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Thammasat Review of Economic and Social Policy

Thammasat Review of Economic and Social Policy (TRESP) is a double-blind peer reviewed biannual international journal published in June and December. The journal is managed by the Research Committee under the supervision of the Academic Affairs Division of the Faculty of Economics, Thammasat University. Our editorial board and review panel comprise of academicians and practitioners across various areas of economic and social policies. The goal of the journal is to provide up-to-date practical and policy-oriented analysis and assessment of economic and social issues, with particular focus on Asia and the Pacific region. However, research findings from other parts of the world that are relevant to the theme of the journal may be considered.

Aims & Scopes

Our journal is dedicated to serve as a platform for debate and critical discussion pertaining to the current issues of public policy. The outcome of such research is expected to yield concrete policy implications. Some of the targeted issues include urban and regional socio-economic disparities, ageing society, healthcare, education and welfare policies, environmental and natural resources, local communities, labor migration, productivity, economic and political integration, political economy, macroeconomic instability, trade and investment, fiscal imbalances, decentralization, gender issues, behavioral economics and regulations; and law and economics. The journal makes its best effort to cater a wide range of audience, including policymakers, practitioners in the public and business sectors, researchers as well as graduate students.

Articles should identify any particular issue concisely, address the problems of the research explicitly and supply sufficient empirical data or strong evidence and substantial argument to support the discussion of policy initiatives asserted by the author(s). Theoretical and applied papers are equally welcome provided their contributions are policy-relevant.

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Thammasat Review of Economic and Social Policy

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ARTICLES

Editorial Introduction

In this issue, our journal is very honored to have Professor Arayah Preechametta of the Faculty of Economics, Thammasat University, accepting our invitation to produce a very insightful article, “On the Distribution Efficiency of an Optimal Monetary Policy”. The article sketches the preliminary plan to integrate current models of optimal monetary policy under heterogeneous agents into an asset price function setting. The distributive effects of monetary policy under this new setting are examined. The paper builds up on Xiang’s (2013) ‘Optimal monetary policy: distribution efficiency versus production efficiency’. Previously, Xiang’s model describes an economy with one type of output, and households assigned to one of two groups with equal chance in each period *t*. Given two sub-periods, households are subject to a liquidity shock at the start of the second sub-period. The modification of the model introduces a new risky asset, Lucas tree, along with government-issued assets of money and risk-free bonds. Households then decide how much to consume in the first sub-period, and the amount of money, bonds and risky asset to carry on to the second sub-period. One of the consequences of adding the risky asset is an arbitrage-free condition, imposing a limitation to the number of feasible monetary policy instruments as compared with Xiang’s earlier framework.

The article goes on to explore the characteristics of feasible monetary policy instruments at the stationary equilibrium. With ‘insufficient liquidity’, the authority is left with the printing money option as the only available policy instrument. The likely outcome ends up with higher inflation, intensifying both distribution and production inefficiencies. The overall direction is congruent with Xiang (2013), despite portraying further closer-to-real-world constraints encountered by the monetary authority. As the stationary equilibrium in this model requires that all asset markets must satisfy the arbitrage-free condition, the value of a discounted bond price in the secondary market can no longer be a policy instrument. Hence, policy-wise, in a situation where there is insufficient liquidity, under certain assumptions on the real interest rate, it is possible to reach full distribution efficiency if the nominal interest rate is set to zero (Friedman rule). This, however, is not strictly the outcome in Xiang (2013).

In the second article, "Sabotage and Deterrence Incentive in Tournament: An Experimental Investigation," by Sorravich Kingsuwankul, the impact of deterrence incentive on sabotage behavior in rank-order tournament is analyzed by an experimental method. In the real-world scenario, the rank-order tournament has often been used as an incentive scheme in many organizations. Examples range from labor contest to sports competition. While contestants can exert productive efforts in order to win high prize, they can sabotage each other behind the principal's knowledge. In practice, sabotage takes on various forms, including destroying others' outputs, manipulating and withholding vital information. Such actions increase rivals' cost of exerting productive efforts and, in turn, increase saboteurs' chance of success in the tournament. This article adapts its theoretical framework from Gilpatric (2011), which extends tournament model to cover cheating. The article interestingly examines the effectiveness of punishment on sabotage in tournament by varying the probability of inspection and the magnitude of punishment. When a saboteur is caught, he loses by default and is fined. The experiment was conducted with Z-Tree (Fischbacher, 2007) at the Faculty of Economics of Chulalongkorn University and Thammasat University. There were 56 participants in total. In line with Becker's (1968) deterrence hypothesis, the article shows that sabotage level decreases as the level of punishment increases. In addition, the experimental data suggest that probability of inspection is a better stick in suppressing sabotage level. Analysis of variance in sabotage levels also suggests that law enforcement can be achieved only when inspection is high enough. When inspection is nil or low, sabotaging becomes a social norm and this is only reversed when inspection is sufficiently high. Important policy implications can be drawn from the outcome. Sabotage can be reduced significantly by implementing an efficient punishment system. In a real-world scenario with a contest-like situation, regulation designers should consider the legitimacy of the punishment scheme. Weakly enforcing a rule for 'the sake of having it' cannot curb sabotage behavior among contestants. Findings suggest that high inspection drives down sabotage as it imparts credibility and legitimacy of the enforced rule. Thus, contestants should perceive that they would be inspected regularly so that they keep sabotage to the minimum.

The third paper, "Integration in Chinese E-Commerce and Public Policy Concerns: An Analysis of Alibaba Group," by Peipei Qin, explores the integration of e-commerce, third party payment and the logistics industry in China. As widely known, Alibaba Group is one of China's premiere e-commerce companies, with subsidiaries controlling various elements of the e-commerce value chain. Some of these subsidiaries include TaoBao.com, a consumer-to-consumer web portal connecting buyers and sellers, and Alipay, a third party online payment platform. However, while Alibaba has found success domestically it has struggled to expand overseas. This article outlines the overview and limitations of e-commerce industry, and inquires whether the high level of competition, coupled with low regulation, adversely affects e-commerce in China.

Regarding the logistics segment related to e-commerce industry, according to China's State Post Bureau, parcel delivery in China grows at an astonishing pace, with the vast majority of parcels due to the growth of the e-commerce industry. However, as the majority of these deliveries remain domestic, a large discrepancy exists between domestic and international shipping costs, limiting opportunities for Chinese e-commerce sellers to expand overseas. Though the e-commerce industry in China has seen spectacular growth, regulation remains lax as the Chinese government still views it as an immature industry. In terms of policy matters, many issues still remain, including concerns over the safety of Alipay. There is a strong need for regulatory bodies in the government to catch up with the business and impose regulations to ensure a healthy and stable environment. The rapid growth of the logistics industry and intense competition, however, has also caused some raised concerns regarding labor issues and vehicular safety standard.

Thammasat Review of Economic and Social Policy (TRESP) is our newly constructed biannual double-blind peer reviewed international journal published in June and December. The Faculty of Economics, Thammasat University and the Editorial Team of TRESP seek to provide an effective platform for reflecting practical and policy-oriented perspectives that links the academic and policymaking community. Having devoted to our 'knowledge-for-all' philosophy so as to drive our society forward, the Faculty decided that TRESP published in an open access model. For further information and updates on this journal, or to submit an article, please visit our website at www.tresp.econ.tu.ac.th..

Euamporn Phijaisanit
Editor-in-Chief

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Invited Article

On the Distribution Efficiency of an Optimal Monetary Policy

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ABSTRACT

The paper studies the impacts of an optimal monetary policy on the distribution and production efficiencies by using a framework of multiple types of household and assets. It extends the work of Xiang (2013) by adding a new type of risky asset, known as Lucas tree, into an existing money-bond model. Some new results can be generated by requiring that all asset markets must satisfy the non-arbitrage profit condition. For example, regardless of insufficient liquidity, a zero nominal interest rate as suggested by the Friedman rule becomes an optimal monetary policy that can lead the economy to its full distribution efficiency and also lower its production inefficiency at the same time.

Keywords: Distribution efficiency, optimal monetary policy, asset price, non-arbitrage profit, liquidity, nominal interest, Friedman rule

JEL Classification: E23, E31, E4, E5

1. Introduction

Bhattacharya, Haslag, and Martin (2005) argued that the Friedman rule[1] is optimal only in the case of a homogeneous agent model. The existence of heterogeneity among agents confirms the redistributive effect of monetary policy and turns the Friedman rule into a suboptimal policy. Andolfatto (2011) used a quasi-linear environment with competitive markets to study the distributive benefits of illiquid bonds under an endowment economy. Xiang (2013), by incorporating a productive sector in the model of Andolfatto (2011), analyzed the interaction of distribution and production efficiencies when those heterogeneous agents can use money-bond exchanges to cope with liquidity shocks.

This paper sketches a preliminary plan to integrate the current existing optimal monetary policy under heterogeneous agents into a setting of asset price function. The results of Xiang's (2013) model at the stationary equilibrium are (i) money has a lower return than an illiquid bond, (ii) the size of the return differential is higher in a high-inflation environment, and (iii) if consumers are sufficiently risk averse, then the distribution efficiency gains from using illiquid interest-bearing bonds to channel liquidity among agents will be higher than the production efficiency loss being generated by an inflationary monetary policy.

2. Equilibrium Allocation in a Multiple-Asset Model with Heterogeneous Households

Based on the model in Xiang (2013), there are two groups of heterogeneous households living in an economy that can produce only one type of output. Each household, *i*

[1] See Friedman (2005).

∈ [0, 1], is assigned to either group l or group h with equal chance for each period $t = 0, 1, 2, 3, \ldots, \infty$.

Each period t is divided into two sub-periods. During the first sub-period, all households live at the same location, named location 0. Their utility in the first sub-period is linear in x_t, where $x_t \in \mathrm{R}$ denotes household consumption (or production if negative) in the first sub-period at date t. This first sub-period output x_t is assumed to be perishable and produced by using labor effort.

At each date t, a liquidity shock, ω_t, on consumer type is realized at the beginning of the second sub-period, where $\omega_t \in \{\omega_l = 1, \omega_h = \eta\}$ and $1 < \eta < \infty$. Such liquidity shock is assumed to be *i.i.d.* across consumers within each group and over time. During the second sub-period, a consumer derives utility, $\omega_t u(c_t)$ from consuming $c_t \in \mathrm{R}_+$ units of second sub-period goods. Utility function in the second sub-period, $u(c_t)$, has a constant relative risk averse coefficient $\rho \equiv -\frac{-c_t u''(c_t)}{u'(c_t)} > 0$, where $u''(c_t) < 0, u'(c_t) > 0, \lim_{c \to 0} u'(c_t) = \infty$ and $\lim_{c \to \infty} u'(c_t) = 0$. Let $y_t \in \mathrm{R}_+$ be the perishable output produced in the second sub-period. $g(y_t)$is a cost function with $g'(y_t) > 0$ and $g''(y_t) < 0$.

For any household $i \in [0, 1]$, the expected lifetime utility function is a quasi-linear function defined as

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[x_t(i) + \omega_t(i) u\big(c_t(i)\big) - g\big(y_t(i)\big)\right] \quad (1)$$

with a discount rate $\beta \in (0, 1)$.

During the second sub-period of each t, each household $i \in [0, 1]$ finds out about its household type when the idiosyncratic preference shocks is realized at the beginning of the second sub-period. Such realization of preference shocks is private information. Each household is composed of a consumer and a producer. After the consumer type is realized, all producers from a household type *l (h)* must sell their second sub-period output to consumers from a household type *h (l)*. In other words, households are not allowed to consume their own output produced in the second sub-period. Fiat money is introduced into the economy as a mean of exchange because individual transaction histories cannot be traced or monitored.

In this paper, a new risky asset, Lucas trees, from Lucas (1978) is added into the original model above. The number of trees, S, is equal to the number of consumers. It is assumed that trees cannot be used to purchase yield from tree, d_t, which is a random variable. The realization of d_t becomes known to all at the second sub-period of each t. It is assumed that the stochastic process of d_t follows a Markov process with a transition function $F(x', x) = \Pr(d_{t+1} \leq x' | d_t = x_t)$, where $F: R_+ x R_+ \rightarrow R$ is a continuous function. At the first sub-period of each t, household is assigned to own s trees from t to $t+1$, where $s>0$. During the first sub-period, each household of type j can sell s_j trees, $0 \leq s_j \leq S$, (which is negative for a purchase) in the asset market for money. Tree owner has the right to collect the non-storable fruit dividends, d_t at the first sub-period of each t. Let p_t denote the market price of tree during period t. Let ω_t and d_t be two independent random variables for all t.

