Information and Over-dissipation in Rent-Seeking Contests

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Tullock's Rent-Seeking Contest

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- agent i earns $= \begin{cases} w - x_i + R & \text{with probability } \frac{x_i}{X} \\ w - x_i & \text{otherwise} \end{cases}$

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- risk neutral equilibrium $x_i = \frac{n-1}{n^2} R$

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Study	**Group Size (N)**	**Expenditure as % of Equilibrium Expenditure**
Fonseca (IJIO, 2009)	2	200.2
Abbink et al. (AER, 2010)	2	205.2
Sheremeta (GEB, 2010)	4	151.6
Sheremeta (Ec Inq 2011)	4	133.3
	2	131.3
Chowdhury et al. (2012)	4	174.7
Faravelli and Stanca (GEB, 2012)	2	110.2
Lim et al. (2012)	2	130.0
	3	127.4

Research Questions

- How does information feedback affect rent seeking expenditures?

  We vary whether players observe other players‘ choices and payoffs
- How does this effect depends on contest structure?

  We compare:

  STOCHASTIC CONTEST

$$\pi(x_i) = \begin{cases} w - x_i + R & \text{with probability } \frac{x_i}{\sum_{j=1}^{N} x_j} \\ w - x_i & \text{otherwise} \end{cases}$$

  DETERMINISTIC CONTEST

$$\pi(x_i) = w - x_i + \frac{x_i}{\sum_{j=1}^{N} x_j} R$$

Why should Feedback matter? Consider DETERMINISTIC

Payoffs can be rewritten as

$$\pi(x_i) = w - x_i + \frac{x_i}{X}R = w + \frac{x_i(R - X)}{X}$$

For $R > X$ player choosing highest rent-seeking expenditure gets highest payoff.

For $R < X$ player choosing lowest rent-seeking expenditure gets highest payoff.

Imitating players with the highest payoff leads to $X = R$.

Why should contest structure matter? Consider STOCHASTIC

- Player i wins rent with probability $\frac{x_i}{X}$
- For a given set of expenditures with mean $\bar{x}_{t-1}$ and standard deviation σ_{t-1}

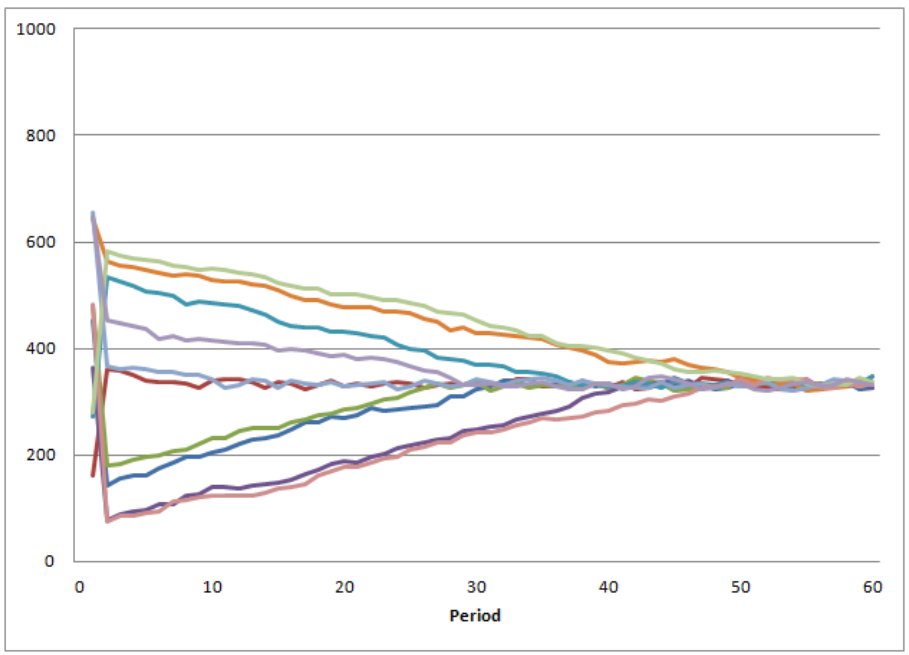
$$E(x_{it}|x_{1t-1}, x_{2t-1}, ..., x_{nt-1}) = \bar{x}_{t-1} + \frac{\sigma^2_{t-1}}{\bar{x}_{t-1}}$$

- Random walk with upward drift
- Imitating players with the highest payoff leads to $x_i = w$ (full expenditure)

