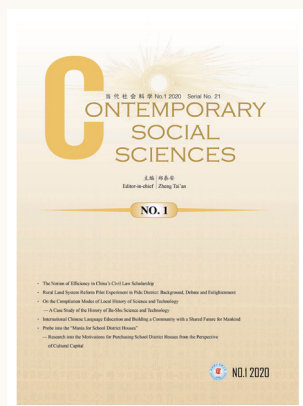


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Sichuan Academy of Social Sciences is the think tank for the provincial government of Sichuan and provincial branch of the Communist Party of China, with full financial backing of the Party and the government. The Academy consists of 15 institutes, 1 graduate school, 10 departments of scientific research management services and 17 branches. At the end of 2015 the staff numbered 1,200, including 710 employees with full financial allocation (459 on-the-job employees and 265 retired employees), and 405 master graduate students. Among the scientific personnel, 62 employees have senior professional titles, and 125 employees have associate senior professional titles; 19 employees are experts entitled to special allowances of the State Council, 21 employees are provincial academic and technical leaders, 16 employees are experts with outstanding contributions at provincial level; and 115 employees have doctorate degrees. The publications sponsored by the Academy are 9 magazines and 1 newspaper, namely *Social Science Research*, *Mao Zedong Thought Study*, *Deng Xiaoping Research*, *Reform of Economic System*, *Rural Economy*, *Forum on Chinese Culture*, *Western China*, *Contemporary County Economy*, *Contemporary Social Sciences (English)*, and *Entrepreneur Daily*; three websites are hosted (namely the portal website of provincial philosophy and social sciences-Sichuan Social Sciences online, website of the Academy-Tianfu Think Tank, English website). With abundant literature information resources, Sichuan Academy of Social Sciences has a collection of 720,000 books, and over 2,000 kinds of Chinese and foreign periodicals. Besides its own database resources, the Academy has access to a variety of academic databases, including China National Knowledge Infrastructure, SOSHOO, Zhonghongwang.com, Duxiu.com, Chaoxing.com, National Social Sciences Database, Communist Party of China's political and theoretical resources database, Dachengdata.com, and DRCnet.com.cn. It has 8 provincial key disciplines and 11 excellent disciplines, 5 first-level disciplines and 44 graduate degree programs of second-level disciplines, 1 joint PhD program, and 1 national post-doctoral research station.

Under the guidance and support of the leadership of the provincial party committee and government, Sichuan Academy of Social Sciences will adhere to the theoretical system of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era as a guide for scientific research work and completion of its main objective: to accelerate the construction of a strong theoretical position, a high-end decision-making think tank, a first-class academic institution and an important base for popularization of science. Its comprehensive strength in local academies of social sciences is among the best nationwide.



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C O N T E N T S

The Notion of Efficiency in China's Civil Law Scholarship	<i>Xiong Bingwan . 1</i>
Rural Land System Reform Pilot Experiment in Pidu District: Background, Debate and Enlightenment	<i>Hong Yun . 27</i>
On the Compilation Modes of Local History of Science and Technology — A Case Study of the History of Ba-Shu Science and Technology.....	<i>Zha Youliang . 40</i>
International Chinese Language Education and Building a Community with a Shared Future for Mankind	<i>Cui Xiliang . 54</i>
Leisure Education and Creative Thinking	<i>Pan Liyong, Wu Xiaowei . 65</i>
Theoretical Mechanisms, Practice Foundations, and Policy Options for Big Data Driven High-quality Economic Growth in China	<i>Li Hui . 75</i>
A Review of Research on the Employment Effect of Artificial Intelligence Applications	<i>Yang Weiguo, Qiu Zitong, and Wu Qingjun . 89</i>
Analysis of the Changes in Rural Chinese Family Structure since Reform and Opening Up	<i>Wang Yuesheng . 102</i>
Probe into the “Mania for School District Houses” — Research into the Motivations for Purchasing School District Houses from the Perspective of Cultural Capital.....	<i>Nie Chen . 125</i>
Lifestyle and Time Use: The Impact of Retirement on Health	<i>Su Chunhong, Li Song . 140</i>

The Notion of Efficiency in China's Civil Law Scholarship

Xiong Bingwan*

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Abstract: The pursuit of economic efficiency is the major driver for the birth of contemporary Chinese civil law. Contemporary civil law scholarship has demonstrated a serious concern for efficiency from the very beginning. However, many examples suggest that the notion of economic efficiency is often diluted or replaced by factors like civil law doctrinal scholasticism, moral notions, inertial thinking of the planned economy or the will of the leader. It has not been systematically attended to or expressed in a detailed and precise way in the contemporary civil law scholarship in China, rendering some economic judgments uneconomical. In the 21st century, it is necessary for the civil law studies to establish a clearer and more precise notion of efficiency, to conduct more direct and accurate evaluations on civil laws' incentives on people's behaviors and their socio-economic effects, so as to reduce the cost of social interactions and promote deeper cooperation and win-win outcome among individuals.

Keywords: Chinese civil law scholarship, individual autonomy, notion of efficiency, notion of fairness, the principle of proportionality

Issues and Methodology

“As long as human societies exist, human beings, as a species, share anthropological and biological commonality, as well as similar general core values” (Xie, 2014b). The unremitting pursuit of economic efficiency is one such core value. To a great extent, the history of human society is the history of constantly pursuing and promoting the efficiency of social organizations

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and production in society. From hunting to farming, then to industrialized mass production and now the Information Age, the evolvement itself demonstrates human's natural tendency to pursue efficiency and promote social welfare. The pursuit of efficiency is also embedded in the mindset and behavioral tendencies of an individual in one's life course: one competes for higher scores at school, and strives for better appraisal at work, and endeavors to achieve excellence. As such tendencies are part of people's daily life and are even their inherent properties, they are not necessarily expressed in idioms and terms later constructed, such as "*shiban gongbei*" (accomplishing twice the result with half the effort) and "economic efficiency".

As observed by Professor Sun Guohua, one of the founders of contemporary Chinese jurisprudence, "generally speaking, people tend to take notions and behaviors that maximize social utilities... as just and fair" (Sun, 2009). Like our natural tendency to appreciate beauty, we prefer notions and behaviors that increase utility, and consider them as the choices of rightness. The same is reflected in the short history of contemporary Chinese civil law, not only in the functional understanding of basic principles, especially individual autonomy, in civil law studies (for example, to "allocate labor and capitals where they make the greatest production"), but also in the great debates over the establishment of modern civil law system at the beginning of reform and opening up. As I will illustrate, the longing for efficient economic production is the primary driver that breeds contemporary Chinese civil law.

Nonetheless, the primitive notion of economic efficiency in the early years has been inherited merely in an unexamined and subconscious manner. Even today, such a notion has never been systematically elaborated on in contemporary civil law scholarship. Rather, it has often been diluted or replaced by civil law doctrines, moral notions, inertial thinking of the planned economy or the will of the leader, over more than three decades. Thus, when it comes to social complexity, lawyers may misapprehend or even ignore the economic effects of legal rules.

In my view, it is high time to reiterate and reinforce the primitive notion of efficiency established at the beginning of China's civil law scholarship when the forms of social organization and transactional structure are getting growingly complicated as they are today. In both legislation and adjudication, it is necessary to shift from subconscious understanding towards conscious assessment of legal rules in civil law. By doing so, we are able to systematically evaluate and improve their incentive effects and to better facilitate economic production and transactions. For the above purpose, this paper will first re-present the notion of efficiency as established at the beginning of Chinese civil law, and will then explain the situation and problems of the notion of efficiency in the current civil law studies. Moreover, this paper will examine the barriers for contemporary lawyers to having a clear notion of efficiency in their daily discourse. This paper will then clarify the common misconceptions of economic efficiency and conclude this article with my suggestions to establish a clear and precise notion of efficiency.

Longing for Efficiency as the Driving Force for Contemporary Chinese Civil Law

In more than one hundred years, especially during the forty-odd years since reform and opening

up, a brand new set of civil law institutions and doctrines has been established in China after an extensive succession of foreign civil laws systems (Liang, 2006; Sun, 2006). Academic theories on individual autonomy and its boundaries abound, with sometimes dazzling variety and complexity. Yet if we look back to the starting point of contemporary Chinese civil law, we will find that things were far simpler.

Contemporary Chinese civil law was born as a twin to China's economic reforms since the 1970s and is even the fruit of the latter. The planned economy in China back then failed to "bring prosperity to" its people, and poverty motivated eighteen families of farmers in Xiaogang Village, Fengyang County to sign the "contract" that distributed collectively farmed lands to each household in 1978. This bottom-up reform ushered in the national project of reform and opening up, leading to an overall reform of the land system and the whole economic system in China, a prelude to a decades-long economic growth. From the national perspective, the transformation from a planned economy to a commodity economy was to improve the economic efficiency of social production and exchanges, or in the expression at that time, to "invigorate the economy". Compared with the planned economy that is based on central planning and directives, the commodity economy based on the law of value not only endorsed the free transactions of commodities among equal individuals, but also stressed the exchange of commodities at fair prices. This is proved to be more efficient than the planned economy. Correspondingly, the system of civil law was established to facilitate the construction of China's commodity economy. "Invigorating the economy is the essence of the reform, the centrality of China's socialistic civil law construction, and the reason for the legislation of the General Principles of Civil Law in 1986"(Wang et al., 1987, p. 13). At that time, the economic reform project aimed at a significant goal. A large number of workers and managers of enterprises were expected to show keen awareness of input and output, of market, of competition and of efficiency in their economic activities. Civil law is exactly the legal instrument of law that serves this purpose" (Jiang et al., 1988, p. 19). "The civil law honors the principles of equality and fair exchange, which are essential to promote economic production and commodity exchange in a socialist society, and to improve the profitability of our enterprises and the living standard of the people" (Tong, 1986, p. 12). Moreover, plenty of civil law rules, like those of legal persons, of bankruptcy, and of land contractual management rights, "all centered on invigorating the economy" (Wang et al., 1987, pp. 21-23).

In hindsight, there were indeed obvious limitations in civil law scholars' understandings of the bearing of civil law on economic efficiency at that time. On the one hand, scholars' understandings of civil law and the commodity economy that it applies to was still constrained by the general framework of the planned economy. Although civil law scholars widely recognized the function of civil law to facilitate commodity transactions and invigorate the economy, the civil law theory at that time generally regarded civil law, including contract law, as a measure to implement national plans, and as a component of public law, rather than an independent field of private law (Tong, 1986, p. 8). That was why the core principle of civil law at that time was "the principle of obedience to the guidance of the national economic plan" (Tong, Jin & Zhao, 1983, pp. 14-15) or "the principle of combining guidance

and free business operation” (Wang et al., 1987, pp. 40-42) in lieu of individual autonomy. While the civil law studies were aware of the function of civil law to invigorate the economy, they did not appreciate well enough the internal mechanism for civil law to help achieve that function. Literature that civil law scholars often cited in support of their theoretical arguments for the construction of civil law system was not micro- or macro-economics, but legal systems and doctrines in traditional civil law countries, such as Roman Law, Napoleonic Code, Civil Code of Germany, etc (Tong, Jin & Zhao, 1983, pp. 1-5).

Despite the limitations mentioned above, “since the reform and opening up in 1978, the development of socialist commodity production and exchange has brought opportunities for the incubation and development of Chinese civil law scholarship” (Wang & Yao, 2010). It is safe to say that the constant pursuit for efficient social organization and production is the major driver for the birth of civil law in the People’s Republic of China. Though the Chinese civil law studies had a very weak foundation at its early age, the doctrines on the protection of individual autonomy in classical civil law scholarship were not alien. However, the principle of individual autonomy itself was not the fundamental concern for Chinese civil law scholarship of that time. Instead, it was the property of that principle to promote efficient production that it really pursued. Had the planned economy sustained efficient social production and distribution, and provided the people with sufficient food and clothing, it would have been unnecessary for China to adopt a commodity economy, or a market economy as it is known today, not to mention the civil law system whose origination and development always goes hand in hand with the market economy. What really took place was that when national economy was on the brink of collapse, both political deliberation and legal discourse pointed to an economic and legal system that was more efficient than the planned economy. Improving economic efficiency via economic and legal reforms was the very consensus of society then, which gave birth to the General Principles of the Civil Law in 1986 and to contemporary Chinese civil law scholarship.

Four decades into the reform and opening up, China is now drafting its first Civil Code. I argue that it becomes vital for us to reiterate the notion of efficiency which has given birth to contemporary Chinese civil law scholarship, and to examine its status in today’s legal theories and institutional designs of civil law. This is not because I believe in historical determinism, but because the short history of contemporary Chinese civil law proves that to honor “the notion of efficiency” is vital to the improvement of social well-being. Such well-being includes far more than the economic interactions and benefits that this article mainly addresses. Even in marriage, for families and other fields with strong moral and ethical features, after setting a common moral or ethical goal, it is still necessary to contemplate institutional options that can minimize the overall social costs.

It shall be further noticed that the necessity to reiterate the notion of efficiency in civil law scholarship does not mean that “efficiency” shall be constructed as a basic civil law principle paralleling principles of individual autonomy, fairness, good faith, and public order and good morality. There are dimensional differences between the notion of efficiency in civil law scholarship and the basic principles of civil law (Zheng, 2016). To emphasize efficiency in the civil law studies is to

ensure that the pursuit of efficiency, a mindset and behavioral tendency that the human-beings prefer, is well embodied in the lawyers' legal thinking of civil law. No matter in the interpretation of the basic principles of the civil law, or for the construction of the civil law system, there is a necessity to pursue economic efficiency.

The Notion of Efficiency in Current Civil Law Scholarship in China

As I have mentioned above, the notion of efficiency at the beginning of reform and opening up was primitive. The pursuit of economic efficiency was much derived from instincts then. By contrast, the notion of efficiency in today's Chinese civil law scholarship is much clearer, which is not only reflected in scholars' functional understanding of the basic principles of the civil law, but is also expressed in the terms they use in daily discussions on specific institutional design. For instance, a typical textbook on Chinese civil law often describes the individual law autonomy, the core principle of civil law, in the following way:

“One empirical rule indicated by the history of social development is that, the system which ensures personal autonomy and free decision-making is in accordance with humanity, and is regarded as the most vigorous system. Another empirical rule proposed by the history of economic development is that ‘autonomous decision-making can allocate labor and capitals where they make the greatest production’ (Wang, 2010).

Moreover, in both legislative debates and academic commentaries on civil law rules, the frequent usage of certain terms, such as “encouraging contract-based transactions”, “maintaining transactional security”, “protecting transactional expectations”, and “balancing interests”, represents the scholars' concern for efficiency in civil law institutions. At least, the theoretical discussions on these terms clearly display the scholars' attention to and pursuit of efficiency on a rather abstract level. However, this current notion of efficiency in Chinese civil law studies still shows two weaknesses, which in turn creates certain barriers for the pursuit of efficiency as well.

Diluted and Even Totally Neglected Notion of Efficiency

Current civil law theories tend to emphasize the function of “individual autonomy” in achieving efficiency and often equate individuals' autonomous decision-making with economic maximization. Civil law doctrines are also phrased like individual autonomy, juristic acts, manifestation of intention, and other formalistic descriptions, without directly addressing (at least without assessing in a detailed way) the economic consequences these formalistic doctrines would bring about. Even when some scholars raise the question of the incentive effects and economic consequences of civil law institutions, few are accustomed to responding to it directly (Liu et al., 2016).

Indeed, constructing civil law doctrines centering on formalistic terms like individual autonomy and juristic acts has several merits and is also a tradition of the civil law family. First, everyone desires free expression and decision, in order to fully experience the sense of independent personality

and peer recognition. Autonomous decision-making itself benefits the welfare of everyone. Second, autonomous decision-making is often a rational decision of one's situation, making people proactively cooperate with other members of society and maximize their benefits through selecting partners, matters and degree of such cooperation. In this sense, ensuring autonomous decision-making usually brings about economic efficiency. Third, the law is only enforceable when it focuses on people's behavior, by offering them incentives in pursuit of desirable results. With an existing social goal, the more accurately understood the regular pattern of people's behavioral choices is the more targeted the design of rules can be, thus making it easier to achieve that goal.

However, when constructing the theoretical system of the civil law around these formalistic terms, some scholars unconsciously show a decreased concern for or even total neglect of the result of people's behavior.

Some civil law scholars simply assume that, as long as a person could make decisions autonomously, maximization will be achieved, and thus there is no need to pay special attention to the efficiency of the results of one's behavior. In particular, to redress the extreme tendency to prioritize society over individuals under the highly centralized economy, Chinese civil law scholars have for long been striving to establish and advocate individualist and rights-oriented legal doctrines. Yet they have also emphasized too much the static enjoyment and protection of existing private rights, ignoring the dynamic mechanisms through which private rights emerge, and thus ignoring the cooperation aspect in private social life and private law, i.e., the process of collaboration between individuals. Granted, most civil law scholars have recognized the necessity to restrict some freedoms (or individuals' autonomous decision-making), regarding reasonable restrictions on freedom as an approach to ensure greater freedom on a larger basis. Yet they usually put their theoretical understandings under guiding concepts such as "public interests" that may have been too abstract, without understanding more thoroughly "the concrete mechanisms of the barriers to realizing public interests". Practically, people usually manage to cooperate with each other spontaneously and achieve comparatively good results under the framework of private law, obtaining benefits to the need of each party. However, often, even when there is a promising prospect for cooperation in line with mutual benefits, such cooperation may still be thwarted by transaction costs. Such circumstances indicate that, to promote a more efficient social organization and life pattern, when advocating individual autonomy, the civil law shall, when possible, clarify the potential intentions of cooperation among people as well as their goals and obstacles, and incentivize all parties to adopt behaviors that promote cooperation and win-win results through institutional designs (Xiong, 2014; Jiang, 2016).

Some other civil law scholars have nearly neglected the incentive and economic effects of civil law rules when constructing formalistic doctrines. Form and function are two basic dimensions of the law (Xiong, 2017). A great number of academic studies on civil law rules prioritize the form, and think little of incentive effects and the economic effects brought by different formalistic interpretations. For example, on discussing the legal effect of unauthorized disposal in the name of the owner (in which case the unauthorized owner pretends to be the owner), the majority of scholars paid attention

to whether such pretense falls into unauthorized disposal in real right law or unauthorized agency in contract law, and whether the rules for acquisition of stolen goods in good faith or apparent agency is applicable to the case. Such discussions are more about formalistic aesthetics, without substantively considering issues such as “which kind of system can prevent unauthorized disposal in the name of the owner to the greatest extent possible and with proper costs” (Ran, 2015). Current analysis often takes a static perspective, lacking the “forward-looking” mindset. In other words, it is not concerned with the incentive effects legal institutions will bring to future behaviors. Clarifying the economic effects of institutions is sometimes marginalized in civil law scholarship, or even seen as unorthodox.

Oversimplification of Economic Analysis

Since the majority of scholars with serious concerns for efficiency seldom systematically attend to basic issues such as “what is efficiency-oriented” and “how to be efficiency-oriented”, their understanding of efficiency sometimes tends to be oversimplified, their concerns for economic efficiency of civil law rules being neither specific nor precise. Thus, they tend to make efficiency judgments that are in fact not efficient when facing complicated contexts. When confronted with apparently uneconomical propositions, they also lack clear and convincing arguments to back up their positions.

In simple social interactions, institutional arrangements based on intuitive understanding of efficiency can usually be economical. For example, the early years of reform and opening up witnessed huge room for improvement in terms of economic efficiency. In fact, production at the final years of the planned economy era (especially in the period of the People's Commune featuring extreme egalitarian practice) was so inefficient that the instinct to survive could spark an efficiency improvement plan. The “contract” signed by the villagers in Xiaogang Village, Fengyang County, was an illustration of this. Even daily experiences such as “attendance without making efforts” could help us understand how to improve the social organization economically. At that time, once legal scholars kept a basic awareness of economic efficiency, their institutional proposals would not deviate too much from the basic requirement for good economy, even if they adopted analytical tools that were not directly related to (or even not related at all to) efficiency (such as borrowing legal theories from other market economies).

However, when China's market reforms go deeper, the once huge room for improvement of efficiency such as a “transition from the planned economy to the market economy” is becoming rare, and the improvement on the social economic effects becomes less easy than before. Therefore, what we need today is to seek incremental improvements on efficiency in wider ranges of issues through more refined institutional designs. Particularly, as the social production and transaction structures become more professional, on a larger scale and more complicated basis with a greater influence from the internet, more factors are now influencing the economic efficiency of production and transactions. In order to achieve better results in adjusting the economy, institutional designs shall accordingly take into account interests of the relevant social groups and provide more targeted and

effective institutional incentives. Oversimplified efficiency analysis has the risk of becoming biased, and institutions designed with the good intention to pursue efficiency may not necessarily conform to economic principles. Moreover, it will also be harder to learn from other jurisdictions and to introduce their doctrinal scholasticism in the hope of improving China's own economic efficiency, as the Chinese society is now confronted with an increasing number of scenarios that have never appeared or have never been properly dealt with elsewhere (e.g. the large number of platform-based economic models).

In the recent decade, the tendency of "oversimplification" has been shown in the discussions on "transaction security" and "transaction cost" by more than a few scholars. For example, the rule of "leasing contracts not affected by change of ownership", as provided in Article 229 of the Contract Law of the People's Republic of China, has been a focus of debating in both judicial practice and the drafting of China's Civil Code. An issue frequently occurring in practice is that, when a third party, like a house buyer or an external creditor of the house owner applies for the enforcement on the house, a long-term lessee suddenly appears and insists on legal protection to his/her tenancy. This long-term lease is possibly fabricated afterwards by the enforcer, but it is hard to prove it (Lu, 2013). Such a moral hazard greatly dilutes transactional security for the third party, which will incentivize the potential third party to pay a high cost to verify the title of the house. Hence, some scholars suggest making "lease registration" as the requisite for lessee's adverse claim, where a lessee without the lease registration shall never claim that his/her lease must not be affected by the change of ownership. But some others hold that the indiscriminate requirement of lease registrations only increases the transaction cost, because the house leasing registration system in China is far from fully digitalized and convenient, and that there are a huge number of short-term lessees in the housing market. Thus, the legislative organ once proposed a reform plan that attempted to reconcile different views. The proposal goes that "any change of ownership to the leased item does not affect the validity of the leasing contract when said leased item is possessed by the lessee in accordance with said leasing contract". Stipulating "possession" as the requisite for the lessee's adverse claim, to some extent, might mitigate the moral hazard of the enforcer. Yet it is foreseeable that a new problem may arise as to how to prove the lessee's "actual possession of the leased item", giving rise to the same moral hazard of "fabrication". A second thought may lead to a more efficient rule, where a long-term (such as over 3 years) lessee shall only be allowed to claim for the validity of the leasing contract with the lease registration while the short-term lessee shall be allowed to make the claim with or without it. Such an option has two merits. On the one hand, the long-term lease which is often for commercial trade often has a long contracting process. Under this circumstance, lease registration is relatively less costly, and will make the transaction more secure for the lessee by preventing the moral hazard when the lessee applies for enforcement. On the other hand, even though the short-term lessee can claim for the validity of the leasing contract without a lease registration, the enforcer is less motivated in preventing a leasing relationship. After all, the benefits obtained from this fabrication are limited, and the enforcer still needs to pay damages to the applicant for such enforcement (especially the house

buyer). Even if they fabricate a short-term leasing relationship, it will not cause great losses to the applicant for the enforcement^①.

When it comes to the economic costs related to transactional security, it is necessary for us to insist on a more precise notion of efficiency, systematically explore and compare the differences among alternative institutions in terms of their incentive effects for behavior and their social economic results. Only then can the most economical system be found out.

Barriers to A Clear Notion of Efficiency

In this section, I will look into the reasons for “diluted, totally neglected, and oversimplified notion of efficiency” and to figure out the factors that hinder the establishment and practice of efficiency in contemporary Chinese civil law. As far as this article is concerned, the factors are as follows:

The Inertial Thinking of the Planned Economy

Human history proves that economic efficiency can never be separated from the idea of “*si*” (private or personal). Property rights (not necessarily fully private ownership) incentivize people to make investments and work hard, and subsequently result in efficient economic production and social organization. However, in the period of the planned economy, especially during the Cultural Revolution, the Chinese society regarded “*si*” as a major obstacle to social development and justice, and academic debates regarding “*si*” were also forbidden, due to rigid ideological constraints. From the very beginning, the notion of efficiency in Chinese civil law scholarship was ideologically prevented from developing and being expressed in a refined manner. “In the period of the reform and opening up after the Cultural Revolution, almost all economic and social sectors throughout China carried out an ideological campaign to set things right (*boluan fanzheng*), but there was no such serious campaign in legal academia” (Yang, 2016). The inertial thinking that conflicted with market economic rules still remained, and continued to influence lawyers’ academic discourse, legislative debates and judicial reasoning (Yang, 2016). “Some inappropriate legal schemes under the General Principles of the Civil Law that had derived from an outdated economic system and ideology are still very much alive today” (Zhu, 2014). Particularly, in today’s civil law studies, more than a few scholars still show strong “nostalgia” towards government planning and regulations when it comes to their relationship with individual autonomy. They “tend to overestimate the advantages of governmental regulation”. Facing emerging challenges in market exchanges, they are accustomed to attributing them to “market failures” and call for governmental interference (Coase, 1960). Their mindset fails to appreciate the logic behind the behavioral choices of relevant market players, and the market’s self-adjustment capability. They never realize the real cause of what they saw as “market failures”. Nor do they pay

^① The problem of fabrication essentially points to ways of title verification, a process that will incur informational costs. For recent research on informational costs of property rights to prospect dealers, please refer to Thomas W. Merrill, & Henry E. Smith, 2000, and their seminal theoretical framework in this regard. For modification of the framework in terms of its mode for calculation of the costs, see Henry Hansmann, & Reinier Kraakman, 2002.

attention to possible “government failures” in an equivalent manner (Williamson, 2016, p. 201).

For example, after the emergence of online ride-hailing platforms, major ride-hailing platforms introduced a surge pricing mechanism during peak hours. The price rises as the demand increases, which is distinguished from the previous dominant set-price mechanism at peak time. Some scholars argue that “the surge pricing mechanism of ride-hailing apps breaches the fair-price obligation of mandatory contracting in taxi’s carrier service. Besides, as some people are not familiar with the technology of mobile internet, they would be excluded from having equal access to taxicab services. Surge pricing business model violates the legislative purpose of mandatory contracting of transport service to protect passengers” (Shan, 2014). These scholars hence advocated that the government should step in the pricing process and prohibit the surge pricing mechanism during rush hours. There is no doubt these scholars aim at protecting passengers’ interest, but they ignore the basic logic of transport market. Rush hours in metropolitan areas usually mean congestion, during which time drivers’ basic cost of providing carrier service (i.e. the cost of petrol and time when driving at a lower speed) will increase substantially. Economically, the charge from such service may not even cover the cost under the set-price mechanism. The more severe the congestion, the more typical this situation will be. That is why many professional taxi drivers choose to stop providing service all together, or to avoid driving into congested roads during peak hours. And nonprofessional taxi drivers may choose to stop taking ride orders on ride-hailing platforms and to provide off-line, unlicensed service to passengers who are willing to pay extra fee. Even if many professional taxi drivers choose to follow the set-price mechanism during peak hours, they are unlikely to provide friendly services to passengers.

Thus, simply asking the government to prohibit surge pricing ignores the severe insufficiency in ride supply that had appeared long before digital, ride-hailing platforms emerged. The prohibition of surge pricing can hardly help passengers get a ride more easily in mega cities as well. As to the argument that people with a stronger affordability will find it easier to get a ride under the surge pricing mechanism, it is worth pointing out that, for one thing, travelling by taxi is not the daily transportation option but a supplementary way of travelling for urban citizens. In other words, taxi service is not a sort of necessary public good that has to be provided by the state. which stands in stark contrast with public goods such as public transportation, healthcare and basic education. For another, the difficulty in getting a ride in mega cities like Beijing and Shanghai is largely rooted in rigid quantity control of taxis licenses. A more effective approach to resolving this difficulty is not to follow the inertia mindset of the planned economy: letting the government set the price for the market. Instead, the right thing to do is calling the government to change its rigid quantity control of taxi licenses so that taxi service providers can compete with each other, to develop public transportation and to encourage carpooling, etc (Xiong, 2016). Of course, completely relying on the market force may also bring problems. If surge pricing ever evolves from a mechanism to encourage ride supply into platforms’ market monopoly strategy, regardless of supply, regulatory authorities should step in and decide whether this commercial model infringes upon the interests of consumers by, for instance,

“intentionally forcing up prices”.

Either way, it is necessary to abandon the two extreme mindsets and avoid simply regarding either the government or the market as a more capable and fair institution for social organization when discussing the relationship between individual autonomy and governmental regulation. We should avoid talking about balancing between individual autonomy and governmental regulation from a totally abstract perspective. Nor should we resort to the inertial thinking that “market freedom prevails in principle” or that “government regulation prevails in principle”. We need to patiently analyze the causes of emerging problems considering their complicated contexts and specific situations, and compare the potential incentives to behaviors and the social economic effects of various options (either relying on the market or regulation). Only by doing so can a more effective policy option be reached (Coase, 1960, p. 18).

The Constraints of Moral Notions

In a diverse system of social norms, moral notions serve as one important source of social organization. Different from legal norms, moral norms are established in a gradual and piecemeal manner throughout social evolution. For example, as one simple story about respecting the aged and loving the young gets told repeatedly and therefore inherited from generation to generation, the conception of respecting the aged and loving the young is generally internalized as a kind of faith and code of conduct to be obeyed and insisted upon. This process of socialization also means that moral norms can only be generated over a long time and will become a highly stabilized constraint on behaviors once generated.

Behind the long generational process of moral notions lies the crystallization of the universal life experiences of the public and the reflection of their intuitive understanding of and preferences for certain ways of social organization and living. Under such circumstances, the code of conduct by such morality can improve the general social welfare. In other words, it conforms to economic principles and therefore is sometimes necessary to be upgraded to general national legislation (Kaplow & Shavell, 2001). One typical example is respecting the aged and loving the young. Since everyone would experience childhood and aged life, people expect good education in childhood and warm supports in aged life. However, we cannot teach or take care of ourselves all on our own and therefore can only expect the cooperation between people from different ages in order to enjoy a complete and joyful life. To put it in a more modern way, this morality reflects the logic of future contracts, with today's pension system for urban residents as the best evidence. That may also be the reason why both China's Constitution and Marriage Law provide that parents are obligated to raise and educate their minor children, and that the adult offspring are obligated to support their parents.

However, the fact that moral norms take long time to develop with their basis on daily life experiences also indicates that they can only take effect in a society with slow evolutions. As observed by Professor Fei Xiaotong, whose works helped lay the foundation for China's sociological and anthropological studies, experiences may not serve as our guidance in many occasions in a

society like China, with all of its rapid development and changes, because the social condition is now different from those that once generated those experiences and their lessons. “In the midst of rapid changes, habits are obstacles to adaption, and experiences are equivalent to stubbornness and out-datedness”(Fei, 2008, p. 84). Directly setting simple moral norms as legal ones would encourage some people to behave in a way detrimental to socioeconomic order, such as resorting to opportunism and rip-offs.

China’s legislation of civil laws since the reform and opening up is largely based on empiricism, to the extent that many laws are made out of existing ones and judicial experiences. Some civil laws made in this way were “limited to the result of practical experiences, and usually are of little use when dealing with new situations and new problems” (Zhu, 2014). One typical example is the academic debate on “the defaulting party’s right to terminate the contract” in the drafting of the current Civil Code. One article in the Part of Contract Law of the Civil Code (Expert Proposal) drafted by the Chinese Civil Law Society proposed that “the legal right to terminate the contract shall be enjoyed by the non-defaulting party in principle, while the defaulting party shall also have the right to terminate the contract when maintaining the validity thereof will improperly increase the burden of the defaulting party.” In multiple academic discussions, more than a few scholars criticized this article and argued that “it violates the principle of *pacta sunt servanda*”, that “it is a tradition for the non-defaulting party alone to have the right to terminate the contract”, and that “it is unbelievable for the defaulting party to have the right to terminate the contract when breaching the contract is immoral and dishonest” (Sun, 2006). Indeed, this kind of statements, based on intuitive moral conceptions, is economical in ordinary contract-breaching cases. If one party can easily breach the contract without fully compensating the counterparty for their expected interests, it will trigger people to behave in an opportunistic manner and “jump out of” the contract whenever there is a better transaction opportunity. It will also beat the counterparty’s contract expectations, so seriously that it may encourage the counterparty to resort to preventive measures, leading to an increase of transaction cost in vain.

In other cases, however, there is a significant change of circumstances. This “change” may not be so serious as to constitute “force majeure”, or that renders the contacting party “unable to perform in law or in fact”, but the economic burden on one party for actual performance will exceed the expected interests of both parties. Such circumstances could be encountered by both the lessee and the lessor in a long-term lease contract for land, housing, oil tanks, containers, etc. In such cases, if the expected interest of non-defaulting can be defined in a relatively accurate manner, and that the full or slightly higher compensation for the non-defaulting can be guaranteed, allowing the defaulting to terminate the contract would promote a “win-win” situation. In economics, this scenario constitutes an “efficient breach” (an economic theory that is frequently misunderstood by legal scholars and that will be further discussed later). Consequently, it is now easy to admit that “the defaulting party’s right to terminate the contract” is not simply a moral issue, but a practical one concerning “the full compensation for and the accurate determination of the non-defaulting party’s expected interests”.

In fact, contracting parties can usually solve these problems on their own by contract arrangements beforehand or re-negotiation afterwards. In practice, a large quantity of contracts may include conditional clauses for future circumstances that may impact contract performance. When such special circumstance occurs, many contracting parties would negotiate to terminate the contract after reasonably compensating the non-defaulting party (the compensation amount usually exceeds the non-defaulting party's expected interests). However, both the arrangements beforehand and the renegotiation afterwards incur costs, and may brew hindrance to efficiently terminating the contract (Shavell, 2004). These negotiations may fail to achieve a win-win situation especially when one party is confronted with a major economic burden while being ripped off by the non-defaulting party. One typical case in this regard is *Xinyu Company v. Feng Yumei over Store Sale Contract*. A large mall developed by Xinyu Company, the plaintiff, was making a business innovation due to poor management. This caused excessively high costs for the plaintiff's continuing performance of a store sale contract with Feng Yumei, the defendant. When the majority of storeowners in the mall accepted to terminate their own contracts by negotiation, Ms. Feng proposed an abnormally high compensation requirement, which could far exceed the expected interest for the defendant upon actual performance of the contract. Rip-offs like this are not so different from the act of holdouts (colloquially called "nail houses" in China) when their houses were taken and demolished for further development. Both can hinder more efficient ways to use property and make transactions. In the above case, as long as the compensation amount can ensure that Ms. Feng have her expected interest satisfied after terminating the contract, it is only fair and efficient to provide the defaulting party with the right to terminate the contract. As for the legislative draft, it is therefore advisable to add an extra rule in the proposed article by the Chinese Civil Law Society that "the defaulting party should not undermine the expected interest of the non-defaulting party when terminating the contract".

The risk of distortion of inter-discipline knowledge

As the discipline of legal studies have for a long time been isolated from other disciplines, many civil law scholars choose to stick to "unique" legal methodology without paying close attention to interdisciplinary knowledge like economics, even though they frequently use economics terms such as "transaction security" and "transaction cost" in their daily academic discourse. On the other hand, as more civil law scholars are seen using the knowledge of other disciplines to address legal problems^①, they may take some interdisciplinary knowledge for granted because they lack the necessary academic "immunity" (Wang, 2006). They may also apply or criticize such interdisciplinary knowledge before reading about it and understanding it thoroughly or even read and cite it selectively for decorating. These problems can easily cause misunderstanding and deepen the intuitive prejudice and resistance of some legal scholars to all interdisciplinary knowledge, especially economics. They

^① This is particularly true for scholarship in common law, as more scholars introduce into legal studies external knowledge including but not limited to political, economic, and cognitive sciences. For one example, please see Henry. E. Smith, 2012, and 2015.

may even approach the wisdom of economics as if with their filters on (Yang, 2000, pp. 4-5). As a result, it becomes even more difficult to systematically focus on and precisely express the notion of efficiency. The most typical illustration of this are civil law scholars' two serious misunderstandings about the theory of "efficient breach of contract".

