Public Disclosure and Private Information Acquisition: A Global-Game Approach

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Introduction

- Public information disclosure is a crucial component of financial-macro regulations
- There are concerns, however, that public information could crowd out private-sector information generation...
- to the extent that overall information quality is harmed (Morris and Shin, 2002; Amador and Weill, 2010; Goldstein and Yang 2019)
- Typically, such conclusions are drawn from models where information are substitutes
- What if, information acquisitions are strategic complements?

Introduction

- This paper studies the impact of public information disclosure in a model of financial market with strategic information acquisition
- The model is a dynamic version of Grossman and Stiglitz (1980) with short-term investors
- Short-termism and resale needs creates information complementarity
  - Everyone wants to know what others know $\rightarrow$ A beauty contest game
- Challenge: multiple equilibria may arise due to the complementarity $\rightarrow$ difficulty in analyzing comparative statics

Main Results

- With equilibrium multiplicity we first analyze comparative statics, fixing an equilibrium

  → Finding: the crowding out effect of public disclosure is robust at each equilibria

- We then apply global game refinement, which gives a unique refined equilibrium

  → Finding: public disclosure crowds IN private information acquisition!

  → Overturns the crowding-out result, but why?

Mechanism

- Role of global game: introducing strategic uncertainty
- Information complementarity + Strategic uncertainty → Overturns the crowding-out result
- Without strategic uncertainty, investors have perfect knowledge about others' actions

  → they only care about the "local" impact of public disclosure

  → Information complementarity irrelevent if it is not a local property of the equilibrium allocation
- With strategic uncertainty, investors care about the "global" impact of public disclosure

  → they take into account global changes in the value of information, including both substitutability and complementarity forces

  → crowding-in could arise

General Model

- Continuum of agents. Each agent decides on a binary action of whether to acquire information or not

- Individual payoff is given by a generic function (micro-founded later):

$$\pi(\lambda, \tau, \chi)$$

  - λ: Share of investors who acqu. info. (Average action)
  - τ: Precision of public disclosure (Aggregate state)
  - χ: Individual cost of acqu. info. (Individual state, -)

- There is strategic substitutability (complementarity) if $\pi(.)$ is de(in)creasing in λ
  - Grossman and Stiglitz (1980): global substitutability
  - Other forces could create complementarity: short-termism and resale motives; relative wealth concerns; private info. on endowment...

- Will study the impact of public disclosure τ on equilibrium λ

Common Knowledge Equilibrium

At a common knowledge equilibrium (without global game refinement):

- Equilibrium $\hat{\lambda}$ determined by

$$\pi(\hat{\lambda}, \tau, \chi) = 0$$

  $\Rightarrow$ Agents have perfect knowledge about others' action $\hat{\lambda}$.

- Hence the impact of public disclosure is evaluated at the particular $\hat{\lambda}$:

$$\frac{d\hat{\lambda}}{d\tau} = -\frac{\frac{\partial \pi}{\partial \tau}(\lambda, \tau, \chi)}{\frac{\partial \pi}{\partial \lambda}(\lambda, \tau, \chi)}\Bigg|_{\lambda=\hat{\lambda}}$$

- The lack of strategic uncertainty means only the local value of information matters

Global Game Refinement

- Assume that χ is heterogeneous and private information $\Rightarrow$ Higher order belief matters
- Equilibrium follows a cutoff rule: acquire information iff χ_i is below some equilibrium threshold $\hat{\chi}$.
- This cutoff is determined by: (Morris and Shin, 2003)

$$\int \pi(\lambda, \tau, \hat{\chi}) d\lambda = 0$$

- The integration over λ captures strategic uncertainty as agents can never observe the entire distribution of individual state
- The impact of public disclosure now needs to take into account its impact on all possible values of λ:

$$\frac{d\hat{\chi}}{d\tau} = -\frac{\int \frac{\partial \pi}{\partial \tau}(\lambda, \tau, \hat{\chi})\, d\lambda}{\int \frac{\partial \pi}{\partial \chi}(\lambda, \tau, \hat{\chi})\, d\lambda}$$

Why Global Games give different prediction?

