Sustainable incentives for promoting compliant behaviors

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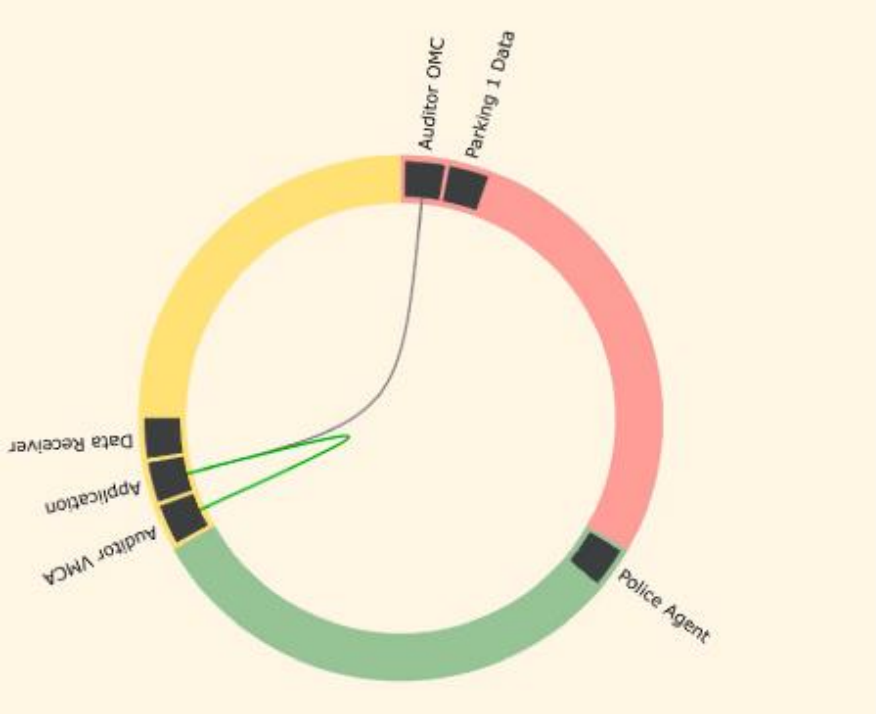
Prospect review



Planner: Planner_VMCA

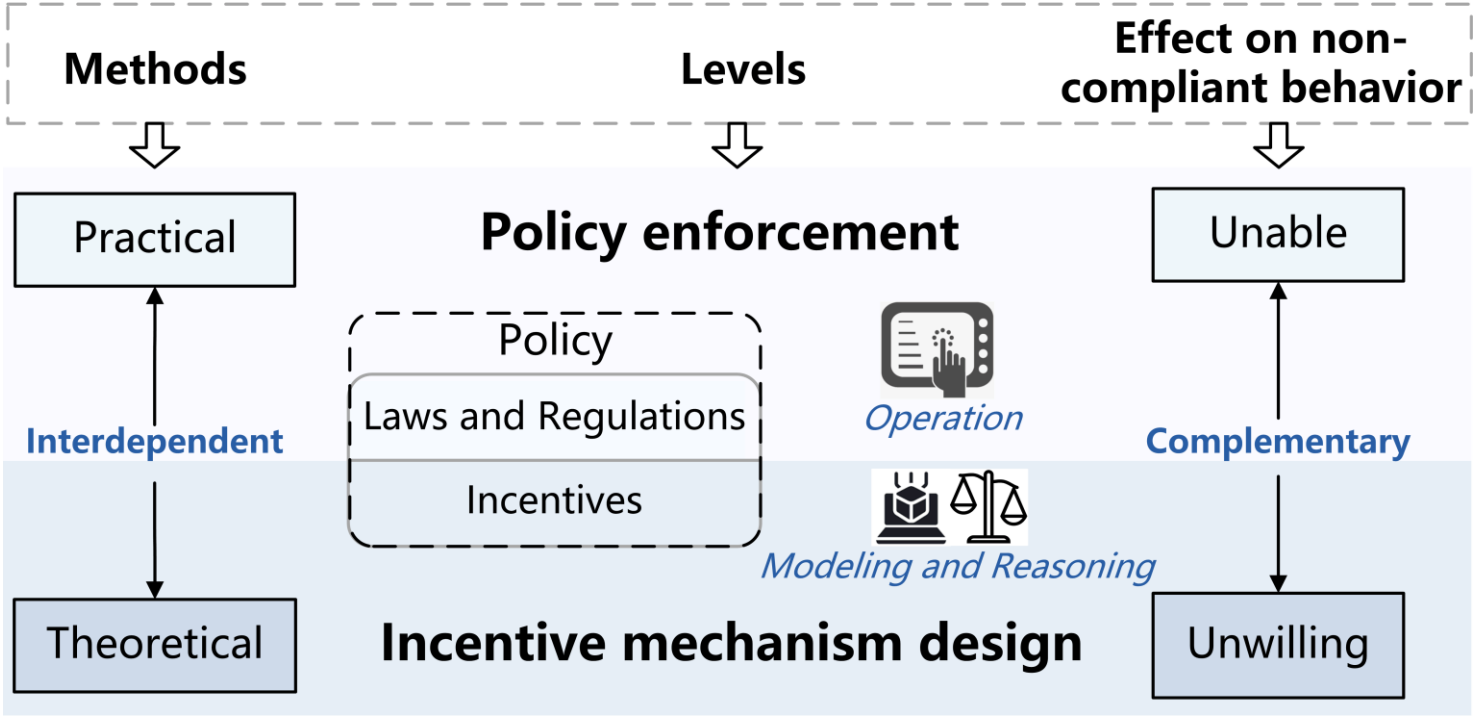
Edit actions

```
me.address = "myPublicKey"
me.private = "myPrivateKey"



sensor001.emergency == true:
      token1 = auditor1.signature(PARKING1_DATA, OMC, VMCA, TRAFFIC_DIVERSION)
      token2 = auditor2.signature(PARKING1_DATA, OMC, VMCA, TRAFFIC_DIVERSION)

token1 && token2:
      result = data1.send(bucket2, [token1, token2])

result:
      print("ok")

!result:
      print(result.status)
```

Prospect review

- Zhou X*, Cushing R*, Koning R, et al. Policy Enforcement for Secure and Trustworthy Data Sharing in Multi-domain Infrastructures[C]//**2020 IEEE 14th International Conference on Big Data Science and Engineering** (BigDataSE). IEEE, 2020: 104-113.
- **Supercomputing Conference 2020**
- **ICT Open 2021**

Policy enforcement and incentives



Research question

- If the incentives can be implemented by **the third-party** in a sustainable way?
- **How long** it will take to drive all participants choose to cooperate?
- Also how does the incentives influence the **accumulated wealth** of the market?
- In this work, we try to explore the effect of incentives, considering its **sustainability**

Model

	C	D
C	R	S
D	T	P

Mutual cooperation payoff	R
Mutual defection payoff	P
Temptation payoff	T
Sucker's payoff	S

- Market with participants
- Compliant ⇔ cooperate (C)
- Non-compliant ⇔ defect (D)

Model

- Incentive mechanism

Table 1. Related parameters under different conditions

Condition	Reward		Probability of reward	Fine		Probability of fine
$[C, C]$	r_0	$*$	$P_0^r = R_{CC}$	–		–
$[C, D]$ *or* $[D, C]$	r_1	$*$	$P_1^r = R_{CD}$	$\|f_1\|$	$*$	$P_1^f = F_{CD}$
$[D, D]$	–		–	$\|f_0\|$	$*$	$P_0^f = F_{DD}$

- Change the expected payoff of participants

	C	D
C	R	S
D	T	P

	C	D
C	R+R_{CC}	S+R_{CD}
D	T-F_{CD}	P-F_{DD}

Model

- Incentive mechanism

Table 1. Related parameters under different conditions

Condition	Reward		Probability of reward	Fine		Probability of fine
$[C, C]$	r_0	$*$	$P_0^r = R_{CC}$	–		–
$[C, D]$ *or* $[D, C]$	r_1	$*$	$P_1^r = R_{CD}$	$\|f_1\|$	$*$	$P_1^f = F_{CD}$
$[D, D]$	–		–	$\|f_0\|$	$*$	$P_0^f = F_{DD}$

- Population: cooperators (x), defectors (y)
- Cost[1-3]: $E = x^2 \cdot M \cdot R_{CC} + xy \cdot M \cdot R_{CD} + \alpha \cdot M(xy \cdot F_{CD} + y^2 \cdot F_{DD})$
- Income[4,5]: $I = c_0 \cdot M + xy \cdot M \cdot F_{CD} + (y)^2 \cdot M \cdot F_{DD}$

