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# Political Ecology of Nation-States with Examples from Chinese History

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**Abstract** States are autonomous political units that unite many communities within their territory, and whose centralized government has the power to collect taxes, draft citizens for work or war, and decree and enforce laws. States attempt to solve the problem of allocating scarce resources because the growth in human needs due to long-term, continuous population increases has always exceeded growth in the environmental carrying capacity. In these self-governed independent territories, people, communities, corporations, and public wealth are protected by complex combinations of individual and collective property rights. However, this stage of social institutional evolution may be forced to change as human populations decline (because many women now reject the option of having children) while improved science, technology, and social institutions solve or mitigate the problem of resource scarcity. In response, the political ecology of states will need to evolve to meet new challenges and develop new institutions that can promote environmentally sustainable social development.

**Keywords** Carrying capacity · Institutional evolution · Resource scarcity · Social costs · State agents

## 1 Introduction

The origin, governance, and evolution of states is one of the most challenging issues in sociology, and has fascinated philosophers, scientists, and others for millennia. However, because historical research has focused on governments rather than the nature of the state

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itself, researchers may have misunderstood the concept of a state. One important early model derives from Marx's dialectical materialism: states evolve and their institutions change due to the struggle between a rich ruling class and a poor majority to control the distribution of resources under the influence of economic forces (Marx 1859). More recently, North and Weingast (1989) have argued that institutional reform can be a way for the elite to demonstrate their commitment to future policies by delegating implementation to interests (i.e., states) that will not want to reverse those policies. However, states are self-governed through government managers. This implies the existence of a contract between a government and the people it governs (Zhao 2006). Marx's theory of class struggle ignores this contract and therefore neglects the role of the people as partners with the government who can directly or indirectly participate in the evolution of the state and its governance. In this view, government should be a "response" to spontaneous forces of evolution that arise at the local level ("tribes") in a competitive political market, in contrast with organizations such as the Mafia or the "rational stationary bandits" described by North (1990) and Olson (1993).

Carneiro (1970) believed that the earliest states emerged mainly in environmentally or socially circumscribed areas, such as areas of arable land surrounded by deserts, mountains, or coasts, or in dense villages that protect this resource from outsiders. This description assumes that finding solutions to resource scarcity is what causes states to evolve. Since the same resource cannot necessarily be used simultaneously to satisfy competing demands, this leads to conflicts of interest that must be resolved, whether by peaceful negotiation or otherwise (Alchian and Demsetz 1973). Historically, resource scarcity has led to serious problems, including social problems (e.g., wars and famines), economic problems (e.g., market distortions and price inflation), and eventually, population decline if the problems become sufficiently severe (Diamond 2004; Cao et al. 2007). The risk is strengthened by factors such as climate change that alter the ability of ecosystems to provide the resources that humans require to survive (Zhang et al. 2007; Ajibade and McBean 2014), and many of the cycles of rising and declining civilizations throughout human history have been initiated by climate change (Frank and Gills 1996; Diamond 2004; Cao et al. 2007).

To more fully understand the evolution, persistence, and decline of states, it is necessary to view social systems as systems that rely on techniques, rules, and customs (i.e., institutions) to resolve the conflicts that arise when it is necessary to determine how to allocate scarce resources. The question of whether and for how long states can persist has not yet been answered to the satisfaction of researchers. To understand the underlying problems, I have returned to the "scarce resource theory" in an effort to explain how states begin and evolve. To make my discussion more concrete and to build on what has already been written on this topic for Western states, I will provide examples from China that may be unfamiliar to Western readers. In contrast with Western history, China has suffered from a huge and continuously increasing population permitted by advanced medicine (Cao and Feng 2012) and cultural diversity (Cao 2012), supported by national institutions capable of preserving Chinese society despite stresses such as plague and warfare. Another important difference is that China never experienced the centuries of religious warfare that affected Europe.

## 2 State Origins and Evolution

### 2.1 Inevitability of Warfare?

In a prehistoric society, such as that of a hunter–gatherer band, each member obtains some share of the benefits of maintaining a peaceful order, often through social institutions that

encourage members of the group to seek cooperation and consensus. In larger and more complex groups, such a simple solution cannot resolve the conflicts between competing interests (Horowitz 2006). In some cases, the group may split into subgroups when it becomes too large to be governed by consensus or when the disagreement becomes intense, but in some cases the new, smaller, groups may once more return to decision-making by consensus (Olson 1993; Cao 2006). However, rather than splitting into new groups, it is also possible that more complex governance structures will evolve. When groups are larger than some critical size, they typically change into self-sufficient entities that exercise sovereignty over local resources and evolve mechanisms for the allocation of these resources (Lim et al. 2007).

