THE PRISONERS' DILEMMA OF DISOBEYING THE RULES: IS CORRUPTION COMBATING A CURE FOR BOTH MARKETS AND NON-MARKETS?

by

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(Under the Direction of Jeffery H. Dorfman)

ABSTRACT

Given the prevalent phenomenon of disobeying the existent formal rules in China, commercial and environmental protests are used as proxies for this disobeying dilemma in competitive markets and non-markets. Driven by a popular view that corruption is the source of this dilemma, two sequential games with two common components -- protests and corruption -- are proposed to model the multi-stage interactions between three players (a group of citizens, a firm, a government official). The model suggests that increased top-down inspection frequency on government officials should be able to alleviate the dilemma. Combining this game theory approach with a unique new dataset on protests, the effect of the recent wave of anticorruption movement in mainland China is calibrated for each province. The results suggest that the anticorruption movement helped 13 provinces to regulate the housing market (reduced commercial protests), on the other hand, it provoked more environmental protests in 9 provinces.

INDEX WORDS: Protests, Corruption, China, Environmental Disputes, Commercial Frauds.

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CHAPTER 1

INTRODUCTION

1.1 Prisoners' Dilemma: A Quick Review

Chinese tourists were notorious for being more likely than their Asian neighbors to jump a queue. Consider a simple game as the game table below. Say there are two individuals, A and B, in a long queue. If both A and B follow the rule, i.e. do not jump the queue, they both get a payoff of 1; if one follows the rule while the other does not, the former get 0.5 while the latter get 1.5; if both disobey the rule, they both get 0.8 (less than 1 because of the unhappy mood in this situation). As the following game table suggests, "disobeying the rule" is the dominant strategy, but the equilibrium payoffs (0.8, 0.8) are strictly less than both obeying the rule (1, 1). It is a classical prisoners' dilemma problem. There is no even mixed strategy here.

Table 1 A Typical Prisoners' Dilemma Game (a)

		B: Obey the rule	B: Disobey the rule
A	Obey the rule	1, 1	0.5, **1.5**
	Disobey the rule	**1.5**, 0.5	**0.8**, **0.8**

How to change this dilemma? By changing players' payoffs, we can turn a Prisoners' Dilemma Game into an Assurance Game that has two pure Nash equilibria, with one equilibrium that is strictly better than the other is (A.K. Dixit et al., 2009). Suppose the payoffs are slightly different as shown in Table 2: if only one follows the rule, the payoff of the other one (that jumps

the queue) is less than 1, say 0.9 (because of embarrassment of being the only one that jumps the queue). Then we have two pure Nash Equilibria, (1, 1) and (0.8, 0.8). We would also have a mixed strategy equilibrium (a mixture of 75% obeying and 25% disobeying). If A believes B has a probability of 75% to obey the rule, A is indifferent between obeying the rule or not. If A believes B has a probability higher (lower) than 75% to obey the rule, A should choose to obey (disobey) the rule as well.

Table 2 A Prisoners' Dilemma Game Changed Payoffs: Assurance Game (b)

		B	
		Obey the rule	Disobey the rule
A	Obey the rule	**1**, **1**	0.5, 0.9
	Disobey the rule	0.9, 0.5	**0.8**, **0.8**

Notice whether the prisoners' dilemma is the only equilibrium depends on the payoffs that are generated by the beliefs of each player. So the key that leads to a dilemma is trust (or distrust): if A believes B is so barefaced that B would rather choose to be the only one that disobey the rule, then A's best response is to follow (disobey as well). Then what forms their beliefs? Observed history does (or former records, or fundamentally speaking, memorized information). Each time individual A encounters a person that jumps the queue, she increases her belief in B's payoff of disobeying.

1.2 Disobeying the Rules: A Long-lived Prisoners' Dilemma in China

We can see this dilemma in many scenarios in China. A frequently observed situation is between a local government and a group of citizens or villagers that are seeking "justice" (guaranteed by some law). Ideally, when there is a dispute, both the local government and

citizens should face each other in a court (through the legal channel). However in reality, both sides claim that the other side is seeking undue benefits or has bad intention (beliefs/distrust about the other player's payoff), and neither of them completely follows the legal processes (disobey the rule). The local government often hides information about an upcoming industrial project rather than inform citizens beforehand. When citizens are concerned about environmental externalities of the project, the government's first reaction is likely to be suppressing rather than listening to citizens' doubts. On the other hand, citizens often believe the top officials of a local government care less about people's welfare than the promotion ladder, and so may easily decide to block any potentially harmful projects and resort to civil disobedience instead of official channels (e.g. a local court, a local Letters and Calls Bureau[1]). For example[2], in Pingjiang, a poor county of Hunan Province, a thermal power plant project incurred popular protests on the streets by more than 10,000 local citizens. The chief China Communist Party (CCP) leader of the county government resigned (which is rare) and wrote a public letter to express his frustration, saying that all he hoped was to promote the economy of this poor county, and he sincerely wished the county could take this superb opportunity of development after this chaos. However citizens doubt the plant would be environment-friendly as the official reports promised: First, the official himself is not a native and he would leave if he get promoted. Second, other branch thermal plants of the same group company had been reported to get three warnings for suspicious

[1] "Letters and Calls" euphemistically means "complaints and help." And people do not only send letter and give phone calls, they also (often) visit these Bureaus in person.

[2] Sina Finance News. Behind the boycotts of Pingjiang power plant: Get warning three times for illegal emission. 2014/11/24. (The original news title: 华电平江火电厂遭群众抵制背后：半月因偷排被批三次. http://finance.sina.com.cn/chanjing/sdbd/20141124/023020898147.shtml) The Chinese characters are already translated in front of the parenthesis. Keeping the original Chinese news titles or terms in this document is just an attempt trying not to loss information due to my potentially imprecise translation.

self-reported emission data, construction before the ratified date, and desulfurization facilities not operated as much as required, in just a half month.[3][4]

"The government has good intention to formulate good laws, but no one is following it." This is a common view held by Chinese people, frequently reflected in my data and backed by some scholars and government officials. A Deputy Minister of the Environmental Protection Ministry openly admitted that "although there are many environmental laws, not many of them are effective."[5] When I was a student in the graduate school of the Chinese Academy of Sciences, in the summer session of 2011, a senior environmental scientist expressed the exactly same idea in his lecture: "The environmental laws are quite complete and stringent in China, the problem is that no one is following it." This viewpoint has the same root of another important popular belief which may have been prevalent for thousands of years: "The emperor is benevolent but the populace is suffering, because the bureaucrats are very bad."[6]

Readers should notice that the Chinese protests introduced below are in essence the same as ancient petitioners kneeling down in front of the emperor's palanquin[7], which is sharply different from modern Western environmentalism movement that are advocating for something that has no direct beneficial/harmful effects on the protesters themselves.

[3] Sina Finance News. "China Huadian Corporation got three warnings in 15 days." 2014/7/21 (Original title: 中国华电集团 15 天被 3 次通报. http://finance.sina.com.cn/focus/HuaDian/)
[4] Pingjiang government then tried to explain away the news (http://ygsn.pingjiang.gov.cn/Item/33967.aspx), which as I see was a little,unsuccessfully, evading.
[5] Sina News. "". 2009/12/21. (Original title: 环评腐败案件上升明显 http://news.sina.com.cn/c/sd/2009-12-21/101119304371_7.shtml)
[6] Original term (in Chinese): "反贪官不反皇帝".
[7] Original term: "拦轿喊冤"

CHAPTER 2

PROTESTS IN CHINA

2.1 Unlawful but Constitutional Practice

"Civil disobedience" literally means "refusal to obey a law". In the context of this thesis, it refers to collective out-law activities such as public protests, "strolling" the streets (euphemism for demonstration), hanging accusing banners (stating requests or reasons), blocking roads or factory gates, sitting all day outside the local government buildings, strikes. For simplicity, all of these activities are referred to as "protests" hereafter.

Although China's constitution grants citizens of rights to assembly and demonstration, they need to get official permits in advance. However, local governments rarely permit any protests in practice, so those activities are "unlawful" procedurally.

According to the series of Blue Book published by the Chinese Academy of Social Sciences, the numbers of protests per year has grown from about 10,000 in 1993 to 80,000 in 2007, involving 730,000 and 3,760,000 participants respectively. Since 2008, the government no longer publishes this number at all. Numerous (if not all) studies have pointed out that most protests are driven by specific legitimate requests that are related to monetary interests or physical well-being. Cases that use protests to express political dissidence or exercise rights of free speech for nothing are extremely rare and would incur severe penalty -- Chinese people are too pragmatic to do that, anonymously speaking out on the Internet is a much better choice in terms of speech coverage and costs. However peaceful and apolitical, when people assemble, violence and riots may occur. Therefore, popular protests are a particular headache to both local

and central government who are always alert to any potential riots. Since the mid-2000s, "maintaining stability", which means reducing protests as many as possible, becomes a top priority for local officials. Since 2011, the cost of maintaining internal stability has exceeded the country's military expenditure.

Based on the main reason of protests, they can be categorized into three groups:

(i) When the rule is not written down or is improper, two parties' expected price for a settlement cannot agree. In essence, it has root in lacking laws or contracts, improper former policies, and bargain power disparity. This type of protests include:

Strikes led by unpaid or underpaid workers (even public teachers);

Land acquisition and compensation disputes (the compensation standard is set too low by law);

Property or business owners protesting over high property management fee or rents;

Taxi drivers opposing high monthly fees charged by taxi companies;

Unemployed or retired workers asking for social security help.

(ii) Government shirks responsibilities or does not act in an unbiased manner when the weaker party of two conflicting interest groups seek legitimate support. This category includes: commercial frauds, environmental disputes, many cases of protests by unpaid migrant workers that do have contracts, and traffic or medical accident disputes.

(iii) Government officials' violent and arbitrary behaviors. For instance, police violence, "chengguan" (urban management officers) violence, and forced demolitions or evictions (along with land acquisition).

In our dataset, protests over unpaid wages are the most frequent subcategory among all the protests. In 2015, there are 28950 cases recorded in total, wherein 9107 cases are unpaid-

wage protests. Commercial fraud protests is the second largest type, with 6328 cases national wide in 2015. Violence during land acquisitions is the third largest group (2183 cases) while environmental disputes is the fourth (1000 cases). These four subcategories constitute 64.3% of all the protests.

Wage arrears and land disputes have long received intense attention, partly because in some extreme cases there are homicides and suicides involved. Nearly half of migrant workers in construction industry did not sign contracts with their employers in 2016; lacking knowledge and resources also makes them especially vulnerable.[8] According to the existent laws, farmers who lose one mu (1mu=1/15 hactare) of land can only receive less than 60,000 yuan; on the other hand, the government may get 100 times of revenue from the land buyer, which understandably can easily provoke anger.[9]

Environmental disputes also received much attention in recent years, because it could lead to ultra-large protests (thousands or tens of thousands participants) and those large protests are somewhat contagious (e.g. anti-PX protests in Xiamen 2007, Zhangzhou 2008, Dalian 2011, Kunming 2013, Maoming 2014, Shanghai 2015).

Compared to the other three subcategories, commercial protests received much less attention, maybe because of their normally smaller size (10-100 people) and involved little extreme behaviors from the would-be property owners (middle class). But it does not mean the welfare loss reflected in commercial protests are any less severe than any other types. Every commercial protest in our dataset has at least hundreds of victims behind, and what they bought

[8] People's Tribune. Wage arrears cannot be a Spring Festival "routine" for migrant workers. 2017/01/20. (Original title: 农民工欠薪绝不能成为过年的"标配". http://paper.people.com.cn/rmlt/html/2017-01/20/content_1754247.htm)

[9] Tencent News. "The State Council is revising the compensation standard of land acquisition -- may increase by 10 times." 2012/11/29. (Original title:国务院修改征地补偿标准 可能至少提高 10 倍. http://news.qq.com/a/20121129/000066.htm)

is the most expensive product and important investment for an average Chinese family (house or financial products, otherwise they would not dare to protest). Besides, the chaos in the market of the most expensive product also reflects the typical chaos in any other markets flooded with "lemons" in China. I think even foreigners may have heard about fake products and poisonous foods made in China. More than 40 years has passed since (George Ackerloff, 1970) described how Indian women were struggling with fake rice that is seriously harmful to teeth. Nevertheless, this situation is still strikingly familiar to those Indian women's now middle-income neighbors (me): "Is this pack of green onions poisonous?" "Does this pop star know that he is promoting an unfinished residential building in the future?" "Do not believe their promises, trust is so expensive." This problem may not seem quite threatening from the narrow perspective of maintaining stability, but it definitely affects every ordinary Chinese citizen' daily well-being, confidence and growth of domestic economy, and of course will hurt a government's legitimacy of a modern government stands on the well-being of its citizens. It is never an overestimation to emphasis the importance of this problem.

In this thesis, I will focus on the commercial and environmental protests, because they mainly have problems with disobeying the existent contract or law (instead of lacking a fair one).

2.2 Background of Commercial and Environmental Protests

Among the commercial fraud protests, a small portion (10%-level) is related to financial institutes (elaborate deceit schemes, Ponzi schemes or embezzlement by bank clerks), while the rest are related to the real estate industry throughout the country. So hereafter, I will deal merely with the latter type.

In China, most commercial residential flats were pre-sale houses (paid in advance, mortgage is signed before the building is ever built). Therefore, it matters a lot whether the real

estate developers fulfill the contracts and their promises later. The further the developer deviates from the contract, the more likely homeowners would organize persistent protests. The extreme situations are unfinished buildings. Search any middle or large city, the news of unfinished building is far more than handful. According to the official news channel, in Shanghai, one of the most open and developed cities in China, there were nearly 200 unfinished buildings in 2003.[10]

It is not difficult to imagine that smaller violations of contracts are countless, one trap after another. For instance, as shown in our data and daily news[8], developers do not compensate homeowners for the delay as specified in the contract. They change the design without a public notice. The so-called "finely decorated houses" are starkly different from the promised model. Houses may have various small quality problems, sometimes the quality problem is too severe to be considered as a safe construction (jerry-built). Even if your family has moved in successfully, here is another trap -- you can never obtain the title certificate because the developer did not proceed lawfully. The house was sold to multiple buyers which should not happen but it happens… (Trust itself is a valuable existence that could reduce transaction costs and bring benefits to larger population. Our familiar online shopping is also based on trust not only to the online-shop owners, but also to the regulators behind all the online shops. What if I complain to the supervisors of those online-shops but am ignored? It is essentially what those house buyers are facing.)

In 2005 and 2010, there were two waves of heated discussion in mainland China, debating whether the pre-sale system should be discarded all together instead of trying to

[10] Xinhua News. "Shanghai half-tailed buildings are reviving. Expert: 'Watch out for their sequela.'" (Original title: 上海烂尾楼上演"前死今生" 专家:当心"后遗症" http://news.xinhuanet.com/newscenter/2003-11/20/content_1188760.htm)

improve it. But this system has not been wavered in any city till 2016 May in Shenzhen, which is also a small trial for a single piece of land.[11]

Is this phenomenon because of the pre-sale system itself? Not necessarily. First, the pre-sale system is common in many countries because it is beneficial not only to developers, but also to house buyers and banks, if operate healthily (張芳正, 2016). Second, in regions with similar cultural backgrounds, Hong Kong and Taiwan, this problem has never risen to the level where people would consider canceling the system. Actually the pre-sale system was invented in Hong Kong in 1955. However, as a large city with free media, there are only two cases of reported unfinished buildings since then.[12] The first case was in 1960, a developer had an over-expenditure problem so house buyers had to pay an additional 30% of house price to help finish the building. Then Hong Kong Lands Department enacted the Consent Scheme to regulate the market in 1961. The second case was in 2003, which is the only one incident after 1961. This case involved collusion between the house developer and the law firm that was responsible for supervision (usage of fund).

Had the written laws fail to forbid and punish contract violations by house developers, or failed to require the developers must have a qualified background and be supervised by a third party for fund usage? Of course not. The pre-sale system was introduced in mainland China in 1994. Since then till 2008, the central government has enacted seven relevant national laws or regulations with four revises.[13] Besides the general problem of Chinese laws and regulations that

[11] Sohu News. “Revoking pre-sale system, will these nine sins disappear?”. 2016/05/ 07. (Original title: 取消预售改现楼销售 这九宗罪是否就不再发生？ http://mt.sohu.com/20160507/n448152008.shtml)
[12] Hong Kong Apple Daily. “The inside story of Junlai half-tailed building.”2003/05/29. (蘋果日報.均來爛尾樓內幕 http://hk.apple.nextmedia.com/nextplus/%E5%91%A8%E5%88%8A%E5%B0%81-%E9%9D%A2-%E6%95%85-%E4%BA%8B/article/20030529/2_3318753/%E5%9D%87-%E4%BE%86-%E7%88%9B-%E5%B0%BE-%E6%A8%93-%E5%85%A7-%E5%B9%95)
[13]"Urban Commercial Housing Pre-sale Management Approach" (Ministry of Construction 1994, revised in 2001 and 2004)

has cultural roots[14], the unavoidable vital problem is that the laws are not strictly enforced. Supervision from the government is never strong enough, which makes house buyers rely heavily on developers' honesty (張芳正, 2016). Therefore the real estate industry is a good reflection of the larger picture of disobeying the rules in private markets in China: Rather than drying out the market or driving out lemons, oranges gradually become more lemon-like, thus more-or-less lemons are prevalent in the whole market.

On the other hand, environmental protests are all about externalities outside the private markets. Typical cases are that urban or suburban citizens protest against some local factories. The factories emit air /water/ noise pollutions that are unbearable to surrounding households or farmlands. Some local mines whose frequent demolition cracked farmers' houses. Large public infrastructure projects often cut off villagers' own roads without providing an alternative. In urban area, citizens do not only boycott projects that have already caused inconvenience or harm, they also boycott projects that might be harmful to human health in the future (e.g. an incinerator or power plant not operated as promised). Trivial cases like blocked vision/sunlight by a nearby new building, and "potentially harmful" cases like electromagnetic radiation from telecommunication base stations may also provoke protests.

2.3 Cell Phones, Cameras, Social Media, and Protests

Transmitting information is essential to organize a protest. House owners in commercial protests may talk to each other directly or use instant messenger apps or Short Message Service

"Urban Real Estate Management Law of the People's Republic of China" (Chairman's Order 1995, revised in 2007)
"Guarantee Law of the People's Republic of China" (Chairman's Order, 1995)
"Urban Real Estate Mortgage Management Approach" (Ministry of Construction 1997, revised in 2001)
"Individual Housing Loan Management Approach" (Central Bank, 1998)
"Property Law of the People's Republic of China" (Chairman's Order, 2007)
"Housing Registration Method" (Ministry of Construction 2008)

[14] Principles are given, but not precise details, just like cooking Chinese dishes.

(SMS). And they are not confined to be acquaintances -- before the emergence of social media, cellphones, or SMS, already played a role in gathering strangers in the famous anti-PX protest in Xiamen in 2007. Tens of thousands of citizens protesting on the streets, which later forced the local government to relocate a paraxylene (PX) plant. According to a study (Jun Liu, 2013), cellphones increased public participation in decision-making on environmental issues. First, the widespread of anonymous SMS concerning the harm of PX project helped to advocate tens of thousands of Xiamen citizens to participate the massive protest on the same day (June 1, 2007). Second, SMS changed citizens' viewpoint and behaviors: police officers did not hinder the protesters, rather, they told the protesters to shout louder. Third, it is harder (or more costly) to shut down the entire cellphone network than Internet, enabled continuous communication and organization.

The most popular social media in China is Sina Microblog ("Weibo"). It was founded in 2009, as a substitute for banned Twitter and Facebook. Although Sina Weibo faced some competition from similar domestic social media websites (Tencent, Netease, Sohu), it remains the largest and most influential one and recorded all the hot spots of society since 2009. According to the annual report by Freedom of the Press, by the end of 2012, there were 0.56 billion netizens while Weibo accounts has reached 0.4 billion[15], compared to the nation's population of 1.35 billion in 2012. Because numerous celebrities, news agencies, and ordinary users can communicate directly with each other, Weibo becomes a training ground of freedom of speech. (Gary King et al., 2013) found that the Chinese government is much more likely to delete posts calling for organized collective actions than plain complaints. Therefore, as I see, people do not need to practice this right by holding costly and risky protests, which makes

[15] But I suspect the active Weibo accounts are far less than its total registered users, since real users are not necessarily active, and there are also well-known "zombie users". According to a news report from China Daily, 120 yuan could buy 5000 zombie followers. (http://www.chinadaily.com.cn/2011-11/22/content_14137247.htm)

protests "purer" to reflect real violation of rules. (Bei Qin et al., 2017) found that many strikes and protests that happened in real world could be found mentioned on Weibo at least one day earlier, and 34.9% of 192 government officials being accused on Weibo were investigated by the government thereafter. Qin then claims that Weibo has a forecast function for corrupt officials. I doubt that the authority would really use anonymous posts on the Internet as clues to detect corruption. The legal channels (Letters and Calls Bureaus or similar offices in other government departments) are already jammed by complaints from identifiable individuals with more detailed evidence. In 2013, according to the Central Commission for Discipline Inspection (CCDI), all the branches of the Commission for Discipline Inspection (CDI) nationwide received 1,220,191 accusations, only 172,532 were investigated. According to the CDI of Hunan Province, they only investigated 2,589 clues out of 28,063 cases that were formally accepted from January to May 2014. From January to October 2013, there were 6.04 million cases formally accepted by all the nation's Letters and Calls Bureaus. How many of them will be investigated? It appears a truism is that social media is used for corruption investigations only when the original social media post has become so influential that it has been reposted far more than 500[16] times. And in fact it is pretty hard to achieve 500 reposts for any normal user, unless you have millions of followers. Another possible explanation for "34.9% of 192 government officials being accused on Weibo were investigated by the government thereafter" is many people's belief that "over 50% of officials are corrupt" and possibly those 192 names were on the core positions (e.g. heads of local CCP committee) that are more likely to be investigated.

