Natural Resources and Corruption: Empirical Evidence from China

Jing Vivian Zhan, PhD
Department of Government & Public Administration
The Chinese University of Hong Kong
zhan@cuhk.edu.hk

Abstract

Comparative studies suggest that the abundance of natural resources often contributes to economic underdevelopment in third-world countries. One major causal mechanism of resource curse, as some scholars point out, is that reliance on resources leads to bad governance and weak political institutions that suffer widespread corruption. However, others argue that resource endowment does not necessarily translate into weak institutions as political elites can invest windfall revenues from resource in building state capacity. How do natural resources affect the quality of political institutions in China, a country that hosts rich natural resources and rely heavily on them for its economic development? This paper explores the relationship between the endowment of mineral resources and the occurrence of corruption of public officials in China. Through cross-provincial and longitudinal data analysis, it finds that the abundance of and dependence on mineral resources undermine local political institutions by increasing the propensity for corruption.

Key words: China, corruption, resource curse, panel data analysis

Paper prepared for presentation at the 2011 Annual Meeting of American Political Science Association. Unpublished manuscript. Please do not cite without the author’s permission.
Introduction

Is the endowment of rich natural resources a curse or a blessing? Intuitively, rich resources such as oil and minerals should benefit the national economy because resource exports can generate extra foreign reserves, government revenues and opportunities of industrialization for the country (Auty, 1995, p. 183). In reality, however, resource endowment has paradoxically caused the so-called Dutch disease (Corden & Neary, 1982) in not a small number of resource-rich developing countries (Auty, 1993). Besides sluggish economic performance (Sachs & Warner, 1995), resource endowment has also been associated with weak political institutions (Collier & Hoeffler, 2005), civil conflicts and even wars (Fearon & Laitin, 2003; Klare, 2001).

A rich literature has emerged in the past few decades that explores and debates the resource curse thesis in various disciplines and from different perspectives. An important branch of the literature concerns the impacts of natural resources on the quality of political institutions and the rule of law, and more specifically, how resource endowment affects corruption. However, lacuna and controversies remain regarding how exactly resources give rise to corruption and under what conditions such effects take place. Some theoretical studies venture certain causal mechanisms through deductive reasoning or formal modeling, but the theory-driven arguments are yet to be tested against empirical evidence. On the other hand, some commendable
empirical works have statistically tested the resource curse hypotheses against cross-national data, but their findings are not necessarily consistent with each other and hinge heavily on the selection of cases and variables and the quality of the data. Moreover, even when the large-N statistical analyses can establish some correlation between resources and corruption, there is a deficit of detailed analysis of the micro foundations of such correlation, i.e. why and how natural resources induce corruption on the ground.

This study contributes to the existing discourse on the effects of resource endowment on corruption by focusing on one single country, China. As a large country that hosts a vast variety and huge deposits of natural resources and that heavily depends on the resources for its development, China demonstrates many symptoms of the resource curse. By looking at this one country closely, we can identify some causal mechanisms through which resource endowment affects the occurrence of corruption. At the same time, the exits wide cross-regional variation within China, which allows us to statistically test the resource curse hypotheses against empirical data. Through a combination of qualitative and statistical analysis, this study finds that resource abundance and dependence do contribute to more corruption in China, and hence it lends support to the resource curse thesis.

The rest of the paper is organized as follows. Section two reviews the discussions
in existing studies on the relationship between natural resources and corruption/rent-seeking. Section Three focuses on empirical cases in China, which suggest a number of ways through which natural resources and the mining industry give rise to corruption. Section Four conducts a panel data analysis to test the resource curse hypothesis. Section Five discusses the findings and their implications. The last section concludes.

**Resources and corruption: Why is there a curse?**

The extensive literature on resource curse has explored the relations between pointy natural resources, namely those resources extracted from a narrow geographic or economic area such as minerals and fuels, and economic underdevelopment through various channels. One school of theories argues that the curse of natural resources arises not necessarily because of the Dutch disease but rather works through political mechanisms: resource rents undermine the quality of political institutions and increase the tendency of corruption, which consequently hamper economic growth (Robinson, Torvik, & Verdier, 2006; Leite & Weidmann, 1999; Bulte, Damania, & Deacon, 2005). Although the negative effects of corruption on economic performance have been commonly acknowledged and sustained by some empirical evidence (Mauro, 1995; Sala-i-Martin & Subramanian, 2003), the linkage between resources and corruption is yet to be fully explored and tested, and it is an important research
topic in its own right.