One misunderstanding is that "efficient breach of contract" is a theory that focuses on efficiency but ignores equity. It equates "efficiency" simply with the defaulting party's unilateral efficiency (or calculates it solely on unilateral costs and benefits), or at least gives the impression that it does. Following this, the theory of "efficient breach of contract" is reduced to the arguments that "breach of contract shall be encouraged when the defaulting party's benefit of breaching exceeds that of actual performance" or that "a party shall be encouraged to breach the contract if the defaulting party's benefit from such breach exceeds the non-defaulting party's expected benefit from actual performance, and if the damages are only to be paid to the extent of such expected benefit" (Wang, 2013, p. 151). For many jurists, such theoretical propositions are clearly a departure from their intuition and common sense, since this misreading of the notion of efficiency fails to consider the harms that the breach brings to the entire social economic order. After all, "what is efficient for the defaulting party is not necessarily efficient for the non-defaulting one" (Xie, 2014a, p. 472).

The problem, however, is that this misreading of the "efficient breach of contract" theory has hardly appeared in the classic literature of economists, and it is merely a strawman argument that legal scholars have made, whether intentionally or unintentionally, when translating and introducing knowledge from other disciplines. The efficiency in the "efficient breach of contract" theory is not the unilateral efficiency of the defaulting party and the amount of damages is not limited to the expected benefits of the defaulting party either. The theory of efficient breach of contract is first of all a descriptive one. It intends to describe the patterns for behavioral choices in contract transactions and even the entire social life, but not to encourage contracting parties to breach (Tang, 2008). The theory contains three major arguments. First, the parties conclude a contract because they anticipate, at the time of the conclusion of the contract, that the future performance of contractual obligations would benefit both parties. However, this "win-win" prospect is premised on the contracting parties' prediction of the social conditions for that future performance. Second, neither of the contracting parties, when concluding the contract, can predict and negotiate on every single condition that may have a substantial impact on the cost and benefit of actual performance. Yet some of these conditions may bring so greater an impact than predicted when concluding that not performing contractual obligations for one party will bring a reduction to the cost (in other words, the benefit of non-performance) greater than the non-defaulting party's benefit from actual performance. Finally, in this case, it will benefit both parties to relieve one party's burden of actual performance (i.e. allow that party to "breach") and to have that party provide the non-defaulting with a compensation no less than its expected benefit (Shavell, 2004, pp. 368-377).

However, does it follow that economists proposing the "efficient breach of contract" theory also advocate that a contracting party can easily choose to jump out from contracted obligations? This

involves the second common misunderstanding about “efficient breach” theory, the idea that “efficient breach” is a theoretical proposition that encourages “a contracting party to easily jump out of the contractual restrictions”(Xu, 2008, p. 188). As mentioned above, “efficient breach” is not a moral question, but one concerning “the full compensation for and the accurate determination on the non-defaulting party’s expected benefits from actual performance”. After discussing “full compensation”, it is worth analyzing “accurate determination” here. The above discussion on “efficient breach” is based on the premises that “the reduction of cost for one party from the breach of contract” and “the expected benefit of the non-defaulting party” can be determined approximately. In theory, if the judge can be informed of these two amounts accurately afterwards, not only can the judge determine whether a specific breach is efficient, he can also make a judgment that benefits both parties when it is. In reality, however, few people know these two pieces of economic information better than the contracting parties themselves. When a dispute occurs, both parties could turn opportunistic. “The buyer may exaggerate the expected value and the seller may exaggerate the extent of the increase in the cost, which are both obstacles to determining the amount of damages”(Xu, 2008, pp. 188-189). Whether the judge overestimates or underestimates these two amounts, it may have a negative effect. While an overestimation of the non-defaulting party’s expected benefit may prevent efficient breaches from happening, an underestimation thereof would encourage opportunists’ inefficient breaches, as one contracting party can easily have the opportunity to jump out. In fact, economists are consciously aware of judges’ informational asymmetry problem and agree that actual performance is generally more conducive to a “win-win” situation between the parties (Shavell, 2004, pp. 352-353). Consequently, judges should not support a claim of efficient breaches except in cases like *Xinyu Company v. Feng Yumei*, where there are obvious rip-offs and situations that significantly and improperly increase the burden of the defaulting party. Even in such cases, procedural requirements, such as one providing that the defaulting party can only “terminate the contract by litigation or arbitration”, can be attached to prevent the right to terminate from being abused.

Certainly, this does not mean that “efficient breach” cannot take place outside litigation or arbitration procedures. Quite the opposite, as mentioned above, if there is no chance for rip-offs, the parties usually have a chance to achieve a win-win situation by adapting the existing contract through voluntary negotiation afterwards (including by terminating the contract after negotiation). In *Xinyu Company v. Feng Yumei*, for instance, if the subject matter in dispute had been a long-term leasehold of a small store on a street instead of a store in a large shopping mall, and if a third party proposed a higher bid to Xinyu Company, the seller could have chosen to fully compensate Ms. Feng, the buyer, in exchange for termination of the contract. In addition, Ms. Feng may have claimed for damages higher than her expected benefits from actual performance, but would likely have limited them to a moderate amount. Because if the claimed damages were too high, Xinyu Company would choose actual performance and give up on that possible lease to the third party. This would mean loss rather than gain for Ms. Feng.

There is a common concern that the defaulting party may not be able to determine whether a

breach is efficient, as the defaulting party is seldom informed of the expected benefit of the non-defaulting party and therefore is unlikely to be able to decide whether the bid by the third party is higher than that by the non-defaulting party. Indeed, no one knows better than the parties involved how to value a particular item. Yet when deciding “how much ‘compensation for the non-defaulting party’s expected benefits’ should be paid by the defaulting party to satisfy the counterparty”, the contracting parties usually choose to renegotiate not based on a one-time offer but through multiple rounds of bargaining, during which the defaulting party will be able to roughly estimate the expected benefits of the non-defaulting party based on the amount of compensation that they are willing to accept. Normally, the accepted amount of compensation would be higher than the non-defaulting party’s expected benefits from actual performance (Sun & Shan, 2010).

Comparison and learning as quick fixes

Since the reform and opening up, China’s civil law and civil law studies, once developed from scratch, have been ever more prosperous. This, to a great extent, benefits from the high-quality comparative studies of the civil law culture in advanced jurisdictions. And such learning process is far from over (Sun, 2006). However, for quite a long time, much of these comparisons and learning in civil law studies were equivalent to a simple translation and introduction of foreign legal rules and doctrines, or a direct “import” of them, without understanding their underlying principles and without paying due attention to China’s domestic contexts. Comparative legal studies often become the comparative studies of foreign law in books, and legal scholars “are still most interested in studying the form and characteristics of mature legal systems”(Shang, 2015). It is fair to say that different jurisdictions do share similar social contexts and value judgments, as relations and forms in civil society are universal in many aspects. For these aspects, direct translation, introduction and application of sound foreign civil law system and doctrines is normally sufficient to establish a sound social order in domestic contexts. This is indeed true for some comparative studies by civil law scholars since reform and opening up. Such an approach not only helps establish a civil law system and its doctrines in a rather rapid way, it also reduces the cost of legal experiments and construction.

However, this is also where the problem comes in. Year after year, the approach of comparative studies, as extensive as it is, may evolve into a kind of quick fixes. The first reaction when a new problem occurs is to borrow legal schemes from advanced jurisdictions, subconsciously presuming that there is a quick fix in foreign jurisdictions that can be used to solve China’s domestic problems. In such a knowledge production process, we probably have not looked deeply into the Chinese context and have not given due attention to the incentives that different legal options may have to domestic players, not to mention their socio-economic consequences. Yet for a rapidly transforming jurisdiction as China, it is remarkably important to look into its specific historical context and recognize the specific time and situations when certain laws are enacted (Pan, 2016).

A typical example is the long-lasting dispute, both in academic debates and judicial decisions, over whether a person that knowingly buys defective goods (hereinafter referred to as “buying-

fake-while-knowing-it”) is entitled to punitive damages. In more than a decade of debate, civil law in China generally evaluate this issue from three perspectives. The first relies on the simple moral notions, as mentioned earlier. It is argued that buying-fake-while-knowing-it for the purpose of compensation violates the public morality of good faith and honesty. Such acts are regarded as of “reaping without sowing”, “engaging in opportunism and speculation”, or “an eye for an eye”. The second strand of arguments is formalistic reasoning, attempting to analyze in a logical way based on such forms as legal concepts and their legal contexts. For example, a common way of analyzing “buying-fake-while-knowing-it” focuses on the elements required to claim punitive damages under Article 148 of the Food Safety Law of the People’s Republic of China and the logical relationship that article has with Article 55 of the Law of the People’s Republic of China on the Protection of Rights and Interests of Consumers. The frequent employment of this method of formalistic analysis is largely a consequence of regarding legal doctrines from other jurisdictions as quick fixes in the last three decades. For emerging issues with strong Chinese characteristics, such as the phenomenon of “buying-fake-while-knowing-it”, their causes, variations, and social effect are all deeply influenced and further complicated by local contexts. Efforts to translate these complex practical problems into formal ones often do not hold water. In particular, when adopting formalistic logic analysis, we can come up with two opposite sets of arguments, one that supports “buying-fake-while-knowing-it” and the other against it. Yet formalistic reasoning alone cannot be relied on to decide between these two conflicting arguments. A third line of argument is functional analysis, by assessing the social effects of supporting or opposing “buying-fake-while-knowing-it”. However, as mentioned earlier, relying too much on comparative studies as quick fixes, some scholars are not accustomed to and capable of accurately and systematically evaluating the economic effects of different institutional options. Even scholars who observe “buying-fake-while-knowing-it” from a functional perspective often fall into extremes and choose to “support it unreservedly because it can prevent merchants from fraudulent acts”, or to “oppose it all because it is too often reduced to mere carping”. By contrast, an effect-based analysis that is precise may conclude that judges should strictly distinguish between claims for punitive damages that are benign (e.g. claims brought against food with substantial safety problems or other commodities that mislead consumer decisions) and claims that are malignant (e.g. claims brought against goods with merely minor labeling flaws). The two camps of claims should be treated differently as well. This will be the optimal option for society as a whole, as illegal production and management can be curbed, welfare of consumers increased, and opportunistic and speculative claims for punitive damages regulated. Empirical research of judicial decisions has also shown that the courts in Beijing and several other regions have taken such a dual practice in trials.

Applying the Notion of Efficiency in Civil Law Studies

The cases mentioned so far, while demonstrating the current barriers facing China's civil law studies in pursuit of efficiency, also show how to improve such notion in civil law studies, a topic to be further explored in this chapter. The notion of efficiency can be practiced in civil law studies in at least two dimensions, i.e., the establishment of a body of civil law doctrines and the construction of a corresponding legal doctrines. This article intends to focus on the latter.

Construction of legal doctrines, is in and of itself a manifestation of efficiency. The law in modern society is nothing but a management of social complexity by encoding various human associations and social organizations. By generalizing from diverse social situations before producing a set of formal concepts, terms, systems, and structural arrangements, the modern law establishes a foundation for efficient communication among people (especially lawyers), sparing them the trouble of having to discuss every single problem from the scratch. These formal terms and structures become legal doctrines through legal scholars' social encoding projects. The same then gets learned and disseminated through legal education and become "jargons" or "stock language" within the legal community. As a result, when a legal scholar talks about a legal term and its corresponding doctrines, other legal scholars can immediately understand what he means. This will not only help to improve the efficiency of communication within legal community and reduce the communication costs, it will also help to enhance the stability of legal norms and social order. This is why "every law gets analyzed by doctrinal scholasticism", as the saying in civil law studies goes. Such "doctrines", or legal theories, constructed by civil law scholars, will be even easier for the legal community to understand, master and spread if they get more symmetrical formally and more systemized structurally. In other words, they will be more efficient.

Such notion of efficiency is even more significant for the latter dimension, as the civil laws influenced by dogmatic scholasticism will directly become the restraints and incentives for people's behavior in civil society. Whether civil law scholars acknowledge them or not, these restraints and incentives are an objective existence. Different institutional designs, as influenced by various legal doctrines, may provide incentives very different in their direction and intensity, which will bring different social costs to the parties concerned. This requires legal scholars, when constructing civil law doctrines, to conduct a thorough assessment of the objects, effects and consequences of the incentives as provided by the institutional designs and to make a comprehensive comparison of the various options in order to determine the most economical option. This is a point extensively demonstrated throughout the cases mentioned so far. It has been demonstrated in the macro transition from relying on state directives to depending on a system of civil law and the changes in the General Principles of the Civil Law. It is also manifested by practical issues of lease registration as a requisite for lessee to claim the validity of the leasing contract upon change of ownership, the defaulting party's right to terminate the contract, the surge pricing mechanism of ride-hailing apps and the right to claim for punitive damages in "buying-fake-while-knowing-it" cases. Sound legal

doctrines should reflect the notion of efficiency, by systematically providing economic reasons for recommending one institutional design over another and their corresponding principles in morality and political philosophy in order to avoid making uneconomical judgments. A careful evaluation of such institutional designs based on the notion of efficiency will in turn help improve their underlying doctrines.

To develop the notion of efficiency in civil law scholarship, in addition to establishing the operational essentials as mentioned above, it is also necessary to make two extra points. First, in the framework of efficiency analysis, the role of models and quantitative analysis in economic analysis should be accurately understood in order to avoid rejecting efficiency analysis due to misunderstanding. Second, outside the framework of efficiency analysis, the relations between “pursuing efficiency” and “pursuing fairness” should be treated rationally to avoid being stuck in invented contradictions and toying with inevitable economic effects after selecting certain institutional designs.

Efficiency Analysis and the Application of Models

Some legal scholars choose not to apply economic efficiency analysis because they equate it with mathematical model analysis that is not familiar to them (Ye, 1997, p. 36). Indeed, a large amount of modern economic studies today uses models that seem complicated to laymen. Briefly, “the model is the simplicity of things, which represents how a specific mechanism runs by removing interference factors”(Rodrik, 2017, p. 14). In situations involving complicated contexts, it is helpful to simplify, and code into a model those factors that will have a significant impact on the choices and consequences of people’s behavior, so as to demonstrate and comprehend interactions and changes between different factors (or “variables”) in a more straightforward and accurate way. Parabolic lines, for example, which do not exactly match the actual trajectory of the tossed object, can help to visualize the parabolic trajectory, making it easier for us to understand how fast an object is moving at different positions on the trajectory. As other examples, “a plastic model of the respiratory system shows only the details of the lungs, ignoring other parts of the body; an architect may create a model to reflect the landscape around a house, or to show the layout of the house; economists’ models are similar, but not physical, they are symbolically expressed in language and mathematics instead” (Rodrik, 2017, pp. 14-15).

It would be wrong to assume that all economic models are complex, or that we cannot understand economic efficiency without resorting to mathematical models. Quite the opposite, mathematical models are merely an auxiliary tool for understanding socio-economic rules. Much of the economic knowledge is so clear and simple that jurists can fully comprehend it simply through sincere communication, with no need for models’ assistance. This can be proved by the above economic efficiency analysis on many civil law cases at the macro, medium and micro levels. In fact, influential and groundbreaking economic theories and principles in history were rarely presented through complex mathematical models. Instead, most of them are based on life experiences that can be

perceived universally. *The Wealth of Nations* by Adam Smith and *The Problem of Social Cost* by Ronald H. Coase are two typical examples. This is mainly because the accuracy of understanding economic efficiency in alternative institutional designs is a matter of degree^①. Our pursuit of such accuracy should go no further than the extent to which it can help make comparisons and choices among these institutional designs. After all, economic efficiency analysis itself is not free, and the costs will rise higher as the analysis becomes more microcosmic and precise. “Theories are better when they are cost-efficient. A more precise theory also means a higher cost and it is not necessarily a bad deal for a theory to sacrifice its accuracy in exchange for a lower knowledge threshold. Therefore, in terms of the function of a theory, its accuracy is not a must, but a choice under various constraints (Ji et al., 2016). In particular, there is a huge difference between the work of legal scholars and that of professional economists, since the former have to make timely evaluations on all kinds of practical problems (disputes). Even if jurists are capable of applying models to analyze the economics of legal systems, the precision of their analysis of the systems’ economic effects is meant to be limited. At least, in most cases, it is difficult (and unnecessary) to resort to complex analytical models.

In recent years, more and more civil law scholars have been paying special attention to incentive effects when analyzing the civil law system (Zhu, 2016). A good deal of literature also provides in-depth studies on the incentive effects of certain rules of civil law and relies on simple statistical models to evaluate the economic advantages and disadvantages among various institutional options (Zhang, 2016). Other academic literature borrows the current popular “proportionality” theory in administrative law scholarship to introduce the basic idea of economic efficiency to civil law scholarship (Ji, 2016), and has put it into application in some studies of certain rules of civil law (Xu, 2016). Nevertheless, more than a few civil law scholars fail to accurately understand the functions of “statistical models” in efficiency analysis. They apply statistical models without considering whether it is necessary or whether the targeted audience is able to comprehend or accept such a method. Therefore, they end up sending a confusing signal to those legal scholars who do not have a clear understanding of efficiency. Either way, it is safe to say that models have to be used carefully by legal scholars in civil law studies.

Efficiency Analysis and the Quantification of Costs

As emphasized above, analysis of different institutional designs requires that their economic costs for the relevant parties and society as a whole be carefully assessed and compared. Yet how should civil law scholars make such assessments and comparisons? Does each cost need to be quantified separately? This is also a point where efficiency analysis is easily misunderstood. To understand this accurately, it is necessary to discuss the purpose of finding out transaction costs.

While transaction cost is a popular concept, even in the eyes of economists, “how to measure

^① I thank Professor Henry Smith for his helpful comment in this regard during our talk on the bus in Jan 2013 in Geneva when we were there for the GHRS conference.

transaction costs is a problem that is devilishly hard to solve” (Williamson, 2016, p.4). Besides, even when it can be accurately measured, it would be meaningless to know only the transaction costs of a single institutional design. The whole process is only meaningful when we start to compare the transaction cost caused by different designs and examine their advantages and disadvantages from a comparative perspective. Therefore, “the comparison of transaction costs of the various alternative system schemes is the golden key to the problem” (Williamson, 2016, p.4). To make this comparison, we do not need to quantify all the transaction costs to be compared one by one. On the contrary, all we need is a conscious awareness that alternative designs can be comprehended through the incentives and socio-economic impact they bring and an analytical habit to observe the logic behind people’s behavior based on real-life experiences.

Here, the debate over planned economy and commodity economy made by the early generation of scholars in Chinese civil laws is a convenient example. Another example is Article 16 of the Company Law of the People's Republic of China, which suggests that guarantee be made upon resolution. If Article 16 is regarded as a mandatory provision on validity, a creditor will be encouraged to verify whether the company has made a resolution for guarantee when accepting it. If, on the other hand, the said article is to be seen as a mandatory provision for administrative purposes, directors or shareholders of the company, who usually work separately, will be encouraged to take measures on a daily basis to prevent the company's legal representative or other capable persons from tendering guarantees *ultra vires*. Obviously, it is less costly to have the creditor bear the cost of a formalistic examination on whether “the company has made a resolution for guarantee,” rather than have the dispersed directors or shareholders prevent the company’s legal representative from tendering guarantees *ultra vires*. Therefore, it is a more efficient option to categorize Article 16 as a mandatory provision on validity.

Efficiency Analysis and the Goal for Fairness

Some legal scholars underestimate the function of efficiency analysis because they tend to set efficiency and fairness against each other at an abstract level. Yet this is nothing but a common myth in the legal community, especially after Richard Allen Posner’s ambiguous representation of mainstream economics got passed around among legal scholars in America^①. Now the same thing is happening again. In fact, mainstream economists pay much attention to fairness and are keenly aware

① Legal scholars in China are greatly influenced by Richard Allen Posner in terms of economics and the latter is often regarded as an authority of the discipline of economics. Indeed, Posner once played an important role in the law and economics approach. In particular, he was the first to introduce the knowledge of economics to the legal community, and he set himself as an example and insisted on applying it in trials and in academic research. Yet economics, or the law and economics approach, is an obvious weakness of Posner compared with his insight into jurisprudence. Like some legal scholars who pick up economics halfway into their careers, Posner never learned the subject systematically. From the very beginning, he misunderstood some key issues in economics and passed such misunderstanding around. This set up some false targets for legal scholars to go against, leaving economics as a subject deeply misunderstood and even intuitively opposed by legal scholars. An example is Posner’s misconception about wealth maximization in his early years. See Louis Kaplow, & Steven Shavell, 2001, p: 996. Another example is his early misconception about “zero transaction cost”. See Oliver E. Williamson, 1994, p: 201 and pp: 201–203. In fact, since the 1970s, some graduates with professional economic education (and some at the same time are trained in law as well) have flocked to law schools, developing and teaching the law and economics approach. They have become a major force in this approach.

of the price of inequality (Stiglitz, 2013, pp: VIII - IX (preface); Sen, 2002). They are also devoted to studying practical problems, such as whether it is possible to achieve a specific social equity goal and how to do it more efficiently. To economists, “an efficient market economy should be a laws-based economy founded on morality that is related to fairness and justice, not a disorderly one full of selfish desires and deceptions, with people benefiting themselves by harming others” (Yang, 2000, p.47).

Economists usually make a strict distinction between what it ought to be, or judgments based on the idea of fairness, and what it actually is, or judgments based on objective facts (in other words, the problem of value judgment and the problem of factual description). However, mainstream economic research focuses on the latter, so it is mainly a descriptive or explanatory science which focuses on objectively describing the differences in incentive effects and social consequences among alternative system schemes. In other words, it explains the deep causes for various socio-economic phenomena (Friedman, 2001, p. 4). This has left some legal scholars with a wrong impression that economists “only pursue efficiency, not fairness”. However, many economists are never indifferent to the former. They simply believe that questions of value need to be answered through serious discussions of political or moral philosophy (Mankiw, 2007, pp.30-36).

Notice that this is not to say that the descriptive analysis on the economic effects of alternative institutional designs is not important for answering the questions of value judgments at all. On the contrary, it is very important, especially for civil law. On one hand, we generally assume that civil subjects have equal capability to engage in negotiations and transactions and therefore have interchangeable social status. As a result, institutional designs that are efficient for the entire civil community are also efficient and beneficial for every single individual. This point, so universally accepted as it is in the civil law studies, often gets neglected. On the other hand, even in situations where there is a need to protect vulnerable groups, i.e., situations where there is a clear goal for fairness or a coefficient for such fairness, we still need to devise system schemes that can achieve this goal in a more efficient way (Adler, 2013). The above discussion of “buying-fake-while-knowing-it” is a typical example.

In addition, the accurate understanding of an institutional design’s economic effects will in turn influence our value judgments (Friedman, 2001, p.4), which will help to evaluate the possibility of achieving the proposed fairness goal and thus avoid being obsessed about how “legal norms should always be observed simply because they are authoritative” (Xue, 2012). Indeed, value pluralism and the reconciliation among different values are the basic characteristics of this era (Xie, 2014b). However, in many debates, the disputes over values among legal scholars are only apparent, behind which are divergent factual judgments of the social-economic effects caused by the same system scheme. If they can honestly and patiently analyze the underlying factual issue, they will eventually realize that they have no disputes over values after all.

The reality, however, is that some scholars are not accustomed to analyzing the economic effects of a given institutional option. Nor are they patient enough to do so. Instead, they tend to directly resort to values, rather conveniently, when discussing practical problems. This way of thinking and

debating is not so hard to account for. “It is often easier to question a man’s motives than to answer his arguments. By treating those who hold different views as ‘bad’ people who want to achieve ‘bad’ goals we can shorten the arduous process of analyzing and gathering evidence and at the same time win over public indignation and moral fervor to support our views” (Friedman, 2001, p. 6). The issue of surge pricing during peak hours discussed above is a typical example. For another example, in the academic discussions on the automatic renewal of the right to use construction land for residential houses in recent years, civil law scholars have had a fierce debate on whether to pay a renewal fee for the automatic renewal. Out of the good intention of protecting citizens’ property rights, some civil law scholars propose that the right to use construction land for residential houses shall be renewed free of charge. Well-intended as such a proposal is, it fails to consider “the differences between residential houses for basic standard of living and residential houses for investment”. It also fails to address the problem of “how to guarantee the basic standard of living for people without housing after a universal free-of-charge renewal”. A policy proposal like this, based only on an unexamined idea of fairness, often does not bring fair results. By contrast, it would be more feasible and more likely to achieve fairness if a dual renewal fee is determined separately for “residential houses for basic standard of living” and “residential houses for investment” after considering the relevant public utility cost that is necessary (Sun, 2016).

In conclusion, in order to promote the notion of efficiency in civil law studies, it is of great significance to clarify the relation between efficiency and fairness in practice, and to find the accurate perspective and extent for conducting efficiency analysis in civil law studies (Li, 2017).

Conclusion

This article expounds the significance of the notion of efficiency, as a commonly preferred mindset of human beings, in civil law scholarship by tracing the historical development of China’s contemporary civil law and reviews the present situation and problems of this notion in Chinese civil law scholarship. This article investigates into the reasons that have hindered the establishment of a clear and precise notion of efficiency in civil law scholarship and reflects on how to develop a more clear and precise notion of efficiency in civil law scholarship of China. In fact, in recent years, some scholars have made good efforts in this aspect, such as trying to introduce “the principle of proportionality”, an instrument to express efficiency that is widely used by public law scholars, to promote the notion of efficiency in civil law studies. They also begin to consciously assess the economics of various institutional options in a large number of studies on institutional designs. This article aims to further reveal and elaborate the notion of efficiency as indirectly expressed through “the principle of proportionality” and hopes to meaningfully add to the theoretical progress on it.

It needs to be reiterated that, both proportionality and economics, as emphasized by the principle of proportionality and the notion of efficiency respectively, focus on the more diverse transactions than monetary and physical ones and point to much more exchange scenarios in market economy

as well. The pursuit of efficiency, as a behavioral tendency rationally chosen by people, can be widely applied to various economic and non-economic social interaction activities. In addition to the property transaction scenarios between equal subjects, it includes other civil activities with obvious characteristics of fair distribution such as consumption contracts and labor contracts while also covering interpersonal relations with strong moral and ethical dimension, such as those of personality, marriage and family. In these scenarios, on one hand, a comprehensive and precise assessment of various alternative system schemes in terms of their potential behavioral incentive effects and social-economic effects helps to examine whether their purposed goals of fair distribution and moral ethics are feasible and appropriate. On the other hand, even if such feasibility and appropriateness are determined in the level of political philosophy and moral philosophy, it is also necessary to use rational thinking and select those schemes that are conducive to achieving the goals while also being able to minimize the cost. In this regard, this article only involves a few issues such as consumption contracts. Many other issues are worthy of further exploration.

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Rural Land System Reform Pilot Experiment in Pidu District: Background, Debate and Enlightenment

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Abstract: By combining top-level design with local pilot practices, rural land system reform, as an important priority on the agenda of deepening comprehensive reform, has accumulated a series of replicable and applicable experiences that are conducive to amendments to relevant laws. This paper takes stock of the basic experience of Pidu District in addressing typical problems arising in its rural land system reform and then investigates the inner link between the reform and the persistence of high housing prices in cities, the capital flowing to the countryside, and the rural revitalization program. Based on this analysis, the author puts forward three basic directions of the rural land system reform: remain committed to marketization, balance the interests of all parties and promote the development of rural industries.

Keywords: rural land system, reform, Pidu District, pilot experiment

Since the first *Land Administration Law of the People's Republic of China* was promulgated in June 1986, a dual urban-rural structure has been in existence in China. With regards to state-owned and collective lands, the law has different institutional arrangements. For instance, collectively owned construction land shall only be used as workplaces for townships and village enterprises, construction sites for rural public facilities and public welfare

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causes and residences. For all other construction uses, the land shall be state-owned. It is undeniable that the foregoing institutional arrangements have met the objective needs of giving priority to urban expansion and promoted the rapid accumulation of social wealth represented by real estate. But this has suppressed the functional value of rural land. Over the past years, “cities regurgitating villages” has become an important way to bridge the urban-rural gap. Reform practice, however, has proven that it is difficult to narrow the “chasm” only by “regurgitating” or, to put it more clearly, “giving more and taking less”. Achieving equality of urban and rural property rights, especially land property rights, entails concentrated efforts on “putting rural land into actual use”, i.e. putting and using collectively- and state-owned lands on an equal footing allowing farmers to share more of the gains from the added value of land.

Since China’s central government launched the rural land system reforms in farmlands, commercial collective lands for construction uses, and homesteads in 2015, some impressive progress in pilot projects have been made, but new issues have surfaced along the way. For instance, the lack of coordination between reforms in farmland, commercial collective lands for construction uses and homesteads and the slow progress in land requisition system reforms. To deal with these new issues, the Standing Committee of the National People’s Congress approved the *Decision of the Standing Committee of the National People’s Congress to Extend the Period of Authorizing the State Council to Provisionally Adjust the Implementation of the Provisions of Relevant Laws in the Administrative Regions of 33 Counties (Cities and Districts) under the Pilot Program including Daxing District of Beijing Municipality* (henceforth referred to as “the Decision”) on November 4, 2017. As per the *Decision*, the period of authorization will be extended to December 31, 2018. By leveraging the starting advantage possessed by Chengdu as one of China’s pilot reform cities targeting coordinated rural and urban development through reforms in all sectors, Pidu District has conducted sample tests and practice examinations to the pilot systems, rules and results. Therefore, it has not only made an all-around breakthrough in “quantity”, but also made a great improvement in “quality”, thus effectively solving a multitude of problems in practical operations, further clarifying the inner link between different reforms and offering a way forward for advancing rural revitalization through the rural land system reform program.

Basic Experience of Pidu District in Rural Land System Reform

Property Rights Division – Enhancing Active Participation of Social Capital

Before 2016, Baiyun Village at Hongguang Town, Pidu District was a typical rural village. Fragmented land, decentralized operation and inefficient output made it an epitome of the majority of Chinese rural villages today.

In 2016, the deep-pocketed Ping An Insurance (Group) Company of China made a strategic investment in Tony’s Farm at Baiyun Village. By virtue of the insurance funds which are featured

by “a big sum, a low cost and a long cycle”, the problems of “substantial investment, long cycle and slow return” plaguing urban modern agriculture were effectively solved. But how to yield appropriate returns through participating in developing rural industries remained a general concern among social investors. Obviously, it is difficult to meet the requirement of capital investments in returns by only relying on the industrial chain of organic agriculture and the subsidies granted by the government, given the important task ahead of leading local farmers to increase their income and achieve prosperity. On this note, how to put commercial collective land for construction uses as well as existing buildings into actual use and ensure liquidation from the division of rights of properties registered as immovable property is considered to be the “last mile” to achieving integrated coordination between reforms.

To crack the hard nut of property rights division and avoid the policy of “banning real estate development on collectively-owned land”, Pidun District decided that the corporate juridical person should be a prerequisite for being qualified to participate in property rights division of immovable property. The logic behind the decision is that companies are defined as profit-making organizations by the Company Law and this status is consistent with the commercial service purpose of commercial collective land for construction use. Starting from this decision, Tony's Farm succeeded in dividing the rights of multiple properties on the same land parcel. Although a smooth path has been created in practice, the logic is still thought-provoking. Commercial collective land for construction use and on-land buildings are registered as immovable property with legal property rights and the division of those property rights should not be subject to restrictions when the division conforms to relevant development plans. I believe that it is “developed, or developed in any disguised form, commercial residential buildings on the collectively-owned land” and “urban citizens' purchase of rural homesteads and houses” remain the main restricted zones under current laws and policies, rather than “developing real estate on collectively-owned land” in general terms. With regards to why to set the aforementioned restricted zone, concern over the possibility that commercial residential buildings on collectively-owned land may deal a blow to the real estate market, or that a large influx of urban citizens buying homesteads may pose a threat to the residence of farmers can provide some explanation. Even so, difference should not be drawn between the corporate juridical person and a natural person which are two types of property right division subjects of commercial real estate on land for commercial use, if the commercial real estate is not developed or sold in a disguised form. Therefore, I contend that there is no need to make the ownership type as a prerequisite for property right divisions in practice.

It is quite foreseeable that the property rights division of Tony's Farm as a demonstration case is bound to boost the confidence of social capital in participating in developing rural industries, thus driving a sound flow of capital to rural areas. There is, however, one caveat. Currently, a great deal of social capital is available for developing commercial residential buildings on collectively-owned land in the name of rural revitalization, and how to eradicate this situation is a necessary imperative for establishing a sound risk prevention and control system with a specific focus on the pre-review and

process supervision of social capital.

After-supply Supervision – Disposing Idle Land in Full Compliance with Relevant Laws and Regulations

According to the ledgers on Pidū District's land parcels entering the market, by the end of 2017, 33 parcels of commercial collective land for construction use have entered the market. Among them, construction of 10 projects have commenced, accounting for 30.30%; 6 projects, accounting for 18.18%, have been completed and put into operation; 23 projects, accounting for 69.70%, are still in the planning stage.

To advance the land that has entered the market to generate revenues as soon as possible and avoid the scenario of leaving land idle, the local government stipulated deadlines for when to begin and complete construction in the transfer agreement template for commercial collective land for construction use. But in practice, construction failed to start or was delayed due to combined factors including changes in the market environment and design plans, as well as the mentality of waiting for a price rise of transferee. As a result, a good portion of the land entering the market has been left unused, and thus the goal of driving the development of local industries through the land entering the market has also been disillusioned. Unlike state-owned land, there is no clear provision in relevant laws and regulations for idle commercial collective land for construction use, and even the *Measures for Disposal of Unused Land* released by former Ministry of Natural resources of as a departmental rule only serves as reference points. The land administration authority, as the owner or the right-of-use owner, cannot intervene. Against this backdrop, how to optimize the allocation of idle land in a form that can further meet the requirements of relevant regulations remains high on the agenda of reformers.

With regards to these problems, Pidū District has taken multiple measures to advance the development of idle land. First, it further improved the transfer agreement template to stipulate the time to commence and complete construction in a more definite and specific manner. Leaving land idle is deemed a breach of the agreement by the transferee under relevant liabilities, thus providing grounds for remedies on a contractual basis with clearly defined methods for calculating damages. Second, it allowed transferors to engage professional lawyers to send a lawyer's letter to inform transferees who let the land remain idle for a long term of their breach of agreement and possible consequences, and urge them to begin construction as soon as possible. For instance, in the Qinggangshu Village project, the collective asset management company succeeded in urging transferee to start project construction by sending a lawyer's letter. Third, it perfected the exit mechanism for transferee. When transferee suffered some objective difficulties like capital chain ruptures, they may fail to continue land development as agreed leaving projects uncompleted or land unused, and therein lays the cause of Pidū District's endeavor to establish an exit mechanism for transferee. Under the mechanism, on condition that the interests of the collective and farmers are guaranteed and the consensus between transferor subjects and transferee subjects is reached,

the transferee is allowed to return all or part of the land that has entered the market to the transferor subjects so as to ensure the more effective utilization of land. Through this Forced Mechanism, Pidu District has kept a tight rein in both obtaining land and utilizing land that has entered the market. For example, on February 19, 2016, a natural person obtained the 3.14 *mu*[0.21 hectares] of land of No.3 Sub-community of Xinghuo Community at Xinminchang Town but repeatedly delayed construction. Therefore, as agreed between the two parties, Xinghuo Asset Management Co., Ltd. of Pixian County was installed to handle the procedures for refunding for the part of the land returned.

Revenue Accounting – Making the Distribution of Gains from Added Value of Land More Transparent

How to help farmers share more gains from the added value of land is a to-the-point requirement put forward by the policies of the central government to pilot districts and counties. Through advancing the coordination between land requisition and commercial collective land for construction use, Pidu District is making a two-pronged effort in narrowing land requisition scope and putting collectively-owned construction land into actual use to make clear the calculation and distribution methods and main uses of such gains via conducting accounting and comparison of gains.

First, the calculation method is clearly defined. For the land requisitioned, the gains are defined as the net proceeds of the revenues derived from transfer of state-owned land minus compensations for demolition and settlement due to land requisition, fees for land reclamation, fees for the paid use of newly added construction land, fees for land development and tax fees due to provision. Compared with the gain calculation method for land entering the market which collects adjustment funds based on the transaction price, the calculation method for land requisitioned is clearer and more reasonable.

Second, the distribution method is reasonably defined. Based on the different sources of gains from the added value from requisition and conversion of collectively-owned land or conversion of state-owned farmland, a sharing distribution model covering three levels of district-level government, sub-district and village (community) is introduced. In comparison with the previous one-size-fits-all requisition compensation model, this new model can increase the net revenues by 10% for either the collective or the farmers, which demonstrates the superiority of this innovative mechanism.

