Collateral Crises

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Motivation

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- How information production shapes business cycles and financial crises?
- Should policies induce transparency?

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  - **Costs:** "Fragility": Firms with good collateral suffer from small shocks and do not get loans that they otherwise would.

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- Larger "ignorance credit booms", larger crises. Endogenous tail events
- After crises, recoveries are faster if
  - Without expansionary policies, information is replenished.
  - With expansionary policies, information is NOT replenished.

Some lose evidence

- Jorda, Schurlarick, Taylor (2011) study 14 developed countries over 140 years (1870-2008)
  - "Our overall result is that credit growth emerges as the single best predictor of financial instability..."
- More recently...
  - Credit boom since 1990s and large credit drop in 2008.
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- More recently...
  - Credit boom since 1990s and large credit drop in 2008.
  - Small shock, sudden and large collapse.
- We test empirically our mechanism is at work behind these relations.

Related Literature

- Financial Intermediation.
  - **Reallocation of funds:** *Diamond (85), Boyd and Prescott (86).*
  - **Provision of trading securities:** *Diamond and Dybvig (83), Gorton and Pennacchi(90), Dang et al (11).*
- Macroeconomics and Crises
  - **Magnification and Persistence:** *Bernanke, Gertler and Gilchrist (96), Kiyotaki and Moore (97), Krishnamurthy (09)*
  - **Fragility:** *Diamond and Dybvig (83), Allen and Gale (04), Ordonez(10).*
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- We provide a theory of fragility, magnification, persistence and asymmetry of cycles, purely driven by information dynamics.

Goods, Information and Agents

- Two goods that can be used to consume or to produce.
  - Numeraire (K): Perishable and reproducible.
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    - Mass 1 of land. A fraction $\hat{p}$ is good.
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    - Whether a unit of land is good or bad can be observed at the beginning of the period at a cost γ (in terms of K) .

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- Two overlapping generations every period.
  - Households: Endowment of K and no projects. ("young")
  - Firms: Projects but not enough endowment of K. ("old")

Firms

- Mass 1 of risk neutral individuals ("old" generation).
- They born with L^* (no disutility), but no K.
- Production function of numeraire.

$$Y = \begin{cases} A\min\{K, L\} & \texttt{with prob. } q \\ 0 & \texttt{with prob. } (1-q) \end{cases}$$

- Production is efficient ($qA > 1$). Optimal $K^* = L^*$.

Households

- Mass 1 of risk-neutral individuals ("young" generation).
- They born with endowment of numeraire $\overline{K} > K^*$, but no L^*.
- They can lend K to firms and buy land X from firms.

Markets for land and loans

- **Land is traded at the end of the period**
  - If the buyer has all the negotiation power, the land price is pC.
- **Loans are traded at the beginning of the period.**
  - The output of firms is non-contractible.
  - Firms can post a fraction x of land as collateral.
  - Assume lenders break even and $C > K^*$.

Aggregate Consumption

- Consumption at period t of
  - A household lending to firm p and buying a land p.

$$\overline{K} - K(p) + E(repay|p) - pC$$

  - A firm with land p.

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- Aggregate consumption at period t is.

$$W_t = \overline{K} + \int_0^1 [E(Y|p) - K(p)]f(p)dp$$

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- First Best aggregate consumption.

$$W^* = \overline{K} + K^*(qA - 1)$$

Information Sensitive Debt

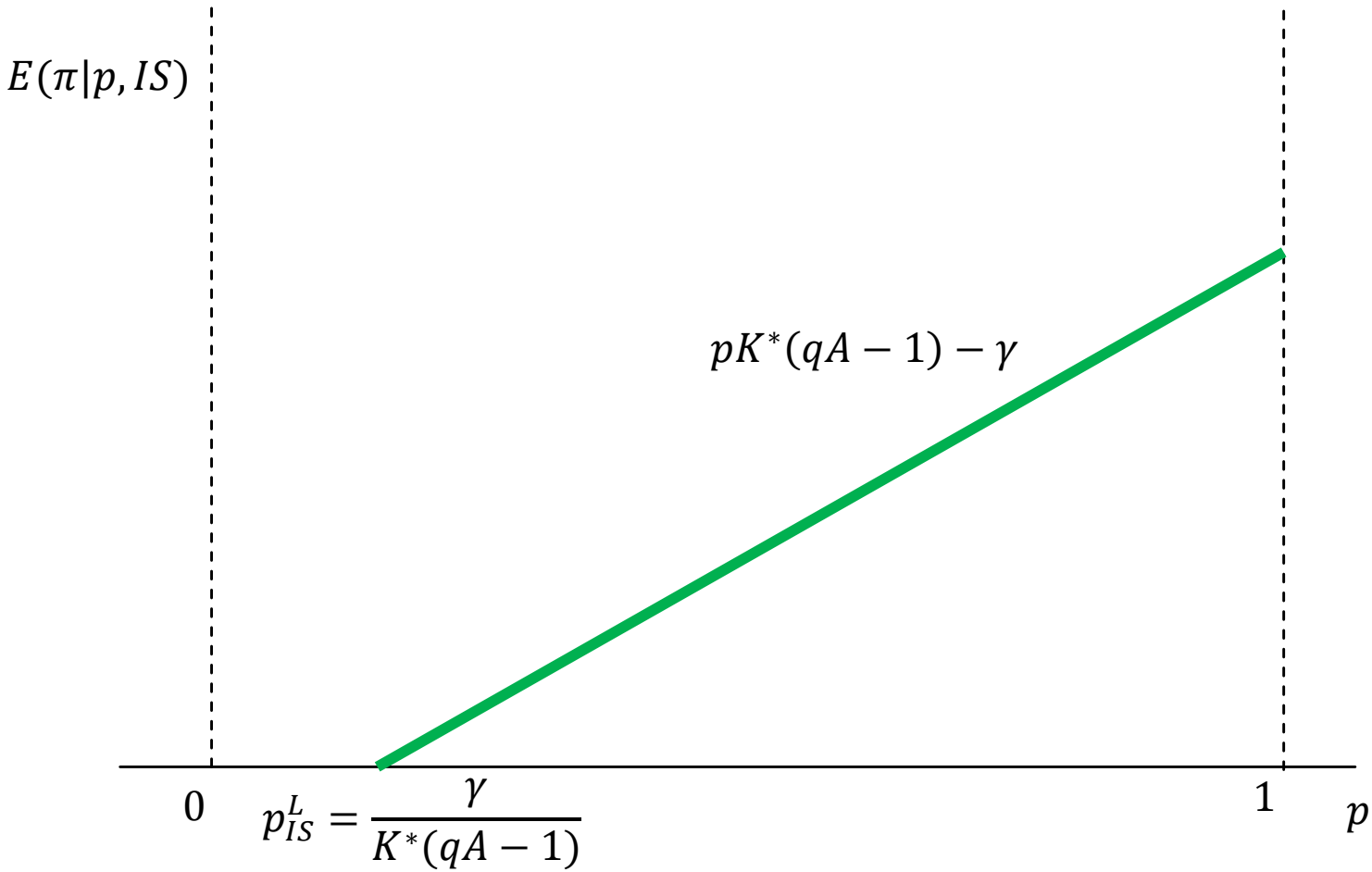
- Firms and lenders learn the true value of collateral.
- Lenders break even and debt is risk free

$$p(qR_{IS} + (1-q)xC) = \gamma + pK \qquad \text{and} \qquad R_{IS} = xC$$

Then

$$x = \frac{pK + \gamma}{pC}$$

Information Sensitive Debt - Profits



Information Insensitive Debt

- Nor Firms nor lenders know the true value of collateral.
- Lenders break even and debt is risk free

$$qR_{II} + (1-q)pxC = K \qquad \text{and} \qquad R_{II} = pxC$$

Then $x = \frac{K}{pC}$

- Loans do not trigger information acquisition if,

$$p[qR_{II} + (1-q)xC - K] \leq \gamma.$$

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$$K \leq \frac{\gamma}{(1-p)(1-q)}.$$

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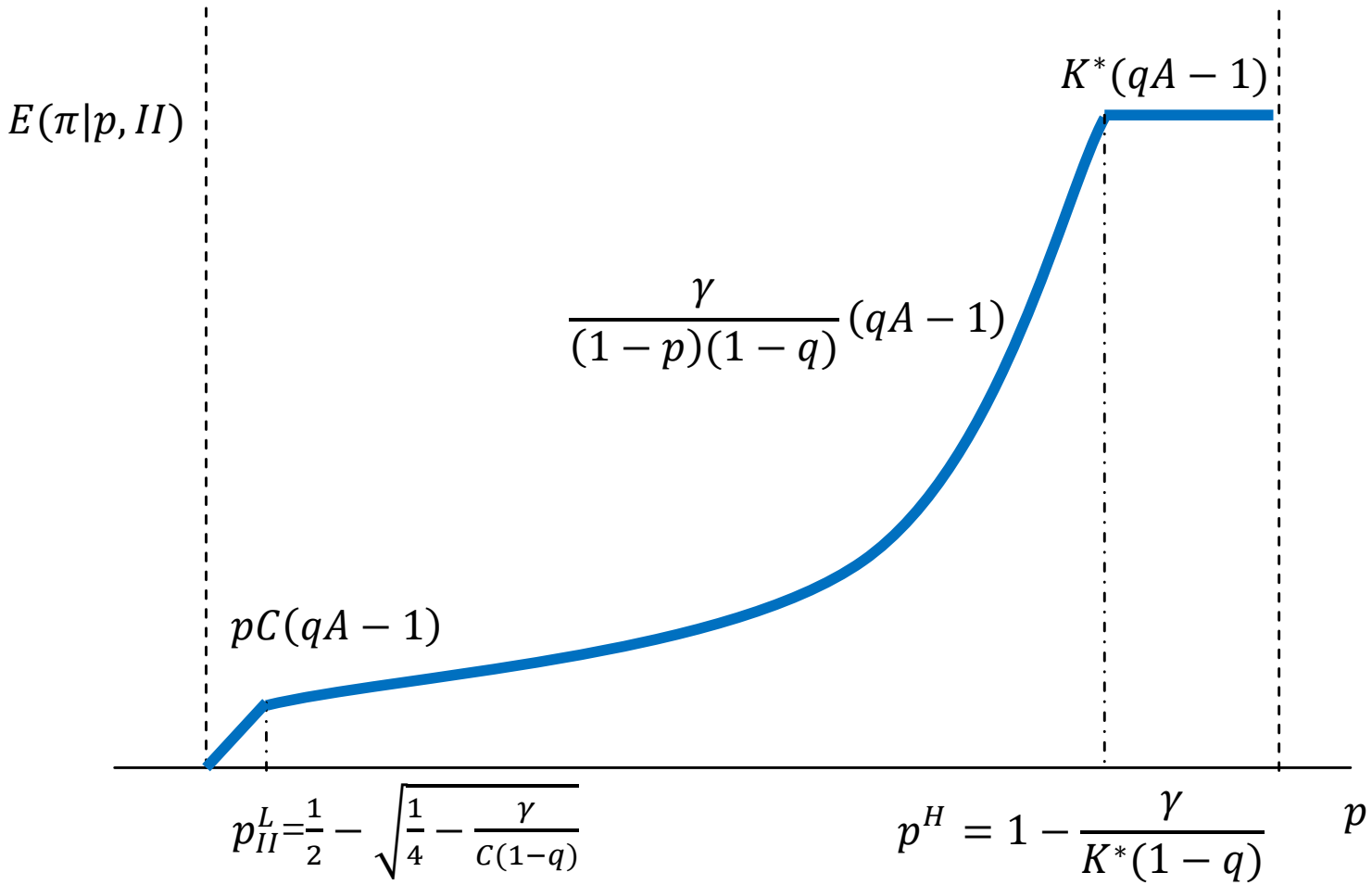