So do pointy natural resources cause more corruption? And if so, why? Existing studies that examine the resource curse from the perspective of corruption have largely taken one of three approaches: theoretical analysis based on pure logic reasoning and/or formal modeling, case studies on specific countries, and large-N cross-national statistical analysis. Although the majority of these studies would answer yes to the first question, few have addressed the second question of why. From the handful that do touch on this question, explicitly or in passing, we can nevertheless infer a few arguments along several related but different lines.

First of all, a most direct reason for why resource abundance induces corruption is that the presence of large resource windfalls creates enormous economic temptations as well as opportunities for corrupt behaviors by government officials (Karl, 1997; Leite & Weidmann, 1999). The abuse of resource rents by public officials is particularly facilitated by the state’s ownership of resource industries in many developing countries. The wave of nationalization of foreign-owned mining and petro firms from the 1950s to the mid 1970s (Ross, 1999, p. 319) simply put more resource windfalls in the hands of government officials.

Second, the lack of market competition for rents fosters corruption (Ades & Di Tella, 1999). Resource-rich developing countries often see ill-defined property rights,
imperfect or missing markets and lax legal structures, which make the rent seeking by politicians and bureaucrats even easier (Gylfason, 2001). Actually such phenomenon is not unique to resource-rich countries, historically corruption abounded in the sales of monopoly rights, including mining and land concessions in Europe and the United States (Bardhan, 1997). However, in lack of democratic institutions, those rich people who bribe government officials to gain exclusive user rights to the resources can lobby against a public protection system of property rights in order to preclude grass-roots demand for sharing the property rights of resources. Their resistance could result in a system that fails to enforce property rights and further fuels rent-seeking and corruption (Sonin, 2003).

Third, another possible explanation resides in the competition for political positions. As the bulk of the rents created in resource economies are dispensed by bureaucrats who mostly come from dominant political groups (Mbaku, 1992), resource discovery or boom enhances the resources under the allocation of political elites and increases the value of being in power, and thus there comes intense competition for the access to powerful political positions. When there lacks good-quality democratic institutions with open and fair elections, the fierce competition gives rise to political corruption in such forms as vote buying in elections and patronage networks, which can help political elites to come into or stay in power.
Moreover, the desire for political positions could also drive up corruption in the allocation of resources that could lead to political elite status, such as education opportunities (Vicente, 2010).

Lastly, the theories of the rentier state contend that states which derive most of their revenues from resource rents have less need to levy domestic taxes and to respond to the needs of the citizens. For the same token, the citizens have less incentive to create mechanisms of accountability and to closely monitor the government and public officials (Ross, 1999; 2001). It can be inferred from this argument that the lack of scrutiny creates room for the abuse of public positions for private gains by public officials. Hence the lack of linkage between the rentier state and the citizenry may be another mechanism through which resource rents contribute to corruption.

However, most of these explanations are conjectures derived from pure theoretical reasoning or based on the observations in a limited number of countries (mainly in Africa). Given the simplified and stringent assumptions of the formal models, the theoretical arguments may not fit the reality well. And the vastly heterogeneous institutional setups in different countries also pose a limit to the generalizability of the findings of selected case studies. To mend the gap in these two types of studies to a certain degree, some cross-national comparisons through large-N
statistical analyses demonstrate that resource-rich countries tend to see lower level of rule of law and suffer higher degree of corruption (Norman, 2009; Leite & Weidmann, 1999; Ades & Di Tella, 1999; Isham, Woolcock, Pritchett, & Busby, 2005; Bulte, Damania, & Deacon, 2005). However, some other studies disagree. For instance, Bhattacharyya and Hodler (2010) argue that resources feed corruption only in countries without democratic institutions. And Treisman (2000) suggests that when the level of economic development and the quality of political institutions are controlled for, resource endowment does not significantly increase corruption.

Therefore, the linkage between resource abundance and corruption is at most inconclusive. It is thus necessary to test existing theories against more empirical evidence and also to search for more linkages between resources and corruption in resource-rich countries with different institutional settings. Moreover, all the existing studies are conducted at national or cross-national level, but not much effort has been made to investigate if the resource curse could occur at subnational levels. Looking closely into the local conditions of resource-rich countries can help us examine more carefully and ascertain with more confidence how resource abundance and corruption are causally linked on the ground.

