System dynamics based evolutionary game model for data transaction quality regulation

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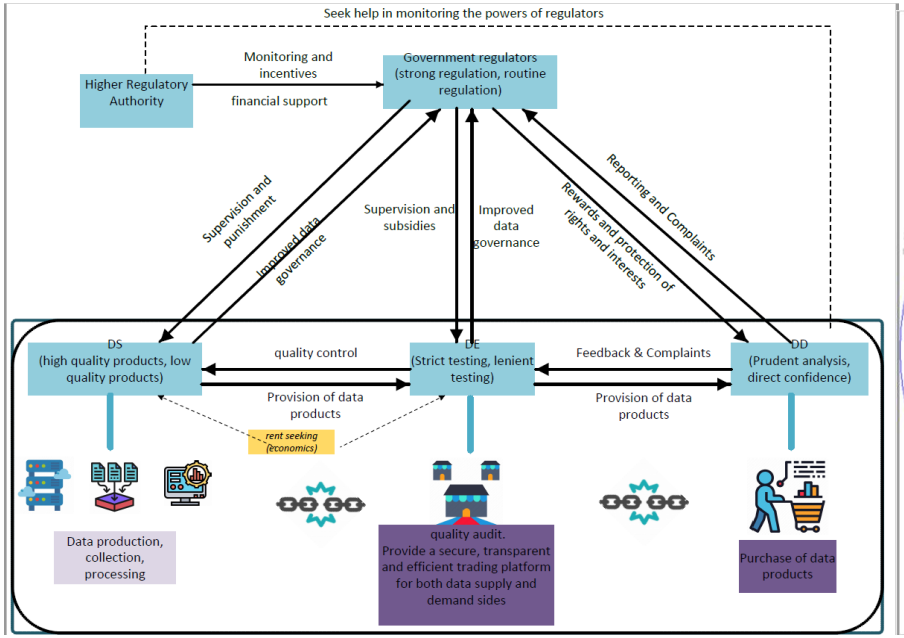
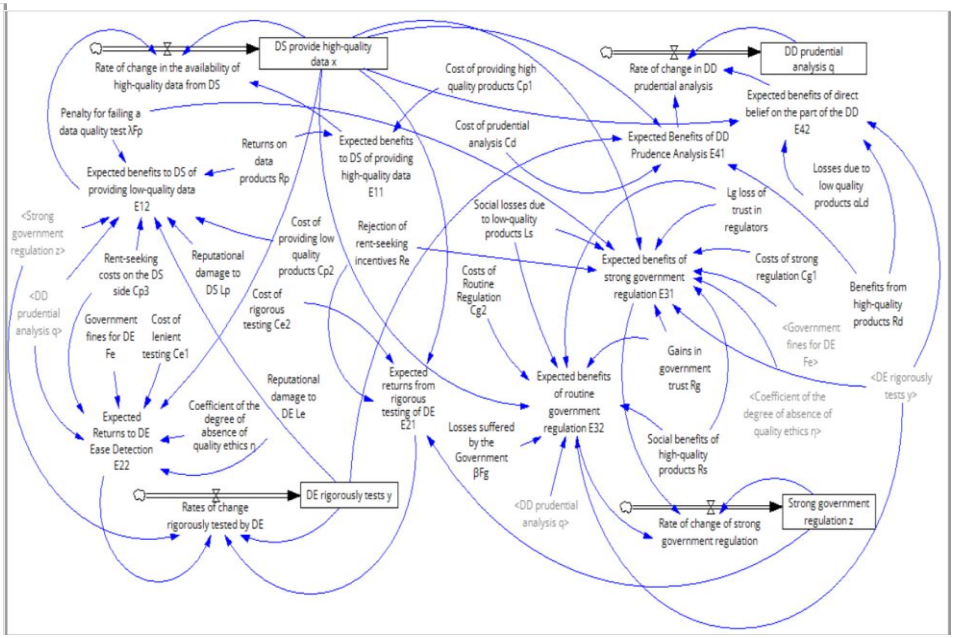
Problems & Ideas

- **Problems** :With IoT and AI growth, data is crucial, but challenges like low-quality data from profit-driven suppliers, weak market oversight, and consumer distrust persist.
- **Ideas:** Construct a four-party evolutionary game model to define the costs, benefits, losses, and fines for each party. Construct a system dynamics model and verify its stability through parameter sensitivity analysis.





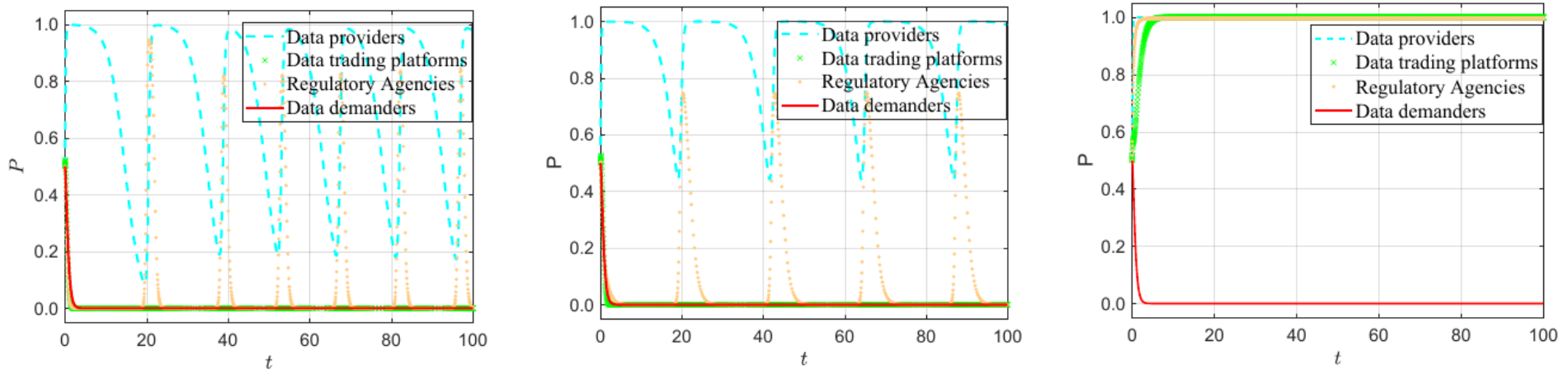
Left: Logical Relations of Four Game Players :Right: SD Model.

Main Contributions

- Contributions:

1. Stakeholders achieve systemic equilibrium through strategic coordination and dynamic gaming, with key factors including regulatory costs, penalty intensity, market inspection rigor, and consumer verification behaviors.

2. Proposed optimization pathways: reduce data production costs, establish non-compliance penalty mechanisms, and implement cost-benefit evaluation systems; strengthen the regulatory framework via dynamic monitoring, quality traceability-credit evaluation loops, and regulatory technology-driven intelligent compliance management.



The impact of the cost Cg1 on the strategy evolution process of the four players.Left: Cg1=10; Middle: Cg1=8;Right: Cg1=2.