Government's Dilemma: Hike in the Administrative Cost or Sprawl of Social Nonconfidence

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December 2019

Abstract

The increasing frequency of fraudulent market events attracts more concerns from both market participants and academia. The role of government in ensuring market healthy is the focus of this paper which mainly discusses possible reactions and their consequences under different circumstances. This paper utilizes Rotten Kid theorem and changes its assumptions to accommodate the interactions among government, service providers and service consumers. From the specific modelling example, I find that the more selfish the government is, the quicker the economy may slip into depression. Therefore, the suggestion this paper puts forward is to establish and implement the effective, stable and transparent legal system as soon as possible to protect the social order.

Keyword: Rotten Kid Theorem, trigger strategy, legal system, social contract, market confidence

Acknowledgement: This paper is a fully independent work by the author Xiang Liao. I would like to thank Prof. Xiaojian Zhao from Monash University Department of Economics, the only official supervisor of this paper, for the constructive advices and helpful comments. All remaining errors are mine.

1. Introduction

This paper primarily focuses on the government's decision on how to react to the market disorder and its consequences. As the government usually defined, it should provide public services and maintain the social order to keep the society running smoothly. However, government is not a magnate but more like a thrifty housewife, handling various costly trifling matters and satisfying every family member's demands with limited budget. But facing too many demands sometimes may cause government to feel difficult in distinguishing priorities, and the failure to do so can lead to unrecoverable consequences. Therefore, it is necessary for government to clarify the first things in the to-do list to avoid hardship in the future.

The motivation to research on this topic mainly originates from the observations and curiosity about the underlying reason of frequent service providers' fraudulent actions in mainland China these years. Top-up activities in the market are the research kernels in this paper. In fact, all the deferred services after consumers' prepayments can be classified as special forms of top-up transactions. To take an example, the most recent shutdowns of teaching centres of "WEBi English" (韦博英语)[1] in many cities is very representative. Students as consumers pay much tuition fee for future trainings. The prepayments' trade depends on consumers' belief on the commitment from service providers to be able to fulfil their responsibilities and to offer corresponding services.

Other examples are not strange, either. The "ofo sharing bicycle"[2] places great barriers for consumers to retrieve their deposits. This situation has been existing for about one year but no effective solutions were put forward. The wave of P2Ps' sudden shutdowns[3] is another significant trick industry for the past two years. Police cannot catch all the criminals or retrieve all the losses for consumers. Many heads of these companies are reported as connection lost, which means it is impossible for consumers to get their money back with the help from government.

Other small-sized trick companies are not rare in daily lives, though they have not got so much attention due to the small impact scope and much less amount of money loss from consumers. Such companies are mainly distributed in service industries that we depend on greatly every day, including small canteens, barber's shops, small-sized supermarkets and sometimes even rental agencies who will abscond with rents. When the dishonest activities accumulate to reach the tipping point, this paper thinks the consumers' confidence will be totally exhausted and no one

[1] https://new.qq.com/omn/20191104/20191104A0MKW800
[2] http://baijiahao.baidu.com/s?id=1651462872879810826&wfr=spider&for=pc
[3] http://p2p.hexun.com/2018-07-11/193432226.html

will trust providers at all. However, such situation will cause great damages to the overall economy, which need to be interfered by the government.

Interests on this phenomenon has already arisen in academia. Financial frauds and the corresponding research in the micro-level illustrates the importance and necessity to educate investors. In former papers the focus is on the financial market and places more emphasis on the investors. Macro-level interactions are given more weight in this paper and I take government as the kernel in the research. The industry switches from financial market to service providers in daily lives. Therefore, this paper can be seen as an extension and complementary to former researches. In addition to topic contributions, I also extend the current Rotten Kid theorem with a new perspective, with interactive family members (kids) instead of totally independent children.

This paper proceeds as follows. In Section 2 this paper introduces the conventional Rotten Kid theorem and our transformation of this model. Specific example with concrete forms is given in Section 3 to help model and calculate the consequences of government's reactions. In the last Section 4, this paper makes some suggestions that may help the economy remain prosperous. Limitations about this paper are also included.

2. Theoretical Model

Our model extends the Rotten Kid Theorem, enabling it to better fit the real circumstances in the Service Industry Game, among providers, consumers and the government. This paper begins by describing the conventional Rotten Kid Theorem put forward by Becker (1981) and extend it to accommodate interactions between providers and consumers, which are family members in the original model, and also the involvement of government to play as a mediator.

2.1 Conventional Rotten Kid Theorem

This section is mostly copied from: Bergstrom, Theodore C. "A Fresh Look at the Rotten Kid Theorem--and Other Household Mysteries." since their summary is much comprehensive and detailed than mine. This part will be rewritten in next version after having more in-depth understanding about this theory.

