Liquidity traps, debt relief, and macroprudential policy: a mechanism design approach

Keshav Dogra[1]

Federal Reserve Bank of New York[1]

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[1]The views I express are my own and do not necessarily represent those of the Federal Reserve Bank of New York or the Federal Reserve System.

Motivation

- Frequently suggested policy in high-debt recessions: **write off debt** (HOLC (1933), Iceland (2008))
  - Keynesian benefits: transfers wealth to high MPC borrowers, boosting demand
  - Cost: Encourages overborrowing ex ante
- Alternative policy: **macroprudential regulation** to prevent overborrowing
  - Cost: may make borrowers worse off
- Write model to ask if debt relief, macroprudential policy are
  - ex ante optimal?
  - Pareto improving?

Literature

Model

- Perfect foresight, time is discrete, $t = 0, 1, ...$
- Borrowers and savers, equal measure, preferences

$$U(\boldsymbol{c}^i, \theta_i) := \mathcal{U}(c_0^i, \theta_i) + \sum_{t=1}^{\infty} \beta^t u(c_t^i) \tag{1}$$

  where $\mathcal{U}_{c\theta} > 0$, $\theta_B > \theta_S = 1$.
- Costlessly produce $y_t^i \leq y^*$ units of variety i output. Consume an aggregate of all varieties.
- Constraints:

$$c_t^i = y_t^i - d_t^i + \frac{d_{t+1}^i}{1 + r_t} \tag{2}$$

$$d_{t+1}^i \leq \phi, t = 1, ... \tag{3}$$

$$d_0^i = 0, \forall i \tag{4}$$

EQUILIBRIUM WITH ZLB $r_t \geq 0$

DEFINITION

A *ZLB-constrained equilibrium* is $\{c_t^i, d_t^i, y_t, r_t\}$ such that

1. Each household i maximizes (1) s.t. (2), (3), (4)
2. $c_t^S + c_t^B = 2y_t$
3. $r_t \geq 0$, $y_t^i = y_t \leq y^*$, $r_t(y^* - y_t) = 0$

graph

NK model

Ex ante overborrowing

Proposition

There exists θ^{ZLB} such that if $\theta_B > \theta^{ZLB}$, then

$$r_t = 0$$
$$u'(c_1^S) = \beta u'\left(y^* + (1-\beta)\phi\right)$$
$$y_1 = c_1^S - d_1 + \phi < y^*$$

- Korinek and Simsek [2014]

ZLB ECONOMICS

- Resource constraint:

$$c_1^S + c_1^B = 2y_1$$

- c_1^S pinned down by savers' Euler equation:

$$u'(c_1^S) = \beta u'(c_2^S) = \beta u'(y^* + (1-\beta)\phi)$$

- c_1^B by borrowing constraint:

$$c_1^B = y_1 + \phi - d_1$$

- Substituting in:

$$c_1^S + (y_1 - d_1 + \phi) = 2y_1$$
$$y_1 = c_1^S - d_1 + \phi < y^*$$

Potential gains from transfers?

- Imagine unanticipated transfer T from savers to borrowers.
  - Borrowers better off
  - Income increases: $y_1 = c_1^S + T - d_1 + \phi$
  - Savers no worse off!
- To restore full employment, need transfer

$$T^{FE} := d_1 - (c_1^S + \phi - y^*)$$

  increasing in d_1.
- Korinek and Simsek [2014], Farhi and Werning [2013]

Equilibrium with date 1 transfers

Definition

An **equilibrium with date 1 transfers** is $\{c_t^i, d_t^i, y_t, r_t, \bar{T}\}$ such that, given a transfer function $T(d)$:

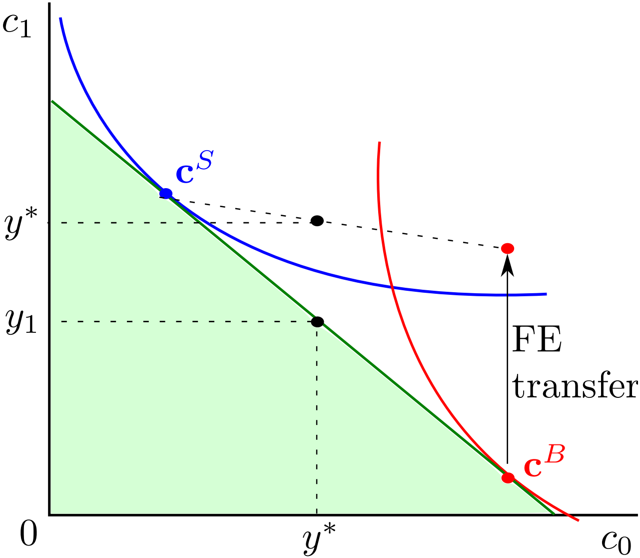
1. Households maximize (1) s.t. (4), (3), and

$$c_1^i = y_1^i + T(d_1^i) - \bar{T} - d_1^i + \frac{d_2^i}{1 + r_1}$$

2. $c_t^B + c_t^S = 2y_t$
3. $r_t \geq 0$, $y_t \leq y^*$, $r_t(y^* - y_t) = 0$
4. Balanced budget:

$$T(d_1^S) + T(d_1^B) = 2\bar{T}$$

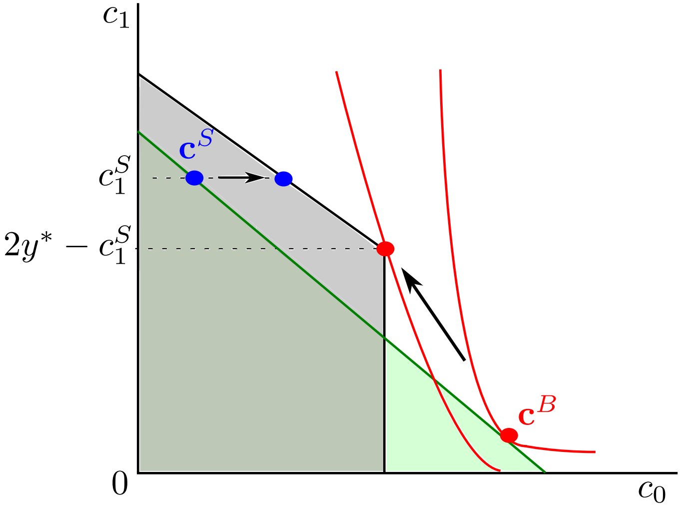
Full employment transfer may not be incentive compatible



Macroprudential policy with private information

- Alternative policy: date 0 debt limit $d_1 \leq \phi_0$.
- Efficient, Pareto improving under full information (Korinek and Simsek [2014], Farhi and Werning [2013])
- Under private information...

Debt limits may not be Pareto improving



Constrained efficient allocations

Social planner solves

$$\max_{c_0^S, c_1^S, c_2^S, c_0^B, c_1^B, c_2^B} \alpha U(\boldsymbol{c}^S, \theta_S) + (1-\alpha) U(\boldsymbol{c}^B, \theta_B) \tag{PP}$$