The government issues money, M_t, and bonds, B_t. New bonds are sold at the first sub-period of each t at a present discount price $0 < \delta < 1$. All bonds will be redeemed at par for money on the next period. Bonds are riskless asset that can be converted into future money. It is assumed that bonds cannot be used to purchase goods, but can be traded for money at a competitive price, δ_2, in a secondary bond market that opens during the second sub-period. In this multiple asset model, money supply must satisfy $M_{t+1} = M_t + B_t - \delta B_{t+1} - (p_t + d_t)s_t$.

At the long-run stationary equilibrium, let money supply expand at a constant rate for all t, then

$$\mu = \frac{M_{t+1}}{M_t}, \tag{2}$$

The value of μ also reflects long-term inflation rate.

In the first sub-period of each t, households have $z_t \geq 0$ units of fiat money, and have $m_t \geq 0$ at the second sub-period. Denote real number by $a_t \equiv v_1 z_t$ at the first sub-period and by $q_t \equiv v_2 m_t$ at the second sub-period where v_1 and v_2 are the values of money in the first and second sub-periods, respectively, and define that $\phi \equiv (v_1 / v_2)$. Real money transfer and real money stock are $\tau_t \equiv v_1 T_t$ and $Q_t = v_2 M_t$, where $T_t \geq 0$ is a lump-sum transfer to household.

During the first sub-period, a household decides how much to consume and how much money, bonds and risky assets to take to the second sub-period. Let a denote total real balances, b denote real holdings of newly issued bonds, and $p_t s_t$ denote real holding of risky asset purchased by household in the first sub-period. Bonds will be redeemed at par for money on the next period. Bonds and risky asset cannot be used to purchase goods.

The households' problem in (1) can be solved for a long-run stationary equilibrium, by

$$W(a,d) \equiv \max_{q\geq 0, b\geq 0, s\geq 0} \{a - \phi\big(q + \delta_2 b + (p+d)(S - s_t)\big) + V(q,b,s)\}, \tag{3}$$

where $V(q, ,b, s)$ is the value of entering the second sub-period at each t with real money q, real bonds b and real risky assets *s*. It is also a weighted-average value of entering the second sub-period at each *t* of all household types, or

$$V(q, b, s_t) \equiv \alpha V_l(q, b, s_t) + (1-\alpha) V_h(q, b, s_t), \quad 0 < \alpha < 1 \tag{4}$$

The real money demand q, real bond demand b and demand for Lucas tree *s* are characterized by

$$\phi = \frac{\partial V(q,b,s)}{\partial q}, \tag{5}$$

$$\delta\phi = \frac{\partial V(q,b,s)}{\partial b}, \tag{6}$$

$$(p+d)\phi = \frac{\partial V(q,b,s)}{\partial s}, \tag{7}$$

and envelope theorem $W'(a, d) = 1$.

In the second sub-period when the household type $j \in \{l, h\}$ is realized, household type *j* solves the following problem for a long-run stationary equilibrium,

$$V_j(q, b, s) \equiv \max_{b_j, s_j, c_j, y_j} \{ \omega_j u(c_j) - g(y_j) + \beta W(a_j^+, d) + \xi_j(b - b_{jt}) + \gamma_j (p+d)(S - s_j) + \lambda_j (q + \delta_2 b_j + p_t s_j - c_j) \}, \tag{8}$$

Given that

$$a_j^+ = \frac{\phi}{\mu}\left[(b - b_j) + (p+d)(S - s_j) + (q + \delta_2 b_j + p s_j - c_j) + y_j\right], \tag{9}$$

And

$$0 \le s_j \le S, \;\; j = l, h \tag{10}$$

$$\sum_j s_j = 0\,, \quad j = l, h \tag{11}$$

where a^+ denotes the real money balances taken into the next period. Let ξ_j, γ_j, and λ_j be Lagrange multipliers, and note that $W'(a,d) = 1$.

Then, the first-order conditions, for a long-run stationary equilibrium, are,

$$g'(y_j) = \frac{\beta\phi}{\mu}, \tag{12}$$

$$\lambda_j = \omega_j u'(c_j) - \frac{\beta\phi}{\mu}, \tag{13}$$

$$\xi_j = \delta_2 \omega_j u'(c_j) - \frac{\beta\phi}{\mu}, \tag{14}$$

$$(p+d)\gamma_j = \lambda_j p - \frac{\beta\phi}{\mu} d, \tag{15}$$

Substituting λ from (13) into (15),

$$\gamma_j = \left(\frac{p}{p+d}\right)\omega_j u'(c_j) - \frac{\beta\phi}{\mu}, \tag{16}$$

The envelope theorem gives $\frac{\partial V_j(q,b,s)}{\partial q} = \omega_j u'(c_j)$, $\frac{\partial V_j(q,b,s)}{\partial b} = \delta_2 \omega_j u'(c_j)$ and $\frac{\partial V_j(q,b,s)}{\partial s} = (p)\omega_j u'(c_j)$. Then, from equation (4), one can also have

$$\frac{\partial V(q,b,s)}{\partial q} = \alpha \frac{\partial V_j(q,b,s)}{\partial q_j} + (1-\alpha)\frac{\partial V_h(q,b,s)}{\partial q_h}, 0 < \alpha < 1, \tag{17}$$

Hence,

$$\frac{\partial V(q,b,s)}{\partial s} = \alpha\left(\frac{p}{p+d}\right)\omega_j u'\left(c_j\right) + (1-\alpha)\left(\frac{p}{p+d}\right)\omega_h u'(c_h), \tag{18}$$

Referring to (5), (6), the envelope theorem $\frac{\partial V_j(q,b,s)}{\partial q} = \omega_j u'\left(c_j\right)$, and $\frac{\partial V_j(q,b,s)}{\partial b} = \delta_2 \omega_j u'\left(c_j\right)$, one obtains $\delta_2 = \delta$. It means that the secondary market price for bonds must be the same as the issuing price.

Let type *l* households buy equity shares while type *h* households sell equity shares in the asset market. Type *l* consumers must satisfy a slack constraint, $\gamma_{lt} = 0$, and thus equation (16) gives

$$\left[\frac{p}{p+d}\right] u'\left(c_j\right) = \frac{\beta\phi}{\mu}, \tag{19}$$

From (5), (17) and (19), one has

$$\left[\frac{p}{p+d}\right]\frac{\mu}{\beta} u'\left(c_j\right) = \alpha\omega_j u'\left(c_j\right) + (1-\alpha)\omega_h u'(c_h), \tag{20}$$

By combining the terms of $u'(c_j)$ in (20), one obtains the relationship of household's marginal utility, for a long-run stationary equilibrium as

$$\frac{\left[\frac{p}{p+d}\right]\mu - \alpha\beta}{(1-\alpha)\beta} u'\left(c_j\right) = \eta u'(c_h), \tag{21}$$

Consider (12) and (19), one obtains

$$g'(y) = \left[\frac{p}{p+d}\right] u'(c_j) = \delta U'(c_j), \tag{22}$$

Goods *y* market clearing condition requires that

$$c_j + c_h = 2y, \tag{23}$$

Money market clearing condition requires that

$$q = Q, \tag{24}$$

The market clearing conditions for the bond market at the first and second sub-periods are

$$b = \theta q, \tag{25}$$

$$b_j + b_h = 0, \tag{26}$$

The market clearing condition for the tree market at the first period is

$$s_j + s_h = 0, \qquad (26)$$

Since type *h* household must be selling bonds, it must be that $b_h > 0$.

Then, the equilibrium allocation (c_l, c_h, y) is fully characterized by equations (21), (22) and (23), given any monetary policy (μ, θ).

In a monetary policy framework that has only money and interest-bearing bonds as studied by Kocherlakota (2005) and Xiang (2013), a policy authority may have at most three different monetary policy instruments, which are money supply μ, bonds to money ratio θ, and a secondary market price for bonds δ. However, if the model is allowed to have one more type of risky asset, one obtains, in the case of $\xi_j = \gamma_j = 0$, from equations (14) and (19), the following non-arbitrage condition

$$\delta = \left(\frac{p}{p+d}\right), \tag{27}$$

Equation (27) clearly states that the secondary market price for bonds must equal to an inverse of the market rate of return of trees. This condition is a result of the non-arbitrage profit condition that holds true for all asset markets when a rational expectation equilibrium exists. Thus, the number of feasible monetary policy instruments in this extended model of money, bonds and a risky asset is reduced to just two choices, which are μ and θ as compared to those previous models of money and bonds.

3. Feasible Optimal Monetary Policies in the Case of Multiple Assets

In order to see clearly the impact of monetary policy on the distributive efficiency under a multiple-asset model, one may start by exploring the characteristics of those monetary instruments, μ and θ at the stationary equilibrium. Let M_{t+1} define the next period money supply by

$$M_{t+1} = M_t + B_t - \delta B_{t+1}, \tag{28}$$

Equation (28) states that money supply in the next period must equal to the existing money supply plus the value of bonds that are redeemed, and then subtracting that result with the value of new bonds being issued in the next period.

By dividing both sides of equation (28) by M_t and rearranging the terms, one obtains at the stationary equilibrium,

$$\mu = \frac{1+\theta}{1+\delta\theta}, \tag{29}$$

Where $\mu \equiv \frac{M_{t+1}}{M_t}, \theta \equiv \frac{B_t}{M_t}, 0 < \delta \leq 1$, and nominal interest rate is $i = \left(\frac{1}{\delta}\right) - 1 \geq 0$.

Note that the specific value of the term $\left(\frac{p}{p+d}\right)$ in equation (27) is given by the preference function of type j household, $\omega_t u(c_t)$. Let assume for simplicity that

$$\omega_t u(c_t) = \omega_t \ln(c_t), \tag{30}$$

Then, it can be shown that, at the stationary equilibrium, Lucas tree pricing function must be

$$p = \left(\frac{\beta}{1-\beta}\right) d, \;\; 0 < \beta < 1, \tag{31}$$

where β is the discount factor. Substituting equation (31) into (27) one obtains,

$$\delta = \frac{p}{p+d} = \beta, \tag{32}$$

where the nominal interest rate is $i = \left(\frac{1}{\delta}\right) - 1 > 0$.

It is also true that the market rate of return of Lucas tree at stationary equilibrium, Ω, must be

$$\Omega = \frac{p+d}{p} = \frac{1}{\beta} > 1, \tag{33}$$

Substituting the value of δ in (32) into (29), one can determine that the optimal money growth at the stationary equilibrium must be positive because

$$\mu = \left(\frac{1+\theta}{1+\beta\theta}\right) > 1, \tag{34}$$

The gross real interest rate according to Fisher equation as in Xiang (2013) is defined as

$$R \equiv \frac{1+i}{\mu} = \frac{1}{\delta\mu} \tag{35}$$

By using equations (32) and (34), it must be that

$$R = \frac{1+\beta\theta}{\beta(1+\theta)} \tag{35}$$

Equation (35) implies that

$$R < \frac{1}{\beta} \tag{36}$$

Equation (36) falls into the case which is called by Xiang (2013) as the 'insufficient liquidity' case. This is a case when $b_h = b$ $(s_h = s)$ and so $\xi_h = 0$ in equation (14) ($\gamma_h = 0$ in (16)). It implies that $\delta\eta u'(c_h) > \beta\frac{\phi}{\mu}$, or $\left(\left(\frac{p}{p+d}\right)\eta u'(c_h) > \beta\frac{\phi}{\mu}\right)$, or type h consumers cannot get as much liquidity from bond sales (risky asset sales) as they need.

In this case, the government cannot purchase more bonds from type h households since they don't have any bonds left. Government cannot increase δ because such action violates equation (27). The only policy instrument available is to print more money to circulate in the economy. Such an action will certainly increase inflation rate μ and end up with higher productive inefficiency.

4. Higher Inflation Intensifies Both Distribution and Production Inefficiencies

The distribution efficiency in the economy with heterogeneous household is defined by

$$D \equiv \frac{u'(c_j)}{\eta u'(c_h)} \tag{37}$$

Full distribution efficiency can be obtained only when $D = 1$. Distribution efficiency rises (falls) with D when $D < 1$ ($D > 1$) because a shift of a marginal unit of consumption from a type *l* (type *h*) household to a type *h* (type *l*) household can increase total welfare.