**How Do Resources Corrupt? Empirical Evidence from China**

In view of the lacuna in the study of resource curse and corruption, China
provides a useful case to explore and test the links between resource endowment and the occurrence of corruption for a few reasons. First, China hosts a vast variety of pointy natural resources, including energy resources such as coal, oil and natural gas, metallic minerals such as iron and copper, and other nonmetallic minerals. Although China does not heavily rely on resource exports for its national income, as many resource-rich countries in Africa and the Middle East do, it is a major force in world mineral production. For instance, it is the world’s top producer of coal, steel and ten types of nonferrous metals and the fifth largest producer of crude oil. Natural resources play crucial roles in sustaining China’s domestic economy and facilitating its remarkable growth in the past three decades. Currently mineral resources provide over 90% of China’s primary energy, 80% of industrial raw materials, and 70% of agricultural inputs (Information Office of the State Council, 2003).

Second, although China is not a typical case that suffers from resource abundance in any significant ways at the national level, some symptoms of resource curse have been identified at subnational levels. The rich fuel and nonfuel mineral resources are highly unevenly distributed across China. Compared with the better developed coastal areas, many underdeveloped inland provinces host more good-quality mines with greater potential of exploitation. This association has prompted quite some scholars to investigate the existence of the resource curse in
China, mainly from the economic perspective. Through cross-regional comparison, several empirical studies concurrently reveal a negative correlation between resource endowment and economic growth at provincial and prefecture levels nationwide and in certain regions (Xu & Wang, 2006; Fu & Wang, 2010; Shao & Qi, 2008).

Given the wide cross-regional variation of resource endowment, China provides an excellent platform for the test of the various hypotheses proposed by the resource curse thesis. This and the next sections will focus on the causal links between resources and corruption, and statistically investigate if resource abundance systematically encourages corruption.

How might resources be linked with corruption? In recent years, an interesting observation in China is that mine workers and government officials are widely regarded as holding the two most dangerous jobs. It is understandable that the substandard work safety in many Chinese mines, especially the smaller ones, subjects the lives of mine workers to the threat of frequent and fatal mine disasters (Wright, 2004). Although not as life-threatening, official positions are also seen as dangerous because of the high probability for officials to fall into disgrace and prison due to corruption. According to a recent survey, among the ten most dangerous official positions, the head of the Department of Land and Resources, which is in charge of the supply and transaction of land and natural resources, ranks the first, followed by
the head of the Department of Transportation, country Communist Party secretary, and the head of the Public Security Department etc. Of the 6810 interviewees, 62% believe the Department of Land and Resources is the most prone to corruption (People's Daily, 2010).

Indeed, under China’s booming economy, land and natural resources have been the most lucrative and sought-after resources. Due to the insatiable needs for energy and raw materials for industrial production and construction, the prices for energy resources, such as coal and oil, and nonfuel minerals, such as iron and copper, have been soaring since the early 2000s. The drastic increase in resource rents lays the foundation for rampant rent seeking and corruption in this sector. Meanwhile, there exist considerable institutional deficiencies regarding the property rights of mineral resources and the regulation of the mining and processing industries. The combination of economic opportunities and institutional deficiencies give rise to corruption in the mining sector in a number of ways, some of which echo what happens in other resource-rich developing countries.

First of all, as in many other resource-rich countries, the Chinese state’s monopoly on the property rights of mineral resources creates a fundamental source of rent seeking. The Mineral Resource Law (Kuangchan Ziyuan Fa) stipulates that the state has ownership over all mineral resources in China, regardless of the ownership
or user rights of the land to which the resources are attached, and that the prospecting and extraction of mineral resources must be authorized by either the State Council or provincial-level governments. As the agent of the central and provincial governments, local officials in charge of the authorization process at subprovincial levels are entrusted enormous power to allocate the prospecting and mining rights. Moreover, without a free market for the transaction of mining rights in China, the government interferes in the transaction of mines with a heavy hand. The state ownership of mineral resources and interference in the mining market inevitably creates huge room for rent seeking. Officials can easily extort bribes from those who seek prospecting and mining rights. For example, they can charge for various services to facilitate the application for authorization, such as illicitly disclosing crucial information and providing false certifications.

A more direct way of rent seeking is for the officials to operate mines by themselves or their family members. Although the Chinese government banned state employees from investing in coal mines in 2005, it only drives such activities underground. As an illustration of corruption in this regard, a county official in charge of coal production in Shanxi Province, the largest coal-producing province in China, invested 20,000 yuan in a coal mine in 2000. Even after the 2005 ban, the official and his family continued to control the mine in disguised ways. In a few years, the small
mine expanded into a major enterprise with a total asset of over 50 million yuan. And the official and his family accrued nearly 300 million yuan in form of housing assets and bank savings (Tan & Hu, 2011).

