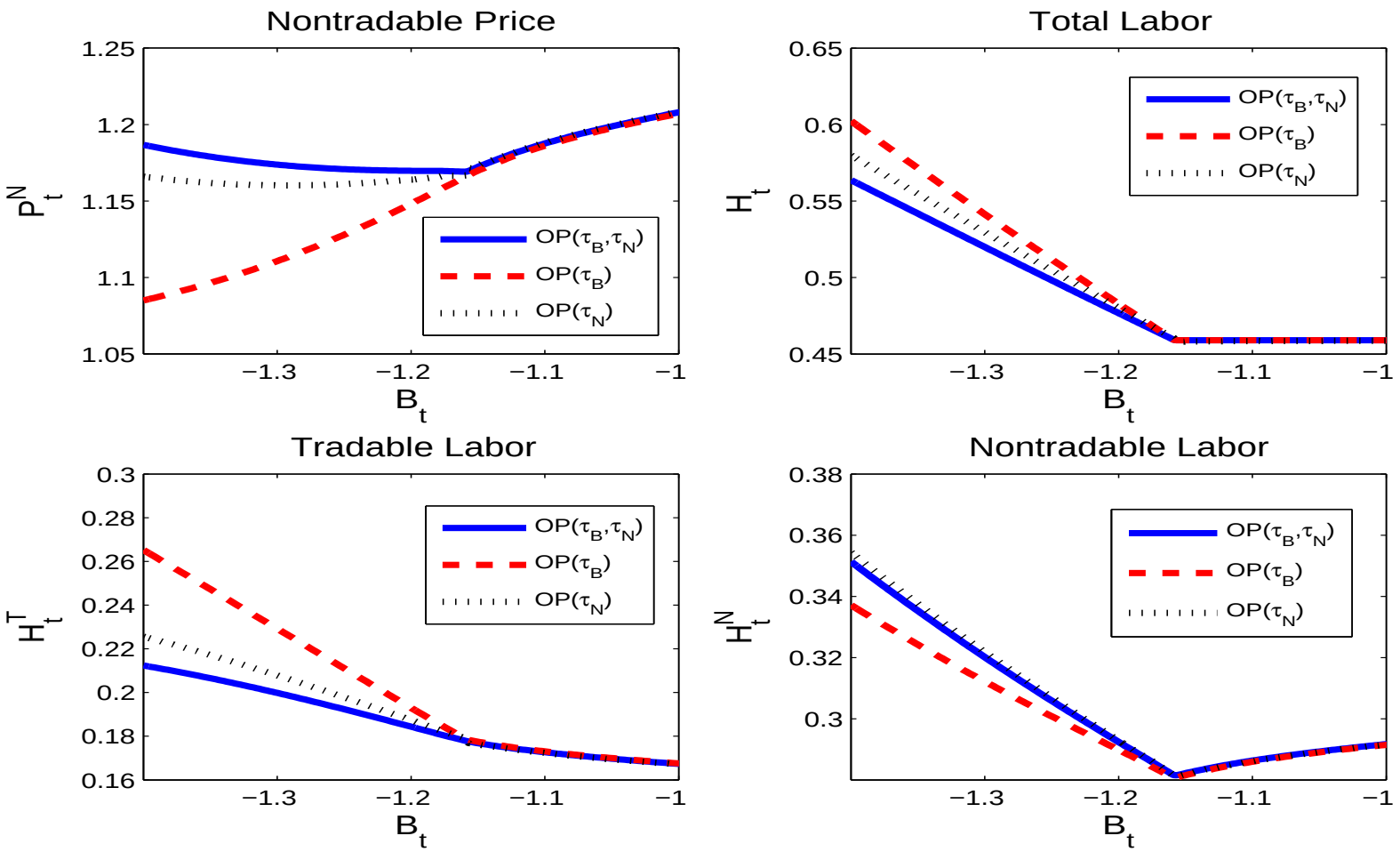

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Efficient Allocations

- Want to study decisions of a planner that internalizes pecuniary externalities
- Wage is required to equal marginal product of labor
- Two possibilities for P^N:
  - "Constrained efficient **I**":

$$P_t^N = \frac{(1-\omega)^{\frac{1}{\kappa}} \left(A_t^N \left(H_t^N \right)^{1-\alpha^N} \right)^{-\frac{1}{\kappa}}}{\omega^{\frac{1}{\kappa}} \left(C_t^T \right)^{-\frac{1}{\kappa}}}$$

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$$P_t^N = f^{CE}\left(B_t, A_t^T, A_t^N \right)$$