- Without global game: (focus on the stable equilibrium where information are locally substitutes):

$$\frac{d\hat{\lambda}}{d\tau} = -\frac{\left.\frac{\partial \pi}{\partial \tau}(\lambda, \tau, \chi)\right|_{\lambda=\hat{\lambda}}}{\underbrace{\left.\frac{\partial \pi}{\partial \lambda}(\lambda, \tau, \chi)\right|_{\lambda=\hat{\lambda}}}_{<0}}$$

- With global game:

$$\frac{d\hat{\chi}}{d\tau} = -\frac{\int \frac{\partial \pi}{\partial \tau}(\lambda, \tau, \hat{\chi})\, d\lambda}{\underbrace{\int \frac{\partial \pi}{\partial \chi}(\lambda, \tau, \hat{\chi})\, d\lambda}_{<0}}$$

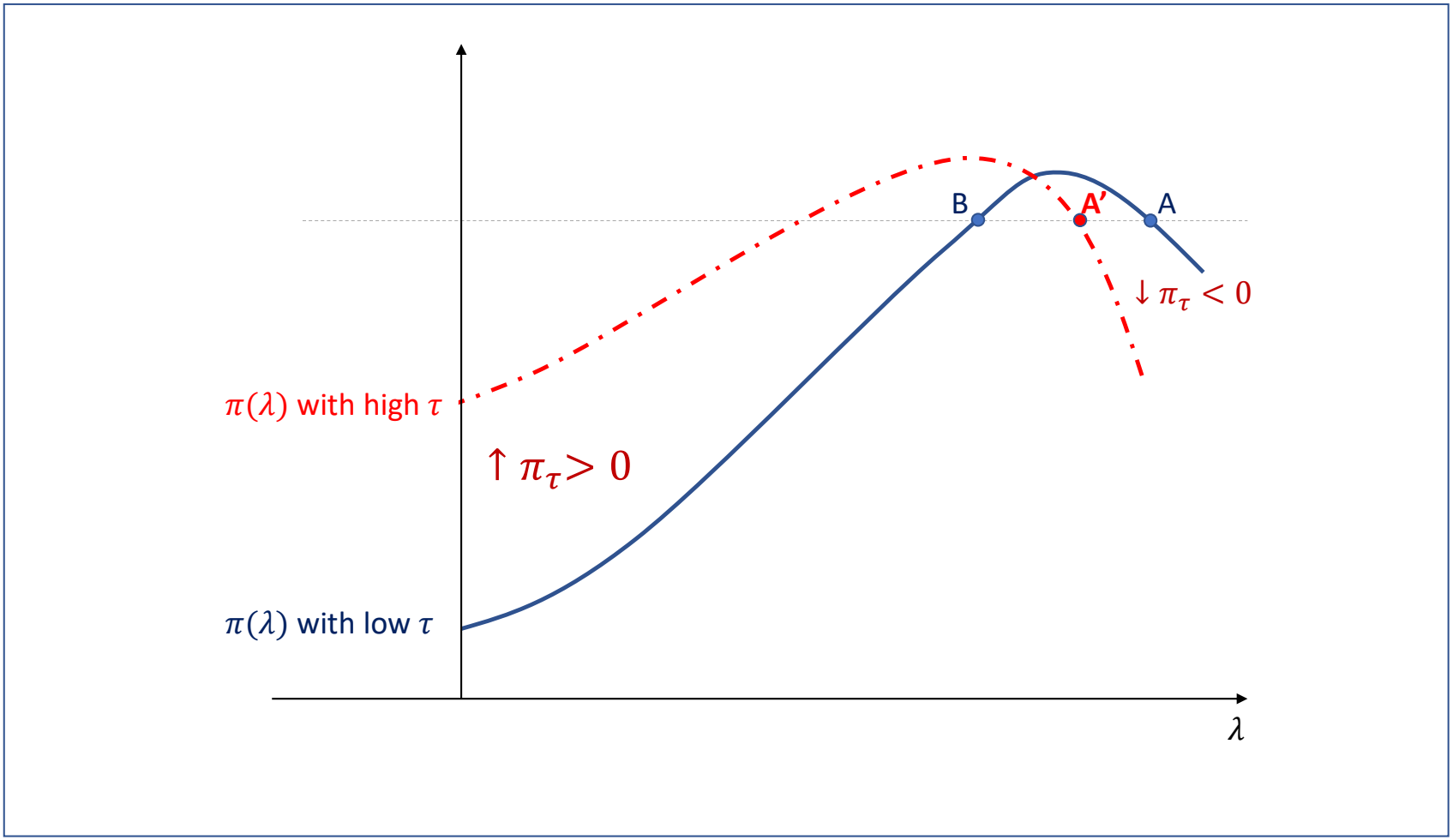
- The key difference lies in the numerator where, in the former case, the impact of public disclosure on value of info. is evaluated at a particular point:

$$\left.\frac{\partial \pi}{\partial \tau}\right|_{\lambda=\hat{\lambda}}$$

- ...while in the latter case, the impact of public disclosure is evaluated for all ranges of λ, due to the presence of strategic uncertainty:

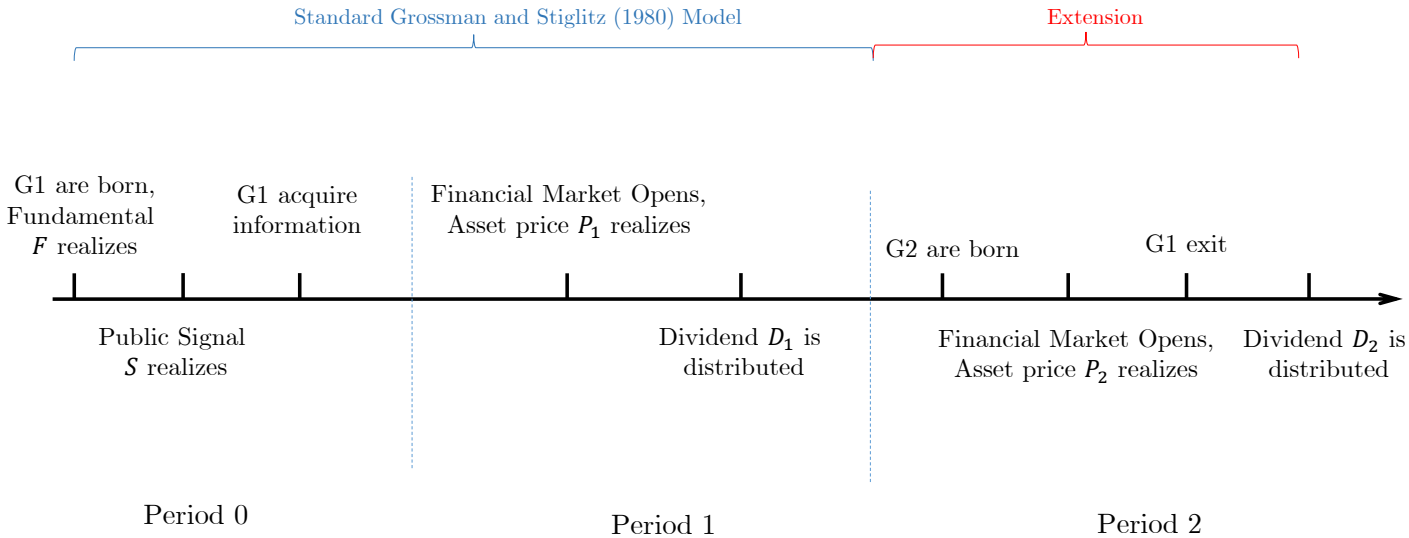
$$\int \frac{\partial \pi}{\partial \tau} d\lambda$$

Graphic Illustration



The Micro-founded Model

- Standard Grossman and Stiglitz (1980) model extended with an additional round of trading: short term trades creates resale demands