As mentioned before, the official number of total protests is not available since 2008, and even if the provincial or county-level number is available, we cannot access their details about

[16] It is a threshold that will theoretically enable the Chinese government to put a blogger in jail for three years, if s/he posts an "untrue rumor" and received 5,000 views or 500 reposts. An English introduction could be found on https://www.theguardian.com/world/2013/sep/10/china-social-media-jail-rumours. We'll also meet this number later.

time, location, reason, and interest groups involved. Typical surveys cannot track protests for the whole country, not on a daily or monthly basis for several years. Even if the respondents covered numerous counties and cities, it is hard to imagine that all the respondents could remember the exact date when their protest happened. Without certain precision and samples, it is difficult if not impossible to access instant effects or examine more interested factors of a given policy.

This may not be true anymore when cellphones equipped with built-in cameras and social media accounts are widespread. All the individuals who have these three tools in hands can upload what happened around them in any place and any time. Since Chinese protesters have a long habit of carrying banners that state their demands, with higher resolution cellphone cameras, we can identify their reasons even if the uploader did not mention or ask. Furthermore, protesters generally will try their best to attract attention by all means, which gives potential uploaders an incentive to record it. For example, when a potential uploader met a road blockage by some protesters, feeling angry and being forced to "have some spare time" may increase the incentive to report through the social media. What if the uploader did not report the location? Another help from technology is the GPS function of cellphones. Since June 2012, Weibo gradually started to automatically show the location of the uploader along with a post. Of course the social media has its disadvantages, too: 1) some people might turn off the GPS function deliberately for safety concerns; 2) posts about sensitive events (e.g. riots, massive protests) might be deleted by the author or the authority after several hours or days. Therefore a post had better be captured in time by the observer, otherwise it might simply disappear. Besides, the portion and personal traits of people who turn off the GPS function is unknown. Are they more likely to be IT geeks or wealthier? This is unclear.

As implied above, the data on protest that I will use in later sections is collected through the social media and cellphones, on a daily basis. Two volunteers[17] recorded the raw data (social media posts with text comments, photos and even videos) for four years and published it on the Internet (2013/06 – 2016/06). They recorded 21,260 cases in 2014 and 28,950 cases in 2015, according to their own yearly summary. Unfortunately, the dataset cannot cover longer period, data in June 2013 and June 2016 are not complete, and its total number of protests per year is far more less than the official total number in 2007 (more than 80,000 cases).[18] Nevertheless, this dataset is still the most detailed and comprehensive records on protests in China, ever. China Labour Bulletin (CLB)[19], a NGO in Hong Kong started to record labor protests since 2011, is using a similar method. But CLB's records are much less complete than the dataset we will use. The total number of protests recorded by CLB in six years (8,040) is less than the number of unpaid-wage protests in a single year of 2015 in our dataset (9,107).

To give a glimpse of the volumes of recorded protests (all categories), Table 3 shows the nationwide protests recorded in each month.

Table 3. Monthly Recorded Protests (All Categories) in China 2013/7 --2016/5

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013							1190	1306	1019	1004	1131	1475
2014	3779	927	1374	1457	1222	1541	1689	1757	1802	1734	1859	2119
2015	2796	4951	1687	1917	2086	2264	2117	2259	2151	2110	2198	2414
2016	3303	2591	1974	2001	1528							

Notes: Numbers in this table from 2014/1 to 2015/12 are given by the two volunteers, other numbers are summarized by me. As implied before, there are numbers in June 2013 and June 2016, but they are not completely covering the whole month therefore I ignore these two months. Usually there would be a peak in January because it is the peak time for migrant workers to ask for unpaid wages, then they would go to hometowns to celebrate the Chinese New Year in February.

[17] Lu Yuyu and Li Tingyu. They were detained by the Yunnan Police in June 2016 so the data collection stopped since then, but their blog with all the raw data still can be accessed: https://newsworthknowingcn.blogspot.com/ (in Chinese)

[18] This underreport is understandable if taking into account of the percentage of population that simultaneously has access to Internet/high-resolution camera/social account/willingness to upload; the probability of being recorded in time by the observers would also reduce the number.

[19] http://maps.clb.org.hk/strikes/zh-cn

2.4 Government Failure

Instead of protests, are there any legal channels to express citizens' concern and grievance? Yes there are. As mentioned in the first section, citizens always have the choice to go to a court or a local Letters and Calls Bureau. But neither of them are regarded as effective means. Every government has a Letters and Calls Bureau/Office[20], but such an office or bureau is not responsible for investigation or arbitration. Letters (complaints) would be directed to the department that initially failed to solve or even caused the complaints, or they might be endlessly kicked from one "relevant department" to another. One report by a team of sociologists in Tsinghua University mentioned that only 1/1000 of cases could be solved by the letter channel (孙立平 et al., 2010). On the other hand, courts as the baseline of rules in a society are not independent from local governments. To the contrary, the chief leader of a local court is lower-ranked than a counterpart in local government. The personnel and financial power of courts are held in the hands of local governments. According to Jun Jing (2009), less than 1% of environmental disputes were processed by the legal system, that is to say, most environmental lawsuits were refused by courts. So citizens have to resort to letter writing and petition (sometimes trudging to the State Letters and Calls Bureau in Beijing). If those are not helpful, people protest. In Guangdong province, among all the 16,523 protests from 2000 to 2004, 62.2% were carried out after letter and petition failed to even produce a proper response (钟其, 2012). Therefore most environmental disputes in China evolve into protests. According to my dataset, some citizens have complained that although they received a favorable verdict from the court, it was hard to enforce. Although urban residents should have more knowledge and available

[20] Provincial/municipal/county governments definitely have such bureaus of offices; villages or even streets may also have their own staffs on this issue.

resources to go through the legal system, they do not seem to act differently from their rural counterparts.

When the legal channels are proved or expected to fail, protests, as the last channel to solve citizens' grievance, emerge from underwater. Since one of the most important functions of a modern government is to enforce the law (the most fundamental social rules), citizens' disobedience is an indicator of weak legal system and government failure in both private and public section.

2.5 Literature Review on Protests and Petitions in China

First to clarify the difference between petition and protests: Petition means writing letters or visiting the Bureau of Letters and Calls. Level-skipping petition to a higher ranked Bureau is legal but strongly not recommended, so it is also an "instability" for lower ranked governments to control. Protest is procedurally illegal, usually involves actions in public places (trying to attract public attention).

To generalize beforehand, due to unavailability of detailed data or on a larger geographical scale, the majority of literatures about protests in China are case studies. Quantified studies are quite rare. A few numerical studies rely on selective samples from newspapers or official publications (which must have been censored). The most precise data to date are questionnaire surveys asking citizens to recall former events. Researchers survey and interview protesters, analyze the origins and development of typical cases, trying to identify the underlying reasons. As to subcategories of protests, earlier studies mentioned protests about unemployment and social security issues, recent studies focus on land disputes and environmental protests. So far I have not found any study that examined the commercial protests.

First, protests are not any new phenomenon to modern China, at least dates back to 1990s. That is, more than 20 years ago, citizens already knew that the last method that could effectively force the government to listen to their desperate requests is to obtain a word from a top government leader whom holds the biggest power. So they gather a large number of people, stand in the middle of a major road – just to get attention of some kind-hearted high-rank officials. This logic is still effective today (and effective since thousands of years ago). In 2003, the former premier Wen Jiabao advocated for an unpaid worker he met in Chongqing, then the worker got back his wages within 24 hours. The same pattern happened again in January 2017. An unpaid worker got his unpaid wages within 48 hours after the present premier Li Keqiang noticed the predicament of his family.[21] According to (Feng Chen, 2000), more than 1.1 million people were involved in labor protests in 1995; the number increased to 3.6 million in 1998. The trigger of labor protests at that time was massive layoffs at state-owned-enterprises (SOEs), which started in the late 1980s and peaked in the late 1990s. More than 10 million SOE workers lost their jobs. The state required those SOEs to provide basic subsistence-level income to their former employees. But this promise did not hold, especially when the unemployed population grew larger and larger. Then there came protests. Although China's news agencies rarely report protest cases, still there were several large events recorded by Hong Kong newspapers from 1994 to 1999. In these cases, hundreds or even thousands of unemployed workers in Liaoning/Sichuan/Hubei/Chongqing/Hunan/Guangxi Provinces took highways or urban roads, carrying banners, asking for wage or food. To understand how a typical protest arises, the author interviewed former workers of a middle-size SOE in Henan Province. In this factory, 85% of workers were laid off by 1997. The government-promised subsidies were no longer distributed to

[21] Official Website of The State Council. "48 hours! Premier Li helped to obtain unpaid wages for a migrant worker in the post-earthquake region." 2017/01/26. (Original title: 中国政府网. "48 小时！总理帮震区农民工"讨"回欠薪". http://www.gov.cn/xinwen/2017-01/26/content_5163712.htm)

them in time. Making a living was also difficult. Selling food along the streets was unprofitable because too many people were doing the same, high fees and taxes for small business were also unbearable.

Second, the majority of protests are practical and self-interested, not political. Again, people are not protesting like it is a new fashion. What fashion bears a risk of being jailed? (And this old "fashion" is knew, not new.) They protest because they have no better choice and still believe in the benignity of the ruler. In the interview conducted by (Feng Chen, 2000), even when workers were vocal about their suspicion that the factory manager was corrupt during the protests, they never protest for corruption itself: The manager was suspected to be corrupt for a long time, but workers never protested before the factory stopped providing a minimum monthly income. As the workers said, they do not care other's business (whether the manager corrupts or not) as long as they can receive money every month. Therefore, the author concludes that managerial corruption is not a sufficient condition for protests; the real condition is threats to subsistence. Corruption only becomes a relevant issue when workers thought their inability to survive is related to manager's corruption. This conclusion is also consistent with an study that found Chinese citizens' willingness to speak out (publicly) is not significantly correlated with corruption level (孙文凯 and 周业安, 2011).

In addition, there were no political purpose behind those protests – workers emphasize that they support the state policy whole-heartedly; they knew very well that the government would not hesitate to use force if it finds them political. Similarly, rural school teachers protested over unpaid wage before 2000, urban public school teachers protested nationwide against low wages in 2014 (赵俊婷 and 刘明兴, 2015). In the Wukan protest (because of land disputes), villagers expressed solid loyalty to the existent policy and CCP. They only required the local

government to follow given policies and laws, and the protest dispersed after high-rank officials heard them and sent a deputy to negotiate with villagers.

(Johan Lagerkvist, 2015) called protests in China a "loyal opposition", which does not reflect any revolutionary rhetoric as many Western observers hoped. (He, Mol et al. 2016) surveyed 430 residents in Beijing in 2013 whose houses might be affected by a high-speed railway (HSR) project. Respondents express support for the project itself but they oppose to non-transparent decision procedures and inadequate facilities to control the HSR's negative effects. Among the 108 residents who participated in anti-HSR protests, the driving reason is private interest: They believe their health/house value/environmental quality would be unfairly compromised. Among the 322 residents who did not participate, the major reason kept them back is that they believe protests would not be useful.

Repeat: Why do Chinese people protest?

Because they have a knotty problem and believe the government is able and willing to fix it.

After all, this is a country where people are so pragmatic that no ideological protests responded to the contagious Arab Spring in 2011. According to the report by the Freedom House, the Chinese government prepared a lot in case such events might happen, but found none in reality.

As a centralized government system, top-down policy undoubtedly matters. Tax reform in 1994 enabled the central government to get 60% of the total fiscal revenue while local governments bear about 70% of fiscal expenditures. In recent years, according to the National Bureau of Statistics, these two numbers are 50% vs. 80%. This huge finance gap along with GDP thirst made local governments increasingly rely on selling collective lands for revenue, which

may lead to more forced migration and less compensation (李郇 et al., 2013). (朱渝, 2013) believes that the more rapid of urbanization, the more farmers' interests will be encroached, which leads to more protests. The tax reform in 2006 canceled agricultural tax (for farmers), further reducing the financial sources of local governments. Local governments became less capable of providing public goods and more aloof to farmers. (王现林, 2015) says that in years of field research, most farmers they met have not seen any staffs from the environmental protection department. He also believes the current punishment is not harsh enough ("…without a strict and daunting punitive system…"). The government of Leping, a city in Jiangxi Province, was found to use 11.74 million yuan (1 yuan = 0.15 USD) of its fiscal budget to pay pollution fees for 36 firms from 2012 to 2014 (so the tax money goes from the government's left hand to its right hand while firms paid zero).[22] Of all the 70 provincial-level industrial parks in Yunnan Province, 57 of them have no centralized pollution processing facility as required by existent policy.[23]

Policies relevant to letter and complaints (alternative channels of protests) also matter. In 2003, the Shelter and Send-back System[24] was abolished. Homeless people and level-skipping petitioners (non-natives) would no longer be sent back to their origin by the police. Then in 2004 and 2005, petitioners peaked and flooded in Beijing. The State Bureau for Letters and Calls cannot handle such a huge amount, so it issued an administrative regulation in 2005. The regulation requires local governments to "take care" of petitioners within their jurisdiction,

[22] Beijing News. Feedback from the fourth group of central environmental inspectors in Jiangxi: Leping Municipal Government used ten millions of fiscal budget to pay pollution fees for firms. The Beijing News. 2016/11/17 (Original title: 新京报. 江西环保督察反馈：乐平市用财政资金为企业代缴千万排污费". 2016/11/17 http://www.bjnews.com.cn/news/2016/11/17/423902.html)

[23] China News. Eight provinces received feedbacks from central inspector teams: Whose environemental decifits is the largests? 2016/11/24. (Original title:中国新闻网. 8 省份环保督察反馈全出炉 "环保欠账"哪家多？ http://www.chinanews.com/gn/2016/11-24/8072843.shtml)

[24] Original term: "收容遣送制度."

prevent citizens from level-skipping petitions. Since then, this regulation evolved into a petition ranking system[25]. Local governments try their best to reduce the frequency of level-skipping petitions, which brings the importance of "stability maintenance" to a new high. According to the survey and interviews conducted in 114 villages (陶郁 et al., 2015), petitions from 2005 to 2008 were significantly less than 2002 to 2004, but at the same time protests increased significantly. This trend is consistent with the Social Blue Book 2009 that mentioned protests once decreased in 2005 but rebounded since 2006. Since local governments want to maintain stability at all cost, some petitioners were beaten or taken into custody, which hurts the legitimate demands of citizens and the legitimacy of local governments.

(饶静 et al., 2011) found that a few petitioners even used this policy as a weakness (local governments want to maintain stability at all cost) to gain excessive benefits from the compromise of local governments. She concludes that it is because that local (non-government) forces are growing out of control and rural society has no spirit of rule of law. Let alone the local forces, I do not agree with her second part of reasoning. Instead of lacking the spirit of rule of law, I think those "excessive demands" by petitioners should be deemed as a common bargain strategy: It is just easier to get a middle-sized compensation (at last) if you ask for a large-sized compensation at first. As I said before, urban residents are not much better than rural residents in terms of solving disputes through legal channels, otherwise there should not be so many commercial protests by the middle class in cities. The key is that the legal system nationwide is not trusted or proved to be impartial and effective. Even if rural residents had never heard about courts (which seems impossible), they could learn from repeated games (history) if the courts are effective.

[25] Original term: "信访排名."

What the past literature may not be able to follow up is that, recently, the State Bureau of Letters and Calls announced that they no longer accept: 1) cases that should be handled by the legal system (since 2014/03/19); 2) level-skip petitions (since 2014/05/01).

(Jun Jing, 2003) detailed a case study that revealed a cumulative change in the attitude of villagers toward environmental pollution. In Dachuan, a village in Gansu Province, there is a province-owned urea factory. In the 1970s, villagers were unaware of the damage of polluted water until a horse and 30 sheep went blind. Village officials complained to the factory, who offered a few jobs and discounts on fertilizers. In 1980, crops along the riverside couldn't even grow, so villagers blocked the factory gate for three days. The factory agreed to provide tap water to part of the village. In the mid-1980s, the upper government started to promote the one-child policy and sent free doctors to this village. The village CCP leader's wife miscarried several times, so he finally adopted a girl (it was too difficult to find a boy available for adoption). Through the doctors and TV programs, villagers acknowledged that environmental pollution is especially harmful to pregnant women and their babies. They started to relate stillbirth and birth defects to pollution from the urea factory. Then till mid-1990s, every year villagers held protests against the factory, both for human health and economic issues: Villagers began to do fish-farming after China's market-oriented reform. The history of protests of this village reflects that villagers are becoming more aware of environmental pollution and their legitimate rights. Many factors contributed to this evolving consciousness: in 1979 came the first Environmental Protection Law, knowledge brought in by doctors and TV sets in the 1980s, and constant cultural habits (reproduction enthusiasm and son preference plus the one-child policy makes people more concerned about their children' health). Another representative trait is that these protests were not to protect the environment for its own end, nor to be the enemy of the

political system: fighting for one's own rights of subsistence, this is the core demand of environmental protests in China. It is also the core of most other type of protests in China.

(David Stephen Zweig, 2010) regards environmental degradation, millions of migrants after demolition, unregulated fees, and prevalent shoddy goods as "political externalities" of economic development. The author surveyed 120 villagers in two provinces (Anhui and Heilongjiang). Only 1.1% of environmental disputes went to courts. Zweig also studied all the 134 cases of rural petitions and protests published in the "Democracy and Legal System" magazine. Most of them (105 cases) happened in 1998-2007. Although the Administrative Litigation Law was enacted in 1990, courts often reject such cases; even if courts accept such cases, citizens rarely win when the defendants are government officials. In one case, a villager lost the lawsuit but a law professor in Nanjing University said in an interview that the verdict was obviously wrong. Winning a lawsuit does not mean a real victory, either. Local governments officials may take revenge. Therefore, who wins depends on who has the larger power, regardless of legal entitlement. Since rule of law is still subordinate to administrative power, Zweig concludes, villagers will continue to combine legal and extra-legal means to fight for their entitled rights. (王现林, 2015) concludes that because of a weak legal system and the stark disparity of the bargaining power of citizens and governments, Coasian bargains cannot take place. Therefore, protesters have to increase the group size to enhance their bargain power.

Apart from the limited power of villagers, limited authority of local governments could be a problem as well. For example, county governments cannot override a provincial policy even if the policy is not considerate for the county citizens. A county government also has no authority to heavily punish a higher-ranked (e.g. state-owned or province-own) firm within its jurisdiction. Environmental departments have to rely on courts to enforce punishments, but

courts are under control of the local government. A study (陶郁, 侯麟科 and 刘明兴, 2015) argued that The 2006 tax reduction[26] earn a good reputation for the central government but at the cost of lowering villagers' trust in local governments. In their survey conducted in 114 villages nationwide in 2005 and 2008, the villages with more authoritative local cadres before 2006 (the tax reduction) experienced more protests if land acquisition happens after 2006. The tax reduction effect is not significant for villages without land acquisition after 2006 or authoritative cadres before 2006.

[26] Farmers no long have to pay agricultural tax to local governments any more.

CHAPTER 3

ROLE OF CORRUPTION

3.1 Role of Corruption, a Popular Belief

Why are the rules not obeyed? Why does the government fail to enforce the rules?

The most intuitive or popular reason in the eyes of ordinary citizens, which is also reflected in my dataset, is government officials' corruption: "If a leader sets a bad example, it will be followed by its subordinates."[27] Recall in section 2.2, we mentioned that unlike mainland China, Hong Kong had only one case of unfinished buildings within the first 10 years since the introduction of pre-sale system. And that case was in 1960, long before Hong Kong's economic miracle (1970-1990) – Hong Kong's GDP per capita in 1960 was only $429.4 (current USD). Even if accumulative inflation in Hong Kong from 1960 to 2000 was 1000% (the number for US is about 800%), it is still much less than China's current GDP per capita. Therefore it is natural to notice that Hong Kong has a very different reputation from mainland China in terms of transparency and corruption level.[28] Obviously it is also the answer proposed by the new central administration, claiming that "corruption is the biggest problem of CCP." Since its inauguration in November 2012, the new administration has devoted huge efforts to launch an unprecedented top-down corruption combating campaign, which is still on going.

Some commentators are pessimistic about a movement-style fight against corruption (instead of more fundamental institutional reform). But it makes sense theoretically anyway. (In

[27] Original term: "上梁不正下梁歪."
[28] But in fact, during the 1960s, corruption in Hong Kong was also rampant. Then in 1974 the famous Hong Kong anti-corruption agency, Independent Commission Against Corruption (ICAC), was founded.

fact, it worked well in reality during 1950s but failed to be successful during the 1980s -- we will see it in Section 3.5 Anti-Corruption Waves)

Before we come to the model, let's first review what has been discussed in literature about corruption.