The production efficiency is defined by

$$P \equiv \frac{g'(y)}{max\{u'(c_j), \eta u'(c_h)\}} \tag{38}$$

Production efficiency is measured by marginal comparison of production cost and utility gains of agents who value consumption the highest.

By substituting equation (32) into (21), one obtains from (37)

$$D \equiv \frac{\beta(1-\alpha)}{\beta(\mu-1)} = \frac{1-\alpha}{\mu-\alpha} \leq 1 \tag{39}$$

The optimal monetary policy, in terms of distribution efficiency $D = 1$, requires that $\mu = 1$. This optimal policy is in line with the zero nominal interest rate as indicated by the

Friedman rule. Equation (39) clearly states that inflation is bad for distribution efficiency, $D < 1$.

Only type h household is restricted by liquidity constraint, so $\eta u'(c_h) > u'(c_j)$ and thus, equation (38) becomes

$$P \equiv \frac{g'(y)}{\eta u'(c_h)} \tag{40}$$

By using equation (20) and (21), one can rewrite equation (40) as

$$P = \delta \frac{(1-\alpha)}{(\mu-\alpha)} = \delta D < 1, \tag{41}$$

Production inefficiency (P < 1) occurs even in the period when Friedman rule, $\mu = 1$, is implemented.

5. Conclusion

The stationary equilibrium in this extended model requires that all asset markets must satisfy a non-arbitrage profit condition. As a result, the value of discounted bond price in the secondary market, δ, must be endogenously determined inside the model so that it is no longer a policy instrument as in the case of Xiang (2013).

Hence, under the situation of insufficient liquidity, in which real interest rate being lower than $1/\beta$, a full distribution efficiency level, D = 1, is still possible to reach providing that the nominal interest rate is set to zero as suggested by the Friedman rule. This result cannot be strictly guaranteed by the outcomes of Xiang (2013).

In addition, inflation clearly has deleterious effects on distribution and production efficiencies in the extended model.

The remaining challenges for future researches on this issue of optimal monetary policy is to explore the presence and implication of a speculative bubble in a non-stationary framework that may relate to the distribution and production efficiencies. This line of research has the potential to generate better understanding about the negative effect of an optimal monetary policy in the situation of asset price bubbles.

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Sabotage and Deterrence Incentive in Tournament: An Experimental Investigation and Policy Implications

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ABSTRACT

This research analyzes the impact of deterrence incentive on sabotage behavior in rank-order tournament using experimental method. Laboratory findings confirm Becker's deterrence hypothesis in a tournament setting. Implementing punishment suppresses sabotage behavior. In addition, increasing probability of inspection is more effective than increasing the magnitude of penalty despite equivalence of expected punishment. Furthermore, analysis of the data reveals existence of cognitive biases influencing sabotage behavior. Findings also suggest that perceived legitimacy of the enforced rule and regulations is important. This study supports existing theoretical frameworks pertaining to tournament and economics of crime, and also provides policy implications for contest designers.

Keywords: Sabotage, Rank-order tournament, Deterrence incentive, Experiment

JEL Classification: C72, C91, D23, M52

1. Introduction

Lazear and Rosen (1981), a seminal paper on tournament, describes a rank-order tournament model in which employees compete for a share of the principal's purse, called 'prizes'. The rankings of their observable output levels determine prize allocation. The use of tournament as an incentive scheme is a common practice in firms and organizations. A notable example is promotional tournament in which the principal seeks to promote only one agent to a higher position. In this case, high prize in tournament implies salary the agent receives at higher post while low prize implies no raise in the salary.

Nonetheless, competition does not always result in an efficient outcome. People are heterogeneous in nature and some may resort to unfair play. When the environment is loosely monitored, it is possible for contestants to engage in unfair means to decrease others' probability of winning and thereby improve their own relative standing in the tournament. Unfair play in tournament studied here is known as sabotage.

In the context of Personnel Economics, Lazear (1989) defines sabotage as "*any (costly) actions that one worker takes that adversely affect the output of another*". In this case, one can imagine the saboteur surreptitiously damaging the rival's output. Such kind of sabotage is rather blatant and outright. From the Industrial Organization literatures, Salop and Scheffman (1983) define sabotage as '*raising rival's cost*'. In this case, the victim of sabotage finds it difficult to effectively exert productive efforts. For instance, employees in the organization can withhold vital information, pass manipulated information and damage others' equipment used in the production process. All these acts are done to make it more difficult for the rivals to win. Though both concepts are different, sabotage either directly reduces rivals' output or increases their cost, which eventually reduces their chance of winning the tournament. Applications of sabotage in tournament exist in a great deal- warfare, business, worker contest, politics and even sports. Irrespective of its form, sabotage is undesirable and it is in the interest of both the contest designer (principal) and the participants (agents) to reduce this unfair practice in order to make competition fair and healthy.

Despite widespread occurrence in the real world, the issue of sabotage in tournament has not been extensively analyzed by researchers owing to data unavailability. Thus, most of the studies in this extension aimed to investigate policies to restrict unfair measure under different contest designs (varying number of prize, prize spread, number of players, etc.). Among these works, Harbring and Irlenbusch (2005, 2008, 2011) and Harbring et al. (2007) are among the most prominent works in this extension. Previous studies suggest that sabotage can be mitigated by minimizing prize spread (Lazear, 1989; Harbring & Irlenbusch, 2005), separating contestants by distance (Lazear, 1989), inclusion of external candidate (Chen, 2003), concealing intermediate information about output (Gürtler et al., 2013) and framing an instruction in an employment context (Harbring & Irlenbusch, 2011).[1] Another method to mitigate sabotage in tournament is by punishment. In the real world, those who commit crime are punished if caught. Depending on the magnitude of punishment and the probability of getting caught, punishment will decrease the marginal benefit (or

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[1] For a complete survey on sabotage in tournament, see Chowdhury & Gürtler (2015). For a complete survey on experimental literatures related to rank-order tournament, see Dechenaux, Kovenock & Sheremeta (2015).

increase the marginal cost) of exerting destructive efforts. Intuitively, appropriate level of punishment should be able to deter sabotage in tournament.

The objective of this study is to analyze the impact of external deterrence incentive on sabotage behavior in tournament. Becker (1968) argued in his seminal work that crime can be deterred with appropriate punishment. Closest to this study, there are two notable theoretical papers by Curry and Mongrain (2009) and Gilpatric (2011) who combine deterrence incentive with rank-order tournament game with cheating. However, gap still exists in the experimental paradigm for which this paper aims to fulfill. In all, this paper aims to incorporate the theoretical framework of economics of crime in a tournament setting so to test its prediction power. The experimental findings would then be inferred to provide contest designers and practitioners with guidelines to deter sabotage behavior by using appropriate extrinsic deterrence incentive.

The rest of the paper proceeds as follows- Section 2 lays down the theoretical framework, Section 3 outlines the experimental design, Section 4 discusses the findings, and Section 5 provides conclusion with policy implications.

2. Tournament Model with Sabotage and Deterrence Incentive

2.1.The Model

This tournament model is an extended version from Lazear and Rosen (1981) where players choose productive and destructive efforts. Productive effort or investment increases own output. On the other hand, destructive effort or sabotage decreases opponent’s output and thereby his likelihood of winning the tournament.

The production function of agent i follows this equation:

$$y_i = e_i - s_{-i} + \varepsilon_i \qquad (1)$$

where
y_i is observable output
e_i is unobservable effort level; $e_i \in [0, \dots, \bar{e}]$
s_{-i} is destructive effort by agent i's rival; $s_{-i} \in [0, \dots, \bar{s}]$
ε_i is performance luck; $\varepsilon_i \in [-\varepsilon, \dots, +\varepsilon]$.

Work environment is in such a way that principal cannot observe efforts (e_i) owing to the random shock or performance luck (ε_i). This random term is i.i.d. for all players and is drawn from a uniform distribution with interval $[-\varepsilon, +\varepsilon]$. Thus, since principal can only observe output (y_i), he awards workers based on their relative performance. Player with higher output will receive winner prize (W_1) and the one with lower output receives loser prize (W_2) where $W_1 > W_2 > 0$.

From this point, the discussion has been adapted from Gilpatric (2011) who examined cheating in rank-order tournament with deterrence incentive. While cheating raises own output, sabotage decreases rival's output but ultimately, they result in "increasing own chancing of winning" in the case of 2-player tournament.

Now we focus on the sabotage decision by player i. If he decides to sabotage ($s_i > 0$), the output level of the opponent reduces by that amount and the consequent effect is the increase in the probability of ranking first. From the parameter defined above, $s \in [0, \dots, \bar{s}]$ which represents a decrease in the output level caused by sabotage. It is assumed here that all contestants are inspected by the principal with probability α and this is a common knowledge in the game.

The inspection system used here is known as "correlated audit"- if inspection occurs, both players are inspected; else none is inspected. In the event that inspection occurs, a contestant is caught sabotaging with probability $\beta(s)$, which is a twice continuously differentiable function which satisfies these conditions- $\beta(0) = 0, \beta'(0) = 0$, $\beta' \geq 0$ and $\beta'' > 0$

Penalty in this game comes in 2 forms; (i) the contestant is disqualified from the winner prize and receives loser prize and (ii) the contestant incurs "outside" penalty in addition to the cost incurred in the contest. The first type of punishment is a common norm to bring about fairness in the competition. The second type of punishment[2] can be thought of as an additional cost after the saboteur is caught (i.e. humiliation, spoiling employment record). In this study, we assume that the probability of getting caught depends on the magnitude of sabotage but the penalty when caught is fixed at F.

We now consider a 2-player tournament game between player i and j. Both players compete for the winner prize by making a simultaneous choice of effort and sabotage. We make two important assumptions. First, the cost of sabotage is incurred upon detection. Therefore, sabotage in this study is "costless" to the undertaker as long as it is not detected. Second, it is assumed that cost function for effort is a standard convex function $C_e(e_i)$ with $C' > 0$ and $C'' > 0$. This experiment uses both real effort task[3] (for effort) and induced value effort task (for sabotage) and therefore quantitative prediction cannot be made regarding effort at equilibrium as true cost function is unknown. Henceforth, cost of effort is represented with disutility from work while

[2] Gilpatric (2011) refers to the second type of punishment as "reputation cost" that reduces future earnings.

[3] Real effort task used here is The Slider Task which was first developed and used by Gill and Prowse (2011).

the cost of sabotage comes with probability of detection. Let $P_i(e_i, s_i, e_j, s_j)$ be the probability that player i ranks first.

The expected payoff of player i can be written as:

$$E\pi_i(e_i, e_{-i}, s_i, s_{-i}) = \alpha\Delta(1 - \beta(s_i))\left(1 - \beta(s_j)\right)P_i(e_i, s_i, e_j, s_j) + \alpha\Delta\beta(s_j)(1 - \beta(s_i)) + (1 - \alpha)\Delta P_i(e_i, s_i, e_j, s_j) + W_2 - C_e(e_i) - F\alpha\beta(s_i) \qquad (2)$$

The first term signifies the payoff when player i wins when inspection occurs but no one is caught. The second term is the payoff when player i wins when inspection occurs but player j is caught and disqualified. The third term is the payoff when player i wins when there is no inspection. The expected payoff function for player j is symmetric to Equation (2).

Assuming that player i is a rational, self-interested decision maker, he maximizes his expected payoff choosing $e_i$and s_i. Equation (3) and (4) are player i's best response functions:

$$e_i: \Delta \frac{\partial P_i(e_i,s_i,e_j,s_j)}{\partial e_i}[\alpha(1 - \beta(s_i))(1 - \beta(s_j)) + (1 - \alpha)] - C'_e(e_i) \qquad (3)$$

And

$$s_i: -\alpha\Delta\,\beta'(s_i)\left[\left(1 - \beta(s_j)\right)P_i(e_i, s_i, e_j, s_j) + \beta(s_j)\right] + \Delta\frac{\partial P_i(e_i,s_i,e_j,s_j)}{\partial s_i}\left[(1 - \alpha) + \alpha\left(1 - \beta(s_j)\right)(1 - \beta(s_i))\right] - F\alpha\beta'(s_i) = 0 \qquad (4)$$

Furthermore, we make a Nash Cournot assumption. In other words, players arrive at a symmetric equilibrium where they choose $e_i = e_{-i} = e^*$ and $s_i = s_{-i} = s^*$. We can write the unique symmetric equilibrium as:

$$C'_e(e) = \Delta \frac{\partial P_i(e_i, s_i, e_j, s_j)}{\partial e_i} \left\{1 - 2\alpha\beta(s) + \alpha\big(\beta(s)\big)^2\right\} \quad (5)$$

And

$$\beta'(s) = \frac{\Delta \frac{\partial P_i(e_i, s_i, e_j, s_j)}{\partial s_i}\left[1 - 2\alpha\beta(s) + \alpha\big(\beta(s)\big)^2\right]}{\frac{\Delta\alpha(1+\beta(s))}{2} + \alpha F} \quad (6)$$

It should be noted that with the Nash Cournot assumption, the marginal probability that the player wins depends on the distribution of the random noise. It was shown in Harbring and Irlenbusch (2008) that in a symmetric equilibrium e^* and s^*, the marginal probability of winning equals $\frac{1}{2\bar{\varepsilon}}$ where $\bar{\varepsilon}$ is the spread of random component.

