Booms, crashes & choking in the financial sector & other speculative industries

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Presentation prepared for the first conference of the Centre for the study of capital market dysfunctionalities, London School of Economics

June 2008

Technological innovation spurs booms

Innovations, in real or financial sector:

- 1920s: Electricity, chemicals, new management techniques
- 1980s: Desintermediation, high yield debt
- 1990s: Internet
- 2000s: Hedge funds, securitization, credit derivatives

Investment to take advantage of innovation => growth of innovative sector (share of GDP, payroll.)

Schumpeter: “The mania of 1719-1720 … was as were later manias of this kind, induced by a preceding period of innovation which transformed the economic structure.”

Booms rely on confidence in a new era

Before 1825 crisis, Disraeli: “period distinguished from previous ages by superior commercial knowledge.”

1927, John Moody: “No one can examine the panorama of business & finance in America during the past half-dozen years without realizing we are living a new era.”

1990’s: New economy, internet revolutionizes life.

2005, Greenspan: “As is generally acknowledged, the development of credit derivatives has contributed to the stability of the banking system by allowing banks, especially the largest systemically important banks, to measure and manage their credit risk more effectively.”

Uncertainty & learning about sustainability of boom

During internet bubble: doubts about sustainability of astronomic stock prices.

During credit bubble: doubts about whether securitization & CDS had sufficiently and reliably increased risk absorption capacity.

Asymmetric learning: as boom develops & no crisis occurs, confidence goes up. When crisis occurs: sharp drop in confidence.

Asymmetric information during booms

Innovation/new technology: Insiders, managers, entrepreneurs understand what their business is about. Outside investors much less informed.

What were dotcom managers doing during internet bubble? What were financial intermediaries doing during credit bubble?

To maintain incentives in spite of information asymmetry: performance contingent pay, large bonuses, agency rents.

Innovation + uncertainty + asy. info. => speculative sector.

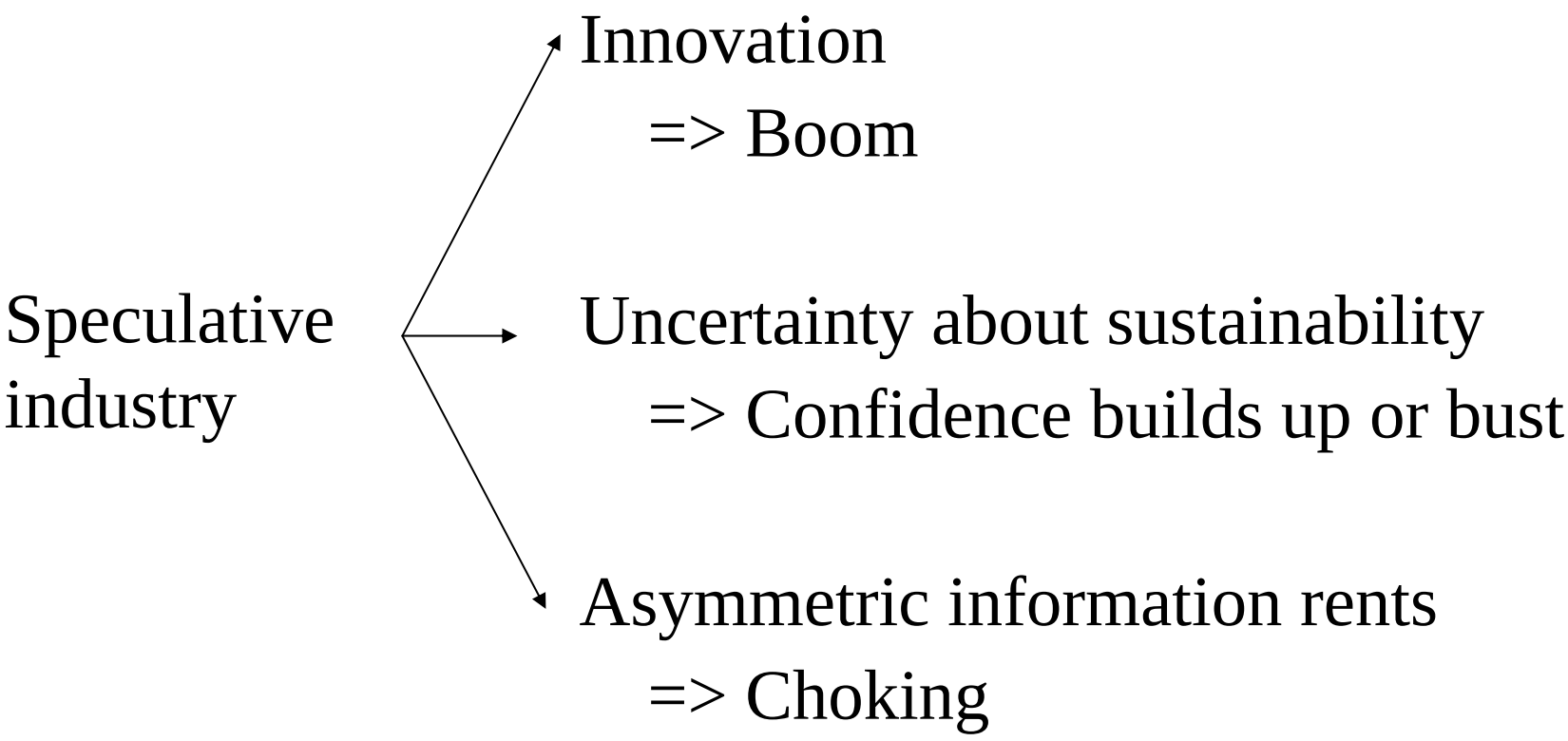
Choking

During boom, as money at stake increases, information asymmetry problems magnified, agency rents increase.

If rents grow faster than value creation, agents take an increasing share of the return, less & less left for investors (e.g.: fees collected by active fund managers absorb large part of excess returns.)

=> Investors discouraged from investing in speculative sector, which shrinks.

Goal of the paper



Model speculative industry, such as, e.g, new financial innovations in 2000s to analyze booms, busts & choking.

Literature

We build from a standard model of moral hazard and its equilibrium consequences (in line with Holmstrom Tirole 1997 & Shapiro Stiglitz 1984).

Our work is related to Santomero & Seater (1999), Philippon (2007), who also build from Holmstrom Tirole.

In their models, financial sector, immune from agency problems, helps mitigating agency problems arising in other sectors.