Third, the main uses are clearly stipulated. In order to balance the needs between urban and rural development, the bulk of the gains from the added value of land are spent in urban investments and construction. Although the development needs in rural area are less than those in urban area, it is an undeniable fact that rural infrastructure is backward. Against this backdrop, the policy mechanism decided to reserve 10% of gains from the added value of land for local infrastructure construction and one-time living allowances to land-requisitioned farmers in cash in order to enhance their sense of gain.

Comments on Several Problems Relevant to Pidū District's Rural Land System Reform

Relationships Between the Persistence of High Housing Prices in Cities and the Rural Land System Reform

As a top priority of China's endeavor to deepen rural land system reform in an all-round way, the land requisition system reform involves adjustments for a more diversified interested parties and a more complicated interest pattern because this reform not only has a direct effect on both the collective and the farmers in the land requisition areas but also relates to the financial revenues of local governments and the future trends of local real estate markets.

In 2017, Pidū District decided to implement three projects of land expropriation system reform including two fire station construction projects and one road construction project. When these projects started construction at the beginning of the year, dismantlement units and dismantlee farmers agreed to the dismantlement compensation standard, method (monetized resettlement), amount and other aspects, however due to a hike in the housing prices across the real estate market in Pidū District in 2017, the agreed compensation standard and amount cannot cover farmers' costs for buying commercial houses in the neighborhood of their towns. In view of this, the dismantlement project on the land requisitioned began but farmers refused to sign the compensation agreement, leading to the suspension of issuing the advance requisition notice.

Local governments have long been relying on the fiscal resources brought by land, and such dependency cannot be shaken off within a short term. Pidū District is the epitome of current county-level municipal governments. On the one hand, this district must rely on land financing, given that it still serves as an important prop for driving local economic development and meeting public service needs. On the other side, this district is attempting to gradually reduce its dependence on land financing through land financing system reforms. It can be easily seen from Pidū District's case that although local governments have impetus for reform, they still cannot overcome their dependence on their original paths in dealing with the realistic problem of how to maintain sustainable development. As a matter of fact, land requisition system reform is not merely a reform at the land system level, but a top-level government-wide overhaul of the finance and tax system. In this connection, it is obvious that by merely depending on advancing land system reforms, some daunting challenges will still arise along the way to accomplishing the goals, like "narrowing down the land requisition scope", "striking a basic balance in the sharing proportion of gains from the added value of the land requisitioned for other use and the commercial collective land for construction use entering the market between the state and the collective" and "making farmers share more gains from the added value of land". This fact has been proved by similar difficulties encountered by other pilot cities and counties in land requisition system reform. Therefore, how to holistically plan the land requisition system reform from a systematic, coordinated and coupling perspective is the key to whether the reform can achieve the

desired effects.

Relationship Between the Capital Available for Investment in the Countryside and the Rural Land System Reforms

Encouraging and guiding social capital to the countryside has remained a consistent direction upheld by the central government, but meanwhile it should also take measures to keep industrial and commercial capital in compliance with relevant laws and regulations to prevent potential harm to rural areas. With regards to the non-existing commercial collective land for construction use, the land consolidation process before the land enters the market would be both time-consuming and money-consuming. By current common practice, village-level collective economic units and social capital will jointly evaluate the costs for land consolidation. For social investors, their cash investment generally includes compensations for old buildings dismantled and attachments thereof, fees for constructing residential communities for relocated dismantlees, makeshift fees for farmers, fees for rehabilitation and expenses relevant to project approvals, planning and designing the resettlement houses and comprehensive project acceptance as well as interest generated by the capital during the period, etc. Based on the estimate of the total investment and the area of commercial collective land for construction use entering the market to be consolidated, a selling price agreed for the land entering the market can be calculated.

Actually, social capital has an edge in participating in land consolidation projects – it can help improve local housing conditions and environments through “substituting cash for resources”, and help promote local industrial development and create more jobs for local people thus creating a win-win scenario through introducing agricultural industrialization projects. But as the reform is still in the exploration stage, attention should be paid to multiple details. First, whether the cost price for land consolidation jointly fixed by social capital and a village-level collective unit before investment can reflect the real market price after the land enters the market in the future. Second, whether the main investment model of social capital – first- and second-tier coordinated land development – can see to it that the land transfer is transparent, fair and equitable since the village-level collective unit and the social capital are “closely bundled” together. Third, whether the contract is legal or reasonable, given the fact that the land consolidation investment agreements in some areas may include deals stipulating that social investors can share in premiums if they fail to win the bid in the open transaction market and their transaction prices may be higher than the agreed-upon land consolidation costs.

Judging from relevant provisions on the transfer management of state-owned construction land, agreement-based transfers of commercial land, first- and second- tier coordinated land development models, premiums sharing and other aspects all are banned by policies. Whether this should also apply to commercial collective land for construction use is still unclear. Since Chengdu launched the rural collective property rights system reform in 2008, farmers have enhanced their awareness of land property rights and have strengthened their negotiation ability for market negotiations through confirmation, registration and issuance of certificates and rural property circulation. Even so, whether

social capital would follow the profit maximization principle to introduce a series of methods like agreement-based transfers, coordinated developments and premiums sharing at the cost of harming the interests of the collective and farmers after the model is replicated in other areas is still to be observed and prevented.

Judging from rural practices, social capital not only invests capital in rural areas, but also advanced technology, management experience, business models and other resources. Although business profits are its main pursuit, securing the lawful rights and interests of social capital whilst giving consideration to the interests of the state, the collective and the farmers is the only way to really advance “Capital to the Countryside” and inject more vitality into the integrated development of primary, secondary and tertiary industries.

To address the reality that existing collectively owned construction land is mostly of low location value and has made a limited contribution to industrial development, the fragmented parcels of collectively-owned construction land transferred within counties are consolidated to add development and exploitation value. Due to the high cost of consolidating the fragmented land parcels, how to encourage and guide social capital to the countryside, set up a rational investment and exit mechanism, give social capital equal status and property rights protections, and secure its appropriate access to gains from the added value of land is not only in line with the spirit of Opinions of the General Office of the CPC Central Committee and the General Office of the State Council on Strengthening the Protection of Intellectual Property Rights, but also in accordance with the goal of maximizing profits for all parties. Therefore, relevant policies on guiding and encouraging social capital’s participation should be formulated in order to keep a tighter rein through procedures and important documents on the acts relevant to commercial collective land for construction use (land for commercial use) like agreement-based transfer in disguised form, first- and second- tier coordinated land development models and premiums sharing that may harm the interests of the collective and the farmers, open a passage for the rational exit of social capital to unleash to the greatest extent the value of commercial collective land for construction use and see to it that the state, the collective, the farmers and even the social capital willing to invest in innovation and entrepreneurship in rural areas can really share more gains from the added value of land in a better way.

Relationship Between the Rural Revitalization Strategy and the Rural Land System Reform

The Rural Revitalization Strategy put forward in the Report at the 19th National Congress of the Communist Party of China points out an important strategic direction for future rural reforms and development. As an important item on the agenda of deepening rural reforms, rural land system reforms are a basic project underpinning future rural development which will not only bring about a steady rise in farmers’ operational and property income but also serve as an important bridge between rural industrial development and improved infrastructure, and industrial and commercial capital. With regards to the Rural Revitalization Strategy, I think that rural land system reforms should be given top priority to the rural property circulation of land owned by the collectives and the farmers

with a specific focus on advancing rural land system reforms under the guidance of the marketization concept.

From the perspective of homestead reforms, as a more and more important asset type for farmers, homesteads are bound to combine more paths to give play to their value as a property in addition to a granted dwelling place with the implementation of the separation of its ownership rights, contract rights and management rights. Moreover, giving a makeover to rural living conditions and appearances cannot dispense with the implementation of all kinds of land consolidation projects. Therefore, how to put homesteads into actual and efficient use to bring their security functions and other property attributes into play still needs efforts in removing institutional barriers in links like exits and utilizations on a reimbursable basis, so that urban residents can also achieve free mobility of rural and urban factors through a market-based way. Sichuan province will reportedly introduce the specific plan for advancing the separation of the ownership rights, contract rights and management rights of homesteads, which will provide a strong impulse for helping the rural revitalization strategy make progress in land reforms.

From the perspective of reforms on commercial collective land for construction use, how to develop industries and boost collective economies also needs to promote sound integration of the secondary and tertiary industries, in addition to developing the primary industry. As shown in the case of Pidū District's commercial collective land for construction use entering the market, equal emphasis has been given to ecological performance, social performance and economic performance through adjusting the linkage between the projects entering the market in water source conservation zones and agricultural products deep-processing zones. For instance, by introducing quality industries, Tony's Farm project in Hongguang Town has solved the core problems of transferring farm lands on a large scale, improving rural living conditions and shifting rural labor, and identified a sustainable industrial development path for developing and boosting the local collective economy, thereby bringing about a tremendous change to rural areas.

In my view, the relationship between the rural revitalization strategy and the rural land system reform should be approached from the following aspects.

First, putting a rural land system into actual use is a prerequisite for "thriving businesses". The traditional relationship between rural and agricultural development patterns and production has kept a stranglehold over developing rural industries and raising farmers' incomes, so the land system is in great need of breaking this stranglehold. With the premise of holding firm to the nature of public land ownership, not crossing the red line for arable land and not harming farmers' interests, efforts should be made to infuse more vitality into rural land systems, for only in this way can it become a real prop for "thriving businesses".

Second, implementing rural land projects is a means of creating "pleasant living environments". Over recent years, Pidū District, and even Chengdu have doubled their efforts in implementing projects for the comprehensive consolidation of rural land, thus giving a great makeover to rural production and living environments. Specifically, through reconstructing houses on their original

homesteads, newly constructing houses on other land and so on, an important change to rural “small dwelling environments” has been brought about. Through optimizing local infrastructure and public service facilities after these projects were implemented, a substantial improvement has also been made in rural “middle dwelling environments”. Through integrating and optimizing the various plans within the district, taking the improvement in water source conservation zones as the starting point and relying on adjusting the policies on land entering the market, industrial development and ecological protections have been coordinated. In the long term, the improvement in “big dwelling environments” will be conducive to improve the local overall environment.

Third, “social etiquette and civility” and “effective governance” are extension effects brought about by rural land system reforms. Taking the reforms on land entering the market as one of its priorities, the rural land system reforms have implemented a diversity of land projects to help farmers move into newly built settlements, which have departed from the original governance structure based on administrative villages and groups and brought a change to traditional production patterns and lifestyles. By virtue of consistent efforts in publicizing social etiquette and civility and guiding the governance of collective economical organizations and their internal governance structures by all departments within the government, marked results have been made in “social etiquette and civility” and “effective governance.”

Fourthly, as to “prosperity”, the implementation of rural land system reforms and the improvement in transportation and road networks have further raised the value of farmers’ houses in terms of renting or mortgaging despite the restrictions on transfers. After their rural land is transferred to proprietors in a uniformed way, farmers can get stable rent incomes, thereby seeing a remarkable rise in property incomes. After primary, secondary and tertiary industries are introduced, a large number of farmers are attracted to work in those industrial parks, thereby increasing their salary incomes. As the collective economy is scaling up, farmers as shareholders have shared in the collective revenues and dividends, thereby enhancing their sense of gain and happiness. As these forms of income combined, the income gap between urban and rural residents will be narrowed and the goal of “prosperity” will be accomplished step by step.

Thus, we should realize the rural revitalization strategy by pursuing rural land system reforms, whose result is an effective means to assess whether the reforms are successful. At present, more synergic supporting policy systems relevant to land system reforms, like introducing new-type agricultural operation subjects, improving governance structures of collective economic organizations, developing full industrial chains for agriculture and advancing coordinated developments of primary, secondary and tertiary industries should be formulated in order to make the reform performance become more prominent.

Policy Enlightenment from Pidū District’s Rural Land System Reform

In 2018, Pidū District’s reforms for the land entering the market moved into a normal period –

the land requisition reforms established a relatively innovative system framework, the separation of ownership rights, contract rights and management rights of homesteads was making stable progress and the exploration for the secondary market of construction land was coming to an end. The following are three main points of policy enlightenment from the local pilot case of Pidu District's rural land system reform.

Rural Land System Reform Should Remain Committed to Marketization

Before the reform, rural land management systems were featured by administrative force, so the “closed nature” and “weak flexibility” therefrom has affected the external expression of the market value of rural land to a varying extent. Heavily influenced by the National Experimental Zone for Integrated Rural & Urban Comprehensive Coordinated Reform and the rural land ownership reform, Pidu District has held firm to the decisive role of the market in allocating resources, and has taken the market-based approach in both system designs and procedural rules. The following three aspects mainly reflect its marketization orientation. First, in order to advance the coordinated construction of markets for urban and rural construction land, it has remained committed to putting the two types of construction land on the unified market following the same rules, and adopted the means of open bid invitation, auction or listing for sale to ensure a fair and equitable result. Second, in order to help homesteads escape the stereotype as merely being a security property, it has brought Chengdu's paid withdrawal policy of homestead into full play to further diversify homestead property attributes to reflect their inherent market value. Third, during the land requisition system reforms, it has added a new link of organizing hearings for public interests, innovated a pre-approval Pre-Announcement mechanism and established a sharing mechanism for gains from the added value of land to see to it that dismantlee subjects can speak their minds and agree upon a dismantlement agreement.

In addition to these market-oriented reform directions, I hold that marketization should play a more pronounced role in the rural land system reforms, for there is still space for further exploration in multiple aspects like promoting market-oriented negotiations between the collective, farmers and social capital on an equal footing and improving the market-oriented system of rural land ownership transaction services.

Rural Land System Reforms Should Balance the Interests of All Parties

The core nature of rural land system reforms is to break the stranglehold of the backward ownership relationship over farmers' property rights to shape a new interest landscape taking into consideration the state, the collective, farmers and even social capital. In the past, homesteads were only used for dwellings, collectively owned construction land was only used by infrastructure and township and village enterprises and land requisition systems adopted the same old mandatory requisition mode no matter whether public interests or non-public interests were concerned. However, to ensure that the state, the collective, farmers and social capital can all share in revenues in a fair

and equitable manner, these past conditions should be changed. For instance, “adjustment funds for the gains from the added value of land” levied by the government is the basis for the state and the collective’s sharing in revenues from land entering the market, “gains from the added value of land” mean the second distribution of revenues from land between the state, the land-requisitioned collective and farmers, the distribution ratio of “2:8” determined by Pidū District for collectively-owned construction land serves as a guidance for the interest distribution between the collective and farmers, “investment agreements” represents a civil agreement on distribution of relevant interests between the collective and social capital, and “paid withdrawal (utilization) agreements for homesteads” reflects the distribution of interests between the collective and farmers, etc.

Albeit current policies have included different regulations on interest distributions, there are still some problems worthy of attention. For instance, the interest distributions during the land requisition system reform not only involves how to help local land financing make a smooth transition, but also how to coordinate interests and make sound choices between the reforms on land entering the market and the reforms on land requisitions. The basis for formulating these interest distributions still lacks convincing supporting data and empirical processes, so the possibility that some inequitable phenomena may appear cannot be ruled out. Therefore, observing and examining the results and effects of rural land systems reforms from the perspective of balancing interests among different subjects is quite a good method to reduce conflicts over interests and ensure smooth progress of the reforms.

Rural Land System Reforms Should Serve the Development of Rural Industries

Whether rural land system reforms can help rural areas achieve prosperity, create pleasant living environment and improve social etiquette and civility is a matter of general concern among rural people. However, system-level reforms can only activate the basic force for economic growth which still needs to rely on investment and construction which are largely determined by industrial development to give a real boost to local economic growth.

According to the investigations, Pidū District, Baiyun Village of Hongguang Town provided 300 *mu* [environ 20 hectares] of land for Tony’s Farm project through a village-wide overall land consolidation. In 2017, thanks to the project, the village saw a per capita income increase by RMB 27,000, and 312 villagers successfully found a job at Tony’s Farm after occupational training. With the implementation of the project, it is expected that the farm will still need more than 1,000 workers with an annual salary of RMB 30,000. It is not hard to draw the conclusion that to accomplish the primary goal of “thriving businesses” set by the rural revitalization strategy, the land system reforms must further meet the needs of industrial development and industrial development must drive rural land system reforms to make constant adjustments in its direction. Only the industries that are best suited to local development realities can really make reform performance become more pronounced, since bringing a change to rural areas and farmers through thriving businesses, rather than advancing unimpeded land circulation, is the radical purpose of the reforms.

Pidu District's rural land system reforms have achieved the desired results. On the surface, they have not only developed the local collective economy, but also helped farmers share more gains from the added value of the land and created better job opportunities for them. Beneath the surface, it has reshaped the urban-rural land interest landscape that has been unbalanced for many years and put it on track towards urban-rural integrated development. Looking ahead, some central and local fiscal and taxation policies, and the household registration system reforms that are closely associated with land reforms will not be in place in the foreseeable future, but we should be aware that reform is a progressive process that cannot be achieved overnight and entails continuous deepening and innovative effort.

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On the Compilation Modes of Local History of Science and Technology

— A Case Study of the History of Ba-Shu Science and Technology

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Abstract: The contents of “Ba-Shu History of Science and Technology” take up a single volume of *A General History of Ba-Shu Culture*. This paper attempts to explore compilation modes of the history of local science and technology by analyzing the compilation of “Shu History of Science and Technology”. There are three approaches available, i.e. a general history-based approach, a discipline-based approach and an integrated approach, also known as a discipline-specific approach based on general history. This paper considers the integrated approach to be the most feasible as it elaborates Ba-Shu culture as a sub-culture of Chinese culture, the connotations of Ba-Shu achievements in science and technology, the special significance of the history of Ba-Shu science and technology, as well as the latest progress in studying the history of Ba-Shu science and technology. This paper also puts forward a possible choice to better approach the compilation of the history of local science and technology, reveals areas worth improving, and indicates a proper direction to move towards.

Keywords: history of local science and technology, history of Ba-Shu science and technology, compilation mode

The study of the history of science and technology (also known as S&T history) comprises the study of the history of science and the history of technology. Science concerns understanding the world, with its achievements being knowledge systems. Technology concerns the transformation of the

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world, with its achievements being operating systems and physical products. Only by transforming the world can we gradually understand the world. Only by inheriting and developing the knowledge systems needed for understanding can we better transform the world. Thus, science and technology although different are closely related. “The connection between science and technology does not bring the two into an integrated whole; likewise, the difference between them does not place them into absolute opposition. Science and technology can sometimes be interactive in a variety of ways through a complicated process, rather than in one single way through a linear process” (Li, 2007).

A General History of Ba-Shu Culture consists of over 20 volumes, among which is the volume regarding the history of Ba-Shu science and technology. The introduction of the science and technology volume explains the significance of studying the history of Ba-Shu science and technology and its historical stages from a macro perspective (Zha, 2012). It first presents an overall framework of the history of Chinese science and technology and then a detailed account of the history of Ba-Shu science and technology including discipline or field-specific achievements.

The science and technology volume covers ancient achievements in technology, astronomy, mathematics, geography, agriculture, traditional Chinese medicine, the Dujiangyan Irrigation System, well salt mining, natural gas exploitation and metallurgy, local Taoist and Buddhist contributions to scientific and technological progress, Ba-Shu folk arts, crafts and techniques, as well as modern achievements in science and technology. More specifically, the chapters on Ba-Shu achievements in astronomy and mathematics mainly concern the area of science while other chapters touch upon both science and technology, although each of those chapters may only focus on one of the two aspects.

The history of science and technology is a brand-new discipline, and the systematic studies of the history of Ba-Shu science and technology have only recently started. Given that science and technology is a huge system of related knowledge, the material selection for this volume aims to highlight the merits of Ba-Shu science and technology and then to interpret its history in chronological order. Readers may notice that there are still many aspects left untouched in the discussion in this regard. The very existence of these blank aspects precisely indicates that more joint efforts are needed to improve the compilation of the history of Ba-Shu science and technology and to enrich people's knowledge and understanding of the general history of Ba-Shu culture.

The study of the history of science and technology around the world mainly follows two approaches. The first approach is from inside to outside, from discipline to society and from a single perspective to a comprehensive perspective. The second approach is from outside to inside, from society to discipline and from a comprehensive perspective to a single perspective. The history of science and technology generally refers to the scientific and technological history of the world. Over the past century, significant research findings have been made in this regard. There were many works specializing in the history of science and some works specializing in the history of technology. Also, there are an increasing number of works specializing in the study of the history of science and technology in an integrated way.

Scholars engaged in the writing and compilation of the history of science and technology

mostly feature an academic background related to science, technology, engineering and art and possess corresponding knowledge of philosophy, historiography, geography and sociology. Any type of scientific and technological history, be it the intellectual history (internal history), the social history (external history) or the combination of the two, has its own historical and regional scope, chronological clues, as well as theoretical framework. True classics on the history of science and technology, although being intellectually challenging, can have a profound and lasting influence on the development of science, technology and society.

There are two main approaches to the study of the history of local science and technology. The first approach is from big to small and from whole to part. The second approach is from small to big and from part to whole. Over the past century, tremendous research findings have been made. However, almost all are about the history of Western science and technology. Many countries have applied such a research framework to the study of their own history of science and technology and, accordingly, the history of Chinese science and technology has become a key research target which is different from the history of Western science and technology.

Inspired by the study of the history of Chinese science and technology, the academic circles of China began to study the history of local science and technology. For example, the study of the history of Ba-Shu science and technology has already made significant progress over the past three decades. Such a big-to-small and whole-to-part research approach has determined historical research clues. What is needed now is a small-to-big and part-to-whole research approach to deepen the study of the history of science and technology, shape a more comprehensive research model, better combine history with logic and promote the creative transformation and innovative development of science and technology. This is where the significance of studying the history of Ba-Shu science and technology lies.

Ba-Shu Culture: A Sub-Culture of Chinese Culture

What is culture? The core of culture is “way of thinking”; the medium of culture is “way of communication”; the shell of culture is “way of life”. Culture features relativity, diversity and variability and highlights man’s uniqueness and individuality.

What is civilization? The core of civilization should be respect of rationality, the medium of civilization is moral communication and the shell of civilization is a healthy life. Civilization features absoluteness, consistency and universality and highlights general acceptance and common grounds.

Different ways of thinking, ways of communication and ways of life give rise to different cultures. Throughout world history, geographically there have been Western cultures and Eastern cultures; religiously, there have been a diversity of cultures; ethnically there have been an even greater variety of cultures.

Since the Spring and Autumn Period (770-476 BC) and the Warring States Period (475-221 BC) China witnessed the “Contention of a Hundred Schools of Thought” and cultural exchanges among regions. Chinese culture was gradually shaped, becoming a mainstream of Oriental culture. By

region, Chinese culture can be divided into multiple sub-cultures, such as the Qi-Lu (now Shandong) culture, Zhongyuan (Central Plains) culture, Ba-Shu (Sichuan) culture, Jing-Chu (Hubei) culture, Wu-Yue (Eastern China) culture, Min-Tai (Fujian-Taiwan) culture, Qing-Zang (Qinghai-Tibet) culture and Xinjiang culture, all of which have contributed significantly to their superior culture, i.e. Chinese culture.

The Ba-Shu culture, being a sub-culture of Chinese culture, cannot be truly understood unless it is studied within the framework of Chinese culture. Chinese culture cannot be truly understood unless it includes the Ba-Shu culture. From the perspective of systems science, Ba-Shu science and technology is an organic part of Chinese science and technology. As modern science and technology develops, the significance of Ba-Shu science and technology is increasingly reduced to an historical and relative sense. Still, the study of Ba-Shu science and technology helps deepen the study of the history of Chinese science and technology.

The general history of a culture is supposed to be a work of high cultural values, rather than a mere piece of accumulated historical facts. As a sub-culture of Chinese culture, Ba-Shu culture must be demonstrated within the greater context of Chinese culture. Disciplines at the core of ancient Chinese science and technology, such as astronomy, mathematics, agronomy and medicine were mostly achievements made with the support of the then “state system”. For this reason, it is not possible to study and expound the history of Ba-Shu science and technology in an isolated way.

Chinese culture is the “trunk”, while Ba-Shu culture is its “branch”. Before Qin Shi Huang (First emperor of Qin, 259-210 BC) unified China, the sub-cultures of Chinese culture had mainly developed separately. After the unification of China during the Qin Dynasty (221-206 BC), these sub-cultures had close interactions and gradually merged into a whole, with their relative independence on the wane.

In the history of China, the unification of China by Qin Shi Huang in 221 BC was a milestone. The part of Chinese history prior to the unification is known as the pre-Qin period. Early in 316 BC, the Qin Kingdom conquered the Ba-Shu Kingdom (current Sichuan), bringing about an epoch-making change to Ba-Shu history.

Prior to 221 BC when Qin Shi Huang unified China, Ba-Shu culture had had relatively independent development. After 221 BC, however, Ba-Shu culture’s relative independence in development was steadily on the wane and its status as a sub-culture of Chinese culture was increasingly highlighted. Even during the Three Kingdoms period (220-280 AD), which was marked by the tripartite division of China among the states of Wei, Shu and Wu. Liu Bei, who proclaimed himself emperor of Shu in Chengdu, continued to stress his identity as a descendant of the royal family of the Han Dynasty (202 BC-220 AD) and his ambition to rebuild the Han regime.

The history of Ba-Shu science and technology should cover the Ba-Shu people’s way of thinking, way of communication and way of life concerning science and technology. By doing so, the general history of the Ba-Shu culture can have its cultural excellence highlighted. Any culture has its unique characteristics and Ba-Shu culture is no exception. An open perspective is a must for an objective

introduction of the history of Ba-Shu science and technology. More specifically, the introduction should be made in the context of the history of Chinese science and technology and should highlight the individuality and uniqueness of Ba-Shu science and technology.

The Connotations of Achievements in Ba-Shu Science and Technology

Achievements in Ba-Shu science and technology mainly refer to scientific and technological achievements “made by Ba-Shu natives” or “made in the Ba-Shu region”. The following two achievement categories also count, i.e. achievements made by Ba-Shu natives outside Ba-Shu region and achievements made in the Ba-Shu region by those who were not born in the Ba-Shu region. For example, astronomer Lohsia Hung was born in Langzhong, Ba county (current Langzhong, Sichuan), Ba-Shu region, although he made his achievements in Chang’an (current Xi’an, Shaanxi), the capital of the Western Han Dynasty (202 BC-8 AD). Another example is Li Bing and his son Li Erlang, who made significant contributions to the Ba-Shu region by building the world-renowned Dujiangyan Irrigation System. However, neither Li Senior nor Junior was born in the Ba-Shu region. Li Bing was born in a place currently known as Yanhu district, Yuncheng city, Shanxi province.

Ancient achievements in Ba-Shu science and technology were mainly made in the areas of astronomy, mathematics, agronomy, medicine, geography, water conservancy, well salt mining, natural gas exploitation and metallurgy. Moreover, the Ba-Shu region also enjoyed a unique status in the world history of science and technology with its advantages in silk production, tea planting, liquor brewing, sugar refinery, paper making and woodblock printing. The Sanxingdui Site and Jinsha Site, along with other archaeological discoveries contain abundant scientific and technological items which are worth further exploration. In addition, it is also imperative to further explore and study the scientific and technological contributions made by ethnic minority groups in Ba-Shu.

Scientific and technological innovations made during the 20th century should be covered in detail. And achievements in the popularization of science and technology should also be mentioned. There are still many untouched areas that need to be covered. The selected Ba-Shu achievements in science and technology should be able to demonstrate corresponding “scientific thinking and technological development” and their influence on contemporary society.

The compilation of *A History of Ba-Shu Science and Technology* follows four categories: characters, works, projects and inventions.

The study of Ba-Shu scientific and technological culture requires properly addressing the relationships between the mainstream culture and the sub-culture. Throughout Chinese history, humanistic culture has remained in the mainstream, with scientific and technological culture being its sub-culture. The study of humanistic culture, which has generated substantial research findings, has had a greater influence than the study of scientific and technological culture, which has generated fewer research findings. Humanistic culture and scientific and technological culture influence each other. More specifically, traditional Chinese cultures, such as Confucian culture, Taoist culture and

Buddhist culture for a long time were in the mainstream of China. During that period, scientific and technological culture as a sub-culture had its own law of development and characteristics, which should be thoroughly studied in a systematic way. Consequently, the achievements in Ba-Shu science and technology must also include the contributions of the Buddhist and Taoist cultures to science and technology.

The study of Ba-Shu scientific and technological culture requires properly addressing the relationships between the Eastern and Western cultures. From a perspective of global culture, both Eastern and Western cultures have made their unique contributions to the world's scientific and technological culture. From the 1st century to the 16th century, China was in a global leading position in science and technology. Such a performance should be partially attributed to the efforts of Ba-Shu people. When it comes to the development of science and technology in modern times, however, China did not make many innovative contributions. Why did Chinese science and technology fall behind in modern times? Can China develop its science and technology faster and better in contemporary times? To answer these questions, this paper will further explore the basic law and characteristics of scientific and technological development.

The science and technology volume is primarily characterized by a combination of history and reality. It “sees the present from the mirror of the past” and also “sees the past from the mirror of the present”. It is written in a chronological order yet is free from any time constraints. It strives to reveal the realistic significance of the history of science and technology by combining ancient times with present days. The pursuit of cultural excellence in the compilation of a general history of culture does not mean the simple accumulation of historical facts. Rather, cultural excellence is pursued through truthful depictions of the Ba-Shu people's ways of thinking, ways of communication and ways of life. Ways of thinking belong to intellectual culture; ways of communication belong to institutional culture; ways of life belong to material culture. The three types of culture should be integrated into an organic whole.

The Unique Significance of Ba-Shu Science and Technology to the World

From a global perspective, the 15th century witnessed the emergence of the “spread of Eastern learning to the West” and the “spread of Western learning to the East”. In such a context, the Eastern culture was introduced to the West and the Western culture to the East, enabling cultural communications across the globe and shaping an inter-infiltrated cultural landscape. Thus, the Eastern culture absorbed many Western cultural elements and at the same time the Western culture also absorbed many Eastern cultural elements. Such a global cultural communication and integration means native culture (native science and technology in particular) in an absolute sense no longer exists.

Judging from the history of scientific and technological development, it becomes increasingly apparent that today's science and technology is neither purely Western nor purely Eastern. Instead, it belongs to all people across the world. Chinese science and technology has contributed significantly to the world science and technology and is an organic part of it. It is fair to say that without Chinese

science and technology, the world science and technology would not have achieved so much today. Likewise, without Western science and technology, the world science and technology would not have achieved so much today, either.

Science and Civilization in China (Needham, 1954-1979), a series of books initiated and edited by British biochemist, historian and sinologist Joseph Needham, was published by Cambridge University Press and has been translated into many languages. The title of its Chinese version was renamed *The History of Chinese Science and Technology*. In a contrastive approach, Needham expounded the contributions of Chinese science and technology to world science, technology and civilization. Based on the common grounds of all civilizations, Chinese science and technology has generated universally acknowledged achievements and become an inseparable part of the world civilizations.

The study of the history of Ba-Shu science and technology is to study the contributions of Ba-Shu science and technology to Chinese science and technology so as to better understand the contribution of Ba-Shu science and technology to the world science and technology. The unique significance of the history of Ba-Shu science and technology to the world lies in specific areas. Ancient Ba-Shu science and technology used to be world-leading, uniquely innovative and hugely influential in areas such as astronomy, mathematics, systematic water conservancy, well drilling, well salt mining, natural gas exploitation, silk production, tea planting, liquor brewing and woodblock printing (Zha, 2015).

The main purpose of studying the history of Ba-Shu science and technology is to sort out and integrate Ba-Shu scientific and technological culture to promote the scientific development of a harmonious society. The adopted approach to the compilation of this Ba-Shu science and technology volume features several innovations. First, the approach has an arguably comprehensive coverage and highlights merits. Every possible effort has been made to make every chapter of the volume “targeted, focused and to the point”. Second, the approach brings every chapter of the volume “cross-cultural, interdisciplinary and trans-regional” features. Third, the approach combines featured pictures and photos with concise yet vivid texts, making the content more attractive to readers.

As science and technology transcends provincial and national boundaries, it is difficult to clearly define Ba-Shu science and technology. There are still some aspects which have been left untouched by previous studies and need to be included. Those untouched aspects include, but are not limited to, the status of Ba-Shu science and technology in the entire history of science and technology, the historical stages of Ba-Shu science and technology and Ba-Shu ethnic minority groups’ science and technology. Only when based on a comprehensive review of basic historical works (*A History of World Science and Technology*, *Science and Civilization in China*, *General History of China*, *General History of Sichuan*) can the volume expect to unveil the unique significance of the history of Ba-Shu science and technology to the world.

Status Quo of Researches on Ba-Shu Science and Technology

Chinese people have been traditionally known for valuing history. It has been a time-honored tradition for the Chinese to value the accumulation of records on the history of science and technology.

In the Western Han Dynasty, Sima Qian already included the chapters on horoscopes, calendars and music temperament in his masterpiece *Shiji* (*The Records of the Grand Historian*), marking the start of including science and technology-related knowledge such as astronomy and tonality in official historical records in biographical style. That was a special case in world history. Even today, China has retained numerous ancient works, which are of great literary value to the study of the history of Chinese science and technology and have become classics for researches in the history of science and technology. Of those works, some are about the history of Ba-Shu science and technology (The editorial department of Zhonghua Book Company, 1976).

Over the past century, outstanding contributions have been made by Chinese scientists in archaeology and archaeological studies. Those contributions have furthered the continuous re-examination of ancient Chinese science and technology. In 1929, Chinese archaeologist Pei Wenzhong discovered the first skull fossil of the Peking Man during excavations at Zhoukoudian (southwest of Beijing), causing a worldwide sensation. The group of fossil specimens unearthed at the Peking Man site in Zhoukoudian indicate that Peking Man (*Homo erectus pekinensis*) used to live around the area of Zhoukoudian some 700,000-200,000 years ago. They mostly scavenged for food and sometimes also went hunting. They were at the Paleolithic period in the history of science and technology.

In 1995 on the vast Ba-Shu land, a number of archaeological groups (including the municipal archaeological team of Chengdu, Sichuan province and the archaeological team from the Archaeological Teaching and Research Section, Sichuan University) launched a journey of archaeological investigations and excavations at the Baodun site (in Xinjin), the ancient Yufu city site (in Wenjiang), the ancient Pixian city site (in Pidu), the ancient Mang city site (in Dujiangyan), the ancient Xiamang city site (in Shuanghe, Chongzhou) and other sites. This archaeological journey for the first time ever discovered a cluster of ancient city sites dating back to the Longshan period of the Central Plains Civilizations, a historical period some 4,550-4,300 years ago. Those sites were active during the Neolithic period in the history of science and technology.

From the initial archaeological discovery in 1929, the archaeological excavations in the Ba-Shu region have continued off and on for decades. For example, the Sanxingdui site was discovered on the Chengdu Plain, followed by the discovery of the Jinsha site in downtown Chengdu. It can be inferred from the numerous cultural relics unearthed at the two sites that the Ba-Shu region was already in the well-developed Bronze Age from 1700 BC to 476 BC. The new archaeological discoveries on Ba-Shu land have enriched people's understanding of the history of Ba-Shu science and technology.

The first scholar to conduct in-depth research into the history of Ba-Shu science and technology is arguably Lv Zifang, who was a professor at the Department of Physics of Sichuan University. Lv Zifang was born in Ba county, Sichuan province and later went to Japan, where he was admitted to Tokyo Vocational School (current Tokyo Institute of Technology) in 1914. He went to the UK for advanced studies of mathematics, physics and astronomy at the University of Leeds in 1918 and returned to China in 1923. He then successively taught at several universities, including Xiamen University, devoting himself to the education of science and technology. After the founding of the People's Republic of China

in 1949, he first taught at the Beijing Institute of Technology for two years before he was transferred to the Department of Physics of Sichuan University and promoted to professor. During his 12 years of teaching at Sichuan University, Prof. Lv Zifang specialized in the study of the history of Chinese science and technology, completing research works with over 500,000 words (Chinese characters), most of which were about the history of Ba-Shu science and technology. Prof. Lv Zifang played a key role in shaping the academic tradition of Sichuan University. Some of his research findings were immediately recognized and quoted by Prof. Meng Wentong at the Department of History of Sichuan University.

In November 1978 advocated by Yang Chao, then Secretary of the CPC Sichuan Provincial Committee, and supported by Li Chang, then Vice President of the Chinese Academy of Sciences (CAS), the Center for the Studies in Dialectics of Nature of the Chengdu Branch of the Chinese Academy of Sciences was established. The first research task assigned to the center was to sort out the manuscripts left by the late Prof. Lv Zifang and to compile a collection of essays. The completed two volumes of *Collection of Essays on the History of Chinese Science and Technology* were published in 1983 and 1984 by Sichuan People's Publishing House (Lv, 1983, 1984). In 1981 a nationwide symposium was held to discuss the late Prof. Lv's academic works on the ancient history of Chinese science and technology.