This evolution of governance seems to have begun during the Neolithic period, around 10,000 years ago, when humans first abandoned a nomadic hunter–gatherer lifestyle that required relatively low levels of governance, and adopted sedentary agriculture, which required more sophisticated governance to manage collective activities such as plant cultivation and animal husbandry (Hibbs and Olsson 2004). The change in technology represented by improved agricultural techniques permitted a sudden population increase (Kates et al. 2001). To meet the growing demand for resources created by this growing population and that could not be met by local resources, sedentary societies often developed an increased reliance on foreign resources, leading to the development of trade networks (Hellenthal et al. 2014) and increasingly complex social structures to support these networks (Cao et al. 2007).

As agricultural production increased, allowing the growth of larger populations, the larger populations required a correspondingly sophisticated government. Thus, for groups larger than tribes, governments tend to evolve naturally—not because of implicit or explicit social contracts or transactions of other kinds, but rather because rational self-interest promoted the development of institutions dominated by leaders who were most capable of organizing the capacity for collective action, whether for infrastructure projects or warfare (Olson 1993). Because such changes in one society would force the development of equally efficient structures by competing societies, this encouraged parallel evolution of such structures in these societies, and led to a dependence on individuals with specialized training and superior skills, and on access to specialized equipment, and these individuals were welcomed by the people who depended on them (North and Thomas 1971). These powerful individuals remained powerful by developing the ability to ensure the collection of the resources that sustained their power, and this made these individuals the logical choice to settle disputes and enforce local laws and customs. Thus, responsibility for dispensing justice also became one of the government's roles as protector of the governed people. The evolution of these fundamental political institutions also inevitably led to significant redistribution of power, wealth, and resources from the less powerful to the more powerful groups in society.

With increasing concentration of human populations in areas of the land that could not support the population without external assistance, the need to acquire additional land and other resources to sustain the population became a significant source of warfare. This predominantly economic cause of warfare, combined with steadily increasing resource needs, increased the frequency, intensity, and importance of warfare (Carneiro 1970). Where strong governments had not developed, anarchic violence became another significant source of warfare as societies evolved mechanisms such as ad hoc or standing armies to defend themselves against outside forces such as bandits. To support these mechanisms, societies would have developed institutions to share food and information, to support decision-making, and to punish "free riders" who attempted to monopolize materials or

means of production or to exploit the cooperation of others (Wiessner 2005; Boehm 2012). In most of these societies, a legal system evolved to protect the weak from predation by the strong (Bowles 2012). The combination of these institutions (resource management, trade networks, protection against outsiders, and a legal system that provides protection against insiders) permitted formerly small societies to expand. Societies that were formally constrained by the limits of their local environment expanded into larger social structures, whether through peaceful negotiation (e.g., trade networks and alliances) or by warfare (i.e., conquest of weaker societies that controlled valuable resources). To retain at least some access to the resources they formerly controlled, the weaker society often had no choice but to submit to the stronger, or risk defeat through warfare (Carneiro 1970).

Charles Tilly's famous aphorism that "war makes the state and the state makes war" reveals how foreign threats prompted the creation of stronger state institutions (Krasner 2011). The continuous preparation for war, or actual warfare, would strengthen the institutions of the centralized bureaucratic structure that was required to organize and provide funding for military institutions. Thus, as smaller social structures evolved into larger and more complex structures through the acquisition or control of external resources, the structure of these political units was undergoing internal evolution to both support and preserve these structures. Increasingly, success in warfare required mobilizing a willing or at least compliant population.

The political institution that survived this evolution was the nation-state, a centralized bureaucratic structure that evolved to maintain control over a defined territory, and that had the capacity to mobilize substantial resources by means of taxation and borrowing and to deploy semi-permanent or permanent armed forces (Bowles 2012). The evolution of taxation and military recruitment systems, along with the ability to borrow large sums of money when taxation was insufficient, allowed nation-states to make war without *ad hoc* requisitioning of the necessary resources (Tilly 1990). The resulting institutions were often perpetuated by individuals who distinguished themselves in warfare, and were subsequently appointed to political office or who seized that office against the wishes of citizens. The same institutions that permitted large-scale warfare also had other uses, such as mobilizing the resources required for large infrastructure projects (e.g., irrigation, roads). The complexity of social structures continued to increase as their interdependence grew, and this interdependence served to bind separate institutions more closely into a single, integrated and centralized, political unit (Carneiro 1970).

China, as an ancient civilization with a continuous historical record, provides a clear illustration of how nation-states originated and evolved from small local "tribes" or small kingdoms into dynastic empires that occupied significant fractions of China, followed by merger of these smaller empires into larger empires that controlled all or most of China. In the prehistoric society that existed about 7,000 years ago, about 1,000 tribes and tribal alliances coexisted in the valleys of the Yellow River (Liu 2000). Archeologists have found the ruins of fortifications (including early castles) from early in this period, and countless such structures emerged during the following 3,000 years (Cao 2006). By 5,000 years ago, China's first recognizable empire had developed in the middle and lower reaches of the Yellow River. This empire, initiated by Fuxi (and his successor Chi You), was defeated by Yandi. Within 500 years, Yandi's descendants were defeated by Huangdi, whose descendants created the basis of a series of states that lasted until 4,000 years ago. This eventually led to the first true Chinese dynasty, the Xia Dynasty (2070–1600 B.C.). For this reason, Huangdi is often considered to be the father of Chinese civilization (Cao 2006). However, the Xia Dynasty did not control all of China's resources, and warfare continued throughout the following centuries, resulting in the emergence of many new dynasties.