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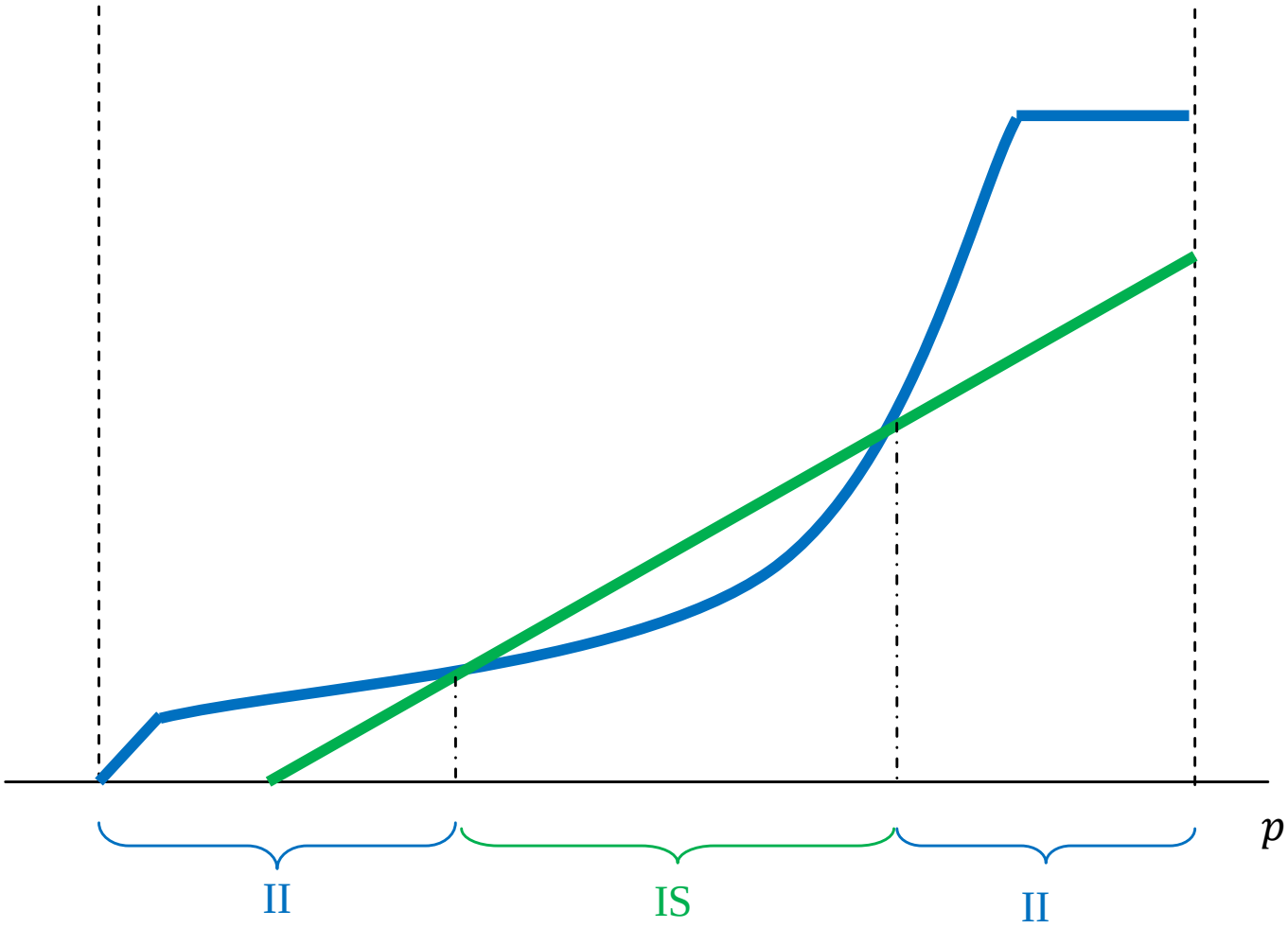
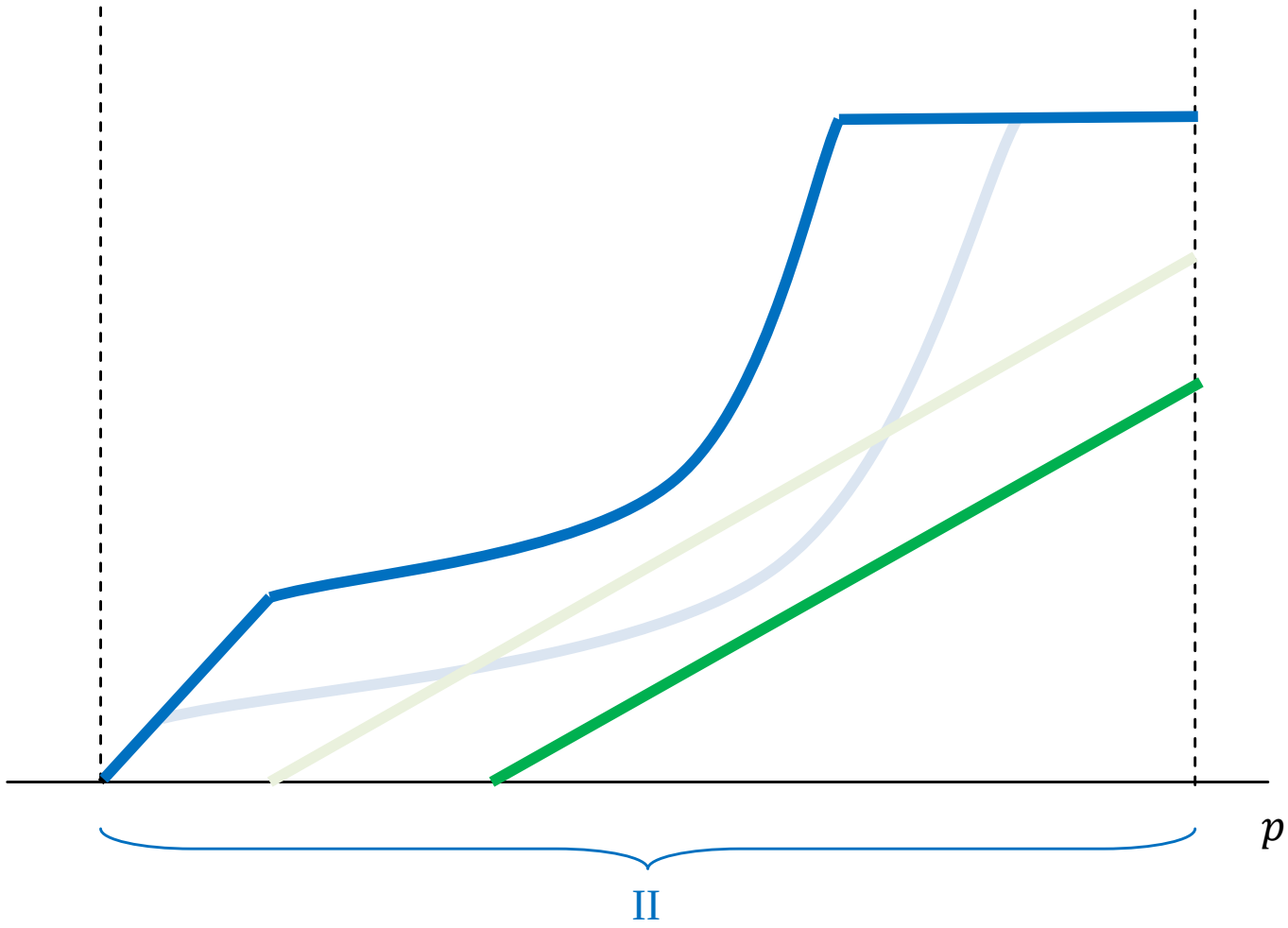
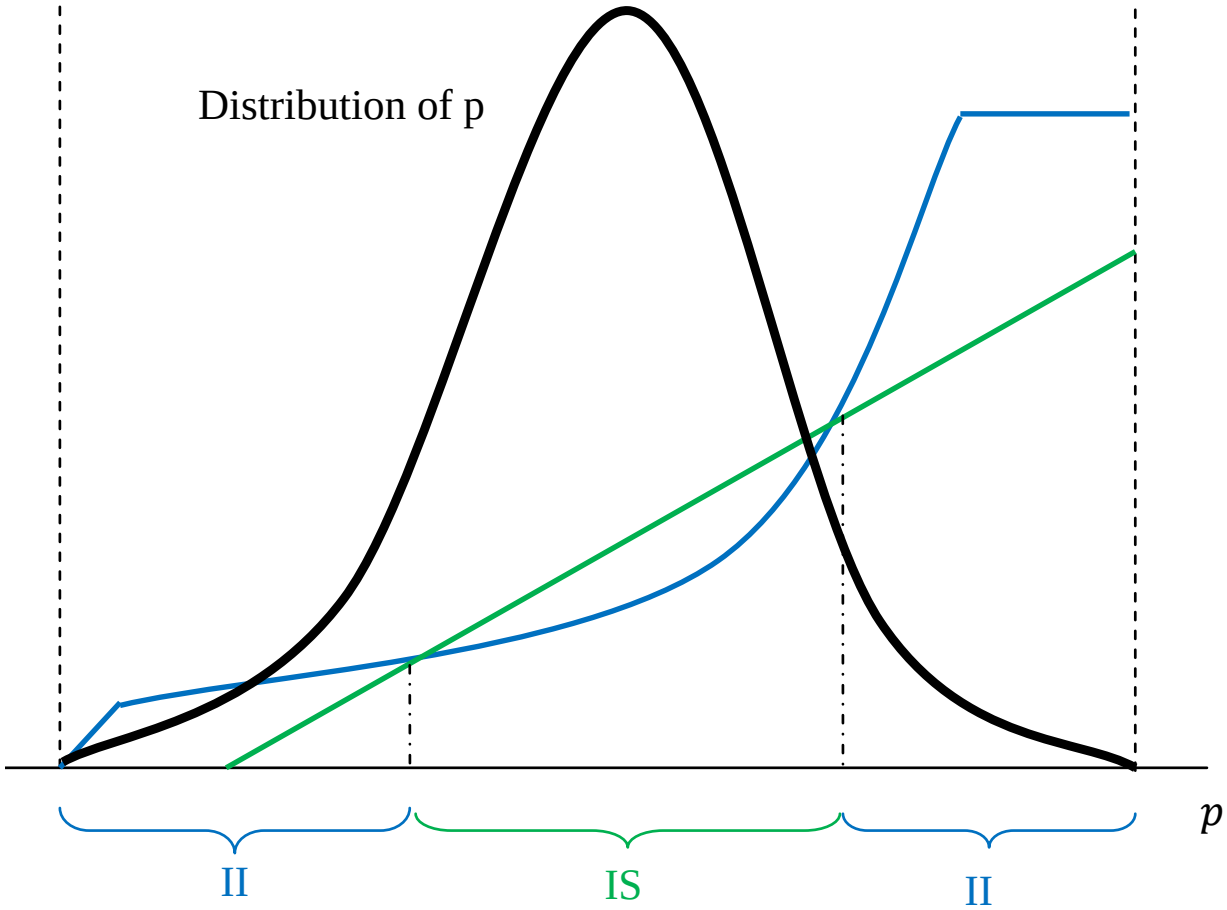