Rotten Kid Theorem is first stated by Gary Becker in "A Theory of Social Interactions" (1974) to describe the interactions within a family. Becker assets that if a family has a head who "cares sufficiently about all other members to transfer general resources to them, then redistribution of income among members [of the household] would not affect the consumption of any member, as long as the head continues to contribute to all" (p. 1076). "The major, and somewhat unexpected,

conclusion is that if a head exists, other members also are motivated to maximize family income and consumption, even if their welfare depends on their own consumption alone" (p. 1080). In A Treatise on the Family (1981), Becker restates the Rotten Kid theorem: "Each beneficiary, no matter how selfish, maximizes the family income of his benefactor and thereby internalizes all effects of his actions on other beneficiaries" (p. 183)

Becker states his formal model and offers a proof in his 1974 paper: One family member, the household head, is benevolent toward all other family members and is rich enough so that he chooses voluntarily to give some money to each family member. There is a single consumption good, and X_i denotes the amount of consumption by family member i. All family members except the head of the household are selfish and interested only in their own consumptions. The head of the household is altruistic, and his utility depends positively on the consumption of each household member. Therefore, one can write the head's utility as

$$U(X_1, \dots, X_n)$$

Let I_i be the income of family member i before any intrafamily transfers occur. Total expenditures on consumption for family members must satisfy

$$\sum_i X_i = \sum_i I_i$$

If the head of the household is making transfers of income to all other household members, then after the transfers are made, the distribution of consumption in the family will be the one that maximizes the household head's utility subject to the constraint that total family consumption equals total family income. That is, the allocation of consumption in the family will be the vector $(X_1, \dots, X_n)$ that maximizes the utility function (1) subject to the budget constraint (2). This is like a standard problem in consumer theory in which the "goods," X_i, have prices of unity and income is $\sum I_i$. Given the reasonable assumption that the X_i's are all "normal goods" for the head of the household, it follows that each X_i is a monotonic increasing function of total family income. Therefore, any of the selfish children who has an opportunity to increase total family income, even if it is at the cost of reducing his or her own pretransfer income, will choose to do so. After all, the only way to increase one's own consumption after gifts from the head of the household are accounted for is to increase family income. This proves the Rotten Kid theorem.

2.2 Extension of Rotten Kid Theorem

Since the relationship between government and market participants are similar to that in a family, I find it reasonable to utilize this theory to model the game in practice. The extension of the conventional game contains three players: government (family head), service providers (Kid 1) and service consumers (Kid 2). The atmosphere in this "family" is not quite harmonious since one kid may do harm to the other to increase his own utility but make the other worsen off. The family head here is not rich enough, either. In accordance with realities in most of countries, the government is always in budget deficit and cannot cover all the expenses of providing public services that are required by the society.

Assumptions of all members' characteristics are consistent with conventional model: government as the family head has both "selfish" and "altruistic" dimensions to their preferences. Both provider and consumer as kids are totally selfish.

Consumers' Utility Function

$$U_c \equiv U_c(s, f, g)$$

Providers' Utility Function

$$U_p \equiv U_p(s, f, g)$$

In the two utility functions above, the parameters are defined as following:

s: percent of overall income to vigilant top-up with subjective awareness of f

f: percent of trick companies (assume the money to trick is always the same)

g: the government's decision on what regulation it will undertake, $g \in \{0,1\}$, where 0 means case-by-case regulation and 1 means implement stable, transparent and effective legal system.

Before moving on to the next part, it is necessary to make brief explanation on the types of decisions that government may make. The Case-by-case regulation is a kind of post-event remedy method for government to prevent trick actions from happening again. However, under this circumstance, the loss of consumers cannot be fully retrieved, stimulating more dishonest providers and impairing consumers' confidence on social contract. The stable implementation of effective and transparent legal system indicates that the government can spend enough money in supervising the market in order and try to prevent any dishonest actions beforehand. In this situation, trick actions seldom happen and consumers' confidence remains in high level all the time.

Government's Preferences

- When the government is purely selfish, it only cares about its own expenditure on market participants: $U_g \equiv -G(c) \equiv U_g(s, f, g, r)$, where $G(c)$ is what government need to pay for normal running of social economy, $1 + r$ is the inflation rate. Generally, the inflation is caused by the amount of extra money printed by the government as compulsory savings from market participants.
- When the government cares not only its current cost, but also the health of social economy and sustainable cooperation between market participants, the government's utility becomes: $U_g \equiv \min[-G(c), U_c, U_p]$.

The government's and market participants' decision problem:

Stage 1: Consumer's Problem

$$\max_s U_c(s, f, g)$$

Stage 2: Providers' Problem

$$\max_f U_p(s, f, g)$$

Stage 3: Government's Decision

$$\max_{g,r} U_g(s, f, g, r)$$

This game can be described as repeated game among three players, tentative to reach an equilibrium. At any $T \in (0, +\infty)$, the game repeats among three players, and parameters, s, f, g, r, change accordingly to reasonably reflect each player's actions in the next round of game. In the next repetition, players are subject to new parameters to take actions and a new set of parameters generated for a later game. The game will continue to happen infinitely.