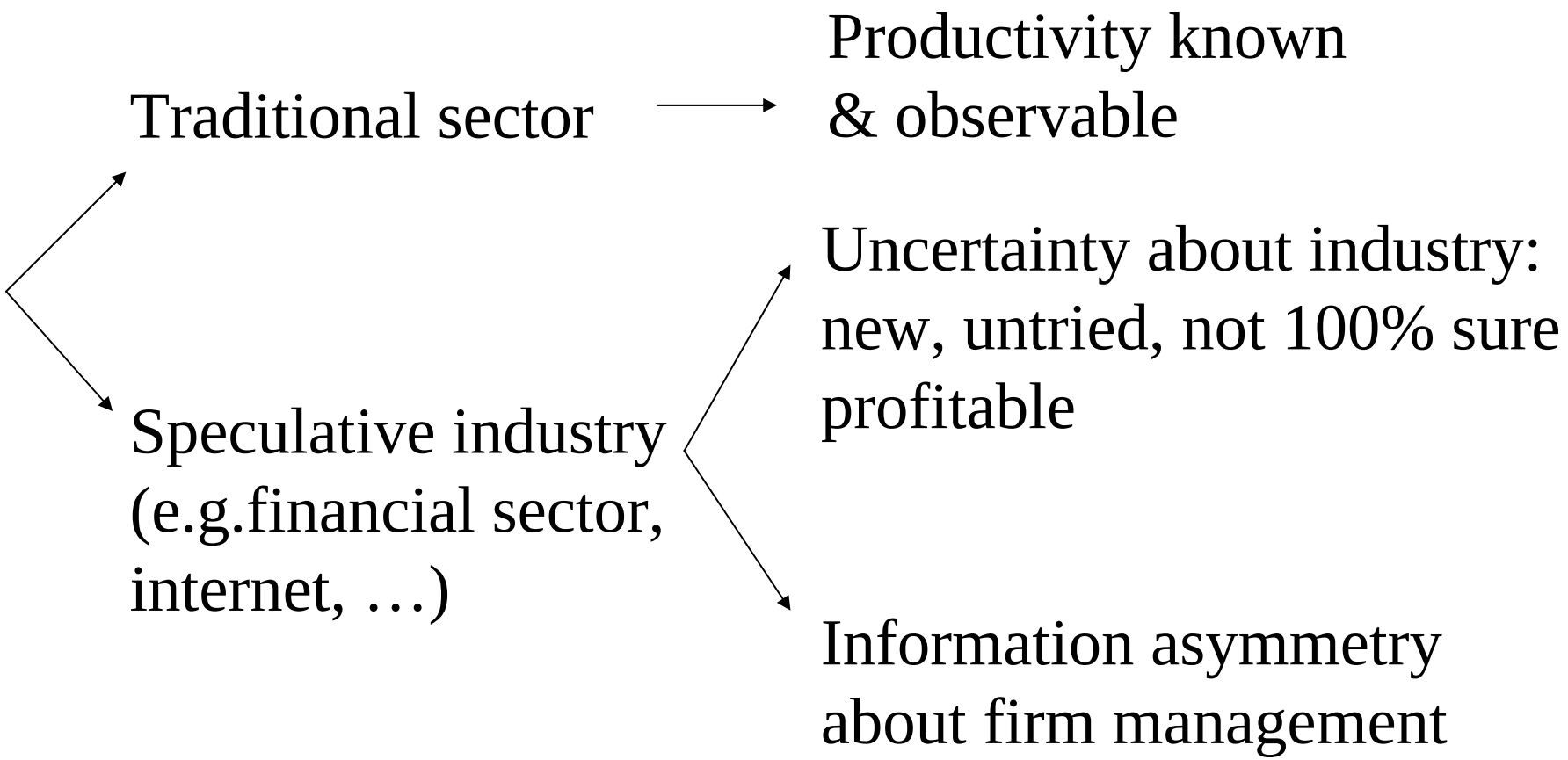
In contrast we focus on agency problems in the financial sector.

The other ingredient we add is Uncertainty/learning which => boom, bust & choking dynamics.

Model

Two-sector economy

Infinite horizon: t=1, 2, 3, … Each period: unit endowment, invested in:



Managers & investors

Mass 1 continuum of investors each endowed with 1 unit:

return opportunity in traditional sector: ρ_i in $[1,\rho]$

CDF of investors' types: $F(\rho_i)$

Mass 1 continuum of managers:

productivity in traditional sector: ν_i in $[0,\nu]$

CDF of managers' types: $G(\nu_i)$

Managers and investors risk neutral & competitive. For simplicity, live only 1 period (extension to 2 periods).

If they work in the traditional sector, they obtain their reservation utility: ρ_i or ν_i.

Allocation of inputs to sectors

To operate one project in speculative sector you need 1 unit of capital **and** 1 manager

Endogenous sharing of value created by these complementary inputs.

Managers & investors decide endogenously whether to operate in traditional sector or speculative sector.

Determinants of success in new sector

Managers must exert effort to ensure that innovative enterprise successful:

- Internet boom: focus on value creation and profitability, abstain from more exciting but less profitable aspects…
- Credit boom: make efforts necessary to check riskiness of loans, reliability of legal & financial engineering, …

Technological innovation has to be fundamentally sound & reliable (we are not 100% sure yet):

- Internet boom: Will customer switch to internet shopping? Are logistics reliable?
- Credit boom: Are CDOs & securitization reliably reducing risk exposure?

Technology

Manager can exert effort or not.

Industry can be hit by shock or not.

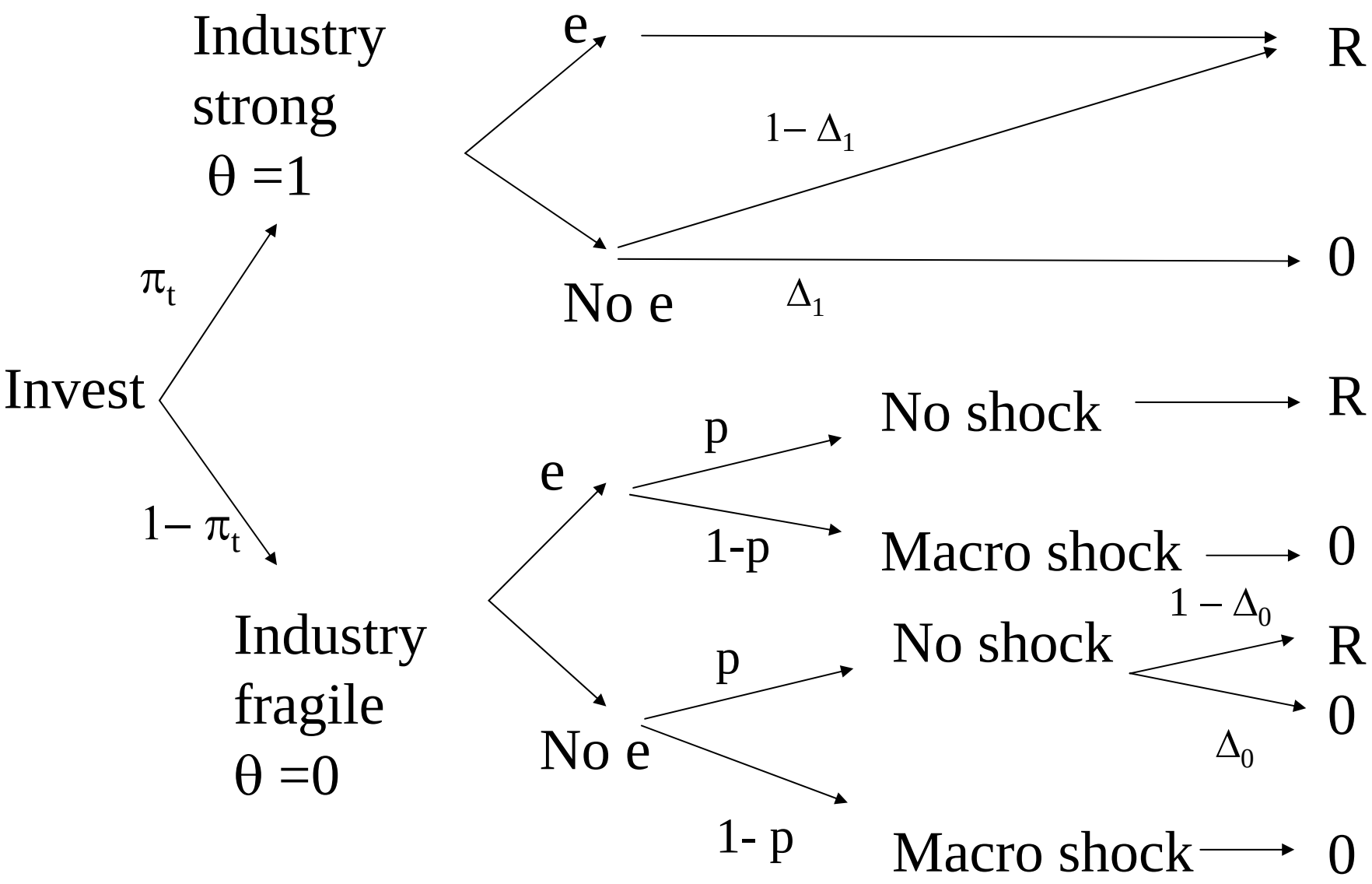
Industry can be strong or fragile.

