Ramsey Asset Taxation Under Asymmetric Information

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Asset Taxation and the Financial System

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- Recent economic turmoil generated renewed interest in Financial Market Regulation, Macro-prundential policies, and a financial transaction tax (FTT).
- In this paper we argue that the government has a role to intervene into the financial system.
- We show that the taxation of financial assets crucially depends on the structure of the financial market, and how

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- Study optimal taxation of assets. Linear and anonymous (consistent with limited information on individual trades)
- Examine properties of allocations and optimal taxes, and how they vary with the structure of financial system:

  1 - Development/Richness of the Financial Market
  $\Rightarrow$ whether private insurance attainable by trading in markets
  2 - Presence of Primary Insurer/'Bank'
  $\Rightarrow$ whether insurance can be provided via long-term contracts

Model

Basic Economy

- 2-period economy, only idiosyncratic risk (for exposition)

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  - additive separable preferences:

$$u(c_0) + \beta \sum_{s=1}^{S} \pi_s(e)\, u(c_s) - v(e)$$

Financial Market

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- (moral hazard) individual effort e private information to the agent, while the realization of individual state s is observable by his 'trading partners'
- (Bid-Ask spread) prices linear in trades (non exclusivity), with different price for buying (+) and selling (-): q_s^+, q_s^- (needed for viability of markets, Bisin-Gottardi ('99))

In the Financial Market also operate Firms:
- produce good at date 1 with technology $F(k)$,
- trade in the asset market (for insurance and credit)

Taxes and Government Information

1. No public production or consumption (no 'need' to tax).
2. Linear, anonymous taxes on each of the existing assets: τ_k, τ_s (government only need to observe consumers' aggregate net trades in each market)

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3. Lump sum taxes/transfers T_0, $T_{1,s}$

   No Public Insurance: We assume Gov't does not observe individual income realizations, hence $T_{1,s} = T_1$ for all s

Households's choice problem

$$U(T,\tau,q) := \max_{c,e,\theta^h,\{a_s^h,b_s^h\}_s} \quad u(c_0) + \beta \sum_{s=1}^{S} \pi_s(e)\, u(c_s) - v(e)$$

s.t.

$$\begin{aligned} c_0 &= y_0 - (1+\tau_k)\, q\theta^h - \sum_{s=1}^{S} (1+\tau_s) \left(q_s^+ a_s^h - q_s^- b_s^h \right) + T_0 + \Pi \\ c_s &= y_s + \theta^h + a_s^h - b_s^h + T_1 \end{aligned}$$

- Firm's choice problem (CE metaphor, like 'vending machine')

$$\max_{k,\theta^f,\{a_s^f,b_s^f\}_s} \Pi = \sum_s \left(q_s^+ a_s^f - q_s^- b_s^f \right) - k - q\theta^f$$

$$\text{s.t.} \qquad F(k) \geq \sum_s \left(\pi_s \left(\hat{e}_s^+ \right) a_s^f - \pi_s \left(\hat{e}_s^- \right) b_s^f \right) - \theta^f$$

$\hat{e}_s^+ \left(\hat{e}_s^- \right)$: firm's conjecture over the effort level undertaken by agents whenever they buy (resp. sell) a claim contingent on s

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- Government budget constraint:

$$\tau q\theta^h + \sum_s \tau_s \left(q_s^+ a_s^h - q_s^- b_s^h\right) = T_0 + qT_1.$$

Competitive Equilibrium (C.Eq.)

Definition: A symmetric C.Eq. with taxes τ_k, T_0, T_1, $(\tau_s)_s$ is: prices of claims, consumers' and firms' optimal choices such that markets clear:

$$\begin{aligned} a_s^f &= a_s^h \\ b_s^f &= b_s^h \end{aligned} \quad \text{for all } s$$

$$\theta^f + \theta^h + T_1 = 0$$

gov't budget constraint is satisfied, and
firms' conjectures are correct (for traded claims):

$$\begin{aligned} q_s^+ &= q\pi_s(\bar{e}) \text{ if } \bar{a}_s^h > 0 \\ q_s^- &= q\pi_s(\bar{e}) \text{ if } \bar{b}_s^h > 0. \end{aligned}$$

Competitive Equilibrium: properties

- Will consider C.Eq. with 'pessimistic' conjectures for non traded claims:

$$
\begin{aligned}
q_s^+ &= q \max_{e \in E} \pi_s(e) \text{ if } \bar{a}_s^h = 0 \\
q_s^- &= q \min_{e \in E} \pi_s(e) \text{ if } \bar{b}_s^h = 0
\end{aligned}
$$

We provide sufficient conditions for existence of symmetric equil.