2.2.1 Modelling Market Participants

Contrary to the independent family members in the conventional model, this paper makes the assumption that the interactions between service providers and service consumers are significant and such interactions play an important role in affecting the government's decision and the overall social welfare.

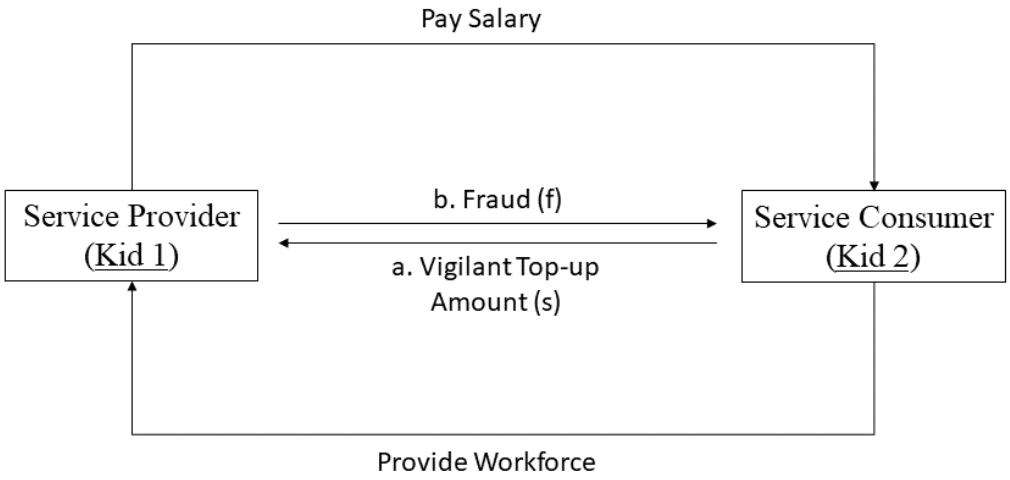

Chart 1. Interactions in Reality between Consumers and Providers

In this place, I assume the relationship between s and f follows reciprocal function with function's image lying in the first quadrant only. Such assumption will ensure the correlation to be convex to be in line with marginal decreasing effect.

The value of s and f can be from 0 to 1 in theory. However, all consumers will stop Top-up at a tipping point, beyond which the consumers' confidence exhausted. This depends on the average risk-aversion level within consumers. When all members are totally risk-averse, then there is no opportunity to trick successfully. In contrast, if all consumers are crazy gamblers with unimaginable risk-seeking activities, trick will be successful all the while. From the consumers' perspective, only a portion of money can be used for top-up service to gain additional discount when savouring those providers' services in the future. It is illogical to postulate that consumers will top-up all the money they have to those "Top-up Cards".

Therefore, both circumstances are not in accordance with reality. I think the increase of s and f will stop at s^* and f^*, and both tipping points are between 0 and 1. Illustrated by mathematical expressions as below:

$$s \in [0, s^*], s^* \in [0, 1)$$

$$f \in [0, f^*], f^* \in [0, 1)$$

Under this assumption, we can get the limitation equations to illustrate the correlation between s and f:

$$\lim_{f \to f^{*-}} s = 0, \lim_{f \to 0^+} s = s^*.$$

2.2.2 Modelling Government's Involvement

In the conventional model, family head is rich enough to transfer money to kids whatever the parent want. However, parent-planner is always annoyed by the running out of money, especially for some poor families at the very beginning. This is similar in the developing countries' governments who has been suffering from insufficient public finance. This circumstance is usually caused by less developed industries, corruptions of government officials or some other inefficient usage. Under such conditions, government has to weigh the pros and cons of implementing a stable, constant and transparent legal system. Two options are available for government to choose: one is the implementation of legal system steadily to prevent fraudulent events from happening, and the other is the case-by-case remedy after the crimes come true.

It is obvious that the first option will maintain the social confidence about service providers and their fraudulent behaviours can be punished immediately. However, the government's punishment always lags behind the occurrence of fraudulent events, which increases the social nonconfidence until no top-up activities exist.

When top-up activities vanish, both consumers and providers need to face the loss resulted from this non-cooperative game. Due to the inflation, both sides' incomes shrink to the level below their optimal utility. Consumers decrease their consumption and service-providers decrease the number of employees, which causes consumers' incomes to decrease further to form a vicious circle. Following this, economic depression emerges to make the limited public finance more insufficient. When this situation lasts too long, all members will be struggling around the poverty line, which will cause social instability. Therefore, if government has the forecast, comprehensive consideration and would like to maintain its power, it needs to make transfers to its social members, maintaining their utility to be consistent with what they were.

$$G(c) = A(c) + tr$$

$G(c)$: overall government cost

$A(c)$: government's administrative cost

tr: government transfers to make up the gap below market participants' optimal utility

3. Results in Specific Example

In this part, I specify parameters in the theoretical model above to make calculations possible. With relatively specific results, I can illustrate under what conditions will the government's reactions lead to expected outcomes.

3.1 Selfish Kids' Relationship

As mentioned in the theoretical part, the relationship between providers and consumers follow reciprocal functions. To make calculations reasonably simple for current calculation, I use first power for independent variable, s.

This assumption contains a defect at this stage due to limited time and real data. For this relationship, I need do experiments to confirm the amount of money that consumers are willing to top-up, given the subjective fraud rate f. After obtaining such experimental data, I can make accurate estimation about the form (the power) of this function.

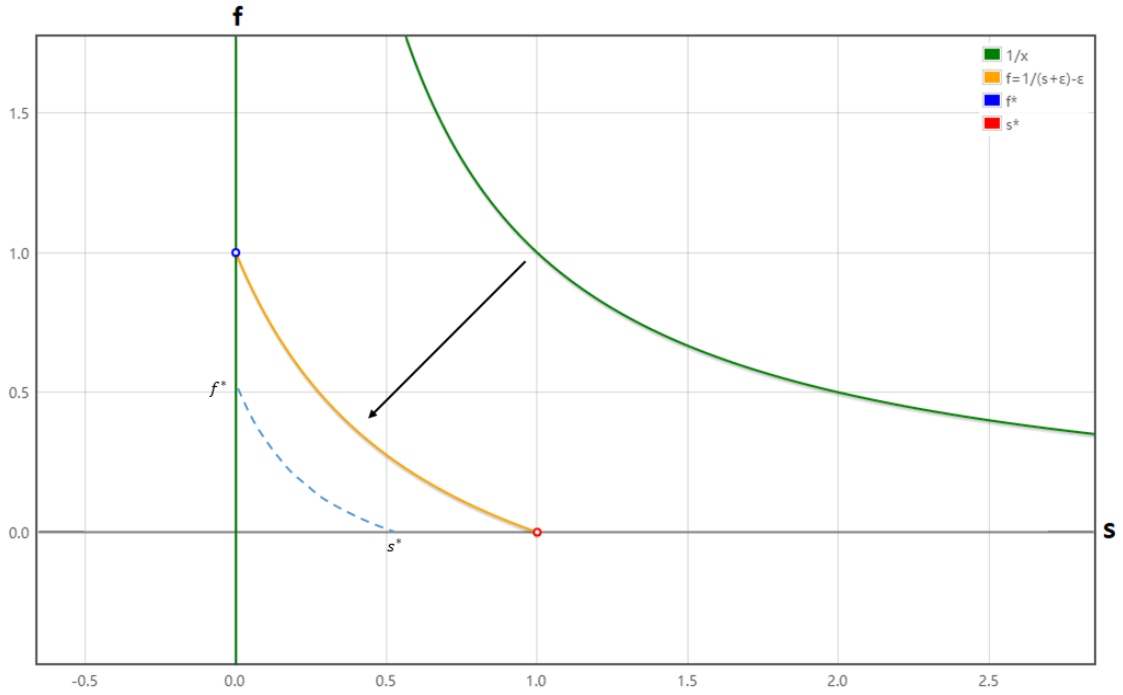

Chart 2. Estimated Relationship Curve between Fraud Rate and Top-up Amount

3.2 Punishment to Regain Confidence

This section mainly examines the existence of self-remedy interactions between market participants to see when and how the social confidence can recover to its original cooperative

status. To draw an analogy, if the two kids can manage to resolve conflicts by their own without parent's interference, it would cost the family head nothing for this trivial matter. But when kids' quarrel escalates into a fierce fighting, the parent must prevent them from hurting each other, otherwise the parent needs to pay for medical expenses for whoever gets hurt. Just as in this game, market participants have no idea whether and to what extent government will be included into such struggles. Therefore, I need to know all possible consequences of the game between market participants when government is left out before I add it again in next section.

3.2.1 Grim-Trigger Strategy

When modelling using G-T strategy, I assume the consumers have perfect memories and they can remember everything as fresh as it just happened. This strategy will be always effective until this generation steps out of the market and is superseded by the new generation of people, who have no memory of their parents' painful experiences.

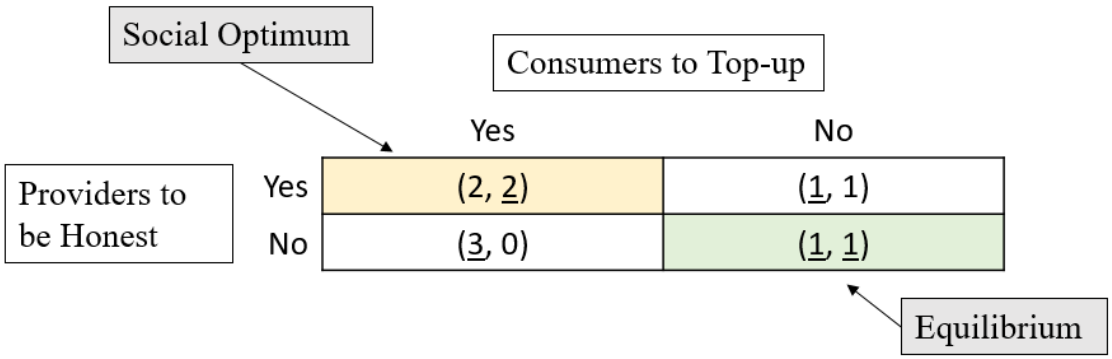

Chart 3. Prisoners' Dilemma between Providers and Consumers

In the Chart 3, when providers and consumers cooperate to increase their incomes, the social optimum is achieved as (2, 2), which includes both their own income and the award from their cooperation. However, when providers begin to trick consumers, consumers' own income is lost as the reward for providers' trick actions but do not need to provide corresponding services. Therefore, the status is described as (3, 0). After being tricked with lost, consumers become vigilant towards all such kinds of top-up services and stop top-up after the tipping point. At this time, both consumers and providers cannot get additional reward but only their own incomes as (1, 1), the final equilibrium in the Grim-Trigger Strategy.

Under this condition, only one cycle is considered and consumers will never forgive providers' trick actions. Therefore, the payoff to G-T is:

$$(1-\delta)(1+\delta+\delta^2+\delta^3+\cdots)=(1-\delta)*\frac{1}{1-\delta}=1$$

The payoff to One-Shot Deviation of Providers is the same as equilibrium as below:

$$(1-\delta)(1+\delta+\delta^2+\delta^3+\cdots)=(1-\delta)*\frac{1}{1-\delta}=1$$

But the payoff to One-Shot Deviation of consumers is less profitable for any δ:

$$(1-\delta)(0+\delta+\delta^2+\delta^3+\cdots)=(1-\delta)*\frac{\delta}{1-\delta}=\delta<1$$

Even if providers feel regret about their past actions and want to take efforts to revert to cooperative condition, their efforts will be in vain since no matter which option they choose, the payoffs remain unchanged all the time. When consumers fail to believe providers' commitments and stop cooperation, the payoffs can only be expressed as (1, 1).

Although the best choice for providers at the very beginning is to keep honest and sincere consistently, they may encounter the shortage of funds, plan to quit market forever immediately when the amount of money tricked is enough, or are just short-sighted. No matter what reason determines the providers' dishonest behaviour, the equilibrium is bound to drop from (2, 2) to (1, 1), making both players losers.

3.2.2 Forgiving Trigger Strategy

However, people cannot remember everything as fresh as it just happened. So are consumers. The memories of their monetary losses in former top-up actions tend to fade as time goes by and their beliefs on successful cooperation will be back to the original level. Therefore, I can model this strategy in two phases:

Cooperative Phase: Start with Y and play Y if

- both providers and consumers play Y
- or time k have passed since both players played N

Punishment Phase: Play N for time k if

- providers played N in the cooperative phase

Here I define $k=(m-1)\cdot T^*$ where T^* is the time for consumers' confidence to exhaust. When it comes to the $m\cdot T^*$, the consumers' confidence will recover to its original level which indicates the next round of game between providers and consumers.

During the cooperative phase, the payoff to both players are 2. After a one-shot deviation, the outcome becomes as below:

$$(N,Y),\underbrace{(N,N),(N,N),\dots,(N,N)}_{\text{time } k},(Y,Y),(Y,Y),\dots$$

Therefore, the corresponding payoff can be expressed as:

$$(1-\delta)[3+\delta+\delta^2+\cdots+\delta^k+2\delta^{k+1}+2\delta^{k+2}+\cdots]=3-2\delta+\delta^{k+1}$$

To ensure the inexistence of profit from one-shot deviation in the cooperative phase, the payoff calculated above should be smaller than 2, that is:

$$3-2\delta+\delta^{k+1}\leq 2$$

This inequation can be rewritten as $\delta^{k+1}-2\delta+1\leq 0$, and when k is large enough, this inequation is satisfied. That is to say, given constant δ, the longer k is, the less possible providers will deviate to trick consumers. I can get the range of k as

$$k\leq \log_\delta\left(2-\frac{1}{\delta}\right)$$

as well as

$$\lim_{\delta\to\frac{1}{2}^+}\log_\delta\left(2-\frac{1}{\delta}\right)=+\infty$$

This situation is the same as that in unforgiving game discussion in former section. Since $\delta=\frac{1}{1+r}$, the nonconfidence cycle k is getting closer towards $+\infty$ when $r\to 1^-$, a situation that the government prints money crazily and irresponsibly, disregards the predestined outcomes of hyperinflation and regime change.

During the punishment phase, suppose there are time $k'\leq k$ left. If providers decide to be honest in this phase, the payoffs remain unchanged compared with the situation that they are still dishonest.

3.3 Selfish and Altruistic Government's Cost

Before further discussing the government's choice, I compare the government's costs under two choices: implementation of legal system, or case-by-case regulations. When government chooses case-by-case regulation, the cost increases as the percent of trick providers (f) increases. The more trick companies exist, the more cost the responsible government need to pay, usually increases much faster than the increase of trick companies due to the bureaucracy and

management fees. Thus, I assume the government's administrative cost is in exponential relationship with f which is linear relationship with time (T). This is why the independent variable f does not display as x-axis unit since I assume $f = \varphi T$, that is to say, $f^* = \varphi T^*$. Those relationships can be illustrated as in Chart 4.