If industry strong, project always succeeds if effort.

If industry fragile, project always fail if shock.

If manager shirks, project fails, with probability Δ_1 if industry strong, Δ_0 if industry fragile: $\Delta_1 < \Delta_0$.

Returns


Industry
strong
θ =1
e
R
1– Δ1
0
No e
Δ1
πt
Invest
1– πt
Industry
fragile
θ =0
e
p
No shock
R
1-p
Macro shock
0
No e
p
No shock
1 – Δ0
R
0
Δ0
1- p
Macro shock
0

Effort

If manager exerts effort, expected output = $E_t[\ p(\theta)\ ]\ R$

If manager does not exert effort:

private benefit from shirking = B

expected output = $E_t\ [\ p(\theta)(1 - \Delta(\theta))\ ]\ R + B$

expectation taken with respect to θ given info at time t

Effort socially optimal: $E_t[\ p(\theta)\ \Delta(\theta)\ ]\ R > B$

Value < 0 if no effort: $E_t[\ p(\theta)\ (1- \Delta(\theta))\ ]\ R + B < 1.$

Shirking affects default risk more when industry fragile:

$\Delta_1 < p\ \Delta_0.$

Equilibrium when effort is observable

Equilibrium conditions

Expected output | effort: $S_t = E_t [p(\theta)] R$

Shared between manager: M_t & investor: $S_t - M_t$.

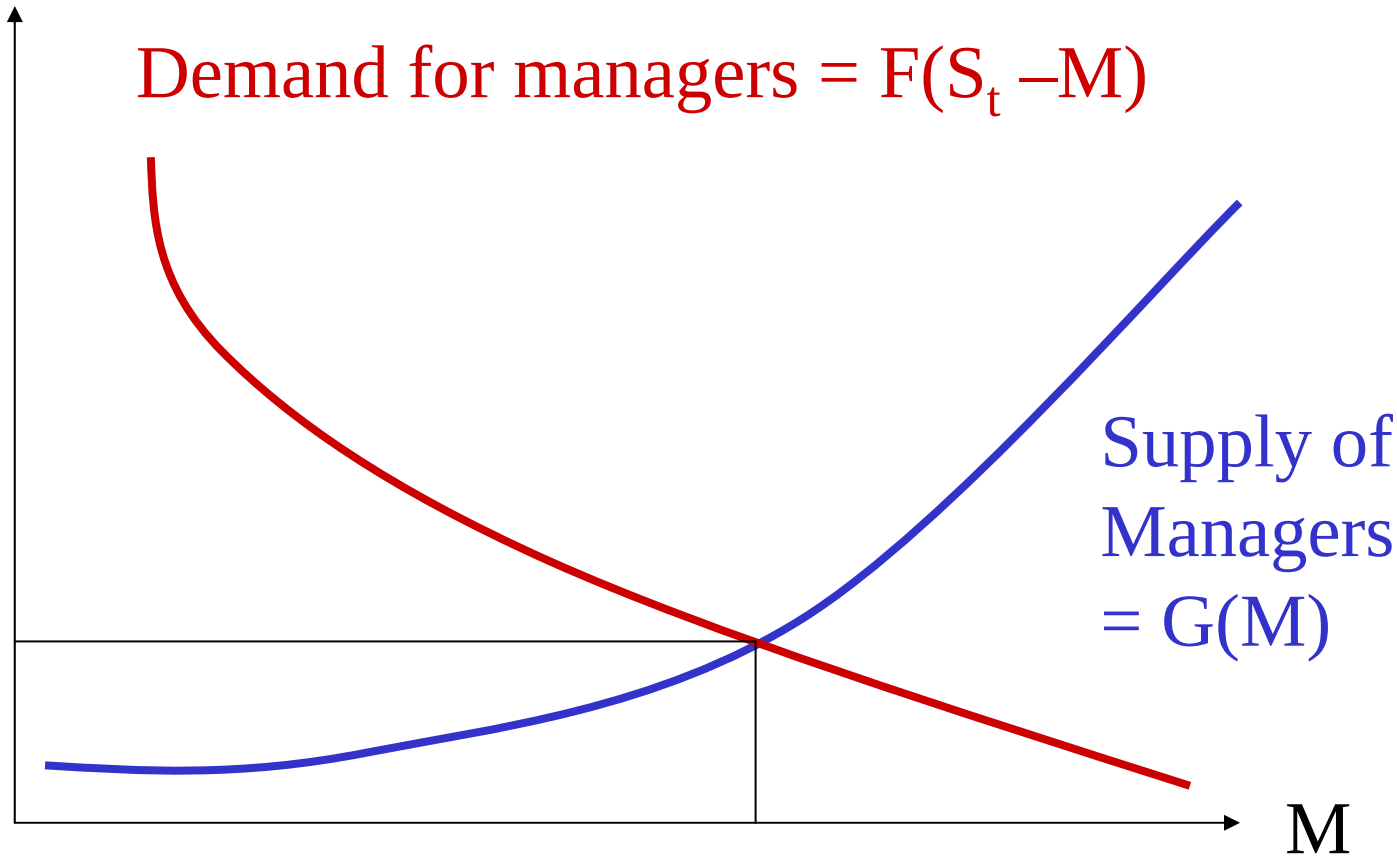
Managers $\nu < M_t$ prefer to operate in speculative sector:
=> Supply of managers: $G(M_t)$

Investors with $\rho < S_t - M_t$ invest in financial sector:
=> Supply of capital = demand for managers: $F(S_t - M_t)$

Market clearing: $G(M_t) = F(S_t - M_t)$ => holds for M_t^*

Pins down marginal manager's type = M_t^*

Competitive equilibrium



Size of speculative sector: $G(M_t^*) = F(S_t - M_t^*)$

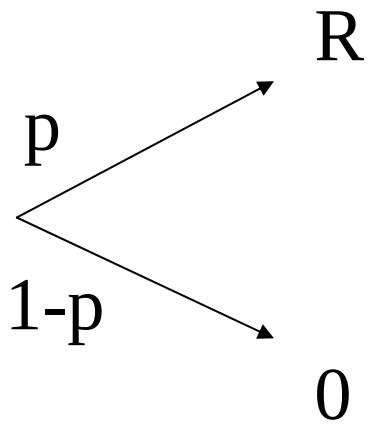
Equilibrium managerial Compensation: M_t^*

Learning

Non-overlapping generations. Link between periods = learning. Bayesian agents observe past outcomes.

Managers exert effort. If project good, return = R.