Equation (6) defines the degree of sabotage in symmetric equilibrium if an interior solution exists. The probability of inspection α should be sufficiently large such that an interior solution exists.

The level of sabotage in equilibrium depends on the probability of inspection α, the shape of $\beta(s)$ which determines how quickly the probability of detecting sabotage increases with sabotage level, the distribution of ε and the ratio of outside penalty to the spread $\frac{F}{\Delta}$. However, when there is no inspection ($\alpha = 0$), both agents will exert maximum level of sabotage because it is costless. But when there is inspection($\alpha > 0$), sabotage should decrease monotonically. It can be concluded that sabotage in symmetric equilibrium decreases with the probability of inspection, ratio of outside penalty to spread and higher random noise. As the primary focus of this research involves sabotage behavior, discussion about how effort reacts with probability of inspection is skipped[4].

Based on the above model, parameters are specified as in Table 1.

Table 1
Parameter specification

Parameters	Specification
Productive efforts	$e \in [0,48]$
Destructive efforts	$s \in [0,10]$
Prize spread ($W_1 = 150, W_2 = 50$)	$\Delta = 100$
Interval size of random component	$\bar{\varepsilon} = 20$
Cost functions for productive efforts	$C(e) = \frac{e^2}{c_e}$ $with\ c_e > 0$
Probability of detection	$\beta(s) = \frac{s^2}{100}$
Outside penalty if caught	$F = 20,40$

Source: Author's specifications

With the above specification, the FOCs in (5) and (6) can be rewritten as:

$$e^* = \frac{5c_e}{4}\{1 - \alpha\frac{s^2}{50} + \frac{\alpha s^4}{100^2}\} \quad (7)$$

$$\alpha s^4 - 40\alpha s^3 - 200\alpha s^2 - 5600\alpha s + 10000 = 0\ for\ F = 20 \quad (8)$$

$$\alpha s^4 - 40\alpha s^3 - 200\alpha s^2 - 7200\alpha s + 10000 = 0\ for\ F = 40 \quad (9)$$

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[4] Interested readers can consult Gilpatric (2011). The sole difference is with 'cheating' and 'sabotage'.

Equation (7) implies that effort level at equilibrium is dependent on the level of sabotage at equilibrium. The value of $e^*$is unknown and depends on the value of c_e. On the other hand, the level of sabotage at equilibrium is independent of effort level. From Equation (8) and (9), s^* can be calculated for any positive level of α. When $\alpha = 0$, it is rationale for subjects to choose $s^* = \bar{s} = 10$. Thus, we can conclude that when there is no inspection, we have corner solution where subjects choose maximum level of sabotage, which implies $s^* = 10$. When inspection is enforced, sabotage reduces with an increase in the probability of inspection α and level of penalty F.

2.2.Experimental Design

As the main objective of this research is to test the impact of deterrence hypothesis on sabotage behavior in tournament, only probability of inspection and magnitude of penalty are varied across treatments. NoDeter treatment is a baseline case in which there is no inspection. There are 3 treatments conditions; (i) Deter treatment, (ii) DeterPenalty treatment and (iii) DeterInspect treatment. Table 2 shows the probability of inspection, the magnitude of punishment, and theoretical prediction for sabotage level at equilibrium for each treatment.

Table 2
Treatment specification and sabotage level at equilibrium

	No inspection ($\boldsymbol{\alpha = 0}$)	**Low inspection ($\boldsymbol{\alpha = 0.4}$)**	**High Inspection ($\boldsymbol{\alpha = 0.8}$)**
Outside penalty = 0	NoDeter (Treatment 1) $s^* = 10$	-	-

Table 2 (Continued)

Outside penalty=20	-	Deter (Treatment 2) $s^* = 3.67$	DeterInspect (Treatment 4) $s^* = 2.03$
Outside penalty =40	-	DeterPenalty (Treatment 3) $s^* = 3.06$	-

Source: Author's experimental design

Table 3
Experimental Protocol

Session type	**Game 1**	**Game 2**	**Game 3**	**Questionnaire**
Type 1	NoDeter	Deter	DeterPenalty	Holt and Laury & questionnaire
Type 2	NoDeter	Deter	DeterInspect	

Source: Author's experimental design

There will be 2 types of experimental sessions (see Table 3), which are different only in Part 3. Each session is divided into 4 parts. In parts 1-3, subjects play tournament game with sabotage according to the specified treatments. Each part contains 10 rounds of the game. Every session ends with a post-game Questionnaire which includes Holt and Laury form to measure risk aversion.

This design uses both "within-subject" as well as "between-subject" design. Within the session, subjects play tournament game under 3 institutional setting; no punishment, low punishment and high punishment. The difference between sessions is in Game 3 where DeterPenalty (Treatment 3) has high outside penalty and DeterInspect (Treatment 4) has high probability of inspection. This allows us to examine their relative power of kinds of deterrence incentives. Our theoretical model suggests inspection to be a better stick. The limitation of this design pertains to the "carry-over effect" within the session. Nonetheless, as the asymmetric change of punishment is not of our concern, this design is appropriate in addressing the research questions.

2.3.Experimental Procedure

There were 4 experimental sessions (see Table 4); 2 sessions were conducted at Faculty of Economics, Chulalongkorn University on 28th and 29th April 2016 and the other 2 sessions were conducted at Faculty of Economics, Thammasat University on 11th May 2016. The experiments were conducted with Z-Tree (Fischbacher, 2007). All participants are Economics students (86% undergraduate and 14% graduate). 46% are male. Age range of subjects is 19-26 years (mean age is 22.4).

Table 4
Sessions conducted

Session no.	No. of participants	Venue	Session type
1	22	Chulalongkorn University	Type 1
2	10	Chulalongkorn University	Type 2
3	16	Thammasat University	Type 1
4	8	Thammasat University	Type 2

Source: Author's compilation

Three things need to be noted; (i) participants at Chulalongkorn University were students enrolled in Experimental Economics course while participants at

Thammasat University were Economics students in general, (ii) participants received Starbucks Gift cards as reward for their performance in the game and (iii) prizes for Chulalongkorn students were set at 500, 300, 100 Thai Baht and nothing, while for Thammasat students, prizes were set at 600, 400, 200 and 100 Thai Baht. The proportion of prizes was 1:1:1:2.

Before commencing, participants are informed that they will be playing 3 Games; 10 rounds of each. There is 1 practice round for Game 1 so that participants can get familiarized with the Slider Task. The experimenter informs the participants that only 3 out of 30 rounds will be randomly selected. The sum of payoffs will then be ranked which is used to determine the rewards each subject would receive. They are also informed that they will be randomly matched with a new opponent after each round (i.e. Stranger Matching Protocol).

Instructions used are framed[5] as an employment-context one. Before commencing and during the practice round, subjects are allowed to ask the experimenter about the game. In each round, participants are presented with 48 Sliders with initial value at 0. For each slider positioned at 50, the subject receives 1 Point, which is used as a proxy for effort. After 120 seconds, the screen reports the number of sliders correctly positioned. Then, subjects decide their sabotage level (from 0 to 10). After all subjects make decision, the screen reports the outcome of the tournament. After Game 1 (NoDeter treatment), the experimenter continues with

[5] Although Harbring and Irlenbusch (2011) found framing effect to suppress sabotage, framed instruction is used in this study to merely enhance subjects' understandability of the game. When deterrence incentive is implemented, neutral instruction may rather be equivocal. Translated instruction is available from the author upon request.

instruction of Game 2 (Deter treatment). To ensure that subjects acknowledge the deterrence incentive, a new screen with information about inspection is added prior to the sabotaging stage. In addition, information about probability of detection with each level of sabotage is provided on the screen of sabotaging stage. The experiment is resumed after all subjects understand the game. After Game 2, the experimenter informs the change in Game 3. The change to the game is either higher penalty (DeterPenalty treatment) or higher probability of inspection (DeterInspect treatment). Then, the game is resumed. Subjects are asked to fill out post-game questionnaire form, which includes a lottery form[6] adapted from Holt and Laury (2002) to measure risk aversion. All participants are informed about the selected rounds. They are rewarded based on their rankings of the tournament. All sessions lasted approximately 2 hours.

2.4.Research Hypotheses

Hypothesis 1: Deterrence incentive causes lower average sabotage

Hypothesis 1 corresponds to the classical argument made by Becker (1968). As discussed earlier, theory predicts that sabotage decreases with expected punishment.

Hypothesis 2: The average level of sabotage is lower in treatments with relatively heavier punishment compared to those with relatively lighter punishment.

The experimental design discussed in the previous section allows us to derive both main effect and interaction effects of the factors that are varied. According to the theory, sabotage should follow this relationship; $s_{G3.2} < s_{G3.1} <$

[6] This task is uncompensated.

$s_{G2} < s_{G1}$. This follows directly from the fact that penalty is the heaviest in Game 3.2.

Hypothesis 3: The average level of sabotage in DeterInspect (Game 3.2) is lower than that of DeterPenalty (Game 3.1).

Despite the equivalence of expected punishment in DeterPenalty and DeterInspect, theory predicts that sabotage level is lower in DeterInspect, where probability of inspection is high. This suggests that inspection is a more effective deterrence incentive.

3. Findings and Analysis

3.1.Hypothesis Testing

Before proceeding to the testing of the hypotheses, it is vital to ensure that all sessions are comparable. For this purpose, Kruskal Wallis test is used to ensure equality of populations with regards to the average effort level in the Slider Game.

Table 5
Kruskal-Wallis equality-of-populations rank test (for efforts)

Game	Rank Sum (by Session)				Chi-squared with ties (d.f.=3)	p-value
	1	2	3	4		
1	534	214	568.50	279.50	7.596	0.0551
2	640.50	275.50	411.50	268.50	1.322	0.7239
3	599	228	510	259	2.596	0.4581

Source: Author’s calculation

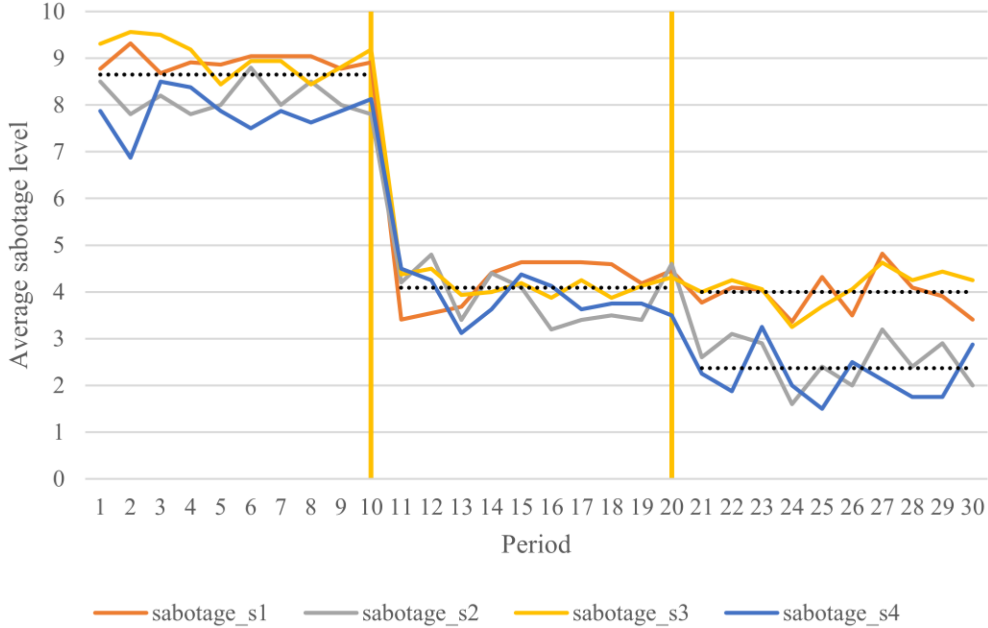
Kruskal Wallis test does not reject the null hypothesis of equality of population ($p > 0.05$ for all games). This implies that despite unequal number of participants across sessions, subjects of all sessions exert similar level of efforts on average. Given similar effort levels, we compare sabotage behaviors in various games to test the hypotheses.