Over time, these dynasties gradually merged into progressively larger states, eventually resulting in a single nation-state that today covers 9.6 million $km^2$ and is home to nearly 1.4 billion people.

To avoid defeat in warfare or to obtain a peace that would avoid warfare, mergers occurred by means of peaceful negotiations, including marriages between the families of rulers and the development of trade networks and other alliances. This was as true in China as it was elsewhere in the world (Hou and Hou 2002; Hellenthal et al. 2014). For example, China's emperors married their daughters to the rulers of other states, or married another state ruler's daughter, until the end of the Qing Dynasty in 1911 (Watson and Ebrey 1991). The world's highest-elevation world heritage site—the Potala Palace in Lhasa, Tibet—provides strong evidence of the historical importance of marriages between the families of rulers (Shepherd 2006; Fig. 1). In 631 A.D., the king of Tibet married the daughter of the leader of the Tang Dynasty (618–907 A.D.).

Unfortunately, peaceful negotiation is not always possible and alliances do not last forever, because the balance of power between different groups can change in response to many factors. When the periodic famines caused by cycles of climate change eliminated a ruler's ability to provide the resources that humans required to survive (Zhang et al. 2007), states declined and violence and anarchy flourished. This led to cycles of alternation between a strong government and periods of anarchic violence (Cao et al. 2007). However, the periods of conflict often provided opportunities for evolution of the institutions of state governance.

**Fig. 1** The Potala Palace, in Lhasa City, Tibet, was constructed by Tibet's king to celebrate his marriage to the daughter of the leader of the Tang Dynasty in 631 A.D. This palace is the highest world heritage site, at an elevation of 3,700 m. *Source*: http://www.3lian.com/gif/2011/11-30/21300.html

During China's Eastern Zhou Dynasty, from 770 to 256 B.C., civil war among competing warlords led to the evolution of standing armies for defense against invaders, a legal system, and the adoption of Confucian philosophical structures by Chinese bureaucracies (Frederickson 2002). When the Qin Dynasty (221–206 A.D.) united the residents of the Yellow River and Yangzi River valleys, early China became powerful enough to manage the construction of the Great Wall to defend against invaders. Although construction of the wall began in 656 B.C., during the Eastern Zhou dynasty (770–256 B.C.), it grew to cover nearly 22,000 km along all of its branches under the Qin. This dynasty also coordinated the construction of a huge irrigation system to prevent both floods and crop failures due to drought, thereby allowing the development of a vast irrigated fertile area that provided abundant crops and sustained the large and growing population of this dynasty against famines (Morton 1982).

Early states evolved with little or no contact with other states, and their extent of influence often extended no farther than a day's round-trip from the capital (Spencer 2010). However, as these states expanded, they gradually came into contact with neighboring states, leading to the evolution of cooperative institutions (e.g., trade) or competitive institutions (e.g., warfare). The inevitable result has been mergers of smaller states into larger ones. Towards the end of the Western Zhou Dynasty (1046–770 B.C.), China was divided into nearly 200 states and federations of cities (Cao et al. 2007). By 221 B.C., the Qin Dynasty had united most of central, eastern, and southern China; by 1644 A.D., the Qing Dynasty had united all of the territories covered by modern China.

### 2.2 Dynamics of Scarce Resources

Resources are never infinite, and this leads to a situation in which some resources become scarce (i.e., available at lower levels than the desired or required level). Humans are nurtured by their environment, and simultaneously produce impacts on the environment through their actions. In ancient times, and particularly for nomadic or hunter–gatherer societies, human populations were sufficiently small that their environmental impacts were small, and the environmental carrying capacity was rarely exceeded. When it was, the populations could simply move elsewhere (Cao 2006). Once humans became sedentary, and were increasingly supported by agriculture and the domestication of livestock, the abundance of food led to a sharp rise in the population, but the sedentary nature of the society inevitably led to complete occupation of all locally available exploitable areas (Carneiro 1970). Thus, the contradiction between finite resources and increasing populations inevitably leads a sedentary population to exceed the environmental carrying capacity, even if the population increases slowly (Cao et al. 2007).

Where local resources were inadequate, and new resources could not be obtained by relying on previous social structures, governments were forced to seek innovative alternatives. Examples included exploration to find and exploit new resources, development of new techniques or technologies to use existing resources more efficiently, and the development of new management methods or institutions (Cao et al. 2007). These changes could arise consciously or unconsciously, and could result from active or passive processes, respectively. It seems that in response to a real or perceived crisis, new forms of social development are adopted to relieve the pressure on the scarce resources available to a society, leading to changes in the relationship between nature and society. These changes occur simultaneously with parallel changes in government institutions in response to the changes. However, the new relationships between society and nature and between a government and the governed are not necessarily more harmonious.