A second form of corruption arises in the fiscal arena. In return to the use of state-owned mineral resources, mining enterprises are subject to a number of taxes and nontax fees, such as resources taxes (ziyuan shui), compensating fee for mineral resources (kuangchan ziyuan buchang fei), user fee for prospecting right (tankuangquan shiyongfei) and user fee for mining right (caikuangquan shiyongfei). The magnitude of the fiscal charges gives rise to corruption in at least three ways. First, it creates enormous incentives for tax evasion. Mining enterprises are motivated to bribe relevant government departments and officials to lower the tax rates. Second, the Chinese central government only roughly sets up a range of tax rates for different grades of resources and allows them to be determined case-by-case according to the type and quality of mines, quantity of resource reserves, mining conditions and various other geographic, economic and technical factors, and it grants local governments and officials considerable discretion to adopt the rates as they see fit. For example, the resources tax rate for coal ranges from 0.3 to 5 yuan/ton, a wide range that could make tremendous difference for the taxed mining enterprises. Such graded and decentralized resources tax system greatly facilitates the manipulation of tax rates.
by local officials in exchange for bribes. Third, the huge sum of resource rents foster embezzlement, misappropriation and squandering. Such corrupt acts involve not only individual officials, but also certain government departments as a collective. A telling example is the exposure of the Collection and Management Office of Mineral Taxes and Fees (kuangchanpin shuifei zhengshou guanli bangongshi) in Leiyang City of Hunan Province. More than 100 employees in this office were found to be involved in embezzlement and bribery. Almost all the top and midlevel officials were charged for corruption (Tan & Hu, 2011).

Third, the huge economic benefits generated from resource rents make the official positions in resource-rich areas a hot commodity. The fierce competition for the lucrative positions, especially those in charge of the mining industries, induces rampant political corruption. As a nondemocratic country without open and fair elections, the allocation of official positions is largely concentrated in the hands of the Chinese Communist Party secretaries in all government branches and at all administrative levels (Ren & Du, 2008), which makes them the easy target of bribery. According to the author’s research in Dexing, a country-level city with rich copper mines in Jiangxi Province, three Party secretaries of Dexing in a roll have been convicted of corruption since the late 1990s. One of their common charges is the sale of public positions in exchange for bribes or other favors.
Fourth, due to the high technical specificity and requirements of the mining industry, it is subject to extensive administrative surveillance on an array of issues, such as mine and work safety and environmental protection, and by a number of government departments, including work safety administration. For example, in order for a coal mine to establish and operate, it has to apply for six permits from four government departments and wait for seven to eight months to get the permits. Given the huge profits coal mines could make (up to 300,000 yuan per day for a medium-sized mine in the high time), the long waiting time imposes heavy costs on the part of the mine owners. In order to simplify the process and lower the costs, the mining enterprises are strongly motivated to go through the backdoor by bribing the officials (Tan & Hu, 2011). Besides, the operation of mines is also subject to government intervention and inspection, which are supposed to enforce mine safety standards. However, local officials can easily turn their administrative power into a vehicle to extort bribes, especially considering that many small or medium sized mines often fall short of meeting the legally stipulated standards in order to save costs (Wright, 2004). In return to monetary gains, the officials would turn a blind eye to the dangerous working conditions in the mines and sacrifice the safety of the mine workers. Therefore, the work safety administrations become a key target for anti-corruption campaigns in China. In recent years, quite some local officials of the
work safety administration and coal mine safety Administration have been convicted of bribe-taking and negligence of official duties, and many of the convicted are behind the scenes of disastrous mine accidents (Wang, 2007).

Last but not least, mining areas, especially in underdeveloped regions with weak rule of law, are often accompanied by active mafia-style organizations (Department of Land and Resources of Sichuan Province, 2006). Due to the pointy nature and relatively low technical requirements for entry, the mining industry can easily fall prey to predatory forces. Driven by the resource rents, the mafias are strongly motivated to seize mines and control the processing and transportation of mining products. Moreover, when the local police force falls short of protecting the security of mining enterprises, particularly those smaller, non-state-owned ones, some mafias can provide an alternative source of security. Interestingly, the mafias often coexist peacefully and even collude with local police force, and some officials essentially provide a safety net for the mafias (Zhan, 2011). The collusion between the mafia and local officials in the legal and judicial departments creates an added source of corruption.