If project not so good, return =



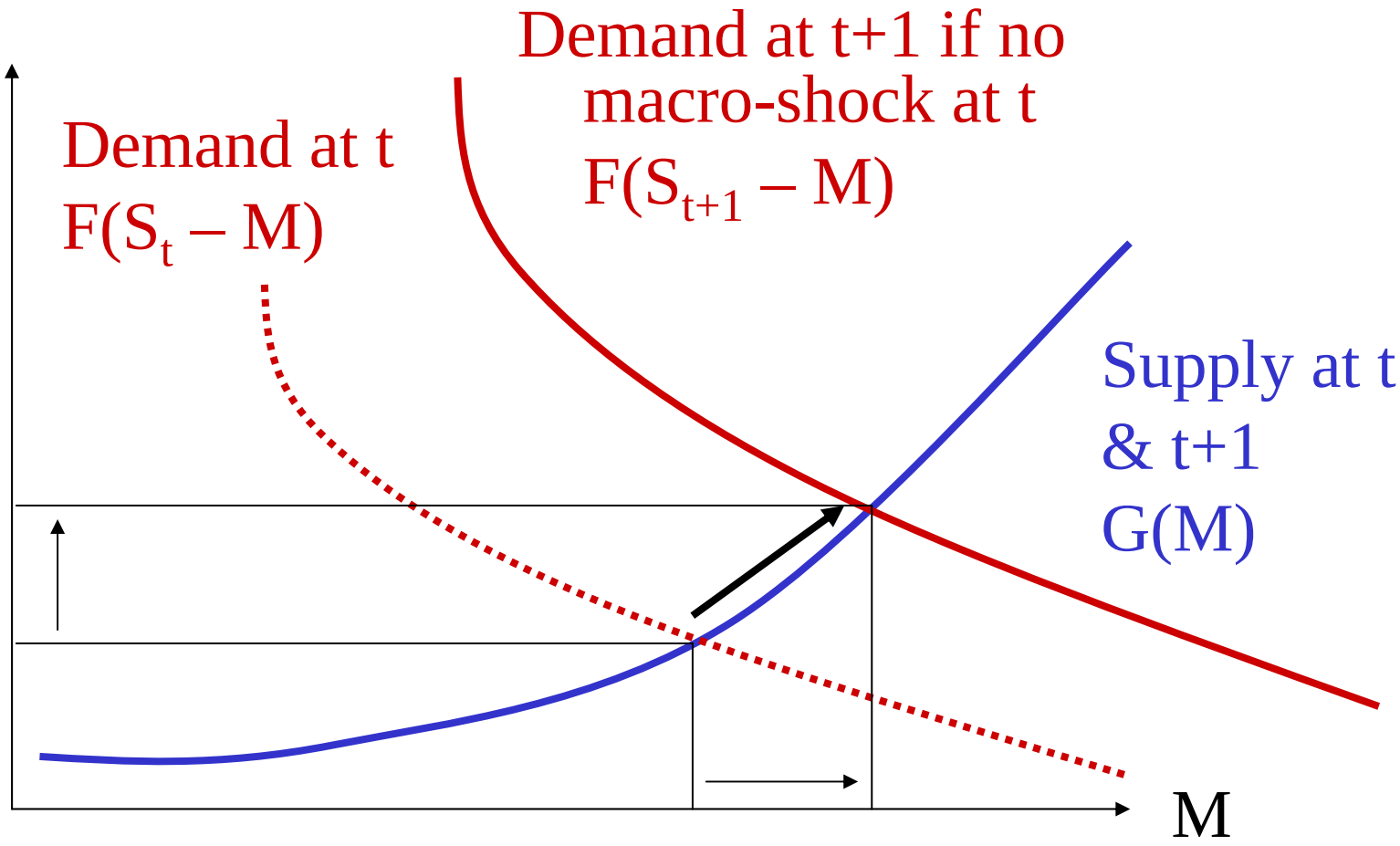
As long as return = R, increase belief that project is good

$$\pi_{t+1} = \pi_t / [\pi_t + p\,(1-\pi_t)] > \pi_t$$

$S_t = E_t(p(\theta))\,R = (\pi_t + (1-\pi_t)\,p)\,R$ goes up.

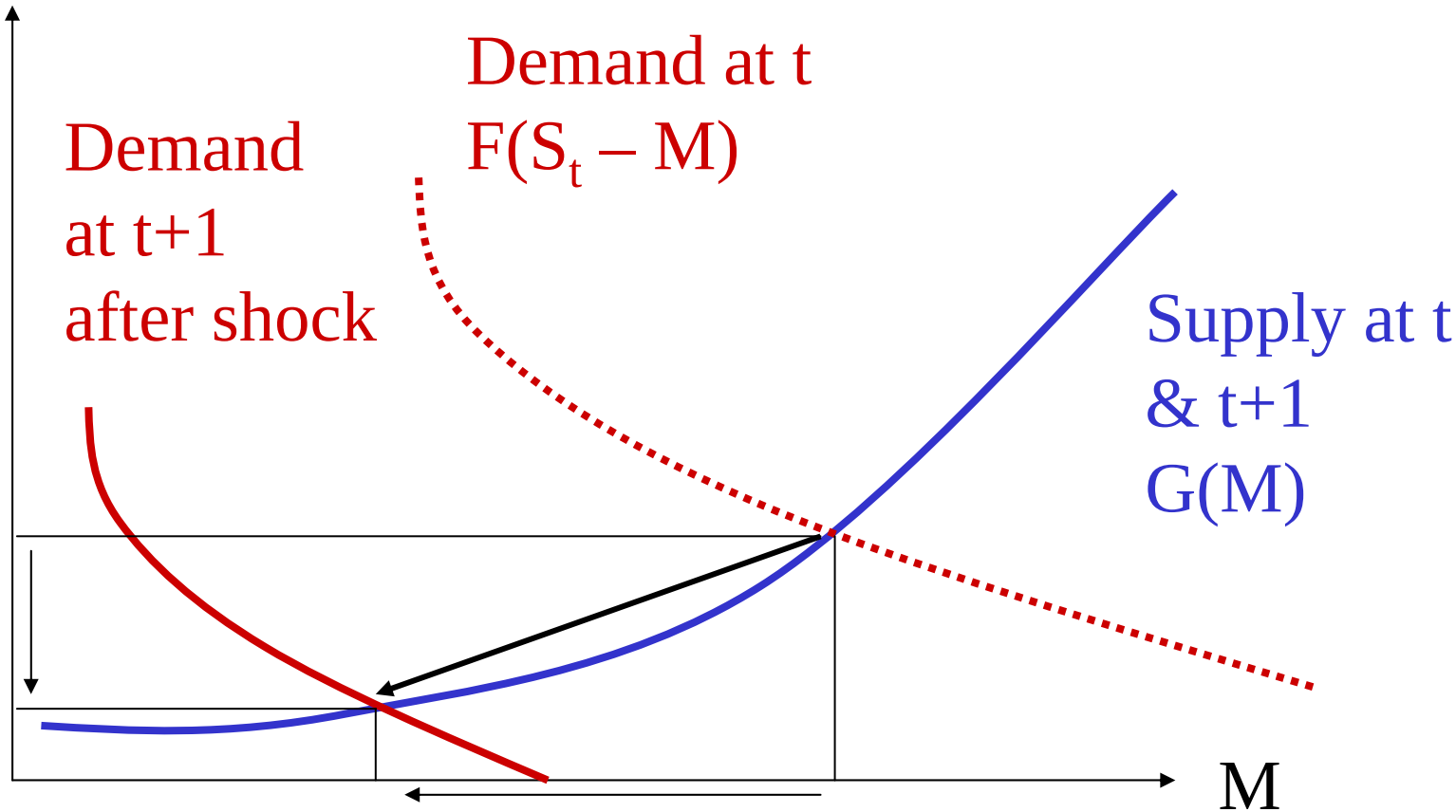
If return = 0, $\theta=0$ common knowledge, $\pi_t = 0$, $E_t(p(\theta)) = p$.