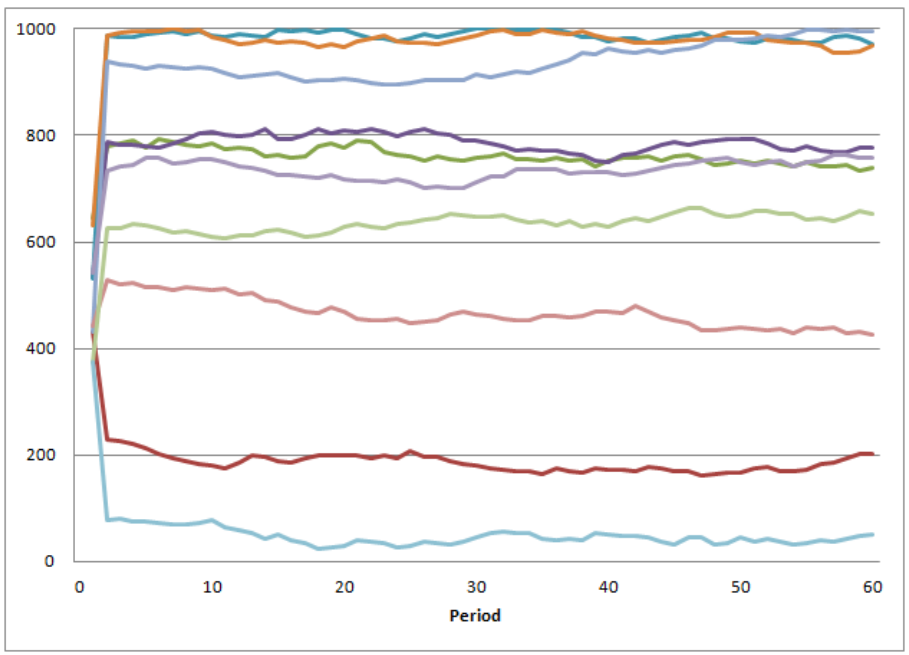
A Simulation

($n = 3$ and $R = 1000$, 10 groups)

DETERMINISTIC contest



STOCHASTIC contest



Experimental Design

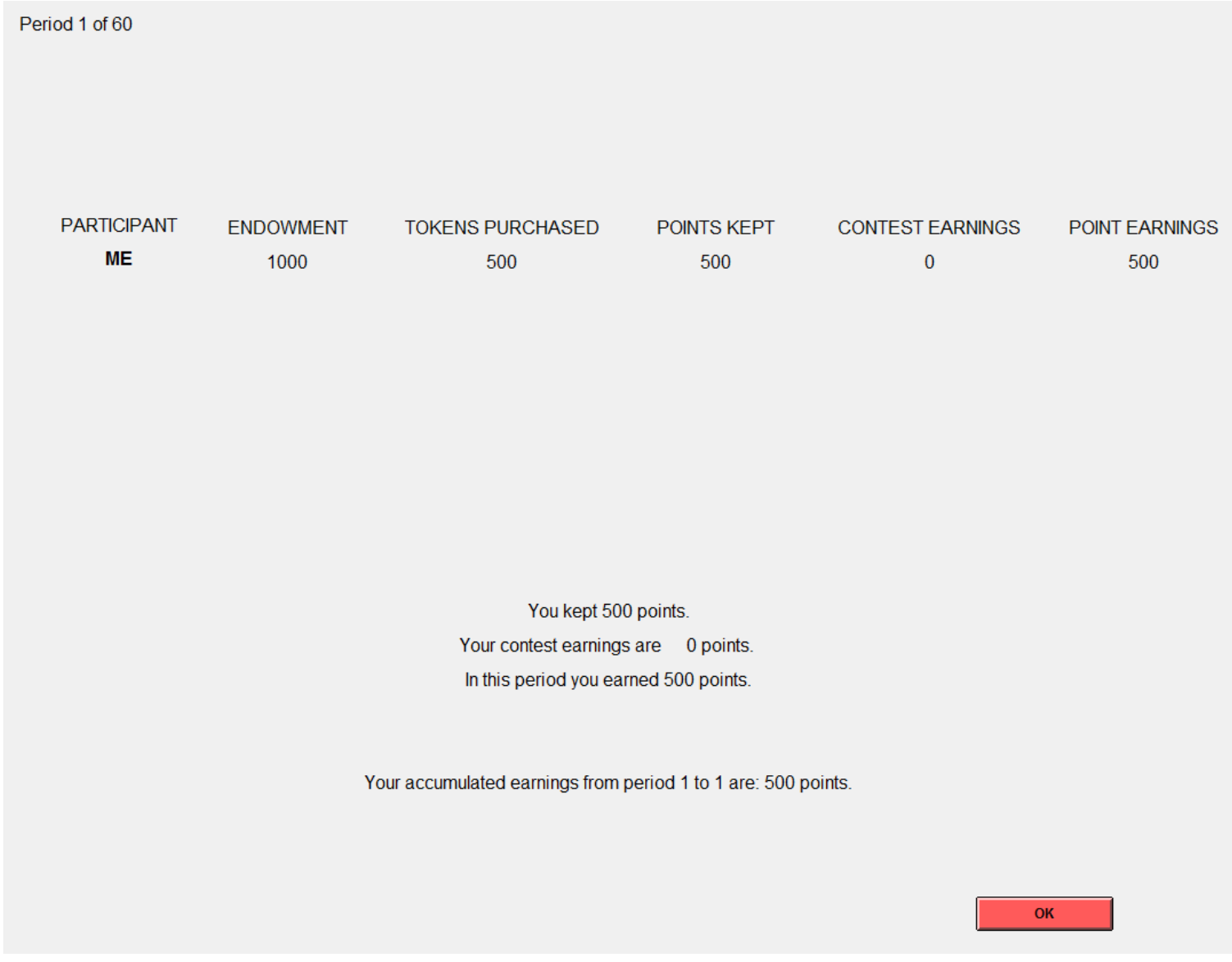
Groups of 3 subjects (undergraduates at University of Nottingham) interact over 60 rounds in fixed groups:

- Each subject given 1000 points at beginning of round
- Subjects compete for 1000 points prize
- Subject i chooses $x_i \epsilon \{0, 1, ..., 999, 1000\}$
- Earnings $= 1000 - x_i +$ **contest earnings**
- **Information** feedback

Accumulated points exchanged for £s at the end of session.
Session lasted 60 minutes, average earning $= £9.40$

	Own Feedback	**Full Feedback**
Deterministic	10 groups	11 groups
Stochastic	10 groups	10 groups

Screenshot OWN information



Screenshot FULL information

Period 1 of 60

PARTICIPANT	ENDOWMENT	TOKENS PURCHASED	POINTS KEPT	CONTEST EARNINGS	POINT EARNINGS
ME	1000	500	500	0	500
OTHER	1000	150	850	1000	1850
OTHER	1000	50	950	0	950

You kept 500 points.

Your contest earnings are 0 points.

In this period you earned 500 points.

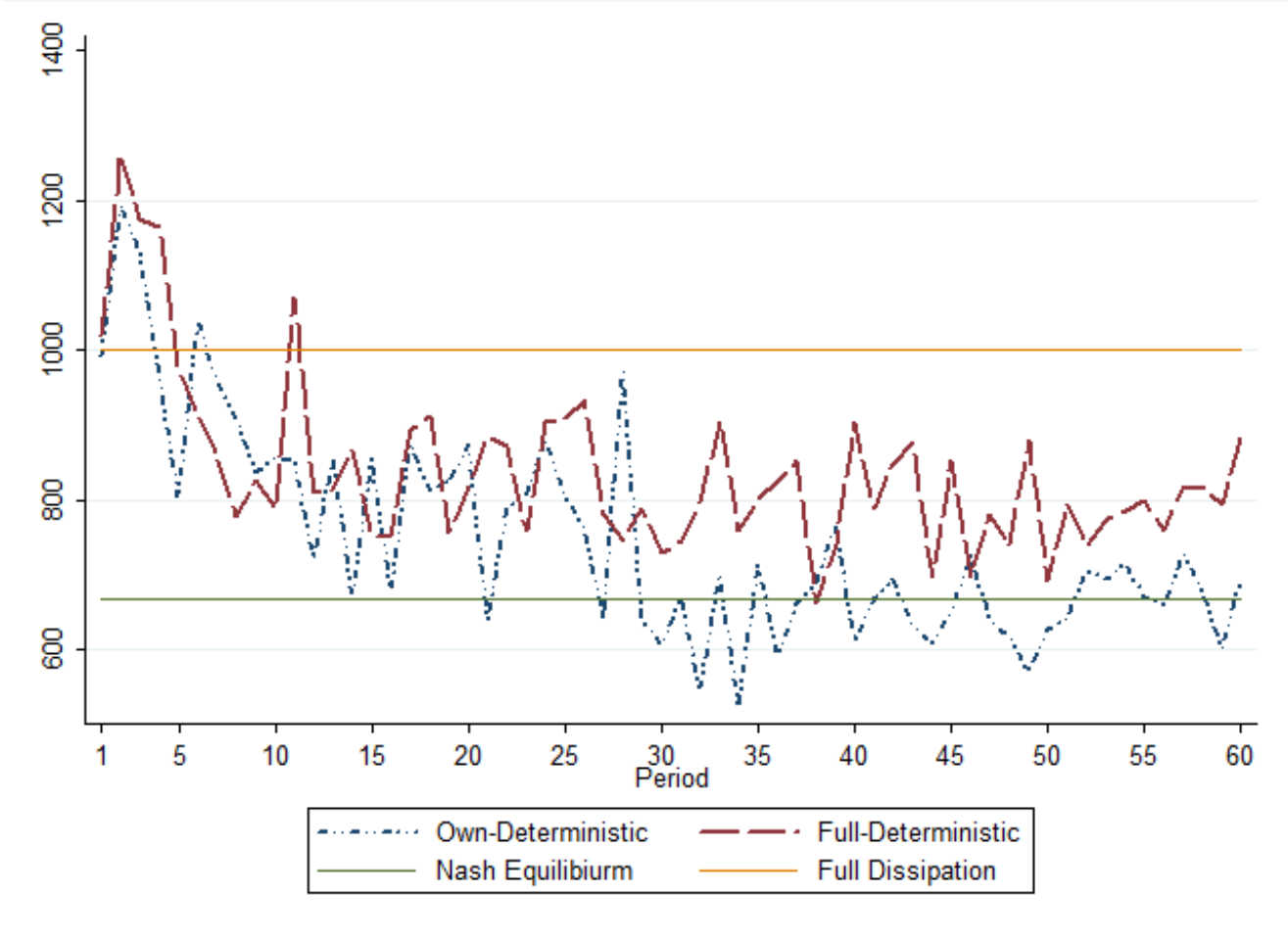
Your accumulated earnings from period 1 to 1 are: 500 points.