Simulation experiments design for reward

- Reward

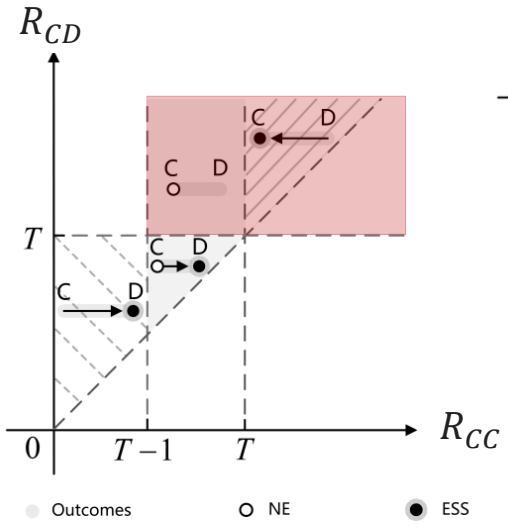


Fig. 1. Equilibrium under rewarding policy

Table 1. Related parameters under different conditions

Condition	Reward	Probability of reward	Fine	Probability of fine
$[C, C]$	R_{CC}		–	–
$[C, D]$ *or* $[D, C]$	R_{CD}		F_{CC}	
$[D, D]$	–	–	F_{CD}	

$$R_{CC} = 1, \overset{+0.25}{\ldots}, 3$$

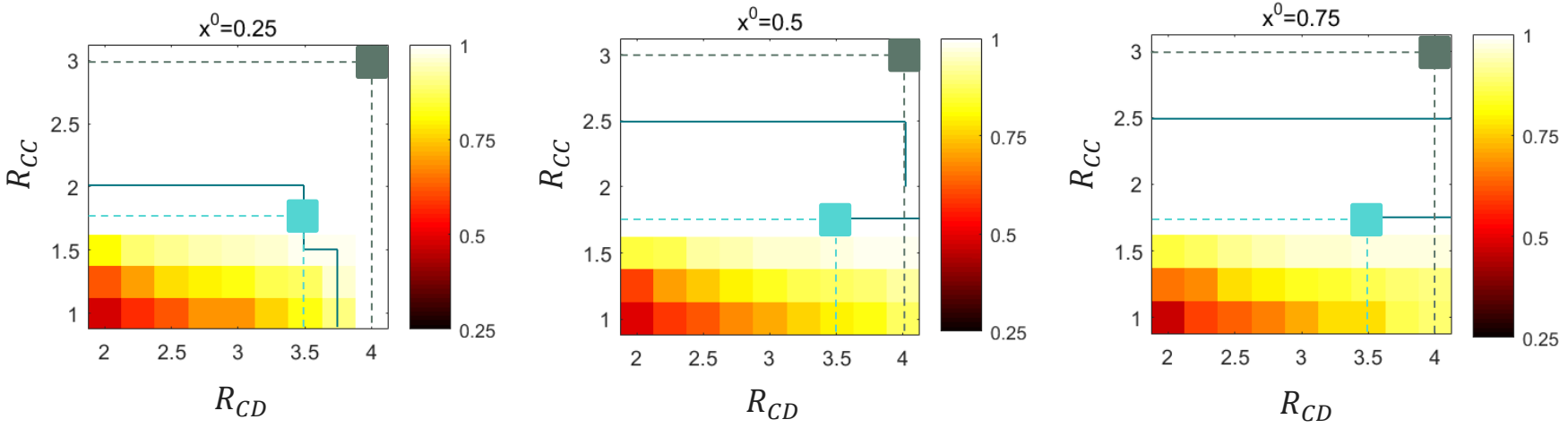
$$R_{CD} = 2, \overset{+0.25}{\ldots}, 4$$

	C	D
C	1(R)	-2(S)
D	2(T)	0(P)

	C	D
C	2(R)	0(S)
D	2(T)	0(P)

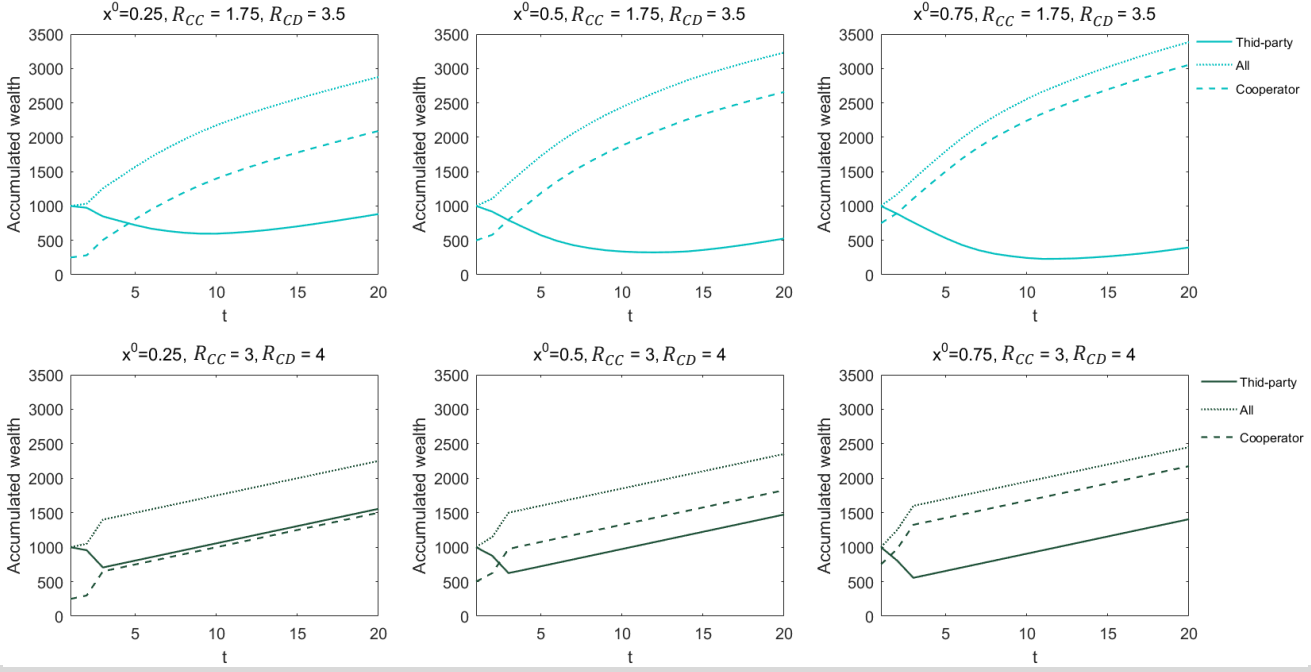
Simulation result: x^{100}

- Reward incentive (beta = 4)

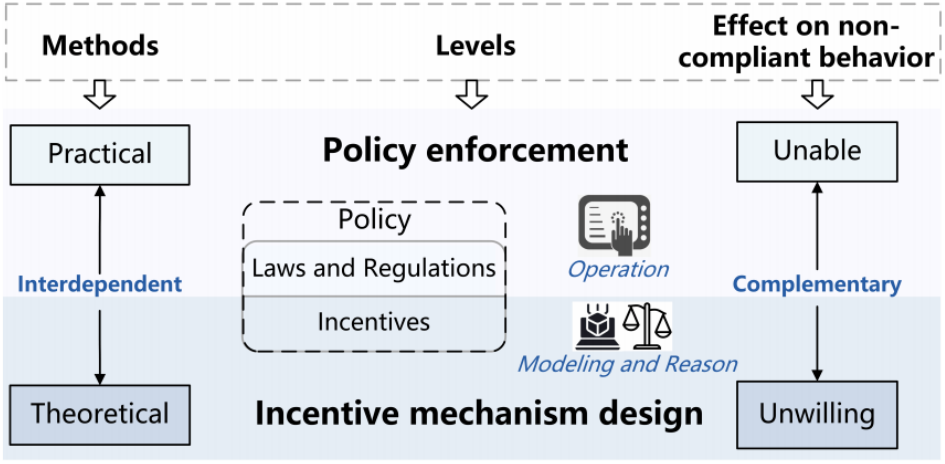


Simulation result: *dynamic wealth*

- Reward incentive (beta = 4)



Conclusions



- This work is our working paper
- Aim at efficiently and effectively motivate agents' compliant behaviors
- An complementary to our former work