Dynamics when there is no shock



Managerial compensation also goes up

Dynamics after shock



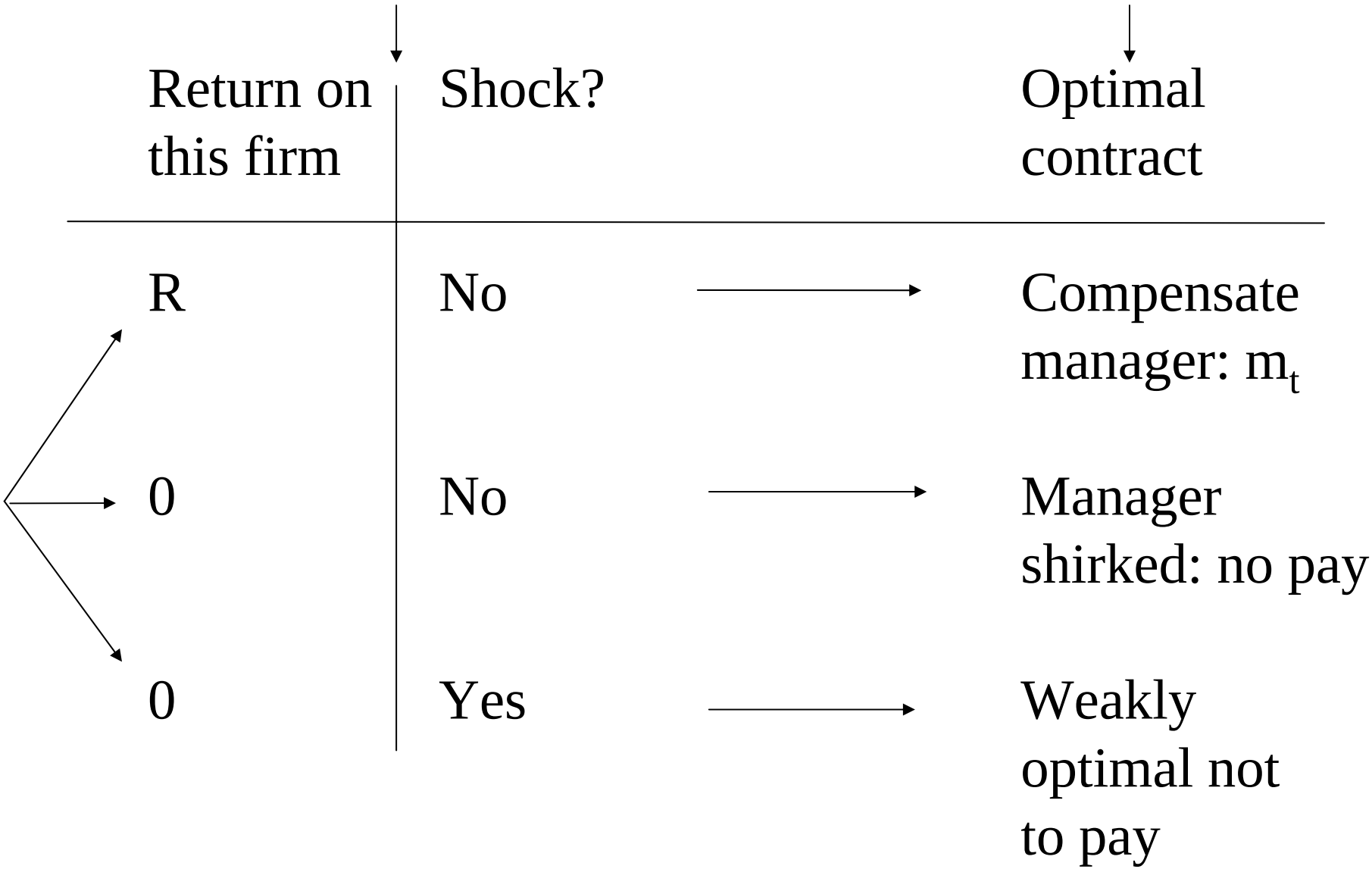
Sector shrinks

Managerial comp. drops

Equilibrium when effort is not observable

Contract

Maps observable variables into managerial compensation



Incentive compatibility condition

Expected utility of manager if works:

$$E_t [\, p(\theta) \,]\, m_t$$

Greater than expected utility if shirks:

$$E_t [\, p(\theta)\,(1 - \Delta(\theta)) \,]\, m_t + B$$

$\Rightarrow$ expected managerial compensation $>$ rent:

$$M_t \geq B\, E_t [\, p(\theta) \,] / E_t [\, p(\theta)\, \Delta(\theta) \,]$$

Pledgeable income

Maximum that can be promised to investors

$$P_t = S_t - B\,E_t[\,p(\theta)\,] / E_t[\,p(\theta)\,\Delta(\theta)\,]$$

Expected output

Rent

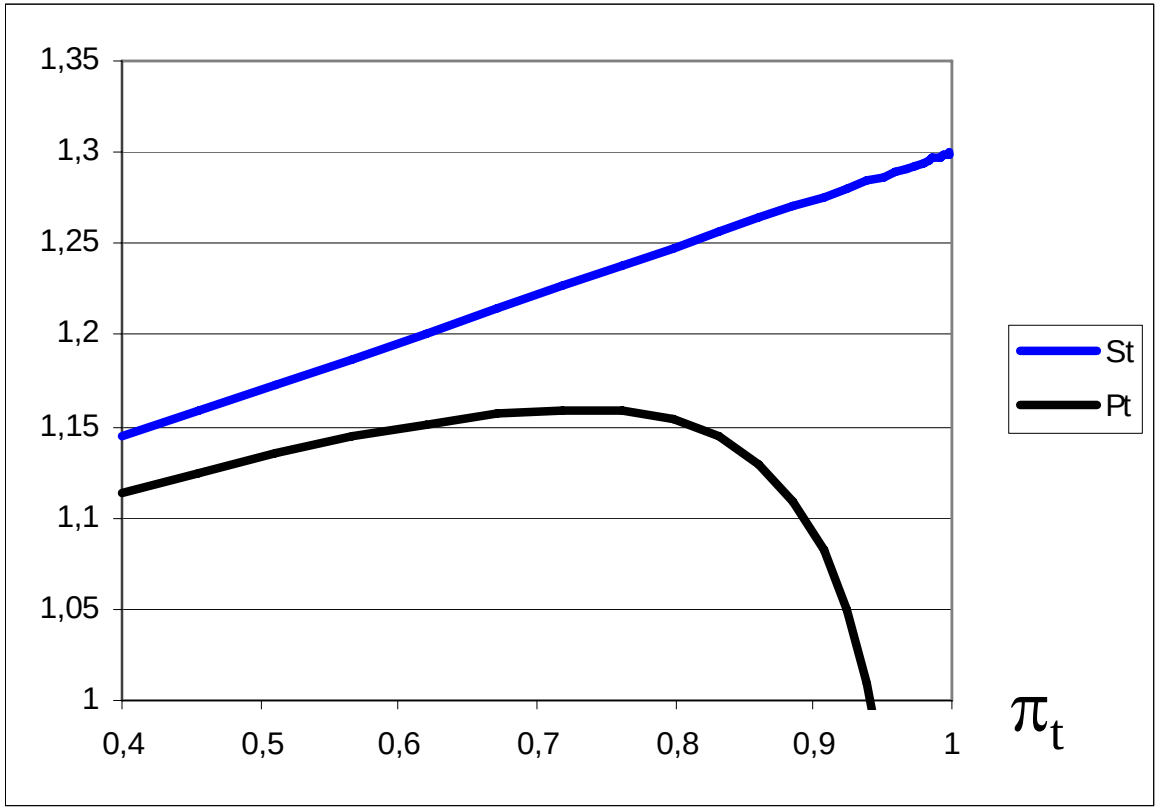
Investor can allocate funds to speculative industry if:

$$P_t \geq \rho$$

Pledgeable income

Opportunity cost

Pledgeable income dynamics



P_t = expected output – rents. Output goes up with π_t.