OK

Deterministic treatments: Group rent-seeking expenditures

Periods 1-30 $\bar{x}_{OWN} = 842, \bar{x}_{FULL} = 884, p - value = 0.48$

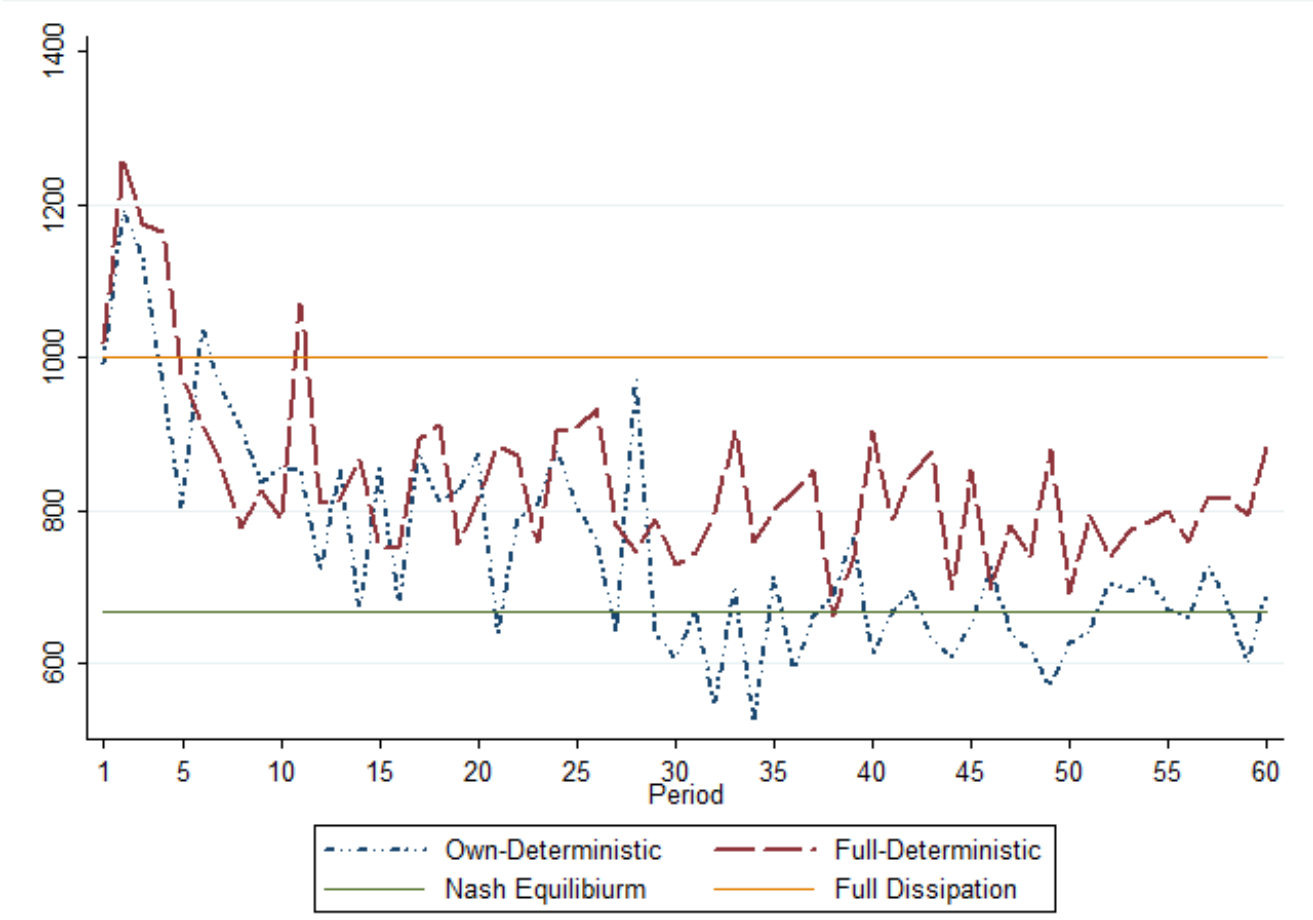
Periods 31-60 $\bar{x}_{OWN} = 657, \bar{x}_{FULL} = 794, p - value = 0.02$



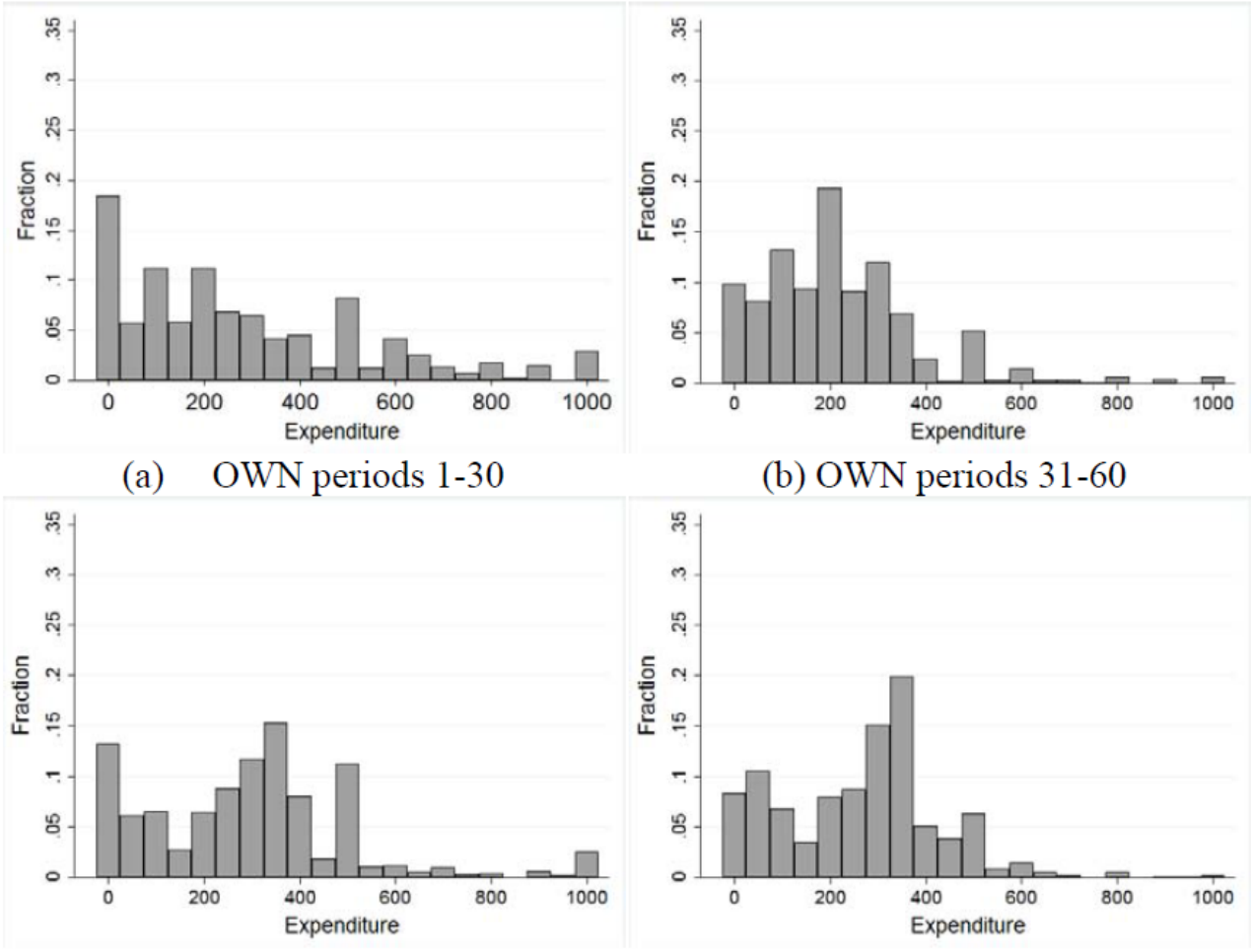
Deterministic treatments: Group rent-seeking expenditures

OWN: expenditure close to Nash Equilibrium

FULL: expenditure higher



Distributions of individual expenditures: DETERMINISTIC



(a) OWN periods 1-30

(b) OWN periods 31-60

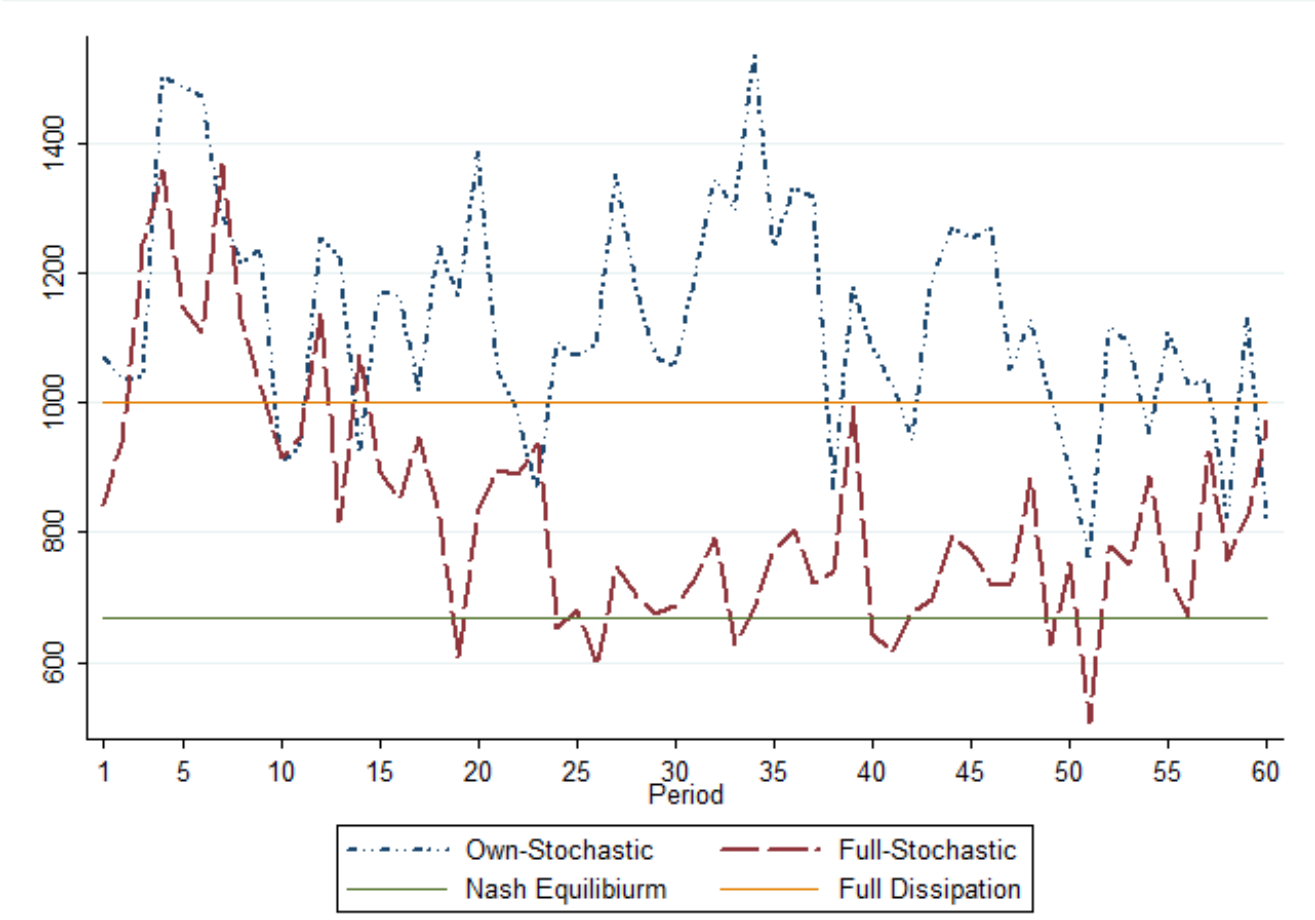
(c) FULL periods 1-30

(d) FULL periods 31-60

