Bailouts and Financial Innovation:
Market Completion Versus Rent Extraction

Anton Korinek

University of Maryland

Presentation at the Cowles GE Conference

New Haven, CT

April 2012

Motivation

Financial losses during crises magnified by financial innovation:

- "Innovations" in the mortgage market
- Numerous "innovations" to leverage FDIC-bailouts:
  - rise of repo market after National Depositor Preference Act (1993)
  - effective seniority through short-term liabilities
  - deposit brokering
- "Innovations" that enabled banks to circumvent capital adequacy requirements
- Role of CDSs in the demise of AIG
- ...

Motivation

Unprecedented losses have led to unprecedented bailouts

- Social desirability of bailouts hotly debated:
  1. bailouts increase ex-post efficiency $\rightarrow$ *market completion*
  2. bailouts redistribute resources $\rightarrow$ *rent extraction* (“moral hazard”)

  $\Rightarrow$ trade-off between the two effects

- Financial innovation shifts the balance between market completion and rent extraction

Further Motivation

Contribution

1. simple analytical model of bailouts to study trade-off between *market completion* and *rent extraction*
2. illustrate how financial innovation may shift this trade-off
3. delineate lessons for the optimal policy design
4. study effects of *financial innovation for rent extraction* on:
   - distribution of resources
   - consumption volatility
   - production volatility

Literature

Contribution to the Literature:

- Literature on bailouts and “moral hazard:”
  e.g. Bagehot (1873), ...

  distinct from “collective moral hazard” (e.g. Farhi and Tirole, 2012)
- Literature on financial innovation:
  e.g. Allen and Gale (1989, 1991), Simsek (2011), ...
- Literature on rent extraction by financial sector:
  e.g. Akerlof and Romer (1993), Philippon and Reshef (2009), ...

Benchmark Model

Benchmark model:

- two agents: households and bankers $i \in \{h, b\}$
- two states of nature $s = 1, 2$
- Probabilities and initial endowments:

	$s = 1$	$s = 2$
probability	$\pi \geq \frac{1}{2}$	$1 - \pi$
households e_h	e	e
banker e_b	e	e_L

- each state consists of two periods:
  1. period 1: allocation systems are executed,
     $\rightarrow$ determine period 2 wealth w_{si}
  2. period 2: production and consumption

Period 1

- **Collect endowments**
- **Apply different allocation systems:**
  - autarky $\mathcal{A}(\cdot)$
  - Walrasian market $\mathcal{M}(\cdot)$
  - production $\mathcal{P}(\cdot)$
  - uncompensated transfers ("bailouts") $\mathcal{B}(\cdot)$
  - compensated transfer rules $\mathcal{T}(\cdot)$
  - combinations, e.g. $\mathcal{M}(\mathcal{P}(\cdot))$, $\mathcal{B}(\mathcal{M}(\cdot))$, $\mathcal{B}(\mathcal{P}(\cdot))$, ...
  - ...

Period 2

Bankers:

- represent consolidated productive sector
- invest their wealth $k = w_{sb}$
- hire labor l at market wage ω

$$\Pi(k) = F(k, l) - \omega l = Ak^{\alpha} l^{1-\alpha} - \omega l = \alpha A k^{\alpha}$$

- market incompleteness: banker cannot borrow
  $\rightarrow$ their wealth is essential for production

Households:

- provide $l = 1$ unit of labor at market wage ω
- put wealth w_{sh} in a storage technology
- consume at end of period:

$$U(c) = U(w_{sh} + \omega) = U(w_{sh} + (1 - \alpha)Ak^{\alpha})$$

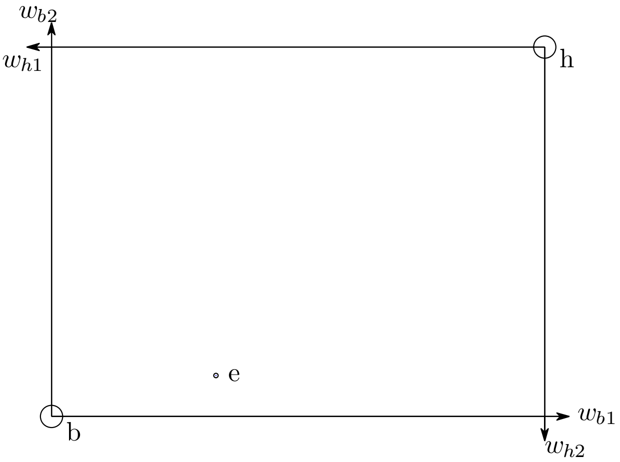
Autarky

Autarky equilibrium:

- Beginning-of-period 2 wealth = endowment
- Banker profits are $\Pi^A = \alpha A E[e_{sb}^{\alpha}]$
- Household utility is $U^A = E[U(e_{sh} + (1-\alpha) A e_{sb}^{\alpha})]$

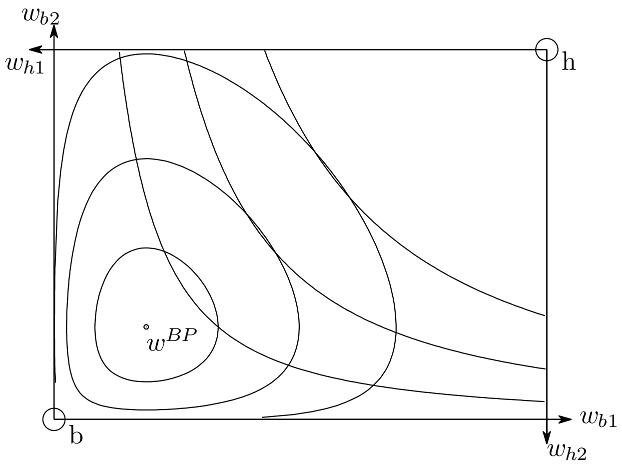
Autarky

Autarky equilibrium in Modified Edgeworth box



Autarky

Indifference Curves in Modified Edgeworth box



Walrasian Market

Introduce Walrasian market to trade across $s = 1, 2$ in period 1:

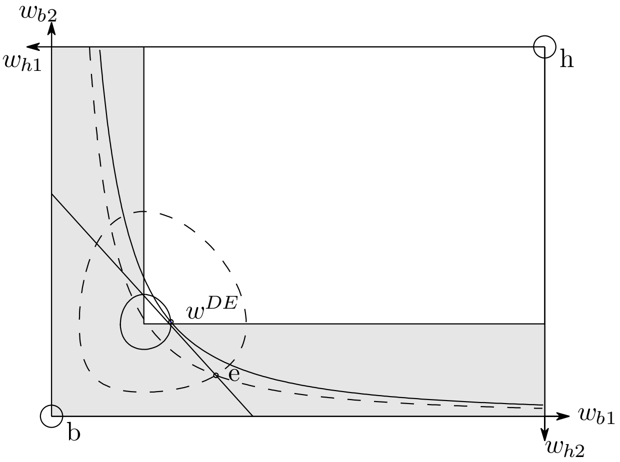
- bankers buy b^{DE} units of goods in $s = 1$ at price p^{DE}
- optimality conditions of bankers and households imply

$$MRS_b = \frac{\Pi'(w_{1b})}{\Pi'(w_{2b})} = p^{DE} = \frac{U'(c_{1h})}{U'(c_{2h})} = MRS_h$$

- resulting levels of utility U^{DE} and profits Π^{DE}

Walrasian Market

Decentralized Equilibrium: trade b^{DE} units



Production Economy

Allow bankers access to production technology:

- concave production possibilities frontier $G(e_{1b}, e_{2b}) = 0$
- only bankers have access to technology
- in optimal allocation, bankers pick (e_{1b}, e_{2b}) s.t.

$$MRT_b = \frac{\Pi'(e_{1b})}{\Pi'(e_{2b})} = \frac{\pi}{1-\pi}$$

- expected level of profits Π^P and of household utility U^P

Combining PPF and Walrasian market:

- optimality implies

$$MRT_b = MRS_b = \frac{\Pi'(e_{1b})}{\Pi'(e_{1b})} = \frac{U'(c_{1h})}{U'(c_{2h})} = MRS_h$$

- expected level of profits Π^{MP} and of household utility U^{MP}

Transfer Allocation

Transfers:

- assume no markets are open in period 1
- observe that $\partial\omega/\partial k > 0$,
  at $k = 0$, $\partial\omega/\partial k = \infty$

Lemma (Pareto-Improving Bailouts)