Undoubtedly, the institutional evolution that led to the formation of a centralized bureaucratic structure was a powerful and efficient force that decreased social costs and increased the state's capacity to mobilize substantial resources. This evolution was accompanied by the formation of specific bureaucracies to control huge programs such as the construction of irrigation canals designed to increase agricultural productivity, the development of military institutions to defend against invaders, and the development of a national road system to allow rapid movement of armies and disaster relief materials in response to crises. These innovations would be welcomed by citizens. For example, China was one of the first countries to develop state infrastructure projects; the Dujiangyan irrigation system, near Chengdu City, is the oldest and longest-term example of hydraulic engineering in the world. It was built in 256 B.C. to prevent floods and provide irrigation water (Li and Xu 2006). The Grand Canal (Fig. 2), which eventually reached a length of 1,794 km, was initiated in 219 B.C., during the Qin dynasty, and provided connections among China's primary rivers (Morton 1982).

The development of a centralized bureaucratic structure in China, the evolution of a legal system, the adoption of Confucian philosophy, the replacement of older metal tools with stronger iron equivalents, and the construction of a huge state all occurred simultaneously. These developments have their roots in a period of turmoil during the Eastern Zhou dynasty (referred to as the "Spring and Autumn Period" and the "Warring States Period"). The need to obtain and control resources both to promote growth and to defend a state against competing states was an important driving factor, eventually leading to the development of a Chinese state so large and powerful that it was mostly safe against

**Fig. 2** Construction of the Grand Canal from Hangzhou to Beijing began during the Qin Dynasty, in 219 B.C. This canal was the primary canal for water traffic in China until recently, and now forms the eastern branch of China's South to North Water Transfer Project. *Source*: http://lvyou.baidu.com/jinghangdayunhehangzhouduan

external influences. Nonetheless, the evolution of states elsewhere in the world brought China into conflict with expanding European political and trade empires. From 1840 to 1949, China endured more than a century of invasions by industrialized Western states, and particularly England. Sun Zhongshan (1866–1925), the originator of National Republic of China, once observed that China only survived these influences because of its huge population, combined with tight control over the state's territory and resources (Feng 2004).

Some form of conflict is inevitable when the environmental carrying capacity cannot sustain the human population and some individuals or groups cannot obtain the resources they need to survive; as I noted in the previous section, this situation commonly led to warfare to gain access to new resources. This was particularly true when an old civilization began to fail, often because its old institutions could not ensure its survival in a new context, and because innovations in science, technology, and society could not produce new social institutions capable of resolving the conflict. Human history provides many illustrations of this phenomenon. For example, widespread conflict arose in Mesopotamia, Egypt, India, and other regions to secure access to farmland (Bowles 2012), and it is likely that such wars also occurred in prehistoric societies. Because China is a hilly country with relatively small areas of arable land, such conflicts have also occurred throughout China (Cao et al. 2007). Unfortunately, conflicts caused by resource scarcity continue to occur (Allen 2013; Dazzi et al. 2013).

### 2.3 Solutions Other than Warfare

Although I focused on warfare in the previous sections, not all innovations in social structures have resulted from or focused on warfare (Haas et al. 1993). The evolution of the modern international economic system, in which the economies of all nations are closely linked, provides an excellent example. Sometimes, institutions arise outside a country. For example, competition for access to natural resources among Latin American countries and among different groups within these countries has been a major source of political disturbances, including violence, in recent decades. To resolve these problem, the Italian Ministry for Foreign Affairs financed a soil survey with a humanitarian purpose: to encourage the development of a peace plan between Peru and Ecuador by improving the socioeconomic conditions of rural populations living in the areas close to the border between these nations (Dazzi et al. 2013). The international system has also provided opportunities for distant nations to intervene in disputes between adjacent nations.

Most regions of the world and most societies have at least some unique resources that they cannot fully utilize but that other regions and societies need. This leads to the evolution of trade networks to move surplus resources to where they are needed. A familiar example is the "silk road" that led across more than 4,000 km, from the Mediterranean basin to eastern China. Although this major trade route became familiar to Westerners through the journals of Marco Polo in the thirteenth century A.D., there is evidence that this trade route was active at least as early as 206 B.C., during China's Qin dynasty (Comas et al. 1998). Such interactions enable participants to develop networks of trust and a reputation that encourages others to cooperate with them to overcome resource scarcities, leading to gains for everyone. However, it is also true that controlling a resource confers power on those who control the resource, and this can lead to efforts to control others by controlling access to that resource; those who need to use the resource can be excluded entirely from access or may have to pay a higher cost to gain access (Ostrom et al. 1999).