Stochastic treatments: Group rent-seeking expenditures

Periods 1-30 $\bar{x}_{OWN} = 1152, \bar{x}_{FULL} = 916, p - value = 0.04$

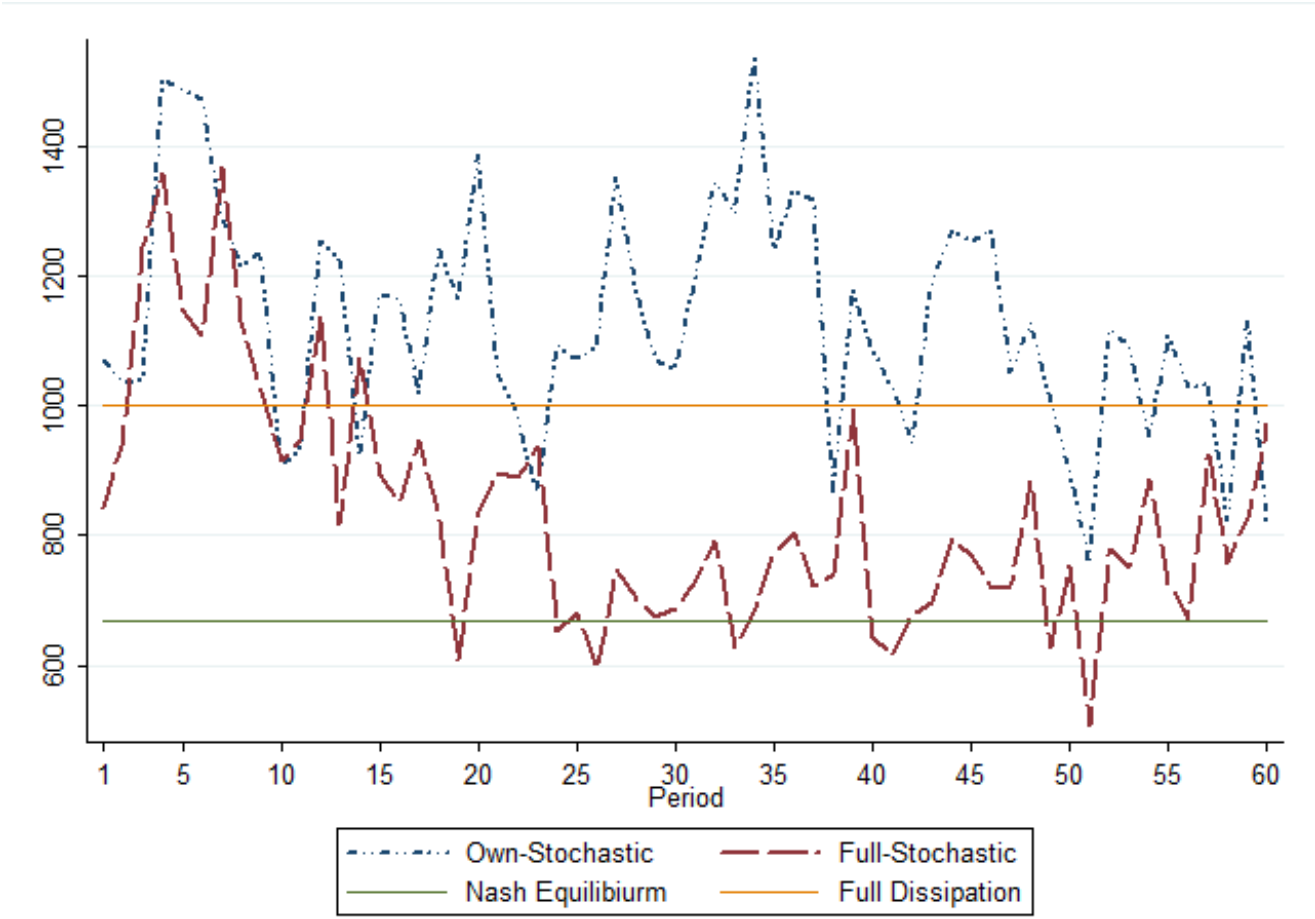
Periods 31-60 $\bar{x}_{OWN} = 1110, \bar{x}_{FULL} = 752, p - value = 0.02$



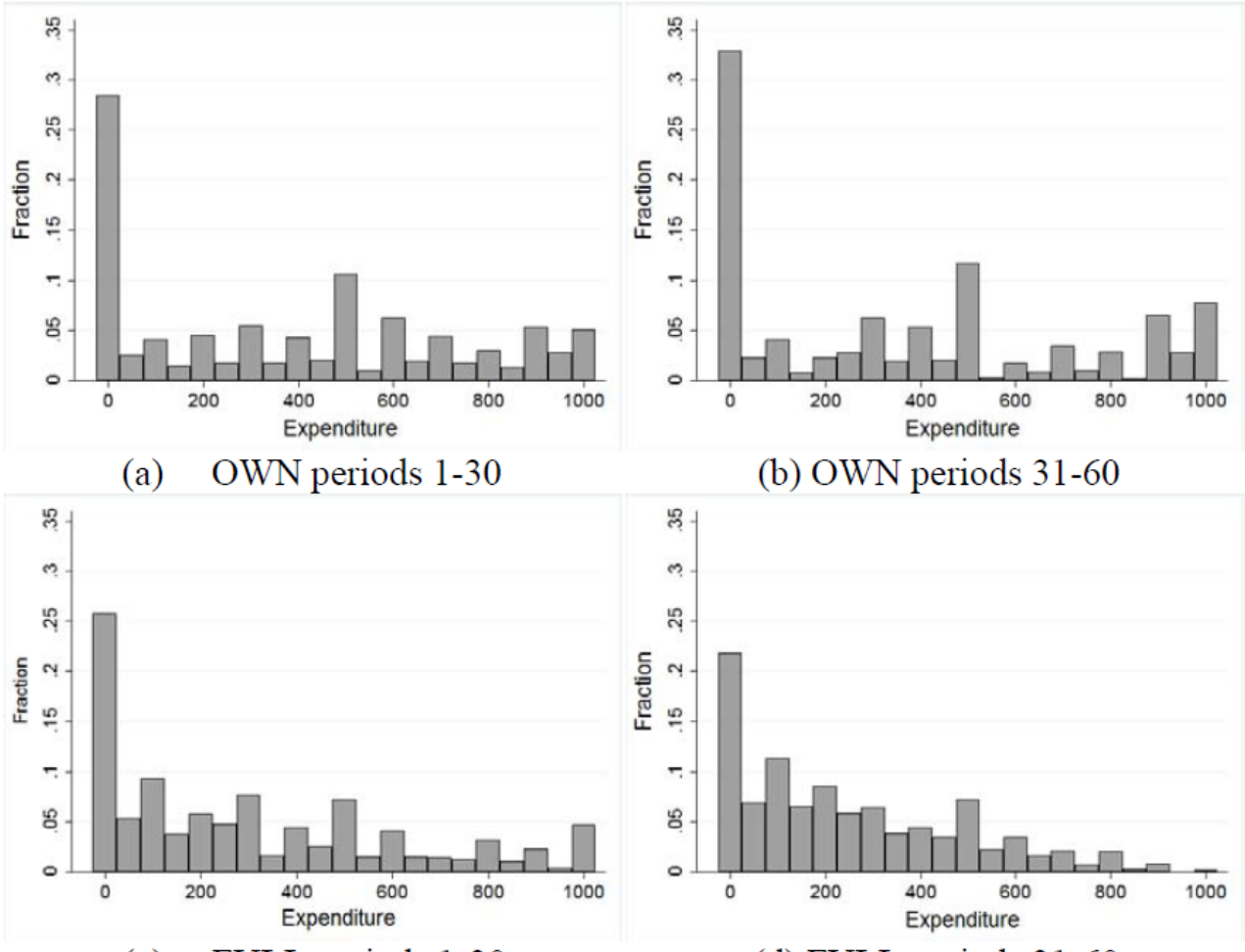
Stochastic treatments: Group rent-seeking expenditures

FULL: expenditure higher than Nash Equilibrium

OWN: expenditure even higher



Distributions of individual expenditures: STOCHASTIC



(a) OWN periods 1-30

(b) OWN periods 31-60

(c) FULL periods 1-30

(d) FULL periods 31-60

Conclusion

- In deterministic rent-seeking contest expenditures sensitive to information about others
  - With own information expenditures converge to the equilibrium
  - With full information expenditures stabilize at a higher level
- In stochastic contest expenditures even more sensitive to information structure and the effect of information is *reversed*
  - With own information expenditures close to full-dissipation
  - With full information expenditures stabilize at a lower level
- This suggests that contests where contestants only observe own information may result in more substantial costs of rent-seeking

Next step?

- Endogenous information sharing