According to Prof. He Lu (1983), a well-known mathematician, "Lv Zifang understood the intentions of ancient Chinese people so well that he was able to reinvigorate their achievements made some 2,000 years ago. In this sense, Lv's contribution was significant." The British scientist Joesph Needham considered Lv Zifang to be a scholar with a profound insight into the study of the history of Chinese science and technology. The Hong Kong-based newspaper *Mingpao* published an article entitled "Beyond Joesph Needham" to introduce the newly published *Collection of Essays on the History of Chinese Science and Technology* by Lv Zifang. Joseph C. Y. Chen, an tenured professor of physics at University of California, San Diego, wrote to Zha Youliang, who was a visiting scholar at that university, asking Zha to bring him a copy of *Collection of Essays on the History of Chinese Science and Technology* (Vol. I & II) by Lv Zifang from China.

Based on Lv Zifang's *Collection of Essays on the History of Chinese Science and Technology* (Vol. I & II), the study of the history of Ba-Shu science and technology was enabled, and related monographs were compiled and published. Among the published monographs were *Study of the History of Ba-Shu Science and Technology* (compiled by Feng Hanyong and other staff at the Sichuan Center for Literary and Historical Studies, and published by the Sichuan University Press in 1995), *Lohsia Hung—An Outstanding Astronomer* (written by Zha Youliang and published by the Sichuan Cishu Publishing House in 2001, 2009 and 2018), and *Outstanding Mathematician Qin Jiushao* (written by Zha Youliang, et al. and published by the Science Press in 2003). Lv Zifang was the first one to study the history of Ba-Shu science and technology in the context of Chinese and global S&T history.

With five years of joint efforts between the Sichuan Center for the Research of Ba-Shu Culture, Center for Ba-Shu Cultural Studies under Sichuan Normal University and Sichuan People's Publishing House starting in 1996, *The Series of Ba-Shu Culture* (consisting of 10

volumes) were compiled and published in August 2001. The Series cover the basic aspects and major areas of Ba-Shu culture ranging from the ancient Shu Kingdom, the history of Ba-Shu culture, the history of Ba-Shu philosophy, the history of Ba-Shu science and technology, major Ba-Shu figures from ancient times until now, Ba-Shu places of historical interest and tourist attractions, Ba-Shu food culture, the art of Sichuan opera and the history of Ba-Shu literature, to the culture of Ba-Shu ethnic minority groups.

Duan Yu, a senior researcher and also then director of the Institute of History of Sichuan Academy of Social Sciences, commented “The *Series of Ba-Shu Culture* was the first book series to fill the gap by including monographs on the ancient Shu Kingdom, the history of Ba-Shu science and technology, the history of Ba-Shu philosophy, the history of Ba-Shu literature and the culture of Ba-Shu ethnic minority groups. There were academic and theoretical innovations in its multiple volumes. The *Series* summarized the achievements in Ba-Shu astronomy and mathematics, assessed the important status of Ba-Shu science and technology in the history of world science and technology, explored the ancient Shu Kingdom’s system of chieftainship, studied Sanxindui theocratic civilization and discussed the ancient Shu Kingdom’s foreign cultural exchange. Representing the latest achievements in contemporary study of Ba-Shu culture, the *Series* has drawn extensive attention in academic circles and laid a solid basis for further theoretical discussions” (Duan, 2002).

Hu Zhaoxi, a professor at the School of History and Culture of Sichuan University held, “The *Series* has unprecedentedly covered a brief history of Ba-Shu science and technology. Although not comprehensive enough to form a general history, it is already a breakthrough” (Hu, 2002). Hu Zhaoxi considered one volume of the series, i.e. *A Brief History of Ba-Shu Science and Technology* to be a breakthrough and pointed out a direction for future development, namely, connecting the highlights of each Ba-Shu scientific and technological achievement by means of general history narration to put things into context.

A Brief History of Ba-Shu Science and Technology was published in 2001 and reprinted in 2010 as a volume of *All About Sichuan Series* by Sichuan People’s Publishing House. In the foreword of *A Brief History of Ba-Shu Technology and Science* by Zha Youliang and Zhou Suizhi, Ba-Shu science and technology is defined as follows: “First, it must cover contributions made by those born in the Ba-Shu region to world science and technology; second, it must cover scientific and technological inventions made within the Ba-Shu region in history.”

In general, the study of the history of Ba-Shu science and technology is still at an early stage.

Approaches to the Compilation of the History of Local Science and Technology

The history of Ba-Shu science and technology belongs to the category of local science and technology. And there are three approaches to the compilation of a scientific and technological history.

General History-based Approach

Based on general historical clues, the compilation of a history of Ba-Shu science and technology

should cover all historical stages of scientific and technological development; from the stage of infancy (Paleolithic and Neolithic periods), the Pre-Qin period, the Qin and Han dynasties, the Wei and Jin dynasties, the Southern and Northern dynasties, the Sui and Tang dynasties, the Northern and Southern Song dynasties, the Yuan Dynasty, the Ming Dynasty and the Qing Dynasty, to modern times.

Is it possible to compile a history of Ba-Shu science and technology by extracting the parts on science and technology from the historical stage-based seven volumes of *General History of Sichuan*? No, it is not possible. *General History of Sichuan* does not contain much about the history of science and technology or introduce it in a systematic way. In fact, the history of science and technology is just mentioned in passing. Nevertheless, *General History of Sichuan* does offer abundant historical materials and inspirational research findings for the compilation of a history of Ba-Shu science and technology.

Discipline-based Approach

Based on the disciplinary structure of modern science and technology, the compilation of a history of Ba-Shu science and technology should cover introduction, mathematics, astronomy, agronomy, medicine, geography, hydraulics, architecture, engineering, physics, chemistry and biology.

Is it possible to compile a history of Ba-Shu science and technology by extracting the parts on Ba-Shu science and technology from the already published works on the history of Chinese science and technology such as *A History of Science and Technology in China* (Vol. I & II) edited by Du Shiran, et al., *Science and Civilization in China* (Vol. I & II) originally written by Joesph Needham and adapted by Colin Ronan, and *The History of Chinese Science and Technology* (30 volumes) edited by Lu Jiaxi? No, it is not possible. That is because none of these works has shaped the concept of “Ba-Shu science and technology”. Still, the research findings on the history of science and technology in China set concrete models for the study of the history of Ba-Shu science and technology.

Integrated Approach: A Discipline-specific Approach Based on General History

This approach combines the disciplinary structure with general historical clues in the context of the history of Chinese science and technology and highlights the merits of Ba-Shu science and technology to compile a history of Ba-Shu science and technology. Much importance is also attached to the expounding of such merits in the general historical context of the development of science and technology in China. This approach is by no means a compromised combination of the first and second approach. Instead, the third approach is a discipline-specific approach based on general history, which is also known as the integrated approach, for short.

What is new about this approach is that the expounding of the historical development of basic disciplines such as astronomy and mathematics is not in the chronological order of Chinese dynasties but is based on major scientists (such as astronomers and mathematicians) and their representative works in history. In the process, their contributions to Ba-Shu science and technology are highlighted. It is my belief that the progress of imperial dynastic alterations is not totally synchronized with the progress of scientific and technological development, for which the stage division of the history of

science and technology should not strictly follow imperial dynastic alterations. This is not a simple application of a particular approach, but a new approach to the compilation of a history of local science and technology.

The history of local science and technology should not be written in an isolated way. Rather, it should be set in a whole picture to allow a part-to-whole comparative study. In this way, a comprehensive view of the history of Ba-Shu science and technology (including its achievements, disparities and deficiencies) is presented to readers. It is true that the primary purpose of studying the history of Ba-Shu science and technology is to carry forward remarkable achievements in Ba-Shu science and technology. Yet at the same time, comparative studies and reflections are needed to identify and reveal those disparities and deficiencies. Only by doing so can Ba-Shu science and technology expect sustainable development, more outstanding talents and more innovations in the years to come.

When studying the history of Ba-Shu science and technology, relevant scholars should attach great importance to the major contributions made by outstanding scientific and technological talents in the Ba-Shu region throughout history, and also to those achievements promoting the comprehensive and sustainable development of the world economy, society and mankind.

The Chinese culture is a sustainable culture and the world's only culture that has continued up to now without interruption. Chinese culture apparently features inseparable "wholeness", which includes the "wholeness of time" and the "wholeness of space". Chinese culture is the "trunk", while other local cultures in China are its "branches". The "trunk" stands for universality while the "branches" represent individuality. Understanding the relationships between universality and individuality is at the core of dialectics.

Chinese culture is characterized by "diversity in harmony" and also "harmony in diversity". Harmonious wholeness is important to Chinese culture, so is diversity. The history of Ba-Shu science and technology is an organic part of the history of Chinese science and technology. An understanding of "diversity" not in the context of "harmonious wholeness" will lead nowhere. Likewise, an understanding of "harmonious wholeness" not in the context of "diversity" will go astray.

Science and technology is an important part of culture. One volume of *A General History of Ba-Shu Culture* is on local science and technology. Since ancient times, scientific and technological developments in the Ba-Shu region have been inseparable to the scientific and technological development of China, which in turn has been inseparable to the scientific and technological development of the world. It was not until the last 50 years that the systematic study of the history of Ba-Shu science and technology began to attract more attention and generate some discipline- and subject-specific research findings. Admittedly, the already completed volume on the history of Ba-Shu science and technology remains shallow and far from profound.

The systematic study of the history of Ba-Shu science and technology has become a new academic fashion which now enjoys favorable conditions. First, this study can borrow substantial research findings which are arguably complete and systematic from *Science and Civilization in China*

and *General History of Sichuan* for reference. Second, preliminary research findings on the history of Ba-Shu science and technology have already been made. There are related publications such as *Study of the History of Ba-Shu Science and Technology* and *A Brief History of Ba-Shu Science and Technology*. Still there are aspects left untouched and waiting to be covered. The science and technology volume of *A General History of Ba-Shu Culture* marks a new chapter in this research area, which requires further studies.

In the preface of *A General History of Ba-Shu Culture*, the contributor Zhang Yujun clearly explains, “The research object of this book is Ba-Shu culture; the nature of this book is a general history of culture that combines specialized histories; the compilation principle concerns ‘three whole’, i.e. vertical, horizontal and staggered whole”.

“The first is vertical whole, which refers to diachronic whole-process of history.” “The second is horizontal whole, which refers to synchronic all-round communication.” “The third is staggered whole, which refers to cross-cultural, interdisciplinary panorama” (Zhang, 2019). The “three whole” principle is an innovative top-level design. It requires close attention to the dialectical unity of time and space, cross-culture and inter-discipline, whole and part, the nation and regions, as well as universality and individuality. The “three whole” principle helps scholars understand that the study of the history of Ba-Shu science and technology should give equal consideration to the three aspects of general history, discipline and specialized theme. Every possible effort has been made to study and compile the science and technology volume. Yet, there is still a long way to go.

Regarding the science and technology volume, vertical whole refers to historical clues and development; horizontal communication refers to logical structure and interdisciplinary integration; staggered communication refers to Sino-foreign comparison and ancient-present fusion. To fulfill the three-communication principle, substantial academic efforts should be made in the compilation of the science and technology volume. The development of science and technology follows its own laws. Accordingly, what is adopted for the compilation is the integrated approach (i.e. a discipline-specific approach based on general history), rather than the general history based-approach, which strictly follows the progress of imperial dynastic alterations. Still, this approach is only a preliminary attempt and is far from comprehensive and mature.

The integrated approach (i.e. the discipline-specific approach based on general history), combines the general history based-approach with the discipline-based approach, and theme discussions with general history-based clues. The integrated approach to the compilation of the history of Ba-Shu science and technology highlights the merits of Ba-Shu science and technology, concludes those merits’ significance, and reveals the limitations of Ba-Shu technology and science in the context of the general history of Chinese science and technology. The following words are added in the conclusion part of the volume to highlight these merits: By discipline, this volume lists all major achievements of all time in Ba-Shu science and technology; in chronological order, this volume lists outstanding Ba-Shu talents (particularly those with significant historical contributions) from ancient to modern times.

Scholars specializing in the study of science and technology are familiar with science and

technology itself but are likely to lack an awareness of general history regarding the historical development of society, for which they may find “vertical communication” difficult. By contrast, scholars specializing in the study of history have a solid historical framework in mind, but probably lack a profound understanding of science and technology, for which they may find “horizontal communication” difficult. There is still a long way to go before the three-communication principle can truly be fulfilled in the compilation of the local history of science and technology. There are ten scholars participating in the compilation of the science and technology volume. They have tried their best to achieve this preliminary level. It is my hope that the experience and lessons summed up in this paper can help lay a more solid foundation for future innovation and development in this regard.

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International Chinese Language Education and Building a Community of Shared Future for Mankind

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Abstract: Human society is now confronted with a variety of threats. Given that, the idea and initiative of building a community of shared future for mankind is positively echoed by people around the world. Accordingly, international Chinese language education should play an active role in building a community of shared future for mankind, which is determined by the mission and nature of this educational cause. The idea of building a community of shared future for mankind points a right way for the development of international Chinese language education, injects new vigor to this cause, and also creates a more friendly and favorable external environment. International Chinese language education should help facilitate the building of a community of shared future for mankind and contribute Chinese wisdom to the common progress of mankind in the new era.

Keywords: international Chinese language education, a community of shared future for mankind, Chinese wisdom

On January 18, 2017, Chinese President Xi Jinping delivered a keynote speech entitled “Work Together to Build a community of shared future for mankind” at the United Nations Office at Geneva, Switzerland. Xi elaborated the vision and significance of “building a community of shared future for mankind and achieving shared and win-win development” for the

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whole world, and proposed a corresponding initiative on China's behalf. The initiative was highly regarded by world leaders and resonated worldwide, as it touched upon the common concerns of people all over the world, i.e. prosperity and development. Since the turn of the 21st century, human society has been confronted with a variety of threats, such as environmental pollution, wars, nuclear crises, disease outbreaks, food safety challenges, poverty, economic crises, non-traditional security threats, terrorism and unilateralism. In such a context, people of all countries should work together to build a community of shared future for mankind and strive for lasting peace, universal security, common prosperity, openness, inclusiveness and a clean and beautiful world. Peace has always been the common aspiration of mankind and international Chinese language education should play a due part in building a community of shared future for mankind.

The Mission of International Chinese Language Education and the Building of a Community of Shared Future for Mankind

Since its establishment as a discipline, international Chinese language education has shouldered such a mission: teaching Chinese language and spreading Chinese culture worldwide to increase communication and cooperation with people around the world and promote world peace. As President Xi Jinping (2017), "Since the end of the Cold War, people have pursued a shared aspiration, namely, to expand cooperation and promote common development." Development cannot be done without cooperation; cooperation is on the premise of mutual trust; mutual trust is based on mutual understanding; mutual understanding requires common tools for communication. Language happens to be the tool for communication that facilitates the most convenient and effective interpersonal interactions. Over the past years, English has steadily advanced towards becoming a global common tongue, but is not yet used by all countries as an official language. Even in the UN, English is only one of the six working languages (with the other five being French, Russian, Arabic, Spanish and Chinese). By contrast, Chinese is the most widely spoken language as a mother tongue worldwide. There is an increasingly strong desire for non-Chinese to learn more about China through Chinese language learning. That is why international Chinese language education is of particular significance at present. After all, international communication and cooperation cannot be carried out just in English. Chinese students are now learning other nations' languages and cultures while numerous students of other nations are learning Chinese language and culture. It is precisely in such a context that international Chinese language education as a discipline came into being. As China further advances its Reform and Opening up, it is undergoing a great rejuvenation of historical significance. China is continually strengthening its ties with countries across the world in the areas of politics, economy, trade and culture and this is attracting more and more people overseas who hope to get closer to China and learn more about what is going on in this vast oriental land. In contrast with those who want to consolidate their relationships with this both old and young country and its people, some people overseas are skeptical about China's peaceful emergence, playing up a so-called "China threat" theory. Even those skeptics

exhibit an urgent desire to learn more about China. To better understand a country's politics, society, economy and culture, one has to have a good command of its language. Otherwise it would be like "seeing flowers through a mist," or a blurred vision. There are so-called experts on Chinese issues without any knowledge of the Chinese language. Their China-related views are inevitably biased and often nowhere near reality. Against such an international backdrop, international Chinese language education can play an important role in making a difference.

It is fair to say that the boom of international Chinese language education relies heavily on the improvement of China's comprehensive national power. This has been testified by Wang Zulei and Wu Yinghui (2015) in their co-authored report on the development of the international communication of the Chinese language. Clearly the Belt and Road Initiative has been echoed by many countries. Yet during its advancement, there was bound to be various barriers, of which language and cultural barriers were inevitable. After all, each language has its own discourse system and means of expression. Ignorance of such a discourse system will result in bias, misunderstanding and even hostility. The fundamental mission of international Chinese language education is to remove possible language and cultural barriers to allow better communication and cooperation among people from different countries and regions, reduce prejudices and misunderstandings and secure more understanding and common views. In this sense, a community of shared future for mankind cannot be built without the support of international Chinese language education. Regarding the mission of international Chinese language education, no consensus has yet been reached among all related scholars. Hu Fanzhu, Chen Jiaxuan and Zhang Hongqian (2018) provided their answers to two primary questions, i.e. "What is international Chinese language education?" and "How should international Chinese language education be conducted?" arousing heated debates in academic circles. Prior to that, Hu Fanzhu and Chen Jiaxuan (2011) had argued that "it is 'why to teach' that primarily determines 'what to teach'" in the discussion of "what to teach in international Chinese language education." According to Hu and Chen, "Chinese language teaching aims to promote world peace. Language is the best tool for communication, promoting world peace and shaping an ideal of cultural diversity." It is beyond doubt that language is the best tool for communication. As far as I'm concerned, language can promote world peace, although this does not necessarily mean language is the "best tool for promoting world peace". Building world peace involves the joint efforts of multiple sectors such as politics, military affairs, economics, diplomacy, culture, philosophy, religion and scientific technology, each of which plays a crucial part. Accordingly, building world peace requires various tools (those concerning politics, military affairs, diplomacy, culture, philosophy, religion and scientific technology) and language.

Essentially, the mission of international Chinese language education is exactly about language education (Zhao, 2013). Language and culture are like the two sides of a coin and cannot be separated. This fact is determined by the very nature of language as a system of symbols carrying a corresponding cultural mark. Representing the crystallization of a language's collective cognition, each system of symbols is a carrier of its culture. This is the "ontology" of a language. Also, language is a tool for thinking and communication. A language that is applied to thinking and communication affects the thinking and

communication of the people who use that language. That is the “application” of language. Neither the “ontology” nor the “application” of a language can exist without its culture. A language implies the values of individuals and social groups who speak it. Yet, those people are usually too accustomed to such values to notice them (Cui, 2005, pp. 33-79). Given this, there is no need for international Chinese language education to excessively highlight its “cultural communication” significance, as language learning naturally covers learning the culture underlying the language being learned. This self-evident argument is also the theoretical basis of the Sapir-Whorf hypothesis. It is a common practice for any country to promote and popularize its own language and culture. While considering this practice to be well justified, many countries prefer to practice it without much open discussion. The association of international Chinese language education with the “promotion of Chinese culture” can create unnecessary barriers to this educational cause. Not long ago, The White House National Security Council (NSC) held a hearing on the issue of the Confucius Institute, which confirmed that China’s previous concern was not “unfounded worries”. Language teaching and cultural communication naturally go hand in hand, bringing “a good spring rain” that “enters the night unseen, like the wind, and moistens things finely, without a sound.” Both “promotion” and “communication” leave somewhat of an impression of imposition, which may produce counterproductive results. Lu Jianming (2016) argued, “It has to be specified that our top priority and also the most immediate task is to try all means to help overseas learners of the Chinese language to learn and master the language, particularly the written language as soon as possible. The international popularization of Chinese language, or to say international Chinese language education, must not deviate from this core task. The relationship between Chinese language teaching and cultural education should be well balanced.” Lu’s remarks were clear, relevant and to the point. Education is one thing, while promotion is another thing. Education is a cause of vital and lasting importance. It is a long and difficult journey which cannot be completed by those seeking quick success, instant benefits and once-and-for-all solutions, nor by those “shifting with the wind” and following whatever the fashion may be. Educators are supposed to be determined and such a determination only comes from cultural confidence.

The idea of building a community of shared future for mankind is of great significance to the development of international Chinese language education. The reason why building a community of shared future for mankind can receive warm responses and evoke intense resonance worldwide lies in the fact that this idea goes with the tide of global development. The “community with a shared future for mankind contains the truth of the world” (Ye, 2016). International Chinese language education should also go with the flow by transforming “China’s effort to sell” to “overseas desire to learn”. In short, China should actively promote the endogenous power and external attraction of international Chinese language education.

The Idea of Building a Community of Shared Future for Mankind and the Driving Force for the Development of International Chinese Language Education

The development of any discipline or cause has to be driven by an endogenous power and a

favorable external environment, and requires the combined effect of “good timing, geographical convenience and harmonious human relations”. International Chinese language education is a discipline and a cause, which means its development also requires the combined effects of “good timing, geographical convenience and harmonious human relations”. As Lu Deping (2016) put it, “An effective approach to the international popularization of the Chinese language should give consideration to the conditions of both the sender (China) and the receiver (foreign countries or regions). By conditions, we mean a driving force from the sender and a drawing force from the receiver, as well as the interactions between the two forces”. Lu’s argument makes sense. The driving force of international Chinese language education depends on the Chinese people, their understanding of this cause of education, strategic positioning, action planning, level of discipline development, capacities of basic and applied research, as well as the standards of talent training. China must maintain an objective analysis of the existing problems in its international Chinese language education and formulate feasible solutions. There are many approaches to international Chinese language education. Among these approaches are the national education systems of relevant countries and the Confucius Institutes across the world. How to enhance the soft power of the Confucius Institutes is now an issue requiring serious study (Cui, 2018). China’s continuously rising hard power and soft power create an opportunity to develop international Chinese language education. This is what we call “good timing”. China, the birthplace of Chinese language, has developed a solid academic basis for the study of Chinese language and the teaching of Chinese as a foreign language. Over the past decade China has cultivated and reserved a large number of professionals. As of September 2015, there were 363 institutions of higher learning offering Bachelor of Arts (BA) programs in international Chinese language education, with a combined enrollment of 63,933 students. There were 108 institutions of higher learning offering professional master’s programs in this discipline, with a combined enrollment of 10,133 students (Shi, 2016). As of December 31, 2016, there were 512 Confucius Institutes and 1,073 Confucius Classrooms established in 140 countries and regions across the global^①. This is what we call “geographical convenience”. The initiative of building a community of shared future for mankind, proposed by President Xi Jinping, has pointed the right direction for the development of international Chinese language education, put forward new requirements, set up a bigger platform and won the support of people of all countries. This is what we call “harmonious human relations”. The idea of building a community of shared future for mankind provides endogenous power for the development of international Chinese language education as a discipline and a cause.

The reason why this idea provides endogenous power for the development of international Chinese language education mainly lies in the following four aspects:

First, international Chinese language education should serve the cause of building a community of shared future for mankind. Language education itself can be purely technical. What to teach,

① Website of the headquarters of Confucius Institutes <http://www.hanban.edu.cn>

how to teach, how to learn and by what means to teach and learn, along with the philosophical background and theoretical framework of teaching and learning are all purely academic questions which are combined to lay a basis for the development of international Chinese language education as a discipline. Under the guidance of the idea of building a community of shared future for mankind, however, relevant Chinese scholars should also study the philosophy and environment for the development of international Chinese language education and must avoid pan-politicization and ideologization of such issues as what to teach, how to teach and why to teach. The specific goal is to accomplish the mission of Chinese language education; while the ultimate goal is to facilitate the building of a community of shared future for mankind. The lofty goal belittles any utilitarianism-driven selfish ideas. It is true that international Chinese language education can benefit China, which, nevertheless, is a rational reward to China for all of its contributions.

Second, international Chinese language education should follow the steps with the building of a community of shared future for mankind, which is a practice, as well as an idea. As President Xi Jinping (2017) put it, “Actions hold the key to building a community of shared future for mankind. To achieve this goal, the international community should promote partnership, security, growth, inter-civilization exchanges and the building of a sound ecosystem.” In particular, cultural exchanges are closely related to international Chinese language education. In recent years, a mechanism for Sino-foreign people-to-people exchanges is taking shape and emerging as an important platform for China to communicate with other civilizations. The Ministry of Education of the PRC specially established the China Center for International People-to-People Exchange (CCIPE). International Chinese language education should also be a major part of this platform so that its related alumni network, educational exchanges and cooperation resources can support Sino-foreign people-to-people exchanges. Take calligraphy education as an example. It is an organic part of international Chinese language education (Chinese writing system) and also an integral part of the abovementioned people-to-people exchanges (exchanges in the art of calligraphy). The Chinese language is the most ancient writing system of all presently used languages in the world. To many learners, this time-honored language is both intriguing and difficult to master. The art of Chinese calligraphy, which was developed based on this writing system, is mysterious and enigmatic to learners growing up in an alphabetic writing environment. Previously, exchanges in Chinese calligraphy were restricted to cultural and artistic areas. At present, however, students at Confucius Institutes also learn Chinese calligraphy. Presumably many of those who are learning Chinese calligraphy will subsequently fall in love with Chinese characters, then the Chinese language and eventually the country of China. Thus, Chinese wisdom sows the seeds of “harmony” and “magnanimity” overseas and will one day harvest “win-win fruits”. That is why international Chinese language education is essential to the building of a community of shared future for mankind.

Third, international Chinese language education should keep a foothold in China and at the same time have a global perspective. According to President Xi Jinping (2013), “The Chinese people should develop a global perspective to better coordinate domestic development with opening up to

the outside world, integrate the development of China into the development of the world, and combine the interests of the Chinese people with the interests of people of other countries.” Accordingly, international Chinese language education should develop a global perspective and size up the situation to combine its subjective efforts with the objective needs of people overseas. A global perspective is needed in corresponding text compilations, curriculum designs, teaching staff training, teaching practices, proficiency tests and academic research to see the world through China’s lens and the world to see China through the world’s lens. “In this information era characterized by big data, cloud computing, networking, globalization and space exploration, we (Chinese people) should think from a global perspective. The international popularization of the Chinese language should also be viewed from a global perspective” (Lu, 2016). Of course, China is part of the world and is not in opposition to the rest of the world. Global perspective here means China should not return to its old ways of a closed economy and isolationism, or turn a blind eye to global events. Such a global perspective is developed on the premise that international Chinese language education keeps a foothold in China, which after all is the very headquarters of this educational cause. Still, it is necessary to point out that international Chinese language education is not a business exclusive to China. In fact, it is also promoted by organizations in North America, Europe, East Asia, Southeast Asia, Australia, Africa, the Middle East and Latin America. In this regard, each region has their unique traditions, characteristics and advantages that are worthy of study. International Chinese language education, as a branch of language studies, belongs to second language teaching, for which China should draw on the successful experiences and research findings in second language teaching from countries across the globe.

Fourth, the building of a community of shared future for mankind helps create a better environment for the development of international Chinese language education. The history of human development over the past thousands of years indicates that war and peace is an eternal theme of mankind. Human civilizations have survived numerous bloody struggles and wars before reaching the levels of today. It is high time to have some serious reflection regarding a shared future for mankind. All of the wars in history, large or small, and particularly the two world wars, plunged people into misery and suffering and brought severe damages to economies, industries, and individuals at every level. At present local wars are ceaseless, and refugee problems are tormenting the whole world. Nuclear war is like the Sword of Damocles hanging over our head. Under such circumstances, the building of a community of shared future for mankind is a present imperative. This cause requires cooperation, interactions, and considerations regarding the interests and concerns of all peoples and nations. A community with a shared future can help create a favorable external environment for international Chinese language education, reduce skepticism from the outside world and expand common grounds. Emerging as a powerhouse for the growth of the global economy, China is playing an increasingly important role in international affairs. As an ancient Chinese verse goes, “The water seems wide at the full tide; A sail with ease hangs in the soft breeze.” International Chinese language education can seize this moment to “ride the waves and sail far”.

The Development Strategy of International Chinese Language Education and the Building of a Community of Shared Future for Mankind

Given that international Chinese language education is so closely related to the building of a community of shared future for mankind, its healthy development becomes a major concern. The successful development of any discipline or cause relies heavily on the formulation of a rational development strategy and accurate positioning. During the process of building a community of shared future for mankind, more consideration should be given to how international Chinese language education should fit the times, go with the tide of world development, meet social needs and resolve problems in development.

International Chinese language education as a discipline was developed from “teaching Chinese as a foreign language”, for which it inevitably bears the feature of being “foreign-oriented”. “Teaching Chinese as a foreign language” when conducted in China and offered to overseas students includes teaching both Chinese language and culture. By contrast, international Chinese language education is conducted overseas but it is worth emphasizing that the domestic part, teaching Chinese as a foreign language, remains the key issue and this must not be challenged when promoting international Chinese language education. The following questions concern development strategy and require corresponding top-level design. Where should international Chinese language education be located in China’s existing disciplinary system? How can international Chinese language education improve its development path while carrying forward its tradition? How can international Chinese language education coordinate “teaching Chinese as a foreign language” (in China) and “overseas Chinese language education” during development?

On the Disciplinary Status

The first question concerns disciplinary status. According to the discipline list most recently released by Department of Degree Management & Postgraduate Education (Office of the State Council Academic Degrees Committee)^①, international Chinese language education belongs to a second-level discipline (050103) in parallel with Chinese language and literature (050101), and Chinese language (050102) and is subordinate to the first-level discipline of China’s languages and literature (0501) (including those of the majority i.e. the Han Chinese and ethnic minority groups). I discussed the disciplinary positioning of international Chinese language education in another essay (Cui, 2015) and will not elaborate on it here. What is to be discussed here is its disciplinary status. As an emerging discipline, international Chinese language education is also an interdisciplinary subject whose basic theoretical framework should be built and improved for the purposes of talent cultivation and discipline development. A discipline without basic theoretical support cannot expect to go far. At present international Chinese language education is based on two disciplines, Chinese language and literature and pedagogics and it lacks a clear disciplinary boundary and an independent theoretical

^① *Catalogue of Disciplines Granting Academic Degrees and Cultivating Talents (2011)* released by the Ministry of Education of the PRC.

system. Accordingly, there is a lot to be developed in its applied research. Only by laying a solid foundation for international Chinese language education can its disciplinary system be built and its disciplinary status be consolidated.

On the Relationship with Teaching Chinese as a Foreign Language

The second question concerns its relationship with teaching Chinese as a foreign language. International Chinese language education, born out of teaching Chinese as a foreign language, is inseparable from it. Some people consider teaching Chinese as a foreign language to be a move of “coming in” and international Chinese language education to be “going out”, which is in fact not so appropriate. In the new era, guided by the idea of building a community of shared future for mankind, whether it is about “coming in” or “going out”, there is only one ultimate goal of China’s language education – contributing to the building of a community of shared future for mankind with quality language education services. Given that, international Chinese language education and teaching Chinese as a foreign language belong to an inseparable organic whole. While committed to the school-running of Confucius Institutes overseas, China should also increase its investments in teaching Chinese as a foreign language domestically (which is now also an integral part of international Chinese language education) and give due support to its disciplinary development. Teaching Chinese as a foreign language in China has a sound and complete system, a solid foundation, normative teaching, outstanding academic achievements and a profound influence.

On the Relationship with Overseas Chinese Language Education

The third question concerns its relationship with overseas Chinese language education, which refers to the education of Chinese language and culture offered to the children of overseas Chinese. It has a longer history than teaching Chinese as a foreign language (in China) and international Chinese language education. Southeast Asian countries even developed their own independent systems of Chinese language education. Ever since the 1980s overseas Chinese language education has grown and prospered with the emerging “Chinese fever” and studies related to overseas Chinese language education has gone deeper. From a perspective of language teaching, overseas Chinese language education generally falls into the category of second language teaching and to a large extent overlaps with international Chinese language education. In terms of institutional settings, the Overseas Chinese Affairs Office of the State Council is responsible for supervising overseas Chinese language education, while the Office of Chinese Language Council International is responsible for guiding international Chinese language education. The two institutions, although stand off each other, each go their own way without much collaboration. In the context of building a community of shared future for mankind, overseas Chinese language education shoulders the same mission. International Chinese language education and overseas Chinese language education should coordinate development and share resources with each other. If possible, an integration of the two in top-level design would help avoid unnecessary waste and reduce unnecessary contradictions.

Building a Community of Shared Future for Mankind and Chinese Wisdom

The idea of building a community of shared future for mankind has its realistic grounds which are based on the common values of mankind. “There are common values of mankind, as people of different countries and ethnicities all want to live a happy life, which is their common ideal” (Zhang, 2017). In an era of the global village, it is necessary for all people to give serious considerations to the status and role of Oriental wisdom in global governance. It is particularly noteworthy that the time-honored Chinese wisdom, through the baptism of modernization, has been revitalized. Such a baptism was enabled by the “spread of Western learning to the East”. The modernization of Chinese culture is essentially a process of discarding the dross and retaining the essence, and sifting the true from the false. By eliminating the dross, the Chinese people are thus able to carry forward the excellent parts of traditional Chinese culture. The exchange and mutual learning between civilizations can benefit human society. International Chinese language education, through language and culture teaching and cross-cultural communications, creates a channel for China to contribute Chinese wisdom to the entire world.

Chinese wisdom has formed a system different from that of Western wisdom. This system originated in ancient times and was already well developed in the Spring and Autumn Period (770 BC-476 BC) and the Warring States Period (475 BC-221 BC) when there was a contention of a hundred schools of thought. During the process of development, the system of Chinese wisdom has continued to absorb new ideas from foreign civilizations and this has continued to this day. Its very existence today is already a miracle. The core of Chinese wisdom contains the Chinese people’s world view and philosophy of life, which is a combination of the quintessential essences of the schools of Confucianism, Buddhism, Taoism, Legalism and Medical Skills. Such a world view and philosophy of life attaches great importance to the unity of Heaven and human and the observance of social ethics. It advocates harmony in diversity, win-win cooperation and common prosperity, which is quite different from the mindset of the zero-sum game in Christian cultures. The international landscape is constantly changing and becoming increasingly complicated. Against such a backdrop, Chinese wisdom can help turn hostility into friendship and therefore is a feasible solution to the challenge of world peace.

However, given that Chinese language is a complicated and abstruse art, not many non-Chinese can truly comprehend Chinese wisdom. There have been scholars, such as Lin Yutang, who have devoted vast amounts of time and energy to exporting Chinese culture to the West, but to little effect. Recent years have seen more translations of Chinese works into foreign languages. Due to differences in conceptual systems, however, the translation work is faced with many difficulties. Learning a foreign culture via translations is a “have to” choice. The best way to access Chinese wisdom is through the Chinese language. After all, the creators and speakers of Chinese have accumulated a

wealth of corresponding wisdom, which is recorded in our language. International Chinese language education not only imparts language but also disseminates Chinese wisdom.

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Leisure Education and Creative Thinking

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Abstract: There are two dimensions of creative thinking: a creative “state of mind” and creative “thinking tactics”. The former means clarity of mind which makes people always ready for truth, while the latter points to an effective way of creative thinking. The formation of creative thinking requires a leisurely mindset. Leisure education could help people make the best use of their leisure, let leisure wield a positive influence on creativity cultivation, and eliminate the downside of the current education, thereby rendering people’s efforts to cultivate creative thinking more effectively. The goal of leisure education is to achieve a creative “state of mind” required for creative thinking, while the content and approaches adopted by leisure education could provide inspiration for creative “thinking tactics”. To vigorously expand leisure education will be necessary in this creative age, especially for the cultivation of creative talents.

Keywords: leisure education, creative thinking, “state of mind” and “thinking tactics”

Creativity is the most important driving force that helps upgrade industries and changes the world, and its cultivation has become a crucial topic that must be considered and studied in modern times. Leisure education is helpful for the formation of creative thinking, since it could utilize the strengths of leisure, such as ease, freedom and self-satisfaction, to lead students into a world of creativity with an eased and free mind, and also help them acquire creativity through novel and unique thinking.