Similar processes operate within a society. There are large benefits to be gained from ensuring domestic security by providing a stable and safe environment that ensures the

provision of basic public goods, particularly if these goods are shared in ways that improve the welfare of all or most members of the society (Olson 1993). However, it is also possible for powerful individuals to monopolize access to key resources for their own benefit. Thus, domestic authority structures follow the example of international structures: they may arise from and preserve voluntary agreements, or from the exercise of power (Krasner 2011). A concentration of power and access to resources among China's elite lay at the root of the revolution that led to the formation of the People's Republic of China in 1949. Although the original goal of this revolution was to divide the nation's resources more fairly among all of its citizens, the concentration of resources and power were not eliminated; they were mostly shifted to the state, which managed those resources on behalf of citizens. Even today, the socioeconomic revolution launched by Deng Xiaoping in 1978 to integrate Western capitalist economics with the centralized and socialist Chinese system of government control has not fully eliminated this problem. On the contrary, it may have concentrated more power in the hands of a socioeconomic elite.

The interplay between societal and personal benefits depends on legal institutions that define collective and personal property rights, particularly those that define access to scarce resources. Fair and orderly competition can only exist and economic growth is only possible when property rights are protected and fully respected by most members of a society (Zhao 2006). These rights define the ability to use resources, including one's body and mind, and the right to recommend how societal resources should be shared. These rights are always circumscribed by informal customs and formal laws that encourage or prohibit certain actions. Initially, the use of a scarce resource is on a first-come, first-serve basis (Alchian and Demsetz 1973), and that right continues until others request their own access to the resource. Communal rights evolve from that initial situation, usually in a way that ensures neither the state nor individual citizens can exclude others from using the resource, except in exchange for some other resource; for example, an enterprise may be granted the right to harvest forests or extract minerals in exchange for a state-granted license that defines the terms of this use and tax payments to the state to compensate the rest of society for that use of the resource (Zhao 2006). Of course, warfare is still an option, since powerful states may prefer to gain access to a resource by force rather than providing something equally valuable in exchange (Cederman 2002).

The issue of access to resources faces China during the twenty first century, since the ownership of most resources is still controlled by the central government, leaving citizens with usage rights but not ownership of key resources. Although this could, in theory, ensure fairer allocation of resources to all citizens, in practice it has led to widespread corruption that concentrates the power conferred by these resources in the hands of a smaller number of individuals. Similarly, although the need for external resources has historically been a significant cause of warfare, China appears to be avoiding the temptation to use military force to gain access to the resources it needs; instead, it is using its huge economic power to obtain these resources through the formation of trade alliances (Zhao 2006).

Resource scarcity is defined by the balance between the carrying capacity of the environment and the level of consumption by the humans supported by that environment. The pressure on the environment grows as the human population increases (whether through increased birth rates or longer lives) and as the desire for a higher standard of living further increases consumption of environmental resources. Although renewable resources can sustain this growing demand for some time, nonrenewable resources are gradually consumed; even renewable resources may be depleted when human demands exceed the environmental carrying capacity (Cao et al. 2007). Government institutions

must evolve to supply human needs, or to constrain those needs so as to reduce the social costs of consumption to a sustainable level. A recent example involves the unsustainable use of northern China's scarce water resources to support both rapid socioeconomic development and the agriculture required to sustain this development. In many of northern China's key agricultural areas, there is insufficient water for crops, leading to increasingly intense competition among industrial, agricultural, domestic, and ecological uses of water. As a partial solution, China has invested enormous amounts of money to construct dams and reservoirs, and to implement megaprojects such as the South to North Water Transfer Project (Liu and Yang 2012).

## 3 State Governance

### 3.1 Integrated Governance

Society operates within a system of formal political, judicial, economic, and social rules, and within a system of informal religious and cultural rules and customs (Cao 2012). As in the case of the coevolution of political bodies such as political parties, a legislature, local governments, and government-owned and operated organizations, there is coevolution of economic bodies, such as stock markets, enterprises, and cooperatives, and of social bodies, such as clubs, religious groups, and schools. Each of these organizations comprises groups of individuals bound by some common purpose to achieve a certain objective (Mabogunje 2000; Cederman 2002). During human prehistory, and subsequently during recorded history, groups based on cooperation would have been more likely than individuals to survive challenges by other groups and dramatic changes in the natural environment (Bowles 2012). The fundamental choice to cooperate rather than compete seems to require either a moral choice or a decision based on pragmatism (Cao 2006).

As I noted at the start of this paper, governments are the consequence of coevolution of the abovementioned political and social institutions in response to competition with or threats from other societies. Accompanying this process is the evolution of novel systems of property rights, governance, and other means of exchange and communication among groups of individuals. The institutions that result from this process only work when they are widely adopted (Bowles 2012). Adoption is more likely when these groups participate in the development of the new institutions. When rules are imposed by outsiders, without consulting these groups, this inevitably leads to opposition to the rules and attempts to evade the rules (Ostrom et al. 1999), particularly when the rules do not account for unique constraints faced by local people. For example, the people affected by national-scale Chinese ecological restoration programs such as Grain for Green generally understand why these programs are important. However, because these programs sometimes do not account successfully for unique local conditions, and because they may provide no alternative to the former livelihoods that contributed to the ecological problems that the programs aim to solve, many people affected by the programs may be required to return to their old habits because they have no other way to survive (Cao et al. 2009). External imposition of rules can also lead to conflicts among nations, as in the case of the Opium Wars between China and England during the nineteenth century, and to revolutions that overthrow the established social order, as in the case of the Chinese revolution during the twentieth century.