A planner who maximizes household welfare finds it ex-post optimal to provide transfers to bankers as long as $k < \hat{k}$ which is defined by

$$F_{kl}(\hat{k}, 1) = \alpha(1-\alpha)A\hat{k}^{\alpha-1} = 1$$

Transfer Allocation

Transfers:

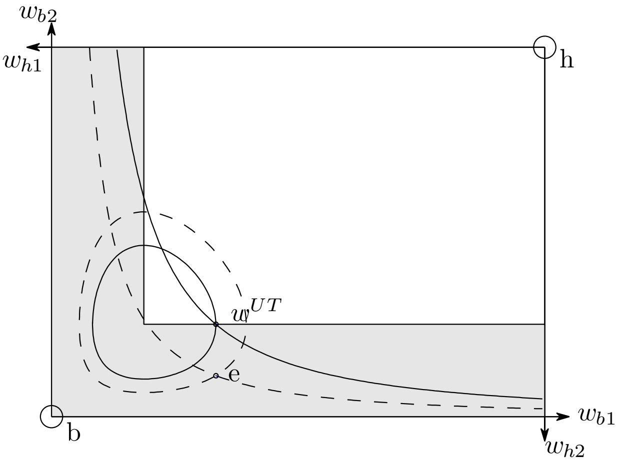
- For given w_{sb}, bankers receive a transfer $t_s = \hat{k} - w_{sb}$ up to a maximum
  - $t^{\text{max}} = \min\{\hat{k}, w_{sh}\}$ under limited liability or
  - $t^{\text{max}} = \min\{(1-\alpha)\hat{A}k^{\alpha}, w_{sh}\}$ otherwise

$\rightarrow$ floor to profits $\Pi^{\text{min}} = \alpha A\hat{k}^{\alpha}$

$\rightarrow$ utility of consumers $U_s = U(w_{sh} - t_s + (1-\alpha)A\hat{k}^{\alpha}) > U(w_{sh})$

Uncompensated Transfers

Bailout Transfer Rule with $\hat{k}$



Transfer Allocations

Market Completion Effect

Proposition (Market Completion)

A transfer rule that ensures $k \geq \hat{k}$ leads to a Pareto improvement.

Compensated Transfer Allocations

Compensated Transfers

Assume the planner follows this transfer rule (w.l.o.g. in state $s = 2$) and imposes a compensatory transfer $t_1 = -\tau(t_2)$ in state $s = 1$

$$\text{where } \tau(0) = 0 \text{ and } \tau'(t_2) \leq 0$$

$\rightarrow$ households receive compensation for transfers

$\rightarrow$ note: $\tau(t_2) = p^{DE} t_2$ replicates decentralized equilibrium

Combining Walrasian Market and Transfers

Assume a Walrasian market *followed by* a transfer rule $\hat{k}$
(and assume households cannot commit not to bail out)

Focus on symmetric equilibria

Banker can follow two strategies:

1. **Insurance regime:** trade in the market to optimally insure
2. **Rent extraction regime:** trade to maximize transfers

$\rightarrow$ choose strategy that maximizes utility

Note: insurance regime replicates the DE allocation

Combining Walrasian Market and Transfers

Rent Extraction Regime:

Bankers have incentive to sell claims against $s = 2$ until

- either $w_{1b} = 2e$
- or $w_{2b} = \hat{k} - t^{\max}$

at the prevailing market price $p^{RE1} = \frac{U'(c_{1h})}{U'(c_{2h})}$

Banker utility is w.l.o.g. $U^{RE1} = \pi\Pi(2e) + (1 - \pi)\Pi(\hat{k})$

Proposition (Rent Extraction)

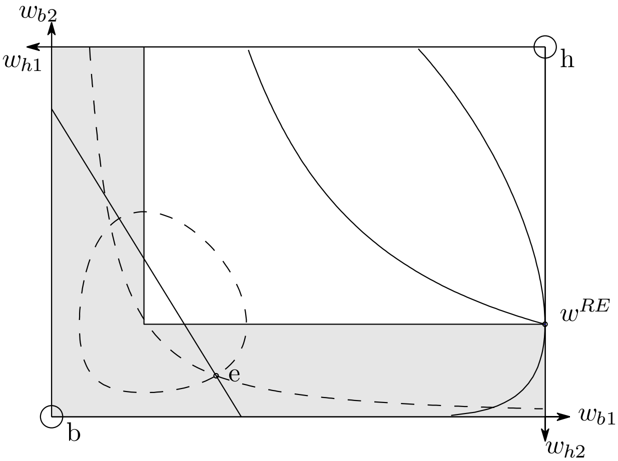
1. Bankers choose the rent extraction regime if $U^{RE1} > U^{DE}$.

2. Bankers are more likely to choose rent extraction the higher $\hat{k}$, the higher π and the lower e_L.

3. In the rent extraction regime, they increase their utility at the expense of households and raise consumption volatility for everybody.

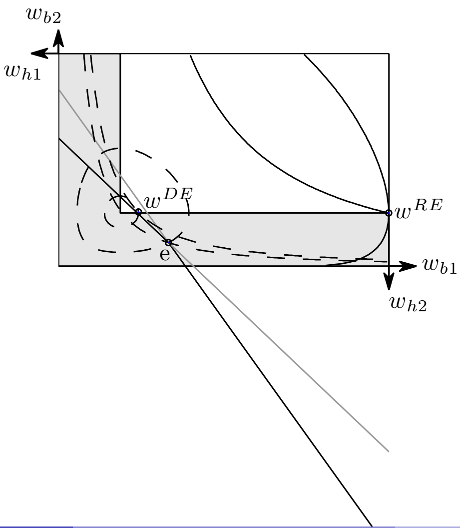
Rent Extraction

Rent Extraction Equilibrium



Rent Extraction

Rent Extraction Equilibrium (zoomed out)



Mixed Strategy Rent Extraction

Note: symmetric equilibrium leaves money on the table

Mixed-Strategy Equilibrium:

Bankers may find it optimal to split into two groups

1. group I of mass n_I extracts transfers in state $s = 1$
2. group II of mass n_{II} extracts transfers in state $s = 2$

In mixed strategy equilibrium,

- rent extraction up to $t_\sigma = t^{\max}$ or $n_\sigma w_{\sigma bI} + \hat{k} w_{\sigma bII} = e_{\sigma b} + e_{\sigma h}$
- n_I and n_{II} are chosen such that $U_I^{RE2} = U_{II}^{RE2}$

Proposition (Mixed Strategy Rent Extraction)

In a mixed strategy rent extraction equilibrium bankers bet with each other and with households to extract the maximum possible surplus in all states of nature.

Market Equilibrium Under Compensated Transfers

Rent extraction can be counteracted by charging for expected transfers

$\rightarrow$ find compensation rule $\tau(t_2)$ to restore efficient equilibrium

$\rightarrow$ financial regulation, tax policy, ...

Corollary (Compensated Transfers)

1. If the compensation rule τ is such that $\tau' < p^{RE}$, the rent extraction equilibrium will prevail.

2. If the compensation rule τ satisfies $\tau' \geq p^{RE}$, the efficient equilibrium can be restored.

Note: $\tau' < p^{RE}$ creates an "arbitrage" opportunity

Market Structure and Financial Innovation

Assume bankers can create market between $s = 1, 2$ at a fixed cost f (see e.g. Allen and Gale, 1988, 1991)

Proposition (Financial Innovation and Rent Extraction)

Bankers are willing to pay a higher fixed cost f to create a market if they do so for rent extraction than if they do so for insurance.

Note: financial innovation directed at creating an arbitrage opportunity

- bailout = Arrow-Debreu security at zero (underpriced) cost
- traded securities sell at a positive value

$\rightarrow$ modern financial markets extremely efficient at arbitrage

Rent Extraction with Production

Assume bankers face a concave PPF $F(e_{b1}, e_{b2})$

Proposition (Rent Extraction with Production)

1. In a symmetric rent extraction equilibrium, bankers choose an endowment $e_2 = 0$ *to maximize* e_1*.*

2. In a mixed-strategy rent extraction equilibrium, bankers reduce aggregate wealth in both states of nature.

$\rightarrow$ massively negative NPV production takes place

Example: housing bubble

Conclusions

1. Bailouts play a dual role:
   market completion versus rent extraction
2. Financial innovation shifts the balance of the two
3. Financial innovation is most profitable if directed at rent extraction
4. Rent extraction equilibria:
   - may shift an economy's aggregate surplus to bankers
   - increase volatility and reduce efficiency
   - may lead to massively negative NPV investments
5. Even if regulation makes rent extraction costly, small mispricing may lead to massive rent extraction