$$c_0^S + c_0^B \leq 2y^* \tag{RC0}$$

$$c_1^S + c_1^B \leq 2y^* \tag{RC1}$$

$$c_2^S + c_2^B \leq 2y^* \tag{RC2}$$

$$c_2^B \geq y^* - (1-\beta)\phi \tag{BC}$$

$$u'(c_1^S) \geq \beta u'(c_2^S) \tag{ZLB}$$

$$U(\boldsymbol{c}^S, \theta_S) \geq U(\boldsymbol{c}^B, \theta_S) \tag{ICS}$$

$$U(\boldsymbol{c}^B, \theta_B) \geq U(\boldsymbol{c}^S, \theta_B) \tag{ICB}$$

Solution

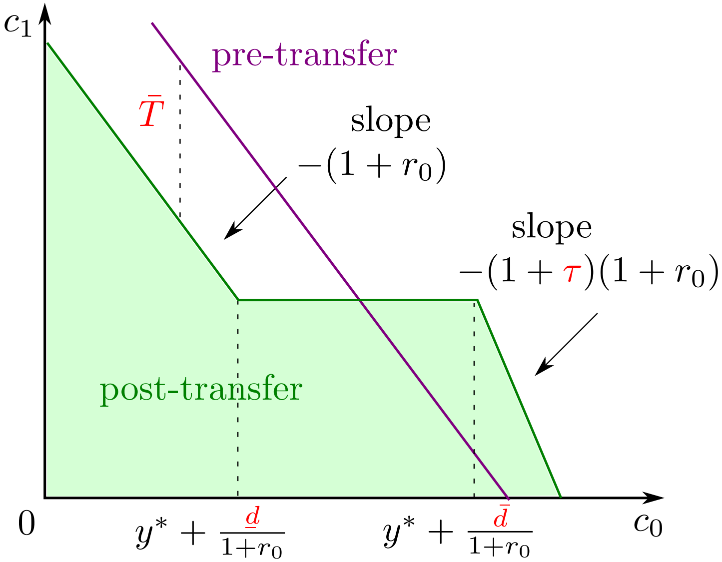
Implementation

Proposition

Any solution to (PP) *can be implemented either as an equilibrium with date 1 transfers, or as an equilibrium with date 0 transfers.*

graph

Date 1 transfers: Debt relief



Debt relief implements efficient allocations

Proposition

There exists $\alpha(\theta_B)$ *such that*

1. *debt relief implements the optimal allocation iff* $\alpha < \alpha(\theta_B)$.
2. *If* (ICS) *binds,* $\alpha < \alpha(\theta_B)$ *and debt relief implements the optimal allocation.*

ICS

graph

Debt relief is Pareto improving at the ZLB

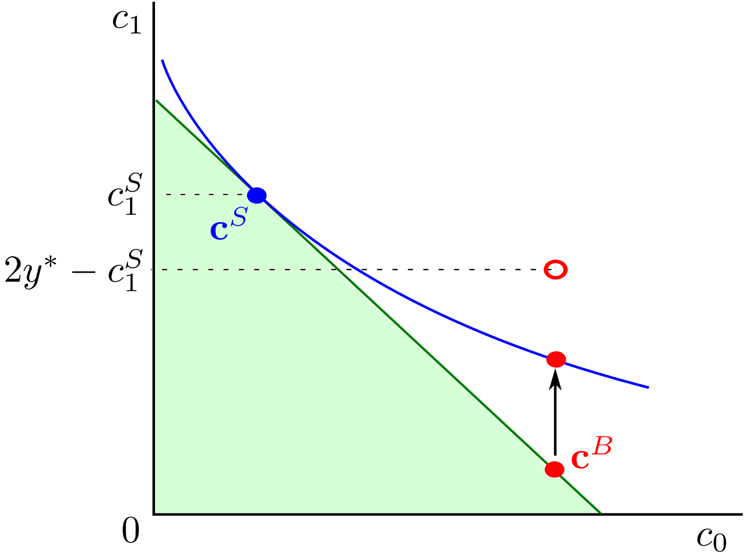
- Debt relief is always ex ante Pareto optimal.
- When is it ex ante Pareto-improving?

Proposition

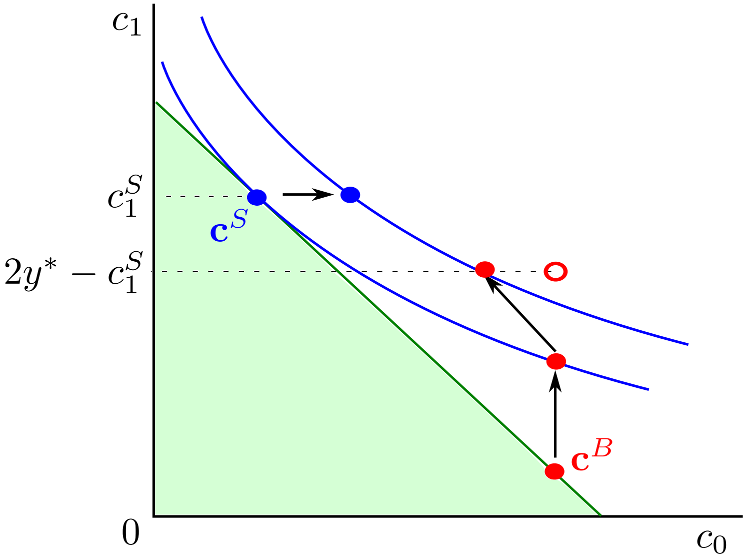
1. *If $\theta_B > \theta^{ZLB}$, the competitive equilibrium is Pareto inefficient. Debt relief is always Pareto improving.*
2. *If $\theta_B \leq \theta^{ZLB}$, the competitive equilibrium is Pareto optimal. Debt relief is not Pareto improving.*

graph

Pareto improving debt relief



Pareto improving debt relief



Targeted loan support programs

Definition

$T_0(d)$ is a **targeted loan support program** (with macroprudential tax) if it has the form