Higher γ implies less information production



Aggregate Consumption



$$W_t = \bar{K} + \int_0^1 K(p)(qA - 1)f(p)dp,$$

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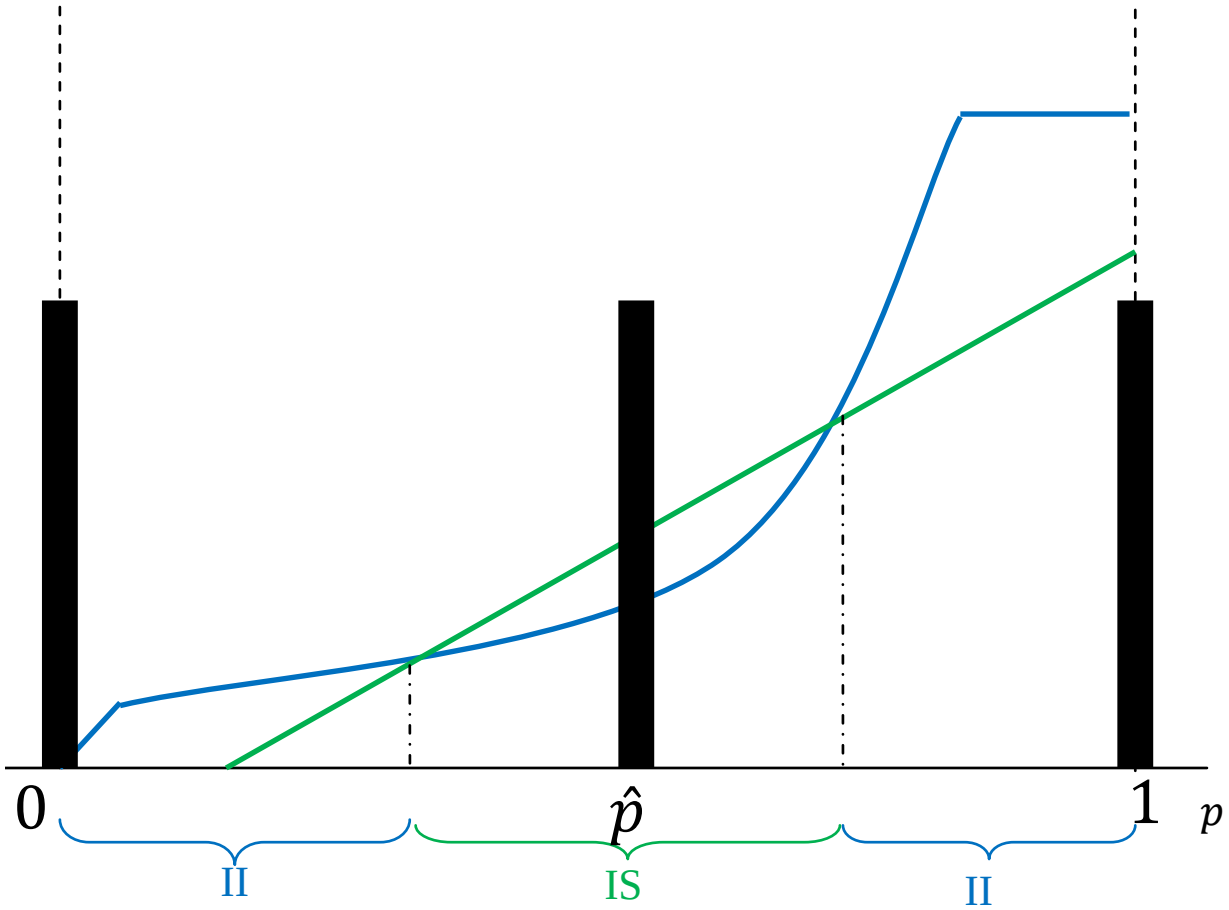
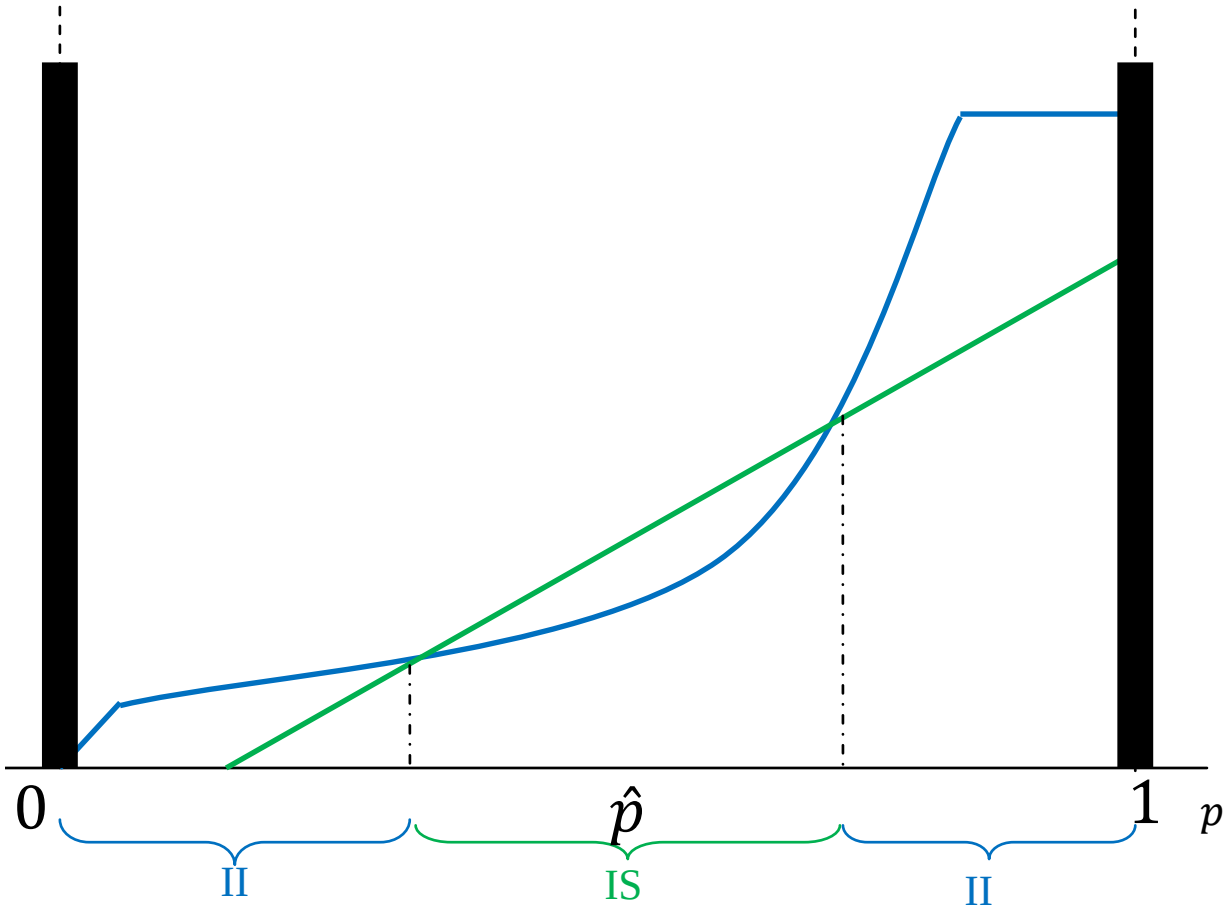
- The following analysis holds when types mean revert
- but let's simplify the exposition
  - Every period, a fraction $(1 - \lambda)$ of land suffers an idiosyncratic shock and becomes good with prob. $\hat{p}$.
  - The shock is observable. The realization is not.

Aggregate Consumption



$$W_t = \bar{K} + [0f(0) + K(\hat{p})f(\hat{p}) + K^* f(1)](qA - 1),$$

Aggregate Consumption - Information Sensitiveness



$$W_t^{IS} = \bar{K} + [(1-\lambda)K(\hat{p}) + \lambda\hat{p}K^*](qA-1)$$

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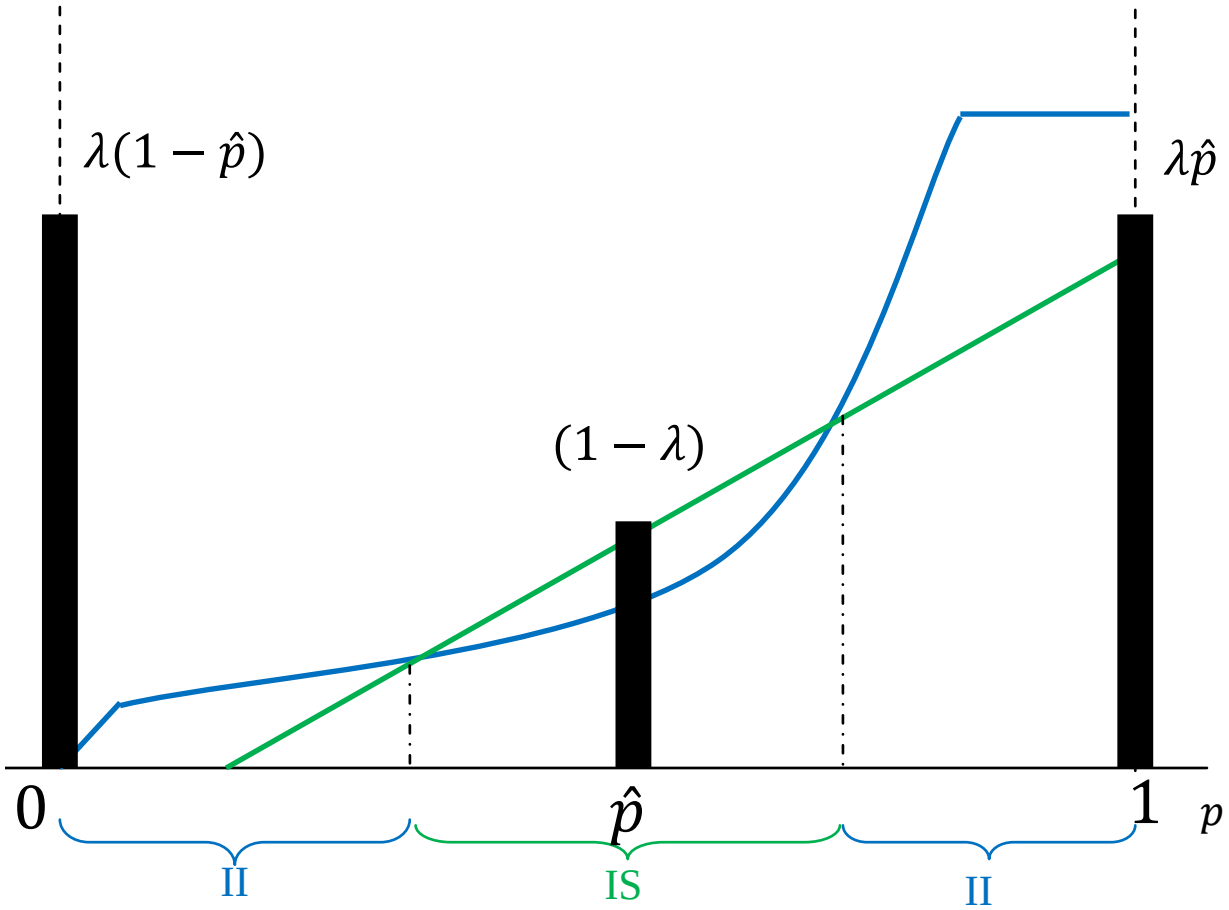
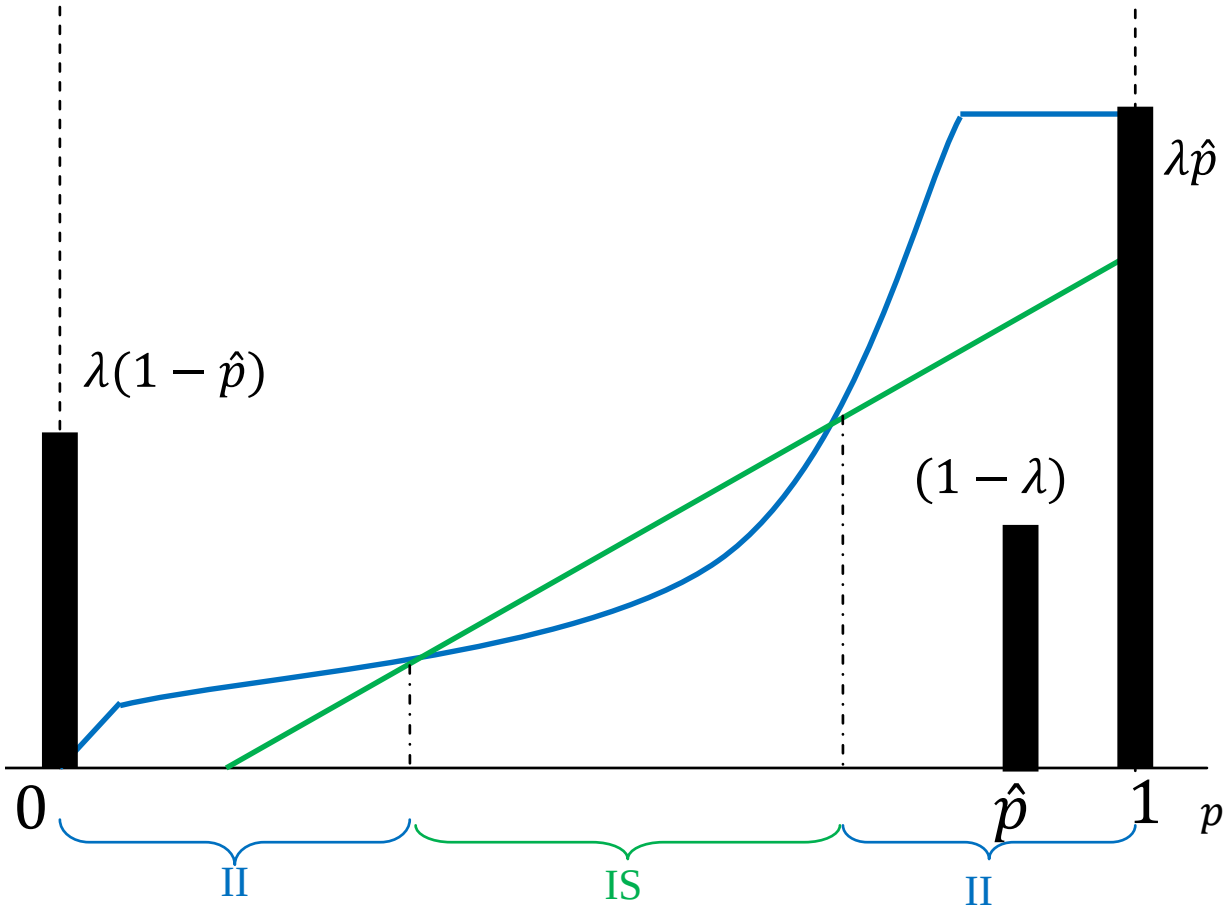