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- Want to study decisions of a planner that internalizes pecuniary externalities
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$$B_{t+1} \geq -\frac{1-\phi}{\phi}\left[Y^T + P_t^N Y^N\right]$$

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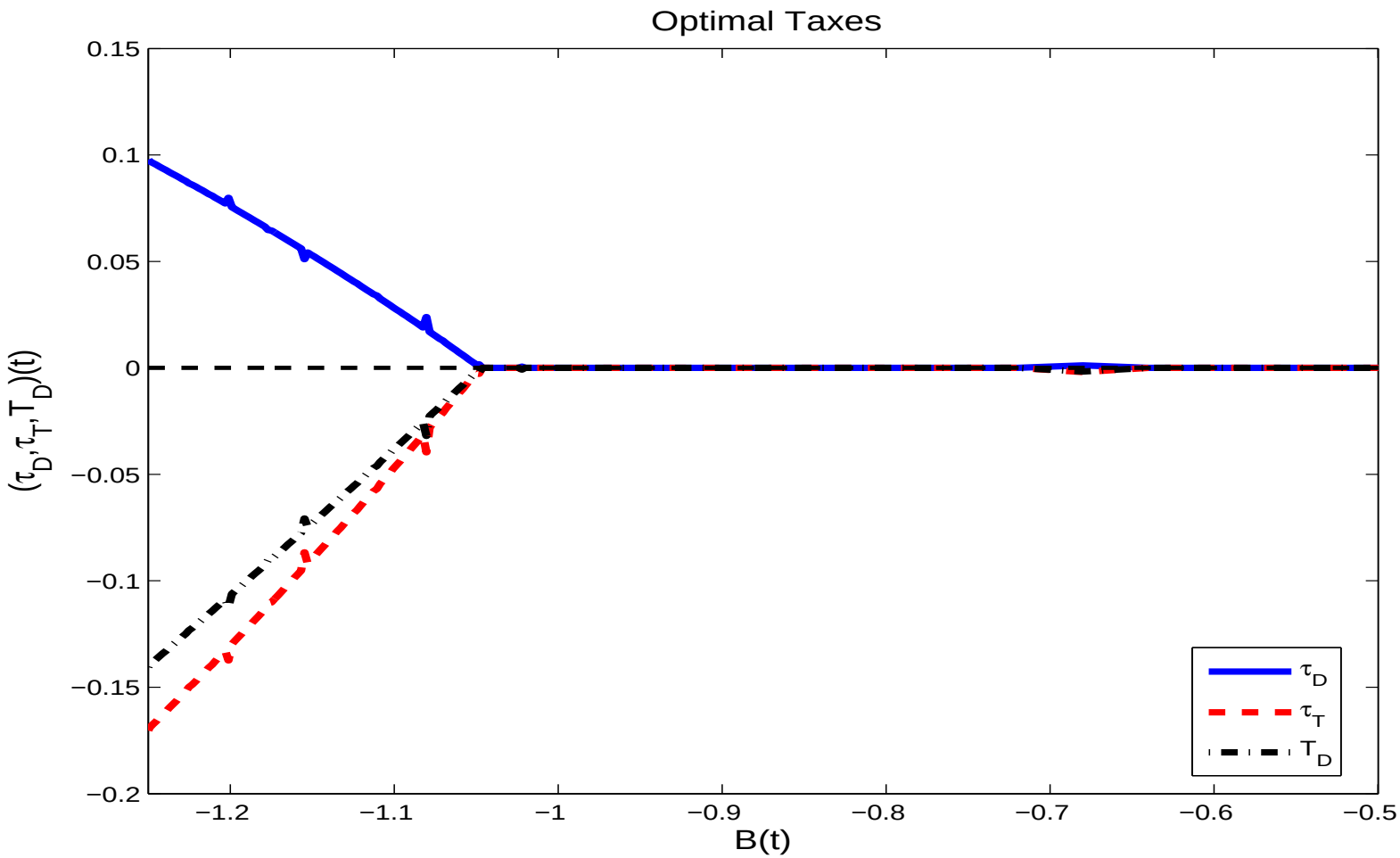
Implementation of Constrained Efficient Allocation

- Can implement SP using taxes on tradable consumption τ^T and nontradable output τ^D, and lump-sum tax on profits T^D, with lump-sum tax T^C to clear government budget