Cross-Regional Comparison: A Statistical Assessment

The analysis above suggests that the existence of mineral resources gives rise to corruption through a variety of channels. However, the anecdotal evidence is
insufficient to establish a significant correlation between resource endowment and corruption. We need more systematic evidence to ascertain if indeed pointy resources such as minerals and oil lead to more corruption. To partly answer this question, a recent study looks into the source of corruption in China from a sectoral perspective. By comparing the “tributes” in form of public relations expenses and forced apportionment of funds that different industrial sectors pay to government officials, the study finds that, among more than ten sectors including real estate, agriculture and construction etc., the mining sector is among the top three sectors that pay the most tributes to government officials, and hence it is one of the most corrupt sectors in China (Zhu & Wu, 2011).

From a different angle, this section sets out to test if there are systematic impacts of resource endowment on corruption. For this purpose, I will statistically examine the 31 provinces in China between 1999 and 2007, a period that saw booming prices for many fuel and nonfuel resources such as coal, oil, natural gas, and iron ore. All the statistics come from National Land and Resources Statistical Yearbook of China (Zhongguo Guotu Ziyuan Tongji Nianjian), Procuratorial Yearbook of China (Zhongguo Jiancha Nianjian), Finance Yearbook of China (Zhongguo Caizheng Nianjian), Statistical Yearbook of China (Zhongguo Tongji Nianjian) and China Data Online.
Before we proceed with the data analysis, it is necessary to clarify the measurement of the key independent and dependent variables in this study. The key independent variable is resource abundance. However, resource abundance can be interpreted and measured in different ways. One way is to look at the absolute level of resource abundance, and measure it by the amount of resource stock or rents (Brunnschweiler, 2008). The other way is to look at the relative dependence of a national economy on resources. The most famous and widely adopted indicator is perhaps the share of primary exports in GDP (Sachs & Warner, 1995; Leite & Weidmann, 1999), although other indicators have also been used, such as the share of fixed-asset investment by mining industry in total fixed-asset investment (Xu & Wang, 2006) and the weight of the output of energy industry in total industrial output (Shao & Qi, 2008). Although many believers of the resource curse thesis do not think the linkage between resources and economic growth depends on the measurement of resource abundance, some studies nevertheless find that under some circumstances the different measurements have led to different conclusions about the existence of the resource curse (Brunnschweiler, 2008).

In this study I adopt two indicators to measure the absolute level of resource abundance (hereafter referred to as resource abundance) and the relative level of resource dependence (hereafter referred to as resource dependence) respectively. I use
the per capita sales income of all mineral products (including solid minerals, oil, and natural gas) of each province (including autonomous regions and the municipalities directly under the central government) to measure the volume of resource rents. And I use the share of industrial output by all mining industries (including solid minerals, oil, and natural gas) in total GDP of each province to measure how much a local economy relies on the resource sector.

The dependent variable, corruption, is a highly contested concept subject to different interpretations in different cultural and social settings. This study follows the widely adopted definition of corruption as the behavior that deviates from the formal duties of a public role because of private-regarding (personal, close family, or private clique) gains (Nye, 1967), which is largely consistent with the legal definition of corruption in reform-era China. However, because the parties to corruption acts have strong incentives to hide their activities, it imposes an inherent difficulty on obtaining reliable data on corruption. To the extent that hard data exist, they are presented in the form of statistics on legal actions taken against those engaged in corruption. So in this study, I will adopt as my measurement the ratio of corruption cases committed by state employees (zhiwu fanzui)\(^1\) that are filed (li’an) and investigated (zhencha) by the procuratorial department annually to the population of each province, expressed as

\(^{1}\) Corruption by state employees include embezzlement, bribery, misappropriation, dereliction of duty, and other violations of official rules.
a rate per 1000 people. Assuming that the data have not been tampered with, and that they reliably report the number of cases initiated by investigators and the number of cases actually prosecuted, such data measure the revealed corruption rate and can only be regarded as an indirect measurement of the actual rate (Wedeman, 1996, p. 65).