The Creative “State of Mind” and Creative “Thinking Tactics” Required by Creative Thinking

Creative thinking is an activity of the mind and the consciousness to

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create new symbols, images and representations that indicate particular ideas, cultures and values (Hu, 2008). During the long human history, it was the utilization of creative thinking that enabled humans to create and develop themselves, and propelled human individuals and societies forward. Karl Marx held that the ability to make tools was the only thing that distinguished man from animals. Ernst Cassirer, however, argued that the ability to use symbols, instead, should mark their difference. But whether tools or symbols, creative thinking is necessary. It is creative thinking that distinguishes man from animals and gives man a creative existence in the universe. Creative thinking, as a mental process to discover and solve problems, provides “the stepping stones to human progress”. On the one hand, creative thinking boosts human individual growth and elevates humanity to a position above animals; on the other hand, the utilization of creative thinking keeps pushing human spiritual and material civilization forward.

There are two dimensions of creative thinking: a creative “state of mind” and creative “thinking tactics”. The former refers to a clarity of mind which allows people to remove the veil from truth through epiphanies or inspirations and see things unfolding into their truest and best selves. Lu You, a poet in the Southern Song Dynasty, once said, “The words are already there; the lucky sometimes stumble upon them”. That also implies that, once entering a creative “state of mind”, people may need no deliberate efforts, but just a little bit of luck combined with a philosophical kind of wisdom to naturally get what they want. Like leisure, a creative “state of mind” is also marked with ease, freedom and self-satisfaction (Pan, 2005) and it sparks one’s creativity and enhances self-fulfillment. With restrictions here and there, humans are never born free, but creative thinking frees them to some measure, allowing them to gallop unbridled in the imaginary world, and in creative mental spheres like literature, the arts or science, all the time with a liberated mind. Only when creative thinking is given freedom will remarkable inventions appear, as those innovations and extraordinary achievements that adorned human history. It is said that many of Einstein’s ideas just popped out when he was walking behind a baby stroller or standing on a bridge waiting for a friend on a rainy day; and Alan Greenspan had his best ideas about economic development when he was taking a bath. Likewise, Chinese literati and artists are also known for the excellent works they improvised when drunk, such as the “hundreds of poems” composed by Li Bai in a stupor and Wang Xizhi’s “Preface to the Poems Collected from the Orchid Pavilion”. Their minds were liberated by the booze.

A creative “thinking tactic”, on the other hand, refers to a specific way of thinking or an approach to solving a problem. It can be well demonstrated by many examples from history, such as Cao Chong’s creative method to weigh the elephant and Sima Guang’s quick wit to smash the vat to rescue his friend. Creative ways of thinking also abound in modern times, such as brainstorming, the tactic used for recognizing the whole through observation of the parts, Fermi’s thinking tactics, the approach of borrowing forces for use, making adjustments when cornered, transcending limitations, and thinking systematically (Yang, 2014). Creative “thinking tactics” have three hallmarks; novelty, diversity and effectiveness. Creative thinking must be a new and unique way of thinking that breaks through stereotypes. When fully utilized, it is supposed to provide myriad answers to a

certain question. Everything in the world is marked with infinite attributes, and creative thinking could identify their multiple dimensions, find multiple solutions to problems, and explore infinite opportunities. What creative thinking tries to do is to select the best option from all the available solutions and to solve a problem more effectively. When one way is blocked, people are encouraged to shift to another direction for their answer and solution to achieve the best results.

The Value of Leisure Education for Creative Thinking

Creative Thinking Cannot Exist without Leisure

Leisure provides a foundation for creative thinking to transcend time and space. The ability to transcend limitations is a fundamental trait of the human mind and also the root cause of its creativity. Creative thinking, as a form of transcendence over reality and stereotypes, can liberate men from both internal and external yokes, invigorate and give full play to their thinking capacities, and thus turn themselves into a work of creativity. Creative thinking can transcend specific circumstances, break through the confinement of time and space, and conceive things and scenes from beyond time and space, just as is reflected in the famous Chinese sayings “The author’s mind is in harmony with the external environment” and “One’s mind can connect to and act together with the things of the world”. Thinking can bring things beyond concrete objects to mind, for example, the happy chirp of birds in the wild may be translated into a pleasant melody, or a melody may materialize into a beautiful story in our mind. It was also owing to thinking’s ability to transcend concrete things that Einstein managed to follow light all the way to space and found new attributes of time and space (Duan, 2002). Such transcendence cannot be realized without leisure providing a foundation in time and space. A man buried in work or trivialities will only focus on things here and now, and how could it be possible for them to see beyond the immediate concerns and unleash their creative thinking? Leisure is an experience of and expression for freedom, and a combination of free time and a free mind. It helps people transcend all tangible and intangible kinds of yokes and covers, be true to themselves, experience in a most natural manner, imagine freely, and go beyond the immediate time, space and things, thereby invigorating their creative thinking. In the free time provided by leisure, people can break away from the regulations and requirements made by concrete affairs, be relatively free from others’ interventions and disturbances, follow and act upon their own will at ease, and become the masters of their own thinking and behavior. Blessed by leisure with a free mind, they can adopt a leisurely mentality, appreciate, discover and create things naturally, joyfully and confidently, employ their imagination to the utmost, and let their thinking transcend the limitations and confinements of reality, thereby preparing themselves in time and space for creative thinking.

Leisure also enriches the spiritual connotation and raises the level of creative thinking. “Creativity as a special activity of the human mind and consciousness refers to the creation of new symbols, representations and images. Those new symbols, representations and images must carry rich thoughts,

cultures and values, or else they will never be considered as true creativity” (Hu, 2008, pp.71-74). True creativity must contain novel and rich thoughts, cultures and value. Leisure, by injecting man’s subjective elements such as talent, wisdom, thoughts, emotions and wishes into creative thinking, bestows upon creative thinking a new and unique connotation, and thus elevates its level. That is also why Josef Pieper held in his philosophy that the core of leisure should be pursuing a quiet and profound life. “If lacking in leisure, humanity will only end up as a slave to work, fettered to a narrow world from which they can never escape. Without leisure, there will be no chance for thinking or any birth of culture” (Pieper, 2005, p. 7). Only in leisure can men become free souls, draw on the best parts of knowledge and culture freely, and cheerfully and create. Johan Huizinga once said that those who were playing games were the freest, truest and most creative people. What he called “those who are playing games” referred to people in leisure, the most creative group. Leisure releases them from all kinds of covers and confinements, and enables them to fully assimilate and learn the best parts of knowledge and culture, and display their true talents and wisdom to the utmost. Meanwhile, it becomes possible for them to fully utilize their own power and initiative, find their way into the truth of the world, understand the truth, achieve their subjective goal in their own manner, and display their own style, taste and level, just as the two poems authored by two famous Confucian scholars in the Song Dynasty indicated. The poems, which read, “Leisure appeased all of my stress and anxieties, and I slept until the window was lit by the rosy morning sunshine. A sober observation will reveal all things at their ease, and they are feeling the seasons just like us people” (by Cheng Hao) and “There lies a glassy oblong pool, where light and shade pursue their course. How could it be so clear and cool? For fresh water comes from the source” (by Zhu Xi), are a vivid reflection of how leisure provides a leisurely state of mind and refreshing inspiration for creativity.

The Drawbacks of the Current Education that Hamper the Development of Creative Thinking

The human brain is home to countless neurons, which are connected by routes full of possibilities. As the world emerges and expands in human consciousness, the human brain also finds a world of reflections, in which pieces of information will follow their particular routes, and reach and gather in the center of the brain, until a vivid picture of “thinking” is formed. The information favors familiar routes and always sets out for a familiar destination. Meanwhile, those unchosen routes become deserted. A human thinking model is thus formulated. After that, man begins to realize that, whenever they are trying to find a new way of thinking, they will face a strong sort of resistance. So, what exactly is hampering creative thinking? Wang Wenge pointed out that “Creativity is an exploitation of knowledge and experience, without which creativity will never happen; on the other hand, however, the already-existing knowledge and experience also represses creativity and keeps the human mind from deviating” (Wang, 2013, p. 24). But in truth, knowledge and experience is neutral in itself and is far from being repressive. Possibly, instead, it is the model of learning that should be responsible for the repression, and the biggest obstacle for creative thinking is perhaps the current model of education.

Professor Zhao Yong from Michigan State University in the US once remarked that “An innovation-driven society must be made up of innovative members. Innovative talents can never be born in schools which only force students to recite standard answers for exams, or award and punish students in proportion to how well they can ‘regurgitate’ the knowledge crammed into their minds” (Zhao, 2010, p. 2). Education should be a process to lift veils, reveal the true self to people, help them improve themselves and achieve an ideal state free from covers, and let them freely utilize their thinking power to create and realize their own value. The current education, however, deviates from that. It is harmful for people’s imaginations and creativity and hampers their creative thinking. By habitually cramming into students’ mind the so-called “only” correct and useful kinds of knowledge and experiences, and then using exams as a weapon to force students to remember them, the current education places students in the same mold, but never encourages students to explore, think for themselves, imagine, discover the colorfulness of the world, exploit their infinite potential, and pursue their unique and truest self. For example, in family education parents tend to choose for their children, and schools use uniform, standard exams as a tool to score students and measure their performance. That is repressing creative thinking. The education gets shrouded in its instrumental value and deviates from its man-oriented foundation. In that manner all things beyond the instrumental value are obscured, including the possibilities for new discoveries or inventions.

The Creative Value of Leisure Education

How should leisure be understood and utilized so that it could better exert a positive influence on creative thinking? How should the drawbacks of the current education and the tethers to thinking be eradicated? Leisure education could be an innovative answer. Charles Brightbill, a US scholar studying leisure education, defined leisure education as an education on the purpose of things beyond work and other activities to sustain livelihoods, and held that leisure education could let people gain self-satisfaction by formally or informally learning to use their free time, bring their talent into full play, and thus make free time playing a role in improving the overall quality of their lives (Brightbill, 2009). On the one hand, leisure education provides people with the basic knowledge and skills they need for a leisurely life, helps them to exploit their talent, and improves the quality of their lives; on the other hand, and what is more important, leisure education gradually brings the meaning and value of leisure and living to people, makes them understand themselves and their relationship with the world, and helps them “add a dimension of value to their existence and build a ‘world of meaning’ and a spiritual haven peculiar to humans” (Liu, 2008, p. 148).

Leisure education allows people to make better use of their leisure time to let leisure enhance their creative thinking. Undoubtedly leisure places people in a free, relaxed and joyful mental state that is ready for enjoyment and self-development. However, it does not mean that people can transform leisure into a good state of mind simply by following their natural instincts. Not everyone can enjoy leisure in a smart way. Many people have free time yet do not know how to use it, while many dream of leisure yet never get a chance to experience it. In both cases the positive role and value of leisure

will be largely hampered, whereby creative thinking becomes barely possible. To use leisure in a healthy, appropriate and smart way, one needs education. Leisure education, aimed at “helping people understand leisure and themselves, utilize leisure, live a leisurely life and realize their own value,” featuring the “cultivation of people’s awareness of leisure, the ability to choose leisure activities, and leisure-related knowledge and skills” in content, allowing people to clearly understand and use leisure in a productive manner, letting life itself blossom in leisure, and helping people move towards a true and ideal self. Only through leisure education can the circumstances around leisure be fully leveraged, creative thinking sparked, and the spiritual connotations of creative thinking be enriched.

Leisure education, by leading people to their truest selves and freeing their minds for exploration, can eradicate the drawbacks of the current education’s pursuit for instrumental value, and break through all kinds of confinement brought by inertial thinking. “The truth about and the meaning of one’s life lie in the self he identifies with” (Feng, 2004, p. 21). The truest self of a person is his fundamental, truest state of existence. The meaning and value of his existence must be revealed by his real living. But, one’s true self is often obscured. Living in a society of complexity, many people have to wear a mask to hide their real thoughts, yield to reality, and block the way to their true selves, thus becoming “aliens” living a “passive” existence (Pan, 2017). Only in leisure can people disarm themselves, get rid of the yokes, and return to their true selves. Leisure does not ask people to escape the modern world like a cynic. Instead, it offers a way back home. In leisure everyone has a chance to find their true self and become better and happier (Goodale & Godbey, 2000). Leisure education leads people to their leisurely, or true, self. It enables people to continuously overcome inevitable limitations, transcend themselves according to an ideal standard, and insist on realizing the goal of freeing humanity itself and letting it return to its truest self. Therefore, leisure education is truly an education that aims to lead people to their truest self. In this process, people can proceed from their true self, get rid of all kinds of yokes and covers, liberate their minds, and give their thoughts free play.

Leisure education encourages truly free exploration. The nature of leisure is freedom, and any attempt to get close to it will bring people closer to a liberated self, a self free of dependence and tethers. Any activity that is free, unbridled, and not repressed is leisurely. To engage in a leisurely activity means that one can act as a free soul and choose as he likes during the activity (Godbey, 2000). A self in leisure is in its ideal and free state. Therefore, a person in leisure is in fact a complete being who is true to himself and lives in a free, ideal state. Zhang Chao from the Qing Dynasty once said, “Leisure is the nicest thing for men, not because idleness appeals to them, but because in leisure they can read, travel, make friends, drink or write. Is there anything more fun in the world?” (Zhang, 2016, p. 144). In leisure people are free to dabble in things they like, explore the unknown, have fun, and improve themselves in a well-rounded manner. The process is a truly free exploration decided and propelled by one’s true self and committed to the improvement of humanity. Leisure education helps people gain true recreation and experience true freedom, encourages them to explore in freedom and try things they truly like that are decided by their true self, liberates people’s mind and lives, leads

them to a free self, and enables them to use free thinking to feel, explore the world and then create.

Such values are suggested for leisure education: The education should be aimed at human self-understanding and self-improvement, be conducted based on people's true selves, ask people to learn things they like rather than those that are forced on them, and not to learn just because others think something is useful; people are supposed to freely explore the unknown world with joy and curiosity, enjoy and leverage leisure, liberate their minds, shatter tethers, liberate their thinking, transcend the immediate time, space and concrete things, fully utilize the power of their true selves and their initiative, bring their talents and wisdom into full play, and depend on their own thoughts, emotions and wishes to invigorate creative thinking, thereby enabling themselves to create and realize their own value, enrich their lives and find the meaning of their life.

The Goal of Leisure Education

The Goal of Leisure Education is to Provide a Creative “State of Mind”.

The goal of leisure education is to help people feel satisfied in leisure and find their life meaningful (Brightbill, 2009). It enables them to understand themselves, be a true and free self, and utilize and enjoy freedom, guides them to improve all kinds of capacities in freedom, create and realize their own value, and establish a world of meaning for their lives, thereby fully presenting a creative “state of mind”.

Leisure education helps people understand themselves, shatter yokes and become a true and free self, and cultivates in them a creative “state of mind” for creative thinking.

Freedom, as one of the basic meanings of one's living, represents the realization of its true self, and leisure offers freedom a broad stage. However, though leisure offers free choices and potential opportunities, it also creates hidden troubles. The choices people make are closely linked with the quality of their leisure and then the quality of their lives. Only by making the correct choices can people find their true, free self, and fully utilize and enjoy freedom, or else they will end up as slaves to freedom and get lost in the freedom. Therefore, leisure education must be launched. Leisure education is truly an education that aims to lead people to their truest self and encourages free exploration. In it people can get a full understanding of a true, or leisurely, self, find their true and free self, and become a complete person. Meanwhile, leisure education reveals the up and down sides of freedom and guides people to make correct choices, namely that it allows people to be free and independent to choose those behaviors they are inherently called to and they themselves find necessary and meaningful, whereby they can avoid the abuse of freedom and its negative repercussions, and be prevented from becoming slaves to freedom and losing their true self. Leisure education can teach people what freedom is and how they should utilize and enjoy it and help them make correct choices. What is called “freedom” here is in fact a free “state of mind” for creative thinking. It is also an essential attribute of creative thinking.

Leisure education guides people to excite their energy in leisure and enhance their creativity and cultivates in people a creative “state of mind”.

Leisure offers myriad possibilities to people, through which they can engage themselves in various activities based on their interest, and in this process invigorate their fundamental capacities such as imagination, executive ability and creativity. Leisure education views leisure as a chance to learn, allows to cultivate people’s good taste, interest, skills and values, and is helpful for the improvement of their behavior. It enables people to enjoy a creative, inspiring, adventurous, consummate life (Brightbill, 2009). Through leisure education people can learn scientific ideas about leisure, improve their ability to choose leisure activities, and enrich their leisure-related knowledge and skills. That will then allow people to put what they learn about leisure into practice, expand their field of attempts, and better excite their potential.

Leisure education enables people to better understand and unleash themselves and aims for the self-fulfillment of a creative “state of mind”.

Leisure does not only mean a natural, eased and free state, but it also refers to an ideal state of self-fulfillment and self-satisfaction. Only in leisure can people remove their mask, shatter yokes, return to their true self, and realize their potential. Self-realization is not an inborn talent, but an outcome of education. One of the greatest goals of education is to help people realize their potential (Brightbill, 2009). Leisure education, aimed at leading people to their true self, allows people to choose their leisure activities consciously rather than blindly follow others. It helps people find their true self and cultivates a keen perception in them (Brightbill, 2009). It encourages people to keep liberating themselves and always return to their true self and sets that as its ultimate goal. It is in this process that creative thinking is invigorated, and people turn themselves into a work of creativity and achieve self-fulfillment.

The Content of Leisure Education is Aimed at Providing Inspiration for the Creative “Thinking Tactics”.

In terms of its content and approaches, leisure education guides people to utilize leisure in a productive, clear-minded and intelligent way, and cultivates in them an awareness of leisure, an ability to choose leisure activities, and leisure-related knowledge and skills, thereby enabling people to see leisure through a new lens, identify diverse recreation means, make an appropriate choice, better lead a leisurely life, and achieve better outcomes. Then it provides effective inspiration for the creative “thinking tactics”.

Leisure education cultivates scientific ideas about leisure among the public, enables them to see leisure from a new angle, and inspires a new way of looking at the creative “thinking tactics”.

People have long held several misunderstandings about leisure. For example, some equate leisure with rest and relaxation, squandering away free time passively and blindly; some confuse leisure with indulgence in pleasures and idleness even to the extent that they render their life meaningless and see

their soul distorted; some see leisure as mere consumption and an opportunity to show off, stripping leisure of all its spiritual value; some consider leisure as a terrible opponent to work. It is the goal of leisure education to cultivate scientific ideas about leisure among the public, correct their former misunderstandings, and help them acquire the correct understanding about the nature of leisure. Leisure is never simple relaxation, meaningless indulgence or a formidable opponent to work. Instead, it is an opportunity for people to be liberated from external stress, have fun, enjoy freedom and improve themselves. Only when leisure is scientifically treated can it be correctly utilized, controlled and developed into a form of wealth, thereby building a new spiritual haven for creative thinking and offering a new perspective. Traditional proverbs like “God helps those who help themselves” and “With time, iron bars can be ground into needles” may not work here. Instead, in today’s context, diligence does not always herald success and play is not necessarily an evil. Only at ease and in leisure can people perceive their inner thoughts, from which creativity may pour out (Pan, 2017).

Leisure education improves people’s ability to choose leisure activities, brings them to a wide range of recreational means, in which they can select the one that best suits them, whereby diverse “thinking tactics” can be sparked for their creative thinking.

Based on one’s interest, expectation and strengths, the ability to choose leisure activities means individuals’ capacity to have an independent and free choice in their recreation so long as they are morally appropriate and helpful for their self-development. It includes people’s capacity to utilize time, their aesthetic abilities and capability to choose for themselves. Given the diversity of the means of recreation, their combination could yield myriad possibilities. What leisure education does is help people find those diverse recreation means and then select those creative ones that best serve their purpose and ideals. The real meaning of freedom is that one can always try and become free to choose and decide all the details of a leisure activity (Mundy & Odum, 1989). Therefore, the most important thing for people to do is understand themselves and their deepest needs, and be free to choose a recreation they really like. Only interest, the strongest driving force for creativity, can inspire diverse or even infinite possibilities of creativity.

Leisure education, by increasing people’s leisure-related knowledge and skills, can make leisure more productive and thus enhance creative “thinking tactics”.

Without certain leisure-related knowledge and skills, some leisure activities may turn out to be less fun. The satisfaction people gain from any activity is inseparable from the increase of their knowledge and skills. Whether it is cooking, boating, playing golf, writing poetry, collecting antiques or playing bridge, all those leisure activities are, without exception, enriched as people’s knowledge and skills are improved (Goodale & Godbey, 2000). Mihaly Csikszentmihalyi proposed the concept of “flow” to define the optimal experience people attain at work or in leisure. It means a surge of elation people feel at the moment of self-fulfillment. The “flow” experience requires that an activity should never be more difficult than one can afford. It is undoubtedly an optimal mental state for a creative person. Creativity is a combination of knowledge and action. Without necessary skills, one may aim high yet accomplish little, and his creativity may flounder due to the lack of tactics. Therefore, only

by mastering leisure-related knowledge and skills through leisure education can people fully utilize freedom, effect creativity and enhance its role.

The goal of leisure education is to help people “feel satisfied in leisure and find their life meaningful”, and enable them to understand themselves, be a true and free self, and utilize and enjoy freedom. Leisure guides them to improve all kinds of capacities in freedom, create and realize their own value, and establish a world of meaning for their living, thereby fully presenting a creative “state of mind”; in terms of its content and approaches, leisure education helps cultivate an awareness of leisure, an ability to choose leisure activities, and thus develop leisure-related knowledge and skills, thereby enabling people to see leisure through a new lens, identify diverse recreations, make appropriate choices, better lead a leisurely life and achieve better outcomes to provide effective inspiration for the creative “thinking tactics”. Leisure education is a new approach to cultivating creative thinking that especially should be promoted in this age of creativity.

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Theoretical Mechanisms, Practice Foundations, and Policy Options for Big Data Driven High-quality Economic Growth in China

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Abstract: In the transition of China's economy from high-speed growth to high-quality growth in the new era, economic practices are oriented to fostering new growth drivers, developing new industries, and forming new models. Based on the data flow, big data effectively integrates technology, material, fund, and human resource flows and reveals new paths for the development of new growth drivers, new industries and new models. Adopting an analytical framework with “macro—meso—micro” levels, this paper elaborates on the theoretical mechanisms by which big data drives high-quality growth through efficiency improvements, upgrades of industrial structures, and business model innovations. It also explores the practical foundations for big data driven high-quality growth including technological advancements of big data, the development of big data industries, and the formulation of big data strategies. Finally, this paper proposes policy options for big data promoting high-quality growth in terms of developing digital economy, consolidating the infrastructure construction of big data, expediting convergence of big data and the real economy, advocating for a big data culture, and expanding financing options for big data.

Keywords: big data, high-quality growth, innovation-driven

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Introduction

After 40 years of arduous exploration since reform and opening up, China's economy has transformed from high-speed growth to high-quality growth. This is a conspicuous feature of China's economic development in the new era as well as the fundamental principle of its growth in the future. How to realize high-quality growth by improving economic growth, promoting upgrades of industrial structures, and innovating business models will be the focus of researches and the prominent issue to be addressed now and in the future. High-quality growth is now happening in the era of big data and big data has become an important indicator of a country's comprehensive strength as it integrates cloud computing, the Internet of Things and other new technologies and promotes the in-depth integration of information technology and economic and social development. Big data has become a new resource, "the new oil that fuels the future society." With enormous potential values, it can tremendously affect and change economic development, social governance, and the production and living of the people. It provides new tools for addressing new challenges and new problems in the high-quality economic growth of China.

The dynamic development of big data involves five stages: software development—scientific research—commercial application—national strategy—social life. The proposition of Moore's law and the technological development of transistors in 1966 laid the physical foundation for big data. With the emergence of "data mining" in 1989, big data began to generate "big values". Then the spread of social media, starting in 2004, turned every user into a potential data generator and big data began to take form (Tu, 2014). In September 2008, an essay published in *Nature* put forward the concept of big data for the first time from the perspective of scientific research. Later, an increasing number of foreign scholars were engaged in the study and application of big data. Howe D et al. (2008) theoretically discussed the application of big data in specific industries. McAfee A et al. (2012) reviewed the origin and history of big data. Sejnowski T J et al. (2014) studied the application of big data in the neurosciences. Krumholz H M (2014) conducted in-depth research on the application of big data in medical care. Zikopoulos P and Eaton C (2011) focused on the exploration of big data technologies. Domestic scholars, including Yang Yi (2012), Han Fangfang (2013), and Wang Xincan (2013), also gave general reviews and summaries of the development of big data. In recent years, Chinese scholars discussed the influence of big data on the research paradigm of economics. He Da'an (2018) proposed a theoretical analysis framework for the innovative fundamentals of microeconomics in the upcoming "the data dialogue". Zhu Haijiu (2018), however, proposed the viewpoint that data are unable to tell people what to do in the future. Some scholars discussed the influence of big data on social governance (Sun, 2018) and macro regulation (He & Yang, 2018). While China is one of the first countries to study the influence of big data on the theories of economics, there are few studies on the influence of big data on high-quality economic growth. How does big data permeating into every field of social production and life affect high-quality economic growth? What are the theoretical mechanisms and practice foundations? How can we design supporting policies

that will encourage leap-forward developments in big data industry that will become the new engines for high-quality economic growth? In these questions lie the logical starting point and significance of this study.

Following the research approach of “theoretical mechanisms—practice foundations—policy options”, this paper elaborates on the internal mechanism of big data promoting high-quality economic growth through efficiency improvements, upgrades of industrial structures, and business model innovations. Then it reviews the practice foundation of big data promoting high-quality economic growth in terms of technological advancements of big data, the development of big data industries, and the formulation of big data strategies. Last, this paper proposes policy suggestions of utilizing big data to promote high-quality economic growth in the context of the new era from the developing digital economy, consolidating the infrastructure construction of big data, accelerating the integration of big data and the real economy, advocating for a big data culture, and improving big data financing.

Theoretical Mechanisms for Big Data Promoting High-quality Growth

At the stage of high-quality economic growth, practices are oriented to fostering new growth drivers, developing new industries, and forming new models from the macro, meso, and micro levels respectively. Based on the analytical framework with “macro—meso—micro” levels, this paper proposes theoretical mechanisms of big data promoting high-quality growth (Figure 1). At the macro level, this paper reveals the important role of big data in efficiency improvements from the aspects of promoting the combined efficiency of production elements, stimulating innovation efficiency and improving macro regulation efficiency. At the meso level, this paper explains the effect mechanism of big data on upgrades of the industrial structures from changing industrial correlations, facilitating industrial convergence and generating big data industries. At the micro level, this paper analyzes how big data can urge innovation in business models from upending the thinking models, changing the

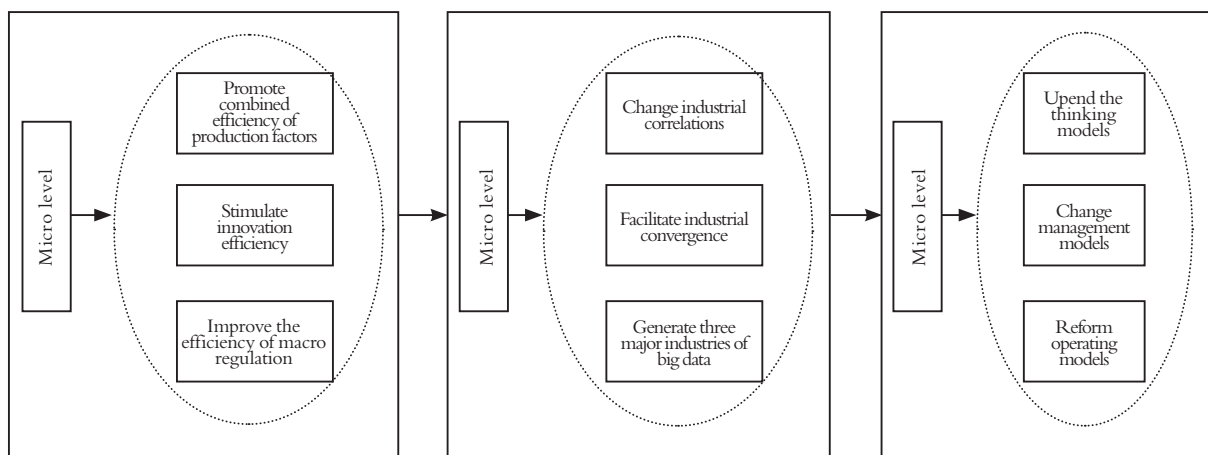


Figure 1 Theoretical Mechanisms for Big Data Promoting High-quality Economic Growth

management models, and reforming the operating models.

Big Data Drives High-quality Economic Growth by Increasing Efficiency at the Macro Level.

Big data improves the combined efficiency of production elements. Competition drives a company to move forward, while efficiency is where the life of the company lies. Efficiency is the ratio of input to output. The pursuit of high efficiency requires that a company be able to respond rapidly to the market and give timely feedback and take immediate action in all procedures regarding the value chain, including research and development(R&D), procurement, production, sales, logistics, and services. In this process, big data thinking is indispensable. There are significant changes in the combinations and positions of production factors in the era of big data. Traditional patterns of production factors are restructured. In the meantime, big data, relying on the internet, transforms the inputs, combinations and utilization methods of traditional resources and liberates man from burdensome labor to realize the maximum outputs with the minimum inputs of labor, capital, land, and resources. In this way, big data notably increases the combined efficiency of production elements and brings important new driving forces to high-quality growth.

Big data stimulates innovation efficiency. At the stage of high-quality growth, it is difficult to sustain the former pattern of promoting economic growth through massive investments. Innovation becomes the first driver for high-quality growth. Driven by innovation, China is beginning to develop a “Three new economy”^① to constantly bring new impetus to economic growth (Ren, 2018). As a result, innovation becomes an internal demand for high-quality development. Innovation efficiency depends on the efficiency of cooperation among the sub-systems as well as the internal efficiency of each sub-system. Their organic integration decides whether innovation is successful or not. Big data provides brand new impetus to innovation efficiency. Based on the data flow, it exerts a profound impact on the division of labor and cooperation patterns of the society by effectively integrating technology, materials, funds, and human resources flows and deeply merging the Internet, cloud computing and other industries. Thus, big data becomes an important tool for process innovations, management innovations, and system innovations. For the logistics and computer industries that are included in the big data platform, their employed populations and production efficiencies are far higher than those of traditional manufacturing. So is their innovation efficiency.

Big data improves the efficiency of macro regulation. Mismatches between demand and supply, excess production capacity, and low-end locking of the economic structures seriously hinder high-quality development. Due to mismatches of resources, excess resources will be allocated to industries where supply exceeds demand, resulting in excess production capacity. Industries, where supply falls short of demand, will be in inadequate supply due to a lack of resources. Low-end locking of

① “Three new economy” refers to the economy featuring new industries, new business forms , and new business models.

economic structures brings about an imbalanced supply of low and medium-end products and high-end products. That means, low and medium-end products would be in excess, but high-end products would be in shortage. In the face of mismatches between supply and demand, excess production capacity and other market failures, the government will take macro regulatory action. Whether the macro regulation decisions are scientific is decided by the “quantity” and “value” of data in the hands of the government. The collection and processing of big data could effectively solve the “quantity” and “value” problems of data so that the government could conduct macro regulation in a more proactive, scientific, and systematic manner. With the great support of data, the government can balance and coordinate the scientific ratios of the economic sectors and formulate effective economic development strategies from a universal and sustainable standpoint. Based on mass data analysis, the local markets can utilize the law of value to spontaneously allocate resources in an effective manner in the short run. The government, however, could use big data for the overall macro regulation to increase the efficiency of macro decision-making.

Big Data Propels High-quality Growth by Promoting Upgrades of Industrial Structures at the Meso Level.

Big data changes industrial correlations. Industrial correlations, the inner linkage of industries underpinning and reinforcing each other, are mainly manifested by the supply-demand correlations of products and technologies. In the supply-demand correlations of products, the products of one industry are the production factor of other industries; in the supply-demand correlations of technologies, one industry has to base its production on the technical support from other industries. Industrial correlations change dynamically with technological advancements. The era of big data, featuring extensive applications of cloud computing and the Internet of Things transforms traditional industrial correlations. Enterprises may utilize big data decision-making means to accurately analyze the demand and supply of products in the market and avoid the blind and random production as much as possible. Intelligent manufacturing has become a prevailing trend.

Big data facilitates industrial convergence. Industrial convergence represents the need for industrial improvements in efficiency and the natural result driven by external factors, including technological innovations and economic globalization. There are many factors that will affect industrial convergence, and technological innovations are undoubtedly one of the most important drivers. Big data, as a brand-new economic resource, is an important technological innovation. Through the in-depth convergence with traditional manufacturing, it may urge traditional manufacturing to allocate resources more effectively and organize procurements, production, marketing, logistics, and other business activities more accurately, thus realizing high-quality growth. At the same time, in-depth convergence of big data and traditional manufacturing may give birth to new producer services, thus pushing forward optimization of the industrial structures.

Big data generates three major industries. Based on big data, new industries that adapt to high-quality growth emerge in large quantities, mainly classified into industries directly involving big data,

industries in relation to big data, and industries where big data exerts influences. With the help of big data, these industries have succeeded in improving both management and production efficiency, providing better customer experiences and bringing about higher economic and social benefits at the same time. Industries directly involving big data are those developed from the core technologies of big data. They are mainly engaged in big data collection, processing, storage, analysis, and cloud platform operations, which are the value-added core services of big data, and fall in the category of digital economy. Such industries directly drive the economic growth of China and are an important direction of China's modern services in the future. Industries in relation to big data are the upstream and downstream industries that serve the industries directly involving big data, mainly engaged in integrated circuits, electronic devices, software development, and smart terminals. Industries, where big data exerts influence, are new business forms of traditional industries that are upgraded and transformed based on the core technologies of big data, including intelligent energy, intelligent manufacturing, intelligent agriculture, intelligent tourism, telemedicine, and the digital cultural and creative industries.

Big Data Pushes Forward High-quality Growth by Innovating Business Models at the Micro Level.

Big data upends traditional thinking models. How big data changes the existing thinking models is reflected in the following aspects: First, big data refers to the entire dataset rather than the random samples; second, big data represents hybridity rather than accuracy; third, big data is about correlations rather than causal relationships. Under the new economic conditions in the new era, the traditional business models encounter bottlenecks in their development because they fail to meet the needs of technological advancements or meet the diversified needs of the markets. Big data brings opportunities for business model innovations. As the amount of data continues to grow, data are no longer irrelevant but correlate with each other in a sophisticated manner. Cross-boundary convergence will be the theme of business development in the future.

Big data transforms traditional management models. The era of big data brings challenges to the traditional management models of enterprises, putting them in a disadvantageous position in the competition of high-quality growth. The "elite decision-making" model featuring decision-making by the senior management will be turned into an innovative model featuring decision-making by the public. Decision-making based on experience and intuitions will transform into that based on the collection and analysis of data. In the era of big data, the key to enhancing the market competitiveness of a company lies in how to fully mine useful information from mass customer information and consumption records to construct an effective data management platform.

Big data reforms the traditional operating models. In the era of big data, companies may mine value from large-scale diversified data and change their original models of profit and operation, to create enormous economic value. Utilizing big data technologies, enterprises may accurately target their customers and analyze their potential demands. On this basis, enterprises will redefine their

supply chains, optimize production and marketing processes, improve operating efficiency, expand income channels and gain more profits. Nowadays, big data has penetrated manufacturing, finance, retail, and education, which creates enormous economic and social benefits. In this era, enterprises that achieve success through business model innovations have sprung up in China, such as Alibaba and JD.com.

Practice Foundations for Big Data Promoting High-quality Growth

The McKinsey Global Institute(MGI) recognized big data as the “fourth industrial revolution” in its report in 2011, making this invention comparable to that of the steam engine, electricity, and the Internet. The report detailed the application of big data in business and defined big data as a new type of productivity. In 2012, the World Economic Forum(WEF) in Davos, Switzerland focused on the subject of “big data” and put forward the concept of “data assets”. In the same year, the US government input \$200 million to support big data development, upgraded big data as a national strategy and placed it at the heart of national interests together with digital sovereignty, territorial sovereignty, air supremacy, and command of the sea. China also began to attach importance to big data at the same time. In 2013, the Ministry of Science and Technology of China included big data in its “973” national basic research program; in 2015, the State Council published the *Action Outline for Promoting the Big Data Development*; in 2017, the 19th National Congress of Communist Party of China (NCCPC) further pointed out that, with the convergence and fusion of information technology and human life and production, data have exploded and clustered throughout the globe, which produces a significant effect on economic development, social governance, and people’s lives. In general, China is moving at the same pace as other major developed countries regarding big data as a national policy.

Big Data Technology Provides Innovation Support for High-quality Growth.

The support from backstage technologies is indispensable for the popularization of big data. Big data technology is a type of technology used to select useful and valuable information from varied types of data. Big data technology runs through every procedure of big data applications from the collection, sorting, and storage to processing and display. The core technology of big data mainly consists of data collection, storage, cleaning, mining, and visualization. In recent years, the development and popularization of new technologies, including the Internet of Things, cloud computing, data integration, linked data, and information release, provide innovation support for promoting high-quality growth by big data.

Around the world, Google, Microsoft, and Oracle companies have taken the lead in innovating big data products and services and applying big data to transportation, public security, social security, food safety, and other fields of livelihood, which achieves remarkable results and significantly increases social governance efficiency. As for the specific situations in China, big data technology

has driven the emergence of a large number of “smart+” digitalized integrated livelihood service platforms. Big data has penetrated into medical services, ecological maintenance, education services, household services, and community services and plays an important role in drug safety, environmental protection, education standards, quality of life, and city governance. Internet enterprises represented by Baidu, Alibaba, and Tencent have been deeply engaged in the practice of high-quality economic growth. They make full use of big data platforms and play their part by different means.

Big Data Brings Important Opportunities for High-quality Industrial Growth.

The continuous improvement of big data technology drives the “commercialization” and “industrialization” of big data. Most big data-related industries fall into the modern service sector, which is an important industrial foundation for high-quality economic growth in China. As Per the “four 70%”^① criteria for the service sector of a mature economy, there is still space and the requirement for further development of China’s service sector, and big data provides an important opportunity for the leap-forward development of a high-quality service sector. In recent years, China’s big data industry has made significant progress. It is estimated that China will contribute 20%^② of the world’s total data by 2020. By that time, China will become one of the countries with the most abundant data resource reserves in the world. The implementation of a series of supporting policies optimizes the environment for the development of China’s big data industry. Most provinces have set detailed and highly operable goals for all stages of big data development.

Big data exchange platforms serve as an important foundation and means to push forward the development of big data industries. China has built over 20 big data exchange institutions in recent years and the big data transaction markets are becoming growingly optimistic. Guizhou Province is at the forefront of the development of big data industries in China and has formed a characteristic development model for this industry. A big data exchange has been built in Guiyang. Its scope of business covers multiple fields, including big data credit investigations, financial big data, and governance big data. Its business models are diversified, including online transactions, transactions of the right to use, and equity transactions. Some provinces have made plans and set specific goals for their big data industries to achieve by 2020. Among them, Jiangsu Province targets one trillion yuan, Guangdong Province 600 billion yuan, Beijing and Shanghai 100 billion yuan, respectively, and Guizhou Province 450 billion yuan^③.

The Formation of Big Data Strategies Lays a Policy Foundation for High-quality Growth.

① An important indicator for the formation of the modern industrial structure is that the service industry takes a dominant position in economic development. In developed countries and regions, the position of the service industry can be summarized into “four 70%”, namely, the value added of the service industry accounts for about 70% of the GDP, the number of employees in the service industry is around 70% of the total social employment population, the service industry contributes 70% of the total economic growth, and producer services account for 70% of the service industry.

② *Big Data Boosts High-quality Development*, published on version 05 of Guangming Daily on May 27, 2018.

③ *2017 Q1 Trade Risk Monitoring Report of Guangdong Province*.

China completed the top-level design of big data policies in 2015 and refined and implemented these policies in 2016. Today, China's big data development has stepped from theoretical research to practical applications and expanded gradually to major industries and fields. All provinces and municipalities are important players in high-quality development. As big data becomes a national strategy, the provinces and municipalities, combining their own advantages in economic resources, scientific and technological resources, and human resources, formulate their strategies on big data development with local characteristics in terms of key technologies, advanced product manufacturing, and construction of industrial ecosystems. In March 2017, the *Analysis Report on Planning of Local Government for Big Data Development* was released. The report reveals that most provinces and municipalities in China have put forward big data development strategies that suit their local conditions and implemented these strategies in line with the requirements of the Action Outline for Promoting the Development of Big Data.

All regions have their explicit goals for big data development. Twenty provinces and municipalities have set specific objectives for local big data development. Among them, most cities aim to be the “application and demonstration center” and “industrial center/leading area” with big data as a powerful driver for local economic and social development. For example, Jiangsu Province aims to “strive for a leading and distinctive national big data comprehensive pilot zone”. Some regions represented by Suzhou and Nanning, based on their local conditions and foundations and in the context of big data progress at home and abroad, set out detailed plans for the development models, business models, and important projects for local big data industries in terms of the industrial ecology constructions and big data applications.

Policy Options for Big Data Promoting High-quality Growth

Major developed countries deem big data as an important move in driving economic development and optimizing state governance. The US was the first country to utilize the Internet and big data to enhance its state governance ability. It attaches great importance to the value of big data and makes it a tool for all industries to use to solve problems. Meanwhile, it also reforms the systems and mechanisms that hinder the development of big data. The Japanese government and non-governmental organizations regard new industries based on big data and cloud computing as a new economic growth pole and constantly enlarge their inputs in science and technology. China should learn from and sum up the precious experience of big data development from other countries and carry out its own big data practices. China should also consider local conditions, study and properly utilize big data based on the realistic needs of its economic and social development, so that big data will become a new momentum driving high-quality growth in China.

Utilizing Big Data to Drive Innovation and Vigorously Develop Digital Economy.

Innovation has become a major driver for China's high-quality development in the new era.

In this context, economic development will be driven by innovation instead of production factors and investments. Innovation has become important strategic guidance of China, an important breakthrough for digitalization and intellectualization of all industries and an important safeguard of high-quality development. The era of big data provides a historic opportunity for China to become an innovative country. Now, China is a significant force in the development of digital economy in the world and ranks near the top in artificial intelligence, big data, and smart cities. Statistics show that, in 2017, China's digital economy grew to 27 trillion yuan , accounting for around 33% of the GDP, ranking second in the world^①.

Digitalization provides strong security for driving innovative upgrades and development and serves as the source of the innovation tide. China should utilize big data to promote innovative development and vigorously develop digital economy. Companies should constantly upgrade their independent innovation capability by making use of the rapid development of big data, cloud computing, the Internet of Things(IoT), and other digital technologies and seize the opportunities of the Belt and Road Initiative. At the same time, China should export the achievements in digital technologies, share these achievements with other countries in the world, and enhance the cooperation with countries worldwide in e-commerce, smart cities, and mobile payments. It should also export the advanced concepts and technologies related to digital economy and innovation models, thus offering more Chinese visions and Chinese approaches to digital innovations.

Consolidating the Construction of Big Data Infrastructure and Increasing the Supply of Public Network Facilities and Services.

The construction of big data infrastructure is the key to realizing a digital power and smart China and the focus of developing the economy of big data. China has achieved leap-forward development in Internet technologies and industries in the past five years. The gap between China and developed countries has narrowed in terms of market values and rankings of Internet companies, the profit model innovation of the Internet, and the development of Internet mobile software. However, as China has a vast territory and its regional development is highly unbalanced, Internet infrastructure construction which is indispensable for big data is still unbalanced and underdeveloped. The Internet infrastructure construction in Central and West China is inadequate to satisfy the demands for developing big data.

To solve this problem, China should first strengthen the transformation of existing big data centers and server resources. China should fully utilize the platform facilities and data resources of companies and governments in stock and build up low-carbon, environment-friendly and highly effective regional and industrial big data clustering platforms. Second, China should focus on improving the construction of big data infrastructure in western regions. China should build new application infrastructure, digital network systems, and backbone networks with

① China Internet Development Report 2018.

consideration to the advantages and characteristics of West China, to push forward the upgrading of existing broadband networks. China should actively foster new models, new industries, and new business forms, including an industrial chain of information technology and information service bases. Seizing the historic opportunity of the Belt and Road Initiative, China should build a northwest sub-center of the Belt and Road Big Data Center. Third, instead of direct investments from governments and state-owned enterprises, China should gradually allow private funds to invest in the construction of big data infrastructure to feature the diversification of management and operating models and optimize investment efficiency. Last but not least, China should also continue pushing forward the construction of administrative data convergence and sharing platforms. The focus should be put on the layout of national big data platforms, big data centers, and other infrastructure and on the overall planning for social data resources and administrative data resources. With the opening and sharing of administrative data as a breakthrough, a number of key projects of big data can be implemented.

Perfecting Institutional Designs and Accelerating the Convergence of Big Data and the Real Economy.

Centering on improving development quality and the quality of the supply system, China should push for the reform of quality, efficiency, and the driving forces of economic development. Seizing the opportunity of integration of digital, network and intelligent development, China should foster and vigorously develop a batch of strategic emerging industrial clusters, to move China's industries toward the middle and high end of global value chains. China should pay attention to the following to accelerate the convergence of big data and the real economy.

China should enhance theoretical studies on the coordinated development of manufacturing and big data industries. China should further explore how manufacturing enterprises utilize big data technologies to achieve integrated innovation development. In concept, China should transfer the former enterprise management systems based on economies of scale and build industrial systems and organization structures oriented to consumers' needs.

China will accelerate the convergence of the 5G information communication technology and the real economy, give full play to the policy guiding role of the government, and encourage enterprises to evolve into network-based, smart, and digitalized enterprises and to change their traditional thinking of business. In the meantime, enterprises should combine their own management and resource advantages and fully utilize the big data technologies for the network-based and intelligent transformation of their designs, manufacturing, management and services.

China should utilize the block chain technology to constantly reduce transaction costs. China should intensify the study and application of block chain technologies and realize the reform of transaction mechanisms in the real economy through technological innovation. A real-name verified transaction system which is based on block chain technologies under the real-time supervision should be set up throughout society to mitigate information asymmetry among transaction parties, which

improves the efficiency of market transactions, and remarkably reduce the cost of market transactions.

China should pay attention to the top-level design and build a mechanism that facilitates the convergence of big data and the real economy. From the development experience of other countries, a powerful management department should first be in place to coordinate, guide, and regulate the convergence process and the organization structure should be improved to push forward the convergence step by step in a planned manner. In key fields, China should give full play to the fiscal and tax policies and increase subsidies to complex and sophisticated technologies.

Developing a “Respect for Data” Culture and Exploiting Big Data to Improve the Governance Capability.

The lack of data cultures was one of the major reasons for underdevelopment in China. The era of big data will be an opportunity for China to realize modernization in all aspects. Today, the world, regions, industries, and human behaviors compose a complex network, in which all components have innumerable links with each other. The topological property of the network reveals that the data link in a multi-dimensional manner, bringing about enormous changes to economic and social activities. In this context, governments, enterprises, and individuals need to master sufficient information in their daily decision-making. They should learn about the information as much as possible to fully understand the problems and their interconnections, make correct and scientific decisions, and guide people's behaviors. Thus, they should develop a cultural habit featuring respect for data, data-based decision-making, and data-based analysis of problems in society.

The high-quality governance capability of a government is an important foundation for high-quality development. For the government, the possession of mass high-quality data is an important precondition of improving its governance capability. China should develop a healthy and rational data culture that keeps pace with the times; it should transform big data from a technological symbol to a cultural one; it should develop a data culture with Chinese characteristics, namely respect for facts, emphasis on precision, admiration for rationality and logic, data-based forecasts, data-based decision making, and data-based innovations. China should treat big data as an important means to improve the China's capacity for governance and open and share the data among central, provincial, municipal, and county/district governments. Big data technologies will be adopted for handling and solving problems concerning public affairs. Based on big data, cloud computing, and artificial intelligence, a government will constantly optimize its ability to handle public affairs for the management of natural disasters, social emergencies, and health and medical incidents. Data-driven industries will be fostered in fields where the market mechanisms are unable to guarantee the effective supply. The government should provide policy support for related enterprises to constantly develop a market environment in favor of big data innovations. The government should set up a data-based decision-making mechanism to enhance its decision-making ability. It should make full use of big data so that the decisions will be more scientific, proactive, and well-targeted. Based on big data, the government should be able to effectively allocate public resources and push forward

the establishment of a fair and just social order. The government will utilize big data to enhance its work efficiency and public service ability, constantly strengthen the role of big data in improving the working competence and efficiency of its departments and upgrade its comprehensive service ability.

Developing a Diversified Fund-raising Pattern and Optimizing the Financing Environment of Big Data.

The development of big data will be impossible without the support of finance. A diversified financing pattern plays an important role in perfecting the financing environment of big data. First, more players should participate in the financing of big data projects. China should actively attract financial market institutions, various international financial organizations, and development financial institutions to participate in financing for big data projects. China should vigorously attract investments in the industrial clusters of big data and industrial chains of big data and actively accept the transferred industrial chains and associated industries of big data. Using investment attraction as an important breakthrough, the government will help boost the development of the big data industry. Second, the government should develop a diversified financing model for big data. Funds will be raised through traditional bank loans and development financial instruments; highly transparent capital markets, such as the equity and debt markets, will be utilized for fund-raising. The government should further explore the financing models of profit and risk sharing to promote institutional innovations and product innovations in big data financing. Third, the government should innovate the financing channels and give play to the platform role of funds. The government should expedite the establishment and operation of big data investment funds, strengthen continuous investments in big data, cloud computing, and Internet industries, and guide social capital to jointly establish an investment foundation for the big data industry. Fourth, China should set up typical examples, timely clarify misrepresentations and misunderstandings, and conduct promotion activities for investment in and financing for big data to create a favorable public opinion environment for big data construction.

In the meantime, China should continue to improve the supporting measures for financing for big data and attract more investments in big data construction. China should also enhance the institutional guarantees for the financing policies of big data, carefully study the policies and measures that support investments in and financing for big data. Financial institutions that are highly engaged in big data construction should be entitled to preferential policies regarding re-lending and required reserves. Effective measures should be taken to prevent, control, and mitigate debt risks. China should also accelerate the construction of a risk control system that caters to the business characteristics of big data and strengthen the supervision, early warning, and risk assessment of financial institutions and markets to strictly prevent liquidity risks.

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A Review of Research on the Employment Effect of Artificial Intelligence Applications

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Abstract: Based on the concept of artificial intelligence (AI) and the summary of existing research methods, this essay reviews the theoretical and empirical research into AI's impact on industrial distribution, jobs, wages and other aspects in the field of employment. The essay finds that AI technology accelerates job polarization in the labor market and causes wage inequality during this process while taking over some occupations and promoting the flow of labor among different industries. In the long run, the substitution and creation effects will coexist for the long term, and the creation effects will exercise increasingly obvious influence; wage inequality can be compensated by long-term social policies; job polarization will not last for long; and workers' flow between industries is essentially a result of matching labor skills with task needs after technological changes. More scholars believe that the impact of artificial intelligence on employment in the future is controllable, and the key is in the broad and effective human-computer cooperation facilitated by the improvement of labor's skill levels through education and training.

Keywords: artificial intelligence (AI), industrial structure, jobs and wages

In recent years, the impact of artificial intelligence (AI) has become an important subject in employment research. Researching the employment effects of the application of artificial intelligence in all aspects of production

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we can learn, at a macro level, the directional influence of artificial intelligence on the employment situation and meanwhile observe, at the micro level, the specific changes of existing work tasks and income distributions. Before discussing the impact of various aspects, it is necessary to clarify the concept and application of artificial intelligence and the existing main methods of research into employment effects. Scholars disagree about the concept of artificial intelligence. In its early stage, artificial intelligence was described as “machines that think” with the ability to think and act in a way that will surpass human beings (McCorduck, 1979). Others believed that the demonstration of such abilities requires specific carriers and external circumstances, for example, both Dreyfus’s (1972) classic criticism against artificial intelligence^① and Searle’s (1992) “biological naturalism”^② argued that the realization of human-like intelligence entails the physical embodiment, like a human, and certain social backgrounds. At present, a more comprehensive description of the concept of artificial intelligence comes from the research of MIT in the field of electrical engineering: artificial intelligence is an organic whole, an expression system for thinking, perception and action, which is established through models, taking the working-out of test methods as its basic operation mode, but this system faces certain constraints, which work through algorithms (programs or methods) (Finlayson et al., 2010).

Since artificial intelligence is entering and reshaping production and life in all aspects, the description should avoid both Luddism in epistemology and technological determinism to maintain an objective understanding of artificial intelligence technology (Zhang, 2018).^③ Therefore, this essay holds that artificial intelligence is a technology created for specific tasks and exhibiting similar levels of human abilities (cognition, thinking, or action), and that this technology needs to work with corresponding carriers (tools) and application environments. Under existing technological conditions, the application carrier of artificial intelligence is mainly computerized and automated equipment, and the application environments refer to circumstances required for the fulfillment of tasks.

At present, the research outside China on the impact of artificial intelligence upon employment is usually based on the task model approach. Autor et al. (2003) distinguished cognitive and manual tasks, and routine and non-routine tasks, and in doing so, they mainly intended to learn how computerization^④ changes the demands for job skills. From a “machine’s-eye” view, they disassembled specific work into different tasks, determined which could be executed by

① Dreyfus’s (1972) critique of artificial intelligence involves four main assumptions of artificial intelligence research: “biology”, “psychology”, “epistemology”, and “ontology”. In the “biological” assumption, the brain is similar to computer hardware, and thinking is like software; the “psychological” assumption is that thinking works by performing calculations on symbols (in the form of algorithmic rules); “epistemological” assumption suggests that all activities can be implemented in the form of predictive rules; and the “ontological” assumption proposes that the reality consists entirely of a set of independent but inseparable facts.

② Searle (1992) argued that if you want to create a conscious existence, you will have to replicate any physical processes that the brain experiences, to mimic and awaken consciousness.

③ Stanford University pointed out the artificial intelligence effect in its 2017 report, asserting that new technology will replace the previous technology through its popularization and turn into the “real” artificial intelligence in the public consciousness, although the previous technology still belongs to the category of artificial intelligence. Because of the existence of this effect, it is necessary to consider which technologies belong to the category of smart technology before learning about how the application of smart technology affects employment. Here it may involve both high-tech and the tools that we are used to.

④ Computer science is especially important for the realization of intelligent concepts. Intelligent computing, intelligent information processing, and computer science are basic dynamics for intelligent realization. This is also an important reason why this essay regards the technology of computerization and automation based on computerization as the embodiment of artificial intelligence.

a computer, and described four cases in which workers could be affected by computers in the workplace; substitution, mutual complementation, imperfect substitution, and conditional mutual complementation. Autor et al. believed that computers had become an alternative labor force for many daily tasks and had shown strong mutual complementarity with the workforce performing non-routine cognitive tasks. However, Autor et al. did not predict complementarity with any labor force performing non-routine manual tasks (non-routine physical labor) (Frey et al., 2017).^①

Impact on the Industrial Distribution of Employment

From the current research results, the agricultural production sector is less affected by artificial intelligence and the labor force in the manufacturing sector will gradually shift to the service sector due to the substitution effects of artificial intelligence (Autor et al., 2013), and Zhong Renyao et al. (2013) believed that this situation is related to the knowledge structure and adaptability of original practitioners. According to a study by the US Bureau of Labor Statistics, by 2024, almost all new jobs will be concentrated in services, especially in the areas of health care and social assistance services (Trajtenberg, 2018).

Impact on Agriculture

Although the application of artificial intelligence at present imposes no significant impact on the number of farmers (Manyika et al., 2017; Frey et al., 2017), artificial intelligence technologies do transform farmers' habits and methods in production and strengthen their links with the market. First, from the perspective of agricultural production, Ampatzidis et al. (2017) pointed out that currently automation and robots can realize human-machine cooperation through the entire process of agricultural production, that is, from crop selection to sowing, disaster prevention, and finally to crop harvesting. Second, from the perspective of farmers' connection with the market, Lele et al. (2017) believed that the current transformation of intelligent and digital technology, in terms of the former's speed and scope, is conducive to the inclusive development of agriculture and rural areas, capable of truly realizing the close connection between farmers and the market in each production process, and able to indirectly increase farmers' incomes by providing higher levels of education, health care, finance and market services.

As existing research has shown, the impact of artificial intelligence on agricultural production is mainly concentrated on transforming agricultural production methods, improving production efficiency, and increasing farmers' income, but the substitution effect on farmers is not obvious. Possibly it is because during the transition from mechanization to automation in the process of agricultural production, the change of ways to accomplish production tasks do not affect the demand

^① Frey et al. (2017) further redefined the task model in their research, subdividing the labor input of non-routine tasks into perception and manipulation tasks, creative intelligence tasks, and social intelligence tasks. According to Arntz et al. (2016), this redefinition (extension) has exceeded the definition of routine and non-routine tasks proposed by Autor et al.

for farmers in the agricultural production process, or are far less comparable to the influence that agricultural mechanization once exerted.

Impact on Manufacturing

Focused on the impact of industrial robots on the US labor market, Acemoglu et al. (2017) studied the relationships between the large-scale use of industrial robots in 19 industries (mainly manufacturing) and the employment rates and wages in 722 commuting zones from 1993 to 2007. They found that the large-scale application of industrial robots has a significant negative correlation with employment and wages, and concluded that the substitution effect of industrial robots on the labor market at present is greater than its creative effect, suggesting that each additional robot per one thousand workers reduces employment by about 0.18-0.34%, and wages by 0.25-0.5 percent. Thus, they deduce that the number of lost jobs from 1990 to 2007 due to the use of industrial robots in the industrial sector ranges between 360,000 to 670,000. At the same time, artificial intelligence also profoundly affects the production models and production systems within the manufacturing industry and changes the skill demands on workers within these systems. Yin et al. (2017) examined the changes in production systems during each industrial revolution and found that in comparison with the assembly line, Toyota production system (TPS), and cellular manufacturing created by the second industrial revolution, the flexible manufacturing system (FMS) and Seru^① production system, which were fostered by the third industrial revolution and use computerization and industrial robots as their software and hardware bases, can better meet the demands of product markets for mass customization under industry 4.0 conditions. According to Yin et al., this will not only change the pattern of future manufacturing development but also impose further requirements for the improvement of workers' skills.

In the research on the industrial distribution of artificial intelligence's impact upon employment, the manufacturing industry has been highlighted. This is not only because the manufacturing industry itself is vulnerable to industrial robots and automation, but also because the manufacturing industry absorbs a large amount of ordinary labor and its labor distribution is more concentrated than that of the agriculture and service industries. The impact of artificial intelligence on manufacturing is not limited to the number of jobs nor is it completely negative. The specific effects depend on the characteristics and attributes of the industry (Acemoglu et al., 2017); it is widely expected that the positive results of industrial robot applications are directly related to productivity, especially in industrial environments, where the use of industrial robots for specific tasks will reduce human workloads and possible dangers while saving labor time and increasing leisure. The primary consideration for negative influences is the impact of industrial robots on employment, and the accountability for accidents while using industrial robot applications.

① Seru production is a production method that can change its own production content in accordance to the needs of different production tasks; it is suitable for multi-variety and small-batch market demand and has both efficiency and flexibility. Since its inception, Seru production has been rapidly popularized in the manufacturing industries in Japan, becoming an assemble system adopted by many Japanese electronics companies.

Impact on the Service Industry

According to the research of Frey et al. (2017), many workers in the service industry are at risk of being replaced by computers while they must accept new colleagues from the manufacturing industries. Workers engaged in telemarketing, insurance underwriting, transportation services, photography, data maintenance, etc. are groups that are very likely to be replaced by computers. However, the creative effect of artificial intelligence has also led to an increase in the demand for labor in some occupations, those that have witnessed the fastest growth involve kindergarten (and primary school) teachers, accounting and finance staff, nurses, healthcare consultants, therapists and social information workers. For the growing amount of labor demand in the social information sector, Deming (2017) believed that the task requirements for social skills cannot yet be met by computerized and automated technologies, which will encourage workers to improve their social skills which will allow them to change their work choices. Moreover, he points out that from 1980 to 2012, jobs with high social skill intensity increased by 24% in the US, while the share of employment grew by 7.2% and wages rose by 26% in the same period.

Impact on Jobs

From the existing literature, the impact of artificial intelligence on jobs not only involves changes in both the number of jobs and the nature of the tasks, namely, substitution and creation effects, but also causes job polarization and accelerates human-machine cooperation.

Job Polarization

The computer revolution in the 20th century and the rapid development of artificial intelligence technology in the 21st century have worked together to significantly impact jobs and a distinct sign of this is the reduced number of jobs with middle incomes and middle-skill requirements (Autor, 2013; Frey et al., 2017). Correspondingly, high-paid mental jobs (cognitive tasks) and low-paid physical labor occupations have increased, and the number of employed people has also changed accordingly. The labor market has shown the trend of polarization and affected workers' employment choices (Goos et al., 2007). As Autor et al. (2013) have noticed, the job-polarization trend in the US labor market is mainly reflected in the increased number of low-skill service jobs while in the routine labor-intensive market, the polarization of employment and wages is more obvious. At the same time, Jerbashian (2016) focused on single-technology fields using data from 10 European countries to prove that the fall of IT prices is related to a decline in the share of middle wage occupations and an increase in the share of high wage occupations, but its impact on the proportion of the lowest paid occupations is less, which is a proof that the intelligent technology represented by computerization has the distinct potential to cause further job polarization.

For the trend of polarization, Autor (2013) believed that it is difficult to ascertain the

complementarity in other areas and the countervailing effects of rising demands in labor markets were difficult to determine as job polarization would not continue indefinitely. Frey et al. (2017) pointed out that computerization was mainly limited to low-skill and low-wage occupations, the labor market polarization would stop expanding and its impact can be alleviated through corresponding measures, that is, low-skilled workers would be redistributed to tasks that are not affected by computerization, but workers must improve their creative thinking and social skills in order to win these opportunities.

Replacement of Occupations

The substitution effect of artificial intelligence is more obvious than the impact of any previous technological progress (Cao Jing & Zhou Yalin, 2018). According to a World Bank survey, 57% jobs in more than 50 countries in 2013 were affected by automation technology (Manyika et al., 2017). In the US, 47% of employment faces the high risk of substitution (computerization), the replacement rate is negatively correlated with the requirements of wage and occupational skill, and among the 702 occupations reviewed, workers engaging in transportation, logistics services, office clerks, and some production departments are at high risk of being replaced (Frey et al., 2017). Arntz et al. (2016) analyzed the extent to which jobs in 21 OECD countries could be automatically replaced and the result showed that 9% of jobs in the US are at high risks^①. Likewise, David (2017) found that 55% of jobs in Japan are at “risk” and that workers in non-regular employment were more likely to be replaced. In 2016, the German Federal Ministry of Labour and Social Affairs (BMAS) calculated the probability of jobs replaced by machines in Germany, with a result of 13%. In comparison, Oschinski et al. (2017) surveyed the Canadian labor market and found that the jobs at risk to high automation account for only 1.7 percent of employment. Scholars differ in terms of the results of their calculations and this is possibly caused by disparities between statistical specifications, overestimated technological capabilities, lagging utilization levels, and the heterogeneity of workplaces (Arntz et al., 2016). In addition, substitution effects also vary due to differences between industries, and between time series. As Jiang Jinqiu and Du Yuhong (2015) have found, employment in different industries in short, medium and long terms has different responses to technological progress.

Regarding the development trend of occupation replacement, the traditional view represented by technological unemployment still has a strong voice. As Trajtenberg (2018) pointed out, some new “technology enthusiasts” believed that artificial intelligence would replace most people's jobs in a predictable period, releasing huge productive forces, and that subsequently there would occur negative influences on employment expectations and income distributions. In this regard, scholars hold different views. For example, Arntz et al. (2016) suggested that the existing substitution effects have been overstated and that the research results based on the distinguishing of tasks represented

① Arntz et al. (2016) regard the automation substitution with probability more than 70% as high risk; the value that Oschinski et al. (2017) chose while considering the risk levels of automation approximates the former, and their calculation results for the proportion of the high-risk occupations from high to low are Austria and Germany (12%), Spain (11.5%), Slovak Republic (10.5%), United Kingdom, Norway, Netherlands, and Czech Republic (10%, respectively), Canada, Denmark, France, and the US (9%, respectively), Sweden, Poland, Japan, Finland, and Belgium (7%, respectively), Estonia (6.5%), and South Korea (6%).

merely the possibility of substitution, rather than the actual situation; Autor (2015) and Brynjolfsson et al. (2018) pointed out that most automation systems lack flexibility, and were unable to accommodate the demands of some non-routine tasks. Cao Jing and Zhou Yalin (2018) also believed that the risk of jobs being automated does not mean actual job losses. In addition, the more compromised view is that technological progress will benefit everyone in the long run. But in the short term, not everyone will be a winner (Cortes et al., 2014). Manyika et al. (2017) considered the impact of automation on jobs (occupations), and believed that the transformation at present is full of challenges, but by 2030 most workplaces will be able to provide sufficient jobs for full employment.^①

Job Creation

Although artificial intelligence applications (computerization and automation at present) have shown relatively obvious substitution effects, their creative effects still exist. Acemoglu (2017) proposed that automation would generate new employment opportunities by creating new job tasks while reducing employment. The newly created jobs will consist of two parts, one is the growth of labor demand that artificial intelligence applications bring about by increasing workloads; the other is the new types of jobs around artificial intelligence (algorithm development, AI-designer trainer, intelligent equipment maintenance, etc.). These two employment groups have something in common, i.e., both workers related to the emerging industry of general-purpose technology (GPT)^② itself, and those relevant with the frontier fields in whose major application domains the general purpose technology is deployed, are characterized with youth and entrepreneurship, and meanwhile qualified with the technological knowledge reserve and skills required by the new general-purpose technology (Trajtenberg, 2018).

In addition to the increase of jobs, Wang Jun and Yang Wei (2017) proposed that the progress of new technologies, including artificial intelligence, has an expansive impact on employment and is conducive to improving the quality of work. According to Kremer's (1993) O-ring model, the growth in task productivity increases the value of the remaining tasks in a production chain, while artificial intelligence helps increase the value of remaining manual labor production links when it improves the efficiency of routine physical labor. The first prerequisite for improvement is the complementarity between man and machine in the task process. From 1988 to 2004, ATMs caused a one-third decrease of bank tellers on average in the branches of US banks, but the number of branches throughout the US rose by more than 40%; at the same time, bank tellers were also liberated from the chores of routine cash-handling tasks: they gradually turned from their previous jobs towards sales, customer business, and each occupation thus created more value (Autor, 2015).

① Manyika et al. (2017) believed that theoretically half of activities in work at present can be accomplished through automation, but only a very small number (5%) can be fully automated. Despite of this, the impact of transformation still exists, for nearly one-third of the activities for nearly 60% of the occupations can be automated, which means that all workers are facing a lot of workplace transformation and changes (<https://www.mckinsey.com/featured-Insights/future-of-organizations-and-work/jobs-lost-jobs-gained-what-the-future-of-work-will-mean-for-jobs-skillsand-wages>).

② At the NBER conference in early 2018, artificial intelligence was considered to have great potential for becoming a new general-purpose technology, and it was pointed out that in its constantly expanding application area, AI would bring about a wave of complementary innovations.

Job Cooperation

The study of relationships between a worker on his job and artificial intelligence applications can be understood through the conflict between McCarthy and Douglas's core views, i.e., whether to employ an increasingly powerful combination of computer software and hardware to replace workers in the workplace, or to use the same tool to expand the capabilities of workers in terms of brains, society and the economy. There is no right or wrong position (or opinion) in this debate, only that a controversy about phenomena or trends would lead to a bias when debaters considered these two problems outside of the real situation (Markoff, 2015), and the practical application of technology might provide more inspiration for us instead.

The computer system devised by Douglas C. Engelbart opened a door to office automation, some jobs have been taken over by many artificial intelligence applications (programs, equipment, etc.), but workers accomplishing tasks still have partnerships with those on other jobs, and the difference lies in the added cooperation between workers and machines. Therefore, human-machine cooperation and human-computer interaction determine that we will regard the carriers of artificial intelligence as partners (Markoff, 2015), and to realize human-computer interaction and facilitate these carriers to play their roles in teamwork we need to be qualified with the necessary knowledge and skills concerning the task and other essential features including team knowledge, leadership, communication, monitoring, and feedback capabilities.

Since 2009, applied research oriented toward deep learning has yielded significant results. Changes in the process of artificial intelligence innovation have led to a sequence of key issues in policy and management areas (Cockburn et al., 2018). Specifically, machine learning can incorporate as many variables as possible, stripping out the influencing factors that traditional methods cannot approach (Camerer, 2018). With the development of machine learning, the artificial intelligence applications in the research on relationships between prediction and decision-making have enhanced their prediction ability and decreased their prediction cost under uncertainty, hence artificial intelligence thinking can be regarded as a supplement to human judgment (Agrawal et al., 2018). In reference to existing research, human-computer cooperation on a job will have a clear advantage in the future, therefore, learning how to cooperate with artificial intelligence is also an indispensable skill for future workers.

Impact on Wages

Existing research emphasizes the impact of artificial intelligence and other technological progress on wages, not only because the theme of income inequality is important, but also because the evolution of wage distribution provides market value information on different types of skills (Acemoglu et al., 2011). In addition, the issue of inequality between workers in the workplace, which is caused by artificial intelligence, may be directly related to the impact of artificial intelligence applications on

wages (Chace, 2016).

Impact on Individual Workers

Starting from the premise that workers have been replaced due to technological progress, Acemoglu et al. (2017) argued that the application of industrial robots in manufacturing industries has a strong negative impact on the wages of manufacturing workers. Korinek et al. (2017) classified the different impacts of artificial intelligence on wages and welfare. First, in the best scenario (perfect market where individuals invest in technological progress and carry out risk aversion), technological progress always makes everyone better off. Second, in the second-best case (perfect market, which is accompanied by costless redistribution), if redistribution is given a full play of its role, there will be a win-win situation between workers and technological progress, but when there is not enough redistribution capacity to make up for the workers' losses, it will inevitably lead to resistance, and in the case of excessive income disparity, the improvement of production by means of technological progress will be affected. Third, in a perfect market (with redistribution at a price), wages and welfare will be affected in the short term, but Pareto Improvement exists in the long run. When technological progress causes capital monopoly, it will realize relatively fair resource allocations through redistribution although this depends on the costs of redistribution. Fourth, in the imperfect market, a Pareto Improvement is difficult to achieve, and technological progress will have a great impact on workers' welfare.

From the perspective of workers' educational returns, Brown et al. (2002) argued that wage inequality based on educational returns will expand in the context of technological impact, and this is a result from the fact that the increased mutually complementary level of skills and capital leads to the rise in the demand for high-skilled workers. In the long run, however, unless the improvement of education levels and skills is restricted, the education returns of the higher-educated workers would gradually return to the market average. The resulting countermeasure is to strive for the second-best by means of measures including the development of intellectual property rights, and maximize the Pareto Improvement effect of artificial intelligence in the win-win form of facilitating the improvement of wages, welfare and expanding the application of intelligent technology. When it is impossible to create the second-best situation, it is necessary to facilitate the adjustment of resource allocations and provide support for those who are disadvantaged in the face of artificial intelligence. From the perspective of political economy, Trajtenberg (2018) believed that the realization of "human-enhancing innovations"^① is a matter of orientation, in which government policies play a key role, and needs to place extra emphasis on education, labor training, and service professionalization.

① Trajtenberg (2018) held that technological innovation should aim at the improvement of the skill level of people rather than the substitution for the needs of human skills. He gives an example: AI data mining for electronic medical records can be used for the evaluation of subsequent drug efficacy, but does not replace doctors, rather, it enhances the combination of technology and doctors' ability, resulting in better doctors. Therefore, it belongs to "human-enhancing innovations" (HEI) instead of "human-replacing innovations" (HRI).

Impact on Industries as a Whole

First, within the same industry, job polarization itself represents wage differences based on skill levels. With respect to the specific degree of differences, the rapid development of technological progress has led to growing gaps between the middle and bottom groups in the wage distribution process, and this trend will continue for the long term (Kearney et al., 2015). At the same time, in consideration of management and costs, enterprises with higher levels of artificial intelligence applications may possibly outsource low-skilled jobs to other enterprises, and give high wages to skilled workers who remain inside the outsourcing enterprises (Aghion et al., 2017); consequently, this also widens wage gaps.

Second, for different industries, the absolute value of comparative wages does not make much sense due to the difference in the nature of jobs. However, by comparing the changes in wages we can see different responses that industries make to technological progress. Taking the service industry as an example, Autor et al. (2013) found that in the past 25 years, the actual income and employment rates of workers in the majority of low-skilled occupations and of industries they belong to, have stagnated or declined, but employment and income in the service industry is an exception. From 1980 to 2005, employees without university degrees increased their working time in the service industry by more than 50%, but at the same time, their real hourly wages increased by about 11%, exceeding the wage growth of other low-skilled occupations and industries.