3.2 Definition of Corruption

(Anne O Krueger, 1974) defines corruption as the result of rent-seeking behaviors. Private players gain more profits by bribing power-held officials for permits, franchise, and resources. (Susan Rose-Ackerman and Rory Truex, 2012) defines corruption as the misuse of public power for personal benefit. (John Macrae, 1982) emphasizes that corruption influences resource distribution. Besides these micro-styled definitions, here I regard PERVASIVE corruption as an institutional and government failure (if both the culture and government do not regard corruption as a good thing).

3.3 Effects of Corruption

There are two perspectives with regard to effects of corruption. One is that corruption is "grease" that could improve social efficiency. Another is that corruption is "sand" that distorts resource distribution that causes a social welfare loss. These two perspectives are not contradicting with each other. Since the essence of corruption is failing to implement the rules that should be enforced[29], if the initial policy was good for development, then corruption would impede development (Tina Søreide and Aled Williams, 2013). Here we can induce that if the initial policy is a redundancy, then bypassing it would improve social efficiency. No policy maker does not make any mistakes, and (probably) most governments do have some correct

[29] To clarify if needed: By saying corruption leads to lack of enforcement does not mean corruption is the only channel that leads to lack of enforcement. What it does mean, as we will see in later sections, is that fixing corruption should theoretically help increase enforcement.

decisions. Therefore, it should not be hard to find evidence for both sides, but whether the aggregate effect of corruption is negative depends on how many policies are correct at the first place. According to existent studies, it seems that there are more evidences supporting corruption is sand than grease.

Corruption hurts efficiency, equity, and development. (Vito Tanzi and Hamid Davoodi, 1998) founds that corruption lowers the quality of infrastructure and the efficiency of investment. (周黎安 and 陶婧, 2009) argues that corruption might impede efficiency improvement in governments because officials have incentives to work slower to obtain bribes, which brings in more bureaucratism. (John Macrae, 1982) concludes that corruption could encourage the adoption of capital-intensive technologies, but on the other hand, corruption would also increases the relative price of capital. Cronyism send incompetent people to high positions such that social efficiency and social equity are compromised. Besides, since corruption is transferring money from investable profits to officials' personal consumption (especially on imported luxuries), potential multiplier effects are lost, domestic growth is impeded. Corruption can also induce tax loss and higher inequality (the poor are taxed while the rich gets around it). (张璇 et al., 2015) found that in China, corruption significantly restrains growth of citizens' income and rural residents are more negatively affected. Even members in higher social classes are not immune from it.

Corruption distorts prices. (Susan Rose-Ackerman and Rory Truex, 2012) concludes that corruption is equivalent to an increase in taxes or transaction costs, which changes firms' production decision and hurts the investment climate. Corruption also increases the price of public services, reduce the supply of public goods (e.g., education, health). Government officials may ask for higher kickbacks than private buyers, which distorts the price of imported medicine.

This phenomenon means that when a corrupt official is the decision maker, s/he will maximize her/his own benefits; if this is an incorrupt official, the price signals that the decision are based on are already distorted.

Corruption hurts the environment. (Toke S Aidt, 2011) found that corruption is negatively related to growth in genuine wealth[30] per capita, using cross-national data. Corruption hurts sustainable development because it does not only hurts both human and physical capital accumulation, but also depletes natural capital more than it could gain from GDP increases. (Ramon Lopez and Siddhartha Mitra, 2000) point out that although corruption is not likely to negate the existence of Kuznets Curves, pollution levels are much higher than socially optimal when corruption exists for any level of GDP. The turning point of Kuznets Curve would also arrive later than the social optimum.

Corruption also lowers the legitimacy and credibility of governments. (Mitchell A Seligson, 2002) found that people who believe that "bribes could get things done" are more likely to distrust the legitimacy of political system.

The literature on the side of "corruption as grease" is relatively smaller, but there are some evidence show that corruption could help firms to enter the market quicker (Axel Dreher and Martin Gassebner, 2013).

3.4 Factors That Affect Corruption

Opportunity cost and inspection probability matter. (Gary S Becker and George J Stigler, 1974) believes the society has its own optimal amount of enforcement. Failing to enforce means there is not enough incentive to obey rules, more victims could increase this incentive. To

[30] Genuine wealth = Physical investment + Human resource investment – Natural resource depletion.

increase the quality of enforcement, we should raise the salary of enforcers. (Susan Rose-Ackerman, 1975) models that more inspection would increase the size of bribe, but risk preference is not clearly related to the size of bribe. (Tina Søreide, 2009) concludes that risk-averse firms are more likely to pay a bribe.

Market competition matters. (John Macrae, 1982) thinks that the size of bribe depends on the official's power, risk of getting caught, what business rivals could do, and the size of fines. He models a simultaneous-move game in which one of two firms is considering whether it should bribe the official to increase its chance of winning a contract. The model shows that bribing the official is the dominant strategy. By increasing the risk of being discovered and the size of punishment, the game is no longer a prisoners' dilemma. But Macrae is not optimistic about increasing the penalty because officials are corrupt in the first place. (Thomas Herzfeld and Christoph Weiss, 2003) does find that corruption causes legal ineffectiveness. Macrae also concludes that increasing the number of firms in the market could reduce corruption because it reduces the favor that the official could offer to each firm, thus reduces the size of bribe. (Alberto Ades and Rafael Di Tella, 1999) holds a similar viewpoint from another angle. His bribing model predicts that more market competition could reduce firms' profits, thus reduce the potential rent that a government official could possibly demand.

Education and GDP matter. (Alberto Ades and Rafael Di Tella, 1999) also supports that higher GDP and average schooling years are correlated with lower corruption. (Daron Acemoglu and Thierry Verdier, 2000) uses a maximization-styled model to analyze the situation when individuals of a population could choose whether to be an entrepreneur or government official, and one official could only monitor one entrepreneur. The result is that if there are more dishonest individuals, more bureaucrats are needed to monitor them. When GDP is low,

government does not have much revenue to monitor entrepreneurs. When GDP is higher, fiscal revenue increases, then the government can increase its intervention on entrepreneurs' behavior. Therefore, GDP and corruption has an inversed U-shape correlation. (Edward L Glaeser and Raven E Saks, 2006) found that higher average income and education should reduce the level of corruption because people are more conscious of political participation and the rule of law, more able to protect their legal rights and expose corrupt behaviors of government.

Culture and social environment matter. (Bin Dong et al., 2012) found that other people's corrupt behavior would influence our attitude toward the justification of corruption. The historical corruption level influences the current corruption level. (Siegfried K Berninghaus et al., 2013) conducted an experiment and found that risk preference relative to punishment cannot explain whether the subject chooses to corruptly, but one's belief about the others' honesty does. Therefore hiding some information could reduce corruption by introducing more uncertainty. (Valentina Rotondi and Luca Stanca, 2015) found that in Europe, particularism will increase corruption while universalism reduces corruption.

Laws, regulations, and information exposure/disclosure matter. (Yujin Jeong and R Weiner, 2011) found that multinational companies in Iraq reduces the likelihood of bribery if in their mother country bribery overseas is illegal. (Leonid Peisakhin and Paul Pinto, 2010) found that in India, simply showing the Right to Information Act (RTIA) is as helpful as bribery when applying for a free ration card. (Leslie Eldenburg and Ranjani Krishnan, 2003) found that in Brazil, being listed could improve the performance of state-owned companies because listed companies are required to disclose information. (Antonio Estache and Liam Wren-Lewis, 2011) believes the two necessary measures to control corruption are 1) to balance the relative power of different interest groups which means to increase the power of the weaker group, and 2) reduce

the information asymmetry between the principal and agent. Free media could also be a powerful aid for anti-corruption on a cross-national basis (Aymo Brunetti and Beatrice Weder, 2003). Cellphone diffusion is found to be negatively correlated with perceived corruption, conditional on several effective premises: free press, international aid agency, reform effort, public awareness (Catie Snow Bailard, 2009). The Guardian editor-in-chief believes that social media will substitute for traditional press to expose corruption because traditional press are less likely to be able to afford investigation.[31]

Compared to Western researchers who mainly focus on models and cross-national studies, Chinese researchers' are more likely to conduct empirical studies in China, trying to verify those theories. (王一江 et al., 2008) conducted an empirical study based on typical corruption cases in China also found that the amount of bribe increases with the position of officials, decreases with officials' education and age, and decreases with percentage of private economy. Another empirical study (周黎安 and 陶婧, 2009) based on provincial prosecuted corruption cases found that corruption increases with numbers of employees of the government, fiscal revenue per person, administrative expenditure, the ratio of FDI/GDP, private economy; corruption decreases with more government expenditure on education/science/culture/health, more foreign trade and higher salary for civil servants. (万广华 and 吴一平, 2012) shows that increasing national and local laws, lagged expenditure (%) of legal system in GDP, and government succession could reduce the corruption level. Government size (measured by ratio of government expenditure to GDP) increases corruption.

[31] "Alan Rusbridger: press can't afford to cover corruption and tax avoidance." https://www.theguardian.com/media/2015/may/21/alan-rusbridger-press-corruption-tax-avoidance-guardian

3.5 Anti-Corruption Waves

Since modern governments are ubiquitous in citizens' daily life, and corruption is misconducts conducted by ubiquitous government employees, no wonder corruption negatively affects people's welfare through numerous channels (as concluded in 3.4). And since corruption also lowers government's image, no wonder anti-corruption has been a hot topic for more than twenty years.

According to (Francesca Recanatini, 2011), the first international anti-corruption wave starts from late 1980s. The object is to build a legal framework, and "fighting corruption by fighting corruption." As a result, more than 30 countries established anti-corruption authorities (ACAs) and passed many international agreements. But after 20 years, ACAs do not seem to be significantly effective because they often are lacking effective legal standing, independence, separate budget, hiring authority, inter-department cooperation, or support from the top leadership, as well as facing difficulties from each country's own institutional or cultural context, etc. (Susan Rose-Ackerman and Rory Truex, 2012) argues that a top-down anti-corruption action, which is determined by upper-rank officials, may simply transfer illegal rents from lower-ranked to higher-ranked officials. The second international wave began by the late-1990s. The basic idea is that corruption is "dysfunction of public administration" which appears in places where monopoly and discretion exist. So increasing accountability and transparency (open budget, free media) are emphasized. But studies that link specific policy to outcomes are lacking.

(Francis T Lui, 1986) uses a two-period model, predicts that there are multiple equilibiria of corruption (high level and low level equilibrium of corruption). He then reviewed two anti-corruption movements in China's history. The first was in the 1950s.[32] Newspapers at that time

[32] Original term: "三反五反."

were filled with corruption cases, thousands of people assembled to watch open trials. Many corrupt officials were sentenced to death penalty, citizens were encouraged to report corruption. Since then, even the overall crime rates declined. Lui says that 1950s till mid-1960s is generally believed to be a "golden age of honesty" and concludes that this experience suggests that a shock of big anti-corruption campaign could move the equilibrium from high-level corruption to low-level corruption. There were no major anti-corruption efforts after the 1960s, so in the late 1970s, increasing corruption again gained attention. So the Central Commission for Discipline Inspection (CCDI) was re-established in 1978. Since 1982 there was another anti-corruption movement which is more persistent and stricter[33] than 1952-1965. However, this time the magic of big shock did not work well. Maybe it is because the new PRC Constitution (1982) has put prosecutorial organs under control of the same-level government. Maybe in the 1950s officials had not been able to form robust collusions (since the P. R. China was only established in 1949) but in the 1980s, such collusions had been formed solidly: If a lower member was investigated, a higher-rank member would offer protection. If a higher-rank member was under investigation, a lower-ranked official would become a scapegoat. Confidential report letters would be passed onto the hands of the reported corrupt official. The author concludes that in a high-level corruption equilibrium, a much larger shock will be needed because investigation is so inefficient that needs more much resources.

According to the reports by Freedom House, in the year of Arab Spring (2011), rather than democratic demonstrations (that did not appear), corruption was a bigger problem. According to a survey with 6,449 residents across the nation conducted by (孙文凯 2011), more than 45% of respondents think that "over 50% of government officials are corrupt", only 3.8%

[33] But I have heard little accusations about the government brutality during this period of anticorruption.

respondents believe that there is no corruption. Although CCP increased its anti-corruption effort, punishes tens of thousands of officials each year (198,953 in 2013), outside comments still regard this effort as selective (which the administration firmly rejected).[34] The authority encourages citizens to report corruption through official channels and closed several independent bribery-reporting websites.

In November 2012, the new CCP leadership was inaugurated, A third wave of massive anti-corruption movement began. The central government sends "central inspection teams" to each province at an exogenous time to provinces (its timetable is predetermined by top officials). The central teams will stay in the inspected province for two months, they are able to investigate provincial-level officials and enterprises in each province. There were nine rounds from June 2013 to May 2016 (and the these activities are still going on). Each provincial government also sends "provincial inspection teams" to each city and county within its jurisdiction by some predetermined timetable. The provincial teams are able to investigate municipal or county-level officials. Besides these two layers of inspection, the local layer (city/county/town/village) will also send their inspection groups. The former two layers (state, provincial) are easier to observe while the (third/lowest) local layer of inspection is nearly impossible to gather data on for outsiders.[35]

At the same time, power was more centralized and control on media and ideologies are much tighter. As to traditional media, in January 2013, the new-year headline of Northern Weekends (a prominent newspaper) that was asking for rule of law was not allowed to publish. As to new media (the Internet and social media), in August 2013, a famous blogger Charles Xue, who has 12 million followers on Weibo, apologized for having sex with multiple prostitutes. On

[34] http://www.bbc.com/zhongwen/simp/china/2014/04/140417_anticorruption_tigerflies

[35] The number of city/county/town/village governments are over 300/2000/10000/80000. Local level governments are much less likely to publish their inspection activities regularly.

September 9, 2013, the Highest Court announced that slanderous information that has been reposted more than 500 times on Weibo may induce a three-year sentence. These are warning signals send to online users, aiming to increase their self-censorship. Forced (or unnoticed) deleting of posts is also common. Lawyers asking government officials to publish their assets were arrested. Advocating democratic reform is an absolute no-no (three men were sentenced to between seven to ten years for this). There are more than 2000 news agencies, but all of them are under close control of the state, despite some of them have private shareholders. All the news on these outlets must be censored before publishing. In many places, journalists can only get paid for published reports, and journalists are not immune to bribery. The journalist who exposed the alarming poisonous milk powder scandal resigned after that, and announced that his ideal was dead.[36] Therefore again, it is not hard to understand that most protests in China are only standing for basic rights and severe injustice. Despite newly emerged technologies and social media, through 2012 to 2016 in the "Freedom in the World" rankings, China's freedom status is stably 6.5 points (worst = 7 points) with a downward trend (said by the Freedom House).

3.6 Would Selective Anticorruption Be a Problem?

As to selective anti-corruption, maybe it is not intentional on the top level but it might happen on lower levels. (李連江 and 劉明興, 2016) gave an example that involves complex power struggles in the name of anti-corruption: The former Secretary of the Yunnan Provincial Party Committee, Bai Enpei is not a native of the province. When he assumed the office, he got rid of some local officials from his opposite force, in the name of anti-corruption. Then the opposite side found a former top official, Yang Weijun, to accuse Bai since 2009 for illegal land

[36] BBC Chinese. "The journalist from Dongfang Daily who exposed the poisonous milk scandal resigned". 2012/09/04. (Original title: BBC 中文网. "《东方早报》揭露毒奶粉记者离职". http://www.bbc.com/zhongwen/simp/chinese_news/2012/09/120904_china_reporter.shtml)

acquisition. Finally in 2014 during the anticorruption movement, Bai was dismissed and sentenced to death with two years of reprieve. He admitted that he had received 247 million yuan for power abuse in real estate projects, mineral permits and personnel promotion. The author emphasizes that there were numerous land dispute victims called Yang for help, but Yang only took care of this single case throughout.

Yet, I have to argue (objectively), the fact that Bai was fine despite the fact he had been accused for four years but only got caught during the anticorruption movement (2013--) seems to be an illustration that the top-down anticorruption is effective, as long as his crimes are not forged.

Furthermore, even if the anticorruption movement is completely selective in that only members from an imagined opposite side will be investigated, as long as the investigation frequency is not declining, the movement should still be somewhat effective. Why? Because the average monitoring pressure is still increasing even if the vacant positions were all filled with "one of their own." Even if half of the government population were immune from investigation, the other half are still forced to reduce their misconducts, which means the average misconducts still should decline. By the end, investigators still have to report something unless there are no obvious cases anymore.

Therefore, the real question is whether the investigation frequency and penalty have truly increased sufficiently such that the system could pass some thresholds. According to the official numbers from CCDI[37], at least the frequency is increasing (Figure 1). (I would assume the penalty level has not changed since there are no major changes in law about this.) We will examine whether the frequency has increased sufficiently in Chapter 5 and 6.

[37] Xinhua News. "Number of disciplined officials has been increasing during recent years. Experts: Anticorruption is not a transient movement." 2016/10/26. (Original title: 新华网. "党纪处分人数连年上升 专家：反腐绝非短暂一阵风". http://news.xinhuanet.com/legal/2016-10/26/c_1119787127.htm)

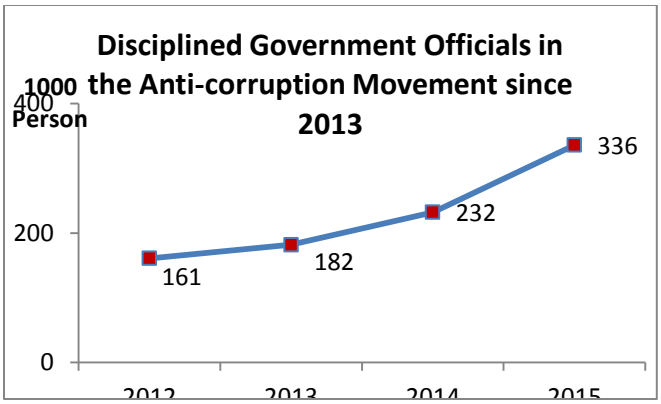

Figure 1. Disciplined Government Officials in the Anti-corruption Movement since 2013

CHAPTER 4

ONE COMMON FRAMEWORK, TWO SEQUENTIAL GAMES

To understand the intuition in Section 3.1 (an unprecedented corruption-combating campaign might be able to get China out of the dilemma), a simple prisoners' dilemma game is too simplistic to describe a more complex reality. An ongoing real world is more likely a sequential game rather than a simultaneous-move game. We have to consider a three-player sequential game that involves a key third party – a private firm that introduces the role of corruption.

4.1 The Commercial Protest Game

First consider the commercial protest case. Suppose the three players are **C** (a small group of citizens), **F** (a private firm), and **G** (the local government official in charge). The full set of payoffs is given in Figure 2.[38]

In the first step (Node 1), **C** can choose to buys a house from **F** or not. If **C** does not buy a house, payoffs for (**C, F, G**) are (1.5, 0, 5). **C** can spend the money on other stuffs, **F** has no business, **G** still has tax and GDP but is lower than if **C** buys the house. If **C** chooses to buy a house, it will pay ***F*** at a fixed price, 10.

In the second step, **C** has decided to buy a house, so **F** can choose to be honest or not (Node 2, 3, 4, 5). Assume no matter how **F** chooses, the payoff for **G** is fixed to be 6 (tax and fees are collected by the time of transaction). If **F** behaves honestly, the building quality, *Q*, would be 3 (realize the contract as promised), **F** will have normal profit 1, the payoffs are (3, 1,

[38] The figures are generated through a free software "Gambit 15.1.0". (www.gambit-project.org) It is much easier and more visually appealing to draw game trees and calculate equilibrium than other methods. Thanks a lot.

6).[39] If **F** behaves dishonestly, the quality of its house could be 2, 1, 0. When $\boldsymbol{Q} = 2$, there are situations like delayed completion, false advertisement, changed design, etc. When $\boldsymbol{Q} = 1$, the building has severe quality problem that it is not suit to live in. When $\boldsymbol{Q} = 0$, the building is unfinished or the building project has never started construction.

If **C** choose to accept, the payoffs are (2, 2, 6), (1, 3, 6) and (0, 4, 6) for $\boldsymbol{Q} = 2, 1, 0$, respectively. Here we can see that buying a house with $\boldsymbol{Q} < 2$ is worse than not buying a house. If **C** expects so, then the market for pre-sale house collapses.

When $\boldsymbol{Q} = 2$ or 1 or 0, **C** can choose to protest with a cost of -0.1 or -0.2 or -0.3. That is, **C** would protest differently according to its dissatisfaction. **F** would receive an equivalent harm, while **G** would receive twice harm since stability maintaining is the top priority for the government.

If **C** chooses to protest, **F** has two choices: 1) bribe **G** to suppress **C**, or 2) **F** can directly give **C** a compensation = $3 - \boldsymbol{Q}$. The bribe equals twice of **C**'s protest cost, which also equals the damage of the protest imposed on **G**. So the bribe equals 0.2 or 0.4 or 0.6, respectively.

G can choose to 1) accept the bribe from **F** and suppress **C**, or 2) **G** can refuse the bribe and punish **F**. "Punish" means **F** has to pay **C** a compensation of $(3-\boldsymbol{Q})$ and a 10% fine of $(3-\boldsymbol{Q})$. The fine will be confiscated so it will not change **G**'s payoff. If G suppresses C, it would also cost **G** nothing because **G** is using public power – suppressing **C** incurs a cost only to **C**, the value is the same as **C**'s protest cost. Suppress **C** without accepting a bribe is a dominated strategy so it is discarded.