Hypothesis 1: Deterrence incentive causes lower average sabotage

Figure 1 exhibits the average sabotage level in all sessions. Based on the graphical presentation, several observations can be made; (i) sabotage level in Game 1 is at a high level (average of 4 sessions at 8.65), (ii) sabotage level reduces when deterrence incentive is implemented (iii) in sessions where subjects played DeterPenalty in Game 3 (sessions 1 and 3), sabotage level is somewhat the same as in Game 2, (iv) in sessions where subjects played DeterInspect in Game 3 (sessions 2 and 4), sabotage level is lower relative to that of Game 2. At this simple level, deterrence hypothesis seems to hold well, except for DeterPenalty.

To confirm the hypothesis, sabotage levels of Game 1, 2 and 3 are compared. As subjects play the 3 games consecutively, within-subject analysis is employed. Using average sabotage levels for Wilcoxon signed-rank test (yielding one observation per individual), it is found that sabotage is higher in NoDeter in comparison to Deter, DeterPenalty and DeterInspect.

Figure 1
Average sabotage level in respective period and session



Source: Author’s illustration
Note: sabotage_s1 refers to average sabotage level in session 1, so on. Black dotted lines are weighted average sabotage levels for all sessions in respective games.

Table 6
Wilcoxon signed-rank test (Game 1 and 2; Game 2 and 3; Game 1 and 3)

Session no	Observations	$H_0: sabotage.G_1 = sabotage.G_2$		$H_0: sabotage.G_2 = sabotage.G_3$		$H_0: sabotage.G_1 = sabotage.G_3$	
		Critical value	Prob > |z|	Critical value	Prob > |z|	Critical value	Prob > |z|
1	22	z = 3.815	0.0001***	z = 0.488	0.6256	z = 3.686	0.0002***
2	10	z = 2.553	0.0107**	z = 2.293	0.0218**	z = 2.499	0.0125**
3	16	z = 3.413	0.0006***	z = 0.440	0.6599	z = 3.466	0.0005***
4	8	z = 2.457	0.0140**	z = 2.457	0.0140**	z = 2.460	0.0139**

Source: Author's calculation
Note: *** indicates 1% level of significance, ** indicates 5% level of significance

The null hypotheses that average sabotage level in Game 1 equals that of Game 2 and 3 are rejected (at 1% and 5% level of significance). This implies that sabotage levels in Game 1 differ significantly from those in Game 2 and 3 where deterrence incentive is implemented. However, when average sabotage levels in Game 2 and 3 are compared, Wilcoxon sign-rank test rejected the null hypotheses (at 5% level) for sessions in which subjects played DeterInspect as Game 3. On the other hand, the test finds no significant difference in average sabotage between Game 2 and 3 for sessions in which subjects played DeterPenalty as Game 3.

It can then be concluded that this result supports Becker's deterrence hypothesis (at least qualitatively) as sabotage level decreases with punishment. However, sabotage behavior in DeterPenalty treatment deviates from expected pattern. Thus, result 1 can be summarized as follow:

Result 1: Sabotage can be suppressed by implementing deterrence incentive. In general, our finding supports Becker's (1968) deterrence hypothesis (except for DeterPenalty in which sabotage only weakly decreases).

Hypothesis 2: The average level of sabotage is lower in treatments with relatively heavier punishment compared to those with relatively lighter punishment.

Table 7 compares predictions by theory and average sabotage levels in all games. Due to unequal number of observations in each session, weighted average for each game is reported.

Table 7
Comparisons of theoretical predictions and average sabotage levels in all games

	Game 1 (NoDeter)		Game 2 (Deter)		Game 3.1 (DeterPenalty)		Game 3.2 (DeterInspect)	
Session no.	Theory	Experi-ment	Theory	Experi-ment	Theory	Experi-ment	Theory	Experi-ment
1	10	8.90	3.67	4.22	3.06	3.93	-	-
2	10	8.14	3.67	3.90	-	-	2.03	2.51
3	10	9.03	3.67	4.14	3.06	4.09	-	-
4	10	7.85	3.67	3.86	-	-	2.03	2.19
Weighted Average	10	8.65	3.67	4.09	3.06	4.00	2.03	2.37

Source: Author’s calculation

It can be summarized from Table 7 that sabotage level in games with relatively lighter expected punishment is lower. However, the difference in sabotage levels in Game 2 and 3.1 is very small. Two sample t-test confirms insignificant difference in the average sabotage levels in Game 2 and 3.1 ($p = 0.6364$). Thus, it can be concluded that sabotage level in games with relatively heavier punishment is lower (except for Game 3.1 to Game 2 where sabotage levels are similar). Therefore, result 2 can be formulated as follow:

Result 2: Sabotage levels in treatment with heavier punishment are lower than those with relatively lighter punishment. This only holds true for the case of DeterInspect, where probability of inspection is high. However, sabotage levels in DeterPenalty are similar to those in Deter, despite the increment in the level of penalty.

Hypothesis 3: The average level of sabotage in DeterInspect (Game 3.2) is lower than that of DeterPenalty (Game 3.1).

To test Hypothesis 3, we find if there is a treatment effect in Game 3. In Game 3, participants either played DeterPenalty (Game 3.1) or DeterInspect (Game 3.2). Since samples are independent, we employ Mann-Whitney U test for Game 3, comparing them by treatment[7]. The test rejects the null hypothesis at 5% level of significance ($p = 0.0256$), implying that subjects in DeterPenalty and DeterInspect reacted towards types of disincentives differently. Despite the same level of expected punishment, probability of inspection

[7] As Game 1 and 2 are same for all sessions, there should be no treatment effect. Kruskal Wallis confirms no significant difference in sabotage behavior across sessions in Game 1 and 2 ($p = 0.5404$ and $p = 0.9701$ respectively).

is a better tool to curb sabotage in tournament. With this finding, we can formulate Result 3 as follow:

Results 3: In line with the theoretical prediction, sabotage level in DeterInspect is lower, compared to that of DeterPenalty despite the equivalence of expected level of punishment. This finding suggests that probability of inspection is a better 'stick' in suppressing sabotage behavior in tournament.

3.2.Noise in the Experimental Data

To reinforce Table 7 that biases exist, Table 8 reports one-sample t-test which indicates significant differences between experimental data and theoretical predictions. For NoDeter treatment, the test rejects null hypothesis at 1% level of significance, confirming a negative bias. For Deter and DeterPenalty treatments, the test also rejects the null hypothesis at 1% level of significance. This implies that sabotage behavior in the 2 settings exceed the predictions. For DeterInspect treatment, the test only rejects the null hypothesis at 5% level of significance, indicating a more subdued positive bias in this case.

Table 8
One-sample t-test, comparing experimental data and theoretical predictions

Game	Hypothesis	Critical value	Pr $(T < t)$	Pr $(\|T\| > \|t\|)$	Pr $(T > t)$
Game 1 (NoDeter)	$H_O: mean = 10$ $H_a: mean < 10$	$t = -11.0726$	0.0000***	0.0000***	1.0000
Game 2 (Deter)	$H_O: mean = 3.67$ $H_a: mean > 3.67$	$t = 3.4926$	0.9997	0.0005***	0.0003***
Game 3.1 (DeterPenalty)	$H_O: mean = 3.06$ $H_a: mean > 3.06$	$t = 6.0035$	1.0000	0.0000***	0.0000***
Game 3.2 (DeterInspect)	$H_O: mean = 2.03$ $H_a: mean > 2.03$	$t = 1.8289$	0.9655	0.0691*	0.0345**

Source: Author's calculation
*indicates 10% level of significance, ** indicates 5% level of significance, *** indicates 1% level of significance.

The theoretical prediction that a rational utility maximizer would choose maximum sabotage in NoDeter treatment ($\bar{s} = 10$) is invalidated. There exists heterogeneity in the sabotage behavior; while some subjects chose maximum sabotage level, a group chose a suboptimal level of sabotage. Two subjects chose zero level of sabotage for all periods even when there is no deterrence incentive. Choosing sabotage below $\bar{s} = 10$ in NoDeter treatment is to play a 'dominated strategy'. This might have occurred because humans may not be 'purely selfish' as claimed by an economic theory. Other studies (i.e. see stealing game by Schildberg-Hörisch & Strassmair, 2012) have also found a similar 'prosocial' behavior which contradicts theoretical predictions. Presumably, even though this competition is a non-cooperative game, not all subjects want to win by unfair means. Hence, the 'supposedly irrelevant factor' in the economic model results in a negative bias in the behavior in NoDeter treatment.

On the other hand, sabotage behavior in treatments with deterrence incentive exhibits positive bias. The data shows that when there is threat of punishment, subjects either reduce their sabotage or sabotage more highly. While reducing level of sabotage is intuitive, those who sabotage more highly do so owing to the need to compensate for the risk of detection itself. In other words, when disincentive is in place, there is a tendency that less people will sabotage, but those who decide to sabotage intensify their activity to compensate the risk born.

Another plausible explanation for the prevalence of positive bias in sabotage behavior may exist on account of cognitive biases known as "self-serving bias" and "optimism bias". Self-serving bias refers to a tendency for people to attribute an occurrence of positive events to be intrinsic, while attributing negative events to extrinsic factors. This cognitive dissonance is quite common (i.e. we often account our success on how hard we work but blame misfortune when we fail). Optimism bias refers to a tendency for people to have unrealistic optimism. Studies in psychology and neuroscience have found that people are more likely to be overoptimistic and anticipate outcomes in their own favor. For instance, we are more likely to overestimate the chances of good events (i.e. success, marriage, promotion, winning lottery) but underestimate the chances of bad events (i.e. failure, divorce, getting fired, losing a bet).

In the light of these biases, participants may suffer from the illusion that they may not be caught. Put differently, they may underestimate probability of bad outcome (getting inspected and detected), and thus think that they will not be caught. This finding is in line with that of Nagin and Pogarsky (2003) who found that subjects who suffer from self-serving biases are more likely to cheat in their experiment. This is why in Deter and DeterPenalty treatments, where probability of inspection is low, positive bias is more pronounced, compared to DeterInspect treatment where probability of inspection is higher.

In addition to the self-serving and optimism biases, motivational crowding may play a role in the biased decision-making. Intrinsic motivation may influence decision making when there is no deterrence incentive. However, implementing deterrence incentive interferes with subjects' intrinsic motivation, shifting their attention to extrinsic ones. In effect, subjects become less inclined to play fair when they are being monitored. This finding is in line with literatures pertaining to motivation crowding theory[8]. Since the net effect of deterrence incentive is ambiguous, this may have caused biases in the experimental data.

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[8] See Tversky and Kahneman (1986)

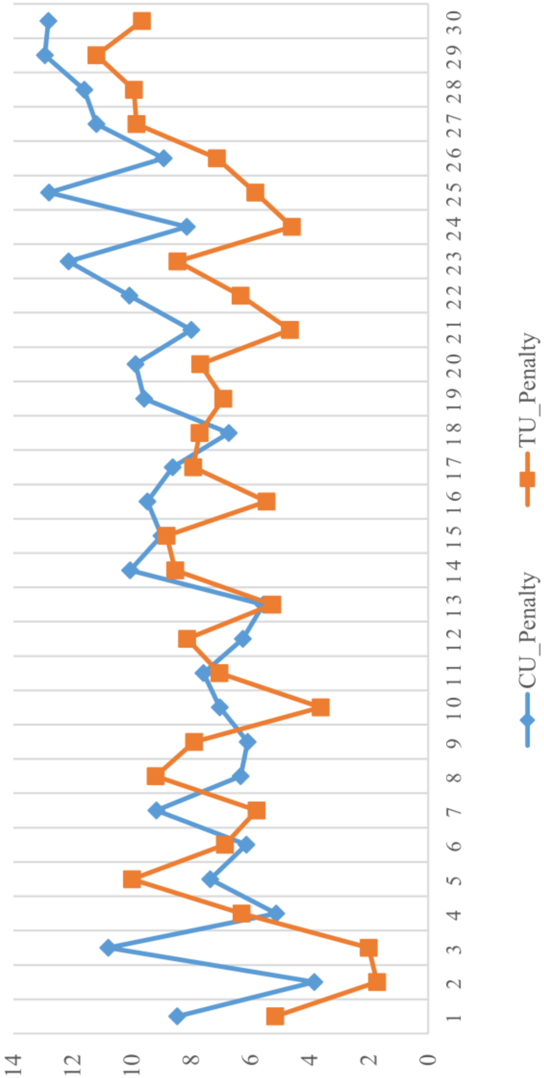
3.2.1. Variances and Adjustment Towards Social Norm

The experimental findings also shed light on behavioral adjustment towards a social norm. Figure 2, 3 and 4 exhibit variances in the sabotage levels chosen in each period. Upon observation, variances of sabotage in NoDeter and Deter are somewhat similar; variances fluctuate but stabilize at a high level. However, the patterns of variance start to diverge at around period 23. In sessions with DeterPenalty as Game 3 (see Figure 2), the pattern of variance is upward. On the other hand, in sessions with DeterInspect as Game 3 (see Figure 3), the pattern is downward. F-test confirms that variances of DeterPenalty are significantly higher than those of DeterInspect at 1% level of significance ($F(379{,}179) = 1.5188, p = 0.0008$).