A look at the statistics of these variables reveals a few things. First, the two measures of resource abundance and dependence are highly correlated, with a correlation coefficient of 0.81, which means regions endowed with rich mineral resources also tend to rely heavily on these resources for their local economy. Second, mineral resources are highly unevenly distributed in China. The most resource-rich areas include Heilongjiang, Tianjin, and some inland provinces such as Qinghai and Xinjiang, while the coastal areas such as Beijing and Shanghai, and Guangdong fall at the lower end of the resource distribution, and Tibet is also a resource-poor region. Likewise, corruption is also highly unevenly distributed, with Tianjin, Heilongjiang and Shanxi as the most corrupt provinces, while Tibet, Guangdong and Chongqing appear to be among the cleanest provinces. A simple bivariate regression reveals a striking correlation between the dependent and independent variables\(^2\). As Figure 1 shows, both resource abundance and resource dependence are significantly positively correlated with corruption rate.

\(^2\) As the distribution of all the three variables is highly skewed, in the data analysis they are normalized by taking natural log.
However, the highly positive correlation does not guarantee a significant effect of the independent variable on the dependent variable, as there may be confounding variables missing from the equation. To further investigate the relations and to test the resource curse thesis, I conduct a panel data analysis on all the 31 provinces for the years between 1999 and 2007. Besides the key independent variables, some control variables are also included in the models.

A major control variable is the economic development level. As a lot of corruption cases, such as embezzlement, bribery and misappropriation, are economic corruption in nature, they supposedly depend on the availability of economic resources. A higher level of economic development arguably provides more motivations as well as opportunities for corruption. I adopt the most commonly used indicator of per capita GDP to measure overall economic performance of each province. Due to the unbalanced economic development among different regions of China, the distribution of per capita GDP is also highly left-skewed with a bunch of better-off outliers like Shanghai, Beijing, Tianjin and Zhejiang.

As corruption is conducted by state employees, the size of the state and its bureaucracy directly affects the occurrence of corruption. The more people working for the state and wielding political and administrative power, the more likely it is for
someone to abuse the power for private gains. I use the percentage of state employees working in administrative departments and government agencies in the population to measure the bureaucratic size.

There is another very important factor that we need to consider. Ignoring this effect will directly invalidate this study. As the dependent variable is revealed corruption rate, we have to take into consideration the strength of law enforcement, which may have significant impacts on both the occurrence of corruption and the probability of detection. To measure the strength of law enforcement, I adopt the per capita government expenditure on the legal and judicial organs, including the public security department, procuratorial agency and the court of justice. Because the government’s investment in the judiciary apparatus often suggests how much attention it pays to striking down corruption and other kinds of crimes, the expenditure in this regard may be positively related to revealed corruption rate. On the other hand, the government’s efforts in law enforcement may well deter crimes. Thus it is also possible for a higher expenditure to lead to a lower rate of actual corruption and hence also a lower rate of revealed corruption. In either case, it is necessary to include this variable in the data analysis and to assess its impact on the dependent variable.

Last but not least, corruption may be affected by the freedom of the market, or say the scope of control rights over economic activity in the hands of politicians and
bureaucrats (Kaufmann & Paul, 1997). As the analysis in the previous section suggests, the mining industry operates under the heavy intervention by the state. If there exists a better developed local market, even a secondary market for the transaction of mining rights, it may decrease the chance for rent seeking by government officials. I adopt two proxies to measure the development of the market economy. First, a better developed market is associated with a more important role of trade. Thus I use the shares of import and export in GDP as two indicators of the openness of the local market. Second, a market economy necessitates an active private sector. I use the percentage of fixed-asset investment made by state-owned units to negatively measure the weight of the private sector in the economy.

The summary statistics of the dependent and explanatory variables are listed in Table 1. We can see that the distribution of some variables is highly skewed. Thus in the data analysis below they will be normalized by taking natural log.

(Table 1 about here)

To analyze the panel data, I adopt the following fixed-effect model that takes into consideration the region and year factors:

\[
\text{Corruption rate}_t = \alpha \text{Resource}_{it} + \beta' X_{it} + \mu_i + \nu_t + \varepsilon_{it},
\]

where the subscript \( i = 1, 2, \ldots, 31 \) for the 31 provinces, \( t = 1, 2, \ldots, 9 \) for the 9 years from 1999 to 2007. The key independent variable Resource can take one of two
measurements, resource abundance and resource dependent, and $X$ is the set of control variables that include per capita GDP, share of state employees in population, the share of foreign trade in GDP, the percentage of fixed-asset investment by state-owned units, and the government expenditure on law enforcement.