When **C** is suppressed, **C** can write letters to complain to higher-rank authority, then there is a chance of $\boldsymbol{p}$ that there will be investigations on **G**. If **G** is investigated (Node 19, 21,

[39] The relative portion of 3:1:6 is based on news about the composition of a house price. It is usually assumed to be 60% for government revenue (tax, fees, land price), 30% for construction, 10% is net profit the house developer.

23), it will receive a punishment proportional to the bribe, **F** will also be punished. The probability of being investigated by the upper level authority, ***p***, might increase as the bribe amount increases. So ***p*** at Node 19/21/23 may not be the same, assume they are ***p1***, ***p2***, ***p3***.

Based on this set of payoffs, we can calculate when **F** will choose ***Q***=3 under different assumptions:

4.1.1. Full Information, *p1=p2=p3*

Three players all have full knowledge about payoffs and ***p***. But ***p*** is restricted to be the same, no matter how large ***Q**** (the equilibrium house quality) is. There are two possible rollback equilibria: either the market exists with good quality house (Figure 2) or the market collapses (Figure 3). The condition for ***Q****=3 is ***p1***=***p2***=***p3***>0.1.

Table 4 Equilibria with full information and *p1=p2=p3*

p range	C's best response (BR)	F's BR	G's BR	Market	E_C	E_F	E_G
p>0.1	Buy	***Q****=3	--	Exist	3	1	6
p⩽0.1	Not buy	--	--	Collapse	1.5	0	5

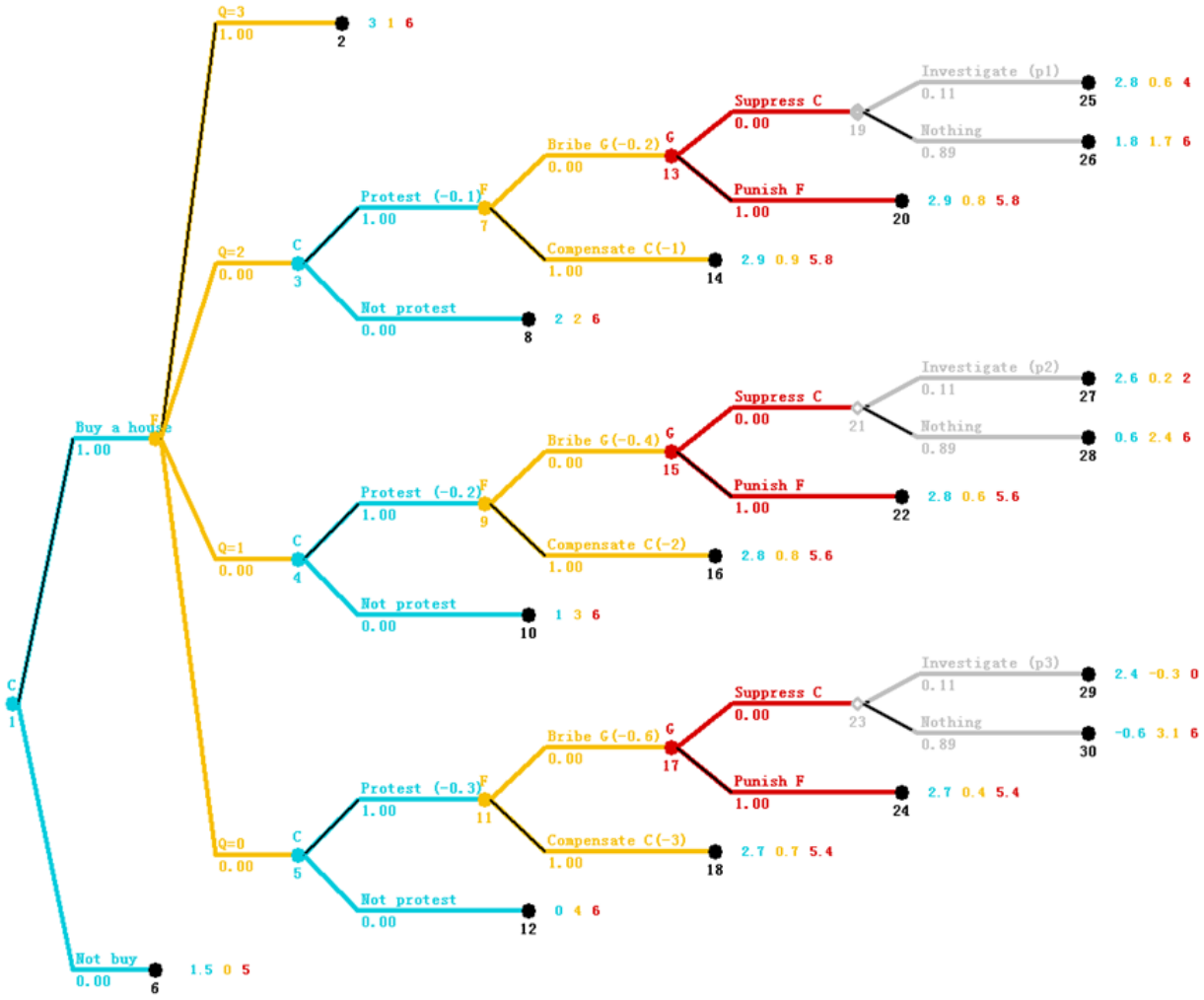

Figure 2 *p1*=*p2*=*p3*=0.11, *Q=3**

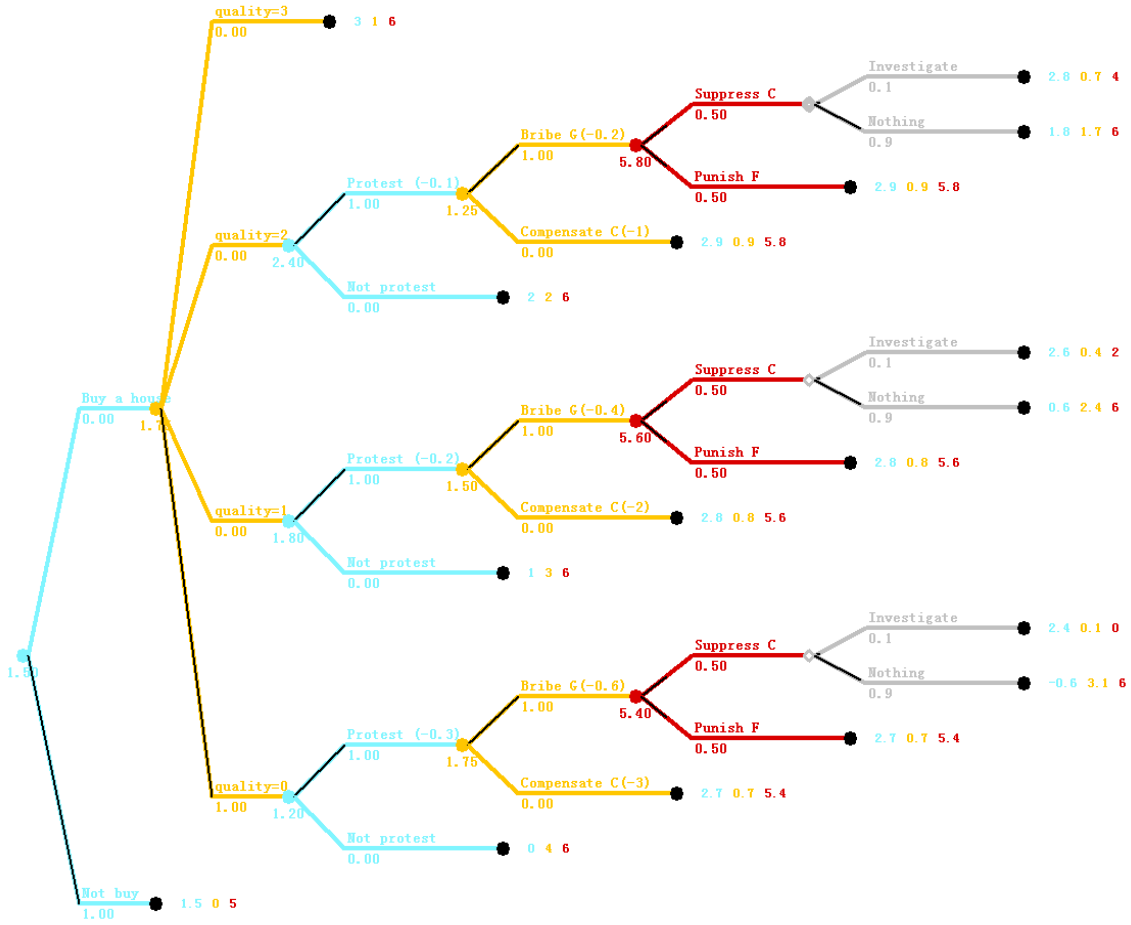

Figure 3 *p1=p2=p3*=0.1, Not buy (the house market collapses)

4.1.2. Full Information, *p1≠ p2≠ p3*

Assume all the three players know the value of ***p*** and the higher authority makes ***p*** vary proportionally with severity of the problem: when ***Q*** is lower, ***p*** is larger.[40] There are four rollback possible equilibria, but market only exists when ***p3***>***p2***>***p1***>0.1 or ***p3***>***p2*** >0.1. That is, the market only exists when **G** would punish **F** with some positive probability for selling

[40] "抓大放小."

unacceptable houses (***Q***=1, 0). The most desired equilibrium (***Q****=3) is achieved only when ***p3***>***p2***>***p1***>0.1.

Table 5. Different rollback equilibria when *p1<p2< p3* varies

Range of ***p***	**C**'s best response (BR)	**F**'s BR	**G**'s BR	Market	E_C	E_F	E_G
p3⩽0.1	Not buy	--	--	Collapse	1.5	0	5
p1 < ***p2*** < 0.1⩽ ***p3***	Not buy	--	--	Collapse	1.5	0	5
p1 ⩽0.1 <***p2*** < ***p3***	Buy; Not protest	***Q****=2	Suppress ***C***; Punish ***F***	Exist	2	2	6
p1>0.1	Buy	***Q****=3	--	Exist	3	1	6

An example is given below where the value of ***p*** in the three scenarios are 0.1, 0.15, and 0.2 respectively (Figure 4). The rollback equilibrium is (**C** buys a house; **F** sell a house with ***Q*** =2; **C** protests; **F** bribes **G**; **G** is indifferent between suppressing **C** and punishing **F**). The expected payoffs for (**C, F, G**) are (2.4, 1.2, 5.8).

Interestingly, since the thresholds for **G** to be indifferent between punish **F** or not (at node 13, 15, 17) are the same (p*=0.1), it is less efficient to require that ***p1***≠***p2***≠***p3***. That is, ***p1***=***p2***=***p3***=0.11 is more efficient than ***p1***=0.1, ***p2***=0.14, ***p3***=0.18, both in terms of ***Q**** and resources consumed by investigation. It is counter-intuitive at first sight, because paying more attention to more harmful results is very intuitive. However, this intuition does not make sense if we look closer -- because the threshold (***p****) to deter an unwanted choice (***Q***<3) is not necessarily proportional (or even relevant) to its negative impact. In this case, three ***p**** are completely determined by **G**'s payoffs and they all equal to 0.1. If the smallest value higher than the thresholds of ***p2*** and ***p3*** are both 0.11, of course it is wasteful to set them to be 0.14 and 0.18. That is, what really should be proportional to the negative impact of F's choice is the magnitude of punishment to G, not frequency of investigation to G.

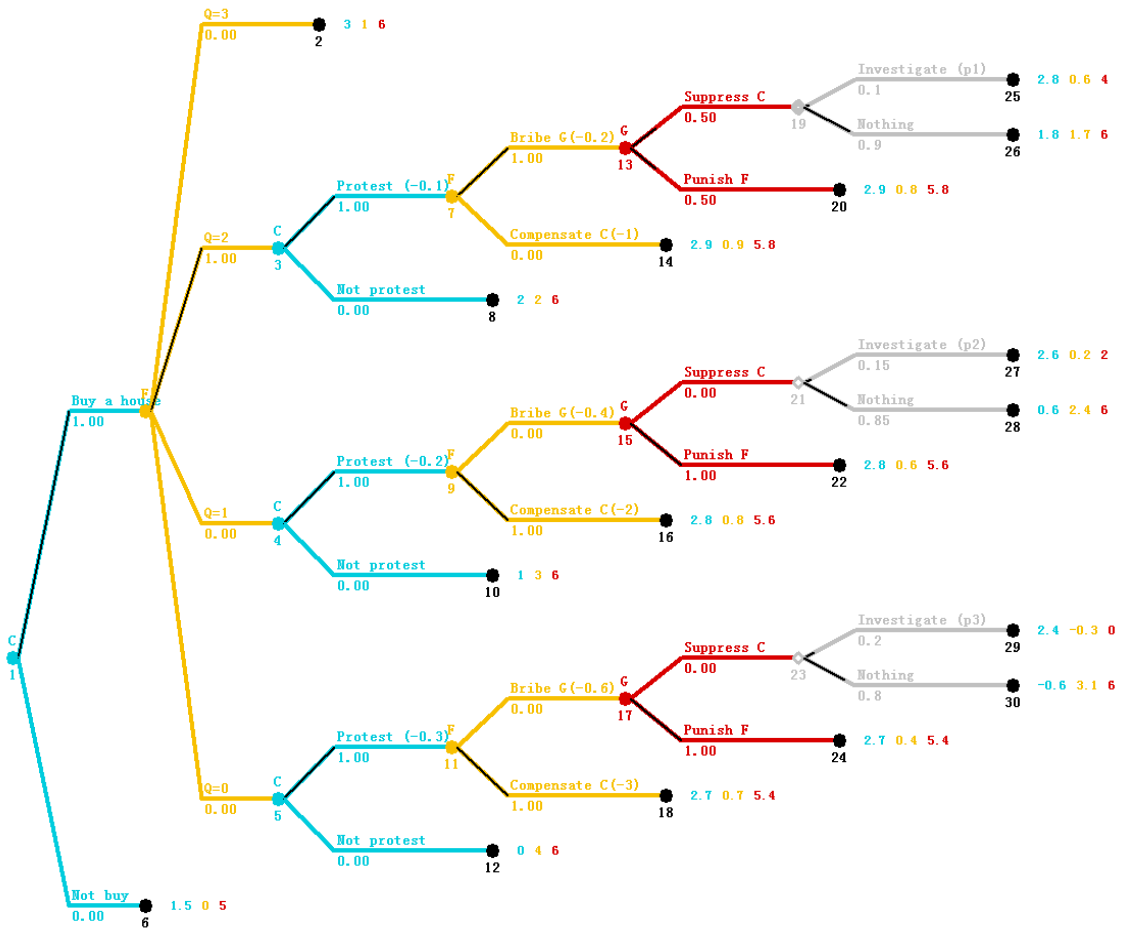

Figure 4 *p1*=0.1, *p2*=0.15, *p3*=0.2, *Q=2**

To illustrate this, imagine we have 1,100 investigators available and each person can check only one case. However, we have 10,000 cases on hand: 8,000 "delay" cases (***Q***=2); 1,500 "jerry-built" cases (***Q***=1); 500 "unfinished" cases (***Q***=0). Therefore, we have to selectively investigate 1,100 cases. How to assign investigators for each type?

Choice 1: We send 880 investigators to check delay cases, 165 to check jerry cases, and 55 to check unfinished cases (***p1***=***p2***=***p3***=11%).

Result 1: We could achieve ***Q****=3 in the future rounds.

Choice 2: According to conventional wisdom, we send 800 to check delay cases, 210 to check jerry cases, and 90 to check unfinished cases (***p1***=10%, ***p2***=14%, ***p3***=18%).

Result 2: The future equilibrium would be ***Q****=2. To achieve ***Q****=3, we have to hire another 80 investigators to check delay cases otherwise the market would be filled with delay cases.

4.1.3 Without an Exit Option

Now imagine that **C** does not have an exit option; that is, **C** cannot choose not to buy a house. It is possible for some Chinese because in many regions of China, the traditional culture highly pressures young people to get married and a new couple needs to buy a house. Besides, the country also has a well-known problem of seriously imbalanced sex ratio.[41] Too many unmarried men competing for fewer women may also increase the demand from single men to buy a house -- in order to get favor from a marriageable woman.

Then what would happen if there is not a "Not buy" option? It would be equivalent to making the payoff for **C** at Node 6 negative. The result can be shown by simply change the payoffs at Node 6 to be (-0.5, 0, 5). Under this condition, as long as any of ***p1***, ***p2***, or ***p3*** is less than 0.11, **F** would choose to supply the worst quality house available (***Q****=0). Unlike before, the market for shoddy goods no longer collapses.

Still, I do not think it is an illustration of "adverse selection" that some people purposely choose shoddy houses (***Q***=1, 0). It may be because people cannot afford to buy good-quality houses. Then the solution is to develop the economy and average productivity. But in our cases, no matter what quality of house does **C** get, the price of the house is the same, therefore the

[41] "Population expert: At least 30 million males in China will not find a wife." Sina Finance News. 2017/02/13. (Original title: "专家：保守估计中国未来 3000 万男人娶不到媳妇" http://finance.sina.com.cn/china/2017-02-13/doc-ifyameqr7457256.shtml)

major reason could not be attributed to average productivity. It could also be that people believe they do not have any better choices; their degree of freedom in life is restricted by cultures and traditions. This is essentially why trends of thoughts in history could improve or reduce an individual and a society's well-being.

4.1.4. Asymmetric Information & Diagnosis Table

Assume three players know all the payoffs. However, the real value of ***p*** (or ***p1***, ***p2***, ***p3***) is unknown to both **C** and **F**. So **C** and **F** have to take a guess on ***p***. Since **C** is an outsider and has no personal connections to **G**, it has restricted method to gather information except those the government chooses to release publicly. Therefore, the official news channels (TV and newspaper) have a huge influence on **C**'s belief on ***p***. To the contrary, **F** is closely connected with an insider (**G**), therefore **F**'s guess of ***p*** might differ from **C**. In addition, usually **F**'s guess is closer to the real value of ***p***.

According to our dataset (Table 6) , most cases are ***Q***=2 cases, which is as expected. What is unexpected is that ***Q***=1 cases are quite rare, much less than ***Q***=0 cases. It seems that the Chinese government is more concerned with jerry-built cases than unfinished buildings. Well, it is understandable when we compare the relative impact of a collapsed residential building with a nonexistent building. After all, an unfinished building does not bear the risk of physically burying hundreds of lives.

Table 6 Commercial protests owing to different quality of houses

Period	Total protests	Average protests per month	***Q***=2 cases	***Q***=1 cases in protests	***Q***=0 cases in protests
2013/07 – 2013/12	400	66.7	90% -- 95%	<1%[1]	4.25%
2014/01 – 2014/12	2172	181.0	90% -- 95%	<1%	4.69%
2015/01 – 2015/12	4919	409.9	NA[2]	NA	NA
2016/01—2016/05	2361	472.2	NA	NA	NA

Note 1: There are 8.75% and 7.00% cases mentioned "quality problem" in 2013 and 2014, but most of them are actually ***Q***=2 cases (minor quality problems). There are only a handful of ***Q***=1 cases (only 5 cases claimed "jerry-built" in 2014, none in 2013).

Note 2: It is a pity that I do not have enough time to review detailed reasons for year 2015 and 2016. So the proportions of ***Q***=0,1,2 cases in these two years are currently unavailable to readers and me. But let us assume that tomorrow is better than today, so jerry-built and unfinished buildings would not become a major problem in 2015 and 2016.

Now we can reasonably suppose ***p2***>***p3***>0.1>***p1***, so ***Q****=2. So our problem is simplified to be "how to move ***Q**** from 2 to 3?" How about the official news announces that ***p1***>0.1 hereafter? There could be four possible cases as below.

Table 7. Different beliefs and results (Diagnosis Table)

Beliefs on the announcement that ***p1***>0.1 hereafter		Results	
F believe	C believe	***Q****=3	Not protest
F doesn't believe	C believe	***Q****=2	Protest
F believe	C doesn't believe	***Q****=3	Not protest
F doesn't believe	C doesn't believe	***Q****=2	Not protest

What matters to a decision maker is that if protests increased after the announcement, it means the announcement is believed by **C** but not **F**. Under this condition, **F** does not change its behavior and quality of house whereas **C** has higher expected payoff from protest (confidence in **G**) so they protest more. Based on our data in Table 6, it seems to be the reality exactly. Average commercial protests per month (Figure 6) increased sharply from 2013 to 2016. It is completely disproportional to the trend of sold commercial residential buildings (Figure 5 and Figure 6) from 2010 to 2015.[42] In China, a twenty-story building only needs less than two years to build.[43] If **F** also believes that ***p*** has or will be increased (which means **G** truly feels more penalty or higher investigation frequency), **F** should switch to ***Q***=3 within two or three years. If a switching point exists, it should be captured by our dataset since it covers a span of four years (2013-2016).

[42] Considering that in China a building typically needs two years at most to finish so it showed the numbers from 2010.

[43] I asked my architect friend.

We will see later in Chapter 6 whether this is true and if there are other factors could explain away this trend.

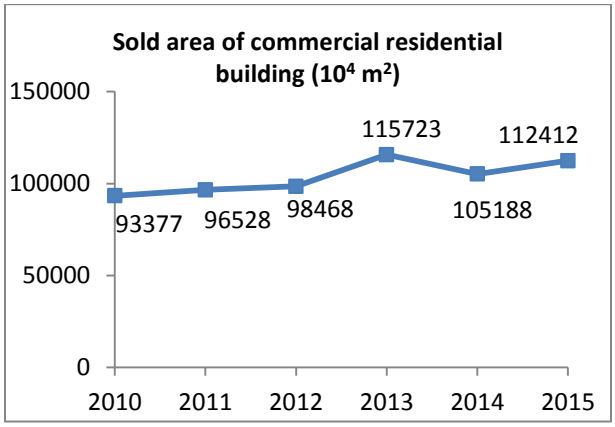

Figure 5. Sold Area of Commercial Residential Buildings

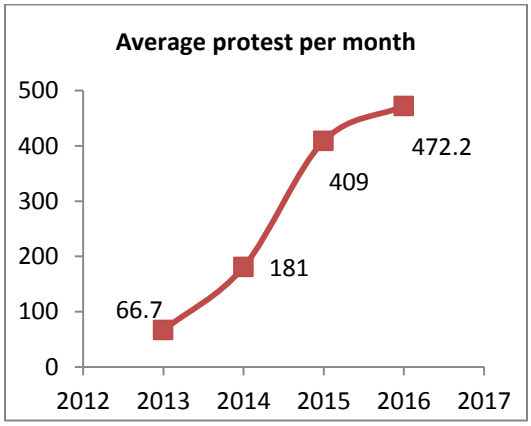

Figure 6. Average Commercial Protests per Month in China

4.1.5. How about a Tax Cut to F?

Ren Zhiqiang, a prominant Chinese house developer, complained openly in 2009 that the government collected too much tax and fees from a house which makes house prices so high. However, as it seems to me, whether the price of a product is high or low also depends on the price-quality ratio. If consumers can afford a product and still think its price is "too high", maybe it also means its quality does not match its price. So, what if the government cuts some taxes and

fees so that firms can retain more revenues? Will a tax cut incentivize firms to provide better quality houses? Interestingly again, the answer is NO.

Let us modify the model again to mimic a tax cut by reducing 0.5 from **G** at each nodes and increase this 0.5 to **F**. Recall that we achieved $Q^*=3$ when we set $p1=p2=p3=0.11$ in Figure 2. How about this time? The new equilibrium is $Q^*=1$, so the market collapses!

How to achieve the $Q^*=3$ then?

Option 1: We can increase the penalty for **G**. For example, reduce 0.5 from each case when an investigator catches **G**.

Option 2: We can increase p if former p is too low to pass its threshold. For example, let $p1=p2=p3=0.14$.

This is a dilemma (but not prisoners') – how can we reduce revenue for the government and at the same time increase the investigation frequency and penalty to corrupt officials?

Jail corrupt officials for a longer time? It may cost us more money. Under the current condition, it is impossible to ask local governments to increase investigation or the term of penalty with less revenue. Local governments already have severe debt problems.[44]

Maybe corrupt officials should stay in labor camps to earn their own meals in jail, instead of being jailed in some hotel-like special rooms? I am sure this proposal will never be passed by the National Congress (under the veil of ignorance) and labor camps are already canceled in 2013. And labor camps are not used to treat officials.

Maybe it is a good idea to require the richer central government to send its own investigators directly to municipal and county CCP organizations? CCP is already doing this in the corruption combating campaign since 2013! So theoretically this campaign should help more or less, we will see this later.

[44] http://www.economist.com/blogs/freeexchange/2015/03/china-s-local-government-debt

4.2 Implications from the Commercial Protest Model

(1) The probability of investigation and level of penalty to government officials essentially determine the market equilibrium.

Firms would never offer a fair quality house (***Q***=3) if they know ***p1***<0.1, or penalties to misconducted officials are too low – "penalize you to drink three more cups of wine."[45] Therefore significantly increasing investigation frequency and penalty magnitude should improve the market average quality and reduce protests.

However, announcing this new information loudly on TV is necessary but not sufficient, because players choose how to act based on their beliefs. They may observe if the investigation is not persistent or penalty is not severe enough. Even if they cannot observe the whole picture due to media restrictions, some of them may have personal channels to verify the truth. This is why some people are pessimistic about a corruption combating movement: a short-term policy will not change people's long-term expectation. Some other people worry that the movement might be too selective to be unbiased therefore would not be effective. We will then use our dataset to determine whether the corruption combating campaign is effective in each province. The diagnosis table of four possible scenarios about protests is detailed in 4.1.4.

(2) It is better to determine the real optimal probability of investigation ***p****** based on the payoffs of government officials, instead of determining ***p****** based on impact of firms' choices.

(3) Market competition alone does not necessarily fix corruption.

The theory "market competition could reduce corruption through the channel of reducing every firm's profit" may not hold in a prevalently corrupt society. Because a firm could still have a large profit by brutally entrapping customers and lowering the quality of its products, despite

[45] Original term: "罚酒三杯."

the existence of many market competitors -- clever opponents are also doing the same thing. It is like a collusion that does not need communication and effort of cooperation. So the path of reducing corruption by reducing firms' profits (therefore reducing the amount of bribe) may only applies to a society that is already not that corrupt. Remember the Indian's rice market in Ackerlof's paper, it should also be a competitive market, right? He also mentioned that only exported Indian goods have better quality, obviously it has something to do with the government from the other side of foreign trade. (India and China are so alike.) Being in a large market with numerous customers, the gains from entrapping customers is far more enough to offer a big bribe to seek for protection from a powerful government official. Lowering 10% of a $100,000-worth house's quality only hurt each house owner of $3,000, but hurting 100 such owners generates an extra profit of $300,000 that seems a good deal to split between a firm and a powerful official. Big brands and certificates does not necessarily guarantee a good quality – in the 2008 poisonous milk scandal, the top three milk brands were also not clear[46]. Especially in China, there are many state-owned and province-owned enterprises, which makes the firm-government collusion more convenient and cheap. (So in section 3.4 studies found that private economy decreases corruption.) The outcome of this collusion is rampant shoddy goods on the whole market and sharply wealth inequality. That is, corruption does not only lower the quality of public goods, it also lowers the quality of products sold in competitive markets.

(4) It is the payoff of an exit option (Not buy a house) that determines the bottom line where the market will stay on. If every customer decides that not buying a house (or getting married) is better than buying a jerry-built ($\boldsymbol{Q}$=1) or unfinished house ($\boldsymbol{Q}$=0), then there would be no bad quality houses in the market. This single ideological change could save public money. How? Because the firms would anticipate this and change their choices, so the government will

[46] https://en.wikipedia.org/wiki/2008_Chinese_milk_scandal

no longer have to spend much resource to increase the investigation frequency of such cases. If customers cannot exit the market, and investigation probability is not high enough, the worst possible equilibrium could happen (***Q****=0). Voting by foot is a valuable regulator, just as (Justin Yifu Lin, 1990) mentioned how the exit option improved farming productivity in collective farms before the failed "Great Leap."

4.3 The Environmental Protest Game

Then we consider the environmental case. Still, the three players are: **C** (a small group of citizens), **F** (a private firm), and **G** (the local government).

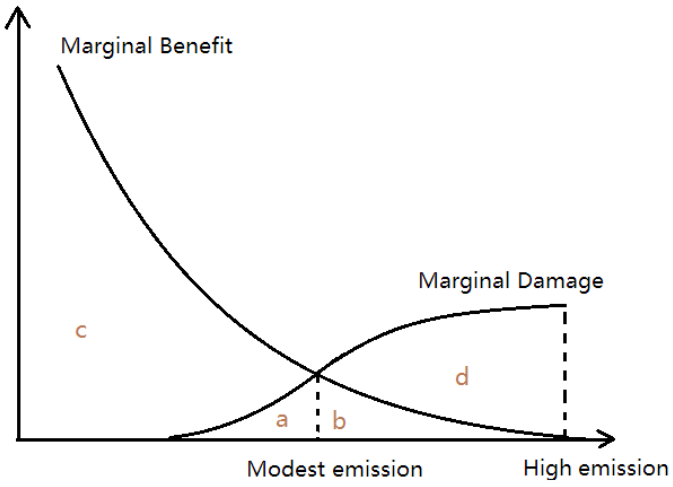

Figure 7. Margial Benefits and Damages (Slightly modified from the classic model)

To determine the relative payoffs of environmental damage and benefits, since we have no outspoken businessperson here, let us consider a pair of slightly modified marginal benefit/damage curves (Figure 7). The marginal damage curve does not have an increasing slope in high emission level because Chinese people only care about the value of their own lives (which puts a limit on the maximum marginal damage).

As showed in former sections, adding more choices does not change the conclusion much but only occupies a much larger space. So here we only consider two choices for **F**: "Modest

emission" is the emission level that are endurable to surrounding residents (not necessarily "efficient", just "endurable"). "High emission" is the maximizing-profit emission level from the firm's perspective. Let a=1, b=1.5, c=13, d=4, roughly mimicking the relative areas of *a*, *b*, *c*, and *d*.

So when **F** operates at a modest emission level, total damage is a=1, total benefit is $a+c$=14. Let us assume **F** and **G** split this total benefit equally without compensating **C** at first. The payoffs for (**C, F, G**) are (-1, 7, 7). When **F** operates at the high emission level, total damage is $a+b+d$=6.5, total benefit is $a+b+c$=15.5. Of course **G** would get more revenue but **F** will manipulate the emission data so it gets a slightly higher payoff than splitting equally. So the payoffs are (-6.5, 8, 7.5).

Assume the cost of protesting by **C** for three players are (-0.2, -0.2, -0.4). Suppressing **C** only incurs a cost of another -0.2 to **C** but not to **G** (because **G** uses public fund to suppress **C; G**'s career is mainly hurt by the raising of protests). Bribe from **F** to **G** is 0.3[47]. If **G** accepts the bribe, it will suppress **C**, otherwise **G** would punish **F** as the law requires. Compensation from **F** to **C** is 4 -- because of high pollution, some permanent damage has been made on **C**'s health that cannot be compensated any more. **F** would also be fined by 0.2. The probability of **G** being investigated is p, and it is conditional on the action of "Suppress **C**" – if **C** is suppressed, **C** would write letters to higher authority to accuse **G**. If **G** is being investigated, its payoff is 5. **F** surely would have to compensate 4 to **C** and pay a fine of 0.2. So the payoffs for the last nodes are (-6.5-0.2-0.2+4=-2.9, 8-0.2-0.3-4=3.5, 5) and (-6.5-0.2-0.2=-6.9, 8-0.2-0.3=7.5, 7.5-0.4+0.3=7.4).

[47] The bribe is set to maximize the probability of ***F*** to gain extra profits: make the switching point of ***F*** and ***G*** to coincident. Given G's payoff equals 5 after being caught for taking bribes (B), Node 10 and Node 11 become (-2.9, 3.8-B, 5) and (-6.9, 7.8-B, 7.1+B). Solve for two equations $(3.8-B)*p+(7.8-B)(1-p)=7$ and $5p+(7.1+B)(1-p)=7.1$, the solution is $p^*=0.125$, $B^*=0.3$.

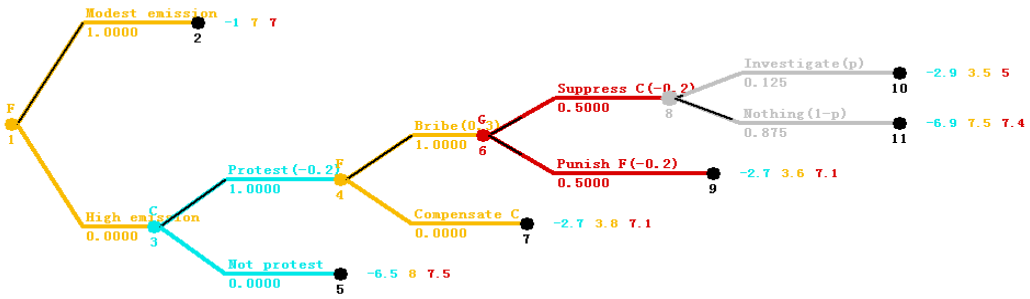

Figure 8. Protest=0.2, Punishment=0.2, Bribe=0.3, Compensation=4, Investigated=5, p=0.125

4.3.1. Diagnosis Table

As shown in Figure 8, the turning point to make **F** choose Modest Emission and **G** to be indifferent between Punish **F** and Suppress **C** is the same, p^*=0.125.

The turning point for **C** to protest is p=0.1. Because when $-2.9p-6.9(1-p)=-6.5$, **C** is indifferent between Protest or Not Protest. So **C** would only choose Protest if $p>0.1$.

When $0.1<p<0.125$, we can observe the equilibrium of disobeying the rule by all the three players: (**C** chooses Protest, **F** chooses High Emission and Bribe, **G** chooses Suppress **C**).

We can calculate within different range of p, what are the best strategies of the three players.

Table 8 Diagnosis Table for Current Position with regard to Environmental Protests

Stage	*p* (Investigation)	C (Citizens)	F (A firm)	G (Local official)	Payoffs	Protest frequency
I. High Pressure & Exploitation	$p< 0.1$	Not protest	High; Bribe	Suppress C	(-6.5, 8, 7.5)	Few
●Turning point	$p=0.1$	Indifferent	High; Bribe	Suppress C	(-6.5, 7.55, 7.33)	--
II. Insufficient	$0.1<p< 0.125$	Protest	High; Bribe	Suppress C	(>-6.5, >7, >7.1)	Increase

investigation						
●Turning point	p=0.125	Protest	Modest; Bribe	Indifferent	(-1, 7, 7)	--
III. Over investigation	p>0.125	~~Protest~~	Modest; Compensation	Punish F	(-1, 7, 7)	Decrease

Similar to 4.1.4, only when **F** believes $\boldsymbol{p}$>0.125 will **F** select Modest and Compensation, which are the only two strategies that could reduce protests.

We will see in Chapter 6 whether after adding various controls, there is still an increasing time trend for each province. If so, it means the corruption combating campaign since 2013 is not effective so firms do not believe it. We can also see whether the "strictest ever" Environmental Protection Law enacted in 2015/01/01 could reduce protests by increase punishment.

4.3.2. Hiding Information

As typical environmental protests in cities when people believe a base station or a transformer station may induce cancer (not verified by science so far). What caused this situation? As said before, historical records. The more **G** hides information from C, the more likely **C** should believe that this project is harmful. After a turning point, **C** is 100% sure that if **G** is hiding then the project is harmful. It can be explained by another small model below.

Assume the nature determines the probability, p, that a base station that **G** wants to build near **C**'s community is harmful. **G** can observe it but **C** cannot. **C** must choose between protest or not without knowing the truth (**C** cannot differentiate whether it is at Node 5 or Node 6). If **C** protest, both **C** and **G** get nothing (0, 0). If **C** does not protest, which means tacit permission, **C** may get 2 (the base station is truly not harmful) or -1 (the base station is truly harmful).

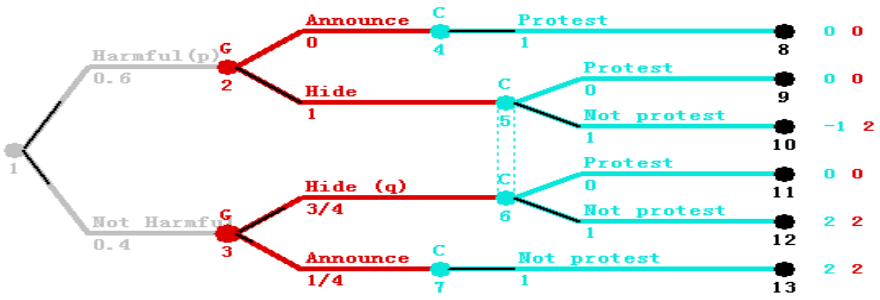

Figure 9. Game Tree for Hiding Information by G, p=0.6, q=0.75

To find out the Nash equilibria we have to turn the extensive game (Figure 9) into a game table (Table 9). The payoffs for all the possible situation are given in terms of ***p***.

Table 9 Game Table Version of Hiding Information by G, $q = (2-3p) / (2-2p)$

		G (Local Gov.)			
		A at 2; A at 3 (AA)	A at 2; H at 3 (AH)	H at 2; A at 3 (HA)	H at 2; H at 3 (HH)
C (some citizens)	P at 4; P at 5/6; N at 7 (PPN)	**2(1-*p*), 2(1-*p*)**	0,0	**2(1-*p*), 2(1-*p*)**	0, 0
	P at 4; N at 5/6; N at 7 (PNN)	2(1-*p*), 2(1-*p*)	2(1-*p*), 2(1-*p*)	2-3*p*, 2	**2-3*p*, 2** (If $p<2/3$)
				q	1-*q*

There are three pure Nash equilibria (bolded) above: (**C** plays PPN; **G** plays AA), (**C** plays PPN, **G** plays HA), (**C** plays PNN, **G** plays HH). And there is a mixed Nash equilibrium: (**C** is indifferent between protest or not; **G** plays HA with probability of ***q***, plays HH with probability of 1-***q***).

a. (PPN; AA) means if **G** always announces its construction plan, **C** will not overreact (believe in **G**'s announcement if **G** claims the base station is not harmful).

b. (PPN, HA) means if **G** sometimes chooses Hide and sometimes choose Announce, **C** should protest whenever **G** hides.

c. (PNN, HH) means if **G** never announce even if the project is truly beneficial to both of them, ***C*** would never protest. And this equilibrium only appears if **G** observes that $p < 2/3$.

d. (PNN, HA $\times q$, HH $\times(1-q)$) means if **G** plays HA and HH with a mixture of certain probability, **C** cannot decide if it is better to protest. What should **C** choose to do if **G** hides the information? **C** can calculate q in terms of p to see if there is a pattern. Solve for the equation $2(1-p)q=2-3p$, **C** gets $q^*=(2-3p)/(2-2p)=1.5-1/(2-2p)$. It means when p increases, q decreases: when **G** knows the project is harmful, **G** will announce less.

Here we can understand **C**'s overreaction is actually rational and reasonable: the more **G** hides information but not all the time, the more likely the project is harmful to **C**:

-- Why is **C** overreacting?

-- Because **G** is hiding too often now but it does not always hide historically. At least everyone knew about the Three Gorges Project (a large environmentally sensitive project) before it was built, why are you stealthily building a base station in our community?

4.3.3. The Role of Petition-Ranking System

What would happen if some policy is binding on **G** to suppress **C** no matter if **F** bribes **G** or not? One example is the petition ranking system launched in 2005. Because **G** would suppress **C** no matter whether **F** chooses High emission or not, **F** does not need to bribe **G** anymore. So even if **G** is investigated, **G** would not be punished because suppressing is the correct choice. Then it would be equivalent to set **G**'s payoff at (Node 9, Node 10, Node 11) to be (4, 7.1, 7.1) [48], and set **F**'s payoffs at (Node 10, Node 11) to be (3.8, 7.8). The new set of payoffs is shown in Figure 10.

[48] G's payoff 4 is not unique, any number less than 7 is fine.

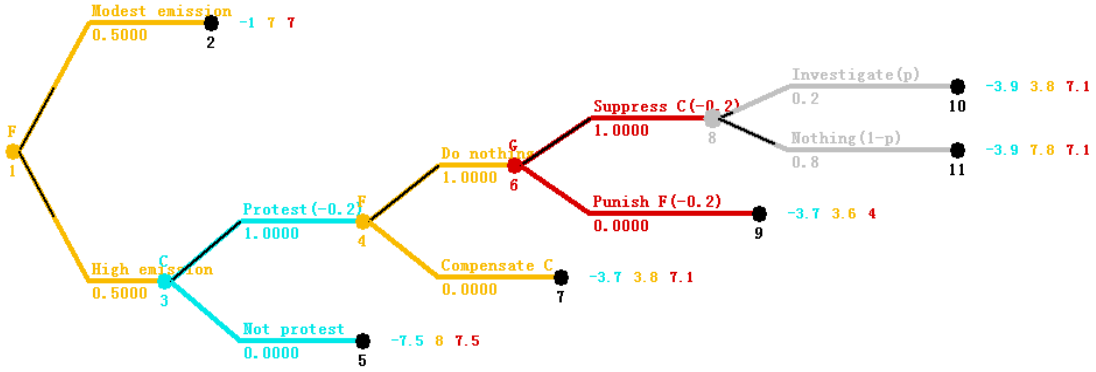

Figure 10. Bribe=0, G(Punish)=4, G(Investiation)=G(Nothing)=7.1

At this time, ***p***=0.125 is not the turning point any more. The new turning point is 0.2, which means our investigators have to work much harder to achieve our environmental goal.

Therefore, the petition ranking system has a very negative side-effect in terms of protecting the environment efficiently. However, this policy serves as the best strategy to develop GDP (not considering the environment) -- because neither compensation (to poor citizens) nor bribes (to officials) would contribute to more domestic investment as much as letting firms keep the money do. A real world coincidence is that before the global financial crisis in 2008, China achieved the highest rate of GDP growth right after the ranking system took place: 12.719% (2006), 14.231% (2007).[49]

4.4 Implications from the Environmental Protests Model

(1) Given our set of payoffs, if **C** believes the investigation probability ***p***<0.1, **C** would endure the initial damage of -6.5. It does not matter how **F** and **G** thinks. Therefore, protesting is actually a reflection of **C** (citizens) trusting investigators (from the central government).

[49] Numbers from the online database of the World Bank.

(2) If **G** believes $\boldsymbol{p}$>0.125, **G** would choose to enforce the written rules ("Punish F"), **F** would choose Modest Emission and Compensation if it unintentionally made damages to citizens.

(3) Using Table 8 we can observe the real predominant strategies and roughly determine which stage we are in, and adjust **p** so that we can achieve our goal:

- ✧ It is easier to make **C** protest than to make **F** switch strategies, even if **F** believes in the same $\boldsymbol{p}$ as **C** does. So there is a range of $\boldsymbol{p}$ from 0.1 to 0.125 that every player is disobeying the rules: (High Emission; Protest; Bribe; Suppress **C**). It means we are at Stage II, we should increase $\boldsymbol{p}$ by 25%.
- ✧ If we observe (Modest Emission; Protest; Compensate **C**; Punish **F**) occasionally, it is natural because there are accidents in practice.
- ✧ If we observe (Modest Emission; Protest; Compensate **C**; Punish **F**) frequently, then we have serious trust issues: It means the local government is hiding too much that makes **C** overestimates the potential harm. That is like **C** believes it is at Node 5 but in fact it is at Node 2, **C** is protesting despite in fact **F** is only modestly polluting. Thus **C**'s distrust on **F** and **G** increases unnecessary protests (overreaction). The only solution is to make local governments release information as often as possible so it can gradually gain back trust from **C**.

(4) Maintain-stability policies that require local government to suppress protests unconditionally would make GDP grows faster at the cost of making the environmental condition much worse. So the cancellation of the petition ranking system should help to improve the environmental quality and reduce protests.

(5) If the higher authorities no longer accept level-skip petitions, it would be equivalent to reduce ***p***, which may cancel out the positive effect of corruption combating campaign (increase ***p***) on environmental protection.

4.5 Generalization

In the above sections, we only used specific numbers in the games to infer the impact (or trend) of an increasing ***p*** on players' choices (as ***p*** increases, protests increase at first, then decrease). In this section, we will generalize the game to see if the trend holds generally.

Since in former sections we have seen the role of the first node (i.e. **C** chooses whether to buy a house) is just to hold the bottom line of the game, here we will use a simpler framework as used in the environmental game (it is also the common framework) for generalization. Replacing the numbers in the common framework (Figure 8), we get:

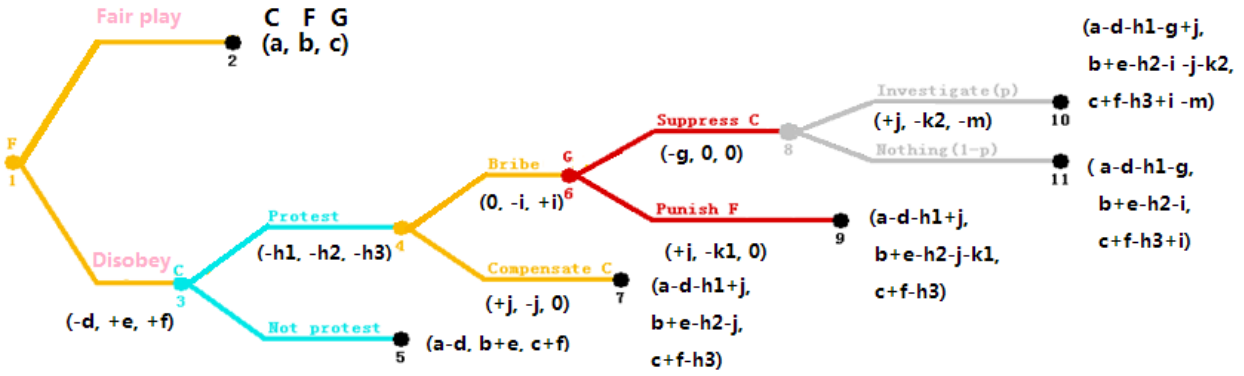

Figure 11 Generalization of the common framework

Every letter represents a positive number, except that $f \geq 0$ (to reflect the possibility in commercial game that the **G** does not get more if **F** cheats **C** and **F** does not bribe **G**). Every parenthesis under each action line is the change of payoffs for each player, respectively. "Fair play" means to obey the rules (laws, regulations, contracts).

Take ***p*** as given, we can further simplify the game by combining node 10 and node 11:

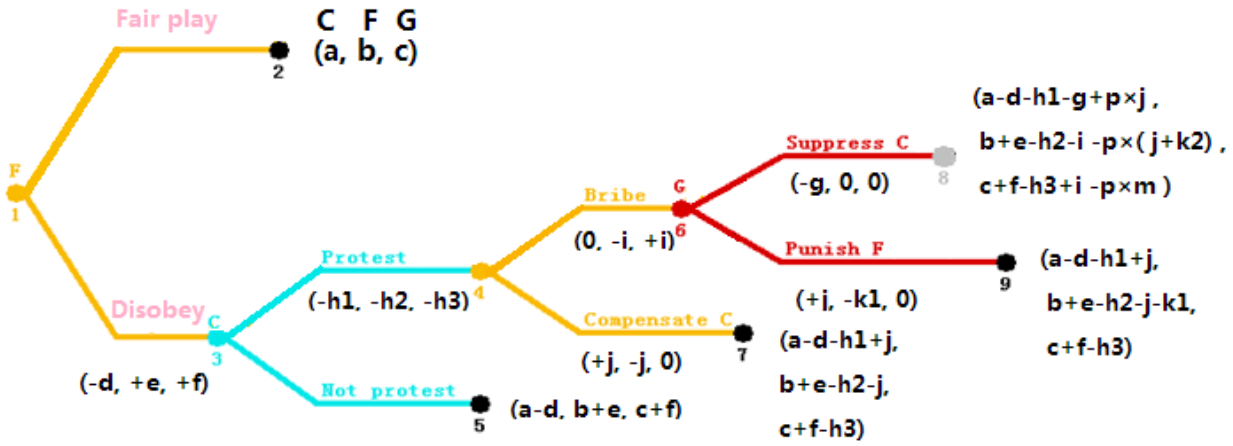

Figure 12 Simplify the common framework by combing node 10 and node 11

If **G** chooses to punish **F**, there is no point for **F** to bribe **G** – **F** would rather to compensate **C**. Therefore, the game could split into two smaller games: (a) when **F** bribes **G** (and **G** suppresses **C**), or (b) when **F** compensates **C** (because **F** knows **G** would punish **F**).

4.5.1 Split game (a)

When ***p*** < *i/m*, **F** bribes **G** and **G** suppresses **C**.When doing rollback analysis, first **C** decides whether to protest, and then **F** decides whether to obey or disobey.

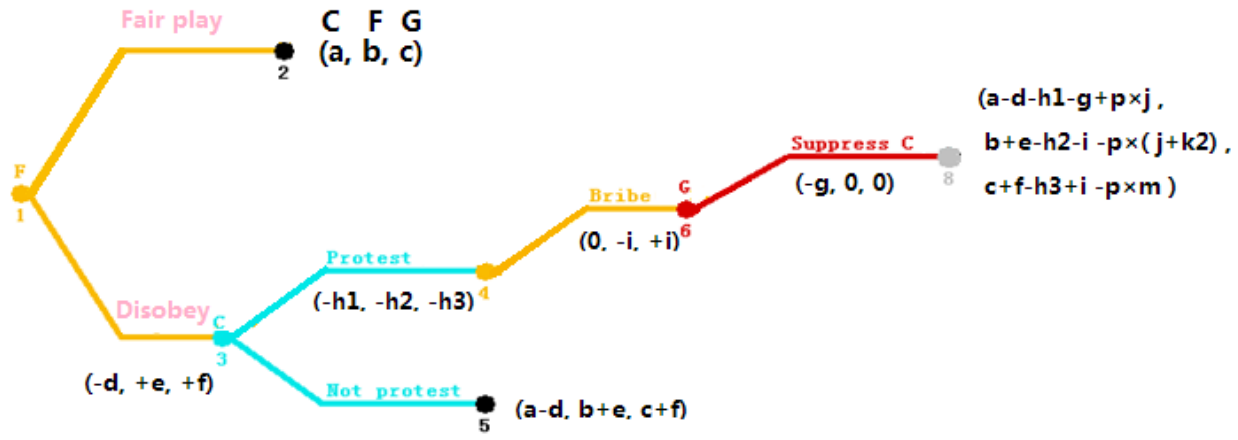

Figure 13 Split game (a): When G suppresses C

Compare **C**'s expected payoff between node 8 and node 5, we have two scenarios: ① If ***p*** < (*h1+g*)/*j*, **C** would not protest. Then **F** would definitely choose "Disobey" since *e* > 0 so *b*+*e* > *b*. This implies limiting **C**'s option to protest would also decrease **F**'s willingness to fair play. ② If ***p***>(*h1+g*)/*j*, **C** would protest. It means increasing p would increase protests until **F** changes to "Fair play." Then when ***p*** > (*e-h2-i*)/(*j+k2*), **F** would choose fair play -- **F**'s expected payoff in node 2 is larger than node 8.

Now we have three thresholds for p: (1) *i/m*, (2) *(h1+g)/j*, (3) *(e-h2-i)/(j+k2)*.

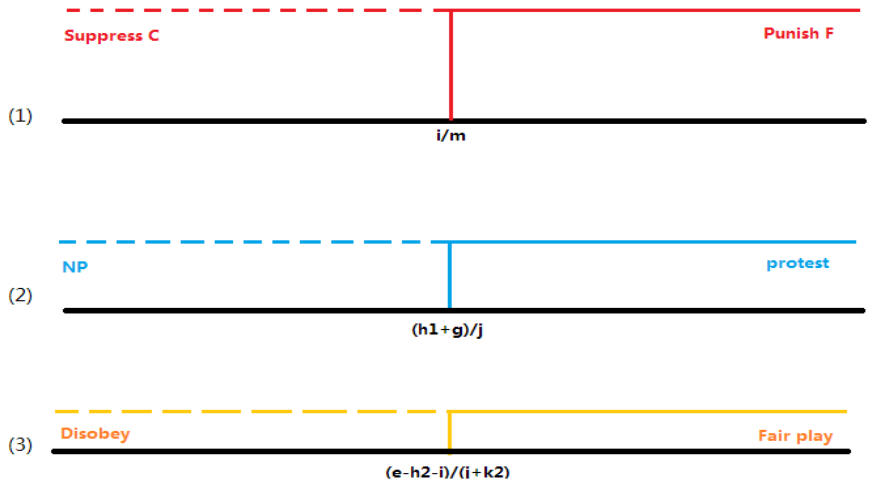

Figure 14 Split game (a): Three thresholds for p

That means, there are six possible arrangements of their relative positions. I draw them all below. We can clearly see that no matter how these thresholds arranges, there are only two possibilities between protest and ***p***: as ***p*** increases, either there is no protest from the start, or protest would first increase then decrease (after ***p*** passes a certain threshold).

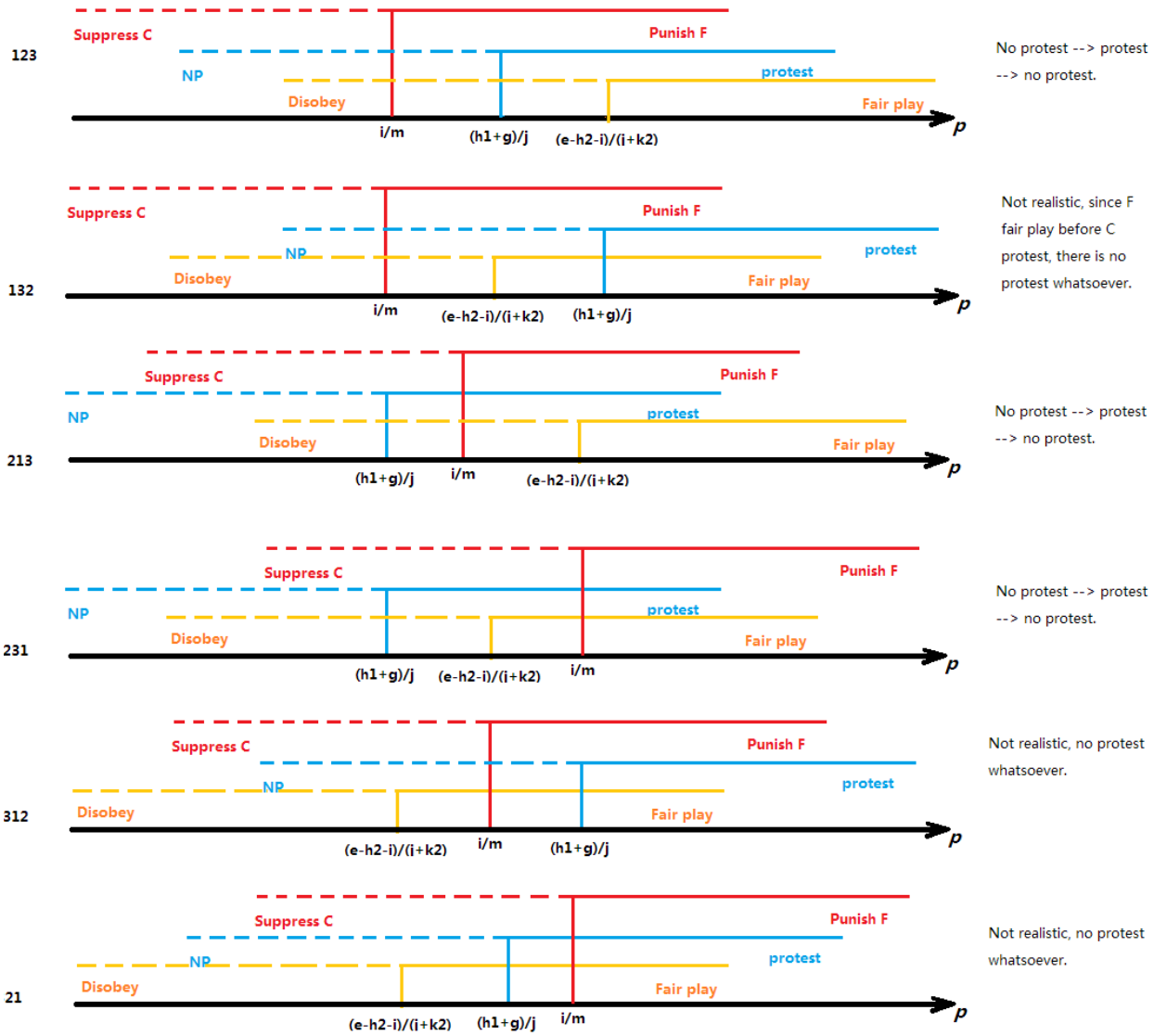

Figure 15 Split game (a): Six orders of the three thresholds for p

4.5.2 Split game (b)

When ***p*** > *i/m*, **F** compensates **C** before **G** punishes **F** (because *k1*>0 assumed in Figure 11). Under this situation, the results depends on the setting of laws – thresholds here do not depend on ***p*** any more.

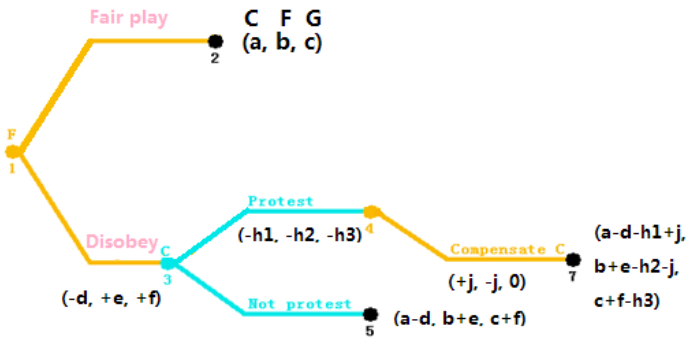

Figure 16 Split game (a): When G punishes F

Again, **C** chooses whether to protest.

If *j* < *h1*, then even if ***p*** is 100%, **C** would not protest, which contradicts the reality: There are plenty of protests, and *h1* is never that high compared to *d*[50] or *j* -- *j* should be close to d. So we can exclude this possibility. It should be *j* > *h1* and **C** protests.

Then **F** decides whether it will play fairly:

When *e* > *h2+j*, **F** would never choose fair play no matter what ***p*** is. It does not make much sense too – it is equivalent of saying that the contracts signed by house buyers or the environmental protection laws are not fair for buyers or citizens from the start. If this was true, then we would expect even after ***p*** has increased to a very high level, citizens are still protesting

[50] According to a report done by the legaldaily.com.cn, 95.6% of typical protests in 2012 end in a week. (Note: legaldaily.com.cn is the official website run by Legal Daily. Legal Daily is the official newspaper run by the nation's Central Political and Legal Commission.) According to the National Bureau of Statistics, a week of national average disposable income in 2016 is only 23821/52 = 458 yuan (66.5 USD), but the average house price is 6473 yuan/m ²in 2015. So a week of income loss is incomparable to even a 1% quality loss of a small house that only worth 300,000 (assume a fair quality means it's quality worth 30% of the house price, so 1% of quality loss = 900 yuan).

and firms are not changing to fair play. Then only updating the law would help. If this is true, we should expect only the new enacted Consumer Protection Law or "the strictest Environmental Protection Law" has some significantly negative effect on protests, but no turning point of protests before these two laws.

When $e < h2+j$, then after p has passed i/m, **F** would change to fair play, protests would only accidentally occur (just like in Hong Kong).

4.5.3 Summary

As expected, the generalization version of our games does not change implications with regard to protests and inspection probability: as $\boldsymbol{p}$ goes up, protests increase at first, but eventually protests would go down after $\boldsymbol{p}$ has passed some threshold (goes large enough).

Indeed, there are some new insights from the generalization model, which is the role of law – the proper size of penalty. If protests in a country (or province, city, etc.) does not respond to increased inspection probability, there are two possibilities. First, it is because $\boldsymbol{p}$ is too low (so we should further increase $\boldsymbol{p}$ in order to see a decline in protests). Second, it is because the existent laws are not fair or strict enough (then no matter how high $\boldsymbol{p}$ is, protests would not decline).

In summary, increasing the inspection frequency and enacting stricter laws should help to reduce protests. It seems that the Chinese government is again on the correct track – and it also differentiated the launching time of increasing the inspection frequency and enacting stricter laws (a good news for empirical analysis we will do in later chapters).

CHAPTER 5

EMPIRICAL MODEL

5.1 Hypothesis

Based on the implications of our models in Chapter 4, as well as folk wisdom: Corruption combating is at least part of a cure for "the dilemma of disobeying the rules" (I will use "civil disobedience" to refer to this six-word term). Because it is those who hold more power who disobey the rules at the first place, so others have to deviate as well. I will use protests as a proxy for the phenomenon of disobeying the rules by our three players (**C, F, G**), in each province.

Hypothesis: Along with the anticorruption movement in progress, protests should start to decline over time, at least for some provinces.

I will not only test whether this hypothesis is true, I will also test in which province the anticorruption movement is effective, and calibrate how long does it take to show the effect.

5.2 Empirical Model and Data

Let us consider what factors might affect the occurrence of commercial and environmental protests in a given month in a given province. Combining information from chapter 2 with a little common sense, it includes:

(a) Either firms or governments or citizens disobeyed some rules;

(b) Anticorruption movements on the state/provincial/local level;

(c) Newly passed laws or regulations;

(d) Economic fluctuations, relative power, consciousness of rights;

(e) Time-specific effects;

(f) Fixed effects;

(g) Technologies.

The central idea is that (as also mentioned in 4.1.4) after controlling all the exogenous effects on protests, what leftover is the unobservable provincial anticorruption effect on protests. The empirical model is specified as below. Descriptions of variables and data sources are listed in the same order:

$$\begin{aligned} \boldsymbol{ProtestCE_{it}} = \alpha \cdot \boldsymbol{XA_{it}} + \beta \cdot \boldsymbol{XB_{it}} + \gamma_1 \cdot XC_{it} + \gamma_2 \cdot XC_{it}^{\,2} + \eta \cdot \boldsymbol{Law_{it}} + \lambda \cdot \boldsymbol{Economic_{it}} \\ + \theta \cdot \boldsymbol{Month_t} + \xi \cdot ID_i + \varphi_1 \cdot Netizen_{it} + \varphi_2 \cdot Netizen_{it}^{\,2} + \varepsilon_{it} \end{aligned} \quad (1)$$

$$XC_{it} = ID_i \times TM_t \quad (2)$$

$$XC_{it}^{\,2} = ID_i \times TM_t^{\,2} \quad (3)$$

The two dependent variables are $ProtestC_{it}$ and $ProtestE_{it.}$ They are the observed number of commercial or environmental protests that happened in each province (i) each month (t). The data source was described in Chapter 2.

The independent variables of interest are $XA_{it,}$ XB_{it},and XC_{it}. They are the inspection activities in the anticorruption movement that happened on the national level (A), provincial level (B) and local level (C), in each province and month. There are several stages of a complete inspection round: Inspection → Feedback → Correction reporting. During all these stages, the inspection team might also announce that some officials are under investigation or have been punished. Thus XA_{it} and XB_{it} are composed of: announced number of officials being investigated ($invA_{it}$, $invB_{it}$) or punished ($punA_{it}$, $punB_{it}$), dummies indicating there is an inspection team conducting the inspection/feedback/reporting tasks ($xunshiA_{it}$, $xunshiB_{it}$; $fankuiA_{it}$, $fankuiB_{it}$; $zhenggaiA_{it}$, $zhenggaiB_{it}$). In addition, the cumulative sum within the past three and seven months are also included ($p3invA_{it}$, $p3invB_{it}$, $p3punA_{it}$, $p3punB_{it}$, $p7invA_{it}$, $p7invB_{it}$,

$p7punA_{it}$,$p7punB_{it}$) to catch if changes in players' behavior are gradual. These variables were found on the central or provincial discipline organs' websites[51].