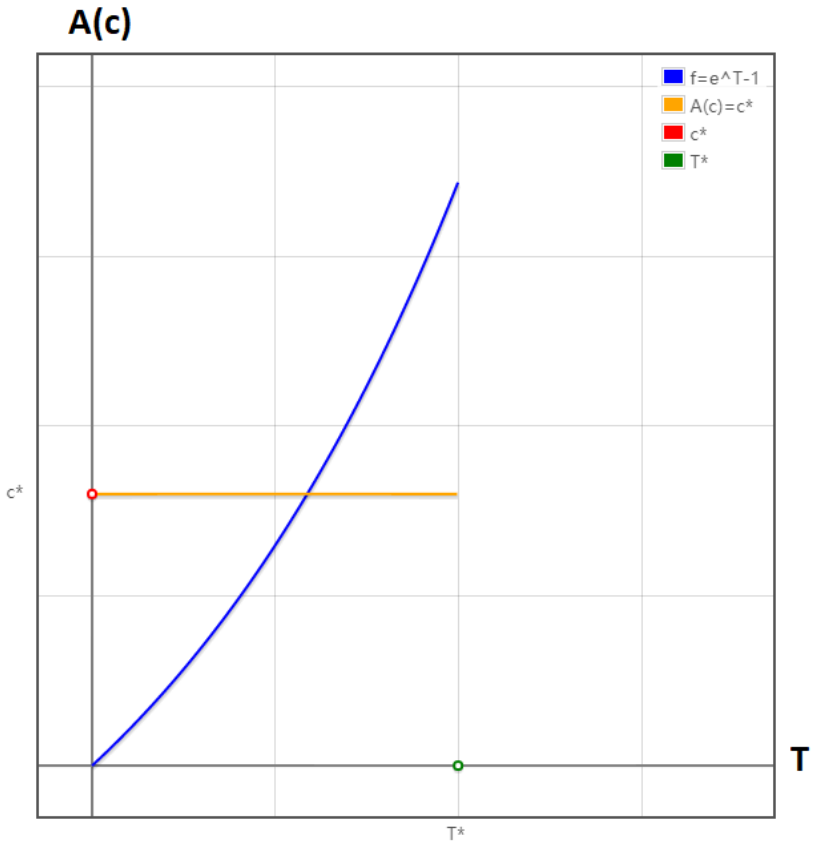

Chart 4. Government's Administrative Cost in First-half of Game

In this phase, interactions between consumers and providers are only considered from 0 to T*. If the government chooses to implement the legal system steadily, the administrative cost is the area of the rectangular $A(c)_{Law} = c^* \cdot T^*$. If case-by-case choice is selected, the administrative cost becomes

$$A(c)_{Case} = \int_0^{T^*} (e^T - 1)\, dT$$

In addition, the transfer payment should also be considered as a part of government's cost when the society loses confidence on normal social contract in the market. When consumers lose confidence, they will stop cooperation with providers and degrade the payoff of both players to

be their own incomes without any additional reward. The utility difference and government's transfers can be expressed as total transfers (tr) and transfers to both players at different times:

$$tr = t(p) + t(c)$$

$$t(p)_i = I_p^* - I_{pi} = I_p^* \cdot \left[(1+r)^i - 1\right], i \in [1, k]$$

$$t(c)_i = I_c^* - I_{ci} = I_c^* \cdot \left[(1+r)^i - 1\right], i \in [1, k]$$

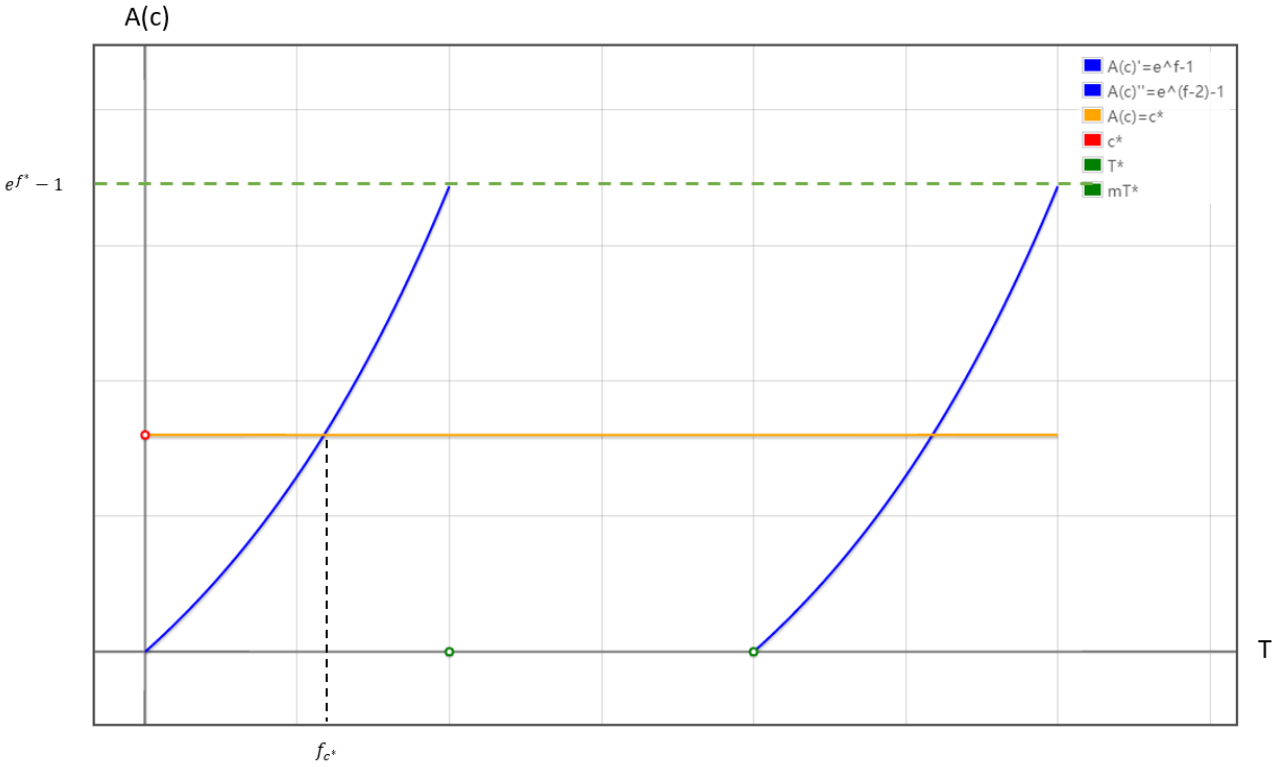

Chart 5. Government Administrative Costs Comparisons

As our model described in theoretical part, the government's total cost under two choices can be written in the following equations:

$$G(c)_{Case} = A(c)_{Case} + t(p) + t(c)$$

$$= \int_0^{T^*} (e^T - 1)\, dT + \left(I_p^* + I_c^*\right) \int_0^{(m-1)\cdot T^*} \left(\left[(1+r)^i - 1\right]\right) di$$

$$G(c)_{Law} = A(c)_{Law} = c^* \cdot (m \cdot T^*)$$

It is obvious that only when $G(c)_{Case} - G(c)_{Law} > 0$ will the government choose to implement stable, effective and transparent legal system to control the market dishonest activities. After calculation, we can get result below:

$$G(c)_{Case} - G(c)_{Law} = e^{T^*} - 1 - m \cdot \tau \cdot tr_i - (m \cdot c^* + 1) \cdot T^* < 0$$

$$m > \frac{e^{T^*} - 1 - T^*}{\tau \cdot tr_i + c^* \cdot T^*}$$

From the inequation above, I can conclude only when m exceeds some values can the government implement law system stably and effectively. As we can see, m is in reciprocal relationship with $\tau \cdot tr_i$ and $c^* \cdot T^*$, but the increase of $e^{T^*} - 1 - T^*$ will extend the nonconfidence cycle.

It is easy to understand when the fixed, constant cost ($c^* \cdot T^*$) for government to implement the law increases, the nonconfidence cycle will be shortened due to fewer trick actions that providers may take with the risk of being punished immediately. The transfer cost is great expenditure for government, and with such enough transfers, both players can be back to cooperative situation without any delay or difficulty. Therefore, the nonconfidence cycle is shortened with government's placebo. When the time needed to exhaust consumers' confidence is long, the nonconfidence cycle will surely be extended as the proverb says, "The more we love, the more we hate".

Nevertheless, the reality is not always so satisfactory and many factors can never come into being or reach perfect states. When the government is not as altruistic as I assume or do not care its children that much, the pandora's box opens and unimaginable consequences follow up to leave little space for turnarounds gradually.

3.4 Purely Selfish Government and Consequences

Public finance is always in deficit for most of countries since money is never too much to spend. Ways to spend taxpayers' money consist of varieties: systematic audits for financial budget, no transparent audits but still in efficient use, no audits and corruptions, extravagance, etc. When legal system is convincing and transparent,

Consumer's Tolerance Naïve consumers tend to believe that providers are reliable and will top-up for discounts in their future services. The length of this tolerance is denoted as T^*, a tipping point beyond which consumers' confidence is exhausted. The more consumers can tolerate providers' dishonest actions, the longer this time is, and the more cost the government need to bear. However, government can also choose not to let market's honesty under surveillance: pay less than the ideal level, that is $A(c) < e^{T^*} - 1$. When consumers find the sprawl of dishonesty without enough control, Grim-Trigger strategy comes into effects, indicating

the unforgiving consumers or the forgiving cooperation happens only after infinite time k. At the beginning, government can indeed save money from such decision. However, in the long terms, social confidence cannot recover for much longer time than expected and government need to make more transfer payments to ensure the economy not slip into depression.