Conclusion and Evaluation

The current research consists of three main aspects; phenomenon description, detail analysis and trend prediction. It involves theoretical and empirical investigations and presents both positive and negative views. These views differ simply due to their different research perspectives and contents and involve nothing about right or wrong. Artificial intelligence has shown some negative effects on employment at present, and its destruction mechanisms, including substitution effects, the reduction of job numbers, and the widening of wage gaps, have also been recognized by many scholars, but the rapid progress of artificial intelligence cannot really play its role without the corresponding upgrading of other industries, and we need to continue observing whether these negative effects still exist after society, industries or organizations are correspondingly adjusted. However, it is still possible to grasp the future trends. The fact that artificial intelligence and its carriers used in the production sector are still under the background of computerization and automation (Acemoglu et al., 2018; Frey et al., 2017), the main considerations in the future should be the improvement of workers' skill levels conditioned on artificial intelligence applications and the demands for employing education and training to help them adapt to technological progress (Arntz et al., 2016). For the realization of effective human-computer cooperation, the 2018 report of : The Age of Artificial Intelligence: Towards a European Strategy for Human-Centric Machines issued by the European Political

Strategy Center^① suggests that some workers will indeed be unemployed because of the application of artificial intelligence and other technologies, but the future focus is on facilitating the transition and improvement of skills on the basis of providing support and security to high-risk workers and we should attach importance to the development of a symbiosis between humans and machines to realize the improvement of workers' abilities and value, in lockstep with the development levels of artificial intelligence.

At present, the research into the impact of artificial intelligence on employment is primarily about achievements, but by reviewing the literature, we can find that there are still some problems in terms of research direction, interdisciplinary cooperation, and research objectives.

First, existing research is mostly focused on the substitution and creation effects of artificial intelligence on employment, paying more attention to the changes of employment quantity, but less to what economic and social significance the changes of industries, professions and occupations behind those two may have. Ma Hong et al. (2013) believed that employment quantity is only one aspect of employment structure, the creation and disappearance of large numbers of jobs simultaneously exist behind the changes in numbers, and have totally different meanings to the labor market. In addition, no research at present can accurately quantify the impact of artificial intelligence development on employment prospects. Therefore, while examining the changes of employment quantity, future research should pay more attention to the impact on the labor market and the economic society, which is represented by quantitative changes, and thus displays what significance the investigation into employment effects has in practice.

Second, existing research lacks cooperation with researchers in artificial intelligence technology. The biggest difference between the application of artificial intelligence and that of other technologies is that artificial intelligence is combined with jobs more deeply and more complicatedly. Economists and sociologists can finish the division and weight distribution of work tasks, but do not know whether a task can be independently accomplished by artificial intelligence, or if it must involve human participation. Arntz et al. (2016) argued that existing research tends to overestimate the capabilities of artificial intelligence technology and ignore backward application levels^②. So, the cooperation with technological researchers is required to achieve an accurate match of tasks and technologies which will improve the relevance and accuracy of the analytical results.

Third, current research in China mostly focuses on status quo description and trend forecasting and lacks empirical research into the specific impacts of artificial intelligence on employment. This is possibly because the current insufficient statistics for labor market data in China cannot support the micro-level study of employment effects. It involves the particularity of computer capital and

① The Center acknowledges the positive role of artificial intelligence, but also argues that artificial intelligence can have an unstable impact on economic and social life, and analyzes in this report the opportunities and challenges brought by artificial intelligence(https://ec.europa.eu/epsc/publications/strategic-notes/age-artificial-intelligence_en).

② According to a monitoring report released by the Federal Ministry of Economic Affairs and Energy in 2015, the digitization of the German manufacturing sector is still in a rather low degree, and will remain in the state of slow advancement until 2020 due to the restriction of technological conditions (Arntz et al., 2016).

technology investment that Autor et al. (2003) mentioned in their task model, and also the factors that are difficult to investigate within the current application scope of artificial intelligence in China, especially the situation where the ranges and levels of automation and computerized equipment applications in manufacturing enterprises are uneven and in lack of practical basis for shaping representative research. Therefore, as China is paying increasing attention to artificial intelligence and the field of application continues to expand, more data at sector or industry levels, and at the national level or regional levels will be needed in the future to consolidate the data base of empirical research in this area.

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Analysis of the Changes in Rural Chinese Family Structure since Reform and Opening Up

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Abstract: This article uses data from censuses since 1982 to reveal changes in the family structure of rural China since the launch of reform and opening up and against the backdrop of institutional relocation, social transformation and an aging population. Since the advent of reform and opening up, rural family structure and its changes can be divided into two phases. Before the 1990s, the household contract responsibility system was implemented, labor in rural villages was still mainly engaged in farming, and the number of nuclear families remained stable with a steady rise. After the 1990s, as reform progress deepened, substantial numbers of young and middle-aged laborers in rural villages began to relocate into non-farming sectors and aging in rural villages rose. As those born in the early days of the family planning policy gradually matured, family structure was directly affected and changed in new ways and forms not seen before. Vocational divisions of labor among the parents of young families and married offspring emerged and the significance of cooperation for family economy and daily life between parents and offspring rose in importance. Also, the prevalence of immediate families with three generations climbed while the standard nuclear families declined, the ratio of middle-aged couples with young children that worked outside the home increased, the function of middle-aged and senior parents in the upbringing of infants and children enhanced, and the commonness of incomplete family types such as only grandparents with grandchildren increased. During this phase, the number of seniors living alone surged to the point of becoming a matter worthy of attention.

Keywords: reform and opening up, social transformation, family structure, rural village

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At the launch of reform and opening up in 1978, the Chinese society ushered in a new phase of development. Under the driving forces of multiple key policies, monumental changes began to emerge in various facets of the rural villages of China such as production and business models, labor employment areas and opportunities, and the age structure of the population, leading to unprecedented social transformations. These created remarkable effects on the residential methods and family structures of Chinese citizens. Then, what changes have taken place in rural Chinese family structure since the advent of reform and opening up? What are the distinguishing features? What were the specific influential factors? This paper will investigate and remark on these changes.

Purpose of Research and Explanation of Data

Changes and Reforms in Rural Chinese Village Society Since 1978 that Have Affected Family Structures

The end of the collective operation methods under the collective economic system, and the return of the family as the basic unit of production.

In 1956 it was common for rural villages in China to establish an “advanced agricultural producers’ co-operatives” collective economic system. In 1958 this was converted into the people’s commune system which featured an even higher degree of collectiveness, thereby forming a management and operational model with a three-tiered (production team, a production brigade and people’s commune) ownership structure founded on “teams” as the basic units of production. Each individual farming family was a household within the production team, a collective economic organization, and the labor of each family could participate only in economic activities centrally organized by the production team. They then obtained food and a corresponding remuneration. Thus, within the people’s commune system, the function of the family unit, as an organ of production, no longer existed. It is worth noting that during the period between 1958 and 1960, quite a few rural villages constructed canteens based on the team being the unit of production, thus the daily food preparation and consumption functions of the family were also nullified. At first, these canteens enforce zero or just minimal restrictions in the method of dining, which resulted in severe waste and subsequently a food shortage. The system was not sustainable and after a brief period it was cancelled and the corresponding functions of family life were restored.

The collective economic system suppressed any income gap that might have appeared between rural village families. The family labor force had no opportunities or development space other than collective farming as the labor force of each family relied on their own labor to obtain work credits and acquire remunerations. Since basic life necessities, including food, were distributed according to the “population seven work three” (for each family, 70% of material distribution was based on the population of the family while the remaining 30% was based on work credits earned by the labor force of the family) or the “population eight work two” system, and thus even family members without

labor capacity could obtain food necessary for sustenance. Of course, the currency income and food materials obtained by each family and its members from the production team were at a rather low level, barely enough for basic maintenance.

The biggest issues with the collective operation system were lack of incentive and low labor efficiency. Around 1978 during the early period of reform and opening up, this kind of operational model was continued but supplemented by the “workload contracting” method that somewhat increased labor efficiency. In 1982, the central government made in-depth institutional changes and reforms in the rural villages and the collective economic organization was replaced by household responsibility system. This marked the end of the collective ownership and operational system that had been the norm for nearly a quarter of a century since the advanced agricultural producers’ co-operatives were founded in 1956 and indicated the return of the rural farming family as the basic unit of production. This was a change that signified the end of an old era and the beginning of a new epoch in the contemporary history of rural villages of China and formed the bedrock for other changes and reforms that were to take place in these villages.

Shift of rural village labor toward nonagricultural areas.

Under the organization of the collective economy, the labor force of rural families in nonagricultural industries was greatly restricted. For one thing, the low labor efficiency in the collective operation model meant that more laborers were required, which made controlling the outflow of labor toward nonagricultural areas a necessity; for another, since the beginning of the 1960s, due to shortages of food and other daily necessities in the cities, newly founded enterprises were slashing staff or even closing down, and thus it was hard for rural village labors to find nonagricultural opportunities in the urban areas. Family members were shackled to the villages and working the land which resulted in the preservation of a relatively complete mode of family residence.

This situation began to change gradually after the launch of reform and opening up. The implementation of the land contracting system markedly stirred initiative among farmers and the limited land in the central and eastern rural areas is no longer enough for farming. Transferring to nonagricultural sectors and increasing family incomes have become the main goals for rural families and their labor. After the mid-1980s, the urban non-public ownership operation method gradually expanded, first in the service industries, and simultaneously with large-scale infrastructure facility projects, both of which created demands for a labor force from outside the system. These changes created opportunities for the rural labor force to relocate to nonagricultural sectors and urban regions.

As the rural household labor force relocated, frequently to distant urban areas, the practice of multi-generations of family members living together in the same village was disrupted and the number of households with absent members, only grandparents and grandchildren and seniors living alone increased. The ability for parent-child immediate family members to maintain family functions and mutually support each other decreased and the indigenous family functions of mutual support through multiple genetically related families weakened.

Implementation of family planning policies, changes in attitudes regarding reproduction, and the reduction in the number of children in the family.

Starting in the early 1970s, family planning policies like delaying or reducing reproduction were enacted across the country, and in 1980 the government enacted the one-child policy. Although a strict one-child policy was hard to enforce in the countless rural villages scattered throughout the nation, there is no doubt that the number of third and fourth births in rural village families declined after the 1980s. For rural villages in the coastal regions, the majority of household had two births or less; while second and third births were the norms for those in the central and western regions. Furthermore, the predominant case was that children were of the same gender. This substantially impacted rural families and their structures.

In most cases, in rural village families with multiple children, especially multiple sons, children who have grown up would mostly live away from their parents; for families with only one son, there was a greater chance of the parents living with the son after his marriage, which in turn lowered the frequency of the separation of rural village families.

Ratio of seniors in rural villages and the expansion of the population.

Generally, the rise in the population ratio of seniors originated from three main factors. First, life expectancy of seniors increased and the absolute number of seniors expanded. Second, the decline in new births reduced the number of young people while the elderly population rose. Third, the number of middle-aged and young laborers that worked elsewhere increased, all of which led to a relative increase in the percentage of seniors in the population. In 2000, China became an aging society, and seniors accounted for 7.50% of the population in rural villages, and 6.67% of the population in urban areas.

Then, under the effects of the four factors, what sort of changes occurred in the structure of modern rural village families? This is an inferential analysis and therefore requires specific data for verification.

Collation of Existing Research Studies

Studies that have investigated the structure of families in Chinese rural villages since reform and opening up are readily available.

First, my analysis was conducted based on data from the 1982, 1990 and 2000 population censuses, and then changes in family structures were explored based on the 2010 census to present the features of rural family structure changes that have taken place during this period. Guo Zhigang noticed that after 2000, due to the family labor force working as migrant workers away from home, the population ratio of grandparent-grandchild households in rural villages climbed drastically, reflecting the situation that most rural village households were occupied only by seniors and left-behind children. Yang Juhua and He Zhaohua indicated that in the monumental societal changes that have taken place since the beginning of reform and opening up, the number of children continued to decline, offspring's relocation to different societies and regions did not subside, the concept of

marriage changed, and the form and function of the family was altered. But it should be noted that there is still a lack of research that considers all rural villages as a holistic whole, explores trends in the changes of the family in such a context, and systematically investigates the impact of various societal and population factors on the forms of rural farming families. In addition, societal changes in Chinese rural villages occurred in phases and no currently available studies have taken this into account, with the majority being summarizing or general analysis, and thus rural family structure changes and their features against this backdrop have not yet been revealed. This is precisely the research objective of this paper.

Data Used for Research in This Paper

This research endeavors to present an overall image of the changes in the rural family structure and their features in different phases since the beginning of reform and opening up. From my point of view, the timing of the four national censuses conducted since 1982 and the phases of rural village societal changes share a relatively high degree of correlation, and the population census data provides the basic material for understanding rural family structure status in times of change and reform.

1982 saw the end of the enforcement of rural collective economic organizations and was basically the beginning of this system's dissolution. Thus the impact the collective operation model had on the lifestyle of farming families had not yet thoroughly dissipated. By the end of the 1980s, the reform and opening-up policies had been in effect long enough to impact the nonagricultural employment patterns of the rural village labor force, but farming was still the primary employment and means of living for rural villages in most areas, particularly in the central and western regions. There was also a rise in the young labor force that could work both in agriculture (operation of contracted land) and nonagricultural side jobs (working elsewhere during non-agricultural seasons). During the 1990s, the large-scale transition of the rural village labor force towards nonagricultural employment began and after 2000 nonagricultural employment for middle-aged and young rural village laborers became common while older middle-aged and senior members were chiefly engaged in cultivation on contracted land although some would partake in nonagricultural economic activities during non-agricultural seasons. This pattern has remained stable.

The 1982 and 1990 census data used in this paper are from the 1% sample database of the censuses, and the 2000 census data is from the 1% sample database of the long-form census, while the 2010 population census data is from a 1% sample excel document of the long-form census provided by the Population Census Office of the State Council. Compared with the data from the previous three population census databases the 2010 data restricts this analysis to a certain extent. In addition, 1% population sampling in 2015 provides the latest information on family changes, but the only currently available materials are the census data forms which make it difficult to use this data to analyze changes in family structures. And we could only refer to this data as we discuss intergenerational relationship structures.

Phasic Changes of Rural Family Structure and Their Features

In this part, we employ data from the four censuses as the basis, divide the analyzed timeframe into four periods or phases, investigate the Chinese Rural Family structure and their changes since the onset of reform and opening up, and strive to present the status and features of the different phases.

Rural Family Structure Toward the End of the Collective Economic Era

The 1982 population census data is a key material for us to learn about Rural Family structure at the beginning of the rural village reform and opening up and the end of the collective economic era.

I have previously performed numerous retrospective studies on the situations of family structure in various rural villages between 1965-1970, concluding that toward the middle and end of the 1960s, nuclearization had been achieved in rural village families. This period was during the implementation of the collective economic system. Therefore, we can deduce that the nuclearization of Chinese rural village families was neither the outcome of urbanization nor industrialization but engendered by the productivity level of a collective economic era that focused on agriculture.

Up until the initiation of reform and opening up in 1978, rural villages across China maintained the collective operational model in the collective economy. The rural household contract responsibility system with remuneration linked to output was introduced to rural villages in 1982. This was the start of the contracted land-use and as the policy was not yet fully implemented, this was a phase of transition between the old and the new. Therefore, I believe that the third population census (1982) is valuable for gaining an insight into the status of the family structures during the end of the collective economic era, and here we are able to obtain for the first time information about the overall status of family structures in rural villages across the nation (original databases of the 1953 and 1964 population censuses are hard to access and there is no way to conduct retrospective investigations).

Table 1 Family Structure in Rural Villages in China in 1982

Family type	%	Family type	%	
Nuclear family	67.95	Couple nuclear family	4.54	6.67
		Standard nuclear family	48.93	72.00
		Separated couple and single-parent nuclear family	10.93	16.09
		Extended nuclear family	2.64	3.89
		Transitional nuclear family	0.91	1.35
		Sub-total of nuclear family	67.95	100.00
Immediate family	22.82	Three-generation immediate family	17.50	76.69
		Two-generation immediate family	3.89	17.05
		Four-generation immediate family	0.61	2.67
		Grandparent-grandchild family	0.82	3.59
		Sub-total of immediate family	22.82	100.00
Joint family	0.84	Joint family	0.84	

Family type	%	Family type	%	
Single-person household	7.47	Single-person household	7.47	
Broken family	0.71	Broken family	0.71	
Others	0.21	Others	0.21	
		Total of couples and single-person households	12.01	

Data source: Calculated based on data from the 1% sample database of the 1982 national census

Note: 1. The “nuclear family” in the table refers to a family comprised of a married couple (or one member of the couple) and their unmarried offspring, a family comprised of only a married couple is also a nuclear family; an “immediate family” is comprised of a married couple (or the parents, or one of the parents), a married offspring and a grandchild; a “joint family” is comprised of a married couple (or the parents, or one of the parents) and two or more married offspring; a “broken family” refers to a family comprised of unmarried siblings.

2. The “standard nuclear family” is comprised of a married couple and unmarried offspring; the “separated couple nuclear family” is comprised of a married couple, but with one member working elsewhere, and unmarried offspring; the “single-parent nuclear family” is comprised of only one parent (because of death, divorce or other reasons) and unmarried offspring; the “extended nuclear family” is comprised of a married couple, unmarried offspring and the couple’s unmarried siblings; and the “transitional nuclear family” is comprised of a married couple and recently married offspring (but the son/daughter in-law does not live in the household).

From Table 1 we can see that nuclear families accounted for the largest proportion of Chinese rural families in 1982, making up approximately 68% of the total; the second most common family type was the immediate family, making up more than 20% of the total; the third most common family type was the single-person household; and the joint family accounted for less than 1%. This result coincides with a multitude of past, small-scale investigations revealing that there was a high degree of nuclearization among the families of rural villages in China at that time.

In terms of the second-tier family types, among nuclear families, the standard nuclear family accounted for nearly 50% of the total, making it the largest second-tier family and represented more than 70% of all nuclear families; next were “separated couple nuclear family” and “single-parent nuclear family”, at 16%; the couple nuclear family was third, constituting less than 7%.

Among the immediate families, the predominant category was the three-generation immediate family, accounting for 17.50% of all families and representing over 75% of all immediate families; next was the two-generation immediate family, and its proportions in total families and immediate families were respectively 3.89% and 17.05%; there were relatively fewer four-or-more-generation immediate families and grandparent-grandchild families, accounting for less than 1% of the total number of families.

It can be seen that in 1982, the year at the end of the collective economic system and the onset of reform and opening up, the majority of Chinese rural village families were either a nuclear family or an immediate family, with the former being the main staple. The standard nuclear family and the three-generation immediate family were respectively the most common type of nuclear family and immediate family.

Family Structure Right Before the Large-scale Transition of the Rural Village Labor Force Toward the Nonagricultural Sector

In 1982, the rural village land contract responsibility system was in full force, and this

institutional shift was a huge stimulant that activated increased productivity among farmers. Since the amount of land available for contracting by farmers in most regions was limited, and land operation was affected by seasonality, the duration of off-time for the family labor force increased as labor efficiency improved and people became more inclined to partake in nonagricultural economic activities. Meanwhile, at the onset of reform, urban areas did not have the capacity to absorb the excess rural village labor, and outside of farming these farmers mostly found work locally by selling or transporting agricultural produce. After the mid-1980s, processing enterprises started to emerge in the coastal regions and the demand for labor increased accordingly. Up until 1990, the number of rural village middle-aged and young labor that worked elsewhere did climb, but the predominantly farming-focused employment structure for most of the labor force did not fundamentally change. Then, in such a situation, what were the new changes that occurred in families in rural villages?

Table 2 lists the basic Rural Family structures in 1982 and 1990, which are essentially the same, with the nuclear family and immediate family maintaining their status as the two main family types. However, a noteworthy point is that the ratio of nuclear families in 1990 was slightly higher than that in 1982, of which the standard nuclear family represented more than 50%, indicating a trend and feature of the continual development of the nuclear orientation of family forms. This indicates that under the land contract responsibility system, the frequentness of separation of farming families did not decline, meaning that after the family reverted to its status as a unit of production, the awareness of jointly forming economic and daily life organizations between parents and offspring, and between married siblings was not raised, and the behavioral pursuit of independent units of living did not change, thus the “marry and spin off from parents” method perpetuated. Objectively, this period was at the height of marriages for those born during the baby-boom of the 1950s and for families with multiple sons. The prevailing custom was for a married son to move out of his parents’ household. For many rural village families with multiple sons, parents had to finish the construction of an independent courtyard residence for their sons before they married, which evolved into a prerequisite for marriage discussions with potential in-laws, so that the newlyweds could live separately from their parents.

In the second-tier family types, the ratio of “separated couple nuclear family” and “single-parent nuclear family” decreased, meaning that during this period there was a dip in the number of families where the married couple did not live together. This development came about due to a relaxation in government policies that restricted the relocation of the spouse of someone who worked in the city from migrating from a rural village to an urban area. Since the family of an employee was now permitted to migrate to the city, both the total number and ratio of single-parent families in rural villages sank, and this development is reflected in the population census data.

Figures related to immediate family relatively did not vary much compared with previous data nor did second-tier family types see many changes.

One point worth noting is that during this phase the ratio of single-person household fell by 18.47% from 7.47% in 1982 to 6.09% in 1990, and the underlying reason deserves further investigation.

Table 2 Family Structure in Rural Villages of China in 1990

Family type	%	Family type	%
Nuclear family	69.88	Couple nuclear family	5.79
		Standard nuclear family	53.65
		Separated couple and single-parent nuclear family	7.73
		Extended nuclear family	2.09
		Transitional nuclear family	0.62
		Sub-total of nuclear family	69.88
Immediate family	22.46	Three-generation immediate family	17.51
		Two-generation immediate family	3.48
		Four-generation immediate family	0.73
		Grandparent-grandchild family	0.74
		Sub-total of immediate family	22.46
Joint family	0.95	Joint family	0.95
Single-person household	6.09	Single-person household	6.09
Broken family	0.56	Broken family	0.56
Others	0.06	Others	0.06
		Total of couples and single-person households	11.88

Data source: Calculated based on data from the 1% sample database of the 1990 national census

Overall, China experienced a momentous institutional reform by switching to the land contract system, farming families once again became units of production, and the large-scale employment-driven, city-bound relocation of the rural labor force began to take shape. But the Rural Family structure did not vary dramatically compared with that of 1982. The second-tier family type figures showed that nuclearization of rural families persisted. Rural Family members of employees in urban areas were able to migrate to the cities due to an easing in policy restrictions, which lowered the ratio of single-parent families in rural villages.

Family Structure After the Large-scale Transition of the Rural Labor Force

After 1990, it was common to see a substantial number of workers migrating from the rural villages of China to the cities. More workers from the central and western regions chose to migrate toward the coastal regions than to stay in their original province.

It should also be underscored that after the mid-1970s, family planning policies were widely adopted in rural villages, with the single-child policy going into effect in 1980. It was normal to see second and third births in rural villages across central and western China, and the number of fourth

or more births plunged compared with the period prior to the implementation of family planning policies. Up until 2000, many children born under this policy would leave home to find work, while others would go elsewhere to attend school. It was common to see families with few children to turn into “empty nests” (households with parents only and no children). What was the actual situation like? We are going to find out through a look at the data from the 5th census carried out in 2000.

Table 3 Family Structure in Rural Villages of China in 2000

Family type	%	Family type	%
		Couple nuclear family	11.36
		Standard nuclear family	46.48
		Separated couple and single-parent nuclear family	6.56
Nuclear family	66.27	Extended nuclear family	1.30
		Transitional nuclear family	0.57
		Sub-total of nuclear family	66.27
		Three-generation immediate family	18.99
		Two-generation immediate family	2.63
Immediate family	24.83	Four-generation immediate family	0.80
		Grandparent-grandchild family	2.41
		Sub-total of immediate family	24.83
Joint family	0.51	Joint family	0.51
Single-person household	7.52	Single-person household	7.52
Broken family	0.74	Broken family	0.74
Others	0.13	Others	0.13
		Total of couples and single-person households	18.88

Data source: Calculated based on data from 1% sample database of the long-form census of 2000.

According to Table 3, trends of changes in rural family structure began to see shifts in the year 2000, with the ratio of nuclear families diverging from the rising trend of 1990 and falling off by 5.17%. Within the nuclear family category, the ratio of “standard nuclear family” dipped by 13.36% while that of “couple nuclear family” surged by 96.20%. The decrease in the overall ratio of the nuclear family is primarily attributed to the drop in “standard nuclear family”. This change indicated that in 2000, although the nuclear family remained the most common family type in rural villages, its relative ratio decreased. I believe this could be associated with a decline in married offspring that live separately from their parents, and the influential factor at play here is the passing of the height of marriages in families with multiple sons. Conceived in an era of few offspring, the “single son” (in rural villages, “single son” household also referred to families with one son and one daughter or one son and multiple daughters), born in or after the 1970s, were more inclined to live with their parents after getting married. For a son that often works away from home, living with parents has the benefit

of the parent's assistance in taking care of his children and helping with household chores.

During this phase, another emphatic reversal in family structure was in the immediate family. The ratio of immediate family edged down a little between 1982 to 1990 but markedly soared in 2000 by 10.55%, and within this category, the proportion of the three-generation immediate family went up by 8.45%. I believe that this was precisely the outcome of families with few offspring in which the offspring decided to live with his or her parents after marriage. Meanwhile, the most drastic change within the immediate family category was the grandparent-grandchild family, which skyrocketed by over 225%. One could say that this development was the result of employment-driven relocation of married middle-aged or young labor from rural villages into the city after giving birth.

The conditions of the rural family structure in 2000 show that the structure of modern rural families has not always progressed toward a nuclear orientation, but in this age when being small is the preferred family size, this turnaround has been moderate. Similarly, family units with multiple married generations, as represented by the immediate family, were not always in decline and experienced a rebound based on the 2000 data. I believe that such a change always hinges upon two requisites, one being the rise in the number of "single sons" and the other being a willingness to cooperate economically between the parents and their grown offspring. Meanwhile, as a higher proportion of the labor force in middle-aged or young families venture elsewhere for work, the demands for older middle-aged or senior parents to help with household chores also climb. In rural villages, parents in "single son families" often cater to the needs of their offspring as much as possible, even to the point of raising family expenditures to meet these needs. This is a crucial reason behind the increase in the number of three-generation immediate families and why such families can be maintained. In some families with multiple grown sons, married couples in the son's generation live separately from parents, and when they work elsewhere, they would delegate the task of rearing their underage offspring to their parents. Thus, it can be said that the growth in the number of three-generation immediate families is very much associated with this type of social environment.

Rural Family Structure During the Early Stage of Social Transformation

Rural village populations have always occupied the main share of the population of China, but this situation has gradually changed since the start of reform and opening up. The tipping point came in 2010, when the permanent populations of urban areas surpassed 50%, with non-agricultural employees accounting for the majority. Cities became the primary place of residence for most Chinese citizens and as a result the social transformation of China has started to surface. Of course, this shift was the result of the continual influx of rural village labor forces into cities, and we are now in the early period of this transformation. For the most part, the residence registration (*hukou*) of rural village laborers who work long term in the cities are still registered in rural villages, and a relatively high proportion of laborers working and living in the city are not with their relatives. Their young offspring and old parents are still living back in their rural hometowns. This has in turn led to an even higher level of aging among the rural village population.

Table 4 Family Structure in Rural Villages in China in 2010

Family type	%	Family type	%
		Couple nuclear family	16.73
		Standard nuclear family	30.92
		Separated couple and single-parent nuclear family	6.28
Nuclear family	57.02	Extended nuclear family	1.08
		Transitional nuclear family	2.01
		Sub-total of nuclear family	57.02
		Three-generation immediate family	20.27
		Two-generation immediate family	3.46
Immediate family	28.52	Four-generation immediate family	0.90
		Grandparent-grandchild family	3.89
		Sub-total of immediate family	28.52
Joint family	0.67	Joint family	0.67
Single-person household	11.79	Single-person household	11.79
Broken family	1.18	Broken family	1.18
Others	0.81	Others	0.81
		Total of couples and single-person households	28.52

Data source: Calculated based on data from the 1% sample Excel document of the long-form census of 2010

Not only did the 2010 structure of rural village families differ tremendously from those of 1982 and 1990, the differences were vast and obvious even when compared to the 2000 census.

The nuclear family retained its standing as the most common type of family, but its proportion dropped by 13.96% compared to 2000, and changes within its second-tier family types were even greater. The “standard nuclear family” that once represented more than 50% of the grand total in 1990 declined to less than 1/3, 33.48% lower than that of 2000, while “couple nuclear family” accounted for 17%, a surge of 47.27% compared with that of 2000. Immediate families rose by 14.86%, reaching almost 29%, of which “three-generation immediate family” grew by 6.74%, the “two-generation immediate family” jumped by 31.56%, and the “four-generation immediate family” went up by 12.50%, while “grandparent-grandson immediate family” shot up by 61.41%. There had been a rise across the board among all the second-tier family types within the immediate family classification. Another huge change was the increase of single-person households, soaring by 56.78% compared with 2000.

If the 2010 and 1990 data are compared, the changes in family structures become immediately obvious, notably the changes in second-tier family types. The “standard nuclear family” plummeted by 42.37% as the “couple nuclear family” soared by almost 190%. The “three-generation immediate family” rose by 15.76%, while the “grandparent-grandson immediate family” swelled by 426% and the “single-person household” category grew by 93.60%.

I believe that the dip in the proportion of “standard nuclear families” and the moderate rise in “three-generation immediate families” in rural villages in this period are connected to a decrease in the frequency of separations of rural village families since 1982. At the same time, the increase in

the possibility of the “single son” to choose to live with his parents after marriage further proves my deduction that since the onset of China’s reform and opening up, especially after rural village labor forces shifted toward non-agricultural sectors, the degree of necessity of family economic and daily life collaborations between different generations of parents and offspring increased, and the trend of multiple generations living together began to appear in families with few sons. At the same time there was also a clear rise in the number of “couple nuclear family” and “single-person household” in rural village families, indicating that a small size-orientation development also existed in the structure of rural families.

The latest information available regarding rural family structures is from 2015, which provides limited family information from the 1% population sample investigation data in 2015. It is difficult to match, compare or contrast this data with data from the four previous population censuses regarding rural family structures. However, generation-related data in family households can be found in the summary data and we can use this to gain an indirect glimpse into the latest conditions of family structures in rural villages, as well as to compare this with the generation-related data in the two previous population censuses.

Table 5: Generational Structure of Rural Families in 2000, 2010 and 2015

Unit of comparison: %

Generational composition	Year 2000	Year 2010	Year 2015
Households with members from one generation	18.21	29.77	30.57
Households with members from two generations	59.72	47.54	45.07
Households with members from three generations	21.13	21.68	23.24
Households with members from four or more generations	0.94	1.01	1.12

Data source: Table 5-1c of Part One of the 2000 Population Census of China on the website of the National Bureau of Statistics of China (<http://www.stats.gov.cn/tjsj/pcsj/rkpc/5rp/index.htm>); Table 5-1c of Part One of the 2010 Population Census of China on the website of the National Bureau of Statistics (<http://www.stats.gov.cn/tjsj/pcsj/rkpc/6rp/indexch.htm>); 2015 data came from the Population and Employment Statistics Department of the National Bureau of Statistics. 1% National Population Sample Survey 2015, 2016. Beijing: China Statistics Press. pp.333-334.

According to Table 5, compared with the generational structure of families in 2010, there were minor changes in 2015. Households with members from one generation edged up by 2.69%, households with members from two generations contracted by 5.20%, and households with members from three generations added 7.20%. We can see that in the 15 years since 2000, the number of households with members from one, three, and four or more generations maintained an increasing trend, two-generation households being the only type that declined. The three-generation households here are predominantly “three-generation immediate families” (and include a very small ratio of three-generation joint families). Similar to my analysis, the reason behind their sustained growth is the rise in the number of “single sons” and their willingness to create joint units of daily life with their parents, which is beneficial to the offspring generation that have to venture elsewhere for work. The one-generation household includes the “single-person household” and also families comprised of just

a married couple, which can be deemed the representative of small families. The increase in the ratio of “one-generation household” indicated that while the proportion of the “three-or-more-generation household” increased, the 2015 structure of rural families maintained their small size orientation development trend.

The changes in the rural family structure since the beginning of China’s reform and opening up may be divided into two general phases, before and after the beginning of the 1990s. In the former phase, although the household contract was implemented and the farming household returned as the independent unit of production and operation, the rural labor force was still basically engaged in farming, with very scarce participation in non-agricultural operation activities when not farming, and migrant work had not yet become full-fledged. The residential format among rural farmers carried on the model from the collective economic era and did not experience too much of an impact from societal changes and reforms, as family nuclearization continued and even showed signs of further advancement. Then in the latter phase, the transformations in rural societies began to take shape, the middle-aged and young labor force working in non-agricultural employment became commonplace. Middle-aged and young males worked elsewhere for extensive periods and even married couples with offspring would both work elsewhere, thus the level of aging of rural village populations further elevated. This has made rural families less complete. At the same time families with few sons, especially those with only one married son, increased. Under the circumstance in which non-agricultural employment was the main staple, the necessity for intergenerational cooperation between parents and offspring became more prominent. Therefore, among the rural villages there was a rise in the ratio of “three-generation immediate families”, and also a sharp increase in “grandparent-grandchild families”, but there was also a third situation, namely the clear growth of the “couple nuclear family” and the “single-person household”. Evidently, against the backdrop of China’s reform and opening up and social transformations, the rising necessity for intergenerational cooperation drove up the proportion of families comprised of multiple married couples in Chinese rural families, while at the same time extremely small family types such as the “couple nuclear family” and the “single-person household” also showed clear signs of increase. This indicates that the modern rural family structure is characterized in two aspects, one being the rise of units consisting of multiple married couples, and the other being the rise of empty-nest seniors and those living alone due to the death of spouse.

Impacts of Rural Population Relocation and Movement on Family Structures

Because the middle-aged and young labor force of families moving elsewhere to work in non-agricultural sectors became the prevailing trend after 1990, the 2000 and 2010 censuses required each family household to report the number of household members that left the household for half a year or more, including those migrant workers that had not changed their household registration and were away from the location of their household registration for more than half of each year. This data

provides possibilities for obtaining an insight into the relationship between family member population flow and family structures.

Impact of Family Member's Migrant Work on Family Structures

According to census data, in 2000 and 2010, respectively 20% and 30% of families reported to have members that worked as migrant workers. In the era when nuclear families and immediate families were the main staple, family members that lived together were mostly immediate family members with relationships by either marriage or blood, and thus the migrant worker was mostly either the married couple, one member of the married couple, or either the parent generation or the offspring generation. Once someone would leave their place of residence to work elsewhere, second-tier family status or even primary-tier family status would change.

From Table 6 we can see that in both periods more than 40% of single-parent families reported to have family members working as migrant workers, with the husband usually being the one working away from home. In both periods respectively more than 65% and 80% of “grandparent-grandchild families” reported to have family members working as migrant workers, and the primary reason was that the married couple in the middle generation both took up non-agricultural jobs in the cities. The figures for broken families were respectively more than 60% and 75%. Also, a high ratio of “couple nuclear family” reported having family members working as migrant workers. Obviously, in the modern era the rural labor force has obtained the opportunities to increase income through migrant work, but at the present stage it is almost always the family's young adults (husband, son, daughter-in-law, parents) that are engaged in migrant work, leading to a rise in incomplete families. Since “grandparent-grandchild families” are comprised of older middle-aged or senior grandparents and grandchildren, the juvenile members lack communication with their parents, resulting in rather immense impacts on their psychology and education. Of course, during the early stage of social transformation, in order for migrant workers to lower the cost of living at the location of their work, it was a common family strategy for working-age members to pursue migrant work, while leaving behind seniors and the underaged. This circumstance is not solely the consequence of the residence registration (*hukou*) system's restriction on the relocation of migrant populations into the cities.

Table 6 Impact of rural long-term family members working as migrant workers on family structures in 2000 and 2010

Unit: %

Family type	Year 2000	Year 2010
	Sum of families with family members working as migrant workers	Sum of families with family members working as migrant workers
Couple nuclear family	29.08	40.20
Standard nuclear family	10.17	12.39
Single-parent nuclear family	43.6	45.18

Family type	Year 2000	Year 2010
	Sum of families with family members working as migrant workers	Sum of families with family members working as migrant workers
Extended nuclear family	20.58	26.02
Transitional nuclear family	29.12	20.27
Three-or-more-generation immediate family	19.17	23.36
Two-generation immediate family	27.39	41.43
Grandparent-grandchild family	67.89	82.93
Joint family	20.53	56.20
Single-person household	26.77	37.51
Broken family	64.43	78.27
Others	19.44	81.33

Data source: Calculated based on data from the 1% sample database of the long-form census of 2000 and data from the 1% sample Excel document of the long-form census of 2010.