$$W_t^{IS} = \bar{K} + \hat{p}K^*(qA-1) - (1-\lambda)\gamma < W^*$$

Aggregate Consumption - Information Insensitiveness



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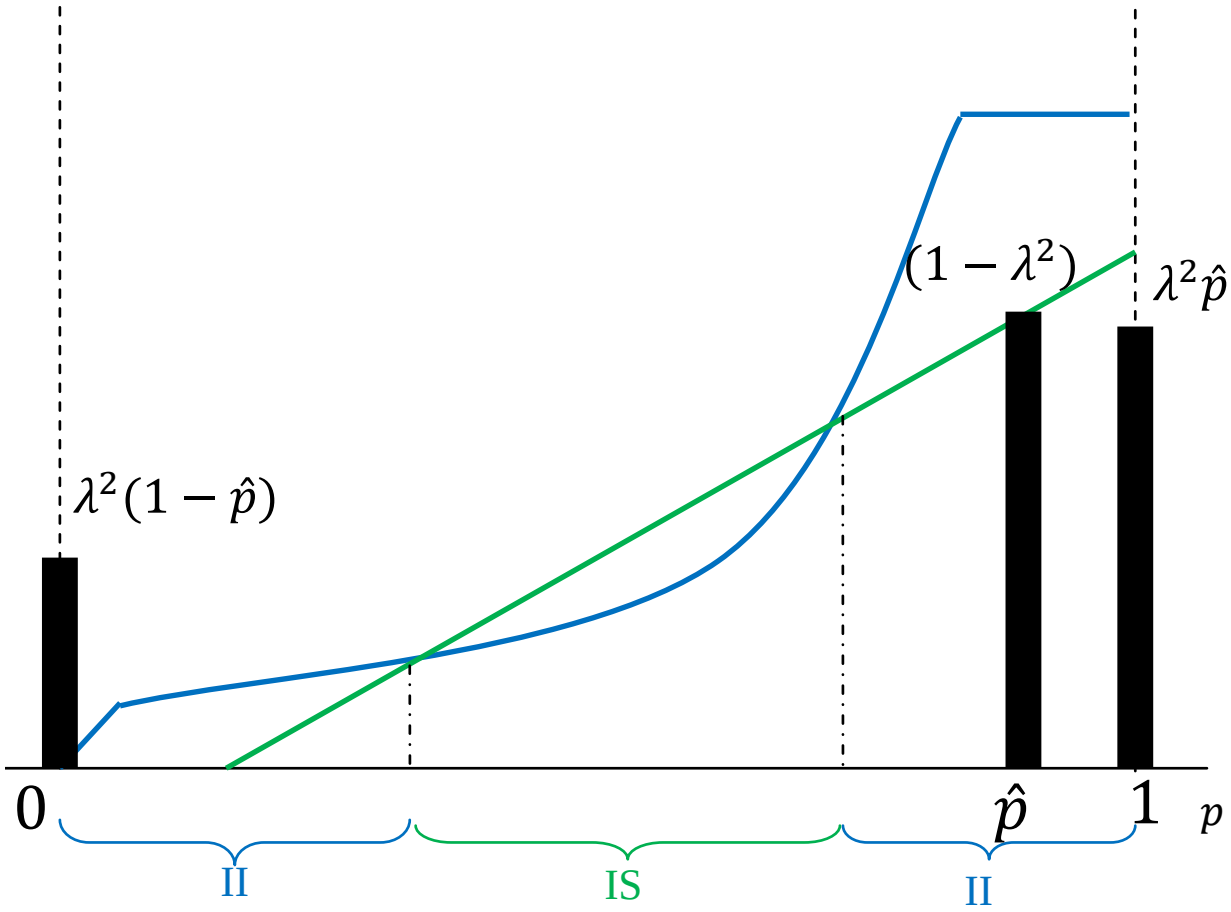

$$W_t^{II} = \bar{K} + \left[(1-\lambda^2)K(\hat{p}) + \lambda^2\hat{p}K^*\right](qA-1)$$

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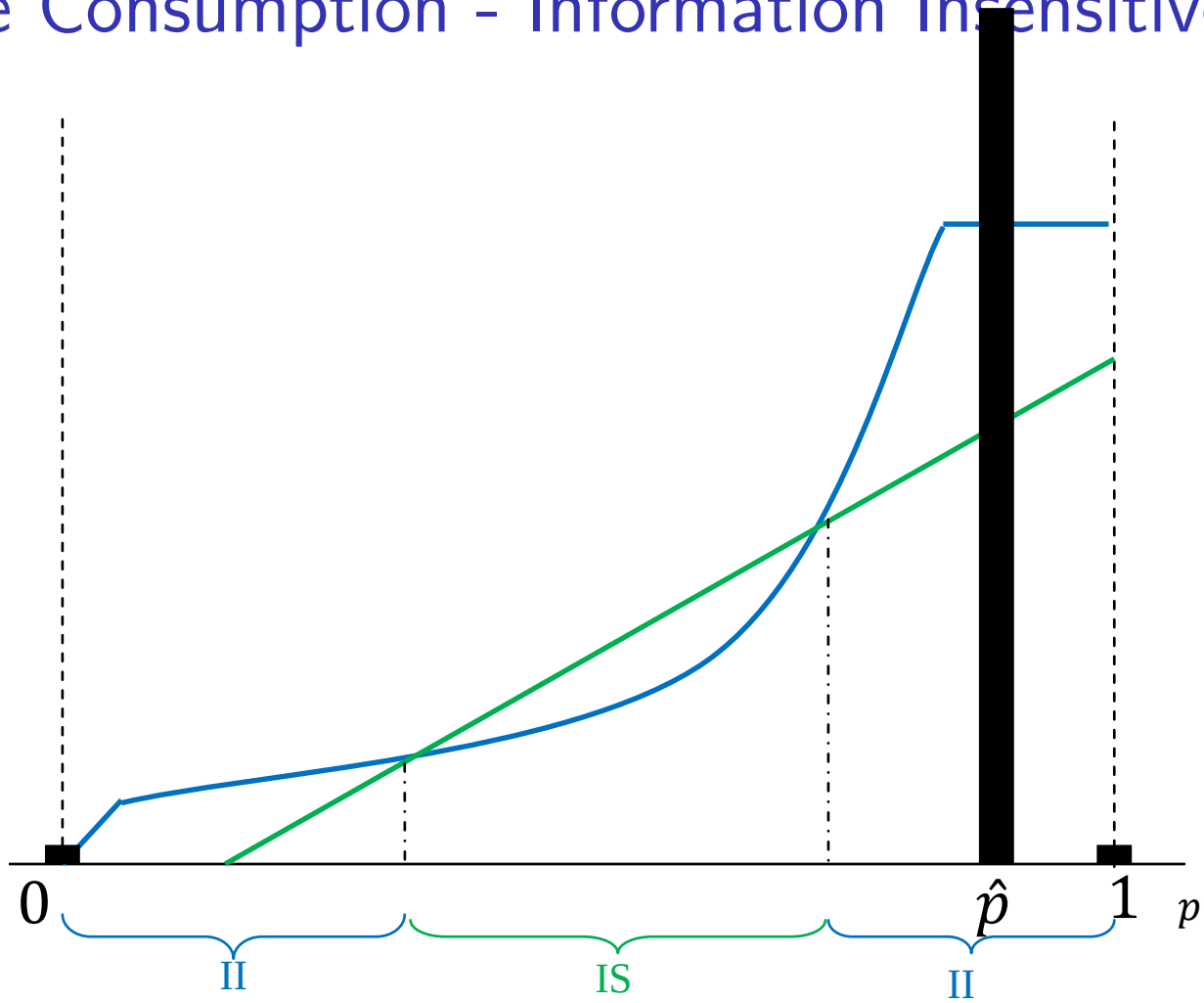
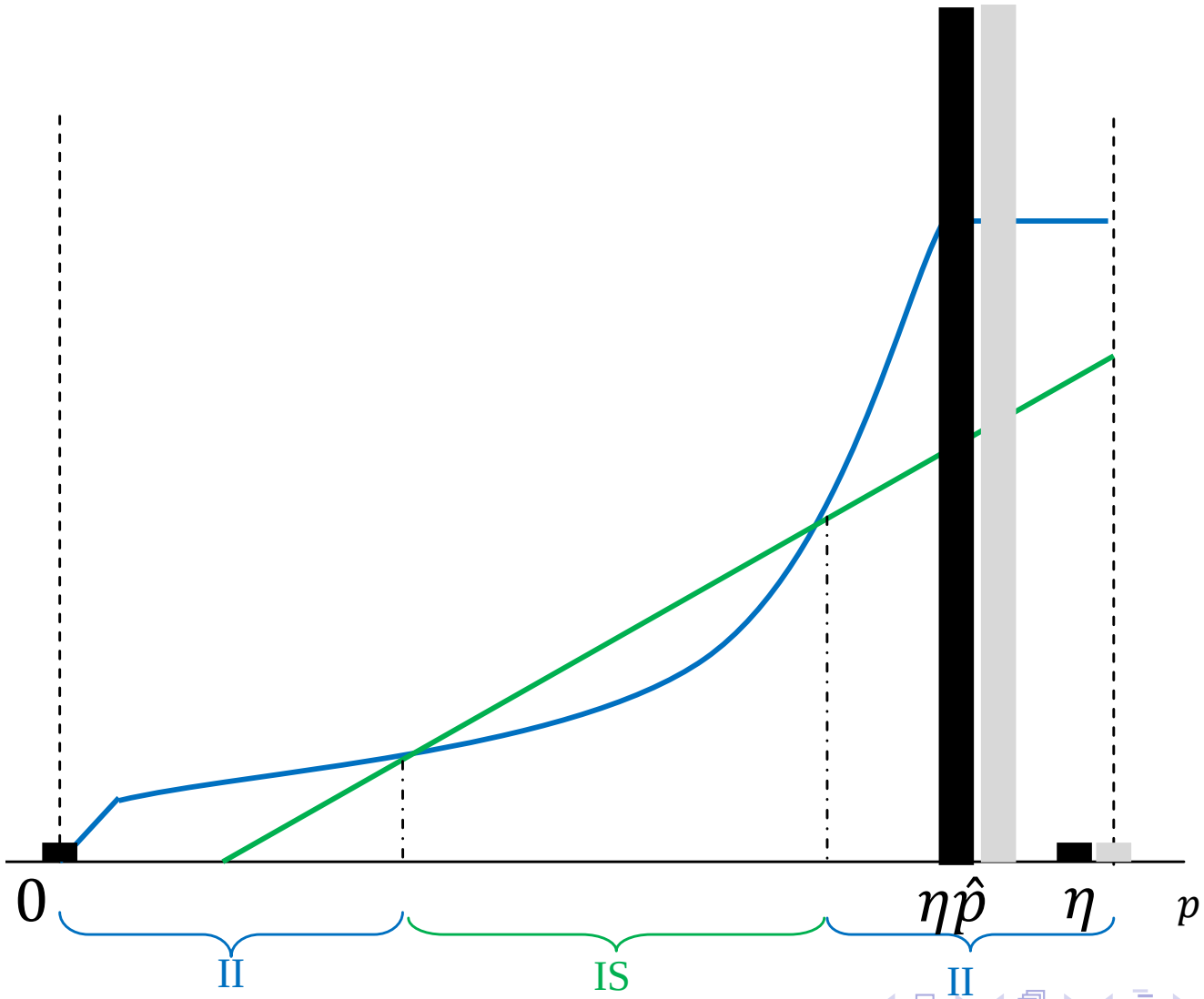


$$W_t^{II} = \bar{K} + (1 - \lambda^t(1 - \hat{p}))K^*(qA - 1) \rightarrow W^*$$

Aggregate Shocks to Collateral



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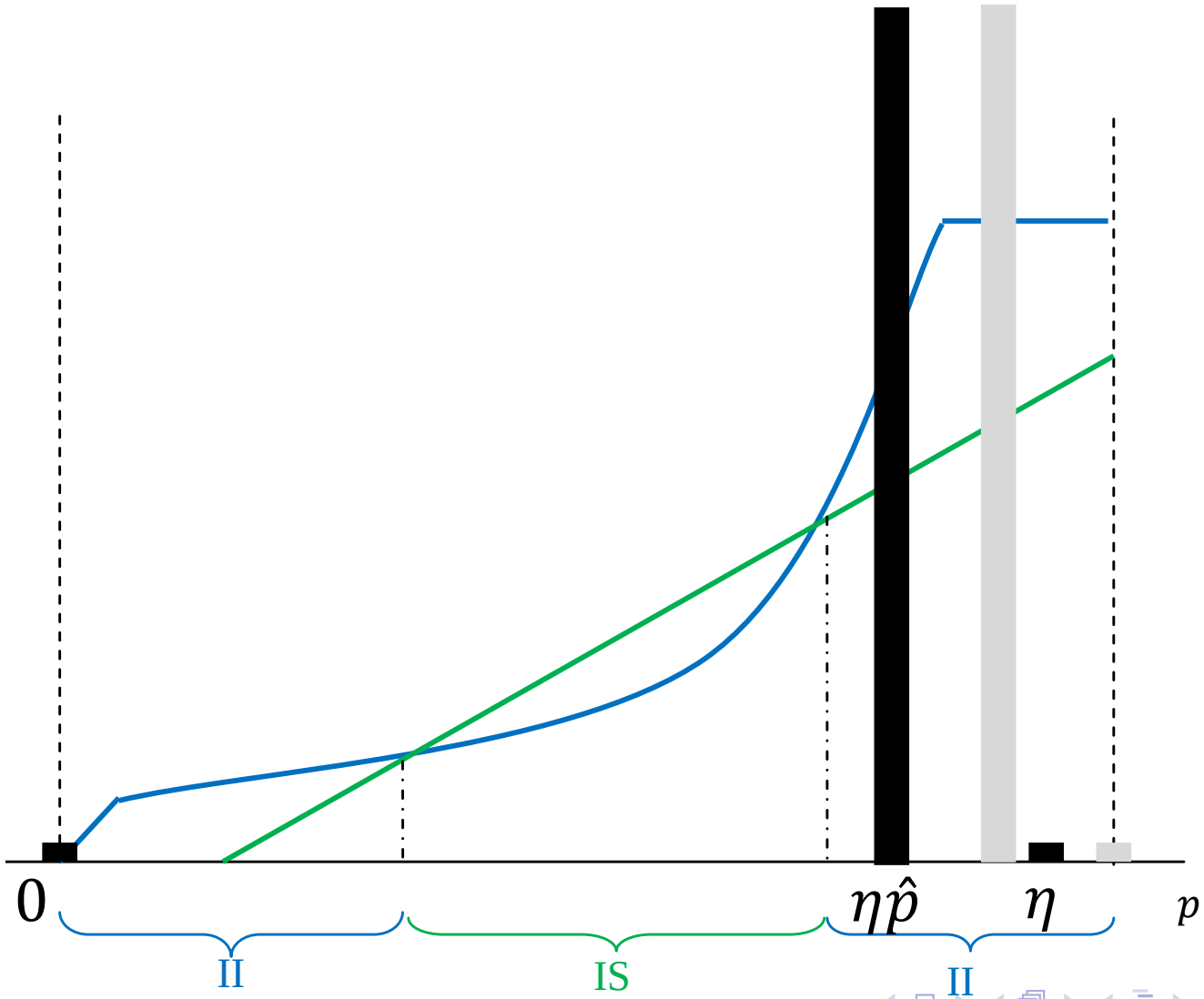