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  i) resource feasibility and
  ii) effort IC constraint

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- Constrained Efficient allocations (C.Eff.):
  maximize U, subject to:
  i) resource feasibility and
  ii) effort IC constraint
- RA are typically not C.Eff.
  This is different from NDPF literature (implement C.Eff)

Limited Financial Market

Limited Financial Market: No Trades in AS

Justifiable by high severity of moral hazard (simple production)

Definition 1 : (π, E) displays full controllability if:
for each $s \in S$ there is $\hat{e} \in E$ such that $\pi_s(\hat{e}) = 1$

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Lemma 2 : *Under full controllability, if $u(.)$ is unbounded above, no contingent claim is ever traded at a competitive equilibrium, only the bond.*

Proof: no arbitrage on contingent claims vs. bond requires:

$$\text{for all } s: \quad (1+\tau_s)q_s^- \leq 0 \quad \text{and} \quad (1+\tau_s)q_s^+ \geq (1+\tau_k)q.$$

Zero Tax on Market Transactions

Proposition 1: Assume only the bond is traded (full-controllab.):

i) If a (symmetric) C.Eq. with zero taxes $(\tau, T) = 0$ exists, it is C.Eff.

ii) If u is NIARA and $\pi(\cdot)$ has log-convex CDF, a symmetric C.E. exists for all τ.

Corollary: *Under the above conditions, 'absent distributional concerns', the optimal tax on the bond is zero:* $\tau_k^* = 0$.

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- Benchmark: No pecuniary externalities
- Message: No 'endogenous' insurance market available. Taxes cannot help sustain incentives/insurance.

Introducing Primary Insurers

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- Competition drives primary insurers' profits to zero
- Consumers can still (re)-trade in the financial market θ^h
- Primary insurers take taxes and prices (e.g., q) as given

Primary Insurer's Problem

$$V(\tau_k, T) := \max_{c_0, \{c_s\}_s, e} \quad u(c_0) + \sum_{s=1}^{S} \pi_s(e)\, \beta u(c_s) - v(e),$$

s.t.

$$u(c_0) + \beta \mathbb{E}_{\pi(e)} u(c_1) - v(e) \geq u(c_0 - \tilde{q}\hat{\theta}) + \beta \mathbb{E}_{\pi(\hat{e})} u(c_1 + \hat{\theta}) - v(\hat{e})$$

for all $\hat{e}$ and $\hat{\theta}$;

$$y_0 + T_0 - c_0 + \Pi + \tilde{q} \sum_s \pi_s(e)\,(y_s + T_1 - c_s) \quad \geq \quad 0;$$

where $\tilde{q} := (1 + \tau_k) q.$

Ramsey Problem

$$\max_{\tau_k, T_0, T_1} \quad V(\tau_k, T)$$

$$\text{s.t.}$$

$$T_0 + qT_1 = \tau\theta(\tau_k, T)$$

- It does not make sense to change q by distorting capital
- The level of private savings is under government's control
- Reactions $\theta(\tau_k, T)$ to taxes is ICC for government

$$\theta := c_s - y_s - T_1$$

Positive Tax on Capital

- Recall financial market is still under-developed as only the bond is traded
- Agents can now get insurance via the primary insurer

Proposition 2: Assume full controllability, and primary insurers

i) E continuum: $\pi(\cdot)$ has log-convex CDF and NIARA

ii) E descrete: If IC binds only wrt one effort level

then at a RA we have $\tau_k^* > 0$.

Intuition

Positive tax on the asset makes joint deviations (to other effort levels and higher savings) less desirable; recall

$$u(c_0) + \beta \mathbb{E}_{\pi(e)} u(c_1) - v(e) \geq u(c_0 - \tilde{q}\hat{\theta}) + \beta \mathbb{E}_{\pi(\hat{e})} u(c_1 + \hat{\theta}) - v(\hat{e})$$

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(ii) Comparing envelope and govn't FOC w.r.t. τ_k

$$\mu u'(c_0 - \tilde{q}\hat{\theta})\hat{\theta} + V_0 \frac{\tau_k \theta_k}{1 - \tau_k \theta_0} = 0.$$

where $\mu > 0$ is multiplier to the IC effort

Where $V_0, \theta_0 > 0$ are derivatives w.r.t. T_0. And $\theta_k < 0$.