The third variable, XC_{it} , is the local-level inspections that contributed to the majority of the 182,000 to 336,000 punished officials. It is unobservable, provincial specific, and time-varying. If all the other important factors are accounted for, what is left over is this effect (a trend). According to this trend, we can determine whether the local-level anticorruption movement is effective in reducing civil disobedience or not (a negative slope means effective). Therefore I will use the provincial dummies (ID_i) multiplied by the time period indicator (TM_t = *1 ~ 35*) to represent the trend (Equation 2). It also enters the model with a squared trend (Equation 3) because the model predicts that there might be some delays for the anticorruption activities to change players' behavior.

Other variables are briefly described in the table below.

Table 10. Description and Data Source of Control variables

Variable Vector		Description and Data Sources
$\boldsymbol{Law_{it}}$		A set of time dummies.
	$law315_t$	Consumer Protection Law (enacted since 2014/03/15 national wide)
	$lawenvi_t$	Environmental Protection Law (enacted since 2015/01/01, national wide)
	$laojiao_t$	The labor camp system that are used to detain level-skipping petitioners (revoked since 2014/01)
	$ranking_t$	The level-skipping petition ranking system (revoked since 2013/11)
	$legalskip_t$	The Letters and Calls Bureaus no longer accept level-skipping cases and law-involved cases (Since 2014/5)
	$taxcut_t$	The new tax reform that claims to cut tax for firms significantly (started from 2016/05/01)
$\boldsymbol{Economic_{it}}$		Data under this category are all gathered from the "National Data" online database operated by the National Bureau of Statistic of China (http://data.stats.gov.cn/), except for mc_{it} and me_{it}.
	GDP_{it}, PPI_{it}	One quarter delayed overall GDP and Producer Price Index.
	$inccity_{it}$, $incrural_{it}$,	The annual disposable income for city/rural/average income of each province.

[51] The CCDI website: http://www.ccdi.gov.cn/. The link of each province's provincial CDI website can be found on the bottom of CCDI's fontpage.

	$inctotal_{it}$	
	$pipublic_{it}$, $piprivate_{it}$	The annual profits of public or private firms of each province.
	$revenue_{it}$	The annual fiscal revenue of each province (lags one year).
	$houseprice_{it}\_100$	The monthly house price index minus 100; $houseprice_{it}\_100>0$ means house price increases.
	$waste_{it}$, sox_{it}, nox_{it}	The annual emission of water water, SOx and NOx of each province.
	$firmC_{it}$, $firmEpub_{it}$	The annual number of real estate and industrial (public/private-owned) enterprises in each province.
	$firmEpri_{it}$	Lags one year.
	$popcity_{it}$, $poprural_{it}$	The annual city or rural population of each province.
	mc_{it}	The number of commercial protests that has attracted the traditional media (TV stations, newspapers) in each province each month. It was compiled from the raw data of the protests dataset -- comments would mention if there came journalists. Only lags are used in regressions.
	me_{it}	The number of environmental protests that has attracted the traditional media (TV stations, newspapers) in each province each month. The source is the same as mc_{it}. Only lags are used in regressions.
	edu_{it}	The number of college students (per 100,000 person) in each province, lagged for five years. It is used to represent the level of consciousness of rights.
	ngo_{it}	The number of non-government organizations in each province each year (lagged 7 months).
$\boldsymbol{Month_t}$	jan_t mar_t apr_t may_t jun_t jul_t aug_t sep_t oct_t nov_t dec_t	It is a set of month dummies that account for both typical climate and holidays in every month.
	ID_i.	It accounts for cultural, geographical, historical, provincial-specific factors that are unlikely to change notably in four years. For example, marriage attitudes, docility, location, long-term climate, etc.
	$netizen_{it}$ $net2_{it}$	Annual number of Internet users in each province. I assume it also represents the advancement in pixels of cellphone cameras. The data is collected from the quarterly reports issued by China Internet Network Information Center (CNNIC). Squared net_{it} to account for the possible multiply effect of pixels × netizens.

A summary of all the major variables are given as below (except dummies). Their names in the regression are also given.

Table 11 Statistic summary of variables

Variables	Name in reg	Obs	Mean	Std. Dev.	Min	Max
ID_i	id	1050	15.50	8.66	1	30
TM_t	tm	1050	18.00	10.10	1	35

$ProtestC_{it}$	y1	1050	9.38	11.90	0	68
$ProtestE_{it}$	y2	1050	2.30	3.29	0	26
mc_{it}	mc	1050	1.06	1.92	0	15
me_{it}	me	1050	1.24	2.05	0	18
$invA_{it}$	invA	1050	0.14	0.42	0	4
$invB_{it}$	invB	1050	0.11	0.41	0	6
$punA_{it}$	punA	1050	0.06	0.27	0	4
$punB_{it}$	punB	1050	0.88	1.32	0	9
$p3invA_{it}$	p3invA	1050	0.06	0.28	0	4
$p3invB_{it}$	p3invB	1050	0.95	12.70	0	409
$p3punA_{it}$	p3punA	1050	0.18	0.49	0	7
$p3punB_{it}$	p3punB	1050	2.48	2.91	0	17
$p7invA_{it}$	p7invA	1050	0.19	0.50	0	6
$p7invB_{it}$	p7invB	1050	2.78	21.94	0	409
$p7punA_{it}$	p7punA	1050	0.40	0.77	0	8
$p7punB_{it}$	p7punB	1050	5.52	5.67	0	34
$houseprice_{it}\_100$	Houseprice_100	1050	0.41	0.79	0	7
GDP_{it}	gdp	1050	6.23	33.69	0	416
PPI_{it}	PPI	1050	0.17	0.80	-2.40	5.70
$incrural_{it}$	incrural	1050	5826.58	4392.30	388.94	20290.17
$inccity_{it}$	inccity	1050	95.84	3.53	79.80	101.00
$pipublic_{it}$	pipublic	1050	11010.14	3786.53	5588.78	23205.20
$piprivate_{it}$	piprivate	1050	27804.50	7225.37	19873.44	52961.86
$revenue_{it}$	revenue	1050	488.97	376.53	-144.48	1475.16
$firmC_{it}$	firmC	1050	766.48	944.86	0.29	4381.55
$firmEpub_{it}$	firmEpub	1050	2396.47	1739.05	186.42	9366.78
$firmEpri_{it}$	firmEpri	1050	2506.33	1905.15	120	9305
$popcity_{it}$	popcity	1050	620.16	252.69	75	1258
$poprural_{it}$	poprural	1050	6937.04	7975.58	44	30583
edu_{it}	edu1	1050	2513.01	1557.06	276.67	7521.50
$netizen_{it}$	netizen	1050	2019.28	1323.21	251.15	5342.37
ngo_{it}	ngo	1050	3.83	4.91	1	26
$waste_{it}$	waste	1050	2165.77	1455.61	259.00	7874.67
sox_{it}	sox	1050	19323.93	13839.93	2941	80385
nox_{it}	nox	1050	235298.10	183136.10	21953.03	911522.60

5.3. Some Justifications

As shown in previous sections, protests in China are not for fun, not for freedom of speech, and not for corruption itself. Protesters are there because they have important legitimate rights being violated by some stronger interest groups (firms or governments). Seeing others

hanging banners or blocking the streets is NOT informative, in terms of inspiring a new method – it is ancient old tradition, even remote villagers know this method, and CCP uses banners to promote its policies all the time. Problems with copycats should be negligible because protesters have to show solid evidences in order not to be jailed instantly -- you cannot mimic an unfinished residential building or polluted river even if you want to. The cost to write a complaint letter is much reduced because of the Internet (there are official reporting websites), but the cost of protesting in person is never lowered. And since there is no follow-ups by whatever media (including our dataset), I would argue that only observing other people protesting would not change citizens' expectation of investigation probability (***p*** in our models). Even if citizens are protesting for undue benefits, protests are still a good reflection of people's disobeying the rules in the society, which still leads to the folk wisdom that I want to test ("If a leader sets a bad example, it will be followed by his subordinates").

Forget about the anonymous exposure on social media, there is far too much information in the pool to be picked up. Only a handful of cases each year could successfully receive enough attention. Even if a case received huge attention, it does not necessarily induce an investigation[52]. "Rolex anti-corruption event,"[53] "thief anti-corruption event,"[54] and "mistress anti-corruption event"[55] are eye-catching, but they are negligible in increasing the overall inspection or investigation probability. Even with one such case per day, we only add 365 clues per year. That is less than 0.03% of the total 1.22 million clues that inspection organs received in 2013. Besides, protesters in commercial and environmental protests in our dataset rarely (if ever) indicate any specific government officials, although they do often indicate the names of house developers and

[52] http://news.sina.com.cn/m/2012-12-11/141925784361.shtml
[53] An official was dismissed a month after his many luxury watches attracted widely attention. http://fanfu.people.com.cn/n/2013/0924/c64371-23011570.html
[54] A thief reported her "client." http://news.qq.com/a/20140823/001356.htm
[55] A mistress reported her corrupt, former sweetheart. http://business.sohu.com/20131017/n388372176.shtml

factory bosses. In any case, the government is not the one that sold victims houses or emitted pollutions directly (and it has more formidable power than firms do).

The Chinese government and citizens are conducting a natural experiment since the anticorruption campaign that they restricted possible large changes from happening in legal, ideological, cultural, and media environments. During this short period of four years, factors such as individual (provincial) culture, legal system efficiency, openness of traditional media, consciousness of rule of law, and geographical or historical traits could be deemed as fixed effects, which leaves the local-level anticorruption effect in the individual time-trend with less interferences. It is hard to think of anyone else who could do better at controlling those factors on such a big scale. If civil disobedience is reduced, that is not because of enhancement in legal efficiency or media openness, not because of reduced consciousness of rights, and not because of reduced corruption (directly), but only through the "obeying the rules" channel (**F** changes its behavior).

About endogeneity of corruption fighting and protests: observed protests should have little impact on corruption fighting. The reasoning is: if complaining (after being suppressed) is useful, there would be no protests (recall that protests is the last resort); and if protests has any foreseeable reporting effect that could effectively increase inspection frequency, then citizens would not have to protest at all – they can simply threat to protest, then officials would punish F. Therefore, the existent protests should have little endogenous relationship with corruption fighting.

CHAPTER 6

RESULTS AND DISCUSSION

Since there is possibly a parabolic time-trend for each province (absorbed by XC_{it} and its squared term), the model residual does not have autocorrelation problem (Durbin-Watson Statistic = 2.12 and 1.89, for the two regressions respectively). Adding one lag of dependent variable to each regression does not change significance and coefficients of interest, and coefficient of the lag are not significant. The residuals do have heteroskedasticity problems, so the robust standard errors are used. Here I only show the significant variables that might be of our interest. The whole table is in the appendix.

Table 12. Regression Results (Only for variables with P-value < 0.05)

Commercial Protests					Environmental Protests				
Province name	Independent Variable	Coeff	P-value (Robust SE)	Trend or Turning point[1]	Province name	Independent Variable	Coeff	P-value (Robust SE)	Trend or Turning point
	p7punA	0.958	0.011			xunshiA	-1.211	0.000	
						fankuiB	0.477	0.009	
						punB	-0.011	0.000	
Fujian 福建	tmid3sq	-0.039	0.005	↘	Anhui 安徽	tmid1	1.724	0.019	↗
Gansu 甘肃	tmid4sq	-0.026	0.031	↘	Guangxi 广西	tmid6	1.549	0.030	↗
Guangdong 广东	tmid5sq	-0.146	0.014	↘	Hebei 河北	tmid9	1.852	0.009	↗
Guizhou 贵州	tmid7sq	-0.041	0.004	↘		tmid9sq	0.025	0.032	↗
Hainan 海南	tmid8sq	-0.022	0.026	↘	Henan 河南	tmid10	4.321	0.006	↗
Hubei 湖北	tmid12sq	-0.045	0.003	↘	Hunan 湖南	tmid13	1.859	0.013	↗
Jiangsu 江苏	tmid15sq	-0.100	0.000	↘	Jiangxi 江西	tmid16sq	0.016	0.048	↗
Inner Mongolia 内蒙古	tmid18	1.644	0.026	17.7	Shandong 山东	tmid21	2.164	0.019	↗
	tmid18sq	-0.046	0.000		Sichuan 四川	tmid25	3.792	0.001	↗
Ningxia 宁夏	tmid19sq	-0.029	0.005	↘	Yunnan 云南	tmid28sq	0.018	0.003	↗

Qinghai 青海	tmid20sq	-0.024	0.012	↘				
Shandong 山东	tmid21sq	-0.128	0.007	↘				
Zhejiang 浙江	tmid29sq	-0.076	0.000	↘				
Chongqing 重庆	tmid30sq	-0.026	0.045	↘				
	law315	-6.447	0.000					
	houseprice_100	1.220	0.040			ranking	-1.55553	0.013	
	gdp	-0.003	0.003			revenue	0.004394	0.048	3596.07
	PPI	0.274	0.019			revenue2	-6.11E-07	0.000	
	edu1	6.248	0.030			poprural2	0.000059	0.040	
	net2	0.000	0.014			meR_3	-0.93292	0.000	
R^2=0.8814 N=960					R^2=0.6976 N=960				

Notes: The turning point or trend refers to the estimated parabolic individual (provincial) time trend. The only exception is "revenue."

Figure 17. Visualization of the provinces of different groups

Here are some interesting findings:

(1) Our hypothesis is affirmed partly. It is true at least for 13 provinces that anticorruption movements do help to fix some "disobeying dilemmas" in free markets. Unfortunately the rest (majority) provinces are not responsive (17/30 and 21/30), and there are 9 undesirable responses (9/30) in non-markets.

So the same anticorruption movement is strikingly different when it comes to a free market than to a non-market. Twelve provinces are experiencing a better-regulated house markets even before July 2013, which means the anticorruption campaign is effective in just half a year. Inner Mongolia saw its turning point in early 2015 -- after 17.7 months from July 2013. But on the environmental side, none of 30 provinces have seen any good news and nine provinces failed to meet their citizens' higher expectation on the environment quality. It seems that using an anticorruption movement to improve market regularity and social welfare is much easier than to improve the environment quality.

Why? Maybe the right-hand-side governments do not want to improve the environment at all (at least on the current stage). It can be explained by our model's assumption: The government gets a fixed portion from the price of a sold house, but it splits the profits with a polluting factory. Therefore, when the house developer becomes more honest (obey the rules), the government official does not loss anything – it is only a redistribution of a pie between the consumer and the developer. It is very different from the environmental case that if the factory pollutes less (obeys the strict environmental protection laws), the pie (that the factory is sharing with the government) shrinks, so the government official is worse off. The beneficiaries (citizens) from environmental protection are unwilling or unable to pay the same amount as a factory does. Notice that all the provinces on the right-hand side are mineral-rich provinces (which could

cause severe water and soil pollutions in the process of production). Provinces with the most fossil fuels (Xinjiang, Shanxi, Heilongjiang) are not on the 9-member list. Is it because a darker sky is easier to endure than colorful waters? Anyway, fixing a market failure is much easier than fixing enforcement failures in environmental sector.

Coincidently, the two models in Chapter 4 did assume a set of payoffs such that the turning point for the housing market ($\boldsymbol{p}^*$=0.1) is smaller than the environment ($\boldsymbol{p}^*$=0.125). Maybe we should try to find out whether it is not just a coincidence.

(2) Most provinces only appear in one group. Only one province is reported in both columns -- Shandong. This overlapping province seems to be the exact instance that its present inspection probability is just between our assumed 0.1 and 0.125 so that one market is better while the other only increased unfulfilled desires. But why don't more provinces appear in both lists?

(3) There seems to be a promising way that leads to less environmental protests: Make your provincial government revenue stay away from 359.607 billion yuan! You can be rich or poor but cannot sit in the middle. So we may be witnessing an environmental Kuznets curve with respect to environmental protest. It makes a lot of sense because the environmental quality is a public good that only the government is willing and able to buy, of course the richer it is, the more it could afford to buy this luxurious good. With respect to the poor provinces, just like the Pingjiang case mentioned in Chapter 1, citizens are essentially trading this luxurious good with the opportunity cost of economic development. To overcome the economic stagnation of a poor county (or a country as well), there seems to be an unavoidable stage that citizens of this county must endure a period of middle productivity and high pollution in order to improve its technology level. After all, the environmental protection facilities employed on the high-revenue

stage eventually have to be produced by some polluting industries that developed from early stages. Even if one country can import new environmental technologies, what products should this country use to trade for the environmental protection facilities produced by other countries? If this country has relative advantage in clean industries, it should not have pollution problem from the beginning.

(4) The R^2 on the right column is much lower than the left, maybe one reason is that, to my surprise, all the three indicators of pollution (waste water, SOx, NOx) are not significant at all. One explanation is that the official emission data (with a declining trend) from these nine provinces may not be truthful. That could be why the expected positive effects of protests on pollutions is left to be absorbed by XC_{it}. Since the citizens are responding to provincial-level anticorruption activities (*fankuiB*), there should be no reason that citizens do not respond to real pollution. Another explanation is that the emission data is too coarse to follow monthly protests, assuming that protests only respond to extreme cases rather than average pollution levels.

Here I have to admit that this empirical model is very sensitive to important factors added in or left out. But thinking in another way, both the emission data and local-level anticorruption are endogenous within this province, so it is still safe to say that an anticorruption movement is not enough to make this province to obey the environmental rules.

(5) Another interesting point: citizens in the left column are responding to the history of a punished top official in the past half year, while firms or local governments do not seem to remember this. It corresponds to the selective anticorruption and asymmetric information section: Firms and officials are less likely to relate themselves with the top toppled-down officials (regard

them as results of "fights between the gods"[56]), while the completely outsider (citizens) believes local firms and officials should feel being in danger.

On the right column, inspection from central teams and punishment by provincial teams help to appease environmental protests instantly. However, reports of warnings (*fankuiB*) to local officials can only convince citizens but have no effect on the other two players.

(6) As reviewed in Chapter 3, laws and education both raise expectations (leads to more protests), but knowing the existence of a law may also help to deter illegal/irregular behaviors (thus reduce protests). Here we see that the deterrence side of the consumer protection law (*law315*) defeats its expectation effects. To the contrary, the new environmental law seems to be ineffective on both sides.

(7) When rural population increases, environmental protests also increases non-linearly. But this effect is very small since adding 20 million rural population would only lead to an expected increase of 0.236 protests per month. This estimation seems to be consistent with 1) the costly nature of protests in China (so people do not protest easily) and 2) the model assumption that the self-interested nature of environmental views of Chinese people put a cap on the costs of pollution (so the marginal damage curve does not increase drastically).

(8) The presence of a journalist three month ago helps to reduce nearly one case of environmental protest. It could be that the media exposure is effective to reduce pollution level, or it could be that after meeting the journalists, protesters gradually feel that protests are not as useful as they thought before so they give up. Nevertheless, it is still much more powerful than toppling down a provincial official. Maybe we should diffuse this information as widely as possible, then we can test whether a government official is truly willing to protect your

[56] Original term: "神仙打架"

environment – if s/he cares more about citizens' health and tax money, s/he should free the traditional media (journalists) at least on reporting environmental issues.

(9) As concluded in section 4.5, if a province is unresponsive, there are two possibilities, one is that the existent law is not formidable (penalty is too low), and the other is that the inspection frequency is not high enough. In our results of commercial protests, both the new Consumer Protection Law and some provinces show a declining trend, therefore it seems that both the inspection and new law have effects to reduce disobeying behaviors by firms. But in the environmental protests, the new Environmental Protection Law is not significant and several provinces even have positive trends of protests (instead of totally unresponsive), therefore in the environmental sector, the major problem still lies on the enforcement side.

(10) Declining trends in some provinces at least suggest that at least not all the crimes are forged in the anticorruption movement.

* * *

To summarize, the folk wisdom that fighting corruption should somehow reduce the disobeying dilemma is reasonable at least for the most important domestic market (housing), despite the legal system and free media stay subordinate to the administrative power. But unless the incentive design has been changed so that government officials are no longer bind to split a GDP pie with polluting industries, the improvement on environmental quality seems to be faraway.

Besides the disobeying dilemma, another tricky one that seems intriguing too is the environment-development dilemma: Is "low income, low pollution → middle income, high pollution → high income, low pollution" a destined path? Is "middle income, middle pollution" possible and better? For a low-or-middle-income country, is it in fact unwise to enforce strict

environmental regulations before it arrives the high-income stage? To put it another way, is it in fact a social optimum not to enforce strict environmental regulations for a low-or-middle-income country?

REFERENCES

Acemoglu, Daron and Thierry Verdier. 2000. "The Choice between Market Failures and Corruption." *American economic review*, 194-211.

Ackerloff, George. 1970. "The Market for Lemons: Quality Uncertainty and the Market Mechanism." *Quarterly Journal of Economics*, 84(3), 488-500.

Ades, Alberto and Rafael Di Tella. 1999. "Rents, Competition, and Corruption." *The American economic review*, 89(4), 982-93.

Aidt, Toke S. 2011. "Corruption and Sustainable Development." *International handbook on the economics of corruption*, 2, 3-51.