An ideology comprises an ethical standard that reinforces or undermines prosocial behavior and that punishes or promotes antisocial behavior, leading to "amity" within groups that are bound by the ideology and "enmity" between groups with competing

ideologies (Shermer 2006). The interactions among groups are defined by the organized ideologies they have adopted, which constrain their religious, social, and political values (Mabogunje 2000). Such interactions arose in ancient times, before the emergence of states, and continue to arise and evolve today (Cao 2012). Ideology can motivate specific interventions, including efforts to change the institutions of other states so that they more closely resemble the structures of the intervener's ideology (Krasner 2011). The Chinese revolution, though focused on China, was also followed by efforts to export Mao's ideology to surrounding nations, and rapidly came into conflict with the American ideology that was competing with China's ideology for dominance in Asia.

It is not surprising that appeals to tradition or sacred values are commonly used to establish the legitimacy of a leader or justify interventions in other states. This explains why some states develop around the charisma of an individual and the institutions they create through their philosophy, their heroism, or their behavior as a role model (Weber 1978). For example, Chinese military leaders were worshipped for their heroism in ancient Chinese society, including the earliest emperors—Fuxi (whose empire lasted from 7,000 to 5,000 years ago), Yandi (from 5,000 to 4,500 years ago), and Huangdi (from 4,500 to 2,000 years ago). Subsequently, philosophical leaders became important; the best-known example is Confucius (Kong Fuzi, 551–479 B.C.), whose teachings influenced Chinese governance structures for more than 2,000 years. After the formation of the People's Republic of China, Mao Zedong replaced Confucian teachings with the Marxist class struggle ideology; Deng Xiaoping subsequently replaced Mao's ideology with one based on the goal of integrating Western market economics with China's traditional ideologies (Cao 2012). During different periods, states have therefore evolved from different ideological bases, including national myths, religious rituals, and the worship of the state itself, each leading to different forms of governance.

New institutions generally evolve from previous institutions, usually as a result of intense competition in a philosophical or political "marketplace of ideas". This competition leads to institutional reform and an improvement in social, economic, or environmental efficiency (Zhao 2006). This competition eliminates inferior institutions and allows only the "fittest" solutions (those that best solve human problems) to survive (Hou and Hou 2002). In nations with emerging federalist political structures, liberalization of national regulations to allow some measure of local authority (i.e., decentralization) is based on the belief of reformers in the central government that local governments best understand their local conditions, and are thus best suited to create efficient institutions (Montinola et al. 1995; Qian and Weingast 1997). China is one of the world's largest countries, with proportionally complex natural and social circumstances. Local modifications to national policies to permit successful local adaptation are therefore necessary to deal with this complexity. For example, since 2000, to achieve both ecological and social progress without detracting from China's primary economic objectives, Sichuan, Hubei, and Yunnan provinces have adopted a strategy of improving communication and transportation between regions by developing road systems that are more in harmony with nature, entitled "near-natural greenways", but have modified the overall approach to develop unique forms that are more suitable for local conditions (Xu et al. 2011).

However, states do not exist in isolation, and they lack "hard shells" that protect their domestic structures from external influences (Krasner 2011). These factors are complicated by competition among individuals and groups for greater prestige, which defines the status of each individual or group within the formal and informal structures of the "world" to which it belongs (Hill 1996). Governments and governance structures may therefore

emerge, not from votes cast by a people's representatives, but rather from indirect "votes" cast by political competition (Myerson 2011).

Political institutions generally focus on governing, and stability is a key objective. This is particularly true in China, where stability (often described as "harmony") has been a key goal of China's culture for millennia. Westerners often underestimate the importance of this factor and how it affects Chinese political behavior (Wang and Juslin 2009). Historical experience has shown that institutional diversity may be as important for a nation's long-term harmonious survival as biological diversity is for an ecosystem's survival. No single institution that governs the sharing of resources works efficiently, fairly, and sustainably under all circumstances (Ostrom et al. 1999). Thus, institutional diversity increases the robustness of the social system (i.e., its ability to withstand internal or external disturbances without drastically changing its structure or dynamics) by ensuring that if one institution fails, another has a chance to succeed. Because many new institutions evolve from old institutions, some old institutions disappear and others survive the challenge posed by new institutions by avoiding conflict and finding ways to coexist with the new institutions. Efforts to achieve pure socialism have failed in many countries that attempted to eliminate fundamental aspects of human society such as traditional religions, customs, cultural characteristics, and ideologies that have been proven by the passage of time to be successful (Cao 2012). Mao's revolution failed, at least in part, because it ignored the importance of these cultural factors in Chinese society, and because Mao incorrectly believed that China could develop a "hard shell" that would protect it entirely from outside influences. Similarly, Deng's revolution may fail if the new capitalist market-centered ideology fails to preserve these aspects of Chinese culture.