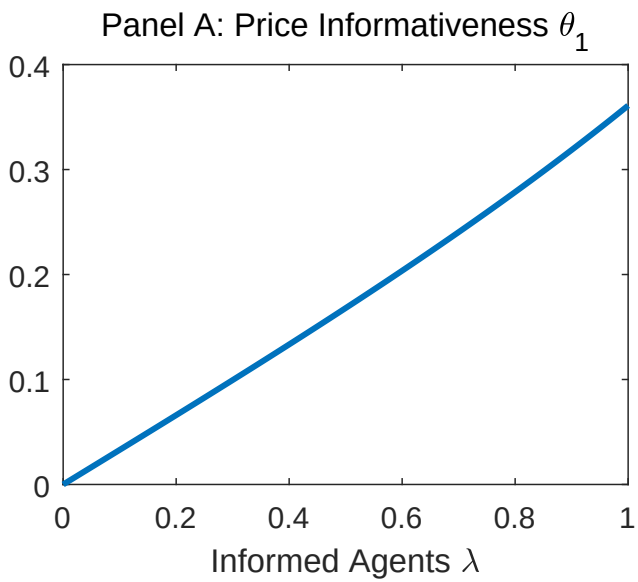


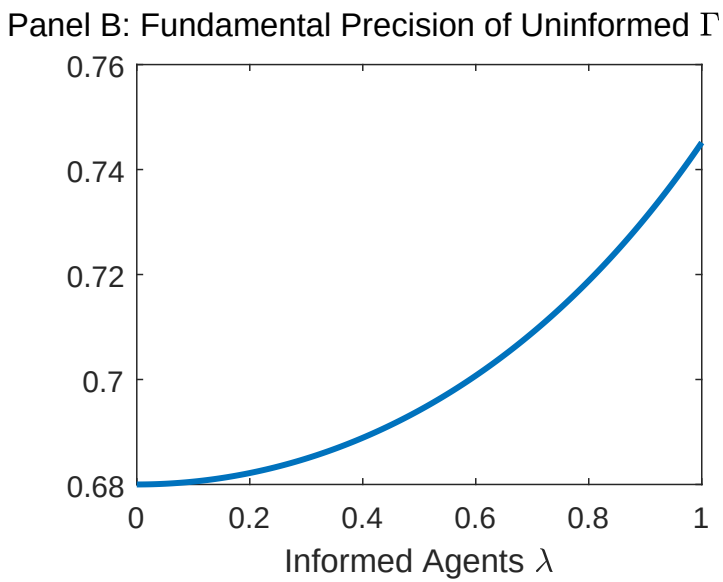
Information Sets

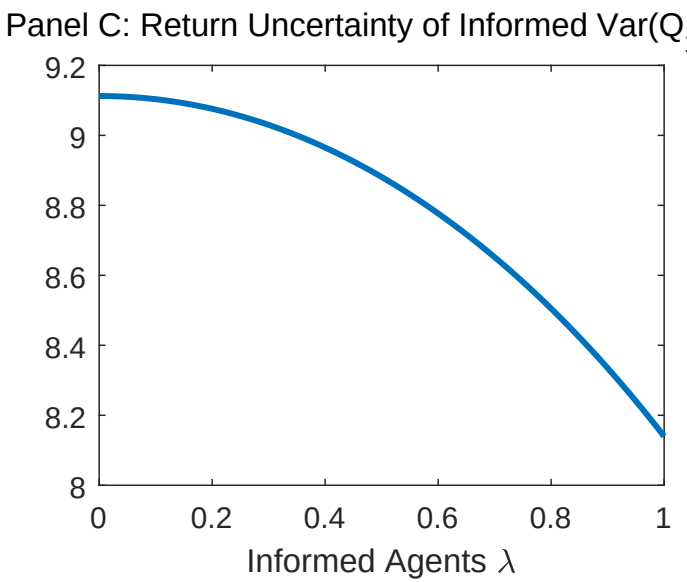
1. Informed G1 Investors $\Omega_1^I = \{S, F, P_1\}$
2. Uninformed G1 investors $\Omega_1^I = \{S, P_1\}$
3. G2 Investors $\Omega_2 = \{S, P_1, P_2, D_1\}$

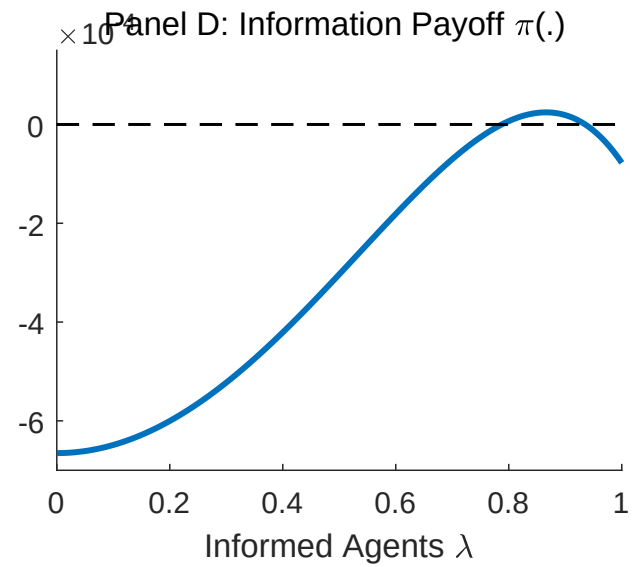
- Information substitutability:
  More informed investors $\Rightarrow$ more information content in the current stock price $\Rightarrow$ lower incentive to acquire information....
- Information complementarity:
  More informed investors $\Rightarrow$ more inforamtion content in the resale stock price $\Rightarrow$ higher incentive to acquire information....