Bailard, Catie Snow. 2009. "Mobile Phone Diffusion and Corruption in Africa." *Political Communication*, 26(3), 333-53.

Becker, Gary S and George J Stigler. 1974. "Law Enforcement, Malfeasance, and Compensation of Enforcers." *The Journal of Legal Studies*, 3(1), 1-18.

Berninghaus, Siegfried K; Sven Haller; Tyll Krüger; Thomas Neumann; Stephan Schosser and Bodo Vogt. 2013. "Risk Attitude, Beliefs, and Information in a Corruption Game–an Experimental Analysis." *Journal of Economic Psychology*, 34, 46-60.

Brunetti, Aymo and Beatrice Weder. 2003. "A Free Press Is Bad News for Corruption." *Journal of Public economics*, 87(7), 1801-24.

Chen, Feng. 2000. "Subsistence Crises, Managerial Corruption and Labour Protests in China." *The China Journal*, (44), 41-63.

Dixit, A.K.; S. Skeath and D. Reiley. 2009. *Games of Strategy*. W. W. Norton & Company.

Dong, Bin; Uwe Dulleck and Benno Torgler. 2012. "Conditional Corruption." *Journal of Economic Psychology*, 33(3), 609-27.

Dreher, Axel and Martin Gassebner. 2013. "Greasing the Wheels? The Impact of Regulations and Corruption on Firm Entry." *Public Choice*, 1-20.

Eldenburg, Leslie and Ranjani Krishnan. 2003. "Public Versus Private Governance: A Study of Incentives and Operational Performance." *Journal of Accounting and Economics*, 35(3), 377-404.

Estache, Antonio and Liam Wren-Lewis. 2011. "Anti-Corruption Policy in Theories of Sector Regulation," *The International Handbook on the Economics of Corruption, 2ed.* 269-99.

Glaeser, Edward L and Raven E Saks. 2006. "Corruption in America." *Journal of Public economics*, 90(6), 1053-72.

Herzfeld, Thomas and Christoph Weiss. 2003. "Corruption and Legal (in) Effectiveness: An Empirical Investigation." *European Journal of Political Economy*, 19(3), 621-32.

Jeong, Yujin and R Weiner. 2011. "Conflict and Corruption in International Trade: Who Helped Iraq Circumvent United Nations Sanctions." *The international handbook on the economics of corruption*, 2.

Jing, Jun. 2003. "Environmental Protests in Rural China." *Chinese society: change, conflict and resistance*, 2.

King, Gary; Jennifer Pan and Margaret E Roberts. 2013. "How Censorship in China Allows Government Criticism but Silences Collective Expression." *American Political Science Review*, 107(02), 326-43.

Krueger, Anne O. 1974. "The Political Economy of the Rent-Seeking Society." *The American economic review*, 64(3), 291-303.
Lagerkvist, Johan. 2015. "The Unknown Terrain of Social Protests in China:'Exit','Voice','Loyalty', and 'Shadow'." *Journal of Civil Society*, 11(2), 137-53.
Lin, Justin Yifu. 1990. "Collectivization and China's Agricultural Crisis in 1959-1961." *Journal of political economy*, 98(6), 1228-52.
Liu, Jun. 2013. "Mobile Communication, Popular Protests and Citizenship in China." *Modern Asian Studies*, 47(03), 995-1018.
Lopez, Ramon and Siddhartha Mitra. 2000. "Corruption, Pollution, and the Kuznets Environment Curve." *Journal of Environmental Economics and Management*, 40(2), 137-50.
Lui, Francis T. 1986. "A Dynamic Model of Corruption Deterrence." *Journal of Public economics*, 31(2), 215-36.
Macrae, John. 1982. "Underdevelopment and the Economics of Corruption: A Game Theory Approach." *World Development*, 10(8), 677-87.
Peisakhin, Leonid and Paul Pinto. 2010. "Is Transparency an Effective Anti‐Corruption Strategy? Evidence from a Field Experiment in India." *Regulation & Governance*, 4(3), 261-80.
Qin, Bei; David Strömberg and Yanhui Wu. 2017. "Why Does China Allow Freer Social Media? Protests Versus Surveillance and Propaganda." *The Journal of Economic Perspectives*, 31(1), 117-40.
Recanatini, Francesca. 2011. "Anti-Corruption Authorities: An Effective Tool to Curb Corruption?" *Chapters*.
Rose-Ackerman, Susan. 1975. "The Economics of Corruption." *Journal of Public economics*, 4(2), 187-203.
Rose-Ackerman, Susan and Rory Truex. 2012. "Corruption and Policy Reform."
Rotondi, Valentina and Luca Stanca. 2015. "The Effect of Particularism on Corruption: Theory and Empirical Evidence." *Journal of Economic Psychology*, 51, 219-35.
Søreide, Tina. 2009. "Too Risk Averse to Stay Honest?: Business Corruption, Uncertainty and Attitudes toward Risk." *International Review of Law and Economics*, 29(4), 388-95.
Søreide, Tina and Aled Williams. 2013. *Corruption, Grabbing and Development: Real World Challenges*. Edward Elgar Publishing.
Seligson, Mitchell A. 2002. "The Impact of Corruption on Regime Legitimacy: A Comparative Study of Four Latin American Countries." *The journal of Politics*, 64(2), 408-33.
Tanzi, Vito and Hamid Davoodi. 1998. "Corruption, Public Investment, and Growth," *The Welfare State, Public Investment, and Growth.* Springer, 41-60.
Zweig, David Stephen. 2010. "To the Courts or to the Barricades: Can New Political Institutions Manage Rural Conflict?," *Chinese Society: Change, Conflict and Resistance.*
李連江 and 劉明興. 2016. "吏紳共謀：中國抗爭政治中一隻隱蔽的手," *《二十一世纪》双月刊*. (Translation: Li Lianjiang, Liu Mingxing. 2016. "Collusion between the officials and local influential figures: A hidden hand in the politics of China's protests." *TWENTY-FIRST CENTURY Bimonthly*.)
李郇; 洪国志 and 黄亮雄. 2013. "中国土地财政增长之谜-分税制改革, 土地财政增长的策略性." *经济学*, 12(4), 1141-60. (Translation: Li Xin, Hong Guozhi, Huang Liangxiong. 2013. The Mystery of Land Finance Growth in China: Tax-sharing Reform, Strategic Interaction of Land Finance. *China Economic Quarterly*, 12(4), 1141-60.)
饶静; 叶敬忠 and 谭思. 2011. "“要挟型上访”——底层政治逻辑下的农民上访分析框架." *中国农村观察*, (3), 24-31. (Translation: Rao Jing, Ye Jingzhong, Tan Si. 2011. "Threatening

petitions" -- An analysis framwork for farmers' petition under the political logic of the lower class. China Rural Survey, (3), 24-31.)
孙立平; 沈原 and 郭于华. 2010. "以利益表达制度化实现长治久安." *领导者*, 4, 11-24. (Translation: Sun Liping, Shen Yuan, Guo Yuhua. 2010. "Achieve a long-term stability through instulization of expressions of citizens' interests." *Leaders*, 4, 11-24.)
孙文凯 and 周业安. 2011. "居民呼吁方式的影响因素——基于城市居民调查数据的分析." *世界经济文汇*, (1), 1-24. (Translation: Sun Wenkai, Zhou Ye'an. 2011. "Factors that influencing the voice type of citizens -- An analysis based on urban residents survey." *World Economic Papers*, (1), 1-24.)
陶郁; 侯麟科 and 刘明兴. 2015. "顶层设计、干部权威与越轨抗争：对中国农村信访潮的再反思." *[Working paper]*. (Translation: Tao Yu, Hou Lingke, Liu Mingxing. 2015. "Top-down reforms, cadres authority, and transgress petitioning: A reflection on the surge of rural petitions in China.")
万广华 and 吴一平. 2012. "司法制度, 工资激励与反腐败: 中国案例." *经济学(季刊)*, 11(3), 997-1010. (Translation: Wan Guanghua, Wu Yiping. 2012. " Law Institutions,Wage Incentives and Corruption Reduction:The Case of China." *China Economic Quarterly*, 11(3), 997-1010.)
王现林. 2015. "农村环境污染的科斯谈判难题研究," 中共中央党校博士论文. (Translation: Wang Xianlin. 2015. "A study of the difficulty in the Coasian Bargains of rural environmental pollutions," *Doctral Dissertaion at the Party School of the Central Committee of Communist Party of China*.)
王一江; 迟巍 and 孙文凯. 2008. "影响腐败程度的权力和个人因素." *经济科学*, (2), 105-18. (Translation: Wang Yijinag, Chi Wei, Sun Wenkai. 2008. "Power and individual factors that affect corruption level." *Economic Science*, (2), 105-18.)
张璇; 李春涛 and 林倩莹. 2015. "行政腐败对居民收入的影响——基于中国居民微观调查的证据." *南方经济*, (1), 18-36. (Translation: Zhang Xuan, Li Chuntao, Lin Qianying. 2015. "How Government Corruption Affects Residential Income: Evidences from a Micro Survey in China." *South China Journal of Economics*, (1), 18-36.)
張芳正. 2016. "大陸預售商品房按揭制度之研究─以履約保證制度為中心." 台湾政治大学硕士论文. (Zhang Fangzheng. 2016. "The Study on Mortgage System for Pre-Sale of Commercial Housing in Mainland Chin─Focus on Escrowa," *Master Thesis at Taiwan National Chengchi University*.)
赵俊婷 and 刘明兴. 2015. "基层教师的集体性维权：体制诱因、行动逻辑与演变趋势." *[Working paper]*. (Translation: Zhao Junting, Liu Mingxing. 2015. "Collective Petition of Teachers in China: Institutional Origin, Mobilization Mechanism, and Evolution Tendency.")
钟其. 2012. "当前浙江环境纠纷及群体性事件研究." *观察与思考*, (2), 61-65. (Translation: Zhong Qi. 2012. "A study on the current environmental disputes and protests in Zhejiang Province." *Observation and Ponderation*, (2), 61-65.)
周黎安 and 陶婧. 2009. "政府规模, 市场化与地区腐败问题研究." *经济研究*, 1, 57-69. (Translation: Zhou Li'an, Tao Jing. 2009. "Government Size , Market Development and Corruption." *Economic Research Journal*, 1, 57-69.)
朱渝. 2013. "城镇化进程中群体性事件法治化防治路径探析——以失地农民因征地拆迁引发的群体性事件为研究视角." *海峡法学*, (2), 86-93. (Translation: Zhu Yu. 2013. "Explore a legal treatment of protests during the urbanization--A study on farmers' protests during the land acquisitions." *Cross-Strait Legal Science*, (2), 86-93.)

APPENDIX

Table 13. The complete regression results

Commercial			Environmental		
y1	Coef.	P>t	y2	Coef.	P>t
xunshiA	-0.24736	0.725	xunshiA	-1.211	0.000
fankuiA	-0.592913	0.401	fankuiA	-0.58503	0.082
zhenggaiA	0.182188	0.745	zhenggaiA	0.025986	0.931
yqxsA	-0.110389	0.903	yqxsA	0.834064	0.22
yqfkA	2.062174	0.08	yqfkA	-0.29012	0.67
yqzgA	0.8632679	0.413	yqzgA	-0.63902	0.249
xunshiB	-0.357706	0.347	xunshiB	0.240983	0.137
fankuiB	0.1792388	0.674	fankuiB	0.477	0.009
zhenggaiB	0.788772	0.141	zhenggaiB	-0.09598	0.673
invA	0.8271087	0.123	invA	0.313727	0.3
invB	-0.102304	0.406	invB	0.007866	0.914
punA	-0.544199	0.357	punA	-0.10122	0.713
punB	-0.007039	0.184	punB	-0.011	0.000
p3invA	0.308285	0.494	p3invA	-0.28199	0.17
p3invB	0.0893049	0.358	p3invB	-0.03198	0.526
p3punA	-0.818523	0.09	p3punA	0.126889	0.588
p3punB	-0.000451	0.936	p3punB	-0.00048	0.897
p7invA	0.2363534	0.525	p7invA	0.190011	0.286
p7invB	-0.079287	0.324	p7invB	0.067388	0.091
p7punA	0.958	0.011	p7punA	-0.13086	0.454
p7punB	-0.002781	0.663	p7punB	0.001072	0.745
tmid1	0.5846987	0.73	tmid1	1.724	0.019
tmid1sq	-0.034489	0.055	tmid1sq	0.00619	0.412
tmid2	0.2972235	0.821	tmid2	0.890207	0.14
tmid2sq	-0.023526	0.173	tmid2sq	-0.00701	0.373
tmid3	1.120814	0.293	tmid3	0.722452	0.247
tmid3sq	-0.039	0.005	tmid3sq	0.005419	0.486
tmid4	1.271849	0.218	tmid4	0.729329	0.199
tmid4sq	-0.026	0.031	tmid4sq	0.000956	0.833
tmid5	2.115319	0.143	tmid5	0.861289	0.343
tmid5sq	-0.146	0.014	tmid5sq	-0.00615	0.888
tmid6	0.5021506	0.733	tmid6	1.549	0.030
tmid6sq	-0.022646	0.089	tmid6sq	-0.00175	0.807
tmid7	2.329112	0.208	tmid7	1.315559	0.155
tmid7sq	-0.041	0.004	tmid7sq	0.005872	0.343
tmid8	0.6680914	0.337	tmid8	0.236778	0.553

tmid8sq	-0.022	0.026	tmid8sq	0.002816	0.603
tmid9	3.031605	0.086	tmid9	1.852	0.009
tmid9sq	-0.069219	0.073	tmid9sq	0.025	0.032
tmid10	1.950534	0.632	tmid10	4.321	0.006
tmid10sq	-0.028191	0.226	tmid10sq	0.013851	0.263
tmid11	1.387053	0.085	tmid11	0.284587	0.519
tmid11sq	-0.020804	0.26	tmid11sq	-0.00034	0.966
tmid12	1.626043	0.18	tmid12	0.647413	0.3
tmid12sq	-0.045	0.003	tmid12sq	0.013197	0.134
tmid13	0.0879175	0.961	tmid13	1.859	0.013
tmid13sq	-0.028807	0.125	tmid13sq	0.012156	0.101
tmid14	0.9472174	0.249	tmid14	0.383999	0.4
tmid14sq	-0.017374	0.145	tmid14sq	-0.00182	0.732
tmid15	0.8813256	0.717	tmid15	0.942058	0.468
tmid15sq	-0.100	0.000	tmid15sq	0.011705	0.398
tmid16	0.6947405	0.576	tmid16	0.814519	0.214
tmid16sq	-0.013519	0.412	tmid16sq	0.016	0.048
tmid17	1.313649	0.192	tmid17	0.357217	0.522
tmid17sq	-0.019639	0.279	tmid17sq	0.003717	0.598
tmid18	1.644	0.026	tmid18	0.422411	0.35
tmid18sq	-0.046	0.000	tmid18sq	-0.00082	0.87
tmid19	1.14647	0.063	tmid19	0.206423	0.533
tmid19sq	-0.029	0.005	tmid19sq	0.001229	0.719
tmid20	0.720944	0.236	tmid20	0.302675	0.379
tmid20sq	-0.024	0.012	tmid20sq	-0.00072	0.848
tmid21	2.172936	0.243	tmid21	2.164	0.019
tmid21sq	-0.128	0.007	tmid21sq	0.037626	0.093
tmid22	1.369957	0.199	tmid22	0.60041	0.319
tmid22sq	-0.021995	0.109	tmid22sq	0.005789	0.381
tmid23	1.771189	0.098	tmid23	0.793951	0.152
tmid23sq	-0.017693	0.291	tmid23sq	0.00437	0.429
tmid24	0.9755873	0.324	tmid24	0.364424	0.555
tmid24sq	-0.033997	0.247	tmid24sq	-0.00192	0.929
tmid25	1.481083	0.634	tmid25	3.792	0.001
tmid25sq	-0.030259	0.284	tmid25sq	-0.00787	0.558
tmid26	0.0289156	0.986	tmid26	1.058918	0.161
tmid26sq	-0.014893	0.451	tmid26sq	-0.00758	0.323
tmid27	0.9503831	0.367	tmid27	0.834835	0.169
tmid27sq	-0.027007	0.23	tmid27sq	0.008842	0.423
tmid28	0.4031268	0.777	tmid28	1.009867	0.126
tmid28sq	-0.000732	0.963	tmid28sq	0.018	0.003
tmid29	1.735403	0.107	tmid29	0.48135	0.458
tmid29sq	-0.076	0.000	tmid29sq	0.001786	0.851
tmid30	0.8590888	0.388	tmid30	0.881029	0.116
tmid30sq	-0.026	0.045	tmid30sq	-0.00227	0.644

				0.264719	0.638
law315	-6.447	0.000	lawenvi	0.348143	0.614
laojiao	0.0410364	0.971	laojiao	-1.556	0.005
ranking	-0.457519	0.649	ranking	-0.77378	0.171
legalskip	-1.890497	0.081	legalskip	-0.13783	0.816
taxcut	1.813142	0.238	taxcut	-3.5E-05	0.148
houseprice_100	1.220	0.040	waste	-4.21E-06	0.698
gdp	-0.003	0.003	sox	-6.92E-06	0.391
gdp_1	0.0031688	0.138	nox	-0.00031	0.452
gdp_2	0.0012435	0.665	gdp	0.000249	0.785
gdp_3	-0.0008	0.641	gdp_1	-0.00042	0.746
PPI	0.274	0.019	gdp_2	0.001166	0.214
incrural	0.0108965	0.123	gdp_3	-0.02207	0.651
incrural2	-1.37E-07	0.409	PPI	-0.00401	0.259
inccity	-0.000798	0.818	incrural	1.23E-07	0.168
inccity2	-6.15E-10	0.985	incrural2	0.000546	0.736
pipublic	0.0017875	0.678	inccity	-1.06E-08	0.531
piprivate	-0.001764	0.595	inccity2	-0.00042	0.781
revenue	0.0021265	0.674	pipublic	0.000271	0.913
revenue2	-7.72E-08	0.831	piprivate	0.004	0.059
firmC	-0.000863	0.453	revenue	0.000	0.012
popcity	-0.11675	0.81	revenue2	-0.00113	0.91
popcity2	0.0000761	0.186	firmEpub	0.00031	0.601
poprural	0.1634283	0.685	firmEpri	-0.27623	0.24
poprural2	0.0000357	0.598	popcity	0.000023	0.431
mc_1	-0.120019	0.807	popcity2	-0.28509	0.213
mc_2	-0.965123	0.06	poprural	0.000059	0.092
mc_3	-0.970671	0.064	poprural2	-0.47001	0.195
edu1	6.248	0.030	meR_1	-0.06444	0.845
netizen	0.0470208	0.373	meR_2	-0.933	0.001
net2	0.000	0.014	meR_3	0.193602	0.608
ngo	0.0016097	0.284	meC_1	0.097247	0.838
jan	6.513	0.000	meC_2	0.249529	0.65
mar	9.935	0.000	meC_3	-0.53459	0.505
apr	8.755	0.000	edu1	-0.02924	0.268
may	10.482	0.000	netizen	9.37E-07	0.811
jun	5.411894	0.16	net2	-0.00015	0.818
jul	6.320577	0.064	ngo	0.751	0.022
aug	4.649424	0.102	jan	0.824	0.025
sep	4.462114	0.076	mar	0.941964	0.1
oct	5.900	0.004	apr	0.99306	0.254
nov	5.278	0.004	may	2.408694	0.186
dem	5.297	0.000	jun	2.485004	0.111
			jul	2.472568	0.069
			aug	2.932	0.011

			sep	1.513393	0.114
			oct	0.636193	0.43
			nov	0.523788	0.421
			dem		
id			id	-411.623	0.42
2	887.9443	0.385	2	-100.961	0.698
3	706.501	0.192	3	-396.438	0.335
4	902.7685	0.295	4	305.2677	0.612
5	-2430.706	0.033	5	-105.383	0.463
6	418.5731	0.171	6	-285.663	0.333
7	692.6418	0.265	7	-731.997	0.279
8	1164.602	0.4	8	38.19288	0.784
9	-450.1508	0.141	9	-289.431	0.494
10	-1450.494	0.128	10	-121.322	0.618
11	667.7727	0.196	11	89.784	0.030
12	56.16963	0.601	12	17.16781	0.807
13	-242.633	0.113	13	-312.937	0.413
14	897.2977	0.26	14	301.409	0.166
15	-970.422	0.026	15	-90.6845	0.575
16	487.3716	0.162	16	-0.32347	0.999
17	532.0235	0.2	17	-349.942	0.406
18	970.8469	0.265	18	-793.852	0.27
19	1191.246	0.418	19	-820.595	0.263
20	1204.291	0.421	20	47.23793	0.91
21	-1668.434	0.06	21	-162.687	0.546
22	740.7116	0.191	22	-154.804	0.538
23	658.1623	0.217	23	-357.943	0.454
24	909.5453	0.333	24	-113.626	0.636
25	-869.8318	0.107	25	-581.827	0.326
26	1119.543	0.35	26	-424.421	0.353
27	957.7042	0.313	27	-159.646	0.299
28	401.8572	0.219	28	145.8726	0.154
29	168.4543	0.448	29	-271.255	0.445
30	889.7935	0.23	30	999.7023	0.23
_cons	-1334.54	0.432	_cons	-1.211	0.000