Government's Transfers As I mentioned in the inequation $m > \frac{e^{T^*}-1-T^*}{\tau \cdot tr_i + c^* \cdot T^*}$, $\tau \cdot tr_i$ has reciprocal relationship with m: the more transfer payments, the more quickly the market can be back to normal state. In this part, transfer payments are affected by inflation rate $1 + r$, and the time needed for consumers to regain confidence i. No matter whether consumers have high tolerance of dishonest actions in the market, government can choose to not make transfer payments to both players to ensure its own expenditure, that is $tr < \left(I_p^* + I_c^*\right) \int_0^{(m-1)\cdot T^*} \left(\left[(1 + r)^i - 1\right]\right) di$. When incomes of both players are below the optimal level, providers will try their best to trick consumers who, with limited money to make any vigilant top-up, tend to never top-up in the foreseeable future. Since market activities decreases, the amount of money the government can tax decreases, which further deteriorate public finance. This is consistent with the result in Grim-Trigger strategy, and at last all three players are losers.

Compulsory Savings or Tax Increase The government may use monetary tools from central bank to print more money, resulting in inflation and compulsory savings from residents for government to spend. This usually happens when tax collected is not enough to cover expenses. In fact, when the market participants reduce their exchanges in goods and services, the fortune generated will be less than expected, which will reduce the amount of money to be taxed accordingly. Such actions by government will further shrink the size of market trades and may speed up its way to depression.

Fixed Costs Under Legal System Optimal and constant costs for government to implement effective, stable and transparent legal system ensure the prevention of dishonest activities as well as the sprawl of social nonconfidence. If the government cannot set aside enough money but a lesser amount for market surveillance,$A(c)_{Law} < c^* \cdot T^*$, the nonconfidence cycle becomes longer, imposing negative effects on social economy. However, the optimal amount of money is hard to estimate and therefore, difficult for government to make financial budget in advance. For those who are suffering from continuous public finance deficit, the allocation for this use is bound to be a lesser amount of money. With less input to control the sprawl of nonconfidence, the cycle will be less severe but longer, still causing great loss to all players.

4. Discussions

4.1 Constructive Advice

With outcomes from modelling of the specific example in the extension of Rotten Kid theorem, some constructive advice can be concluded for governments to make decisions when they encounter such dilemma.

Faced with endless demands from both market participants and itself, the government must make tough choices either to push itself to the fringe of being broke or to see the economy slip into chaos. As what I have modelled, there are two factors that government need to consider to prevent itself from plunging into the tremendous abyss: less extravagance and spend at the key point.

Less extravagance means the government's spending should be in the most economical way, especially for those who are in the early stage of development without too much savings. Any waste or immoral spending will decrease the amount of money government can utilize for social economy's development and social stability.

To spend money at the key point here refers to the establishment and implementation of effective, stable and transparent laws. It is understandable that different governments may hold different views upon what key points should be in the face. However, the sooner the government can take actions to reform imperfect and defective laws, the longer the economy will maintain prosperous, and the more all the members in the society will benefit, reach a win-win-win strategy.

If a country cannot establish effective, stable and transparent legal system, its economy cannot prosper, or cannot sustain prosperous for a long time. The transient boom in economy may be totally ruined by inconsistently implemented laws which exist just in name or formulated only for the interests of government itself.

The conclusion of this paper can also be extended to any field or industry where the legal regulation is inconsistent, instable and not transparent. It can also be applied to situations that government's regulations lag much behind dishonest behaviours.

In fact, all governments cannot prevent the occurrence of the worst consequence but can only defer it happening, unless they can remedy the legal system immediately after new ways of crimes' emergence.

4.2 Limitations

The model and specific example illustrated in this paper still contain some minor flaws which need to be revised in next versions.

In the first place, the relations between providers and consumers, the specific government costs comparisons functions are just rough estimations of the reality, but not accuracy reflection on what may happen in practice. More data need to be collected for this purpose to verify the forms and shapes of those functions.

Secondly, assumptions on some parameters may have subtle changes as the modelling process moves on. Though these changes may not lead to inaccurate math derivations, the meanings behind them cannot convey more insightful ideas. Inconsistency check will definitely be thoroughly done later.

I take no account of the possibility that government may choose to combine two kinds of surveillance. This may well be true in practice since the struggles inside the government will make its policies oscillate between two extremes. To make the paper reasonably concise, this situation is not discussed. I will consider modelling this situation in later versions to make the model more comprehensive.

Budget constraint of the society is not considered in this model since this game is only the partial interactions within all social members. In the conventional model, this condition is necessary to derive final outcomes. Therefore, the ignorance of this constraint may result in inaccuracy in our conclusions. In addition, the existence of budget constraint makes two-period modelling in self-remedy punishment part feasible. Thus, I will revise this paper in next version to include such constraints.

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