The value of information









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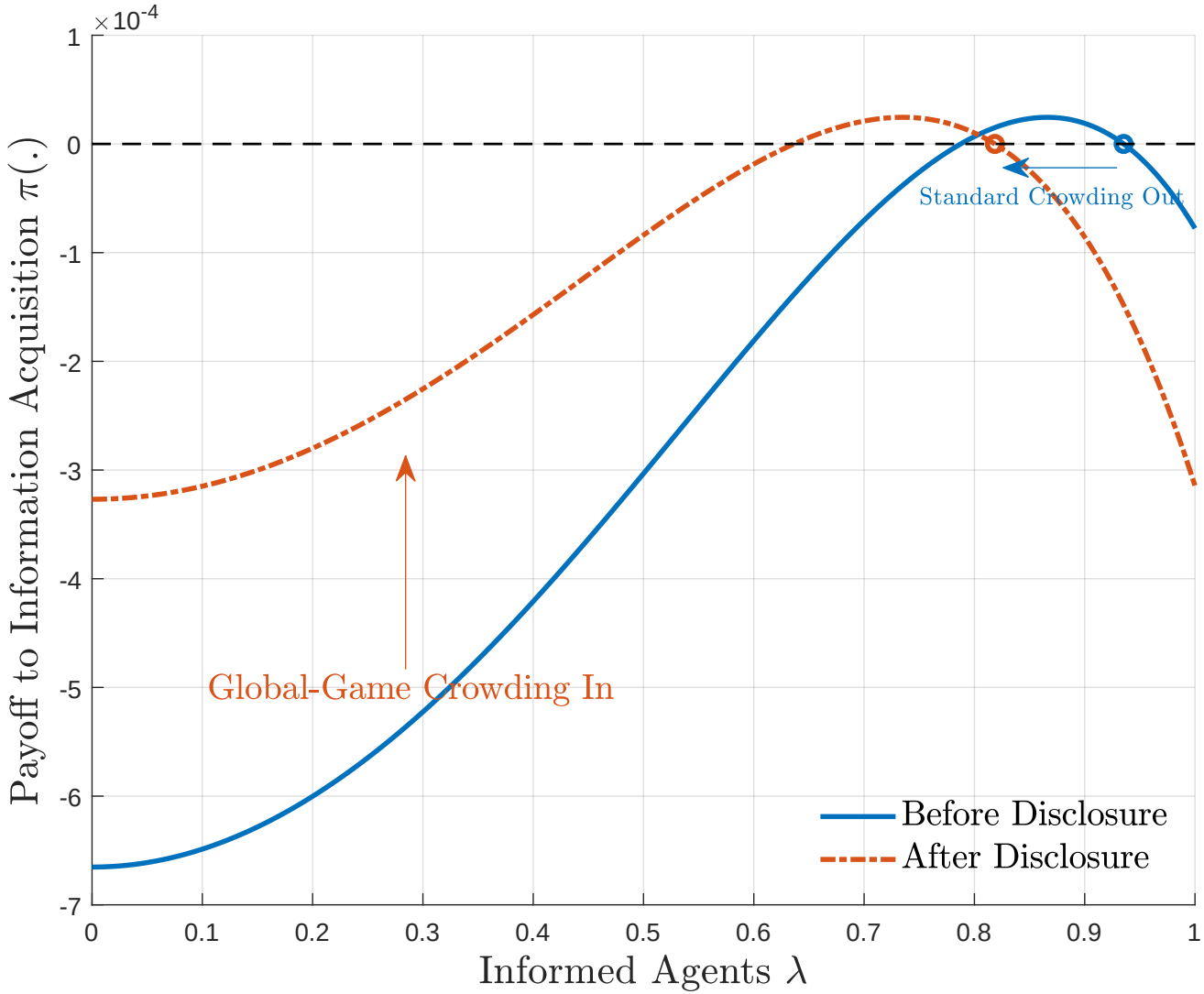
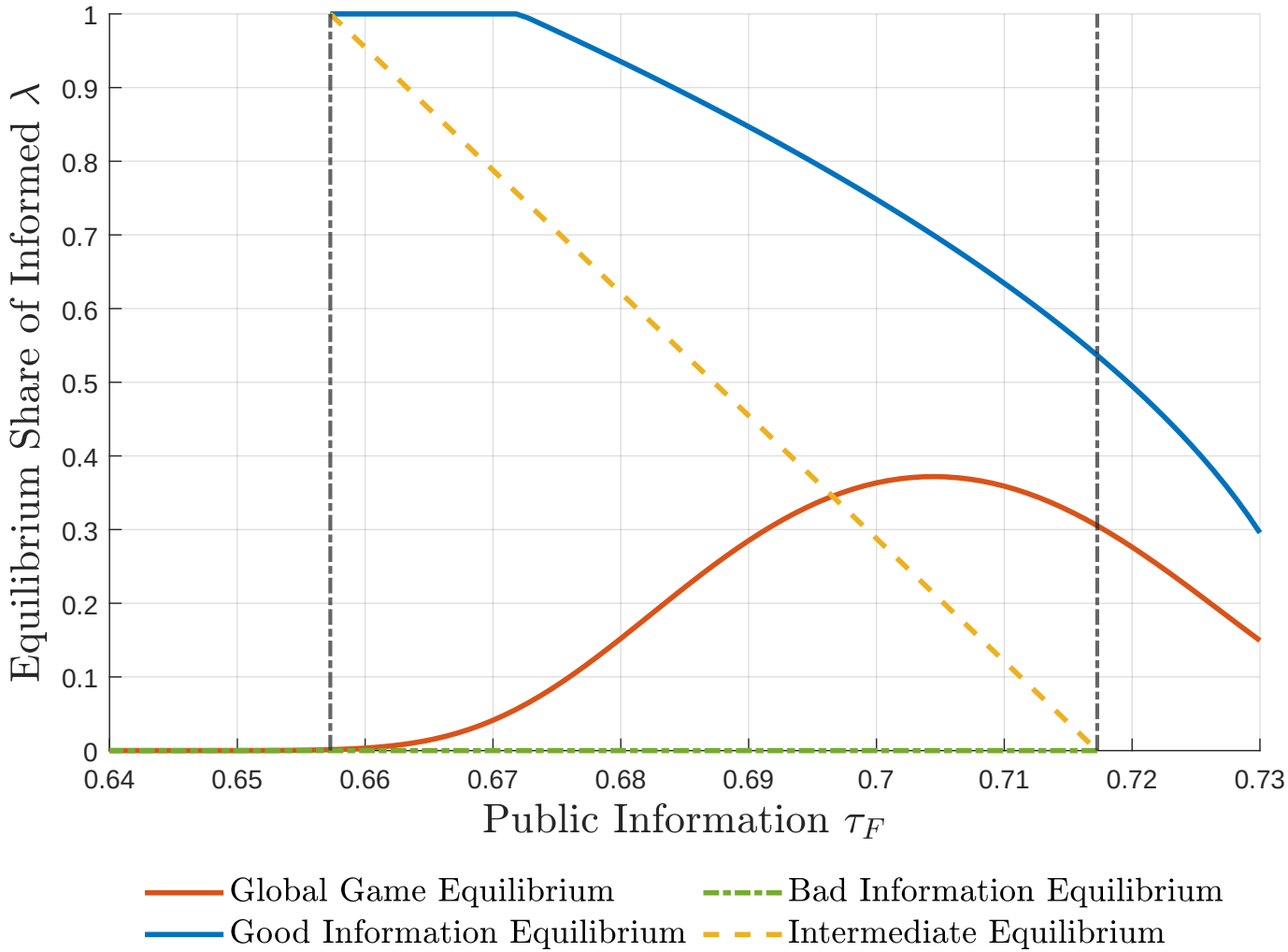


Optimal Disclosure



Conclusion

- This paper studies impact of public disclosure in a model with information complementarity due to short term stock investments and resale demands
- Multiple equilibrium can arise which give rise to difficulty in analyzing equilibrium
- Use global game to refine equilibria and find that public disclosure crowds in more private information acquisition (while none of the underlying equilibrium delivers such property)
- Strategic uncertainty plays crucial role in driving the crowding-in result