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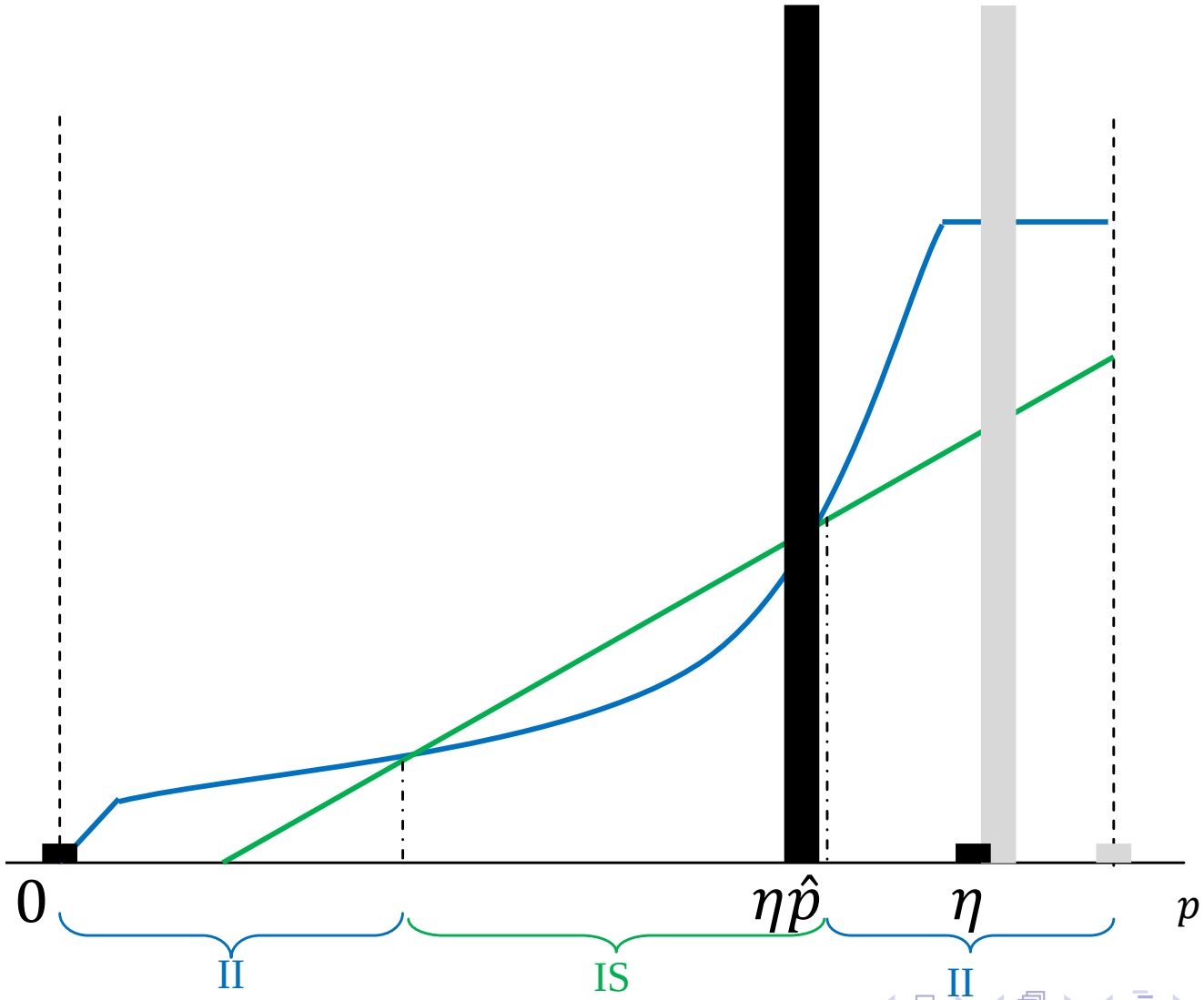
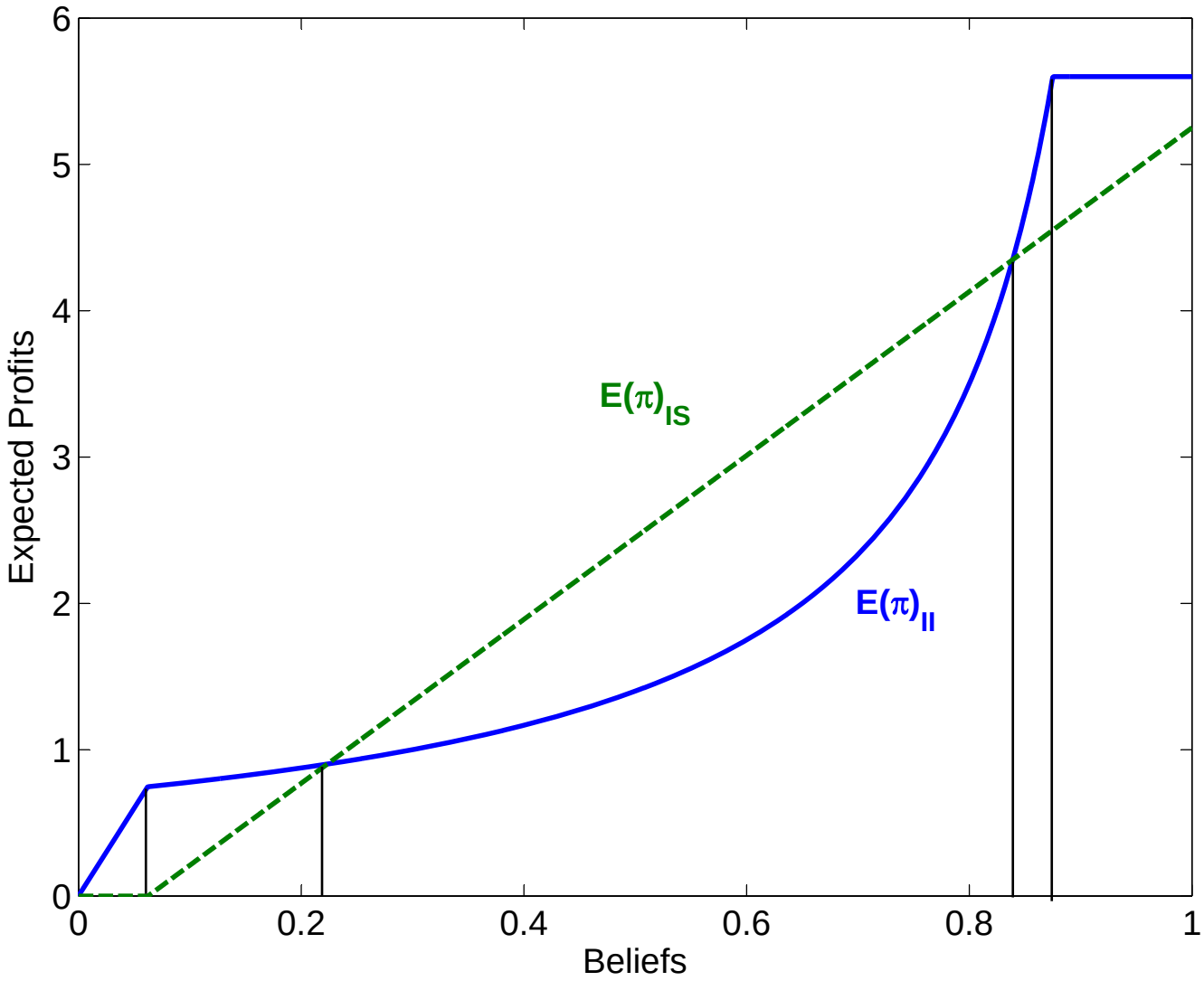
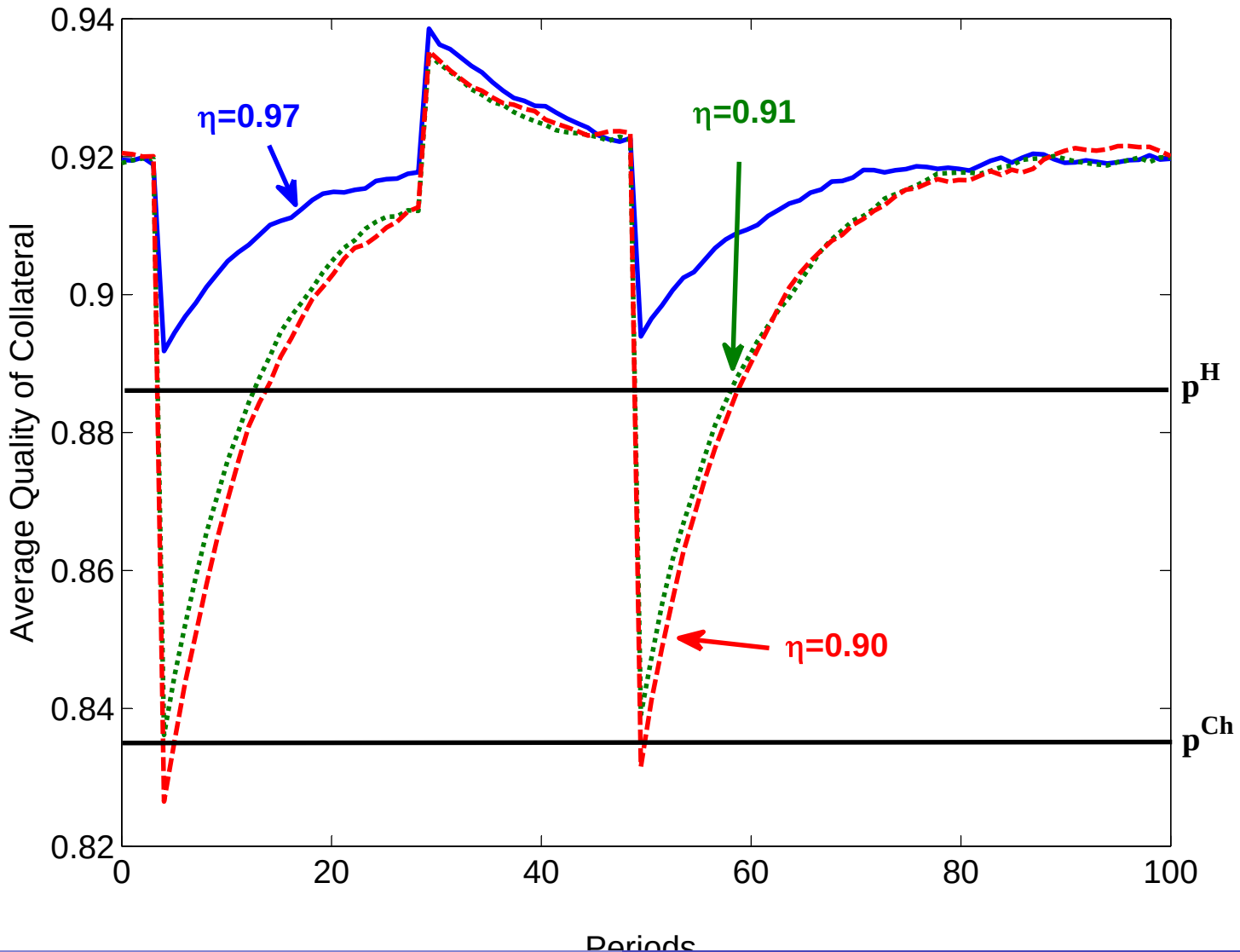