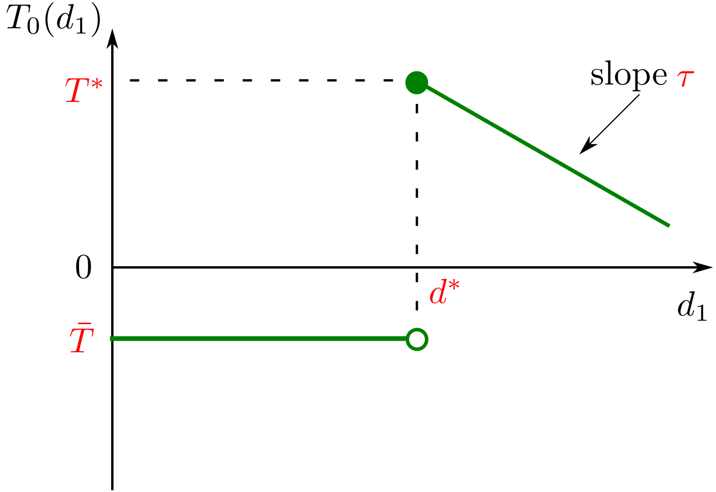
$$\begin{aligned} T_0(d) &= -\bar{T} \text{ if } d < d^* \\ &= T^* - \tau d \text{ if } d \geq d^* \end{aligned}$$

for some $\bar{T}, T^* > 0$, τ.

Implements **same allocation** as debt relief with a cap

- always efficient, ex ante Pareto improving at ZLB

Targeted loan support programs



Conclusion

Debt relief with a cap (or loan support plus macropru tax) is Pareto improving at the ZLB.

Fiscal and macroprudential policy can be **substitutes** when monetary policy is constrained.

In paper: results robust to

1. continuous distribution of types
2. aggregate uncertainty
3. different sources of heterogeneity
4. labor supply

Key ingredients

1. Agents differ in preference for borrowing/saving (impatience), which is private information.
   - Heterogeneity → distribution of debt
   - Private information → incentives matter
2. Zero lower bound constrains interest rates.
   - Output demand-determined, role for fiscal policy
3. Exogenous contraction in borrowing constraint.
   - Aggregate demand shock
   - Introduces MPC heterogeneity

Write Pareto problem, solve for optimal transfer policy.

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Results

1. Unconditional transfer to borrowers is Pareto improving ex post, but not ex ante.

2. Macroprudential debt limit is Pareto improving under full information, but not under private information.

3. Ex ante optimal policy can be implemented with either debt relief with a cap, or with macroprudential taxes plus targeted loan support programs.

4. When ZLB binds, debt relief (or loan support) is ex ante Pareto improving. In normal times, purely redistributive.

Related Literature

- Deleveraging and ZLB (Eggertsson and Krugman [2012], Guerrieri and Lorenzoni [2011]): **I ask what is optimal policy**
- Ex post benefits of debt relief (Fornaro [2013]), and ex ante benefits of macroprudential policy (Korinek and Simsek [2014], Farhi and Werning [2013]): **I add private information, study tradeoffs**
- Optimal taxation and screening (Mirrlees [1971], Saez [2001]): **macroeconomic externality, new motive for redistribution**