### 3.2 Social Cost of Monitoring Compliance

An important duty of the government is to establish and implement a series of rules that encourage citizens who have different ideologies to cooperate in activities that enhance society, such as economic activities and environmental conservation (Wang and Juslin 2009). For citizens to feel motivated to participate in such activities, they must believe that they will gain some benefits (whether for themselves or for society as a whole) from their participation. In any economic system, that belief is supported by a clear system of property rights that cannot be effectively implemented without the government's support (Zhao 2006). Governments also act as agents that create, preserve, or facilitate links among their nation's social, economic, and political systems to support the exchange of valuable resources, such as money, materials, and information; these exchanges would be more difficult without this support (Stovel et al. 2011). Because the government agents have more information than the parties on either side of a commercial or social exchange, they may be able to benefit more than they would in a fully competitive market that assumes equal access to information (Myerson 2011). In fact, governments distort such markets by using their monopoly on coercive power and taking advantage of their greater access to information to maximize their revenues from both formal mechanisms such as fines for antisocial behavior and taxes, and from other mechanisms such as bribes and confiscations (Olson 1993).

China represents an interesting case study of these processes. Given China's severe environmental problems, the central government has embarked on many environmental restoration projects that are historically unprecedented in their scope. Although many Chinese understand the importance of these projects, they feel that they are inadequately compensated for the sacrifices they have made under these projects, and in the absence of

alternative ways to earn a livelihood, may be forced to return to the activities that were responsible for the environmental problems (Cao et al. 2009). From an economic perspective, the predominance of socioeconomic development as a national priority, combined with diversion of regional taxes to the central government to fund national programs, has forced local governments to find other ways to support their operations. Confiscation of valuable land or forced sale of this land to the government at well below the fair market price have enriched local governments at the expense of both the citizens they govern and the environment that must sustain the socioeconomic development (Cao et al. 2014a). Because economic development is prioritized over protection of the natural environment, local governments often have no choice other than to ignore ecological restoration or protection programs imposed by the national government if they want to meet their economic goals. In the absence of monitoring, other than to confirm the rate of economic development, these problems are often not detected for some time.

Fortunately, humans are willing to switch from selfish to altruistic behavior when altruism is rewarded (Milinski and Rockenbach 2007). Therefore, monitoring of behavior is necessary to encourage altruistic behavior and discourage selfish behavior, despite the high cost of this monitoring. Leaders can only remain leaders if they can motivate their supporters to provide sufficient support, and these supporters must be motivated by some expectation of future rewards. The many well-publicized recent examples of prosecution of Chinese government officials for corruption are both a sign of selfish behavior (which existed long before the present governance regime), and a sign that vigilance is productive because it can expose and punish such corruption.

However, in monopolistic political structures, there are few or no competitors. Thus, once leaders have defeated their rivals, they can enjoy the fruits of power without broad support because there are no alternatives to their leadership, and established leaders are often tempted to ignore the claims of their past supporters (Myerson 2011). In this context, the government will choose a system that suits its own needs rather than those of its supporters (Zhao 2006). Without competition to eliminate bad systems and preserve beneficial ones, many governments throughout history have developed institutional frameworks that overwhelmingly favor the creation of political monopolies rather than competitive conditions that would expand opportunities (Mabogunje 2000). Mao's regime provides a familiar example from China (Cao 2012); during this period, an institutional framework based on centralized planning and the exclusion of any other form of governance prevailed. Only in the past few decades has this institution been challenged by competing ideologies, leading to severe pressure for existing governance institutions to change. Needless to say, the government officials who risk a loss of power if these institutions change resist these changes, delaying the adoption of new and more socially efficient institutions.

When policymakers have many options, they are likely to choose the option that maximizes their own utility (Lin 2002). They then have an incentive to initiate changes that increase their utility and discourage changes that would decrease their utility. This can lead to "locking in" of an institution, even if that institution is inefficient for the nation as a whole and will eventually lead to failure. An example is the current Chinese system for evaluating and rewarding the performance of government officials. Because this is exclusively based on short-term economic performance, there is no reward for developing ecologically sustainable development policies. Officials can therefore maximize their utility by ignoring the environmental consequences of their policies (Guan et al. 2011). "Locking in" will increase the perceived cost of change because the purpose of the institution is to preserve the interests of the current leaders rather than seeking social goals

such as stability, an optimal allocation of resources, economic efficiency, and environmental sustainability (Argandoña 2004). In contrast, when the government seeks goals other than their own utility, this creates the conditions for a philosophical revolution that can lead to the birth of institutions such as democracy, the rule of law, and a society that encourages altruism and discourages injustice (Bowles 2012). When the long-term behavior of a nation's government is irrational and ignores the needs of the governed, history shows that this situation inevitably leads to regime change (often violent, and always disruptive), as Marx (1859) proposed more than 150 years ago.