Implementation of Constrained Efficient Allocation



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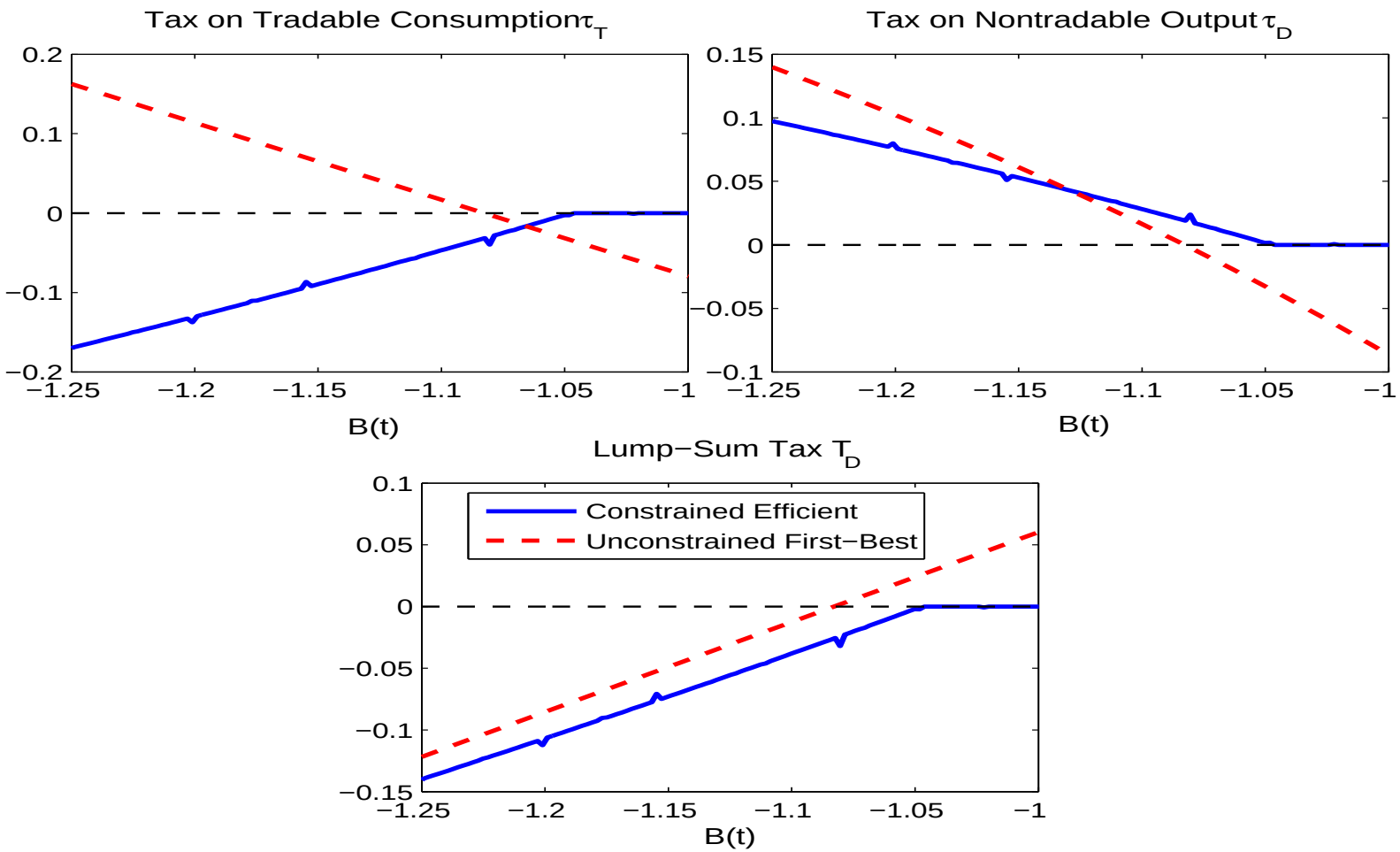
Implementation of Unconstrained Allocation

- Unconstrained allocation dominates SP (by a lot)
- Government commits to subsidizing nontradables if the constraint binds, resulting in constraint never binding

Implementation of Unconstrained Allocation



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- Evaluated on both business cycle and 1995 Tequila crisis
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- Elast. of sub. (tradable and non-tradable goods) $\kappa = 0.76$
- Weight of tradable and non-tradable goods $\omega = 0.32076$
- Utility curvature $\rho = 2$
- Labor supply elasticity $\delta = 1.75$
- Labor share in production $\alpha^T = \alpha^N = 0.66$
- Borrowing constraint 117% of GDP
- Persistence/volatility shock: $\rho_T = 0.553, \sigma_T = 0.028$
- Home real interest rate $i = 0.01587$
- Unconditional probability of sudden stop 2% per quarter