Fluctuation and divergence suggest that people adapt their strategies given the institutional setting. Different games represent different monitoring and sanctioning institutions. In NoDeter treatment, subjects tend to converge to a sabotaging strategy. As time passes and the majority of participants choose to sabotage, the action establishes a "culture" for the society. If the subject does not sabotage, he loses the competitive advantage and falls behind his peers. Hence, subjects conform to the society. Even in Deter treatments, the pattern of sabotage is similar to that of NoDeter. Participants react to deterrence incentive by reducing sabotage level, but as expected punishment is low, sabotaging is still a norm in the society. Sabotage behavior differs in DeterPenalty and DeterInspect treatments. It can be seen from Figure 2 that variance of sabotage in DeterPenalty escalates towards the end of the game. High variance can be interpreted in such a way that subjects are segregated into two groups; those who continue to sabotage intensively and those who adapt by cutting back on their sabotage.

Figure 2

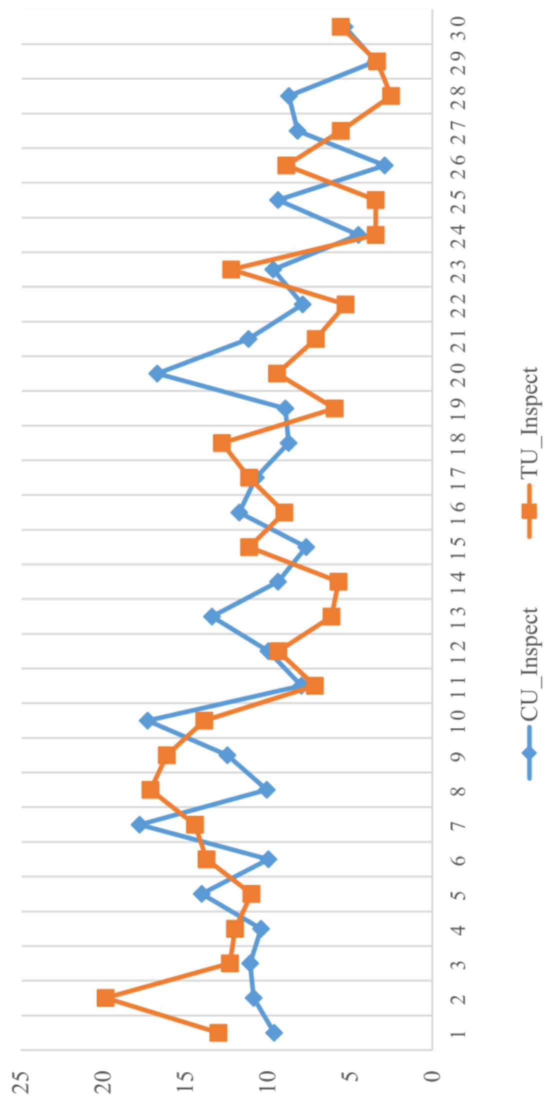
Variances of sabotage in sessions 1 and 3 (with DeterPenalty as Game 3)



Source: Author's illustration

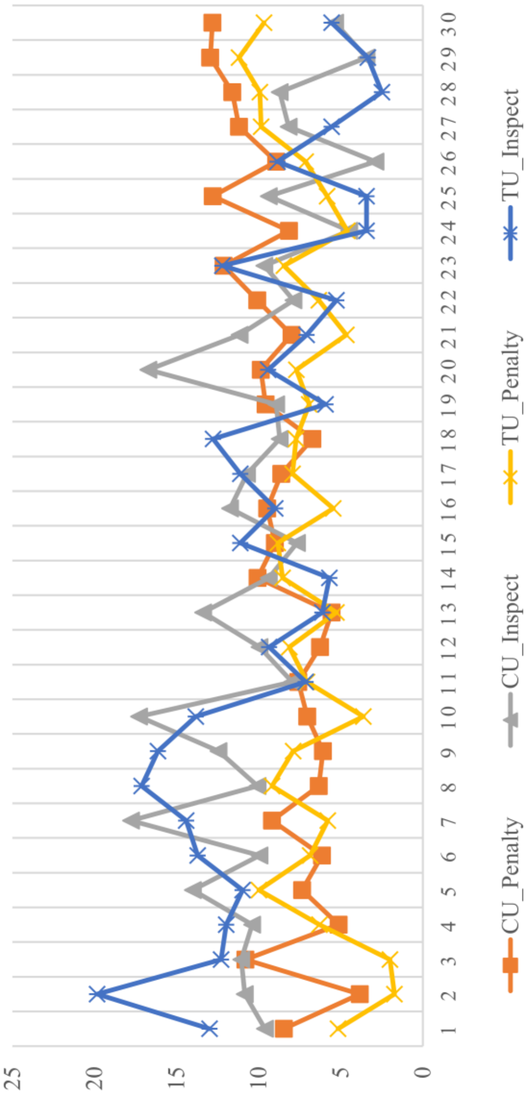
Figure 3

Variances of sabotage in sessions 2 and 4 (with DeterInspect as Game 3)



Source: Author’s illustration

Figure 4
Variances of sabotage in all sessions



Source: Author’s illustration

In contrary, variance of sabotage in DeterInspect gradually descend to a low level towards the end of the game. As probability of inspection is high in this game, majority of the subjects adapt their strategy more quickly and therefore approach a new social norm- “exerting low sabotage”. This may be because deterrence incentive in Deter and DeterPenalty is not powerful enough, rendering the law enforced illegitimate in the eyes of the saboteurs. On the other hand, high inspection imparts legitimacy to the law enforcement and thereby brings about low level of sabotage in the society.

3.3.Panel Regression Analysis

To further support the findings, Table 9 reports random effect regressions for all periods. Time-lag of sabotage is included to examine whether subjects’ decision making display any focalism (i.e. anchoring). A time-lag dummy variable indicating if a subject has been caught in period $t-1$ sheds light on the effect of getting caught on sabotage decision. Other independent variables include demographic variables including gender, age, and dummy variables to control for treatment effects (Deter, DeterPenalty and DeterInspect respectively). In addition, an interaction term of gender and time-lag dummy variable of getting caught is included to find out the effectiveness of punishment based on gender differences. Degree of risk aversion has been dropped from the model as 16 participants made irrational decisions, rendering their degrees of risk aversion unmeasured. Irrational decisions can be detected in Holt and Laury form for those who switch back and forth between safe to risky options.

Table 9
Linear Random-Effects Regressions: Testing treatment effects on sabotage behavior

Independent variables	Dependent variable: $s_{i,t}$ (sabotage level)
$s_{i,t-1}$ (continuous, time lag)	0.6334*** (0.0188)
$caught_{i,t-1}$ (dummy, time lag)	-1.2116*** (0.3063)
$gender$ (dummy)	0.0347 (0.1151)
$caught_{i,t-1} x\ gender$ (Interaction of dummy variables)	1.1087*** (0.4092)
age (continuous)	0.0583* (0.0334)
$Game$ 2 (dummy)	-1.8835*** (0.1580)
$Game$ 3 (dummy)	-1.6414*** (0.1775)
$Inspect$ (dummy)	-0.7045*** (0.2001)
Constant	1.8162** (0.7655)
R^2	0.5990
Individuals	56
No. of observation	1624

Source: Author's calculation
Note: The observation is a subject's sabotage level in a period. Treatment NoDeter (Game 1) is the baseline case. Standard errors are given in the parentheses, *indicates 10% level of significance, ** indicates 5% level of significance, *** indicates 1% level of significance.

Our finding suggests that subjects are persistent with their choice of sabotage. The time-lag of sabotage is highly significant. Time-lag dummies for getting caught suggest that the effect of punishment is effective. When subjects are caught, they reduce sabotage level in the following period due to fear. As for the demographic variables, age is significant at 10% level, which suggests that older samples tend to sabotage more highly. Dummies for Game 2 and Game 3 are highly significant, confirming existence of treatment effects; sabotage level in Deter, DeterPenalty and DeterInspect treatments are lower relative to NoDeter treatment. The dummy *Inspect* additionally breaks down the treatment effect for DeterInspect. The result reports significant treatment effect which suggests that an increment in probability of inspection can further curb sabotage behavior.

One interesting finding is related to gender and the effectiveness of punishment. Even though the dummy variable $gender$, which takes the value 1 for male participants, is insignificant, its interaction term with time-lag of getting caught is significant at 1% level. In effect, a male participant who has been caught in period $t-1$ reduces sabotage in period t by -0.1029, while the female counterpart who has been caught reduces sabotage by -1.2116. This finding implies that the effectiveness of punishment on gender differences is asymmetric. In other words, the same punishment is more effective on female participants.

3.4.Interpretation of Findings

The findings of this study are in line with others in the field of behavioral economics and laws, in particular to those focusing on deterrence incentive and crimes. Overall, the findings support Becker’s deterrence hypothesis. Extrinsic deterrence incentive reduces sabotage behavior in a competitive setting. However, analysis of the experimental data confirms the relative strength of inspection but finds no significant effect of increasing magnitude of penalty.

There are, however, noises in the experimental data. In NoDeter treatment, sabotage level is significantly lower than the prediction. This negative bias may stem from subjects' intrinsic motivation. Nonetheless, when deterrence incentive is implemented, subjects abandon intrinsic motivation and focus on the extrinsic motivation (i.e. 'how to win under such circumstances'). This has, therefore, caused a positive bias in treatments with deterrence incentive, especially in Deter and DeterPenalty treatments, where probability of inspection is low. Subjects effectively 'self-select' their own strategy. While some subjects reduce sabotage in fear of getting caught, those who decide to sabotage do so more aggressively to compensate for the risk of getting caught. In addition, positive bias may also stem from self-serving bias and optimism bias. Participants may underestimate the likelihood of getting caught and think that situation is in their favor. Also, penalty is conditional on inspection and detection. When probability of inspection is low, detection and magnitude of penalty may become irrelevant for some subjects. They may perceive punishment to 'not occur after all' because getting punished requires 'inspection' as well as 'detection' to occur. On the other hand, there is relatively lesser positive bias in sabotage behavior in DeterInspect treatment, where probability of inspection is high. As punishment also includes revoking the right to win high prize, it is better for subjects to play safe by reducing sabotage level. Thus, by cutting back on sabotage level, subjects maintain the right to win.

Furthermore, panel regression sheds light on the behavioral responses of participants in the game. Based on the findings, sabotage decision is anchored. In their mind, subjects evaluate their own strategy using the information given. Saboteurs immediately cut down their sabotage level in the period following the detection. In addition, female participants cut down more level of sabotage after they have been caught. This finding is in line with literatures related to gender differences. Many studies found that females tend to display lesser degree of risk-taking behavior when compared to males. Mather and Lighthall (2012) confirmed that under a stressful condition, males are more likely to take more risky decisions compared to females due to the fact that there are gender differences in brain activity that engages in evaluation of risk (Sundheim, 2014). Charness and Gneezy (2012) analyzed data from 15 investment games and found that women are more financially risk averse compared to men.