## 4 Threshold for a Change in Political Ecology?

Historically, human populations have increased continuously due to improved food security and medical care. However, this trend is changing, and in most developed nations, populations are beginning to stabilize or even decline, as in the case of Japan and Russia (Bongaarts 1998). The industrialized world has witnessed a remarkable decline in fertility rates (the number of births per 1,000 women of reproductive age), and fertility has dropped below the nominal replacement rate of two children per woman in many places (Pearce 1999). This is also true in some developing nations. For example, China's fertility rate (1.35 births per woman) and population growth rate in 2003 (0.07 %) were the fourth-lowest among 15 major countries (Liu and Diamond 2005). In 1960, five countries had fertility rates at or below the level required to replace the population; by 2000, there were 64 such countries, accounting for about 44 % of the world's population (Cohen 2003). There is a high likelihood that the world's population will stop growing before the end of the twenty first century (Lutz et al. 2001). Most of the world's population either already lives or will soon live in a country whose fertility is below the replacement level (Wilson 2004). As income, education, and employment opportunities improve, women are less willing to bear children, particularly in urban locations (Jensen et al. 2004). The results of a survey of 4,600 women in 19 Chinese provinces in 2005 indicated that women in the age cohort from 20 to 49 years would consider having an average of 1.9 children, versus 1.7 for the youngest age cohort (from 20 to 29 years), if the government cancelled the one child policy and provided better support and a better education for these children (Cao et al. 2010).

This major demographic trend, which differs from historical trends, is likely to have important consequences. When the human population begins to decline, this will decrease the pressure on scarce resources. With less pressure to compete for resources, this is likely to decrease the incentive to engage in warfare and other forms of competition to obtain these resources. Rapidly improving science and technology will simultaneously lead to increased efficiency of resource use and increased recycling of precious nonrenewable resources, further decreasing the pressure on these resources. If the resource scarcity theory is correct, these trends will reduce the need for state institutions such as large standing armies that have evolved in a context of competition for scarce resources. Many institutions will have to evolve to face this new context.

Globalization is another powerful force that is causing changes in institutions. Each society has its own institutions, some of which have evolved over millennia, as in the case of China. However, the increasing interdependence among nations is forcing these institutions to change so that they can coexist better with the institutions of other nations. In some cases, this adaptation process will decrease the pressure on scarce resources, as in the case of developing nations that adopt institutions from developed nations such as the

recycling society and environmental sustainability. In other cases, as in the case of climate change, new institutions must be developed to encourage international cooperation to combat a problem that may threaten human survival. To achieve such institutional change, governments must solve an important problem known as the "resource curse" or the "paradox of plenty" (Boos and Holm-Müller 2012). This problem relates to the fact that regions that are richer in resources often experience much slower socioeconomic development than regions that lack these resources; commonly, this results from exploitation of resource-rich but weak nations by resource-poor but powerful nations. International governance will need to change in such a way as to promote international cooperation and altruistic behavior and discourage the kind of selfish behavior that has created this problem. Fortunately, the modern world exhibits high institutional diversity, so there are many examples for us to learn from and many opportunities to adopt new institutions or change older ones to mitigate the problem of resource scarcity.

I will conclude this paper with a brief discussion of how China is following the model I described in this paper. Although China has a large standing army, and continues to invest large sums in funding this army, it has resisted the temptation to employ this army to achieve its goals. Instead, it has relied on diplomacy, combined with massive financial investments outside of China, to secure access to key resources such as oil that the nation needs to grow. The dramatic institutional change initiated more than 30 years ago by Deng has led directly to China's extremely rapid socioeconomic development and increasingly important role in the global economic system. However, it has also caused widespread disruption of Chinese society and the associated governance structures, which are changing more slowly. This development has also created severe risks, including a growing gap between the rich and poor, environmental degradation, growing risks to food security, damage to China's international reputation, and growing social turbulence as a result of what sometimes seems to be runaway corruption (Cao et al. 2014b).

Sustainability requires a change in philosophy to recognize that the ultimate purpose of economic growth is to maintain and eventually increase human security, well-being, and health. To solve these problems and achieve sustainable growth without sacrificing China's new global prominence, the central government must quickly investigate changes in its internal and foreign affairs. Diplomatic and financial relationships with other countries must be strengthened and expanded to further reduce the risk of armed conflict over resources. Continuing reform of the economic system is urgently needed to protect China's economic growth, stabilize its society, improve social welfare, and prevent irreversible environmental degradation (Cao et al. 2014b). The adoption of measures to reward government officials for developing a recycling economy and a model based on *sustainable* socioeconomic development will further reduce pressure on resources. And current institutions must be carefully reviewed and then revised so that they both protect individual property rights and ensure that all citizens share in the available resources. These challenges are not trivial, but China's recent history shows many promising examples of flexibility and an ability to adapt to changing circumstances.

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