As Treisman (2000) points out in his study of corruption, many of the variables are likely to be endogenous. For instance, stronger law enforcement will reveal more corruption; but on the other hand, in places where the economic crimes are rampant, law enforcement may be strengthened in response. Openness to trade may constrain corruption, but corruption itself creates barriers to trade. And higher per capita GDP is believed to facilitate corruption, but corruption may impede or, as some analysts claim, promote economic development. Thus, I will adopt the procedure that Treisman takes: to start by running a series of nested regressions, beginning with only the most plausibly exogenous variables and progressively including groups of variables according to how sensitively they respond to the changing environment. Given the two sets of key independent variables, resource abundance and resource dependence, I will conduct two sets of panel data analysis. The most robust and representative findings are presented in Table 2.

(Table 2 about here)

Discussion of Findings
The different statistical models yield highly consistent and robust findings. The two measures of resource abundance, absolute level of resource endowment and relative level of resource dependence, both have significant positive impacts on corruption rate. The findings support the hypothesis that the existence of rich mineral resources, including oil, natural gas, coal and other nonfuel minerals, does breed corruption. The fact that resource abundance and dependence are significant even after controlling for the level of economic development, suggests that resources induce corruption not by creating more economic resources and hence opportunities for corruption, but work through its own causal channels, probably those discussed in the last section. The findings suggest that there is indeed a curse of natural resources at provincial level in China, at least with regard to the quality of political institutions.

As expected, per capita GDP greatly facilitates corruption by state employees. The consistent statistical significance of this variable in all the models suggests that richer areas are more susceptible to the danger of corruption, and it confirms the impression that corruption has been on the rise in China as the economy booms. One simple but fundamental explanation may be that the plenitude of economic resources generates both temptations and opportunities for officials to engage in embezzlement, bribery, misappropriation or some other crimes to siphon from the enlarging economic pool. This finding is quite alarming for China. As the country is driving at full speed
towards economic prosperity, it has to fight harder against corruption.

Meanwhile, the size of the bureaucratic size positively affects the occurrence of corruption as well. The share of state employees in total population is positively correlated with the dependent variable, although it is statistically significant only in some models. The result confirms that the more people working for the state, the more likely it is for some to abuse the official positions for private gains. Indeed, the huge number of state employees has been a constant source of popular discontents in China. Although the Chinese party-state has tried for several times to streamline the extensive government hierarchy and the numerous government agencies, so far it has had little success restraining the ever-expanding bureaucratic size.

Fortunately, the government expenditure on the judiciary organs including the police, procuratorial agency and the court of justice can significantly curb corruption. This finding is somewhat surprising because stronger effort in law enforcement could potentially detect more corruption cases and thus lead to higher revealed corruption rate. But it turns out that law enforcement expenditure is significantly negatively correlated with corruption rate in all the models, which suggests that the deterrence effect of law enforcement is stronger and offsets its revealing effect. This may suggest a way out of the resource curse in China: the Chinese government should invest more in building up its legal and judicial institutions, especially in resource-rich areas.
Another interesting finding is that the openness to international market also appears to have some negative effect on corruption. This effect shows up mainly in import, which is significantly negatively correlated with corruption rate, whereas the effect of export is neither significant nor consistent. Given China’s allegedly protectionist foreign trade policies, import may be a better measurement than export of the openness of China’s economy. The finding suggests that the more open a local economy is, the less likely it will suffer corruption. On the other hand, the size of the private vs. state-owned sector does not have much effect on corruption rate. Thus we do not have any evidence to postulate that a larger private sector in the economy can help rein in corruption.

Conclusion

This study sets out to examine the effects of resource endowment on the occurrence of corruption, an important but under-examined aspect of the general resource curse discourse. Among the vast literature that explores and debates the effects of natural resources on various aspects of the human society, most notably the economic performance, only a handful touch on this subject, which, via either theoretical reasoning or empirical studies, have advanced a few linkages between rich endowment of pointy resources such as oil and nonfuel minerals and the rule of law, rent seeking or corruption. Through cross-national comparison, a few statistical
analyses have also tried to ascertain a systematic correlation between these variables. However, the existing discussion so far is inadequate and inconclusive.

By focusing on China, a country that hosts a wide variety and huge deposits of natural resources, this study provides added evidence that supports the resource curse thesis. Empirical evidence suggests a few mechanisms through which mineral resources and mining industries induce or facilitate corruption in China. Similar to the experiences of other resource-rich developing countries, the unclear property rights of mineral resources and the heavy state intervention in the mining industries have created an important source of rent seeking. Meanwhile, the competition over the resource rents between the state, enterprises, and individual officials breed a wide range of economic corruption, such as bribery, embezzlement, and tax evasion. Moreover, the resource rents also increase the value of political positions in resource-rich areas and lead to fierce competition for these positions, which consequently induces political corruption in form of local leaders dispensing lucrative positions in exchange for bribes. Last but not least, resource rents also foster mafia activities, the existence of which inevitably involves corruption in the public security and judicial systems.