Finally, our findings are in line with studies pertaining to institutional economics and law enforcement in the society. Cooperative environment cannot be sustained in a sanction-free society because there is no law enforcement. Subjects feel compelled to sabotage as it is a social norm and not doing so deprives them of the competitive advantage in the contest. However, low inspection does not reduce sabotage either as the enforced rule is not perceived as legitimate. Social dilemma, which is to have contestants sabotaging heavily, is resolved by implementing appropriate scheme of deterrence incentive. In our case, high inspection is a key towards a fairer tournament. Though deterrence incentive cannot fully discourage sabotage behavior in tournament, it redirects individuals’ flow of decisions and strategies towards a new social norm (Henrich, 2006).

4. Conclusion, Policy Implications, and Limitations

4.1.Conclusions

This research aims to test the impact of extrinsic deterrence incentive on sabotage in Lazear and Rosen's (1981) rank-order tournament by conducting a laboratory experiment. In the tournament with sabotage, players can increase their chance of success either by exerting productive or destructive efforts. By allowing players to sabotage their opponents, tournament theory mimics one 'additional' dimension of human nature- some people play unfair in order to win the contest.

Theoretically, this study tests a 2-player tournament with sabotage extension and follows a deterrence incentive in Gilpatric (2011). Players are inspected by a perfectly correlated auditing system. In case of inspection, the chance that contestants are detected depends on the sabotage level chosen. If detected, a caught saboteur loses by default (i.e. receive low prize and suffer outside penalty). This, by effect, implies that the opponent wins high prize irrespective of relative output levels. In the case that both players are detected, they both are penalized.

The experimental results support Becker's (1968) deterrence hypothesis that punishment reduces crime. However, sabotage in DeterPenalty treatment is similar to that of Deter treatment, whose punishment is relatively lighter. On the other hand, sabotage behavior is lower in DeterInspect, compared to DeterPenalty treatment despite equivalence of expected punishment. Therefore, this study finds that inspection is relatively better in curbing sabotage behavior. This is because by increasing the probability of inspection and keeping magnitude of penalty low, there is higher chance of triggering detection system, which eventually leads to higher chance of getting detected if subjects do not alter strategy.

Nonetheless, there exists heterogeneity in choice of sabotage. Even in NoDeter treatment when there is no punishment, some subjects play a dominated strategy by choosing low levels of sabotage. This accounts for the negative bias in NoDeter treatment. Similar to other studies, participants display others-regarding preferences and may choose not to hurt others. Additionally, since NoDeter is a control treatment, the intrinsic motivation contributes to subjects' decision making in a meaningful way.

On the other hand, sabotage behavior in treatments with deterrence incentive possesses a considerable degree of positive bias. This can be accounted from the fact that announcing about punishment interferes with subjects' intrinsic motivation and causes them to pay more attention to an extrinsic one. Furthermore, when deterrence incentive is introduced, subjects are segregated into 2 groups; those who exert low sabotage, and those who sabotage more intensively to compensate for the risk of detection. Positive bias exists in a greater deal in Deter and DeterPenalty treatments. Since rate of inspection is low, subjects may experience an illusion caused by self-serving bias and optimism bias. These biases are known to cause people to overestimate chances of good outcomes and underestimate risks. Thus, positive bias in DeterInspect treatment exists in a smaller degree as inspection is high.

As a final note, the findings reveal an insight about law enforcement and social order. Without punishment, sabotage is a social norm. Though some subjects choose low sabotage, they are overwhelmed by those who sabotage highly. However, a new social norm (i.e. low sabotage) can be achieved with an efficient punishment system. As high inspection brings about low level of sabotage, it can then be concluded that sabotage level will be low if and only if subjects perceive the enforced rule as legitimate. If subjects do not perceive the legitimacy of punishment, implementing punishment fails to alter maladaptive behavior.

4.2.Policy Implications

Certain policy implications can be drawn from this study. As tournament is a non-cooperative game, participants may resort to all kinds of actions to increase their chance of success. Contest designers and practitioners in personnel management should take into account the possibility of sabotage behavior in tournament. This loophole in tournament should be filled to make it 'fair' for players who do not display rent-seeking and destructive behaviors.

Sabotage can be reduced significantly by implementing an efficient punishment system to achieve a desirable outcome. Contest designers should also consider legitimacy of the punishment scheme. Weakly enforcing a rule for 'the sake of having it' cannot curb sabotage behavior among contestants Our findings suggest that high inspection drives down sabotage as it imparts credibility and legitimacy of the enforced rule. When imposed rule and regulations are perceived as legitimate, people are more likely to conform to them. Thus, contestants should perceive that they would be inspected regularly so that they keep sabotage to the minimum.

In addition, the rule that 'anyone who is found to have used unfair measures to augment the chance of winning will lose by default' is extremely effective in the sense that contest designer automatically makes the cost of sabotage high. After all, the aim of participating in a tournament is to win high prize. Hence, putting high prize at stake creates a dynamic that reverses contestants' strategy, nudging them to lessen the degree of unfair play.

Nonetheless, inspection in the real environment requires the principal to expend resources. Thus, principal should find an optimum to balance between cost and benefit of inspection. Despite the effectiveness of inspection, announcement of the level of punishment is relatively less costly compared to implementation of an inspection system.

4.3.Limitations and Recommendations for Further Studies

This study possesses several limitations, which can be improved in the future. Unlike most experimental studies, incentive used in this study is non-monetary incentive. Starbucks Gift card is not universally acceptable like cash. Starbucks Gift card is also indivisible and less liquid compared to cash. Nonetheless, 50% of the participants mention their desire to win the prize while 34% mention their desire to win the game (not prize).

However, the issue does not entirely associate with using Starbucks Gift card as an incentive, but with the distribution of incentive. The values of Starbucks Gift cards are unequal. Such prize distribution creates unbalanced incentive for the participants. While some subjects strategically behave to win the prize, others may not put in effort to play the games because incentive is unevenly distributed. Cash payment would solve this limitation as it is divisible. Monetary incentive can be structured in such a way that all subjects are incentivized.

Other limitations arise from experimental protocol. For instance, the number of participants across sessions is unequal. While Kruskal Wallis test confirms that all sessions are comparable since samples exert similar level of efforts in the Slider task, it is more ideal to have equal number of subjects across sessions. This result can also be enhanced by recruiting larger samples.

There are potential areas regarding different designs and rules to discourage sabotage in tournament. For instance, in promotional tournament, caught saboteurs may be removed from the contestant pool for certain time periods as a result of bad reputation. Contest organizers usually share information regarding unfair players, which imposes high cost on the saboteur. Further analysis about the relationship of cognitive biases and sabotage behavior would clarify the causes of noise in the experimental data. Another issue of interest concerns principal's decision in choosing kinds of punishment since inspection is costly in the real world. Design of the game can be innovated to replicate real world situations, which can potentially further the area of experimental paradigm to represent the world.

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Integration in Chinese E-Commerce and Public Policy Concerns: An Analysis of Alibaba Group

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ABSTRACT

Established in 1999, Alibaba's market value reached 231 billion USD in 2004. Taobao.com, including Tmall.com, is Alibaba's consumer-to-consumer portal. In March 2013, the combined gross merchandise volume (GMV) of Taobao and Tmall exceeded 1 trillion CNY. Alibaba Group has developed its own third party payment – Alipay, based on big data analysis – to ensure a safe and clear payment environment for the privacy concerning customers. The logistics industry bonds with online sales tightly. A number of logistics companies seize the opportunity and gain benefits from the booming sales volume. This paper aims to explore the integration of e-commerce, third party payment, and the logistics industry. However, besides the prodigious development of those industries, they have their own limitations. This paper analyzes the limitation of Taobao.com, Alipay, and the logistics industry as well as the dilemma they are facing. Important public policy concerns are discussed accordingly.

Keywords: Adaptation, Innovation, Technological Change and Government Policy

JEL Classification: O31, O33, O38

1. Introduction

The economic transformation in China never lack vivid cases since the first five-year Plan initiated decades ago till the New Normal, which was proposed by the new generation of leaders. Among abundant innovative cases, there is no doubt that the establishment of Alibaba Group with its development trajectory is one of the most outstanding cases in the flow of powerful transformation trend.

The Alibaba Group mainly focuses on the e-commerce sector and has successfully established a complete platform for online sales. In the past 10 years, Alibaba Group and its subsidiary corporations actively participated in the e-commerce in China from scratch, and now it pervades in the Chinese daily life.

TaoBao.com, a subsidiary corporation of Alibaba Group, acts as a consumer-to-consumer web portal. It shares the same features as eBay.com, listing hundreds of million products on an online platform. On Taobao.com, millions of sellers and buyers are actively participating in the business activities. Those players, including sellers and buyers, are the basic two parties of the online sales industry.

In addition, Alibaba Group has developed a third party payment – Alipay, based on big data analysis – to ensure a safe and clear payment environment for the privacy concerning customers. As the scale of the transaction on Taobao.com becomes larger and larger, the registered users of the website are eager to have a secure payment method to ensure the security of their payment. Alipay was designed to fulfill the needs of the registered users.

The remarkable increase in online sales also leads to the development of other industries. The logistics industry is bonded tightly with online sales. For most cases, the performance of logistics directly influences the customer loyalty to the online sales company. A number of logistics companies seize the opportunity and gain benefits from the booming sales volume. The logistic companies have become the fourth party which integrate in the "melting pot" of online sales.

Notwithstanding the outstanding growth trajectory, the platform, the third party payment method, and the logistic company have their own limitations. Although Alibaba's gross merchandise volume is astonishing, its platform in terms of market mainly remain domestic. The situation is similar for Alipay and logistic industry as well. All the business activities are limited in mainland China. Participants from Hong Kong or Taiwan are rare, let alone the rest of the world. The saturated domestic market leads to an even fiercer competition. Despite competition being favored by free market, excessive competition is not. The excessive competition over Taobao.com squeezes the living space of small, individual sellers, and it has a negative spillover to the logistic industry, squeezing the profit out as well.

This paper analyzes the limitation of Taobao.com, Alipay, and the logistic industry as well as the dilemma they are facing. Moreover, the dramatic change in Chinese e-commerce attracts many researchers' attention. However, few papers are dedicated to explore the integration of e-commerce, third party payment, and the logistics industry. Thus, this paper aims to explore the integration of those different sectors and discusses public policy concerns in the industry.

2. Background Review and Conceptual Framework

Established in 1999, Alibaba's market value reached 231 billion USD in 2004. The success of Alibaba seems to indicate the bright future of e-commerce in China. The business-to-business, business-to-consumer, and consumer-to-consumer sales services via web portal provided by Alibaba contribute to the Chinese economic transformation in a significant way.

According to Chen, Seong and Woetzel (2015), Taobao.com has 750 million of product listings and has become one of the 20 most-visited websites globally. In March 2013, the combined gross merchandise volume (GMV) of Taobao and Tmall exceeded 1 trillion CNY[1]. The goods and services listed on Taobao.com are very diversified, ranging from physical commodity to virtual services. Different sellers compete on the same platform.

Although the sale figure on Taobao.com is phenomenal, Taobao.com is more enthusiastic in building a platform for small, individual sellers than for wholesale giants. The policy imposed by the platform is called “little and beautiful” by the CEO Jack Ma. Alibaba Group is always more into cultivating a “wonderland” for small, individual sellers. This could explain why the entry conditions for the sellers on Taobao.com is relatively low compared to other online sales platforms. The low entry conditions certainly attract small entrepreneurs to invest and get involved. As increasing number of small entrepreneurs see and seize the opportunity, the competition turns fierce or even cut-throat.

As Taobao.com facilitates every aspect of life, the increasing GMV urgently requires a safe and transparent payment method for users. In its initial years after Taobao.com was first established, the payment methods between sellers and buyers were determined by themselves. This was not perpetually feasible. Sometimes, however, the payment method was decided arbitrary by the seller part and it might potentially lead to the inequity to the buyers.

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[1] As of 24th May 2017, 1 USD is approximately 6.9 CNY.

In order to cope with the problem, Alibaba launched a third party payment which was Alipay in 2004. Similar with PayPal, Alipay focused on constructing a trustworthy third party payment platform for the registered users on Taobao.com (Li & Liu, 2007). After Alipay was launched, it became the only officially accepted payment method if consumers wanted to shop on Taobao.com. Alipay then extends its service to other fields, especially the financial sector, and really dominates the online payment market of China (Lu et al., 2011).

Alipay surely offers a relatively safe payment environment to the users, but the transparency issue and potential risk requires follow up. In 2013, as a pioneer, Alibaba introduced big data analysis into the system. The company has built a fraud risk management and monitoring system based on real-time big data analysis (Chen et al., 2015). The system can analyze the consumer behavior and monitor all the transactions then rate the user safety level. Buyers and sellers can check the safety level of each other before engaging in business.