$\Delta_1 < p\,\Delta_0$ => moral hazard more severe for $\theta=1$ than $\theta=0$:

=> rents also increase with π_t

When increase in rents > increase in output: P_t goes down.

Equilibrium conditions with moral hazard

Supply of managers = $G(M_t)$

Supply of capital = demand for managers = $F(S_t - M_t)$

Market clearing? $G(M_t) = F(S_t - M_t) \Rightarrow M_t^*$

Yes, if M_t^* is consistent with IC & PC, that is if:

$$M_t^* \geq Rent_t$$

Unconstrained market clearing compensation

large enough to incentivize

Then size of sector = $G(M_t^*)$, // when effort observable

Rationing with moral hazard

If $M_t^* < Rent_t$:

S_t → Rent => Manager

S_t → S_t – Rent = P_t => Investor

$F(P_t) < G(Rent_t)$

$F(P_t)$: Supply of capital = Demand for managers

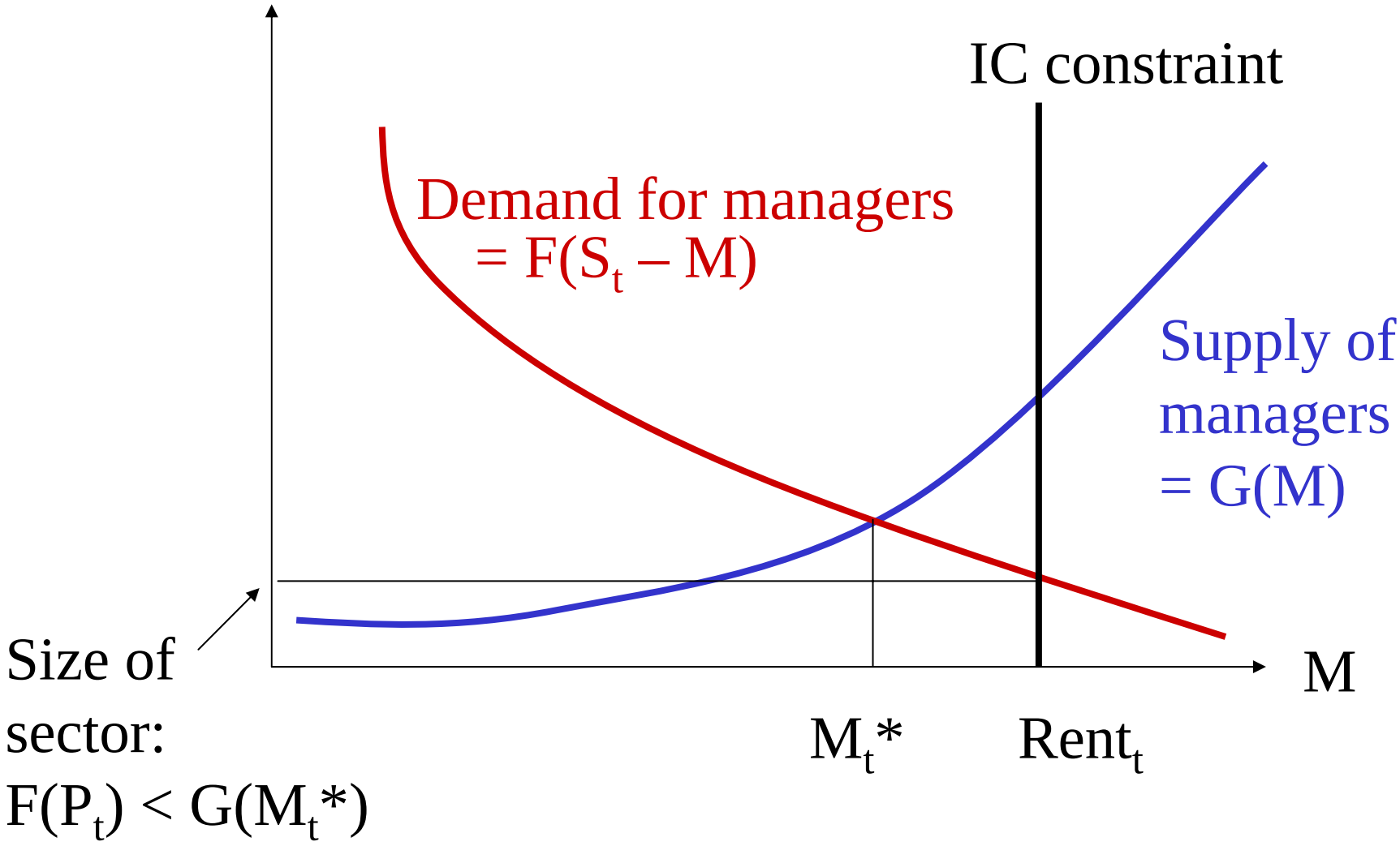
$G(Rent_t)$: Mass of managers who want to work in speculative industry

Some managers would like to earn large rents but can't.

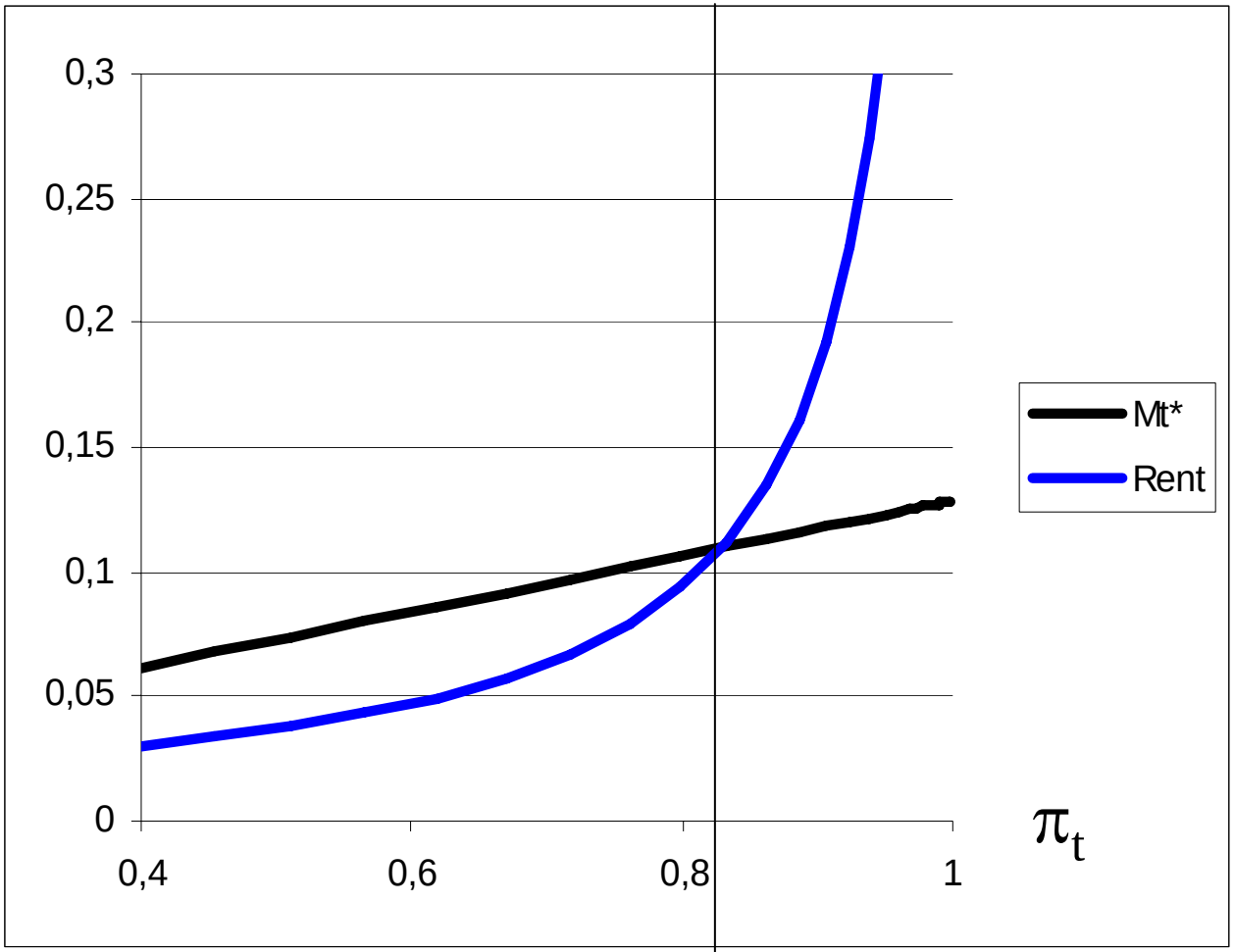
Investors not eager to hire them at high rates

// efficiency wage, Shapiro Stiglitz 1984

Competitive equilibrium with rationing



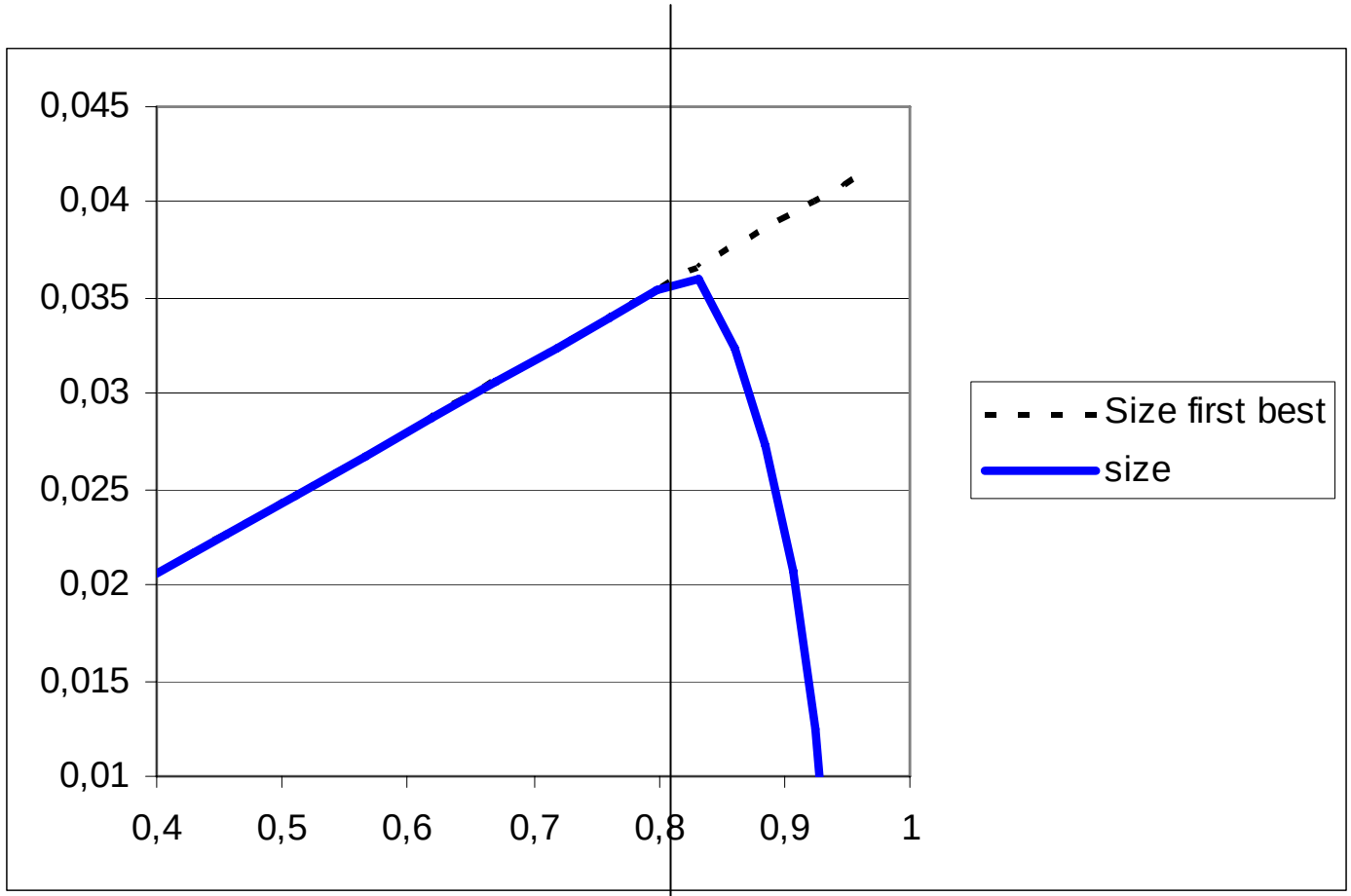
Dynamics of rents & compensation



As without moral hazard
Manager comp = M_t*

IC constraint binds
Manager comp = rent

Size dynamics



As without moral hazard

IC constraint binds

Boom & choking

Two phases (as long as no bad news):

1) Boom: Expected output goes up => managerial compensation (M_t^*) & sector size ($G(M_t^*)$) go up.

2) Choking:

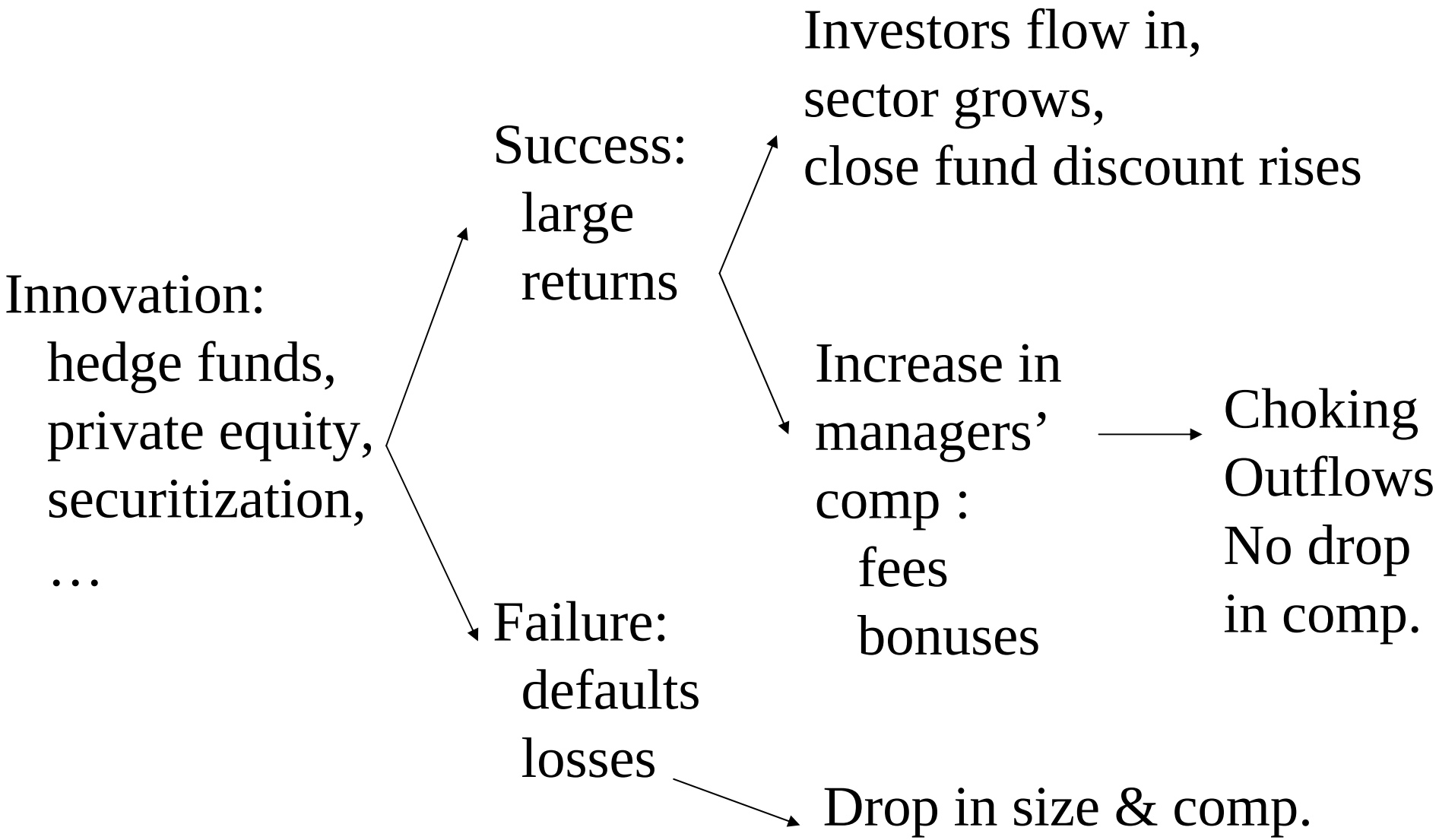
   Rents go up faster than value creation. At some point rents > market clearing compensation.

   Information constraints bind: investor compensation = pledgeable income.

   As pledgeable income declines with π_t sector size goes down.

Implications

Empirical implications for financial sector dynamics



What can be done?

Government/regulator imposed cap on managerial compensation would not help: undermines incentives.

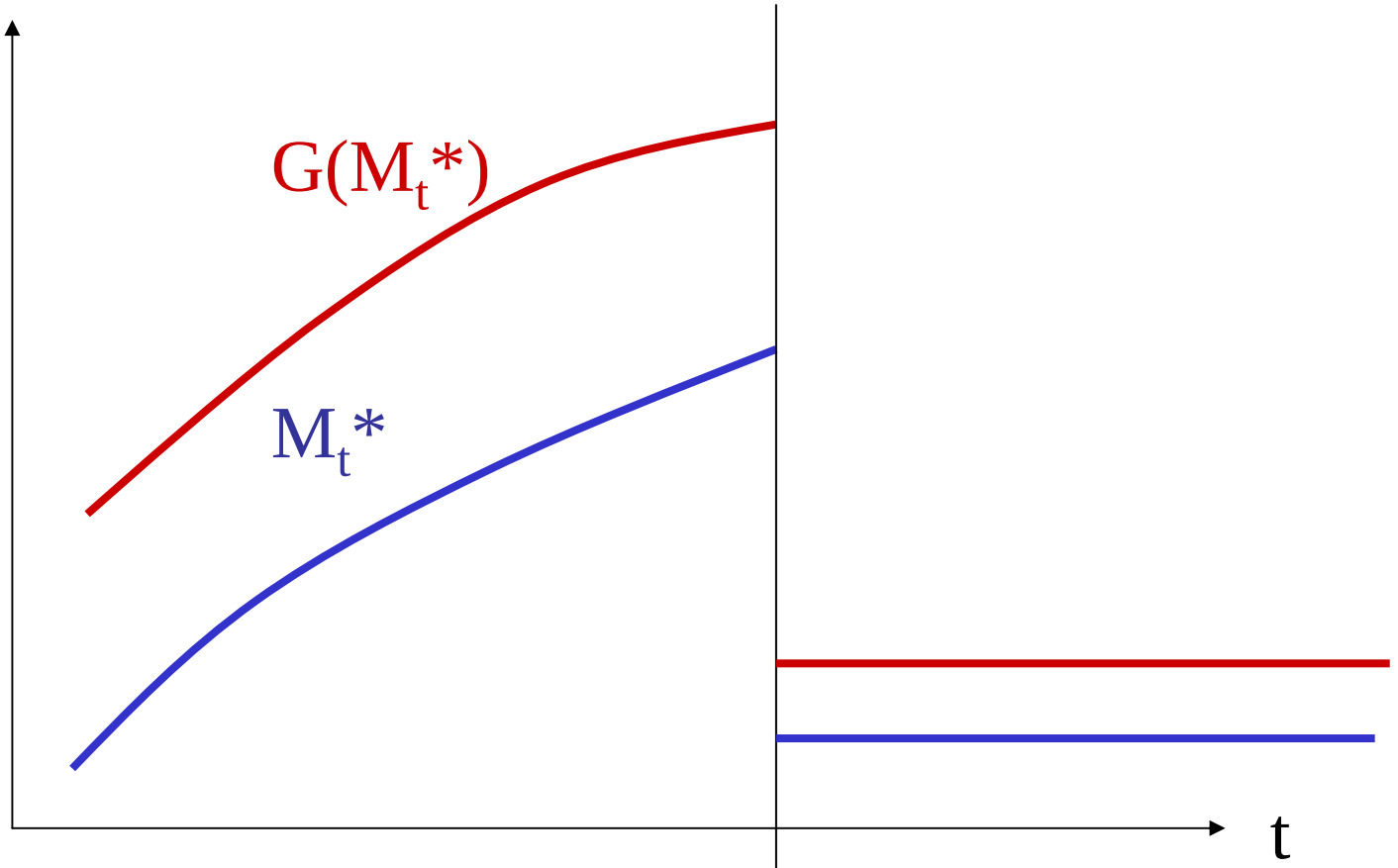
Long term compensation: If managers paid with N>1 period contracts => lower agency rents => less choking.

Transparency & disclosure: Problem due to asymmetric information => disclosure about actions & potential private benefits => lower rents.

Coinvesting: If agents invest their own capital => limited liability relaxed => lower rents => less choking.

Additional material

Dynamics when effort observable



As long as return is R speculative sector grows along with manager. comp.

As soon as return = 0 sector size & wages drop & remain low

Summary

Model dynamics of innovative sector (internet in 1990s, financial innovations in 2000s).

Innovation => Boom.

As long as there is no bad news, sector grows.
Managerial compensation also grows // agency rents.

If bad news (defaults on loans & propagation of crisis), sector size and compensation drop.

Without bad news: rents grow faster than value creation, less & less left for investors, choking.

Feasibility

Participation constraint of investor: $S_t - M_t \geq \rho$

i.e., $S_t - \rho \geq M_t$

Net return to investor — Managerial compensation

Consistent with manager's incentive condition if:

$S_t - \rho \geq B\, E_t [\, p(\theta) \,] / E_t [\, p(\theta)\, \Delta(\theta) \,]$

Net return — Rent