Besides the anecdotal evidence that links mineral resources and corruption, a panel data analysis that compares the provincial corruption rates between 1999 and
2007 reveals a robust positive correlation between the two variables. Both the absolute level of resource abundance and the relative level of resource dependence greatly increase the likelihood of corruption by state employees, even after controlling for per capita GDP, strength of law enforcement, the bureaucratic size, and the development of local market. The findings suggest that the endowment of pointy natural resources does undermine the quality of political institutions in China and serves as a curse rather than a blessing, at least in this regard. Fortunately, the strength of law enforcement, as measured by the government expenditure on legal and judicial systems, has a significantly negative effect on corruption rate. Thus strengthening the legal and judicial systems may be the cure for the resource curse in China, and perhaps in other resource-rich countries as well.
Figure 1. Resource Endowment and Corruption

Resource abundance

Corruption rate (log)

Per capita sales income from mineral products (log)

Resource dependence

Corruption rate (log)

Share of mining industrial output in GDP (log)
Table 1. Summary Statistics of Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Min</th>
<th>Mean</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corruption rate per 1000 people</td>
<td>1.42</td>
<td>3.13</td>
<td>7.03</td>
</tr>
<tr>
<td><strong>Key explanatory variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource abundance (per capita sales income from mineral products)</td>
<td>15.13</td>
<td>645</td>
<td>5569</td>
</tr>
<tr>
<td>Resource dependence (share of industrial output by mining industries in GDP)</td>
<td>0.03</td>
<td>6.39</td>
<td>32.17</td>
</tr>
<tr>
<td><strong>Control variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per capita GDP</td>
<td>2475</td>
<td>13180</td>
<td>65350</td>
</tr>
<tr>
<td>State employees per 1000 people</td>
<td>18.38</td>
<td>29.54</td>
<td>46.42</td>
</tr>
<tr>
<td>Law enforcement expenditure</td>
<td>2.58</td>
<td>44.87</td>
<td>323.6</td>
</tr>
<tr>
<td>Share of export in GDP</td>
<td>0.25</td>
<td>2.00</td>
<td>11.95</td>
</tr>
<tr>
<td>Share of import in GDP</td>
<td>0.09</td>
<td>18.24</td>
<td>15.74</td>
</tr>
<tr>
<td>Fixed-asset investment by state-owned units</td>
<td>14.54</td>
<td>45.59</td>
<td>95.89</td>
</tr>
</tbody>
</table>
Table 2. Determinants of Provincial Corruption Rate (1999-2007)

<table>
<thead>
<tr>
<th>Key independent variable</th>
<th>Resource Abundance</th>
<th>Resource Dependence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Resource abundance (log)</td>
<td>0.143***</td>
<td>0.109***</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>(0.016)</td>
</tr>
<tr>
<td>Resource dependence (log)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per capita GDP (log)</td>
<td>0.076**</td>
<td>0.295***</td>
</tr>
<tr>
<td></td>
<td>(0.029)</td>
<td>(0.055)</td>
</tr>
<tr>
<td>State employee in population</td>
<td>0.009**</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Law enforcement expenditure (log)</td>
<td>-0.286***</td>
<td>-0.319***</td>
</tr>
<tr>
<td></td>
<td>(0.062)</td>
<td>(0.067)</td>
</tr>
<tr>
<td>Share of import in GDP (log)</td>
<td>-0.041*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td></td>
</tr>
<tr>
<td>Share of export in GDP (log)</td>
<td>-0.003</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.028)</td>
<td></td>
</tr>
<tr>
<td>Investment percentage by state-owned units</td>
<td>-0.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td></td>
</tr>
<tr>
<td>Region effect</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year effect</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Degrees of Freedom</td>
<td>215</td>
<td>213</td>
</tr>
<tr>
<td>R squared</td>
<td>0.306</td>
<td>0.370</td>
</tr>
</tbody>
</table>

Significance codes: *** p<0.001; ** p<0.01; * p< 0.05; . p< 0.1

The numbers in the parentheses are the standard errors of the estimates.
References:


