Can staff-rotation of verifiers and local regulators improve truthful reporting in environmental regulations?

The 4th IAEE Asian Conference September 20th, 2014

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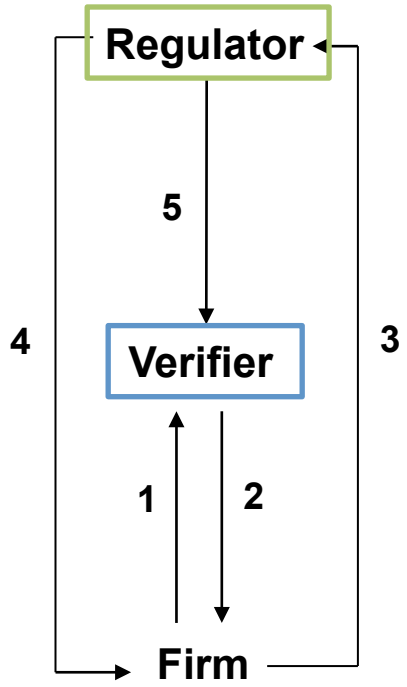
Motivation

- In environmental regulation, such as ETS, CDM, firms are required to report their emissions to the regulator.
- Permit price not only advocates legitimate reduction, but also rewards untruthful reporting.

- To secure truthful reporting, an overlapping system of emissions monitoring is applied:
  1. The regulator requires a verification by a third-party verifier.
  2. In addition, the regulator carries out costly random checks.

Motivation (cont.)

But what if both the verifier and the regulator can benefit from under-reporting and thus neglect their duty?



The overlapping monitoring system may be problematic (Figure 1 & Table 1)

- The verifier is selected and paid by the polluting firm. Hence not an arm's-length contract.
- The regulator's random check is underspecified in almost all schemes.

Figure 1 Compliance process[1] in ETS

The benefits of under-reporting may have triggered corruption.

Table 1 Reporting requirement across Emissions Trading Schemes

	MRV Guidance	Is verification required?	Who selects verifier	Who pays verifier	Is regulator inspection required?	Penalty for misreporting
Canada – Quebec[2]	Yes	Yes	polluting firms	polluting firms	No	Yes ($5000-500000 for a natural person or imprisonment ≤18 months; $ 15000-3000000 in other cases)
China – Beijing[3]	Yes	Yes	polluting firms	polluting firms	Yes (April-May, not specified how often)	No
China– Guangdong[4]	Yes	Yes	polluting firms	polluting firms	Yes (not specified)	Yes (Emitters: 10000-30000 RMB; Verifier: 30000-50000 RMB)
China – Shanghai[5]	Yes	Yes	polluting firms/ SHMDRC[16]	polluting firms/ SHMDRC	Yes (Check unsatisfactory reports, but not specified for satisfactory reports)	Yes(Emitters: 10000-30000 RMB; Verifier: 10000-50000 RMB)
China – Shenzhen[6]	Yes	Yes	polluting firms	polluting firms	Yes (≥5% of satisfactory)	Yes (Verifier: 10000-50000 RMB, disqualified and 100000-200000 RMB.)
China –Tianjin[7]	Yes	Yes	polluting firms	polluting firms	Yes(Check unsatisfactory reports, but not specified for satisfactory reports)	Yes (not specified)
EU ETS[8]	Yes	Yes	polluting firms	polluting firms	Yes (required in some member states, but not specified)	Yes (varies among member states and not clear)
Japan –Tokyo[9]	Yes	Yes	polluting firms	polluting firms	Yes (not specified)	Yes (up to JPY 500000)

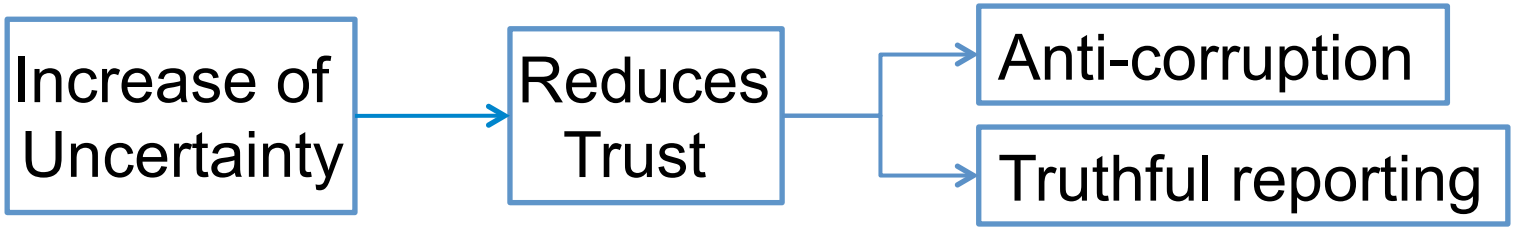
Table 1 Reporting requirement across Emissions Trading Schemes (cont.)

	MRV Guidance	Is verification required?	Who selects verifier	Who pays verifier	Is regulator inspection required?	Penalty for misreporting
New Zealand[10]	Yes	No	N/A	N/A	Yes (Not specified)	$25000 in the case of an individual, and $50000 in the case of a body corporate
USA-California[11]	Yes	Yes	polluting firms	polluting firms	No	Yes (a fine or imprisonment with an uncertain possibility)
China – Chongqing[12]	Yes	Yes	CQDRC[17]	polluting firms	Yes (not specified)	Yes (Publicize non-compliance actions; no subsidies for energy saving in three years; rejection of energy saving assessment in three years; incorporate non-compliance into the leadership assessment of state-owned company)
China – Hubei[13]	Yes	Yes	HBPDRC[18]	polluting firms	Yes (not specified)	Yes (Emitters: warning, fine ≤ 150000 RMB, or exclude from trading. Verifier: warning, fine ≤150000 RMB, disqualified.)
Korea[14]	No	Yes	The Minister of Environment	polluting firms	No	Yes(Emitters: fine with maximum of 10 million KRW)
Turkey[15]	Yes (needs additional legislation)	Yes	polluting firms	polluting firms	No	No

Sources: https://icapcarbonaction.com/ets-topics/mvr-and-enforcement

Research question

- Is there an under-reporting issue that is connected with corruption? If so, how do we deal with it?



- Uncertainty is introduced through staff-rotation.
- We examine which regime of rotation has the most powerful anti-corruption effect and which enhances truthful reporting.

Relevant studies

- Staff-rotation shortens participants' relationship.
- Theoretical studies do not have a clear conclusion:

  1. Yes:

  Uncertainty deters corruption. (Sobel, 1985;Ryvkin & Serra, 2012; Jella, 2012)

  2. No:

  Cooperation (corruption) is a possible equilibrium with a contagious punishment strategy. (Kandori,1992; Ellison, 1994)

- Equilibrium selection problem is a matter of empirical study.

Relevant studies (cont.)

- Experimental studies show corruption level is reduced by staff-rotation.
  - Lab: Abbink (2004), Duffy & Ochs (2009)
  - Field: Duflo et al. (2012)

- However, these studies consider two-player bribery games and would assume the probability of regulatory inspection is **exogenous**. This is unlikely in reality.

Relevant studies (cont.)

- Other anti-corruption methods

1. Punishment

   When inspection is exogenous, punishment can deter corruption (Armantier & Boly, 2011, Abbink et al., 2002),

   however, Castro (2006) observes a contrary result when inspection is endogenous.

2. Rewarding

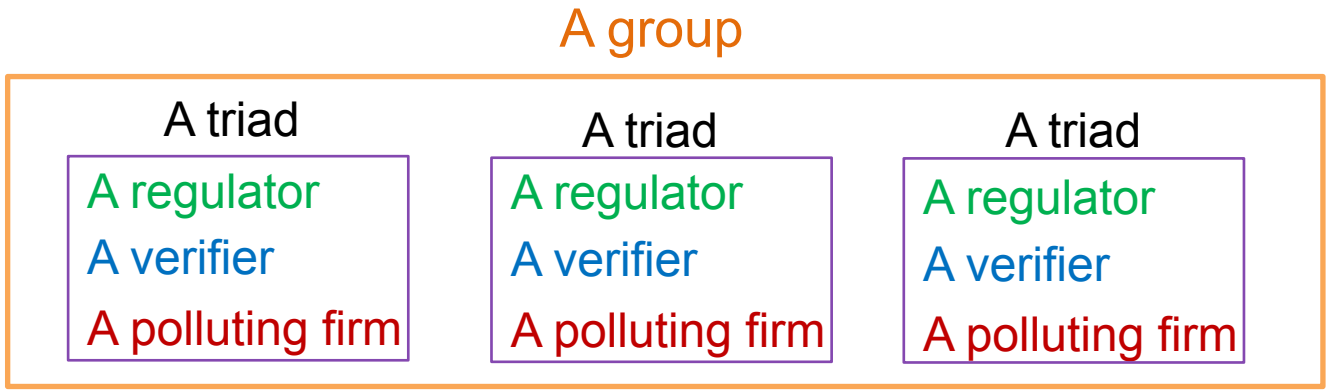
   Rewarding is a potent means to deter corruption when future interaction is not guaranteed (Wu & Abbink, 2013).

- For 1 and 2 to be effective, **minimising interaction** is important.

→ Staff-rotation could be a complementary policy to other anti-corruption policies.

Experimental design

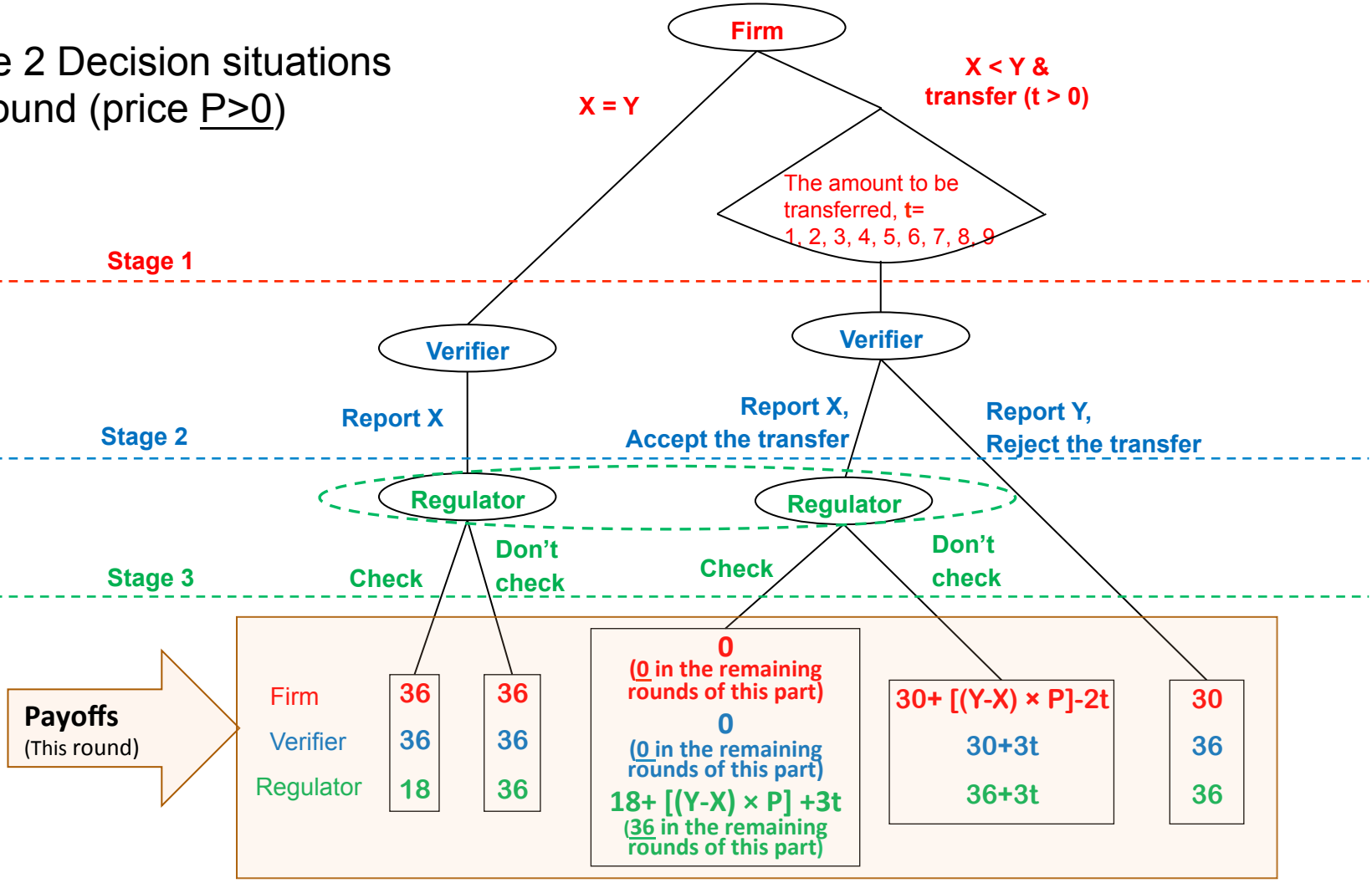
- Three-player bribery game in the context of emissions trading scheme.