Welfare Gains

- Crisis probabilities

CE	**SP**	**OP**(τ_N, τ_B)	**OP**(τ_N)	**OP**(τ_B)
1.96	1.63	0.09	0.60	0.00

- Average welfare gains over CE

	Overall	**In crisis states**
CE	*na*	*na*
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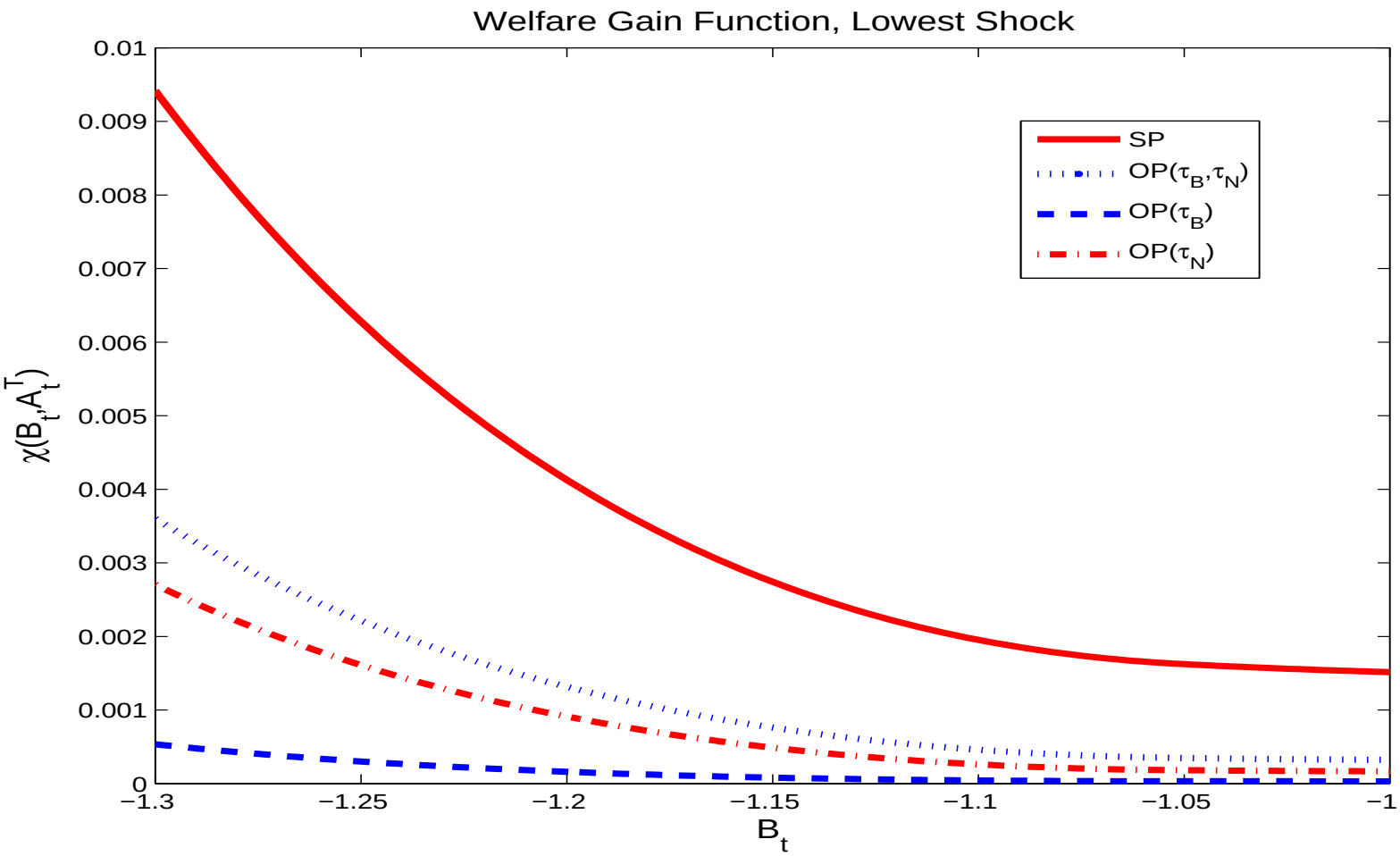

Summary of Main Results

- With insufficient instruments (one), *ex ante* and *ex post* interventions are optimal:
  - Subsidize nontraded sector during crisis, tax it when crisis has positive probability tomorrow
  - Subsidize new debt during crisis, tax it when crisis has positive probability tomorrow
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