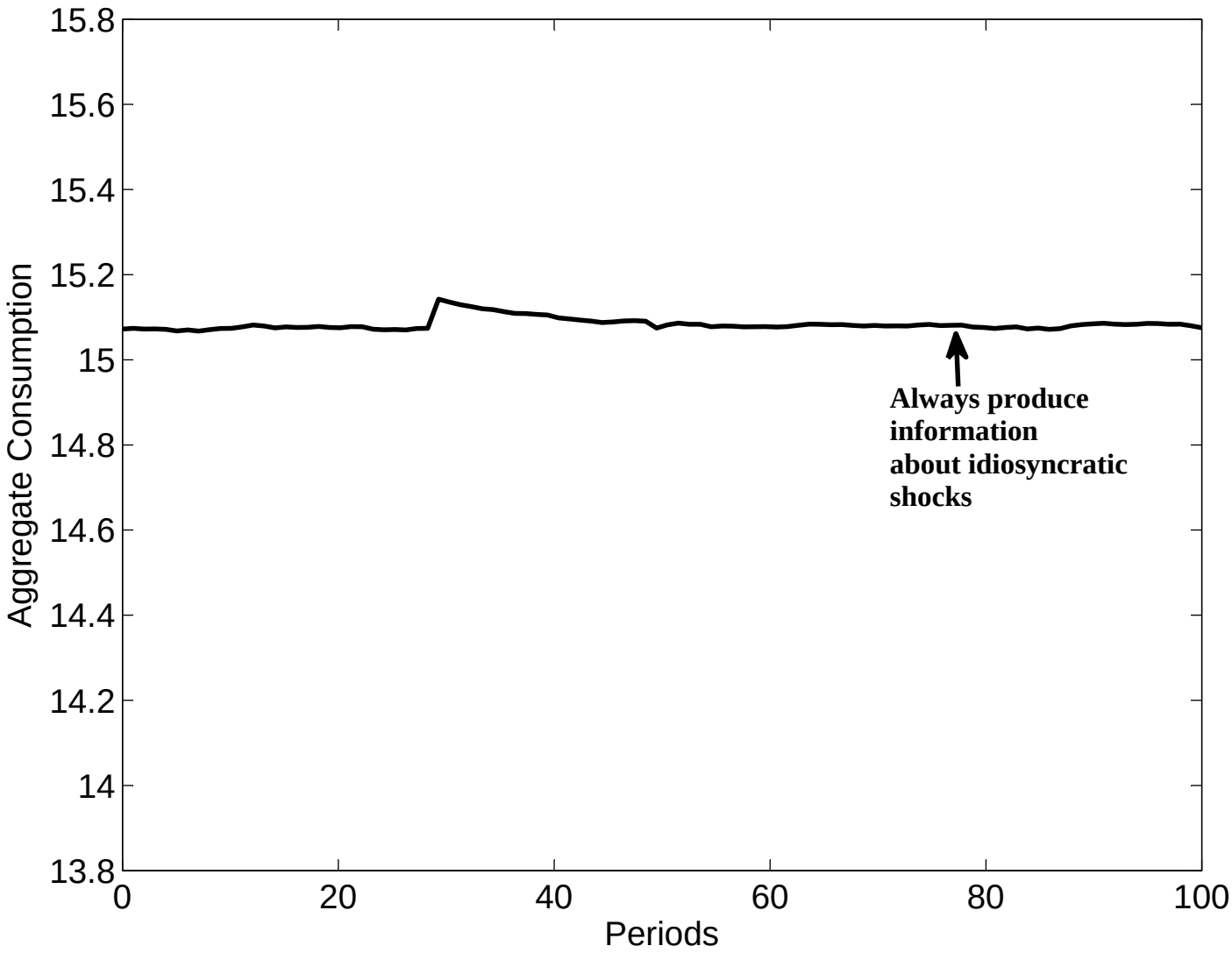
Numerical Simulations: Profits and Cutoffs



Numerical Simulations: Average Quality of Collateral



Numerical Simulations: Aggregate Consumption



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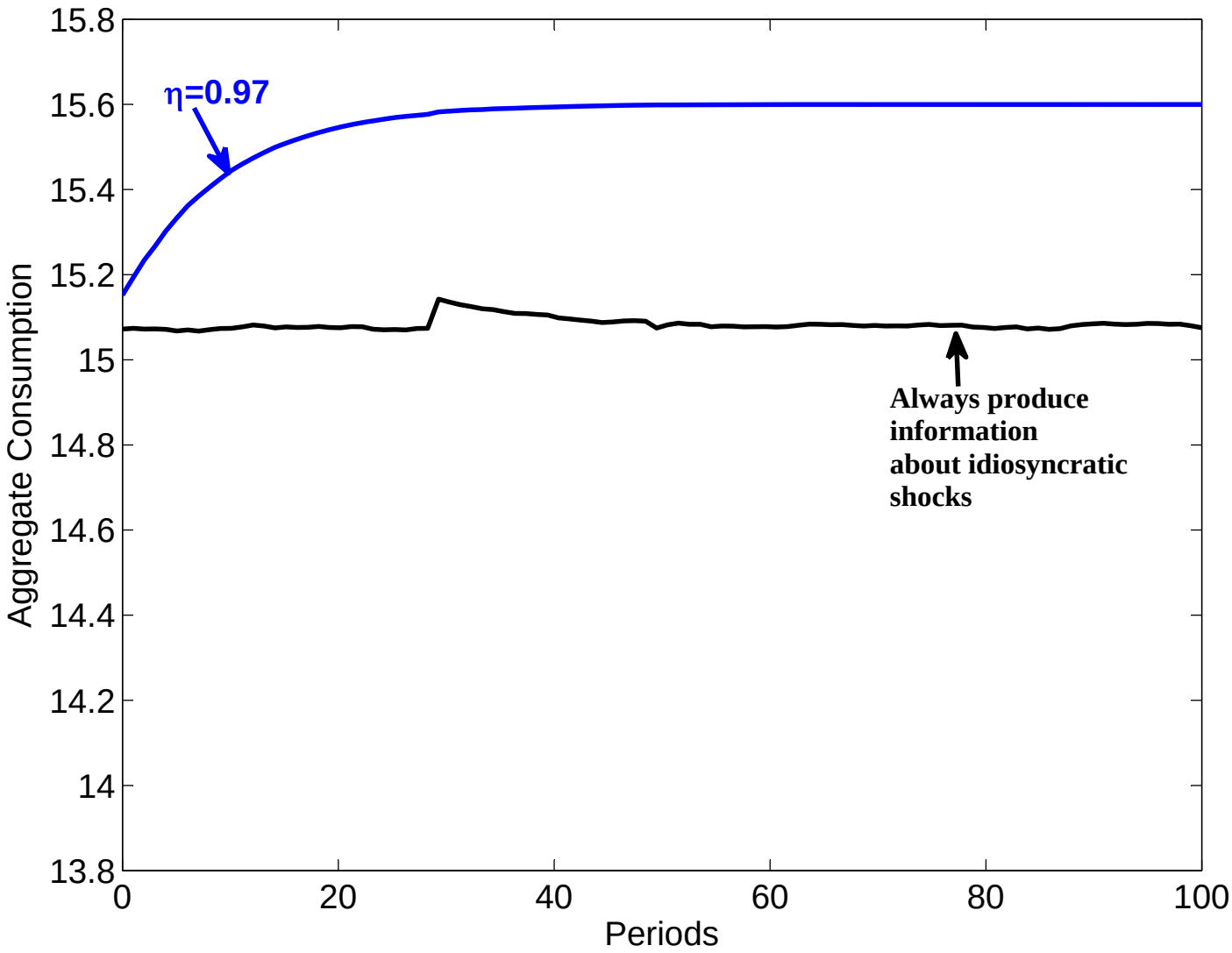

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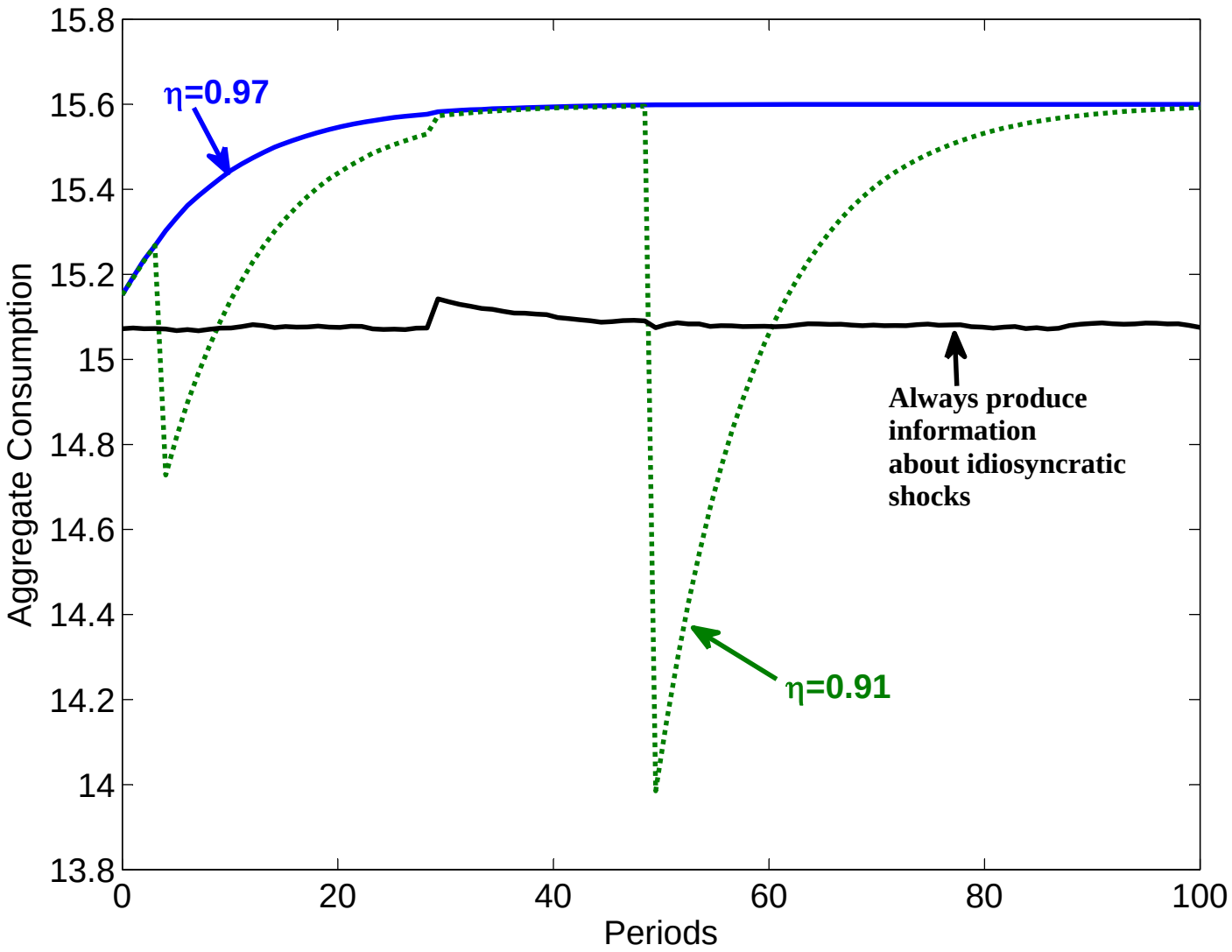

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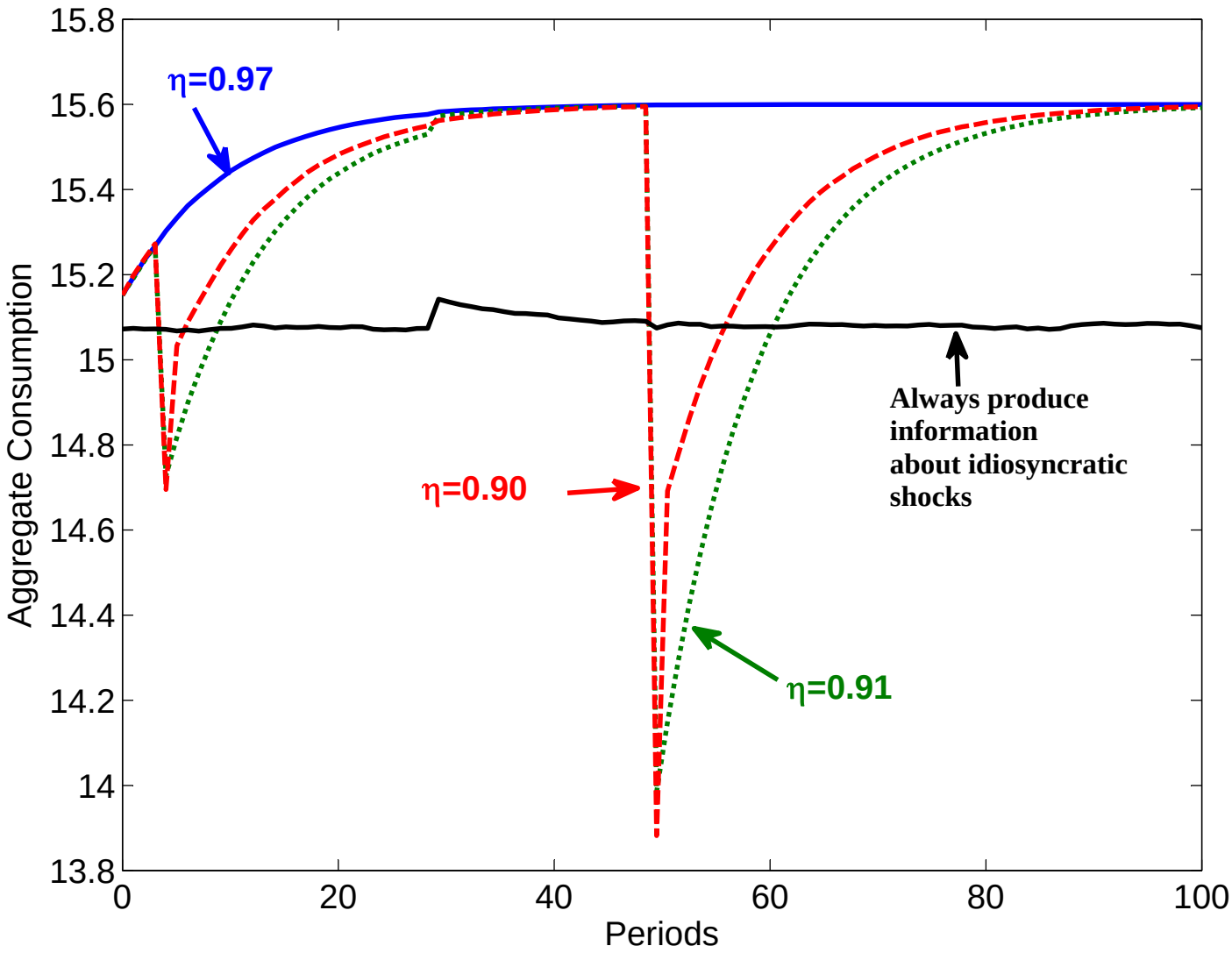
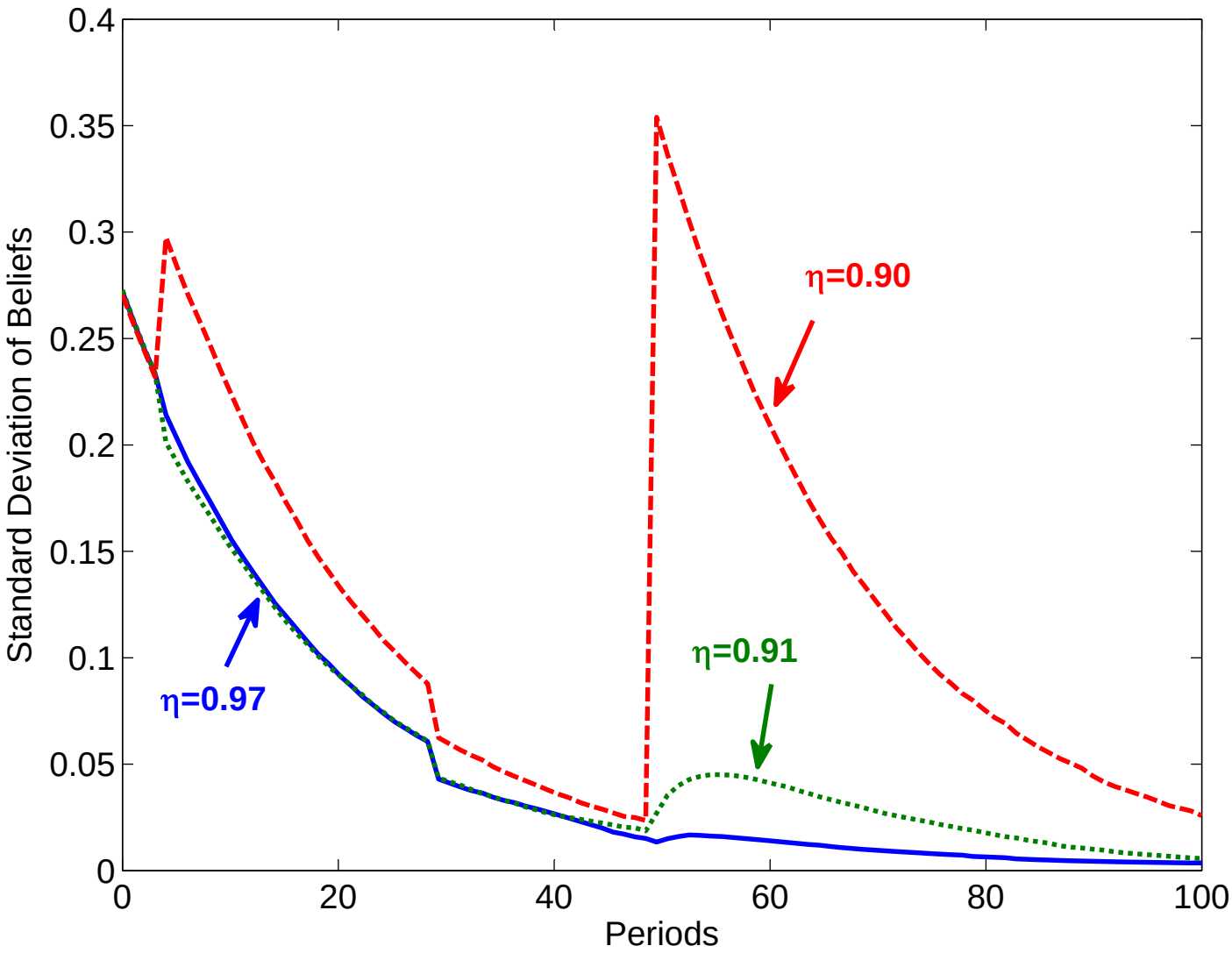


Numerical Simulations: Standard Deviation of Beliefs



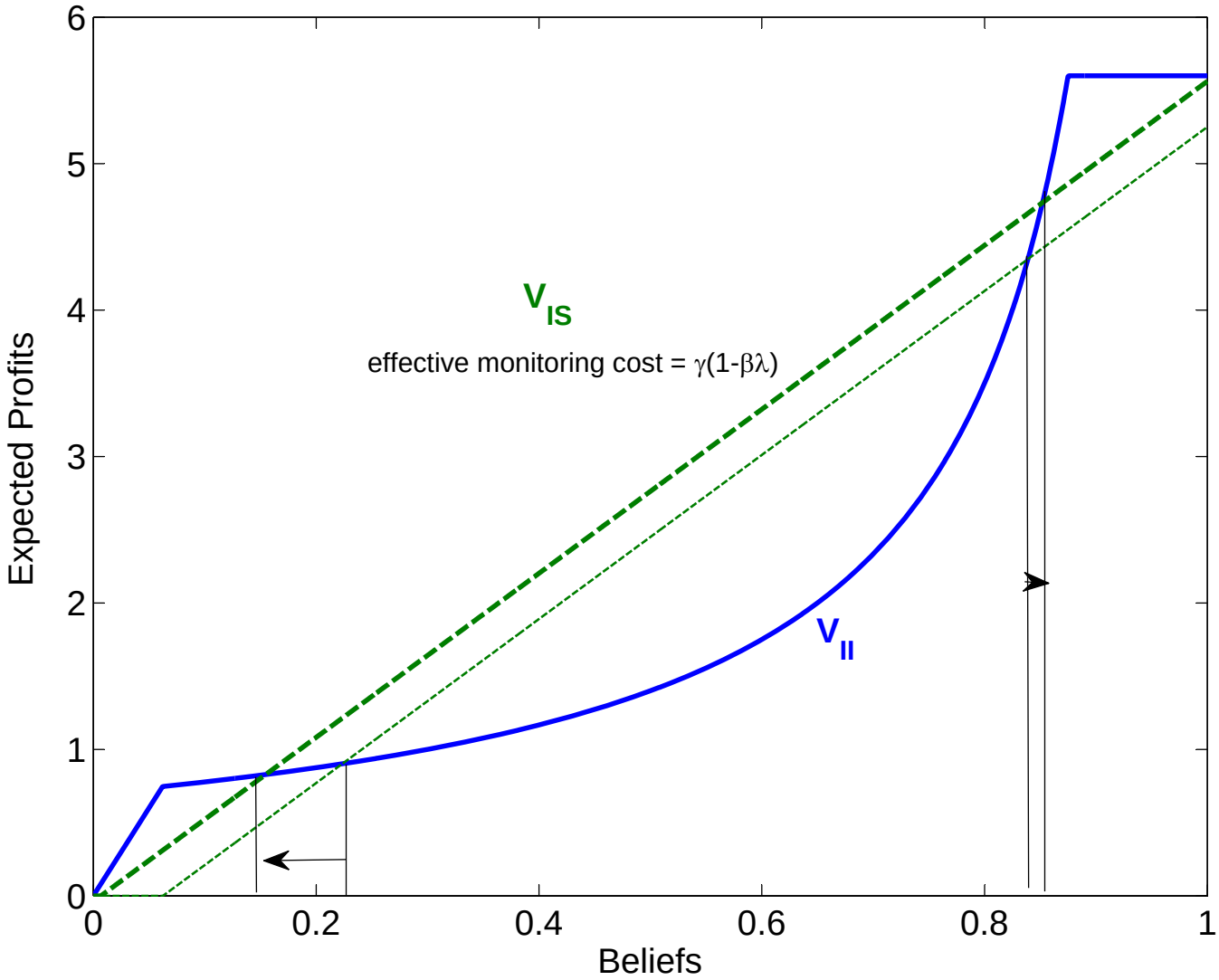
A Planner

- Assume a planner that maximizes the discounted utility of cohorts

$$U_t = E_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} W_t.$$

- Optimal range of information production is wider.
- The planner can implement the optimum by subsidizing a fraction $\beta\lambda$ of the information cost γ.

A Planner: Cutoffs



Preventive Policies

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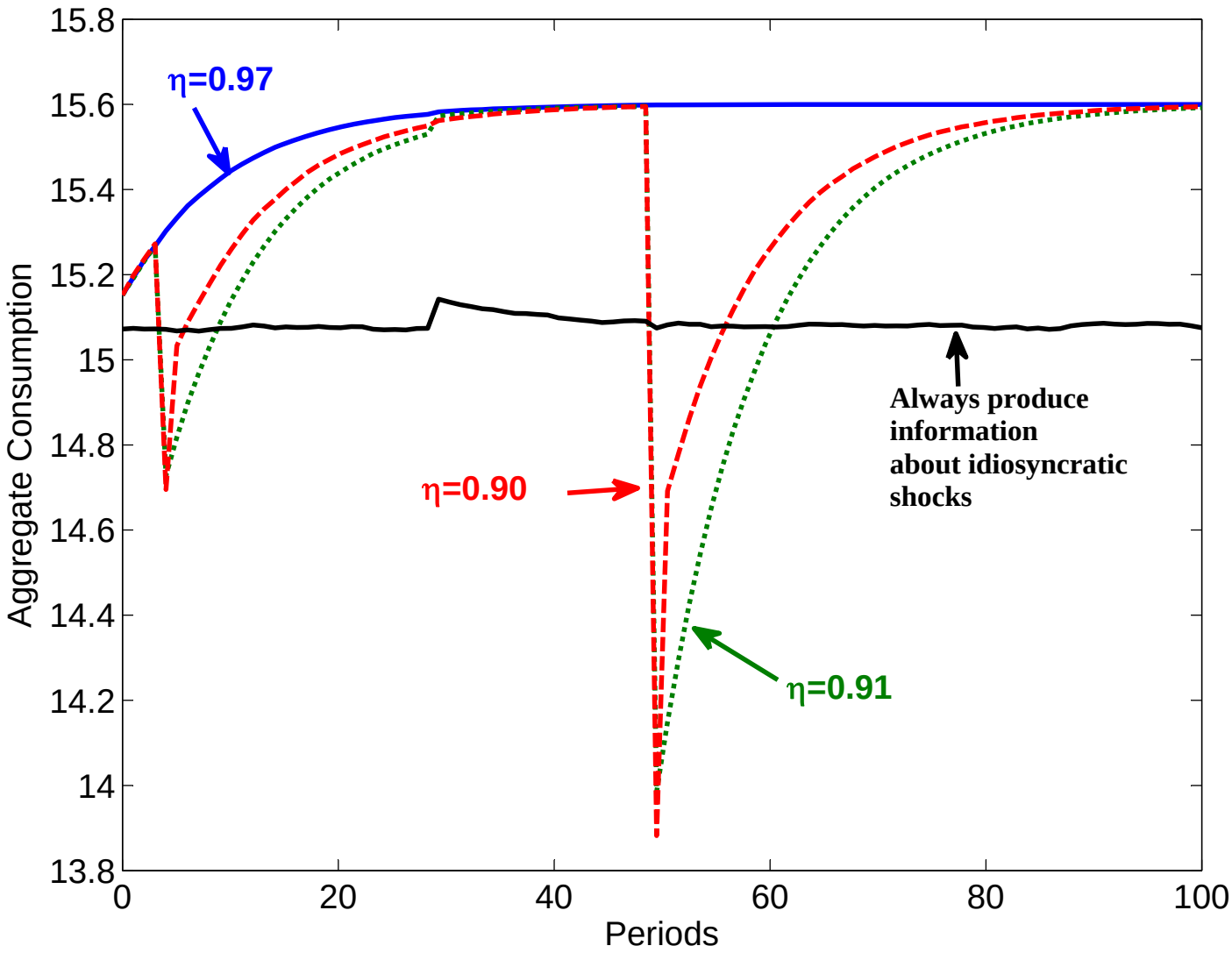
- Under certain conditions (guaranteed if $\eta > \hat{p}$), incentives to acquire information increase with
  - The likelihood of the expected shock.
  - The size of the expected shock.

Ex-post Policies

- Collateral Policies:
  - Restore $\hat{p}$. **e.g., buy and guarantee collateral.**
  - More effective when information is not produced.
- Lending Policies:
  - Avoid information acquisition. **e.g., subsidizing firm loans.**
  - More effective in the presence of collateral policies.

Collateral Policies with Information



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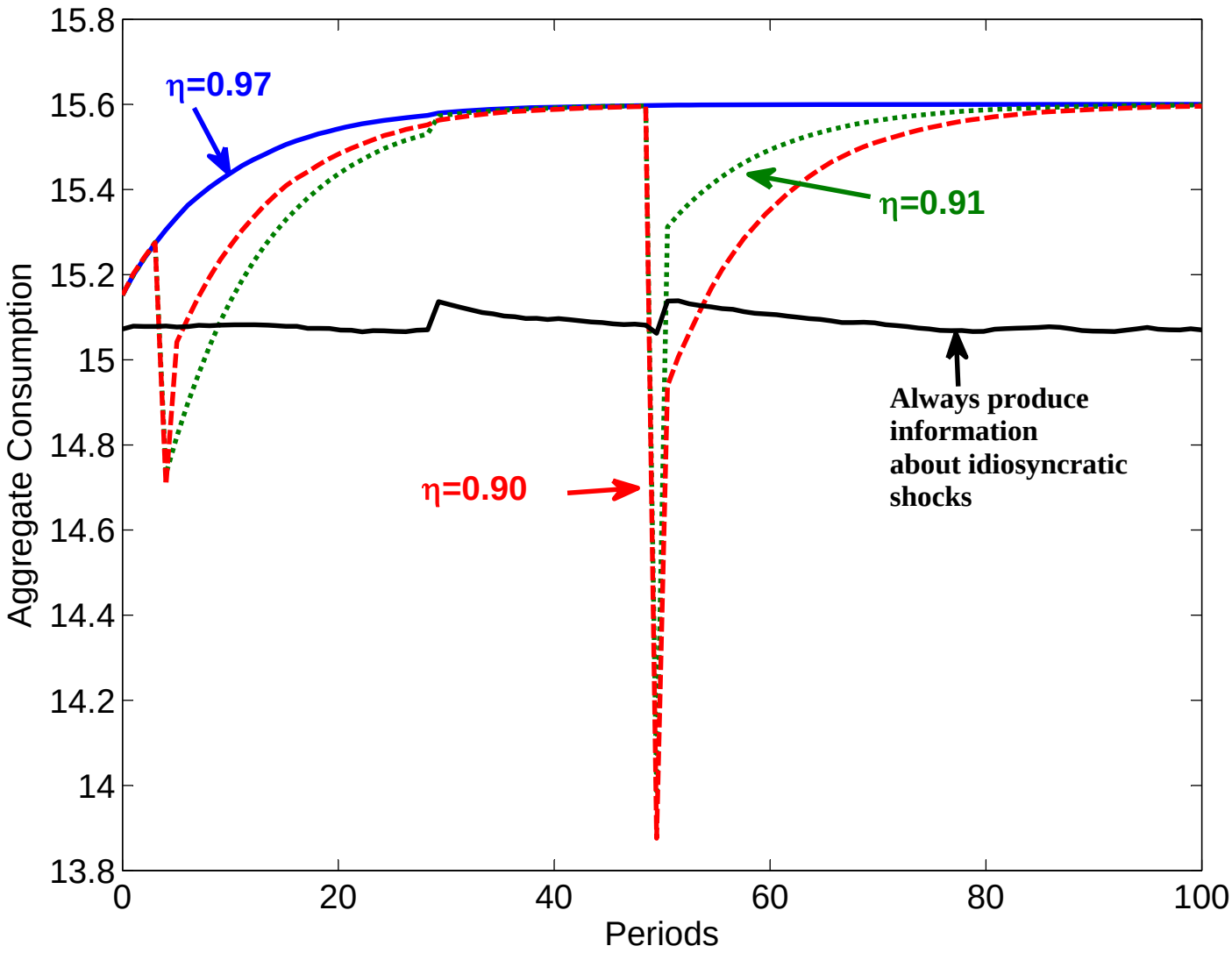
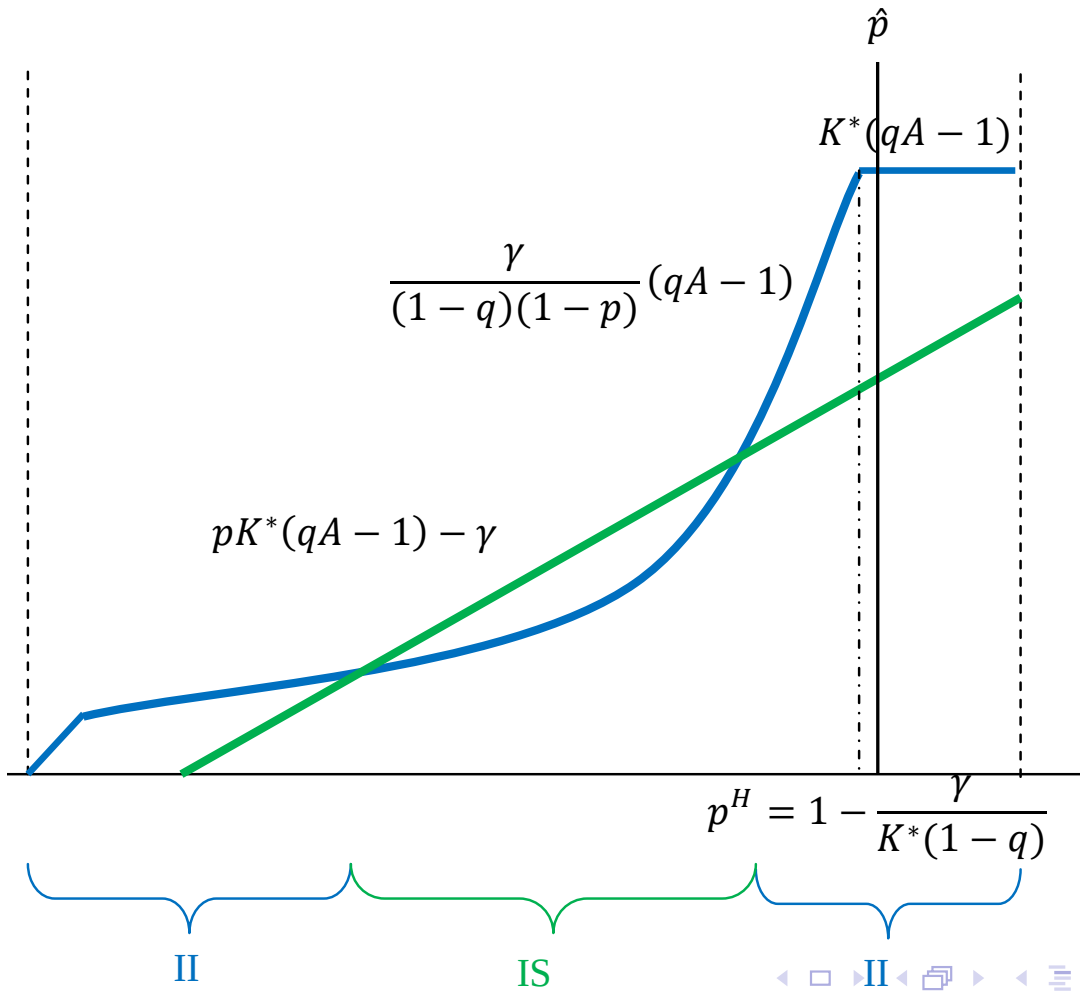


Endogenous Security Structure

- Complex securities arise endogenously to increase borrowing.
- Assume two firms, one with land $p_1 = 1$ and the other $p_2 = 0.7$. How to increase expected borrowing?
- Pooling.
  - No pooling: II for p_1, borrowing K^*. IS for p_2, borrowing $0.7K^*$.
  - Pooling: II for expected quality $\bar{p} = 0.85$, borrowing $2K(\bar{p}) > 1.7K^*$
- More complexity (higher γ).
  - A higher γ that moves $p_H \leq 0.85$ implies total borrowing of $2K^*$.

A Real Source of a Credit Crunch

- A reduction in the success probability q can lead to a credit crunch.



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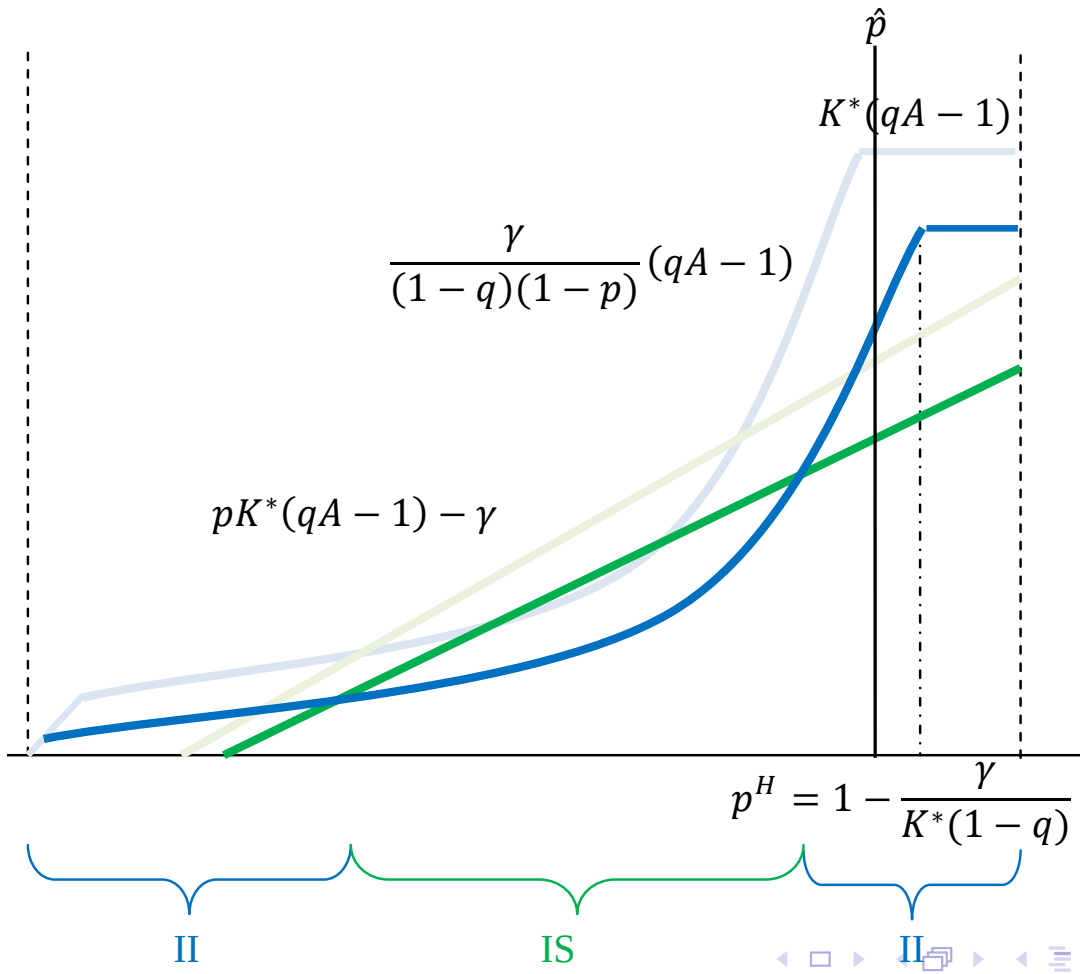

Final Remarks

- Information insensitive debt may be socially desirable, but it is vulnerable to a sudden loss of confidence in its insensitiveness.
- Macroeconomic implications:
  - Longer and larger "ignorance credit booms" generate more fragility and larger crises.
  - Recoveries.
    - NO expansionary policies: Information speeds up recoveries.
    - Expansionary policies: Information delays recoveries.
  - Dispersion of beliefs (and of credit and production) is endogenous. We tested this implication of the mechanism empirically.

Extensions

- Endogenous complex securities.
- Crises without shocks, just decreasing marginal productivity.
- Optimal information production when collateral is productive?