- Treatments:
  - (1) Fixed group (baseline) – FT (54 subjects, 6 groups)
  - (2) Rotate verifiers only – RT2 (45 subjects, 5 groups)
  - (3) Rotate regulators only – RT3 (45 subjects, 5 groups)
  - (4) Rotate both verifiers and regulators – RT23 (54 subjects, 6 groups)

Experimental design (cont.)

Figure 2 Decision situations in a round (price P>0)



3 identical parts with 6 rounds per part.

Hypotheses

- No pure Nash Equilibrium, Mixed Equilibria difficult to derive
- The aim is to investigate the effect of rotation. Existing studies[19]: collusion at the top is likely to induce collusion at the bottom (Laffont and Martimort, 1997).

1. The level and frequency of under-reporting is in general lower under rotation treatments.
2. Rotating the regulator may have a stronger effect.
3. Rotating both has the strongest effect.

Experimental results (cont.)

- Truthful reporting and under-reporting have higher percentage than other outcomes.
- Under-reporting is not completely eliminated suggesting under-reporting does exist regardless of rotation.

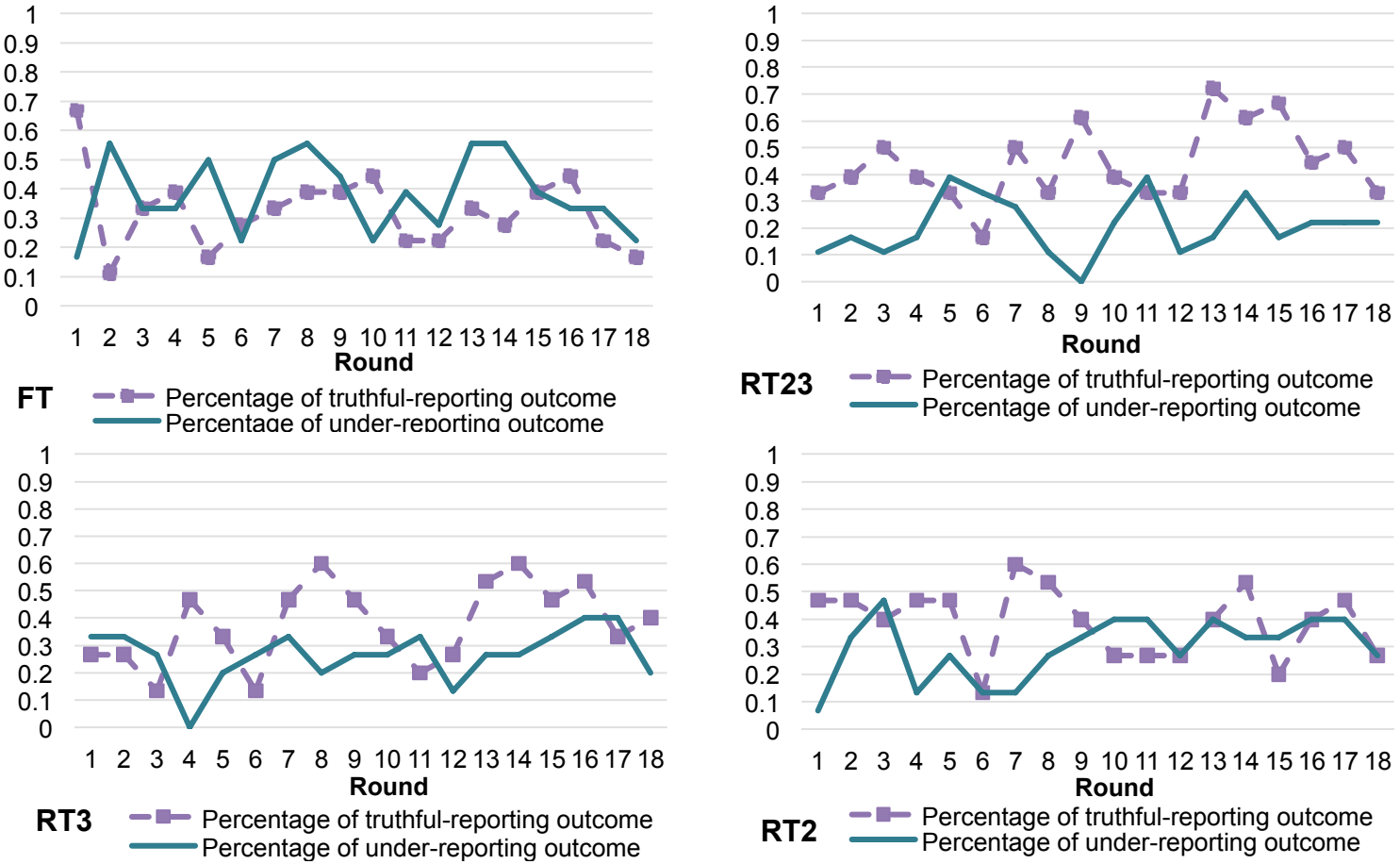


Figure 3 Percentage of truthful and untruthful reporting

Experimental results (cont.)