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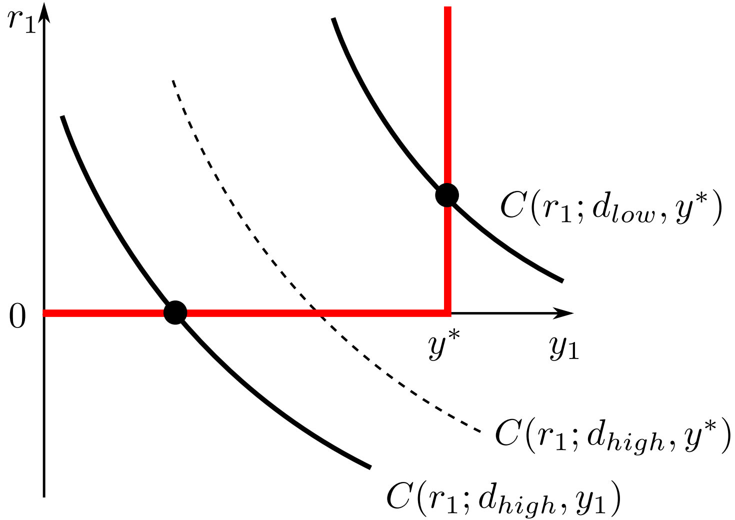
Equilibrium with ZLB $r_t \geq 0$



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New Keynesian model

- Preferences $u(C_t - v(h_t))$
- C_t Dixit-Stiglitz aggregate of varieties j produced by firms with technology $y_t(j) = h_t(j)$
- Prices identical and fixed: $P_t(j) = P = 1$
- Monetary policy sets i_t to ensure efficient output $v'(h_t) = 1$, unless constrained by ZLB $i_t \geq 0$
- **Result:** isomorphic to ZLB-constrained equilibrium, defining $c_t = C_t - v(h_t)$, $y^* = \max_h h - v(h)$.

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Equilibrium with date 0 transfers

Definition

An **equilibrium with date 0 transfers** is $\{c_t^i, d_t^i, y_t, r_t, \bar{T}_0\}$ such that, given a transfer function $T_0(d)$:

1. S, B max (1) s.t. (3) and

$$c_0^i = y_0^i + \frac{d_1^i}{1 + r_1} + T_0(d_1^i) - \bar{T}_0$$

2. $c_t^B + c_t^S = 2y_t$
3. $r_t \geq 0$, $y_t \leq y^*$, $r_t(y^* - y_t) = 0$
4. Balanced budget:

$$T_0(d_1^S) + T_0(d_1^B) = \bar{T}_0$$

Constrained efficient allocations

1. (ICS) binds in allocations favorable for borrowers; (ICB) binds in allocations better for savers. graph

2. When θ_B large, (ZLB) binds. graph

3. In general, full employment, even if (ZLB) binds. But unemployment may be constrained optimal if (ICS) also binds. graph

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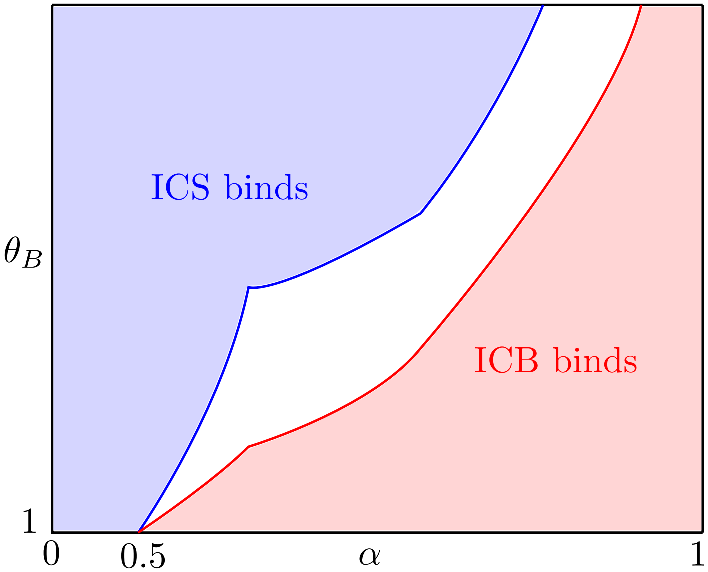
Constrained efficient allocations