RA is not Constrained Efficient: Why ?

1. Take the case where FOC is valid (otherwise one instrument for a joint deviation)
2. Primary insurer does not take into account the effect of taxes so wants to front-load consumption as usual
3. To do that, it distorts cross-state consumption to prevent the agent to save despite the front loading

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3. To do that, it distorts cross-state consumption to prevent the agent to save despite the front loading

$$\frac{\lambda \tilde{q}}{\beta u'(c_s)} = 1 + \mu \frac{\pi_s'(e)}{\pi_s(e)} + \phi \left[-\frac{u''(c_s)}{u'(c_s)} \right]$$

where $\phi > 0$ is multiplier to the Euler Equation

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Definition 2: (π, E) displays full-support (NO Controllability) if for each $e \in E$: $1 > \pi_s(e) > 0$ for all s

- Market for contingent claims may now be active
- Insurance also attainable in the market

Developed Financial Market, NO Primary Insurers

- NO primary insurers (market based financial system)

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Proposition 3: Assume $S = 2$, two effort, and RA better than both Self-Insurance and $e = 0$ with full insurance.

i) If u is CARA then we always have $\tau_k^* > 0$ (tax);

ii) If u is CRRA with parameter σ then:

- If $\sigma < 1$ we have $\tau_k^* < 0$ (subsidy),
- If $\sigma = 1$ we have $\tau_k^* = 0$ (zero tax).
- If $\sigma > 1$ we have $\tau_k^* > 0$ (positive tax)

iii) We always have $\frac{1+\tau_L^*}{1+\tau_H^*} \geq 1$

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- Crucial condition form agents' BC in period 0:

$$\frac{\Delta\theta}{\Delta\pi_H} = \frac{1}{q_H + q_L}\left(q_H \frac{\Delta b_H}{\Delta\pi_H} + q_L \frac{\Delta a_L}{\Delta\pi_H}\right).$$

$$\frac{-\frac{\Delta b_H}{\Delta\pi_H}}{\frac{\Delta a_L}{\Delta\pi_H}} >? < \frac{q_L}{q_H}$$

Taxes to Ease - Not Close - Financial Markets

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- Optimal taxes ease trades in the markets for contingent claims: RA obtains at C.Eq. with nonzero trades