In addition to a safe and transparent system, consumers also ask for a safe, prompt parcel delivery since the majority transactions on Taobao.com are physical commodity trades. The website accounted for over 60% of the parcels delivered in China by March 2013.[2] Due to the high GMV, the performance of logistic industry will certainly influence the customer satisfactory and their loyalty (Ramanathan, 2010).

The logistic company is facing excessive competition as well. Similarly, because of the low entry condition and low initial investment of this industry, many logistic companies are forced to lower the cost to attract customers. Although the

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[2] Berkeley, J. (2013, March). The Alibaba Phenomenon. *The Economist*. Retrieved from www.economist.com

amount of parcels generated by online sales is increasing, the marginal profit of logistic companies is decreasing (Ying & Dayong, 2005).

Competition is known as the "best method of allocating resources in a free market". Competition certainly has many virtues such as lower costs and prices for goods and services, better quality with innovation, greater productivity, and so on and so forth (Aghion et al., 2001). Stucke (2013) indicates that the competition itself, however, is no blessing, especially when the regulations are lacking. In this case, too much of competition on Taobao.com and logistic industry squeezes the living space and marginal benefit of the existing players, while low degree of competition facing by Alipay might potentially leads to monopolization. Considering the immaturity of this new market, the government has not imposed strict regulation yet. Thus, lack of regulation counteracts the market, worsening the situation surrounding existing all concerned parties.

3. Case Analysis

3.1.Taobao.com (Tmall.com inclusive)

Taobao.com was originally launched by Alibaba to provide consumer-to-consumer business to small, individual buyers and sellers. Tmall.com, on the other hand, is the business-to-consumer complement to Taobao.com. Tmall.com establishes itself as the marketplace for quality brand name goods for consumers.

Every registered user can open her or his own online store on Taobao.com for free. The low or no entrance requirement quickly attracts plenty of small entrepreneurs to invest on the virgin land. While on Tmall.com, most of the players are companies and groups including multinational companies such as Apple, P&G, and local Chinese brand; i.e.

Haier and Gree Electric. The GMV of Taobao.com and Tmall.com kept increasing exponentially, especially in the recent years.

From the Wall Street Journal news released on November 11th, 2015, the gross merchandise volume rocketed on every Singles' Day, which is on 11th November, of the year and the scale of daily gross merchandise volume rocketed as well. Singles' Day (or Bachelor Day) is an anti-valentine joke widespread in the internet. However, Alibaba quickly perceives the Singles' Day as an opportunity and sets the November 11th as the biggest shopping festival on Taobao.com and Tmall.com. On Singles' Day, almost all shops listed on Taobao.com and Tmall.com offer huge discounts or coupons to attract consumers to shop online. The scale of Singles' Day is now larger than Cyber Monday in United States (Lin & Li, 2005).

The huge volume in sales indicates that Chinese consumers have adopted to the lifestyle of online shopping. In the past consumers might still concern about the quality of the goods and services online because they are not able to physically examine their quality. But as more and more consumers realized the fact that the quality of goods purchased online is the same as those purchased in the supermarket while the price for goods listed online could be lower, the market structure changed.

Taobao.com certainly facilitates consumers' daily life and they also change the market structure in a subtle way. Nevertheless, it is definitely not a wonderland for any new entrant wishing to avail the opportunity. In addition, the success of former players stimulates the public's nerve and the society gets Taobao's advocacy. Having faith in themselves that they can also generate high revenue, new players rush in the play field, causing the competition to become fiercer than ever.

The pioneers certainly gained huge profit from online sales by low physical investment at the first development stage when the platform was not mature. It was also because of the preoccupation of those former players, the living space of the new players became narrower. Majority of the new players cannot sustain themselves in the compressed space. There is an illusion that with the low access condition every player can play equally on the play field, but actually players are not equal.

The procedure of finding targeted goods on Taobao.com might be a reason as to why starters cannot sustain themselves. Consumers can search for goods and services by browsing different categories or searching by keywords. So, the automatic listing order that comes up after consumers type the key words and click on search becomes crucial. However, the fact related to the criteria used to determine the order of product listings show on the consumers' screen is unknown as the filter mechanism is not transparent to the public. Anyhow, it is certain that the newly opened store is rarely shown up on the first page. The limited chance of newly opened stores being visited online puts an end to the hope of new players- The "Taobao Dream" bursts.

Other than the burst of "Taobao Dream", Taobao.com faces with another limitation that the market is limited domestically. Although the former players gain huge benefit, the benefit comes from the domestic market instead of international market. It has been over a decade since Taobao.com was established, which also implies that the domestic market is somewhat saturated. In order to survive in the cut-throat competition, online sellers choose to lower the price so that they can increase their sales and competitiveness. The public has observed the unreasonable low price of goods and services online due to excessive competition. If this unhealthy and non-sustainable situation lasts in a long run, the profit of all the sellers online might be compressed.

3.2.Alipay

As for the third party payment method introduced by Taobao.com, Alipay did not get much attention when it was first launched. In fact, a lot of Taobao registered users raised some safety concerns associated with this new payment method because in the traditional concept, bank is the most accountable agent when it comes to money transfer while Alipay was apparently not related to any bank.

The number of users increased exponentially after Alipay started to impose ID-based account establishment system. The system requires each Alipay account holder to match their account with a national ID. In this way, Alipay can minimize the risk in transaction by verifying the identity of users before any transactions take place. Moreover, it is much easier to execute regulations or prevent fraud when each account is identified. There is still a fraction of people who still worry about information leakage. This mindset changes as some users observe the safety level of Alipay to be relatively high, while others realize that the benefit of owning an account outweighs the risk.

In general, it can be said that the services provided by Alipay experience has shifted towards diversification. In its initial stage, it could be used only on Taobao.com. However, it has now extended its application to physical stores, top-up services, payment of utility bills, or calling an Uber. In addition, Alipay has its own financial services in which users can deposit money or apply for small amount of loan. The services offered by Alipay penetrate every aspect of residents' daily life.

After Alipay launched its mobile service, it dominated the market share of mobile payment in China in 2013. The market share remained almost the same for the year 2014 and 2015. Although the utilization of Alipay spreads all over China, according to a survey, 74% of the users worry about security and transaction risks when using it. The FinTech, however, is a relatively new concept to Chinese customers as they have not encountered with such situation or equivalent alternative choices before. Thus, it seems as if they have to use Alipay despite the fact that they are anxious of its security. In order to improve its safety level, Alibaba introduced big data analysis.

Big data analysis, proposed in 2011, is based on the technology which can synchronize and analyze any collection of data sets which are large, complex and unstructured. Relying on big data analysis, Alibaba has built a fraud risk monitoring and management system (Li et al., 2014). The main usage and implication is on the transactions via Alipay. The whole system is based on real-time data analysis of user behaviors using machine learning which can accurately predict potential fraud in transactions (Yang & Lang, 2014). The accountability of big data analysis utilized by Alibaba stands on the ground that Alibaba does not only have data from Taobao, Tmall, and Alipay, but also from partners such as Gaode Maps and other subsidiary corporations. The integration of big data generates a big web to ensure the accuracy of prediction.

It is plausible that the big data analysis is accountable in fraud prevention. However, many users still address their concern about the security of Alipay. Most users use it on mobile phone so the account seems to be insecure because individual mobile phone can be accessed or lost easily. On other hand, the utilization of Alipay is so widespread as users who worry about the security issue cannot give up the convenience of Alipay. Thus, these users are facing the dilemma which they are not certain if big data analysis can be helpful or not. Until now, there is no news release about the frauds caused by Alipay, but there are fraudulent cases which utilize Alipay as a transaction method. The victims cannot blame Alipay. However, it is undeniable that the virtues of Alipay clearly facilitate the fraud.

4. Logistic Industry

The booming of online sales will certainly inject zeal into the logistic industry. It is easy to relate the logistic to online sales since the majority of online transactions are associated with trading of physical goods.

According to State Post Bureau - a governmental agency managing logistic companies in China - the number of packages delivered in China increased by 56.4% to 5.77 billion CNY in the first quarter of 2016, compared to 41.7% growth in the same quarter of 2015. Furthermore, around 80% of the packages delivered each day are generated from online orders according to the statistics from Alibaba. This can then be used to set the number of packages delivered as a key indicator of E-commerce growth. From the indicator, it can be seen that the growth of E-commerce is relatively robust.

Since large amount of packages are delivered domestically rather than internationally, there should be a significant difference between domestic and international shipping rates. For instance, for S.F. Express- the largest logistic company in China, the cost of domestic shipping starts at 17 CNY, which is around 2.46 USD. On the other hand, the cost of international shipping starts at 188 CNY (approximately 27.25 USD), which is higher than domestic rate by around 10 times. Due to the relatively high shipping cost, many sellers on Taobao.com are not willing to ship overseas.

High international shipping cost limits the opportunity of online sales from expanding beyond its border. As it is mentioned earlier in the paper, Taobao.com focuses mainly on domestic market instead of international market. It is evident that the shipping rate might be one barrier for Taobao.com to extend to a global scale.

The bureau also states that the average shipping cost per parcel has declined by 8.8% to 13.4 CNY compared to 14.7 CNY in the same period last year. It is a favorable sign at the first glance. Unfortunately, the decline in cost might not imply the productivity of the whole industry has improved but the labor cost is compressed. The improvement of productivity will require longer time and much more effort than to reduce the labor cost of most companies. So, for most of the logistic companies, the excessive competition results in the reduction of labor welfare. The low labor welfare may generate further effects on low level logistic firms but the immediate effect is not evident yet.

Chinese government has introduced policies regarding the standard of delivery vehicle in Shenzhen because some vehicles used for delivery have potential safety hazards. The policy, however, is denied by some people as they think that the government want to limit the development of logistic industry in disguise of policy implementation. This misinterpretation reflects the situation of excessive competition in the logistic industry. Additionally, it implies that the industry really needs market supervision by an authority.

5. Conclusion and Public Policy Concerns

The booming of e-commerce in China certainly attracts many attentions. Alibaba Group plays an important role in it. Taobao.com and Tmall.com are two of the web portals operated by Alibaba Group, aiming to provide consumer-to-consumer and business-to-consumer services among Chinese consumers. Goods and services listed on the website are really diversified, which facilitate consumers' daily life. However, it is limited within the mainland China alone as its market still remains domestically instead of globally. Other than that, the excessive competition squeezes the profit out and chokes the new players.

Alipay, the third party payment method launched by Alibaba Group, was introduced initially as a transaction platform for Taobao users. Although it dominates the market share of mobile payment in China, users are still concerned about the security and safety issues for the nature of online payment. To cope with that problem, Alibaba Group introduced big data analysis to build a fraud prevention management system. Since big data analysis is a relatively new concept to Chinese customers, its effect is still not evident.

The booming of e-commerce benefits the logistic industry which is the fourth party participated in the field. As a key indicator of the growth of e-commerce, the amount of shipped parcel provides new opportunity for logistic industry but at the same time generates problems related to the welfare of employee which cannot be guaranteed. Moreover, it is also hard for international logistic companies to enter the market.

The government still considers the online sales industry as immature, but excessive competition and the problems it entails have attracted the authority's attention. The report issued by State Administration of Industry and Commerce

(SAIC) indicated the defective rate of the goods on Taobao.com reached 62.75% in a recent sample survey. The report also implied that high defective rate was due to the low entry conditions, excessive competition, and lack of quality check or effective supervision from the platform. In response to this report, Taobao posted a letter on its homepage, stating SAIC was cheating in the sampling. The truth has not been clarified to the public yet. However, it is clear that free market with no regulation cannot be relied upon as the defective rate rings a bell, calling the authority to impose regulations on the market.

Although Alibaba Group has launched big data analysis, the users are still concerned about the security issue of Alipay. The users are facing a dilemma that they are not willing to give up the benefit brought about by Alipay, while the security issue seems to be unsolvable in the short run. It is also questionable whether the regulation imposed by government will be helpful or not. As for the short run, the clear and safe payment environment is contingent upon users' self-discipline.

As for the logistics industry, Chinese government tried to impose some regulations to standardize the whole industry. The regulations, however, are mainly executed by the local government instead of the central government. The public authority does not seem to express a wish to intervene the industry at the central government level.

In conclusion, behind the booming of online sales in China, there exist both risks and opportunities. The four major parties participated in the competition gain the bonus while facing many limitations. The government and related public agencies should catch up and impose regulations in order to ensure a healthy and sustainable environment.

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