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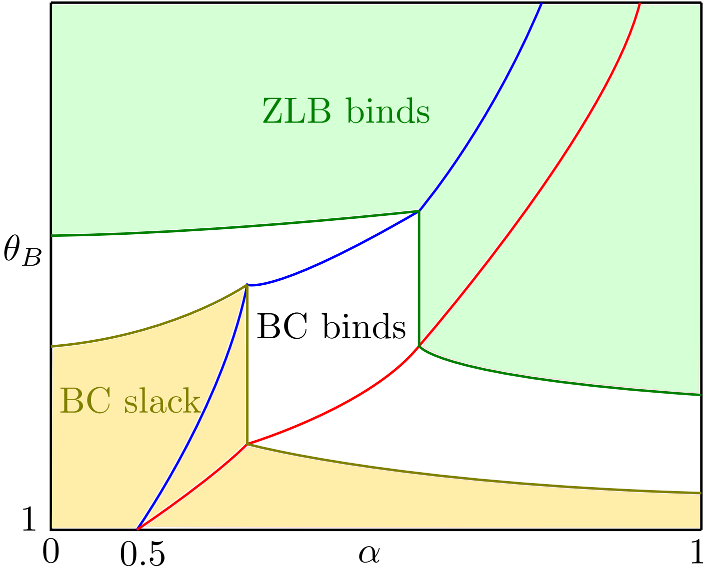
Constrained efficient allocations



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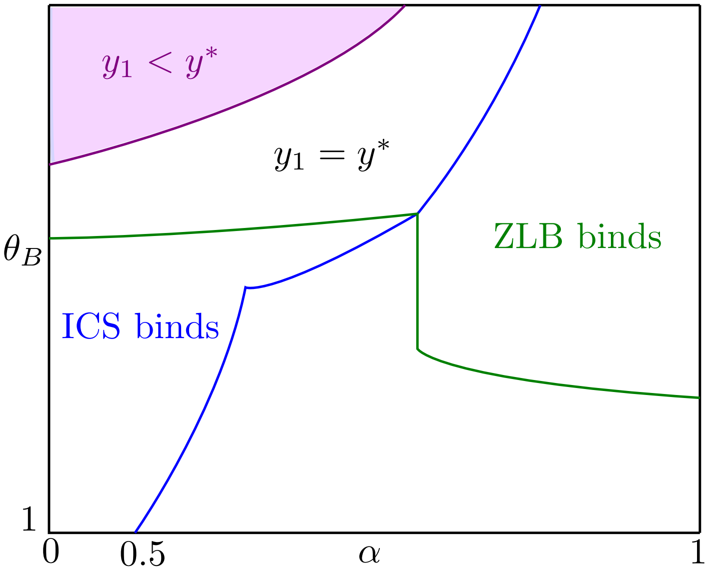
Constrained efficient allocations



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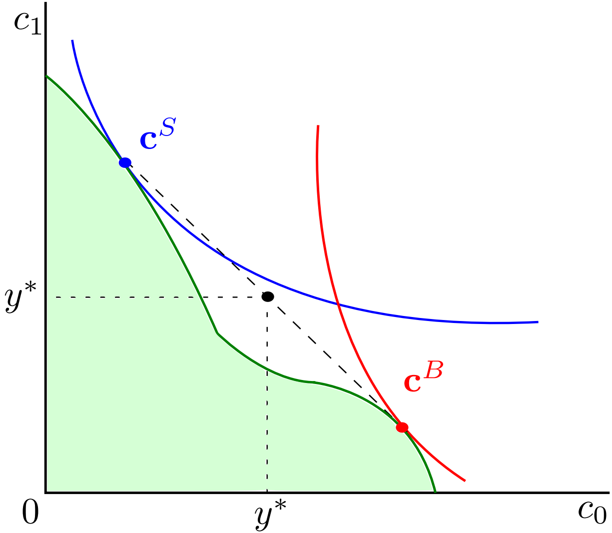
Implementation



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Date 1 transfers: Debt relief

Definition

$T(d)$ is a **debt relief transfer function** if it has the form

$$\begin{aligned} T(d) &= -\bar{T} \text{ if } d < \underline{d} \\ &= -\bar{T} + (d - \underline{d}) \text{ if } d \in [\underline{d}, \bar{d}] \\ &= -\bar{T} + (\bar{d} - \underline{d}) - \tau(d - \bar{d}) \text{ if } d > \bar{d} \end{aligned}$$

for some $\bar{T} > 0$, $\underline{d}$, $\bar{d} > \underline{d}$, τ.

Debt relief implements allocations in which (ICS) binds