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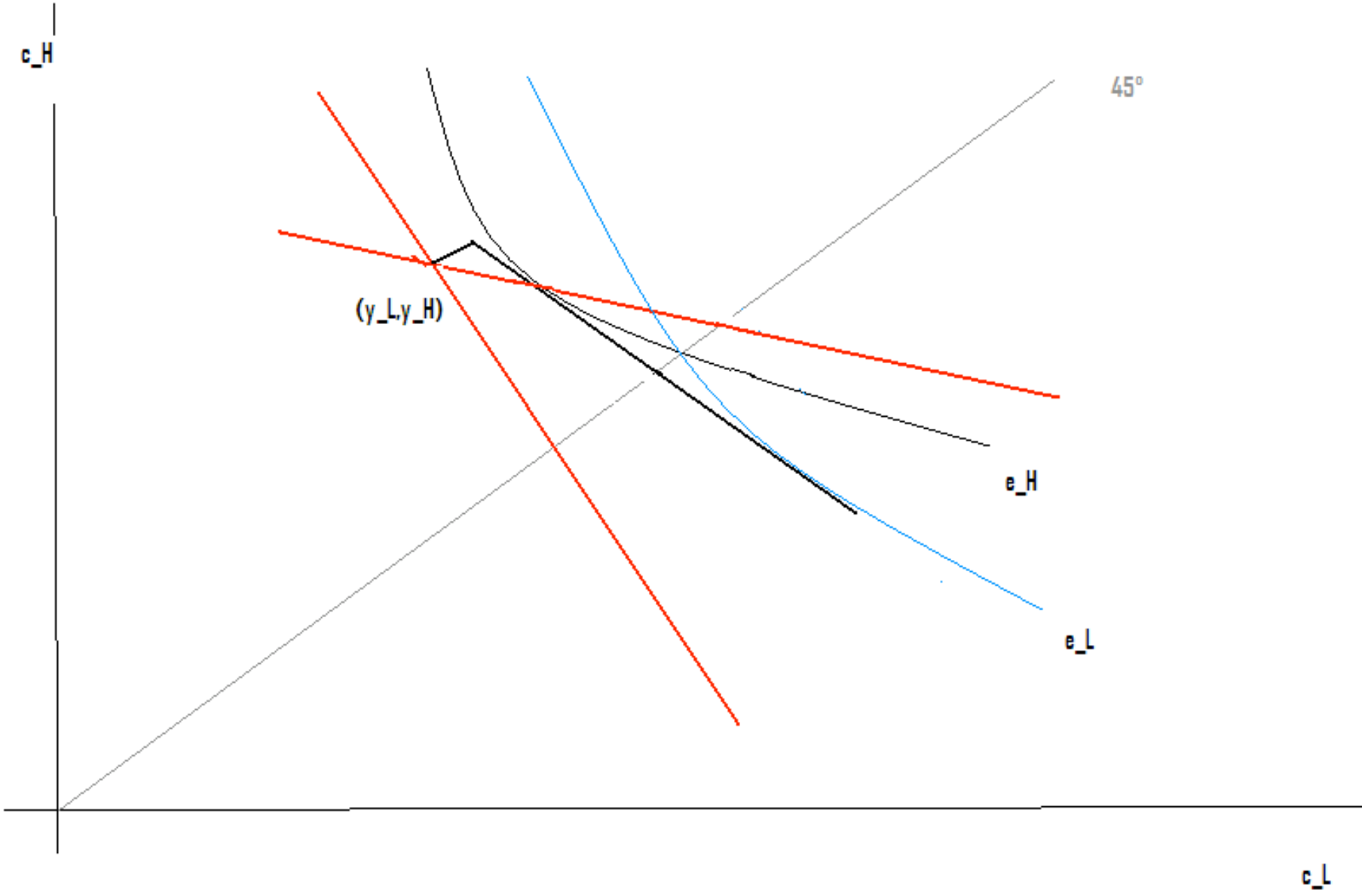
- *Next Slide*: Example illustrating interaction between markets and government intervention:

  RA with nonzero trades and taxes


c_H
45°
(y_L,y_H)
e_H
e_L
c_L

Primary Insurers in a Developed Financial Market

To avoid tax arbitrage we must set $\tau_s = \tau_k$ for all s.

Proposition 4: Assume two effort levels and RA with $e = e_H$

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Remark: Again crucial for tax sign the deviation patterns

NB: Here taxes are used to 'close' the credit market

Ramsey Allocation

Lemma 3: *With primary insurers, and two effort levels*

$$\max_{c_0,\{c_s\}_s,e} \quad u(c_0) + \beta \mathbb{E}_{\pi(e)} u(c_s) - v(e),$$

s.t.

$$\tilde{q} u'(c_0) = \beta \mathbb{E}_{\pi(e)} u'(c_s);$$

$$u(c_0) + \beta \mathbb{E}_{\pi(e)} u(c_s) - v(e) \geq u(c_0 - \tilde{q}\hat{\theta}) + \beta u(\mathbb{E}_{\pi(\hat{e})} c_s + \hat{\theta}) - v(\hat{e});$$

$$\tilde{q} u'(c_0 - \tilde{q}\hat{\theta}) = \beta u'(\mathbb{E}_{\pi(\hat{e})} c_s + \hat{\theta});$$

$$y_0 + T_0 - c_0 + \Pi + \tilde{q}\mathbb{E}_{\pi(e)}(y_s + T_1 - c_s) \quad \geq \quad 0.$$

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- We study optimal linear taxation of assets (Ramsey) in presence of moral hazard and limited gov't information

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Concluding Remarks

- We study optimal linear taxation of assets (Ramsey) in presence of moral hazard and limited gov't information
- Two main Messages:
  1. Asset taxes (distortions) are motivated by need to enhance incentives when insurance is attained at Ramsey allocations
  2. The sign and nature of taxes depend on the structure and development of the financial system

     - With primary insurers, taxes are used to close markets

     - Without them taxes facilitate incentive compatible trading