Table 2 The frequency of under-reporting, individual decision

	Frequency of under-reporting outcome	Under-reporting (Dummy)	Concealing under-reporting(Dummy)	Checking (Dummy)
RT23	-0.528**	-0.459*	-0.716**	0.322
RT3	-0.348*	-0.309	-0.525*	0.576
RT2	-0.259	-0.287	-0.397	0.225

* Significant at 5%, ** Significant at 1%.

Observation 1: The **frequency** of a successful under-reporting outcome is significantly lower under RT23 and RT3 than with FT, while RT23 has the lowest frequency.

Observation 2: With rotation, both the **level** of under-reporting and accepted bribe are lower than in FT. However, only the reduction in RT23 is statistically significant.

Observation 3: Both the firm and the verifier have stronger responses to the **price reduction** than the regulator.

Conclusion

- RT23 has the most significant reductions in the incidence of under-reporting. RT3 has some significant effects. But RT2 does not have a significant effect.
  - The cooperation between the firm and the verifier are influenced by what they think about the corruptibility of the regulator, and the fear of being checked is strong enough to deter the cooperation.

- We observed the occurrence of under-reporting, and the level of under-reporting is always positive under all forms of rotation
  - a limited effect from staff-rotation.

Notes:

1. The accreditation and verification regulation- explanatory guidance (AVR Explanatory Guidance (EGD I), Version of 19 September 2012) page. 7-10. It can be retrieved from http://ec.europa.eu/clima/policies/ets/monitoring/docs/exp_guidance_1_en.pdf
2. See http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=3&file=/Q_2/Q2R15_A.HTM
3. See http://www.bjpc.gov.cn/tztg/201311/t7020680.htm
4. See http://zwgk.gd.gov.cn/006939748/201401/t20140117_462131.html
5. See http://www.shanghai.gov.cn/shanghai/node2314/node2319/node12344/u26ai37414.html, and http://www.shdrc.gov.cn/main?main_colid=319&top_id=312&main_artid=23796
6. See http://fzj.sz.gov.cn:8080/cms/fzbDetails.action?siteName=fzb&pageId=4443
7. See http://www.tj.gov.cn/zwgk/wjgz/szfbgtwj/201312/t20131224_227448.htm
8. See http://ec.europa.eu/clima/policies/ets/monitoring/docs/gd1_guidance_installations_en.pdf and http://www.environmentportal.in/files/Art21-2009.pdf
9. See https://www.kankyo.metro.tokyo.jp/en/climate/attachement/Tokyo_Cap-and-Trade_Program_detailed_version.pdf
10. See http://www.mfe.govt.nz/publications/climate/seip-reporting-guidance/index.html, and http://www.legislation.govt.nz/act/public/2002/0040/latest/DLM158584.html, Subpart 4 of Part 4.
11. See http://www.arb.ca.gov/cc/reporting/ghg-rep/regulation/mrr-2013-clean.pdf, and http://www.arb.ca.gov/regact/2007/ghg2007/frofinoal.pdf
12. See http://www.cqdpc.gov.cn/article-1-20488.aspx
13. See http://gkml.hubei.gov.cn/auto5472/auto5473/201404/t20140422_497476.html
14. See http://www.law.go.kr/engLsInfoPWah.do?lsiSeq=104406 and http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan050317.pdf
15. See https://www.thepmr.org/system/files/documents/TUR-FINAL-MRP_2013-05-03%20Final.pdf. Page. 40-43
16. SHMDRC stands for Shanghai Municipal Development and Reform Commission
17. CQDRC stands for Chongqing Development and Reform Commission
18. HBPDRC stands for Hubei Provincial Development and Reform Commission
19. Sobel, 1985; Tirole, 1988; Bac, 1996; Laffont and Martimort, 1997; Abbink, 2004; Castro, 2006; Duffy and Ochs, 2009; Duflo, Greenstone, Pande and Ryan, 2013

Thank you !