Regional Differences in the Labor Force Relocation and Movement and Their Impacts on Family Structures

The flow of the rural labor force into nonagricultural sectors in modern China shows distinct regional differences. Census data shows that in 2000, 20% of family households reported having migrant workers that would be away from home for more than half of the year, with the ratio being noticeably higher in provinces, municipalities and autonomous regions in the south such as Jiangxi (68.63%), Anhui (51.43%), Chongqing (34.9%), Guangdong (31.37%) and Guangxi (31.78%), while the figures for most other areas were below 20%. In 2010, on average 30% of family households nationwide reported having migrant workers that would be away from home for more than half of the year, and although there were no individual administrative division that particularly stood out, there were a few that were above 45% including Guizhou (49.74%), Guangxi (47.81%), Chongqing (46.65%), Anhui (43.11%), Fujian (42.53%) and Guangdong (41.53%). Those in northern China were less than 20%, with Shanxi reporting 13.28%, Heilongjiang 14.81%, Hebei 15.08%, Jilin 16.15% and Shandong 17.96%. These variations in migrant worker families and their impact on family structures are reported in Table 7.

Table 7 Relationship between Ratio of Rural Families with Migrant Worker and Family Structure in Selected Provinces (Municipalities) in 2010

Unit of comparison: %

Area	Ratio of families with long-term migrant worker	Couple nuclear family	Single-parent nuclear family	Other nuclear families	Immediate family	Grandparent-grandchild family	Single-person household	Broken family	Others
Hebei	15.08	16.49	4.26	42.02	26.67	1.39	8.47	0.40	0.30

Area	Ratio of families with long-term migrant worker	Couple nuclear family	Single-parent nuclear family	Other nuclear families	Immediate family	Grandparent-grandchild family	Single-person household	Broken family	Others
Shanxi	13.28	15.66	5.47	42.25	24.40	1.26	10.28	0.40	0.28
Heilongjiang	14.81	20.46	3.94	41.79	23.92	1.38	7.85	0.42	0.25
Anhui	43.11	18.24	6.98	28.45	21.85	7.13	13.68	2.28	1.40
Chongqing	46.65	20.24	7.35	20.37	18.26	8.72	21.23	2.28	1.56
Guizhou	49.74	16.44	8.34	33.08	19.85	6.77	11.96	2.92	0.64

Data source: Calculated based on data from the 1% sample Excel document of the long-form census of 2010.

Provinces and municipalities in which more than 40% of the families reported having long-term migrant workers had a ratio of “grandparent-grandchild family” approaching or in excess of 7%, “single-person household” also tallied over 10% with Chongqing reporting more than 20% for single-person households, which should primarily be seniors. There were over 2% of broken families and near or more than 7% of “single-parent nuclear families”. Meanwhile, for areas where less than 16% of the families reported to have long-term migrant workers, the proportions of the family types mentioned above were obviously lower, while immediate families (excluding “skipped generation family”) numbered at a relatively higher level. Long-term migrant workers became a key factor that drove the expansion in the number of incomplete families in rural.

Reform and opening up, along with the tremendous societal changes across China that took place thereafter, generated more opportunities for the rural labor forces to transfer into nonagricultural sectors, to raise income levels and to improve living conditions. However, during the early phase of social transformations, the long-term migrant work of the middle-aged and young labor forces in families also came with undesirable side effects, mainly the rise in the incompleteness of families, parents’ lack of attention dedicated to the education of their young offspring, and the duty of child-rearing being delegated to grandparents. Meanwhile, old-aged parents that suffered from diminishing ability to look after themselves were neglected, with quite a large proportion relegated to solitude. This type of phenomenon is almost inevitable in the short-term but should not be allowed to perpetuate in the long-term because that would weaken the core functions of family and erode the value of social development.

Effects of the Senior Population Expansion in Family Structure Changes

As rural elderly life expectancy extends, the size of this population group gradually enlarges. Meanwhile, the increase in the number of middle-aged and young persons that leave the villages would also raise the proportion of seniors in the composition of rural permanent populations. This in turn will amplify the impacts of the senior population on Rural Family structures and their changes. Our basic understanding is that if seniors prefer to live with children that have have

been married, then the ratio of immediate families in rural would rise; if seniors could take care of themselves and they are more inclined to live alone, then the proportions of “couple nuclear family” and “single-person household” would increase. According to data from the 1982 and subsequent population censuses, the ratio of seniors aged 65 or above living in immediate families shows signs of decline, but on the contrary the same ratios in “couple nuclear family” and “single-person household” have risen. We also see that after the year 2000 the number of immediate families have been increasing in rural.

The Proportion of Seniors in Overall Family Household Compositions

The proportion of seniors in overall family household compositions, and their changes, directly reflect their level of coverage in family households. This composition is not only related to the level of aging in rural, but also concerns with the mode of living and senior care among these older people. Of course, the increase of the former, as in the level of aging in rural, more directly lifts the proportion of seniors in family household compositions.

According to data from the 2000 and 2010 censuses and data from the 1% population sample investigation of 2015, we can obtain information about aging levels in rural and the proportion of seniors aged 65 and above in family household compositions (see Table 8).

Table 8 Rural Village Aging Levels and Ratio of Family Households with Seniors Aged 65 and Above

Unit of comparison: %

Year	Aging Level	Ratio of family households with seniors aged 65 and above
2000	7.50	22.02
2010	10.07	25.95
2015	12.03	29.73

Data source: 2000 and 2010 data calculated using information from the two respective population censuses provided on the website of the National Bureau of Statistics of China and 2015 data came from the Population and Employment Statistics Department of the National Bureau of Statistics. 1% National Population Sample Survey 2015, 2016. Beijing: China Statistics Press, pp. 342.

During the social transformations, the continually rising level of aging in rural villages resulted in the continual increase in the ratio of family households that included elderly persons. More than one fifth of family households reported to have been living with seniors aged 65 and above in 2000, with the figure exceeding 25% in 2010 and approaching 30% in 2015. The gradually mounting influence of seniors in the rural family structure is now apparent.

Who rural village seniors live with

Between 1982 and 2010, the majority of rural seniors aged 65 or above had children, and they produced their offspring before the enactment of family planning policies. Thus, most of these seniors have multiple children and at the times of the censuses, most of their children were already married.

Table 9 Mode of Living of Rural Seniors Aged 65 and Above Since 1982

Unit of comparison: %

Mode of living	Year 1982	Year 1990	Year 2000	Year 2010
Live with children	70.33	70.56	63.63	53.3
Of which: Married children	56.44	57.82	53.74	46.54
Unmarried children	13.89	12.74	9.89	6.76
Couple nuclear family	13.58	16.41	21.73	26.63
Single-person household	12.33	9.88	9.28	12.45
Skipped generation family	3.22	2.88	5.11	6.46
Others	0.53	0.28	0.25	1.16
Sum of single-person households and couple nuclear families	25.91	26.29	31.01	39.08

Data source: Calculated based on data from the 1% sample database of the 1982 national population census, the 1% sample database of the 1990 national population census, the 1% sample database of the long-form census of 2000, and the 1% sample Excel document of the long-form census of 2010.

Since 1982, the mode of living of rural seniors aged 65 and above share similarities with the general rural family structure previously discussed, and there were obvious shifts at different time periods.

In the four periods, the ratios of seniors that lived with children all surpassed 50%, with figures from 1982 and 1990 even exceeding 70%. After 2000 the drop in the number was obvious, with 2000 being 9.82% lower than 1990, while the figure for 2010 was 16.23% fewer than 2000.

However, the ratio of seniors that resided with married children are more telling. This type of households contributed to more than 50% of overall households in the first three phases but crossed below the half-way line for the first time in 2010, at 46.54%.

At the same time, the trend of seniors living alone rose sharply after 1990, and especially after 2000. The single-person household proportion then surged by 34.16% in 2010 compared with 2000. The “couple nuclear family” proportion in 2000 soared by 32.42% relative to 1990 and was 22.55% higher in 2010 than in 2000. The sum of the “single-person household” and “couple nuclear family” surpassed 20% of the total in 2000 and accounted for more than 1/4 of the total in 2010.

The rising trend in the ratio of seniors living in skipped generation family is worthy of attention, with the 2000 figure increasing by 77.43% compared with the previous phase, and then 2010 rising another 26.42% higher than 2000. I believe that the reason behind this phenomenon was not due to grown grandchildren holding up their responsibility to take care of aged grandparents. Instead it was because grandparents had to take care of underage grandchildren and can be directly attributed to the married couples in the middle generation working as long-term migrant workers and leaving their children behind to be took care of by the grandparents. This is one of the expressions of the impact that the social transformations have had on rural family structures.

New Changes in Types of Families with Elderly People in with Seniors Lived in 2015

Since the data of the 2015, 1% population sample investigation could not be obtained, comparative

research applying the same categorization method as the four previous phases was not possible. Also, the statistical item called “number of families with elderly people with seniors aged 65 or above” seen in the population censuses since 2000 and the 1% sample investigation in 2015 tallies the number of families with elderly people with a senior resident member, but not each individual senior as a subject of investigation. We use this as the basis for analysis in Table 10.

Table 10 Composition of Rural Family Household with Seniors Aged 65 or Above by Type

Unit: %

Family household type	Year 2000	Year 2010	Year 2015
Single-person household	10.70	16.07	16.05
Couple household	10.28	13.53	15.98
One senior and juvenile (skipped generation family household)	1.15	1.25	1.12
Two seniors and juvenile (skipped generation family household)	0.94	1.05	1.17
Others	76.92	68.10	65.69

Data source: Table 5-4c of Part One of the 2000 Population Census of China on the website of the National Bureau of Statistics (<http://www.stats.gov.cn/tjsj/pcsj/rkpc/5rp/index.htm>); Table 5-5c of Part One of the 2010 Population Census of China on the website of the National Bureau of Statistics (<http://www.stats.gov.cn/tjsj/pcsj/rkpc/6rp/indexch.htm>); 2015 data came from Population and Employment Statistics Department of the National Bureau of Statistics. 1% National Population Sample Survey 2015, 2016. Beijing: China Statistics Press. pp.342.

Per Table 10, the ratio of seniors living in a single-person household roughly maintained the same level in 2015 compared with 2010, but the ratio for those residing in “couple nuclear family” went up by 18.11% in 2015 relative to 2010. This indicates that there was an increasing trend for rural senior couples to live on their own. The overall level of seniors living alone and living in “grandparent-grandchild families” (sum of “couple nuclear family”, single-person household and “grandparent-grandchild families”) continued to balloon. This means that seniors aged 65 and above with reduced independent living ability were not the driving force that fueled the increase in immediate families in rural.

Following the rise in the aging of rural, the number of families with seniors has also steadily risen, with the figure reaching 30% in 2015. However, the number of elderlies that resided with children, especially married children, dropped below the 50% mark in 2010 (only 46.54%). At the same time, the number of seniors that lived on their own, especially elderly couples, has continued to rise since 2000 with the figure eclipsing 25% in 2010, and data from 2015 indirectly show that this rising trend is not showing signs of slowing. Even though the number of immediate families in rural has remained steady, especially the number of “three-generation immediate families” has been climbing. It’s not because more seniors aged 65 and above are living therein, but because the ratio of middle-aged and younger seniors living with married children has expanded. Actually, the increase in the level of aging in the rural caused the increase in the proportion of “couple nuclear family” in the family compositions, thus contributing to the increase in extremely small families in the overall family composition.

Conclusion and Discussion

Obvious Differences in the Rural Family Structure Changes During the Different Phases Since the Launch of Reform and Opening Up

During the early period of reform and opening up, rural in China still employed the collective economic system centered on agriculture, family structure retained its nuclearization-orientation, and even after the implementation of the land contract system in 1980s this situation did not fundamentally changed. The primary reasons why family nuclearization was able to be sustained were that the preference among the main labor forces in the rural was to stay put, and the prevalence of sibling in multi-children families to leave their parent's home after marriage and live on their own. After 1990, following the deepening of the reforms, large numbers of the middle-aged and young labor force began to move to nonagricultural sectors, and noticeable social transformations in the rural began. Seniors' contributions to the composition of the permanent populations in the rural enlarged, and as those born during the early days of the implementation of family planning began to grow up, the ratio of families with only one grown son also rose. Rural family structures started to see new and unprecedented changes. During the course of this social transformation, vocational divisions of labor between the parents' generation and the married children's generation in families with few children emerged, and the necessity for cooperation between these two generations in family economies and daily life increased, which raised the number of "three-generation immediate families" and lowered the number of "standard nuclear families". The number of middle-aged and young offspring generation couples that worked as migrant workers increased, the function of the middle-aged and young senior parent generation in taking care of infants and grandchildren elevated in importance, and the ratio of "skipped generation family" and other forms of incomplete families rose. Older middle-aged and elderly seniors who could not contribute to the care of infants created a rise in the ratio of older people living on their own in "couple nuclear family" or "single-person household".

Pay More Attention to Seniors Who Have Reduced Independent Living Abilities and Who Live on Their Own

As the level of aging in modern rural rose, the ratio of families that include senior members gradually increased. Some seniors capable of living independently would live individually or as couples, and most of the elderly that live on their own usually have children that live separately from them in the same village, and can get help and care from their children. But there are also middle-aged and young children that work elsewhere as long-term migrant workers who are incapable of helping their aged parents on a daily basis. This kind of situation is worthy of attention, and the government should augment public service programs that target seniors, in particular those that live on their own, and provide them with practical and effective aids to minimize the difficulties and risks in their lives.

Prioritize Issues that Exist in Intergenerational Relationships in Families

In terms of the present-day rural, the strengthening of collaborative willingness in families with few children and the formation of “three-generation immediate families” have their upsides. As young and middle-aged members of the offspring generation normally work elsewhere in nonagricultural economic sectors as migrant workers, the capacity for middle-aged and young seniors to help with taking care of their grandchildren and household affairs mainly benefit the offspring generation in these families where multiple generations reside together. Yet, this is not a universal case, as there are families where seniors aged 65 or above, especially those aged 70 or above and with weakened ability to handle domestic chores, do not receive enough care and attention. At present, a relatively high proportion of middle-aged and elderly seniors in rural have multiple adult children, and married children usually are unwilling to live extensively with aged parents. Of course, many of these middle-aged and elderly seniors would choose of their own accord to live on their own in fear of the possibility of generating family conflicts when living together with children. As children, they should realize that they are obligated to support and care for their aged parents, and the village and other social organizations ought to pay attention to amending the offspring generation’s negligence and abandonment of their elderly parents.

Adopt Institutional Measures to Reduce the Formation of Incomplete Family Types

During times of social transformations, the biggest impact afflicted on rural families is the extensive migrant employment of the middle-aged and young labor forces, which leads to a rise in the number of incomplete families and limitations in the performance of intergenerational functions and relationships. During the early part of social transformations, this kind of phenomenon is unavoidable. But following improvements in residence registration (*hukou*), migration and social welfare, family members, particularly underage children, relocating with middle-aged and young parents will increase, which will mitigate the “skipped generation family” and left-behind children issues. At the same time, there is also the possibility of a rise in middle-aged and senior parents that move in with their married children that have settled down in cities to help take care of grandchildren or to obtain better senior support and care. The government should provide more conveniences and beneficial measures to facilitate family members with this type of willingness or plan to engender the gathering of family members as the basis for the urbanization of the modern populace, instead of separation between the main labor forces and their children and parents.

Predictions on Future Changes in Rural Family Structures

The proportion of the rural population in the total population will continue to shrink, the ratio of the middle-aged and young labor force in the permanent population will continue to drop and the growth of the senior population will be sustained. These will become the main influential factors in the structure of rural families. At present, most middle-aged or younger senior parents in rural

have two or three children, which is considered few by historical standards. If grown children establish their home in a rural after marriage and giving birth but work far away from home in a nonagricultural sector as a migrant worker, then the economic and daily life model in which the middle-aged or younger senior parents live together and cooperate with the offspring generation, as in the immediate family model, will continue or even increase. At the same time, following the gradual decline in the number of old couples (those born around 1940) with multiple offspring, the number of “couple nuclear family” or single-person household formed by seniors living on their own will decline. There is possibility that, in the future, if the ratio of the rural youth generation working, getting married and settling in the cities increases while their rural village parents have not followed and moved in with them, then not only will the number of rural seniors with few children and living on their own increase, but the growth trend of the “three-generation immediate family” and other types of family units with multiple marriages will be suppressed.

During an era of social transformations, researchers need to continually understand changes in the mentality of the people about life, observe the new living habits and preferences of different population groups, and identify the impacts that the execution of new systems impart on family relationships to better comprehend the changes the social transformations have on the features pertaining to the family structures in rural areas.

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Probe into the “Mania for School District Houses”

— Research into the Motivations for Purchasing School District Houses from the Perspective of Cultural Capital

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Abstract: In recent years, the “mania for school district houses” has disrupted the housing market and undermined education equity and class mobility, thus becoming a common concern. Most existing research focus on market motivations for purchasing school district houses while neglecting the connections between school district houses and cultural and social elements in the process of class reproduction. To make up for this deficiency this article introduces the neighborhood-based cultural capital theory to explore the diversified motivations, the processes of motivation formation, and the determining factors in purchasing school district houses. Reviews and analysis of interview materials revealed that while theories based on western experience can explain the basic purchasing motivations and their formation processes, there are distinct and varied purchasing motivations in China, more comprehensive and complex forms of capital exchange, and more dynamic factors that impact purchases of school district houses. Suggestions on solving the “mania for school district houses” are also presented.

Keywords: school district houses, institutionalized cultural capital, objective cultural capital, social capital, economic capital

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Introduction: The “Mania for School District Houses” and Worries over “Class Rigidity”

In recent years, sky-rocketing prices of school district houses have led the trends in the housing markets in first-tier cities. This is particularly notable in many city centers where some school district houses are old, shabby, and small, contrasting sharply with their high prices of 100-200 thousand yuan per square meters, thus triggering public attention and media discussions (Wu, 2015). The mania for school district houses originated from the “nearby enrollment policy” initiated to solve school-choosing problems. Yet, the shift from “school-choosing” to “house-choosing” has led to new social problems. In the short term, the price surge of school district houses can disrupt market order and impact the healthy development of the real estate market. In the long term, since such a mania reflects the unbalanced and unfair distribution of educational resources, it will trigger concerns over class rigidity in the social structure (Lu & Zhang, 2015, pp. 13-17). However, most domestic research regarding the motivations for purchasing school district houses focus on their high market prices (Hu, Zheng & Wang Rui, 2014, pp. 1195-1214), market mechanisms (Zhang, Li & Deng, 2014, pp. 193-206), investment willingness and risks (Zhang, Chen & Shi, 2016, pp. 97-111), mainly touching on the supply and demand relations between household economic capital and educational resources. In the long term, school district houses are closely related to residential stratification, social mobility, intergenerational transmission, status symbols, and other social and cultural elements. Therefore, if we solely rely on the linear interpretation of economic capital competing for quality educational resources, it is impossible to explain the complex mechanisms connecting school district houses and social mobility or to explain why among families with similar economic capital, some choose to purchase school district houses and others choose not to. To fundamentally solve the mania, it is necessary to comprehensively understand the diversified motivations for purchasing school district houses and expound on the complex connections between school district houses and class reproduction.

While researching international housing, I focused on the phenomenon of realizing capital growth through the transition of neighborhood space and the dual functions of cultural capital in preventing downward mobility and empowering upward mobility of filial generations. Using the cultural capital theory, I explain the motivations for purchasing school district houses and the formation of such motivations (Boterman & Bridge, 2015, pp. 249–261; Bridge, 2016, pp. 719–730), thus enabling the theory and conceptual operationalization of the connections between house-choosing and class reproduction. The introduction of this theoretical framework is based on the interviews conducted from May to August in 2017 with 10 families that purchased school district houses and 6 families with similar economic capital that purchased non-school district houses. My goal was to unearth the motivations for purchasing school district houses in China and the determinants impacting the formation of the purchasing motivations. My research can add to, and complement, existing domestic research, and test and develop the housing neighborhood-based cultural capital theory. In practice, I

offer suggestions for solving the mania at the source.

Literature Review: Motivations for Purchasing School District Houses and the Theory of Cultural Capital Exchange

In international housing research, the motivations for purchasing school district houses are generally viewed as increasing family capital by choosing a housing neighborhood. In the west, research in choosing housing neighborhoods and family capital accumulation and integration have undergone three stages of evolution. Research at the first stage mainly focused on the motivation for economic capital accumulation. With the rise of cities in western industrialized countries in the 19th century, individual families moved away from big families bound together through blood relationships, and sought to live together among people with similar economic capital, leading to differences of regional house prices and residential isolation in cities. Against such a backdrop, housing neighborhoods were not only viewed as a space selection but also as a symbol of family economic capital (Keller, 1968).

Research at the second stage focused on the construction motivation of social capital. In the 1970s, community development in cities in western countries stabilized. By introducing the concept of social capital developed by James S. Coleman, Robert D. Putnam, and others (Coleman, 1988, pp. S95–S120; Putnam, 2000), housing neighborhood was understood as a social network organization offering space for the increase of family capital (Warren, 1981). Scholars like Ray Forrest and Ade Kearns explored the operation of neighborhood social networks, namely in harmonious neighborhoods with a high degree of trust, cooperation and mutual benefits. With a strong sense of belonging, families could reduce their costs of commercial and social interactions, enhance efficiency, broaden knowledge, improve livelihoods, and realize the accumulation of economic and social capital, thus realizing class reproduction (Forrest & Kearns, 2001, pp. 2125–2143).

Research at the third stage focused on the motivation for increasing cultural capital. In the late 20th century, with the start of renovation of old city centers in western countries, a large number of middle-class households moved back to city centers from the suburbs and chose to settle down in emerging neighborhoods with sound environments and improved infrastructures, forcing indigenous poor people to move away. Such a process of counter urbanization is also called “gentrification” (Butler, 2007, pp. 162–181). Scholars like Tim Butler explained such phenomenon as not only a process of families with higher economic and social capital replacing those with lower economic and social capital, but also as what Pierre Bourdieu stressed, the spatial accumulation of cultural capital represented by materialized middle-class living styles and residential tastes (Bourdieu, 1984), which generated a class reproduction mechanism in emerging communities with cultural capital accumulation as the core (Bridge, 2006, pp. 1965–1978). Such a perspective integrated the relations between the neighborhood gentrification process and class reproduction and developed into an influential theoretical framework.

However, in western countries, some young families moved out of these emerging communities and relocated to conventional ones that were old, shabby and small in house type, yet with better educational resources, challenging the theoretical explanation of gentrification. Scholars like Michaela Benson conducted qualitative comparisons and research in multiple European countries and developed the cultural capital theory that integrated neighborhood selections. They discovered that the motivation for purchasing school district houses was mainly about the pursuit of institutionalized cultural capital. Therefore, under such a framework, choosing houses that are old, shabby, and small does not mean a denial to cultural capital accumulation, but the ongoing transition of different stock forms and incremental forms within cultural capital (Benson, Bridge & Wilson, 2015, pp. 24–43). For young middle-class families with a certain amount of economic capital as the foundation for purchasing power, they are restricted by the possession of economic capital during their youth and cannot own all three forms of cultural capital at the same time, namely; objectified cultural capital represented by materialized residential environments and living styles, institutionalized cultural capital represented by knowledge and skill qualifications, and the overall reproduction of embodied cultural capital such as knowledge, taste, and thinking style. In order to give offspring opportunities for quality education certification enabled by school district houses, they have to forsake objectified environments and tastes and move to houses that are old, shabby, and small. Finally, Gary Bridge and other scholars further improved the cultural capital theory and built a theoretical framework for the space-time interactions of economic, social, and cultural capital (Butler & Robson, 2003, pp. 5–28).

The research of Gary Bridge found that the amount of social capital stock in a present residential neighborhood is the key factor determining whether to purchase houses that were old, shabby, and small (Bridge, 2001, pp. 205–216). Just as Figure 1. shows, limited by economic capital, for Family A, which has a relatively lower degree of embedding into neighborhood social networks and less cooperation and mutual benefits with neighbors, has greater motivation to abandon the lower level of neighborhood social capital stock and purchase school district houses and start the process of converting the objectified cultural capital with a sound residential environment and taste into an incremental quantity of institutionalized

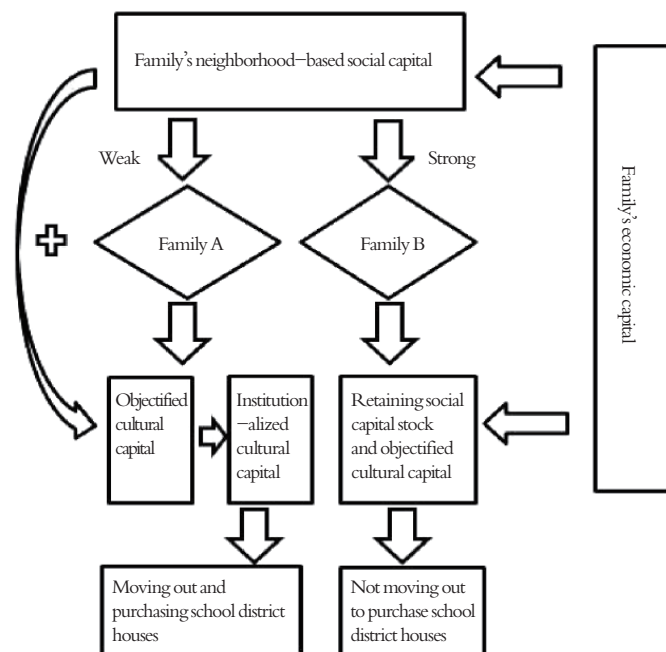


Figure 1. Theoretical Framework of Culture Capital in the Process of Purchasing School District Houses

cultural capital with the opportunity to obtain a quality education certification in the future. For Family B, which has a close neighborhood relationship and relatively stronger neighborhood social capital, they totally lose the stock of social relations accumulated in the original neighborhood after relocating and face an excessive reduction of total family capital. Therefore, Family B chooses to abandon school district houses and no longer seeks to convert the stock of objectified cultural capital into the incremental quantity of institutionalized cultural capital.

Therefore, for the “mania for school district houses” represented by purchasing houses in China that are old, shabby, and small, I introduce the research framework of the cultural capital theory and discuss the following two issues from a Chinese context. First, whether the theoretical framework with cultural capital exchange as the core can explain the motivations for purchasing school district houses, and second, the factors that impact the motivations for purchasing school district houses and non-school district houses, namely the formation of neighborhood choice differences.

Research Design

According to the cultural capital theory, my research first compared school district houses that are old, shabby, and small in key primary school districts (including key primary schools at the municipal and district levels, and primary schools where graduates can be enrolled directly into key junior high schools at the municipal and district levels) in Beijing, a representative of first-tier cities, and the motivations for purchasing non-school district houses. Second, I analyzed the different modes of capital exchange in the formation of purchasing motivations. Third, I explored factors impacting motivation differences in purchasing school district houses. In order to compare Chinese and western experiences, I used qualitative semi-structured in-depth interviewing. As exploratory research, target groups in Beijing were chosen by combining snowball sampling and purposive sampling. Interviewees were chosen by considering the following requirements. First, in order to better embody the relationships between school district houses and class reproduction, I chose families that purchased school district houses that were old, shabby, and small for the enrollment of their offspring, and those with a demand for offspring enrollment that purchased non-school district houses. Second, I chose families that purchased school district houses from December 2014 to May 2017, a period of rapid price inflation of school district houses in first-tier cities, and families with non-school district houses. Third, in order to reveal factors leading to neighborhood choice differences, I chose families with similar economic capital, namely those purchasing school district houses and those purchasing non-school district houses with similar total prices and owning those houses as their only house. Fourth, in order to make the research more typical in sample selection, attention was paid to ensure that the samples included analogue gender, education background, employment, income, and other social and economic features.

From May to August in 2017, interview materials were gathered in two steps. First, experimental interviews were conducted with purchasers of school district houses and non-school district houses.

Then, based on the results of these interviews, a formal interview was conducted after revising the interview questions. To make field observation of school district houses that were old, shabby, and small, and non-school district houses, interview locations were chosen in areas near to the residence of interviewees, as much as possible. For this study, a total of 16 face-to-face in-depth interviews were conducted, 10 involving purchasers of school district houses that were old, shabby, and small and 6 involving purchasers of non-school district houses. Each interview lasted 40-60 minutes and, with the permission of interviewees, were recorded and later transcribed. For the purpose of anonymity, interviewees were coded, with male starting with letter “M” and female “F”. The basic information of the 16 interviewees is presented in Table 1. The ratio between male and female is 1:1; the educational degrees of the interviewees include bachelor, master and doctor. Their employment types include government agency, public institution, state-owned enterprise, state holding enterprise, foreign enterprise, private enterprise, and self-employment. Among the school district houses that are old, shabby, and small there is one along the North 4th Ring Road, two near the North 3rd Ring Road and the others near the 2nd Ring Road. All were built between 1965 and 1990 with an average price of 102 thousand yuan/m² and an average floor area of 48.5 m². Among the non-school district houses with a similar overall price, there are space-time differences in location, area, and time of completion, and differences in the unit prices. All are outside of the 5th or 6th Ring Road and built between 2000 and 2012, with an average floor area 110 m², 2.3 times the size of the school district houses. The average unit price is RMB 51 thousand/m², half that of the school district houses.

Table 1: Basic information for interviewees purchasing school district houses and non-school district houses

No.	School district houses with key primary schools or primary schools where graduates can be directly enrolled into junior high schools	Gender	Education	Work	Location	Completion Time	Unit Price	Floor Area
M1	Zhongguancun No.1 Primary School	Male	Bachelor	Private enterprise	North 4th Ring Road	1981	110 thousand yuan	54 m ²
M2	China-Cuba Friendship Primary School	Male	Master	State-own enterprise	West 2nd Ring Road	1965	105 thousand yuan	60 m ²
M3	Yuxiang Elementary School	Male	Master	Private enterprise	North 2nd Ring Road	1985	130 thousand yuan	47 m ²
M4	Beijing Primary School	Male	Bachelor	Government agency	West 2nd Ring Road	1970	100 thousand yuan	43 m ²
M5	Fendou Primary School	Male	Doctor	State-holding enterprises	West 2nd Ring Road	1985	92 thousand yuan	50 m ²
F1	Wanquan Primary School	Female	Master	Private enterprise	North 3rd Ring Road	1990	100 thousand yuan	50 m ²
F2	Yuzhong Elementary School	Female	Master	State-own enterprise	North 3rd Ring Road	1982	110 thousand yuan	50 m ²

No.	School district houses with key primary schools or primary schools where graduates can be directly enrolled into junior high schools	Gender	Education	Work	Location	Completion Time	Unit Price	Floor Area
F3	Fensiting Elementary School	Female	Bachelor	State-holding enterprises	East 2nd Ring Road	1985	95 thousand yuan	50 m ²
F4	Sanlihe the Third Primary School	Female	Master	Public institution	West 2nd Ring Road	1980	100 thousand yuan	31 m ²
F5	Huiwen First Primary School	Female	Master	State-holding enterprises	East 2nd Ring Road	1986	78 thousand yuan	51 m ²
M6	No	Male	Master	State-own enterprise	North 5th Ring Road	2001	40 thousand yuan	100 m ²
M7	No	Male	Bachelor	Self-employment	North 5th Ring Road	2000	40 thousand yuan	95 m ²
M8	No	Male	Master	Public institution	East 5th Ring Road	2005	50 thousand yuan	105 m ²
F6	No	Female	Master	Self-employment	West 5th Ring Road	2010	70 thousand yuan	98 m ²
F7	No	Female	Bachelor	State-own enterprise	South 6th Ring Road	2002	37 thousand yuan	140 m ²
F8	No	Female	Bachelor	Private enterprise	North 5th Ring Road	2012	70 thousand yuan	120 m ²

The Complex Relationship between Purchasing School District Houses and Class Rigidity

By comparing and analyzing the interview materials, I found that, first, the motivations for purchasing school district houses were not limited to what domestic literature focuses on, namely increasing family economic capital through investment, but also value increases in different forms of cultural capital and social capital. Second, the research sought to find the relationship between pursuing capital accumulation and class reproduction from the motivations for purchasing school district houses, which challenged theoretical explanations based on western experiences and showed the more comprehensive and proactive features of purchasers in a Chinese context.

Diversified Motivations of Capital Exchange

School district houses: not only exchange institutionalized cultural capital.

The research finds that the motivations for purchasing school district houses clearly reflect that purchasers hope to acquire quality institutionalized cultural capital by approaching quality educational resources. Among these interviewees, the interview materials of F1 are typical. She explained that by purchasing a school district house, she can ensure that her offspring gain more opportunities for

acquiring a quality educational certification one generation after another, and finally get “good” work. Such a process shows the relations between purchasing school district houses for offspring, acquiring expected social and economic status, and realizing class reproduction.

“Of course, the purpose is to attend a key junior middle school... key senior high school, universities listed in China’s 211, or 985 key university national projects, and finally land a good job. It does not mean that a school district house can guarantee a good university, but it is a question of higher probability.” (F1, May 1, 2017)

Besides, the research finds that the relationship between purchasing school district houses and class reproduction is not limited to pursuing educational certification but shows a more diverse trend. First, families of the interviewees also pursue embodied cultural capital. In the interview materials of M3, I found that compared with “quality educational resources”, he pays more attention to the accumulation of embodied cultural capital of his offspring with the help of a school district house, such as personal disposition and way of thinking.

“It does not mean that I will push my kids too hard for a good school... What I value more is the atmosphere and cultural background of a school, which is conducive to the growth of kids... in terms of confidence, vision, disposition, and way of thinking.” (M3, May 14, 2017)

Second, some families also pay attention to the quality enhancement of social capital. In this aspect, the viewpoint of M1 is typical. By purchasing a school district house, he hoped to acquire opportunities of embedding into a social network of higher quality. He also expected the positive role of social capital in offering short-term education and long-term social and economic status for his offspring.

“Families that tighten their belts to buy school district houses value their kids... Just as a story tracing back to 365 BC goes that the mother of great Chinese philosopher Mencius moved home three times to ensure an environment conducive to her son’s education. With kids of such families as the classmates of my kids, my kids and I will have chance to know such parents and kids. In such an environment, kids will learn from and encourage each other... When they grow up with such classmates and friends, chances are that help from them are more important than the hard efforts of your own.” (M1, May 6, 2017)

Third, the motivation for economic capital increase is somewhat weakened. The research finds that, in recent years, despite a large degree of appreciation in school district houses, families of interviewees do not view capital appreciation as the major motivation for purchasing school district houses. For instance, M5 purchased a school district house at a price of 92 thousand yuan/m². He stressed repeatedly that, in order to exchange the various forms of capital increase brought by a school district house, he is tolerant of economic capital loss.

“The price was very high when the house was purchased. We were ready to accept a price drop, say, 20% or 30%... At the very least, we can pass down the house to my son, so his kids can use it for school enrollment... It is impossible to attend schools in the district by purely paying more fees.” (M5, May 30, 2017)

Non-school district houses: pay more attention to objectified cultural capital and economic capital.

Yet, this does not mean that only school district houses can enable the various forms of capital accumulation, and then a monopoly on class reproduction. The research also finds that families choosing non-school district houses also follow the theoretical framework that explains housing neighborhood choices and class reproduction. These families expect a higher increase of objectified cultural capital and economic capital. First, in terms of objectified cultural capital, the interview materials of F7 are typical. After comparing school district houses with non-school district houses, she chose a bright and spacious house in a community featuring “separation of man from vehicle”, greening, and an amusement park, all hallmarks of the lifestyle and tastes of the middle-class. She believed that the loss of objectified cultural capital will affect the class reproduction of offspring, namely “bad for growth” and “feelings of inferiority”.

“We inspected school district houses of the 1980s... There were no elevators, and a jumble of things were packed on the stairs. In my opinion, living in such an environment will be bad for my kid’s growth and it is easy to be self-abased. At the very least, my kid should live in a spacious house. It does not have to be luxury. The minimum is to ensure life quality... In my current community, there are ‘separation of man from vehicle’, greening, and an amusement park.” (F7, July 2, 2017)

Second, in terms of economic capital, with the interview materials of M7 as an example, he believes that with a similar overall price, non-school district houses are more capable of “maintaining value” compared with “unmarketable” school district houses and can create more family economic capital.

“Since (school district houses are) very old, (for future buyers), it is impossible to get loans of 30 years... Perhaps nobody will buy such houses... In the long run, non-school district houses are more capable of maintaining value and hedging against inflation.” (M7, July 22, 2017)

The Process of Comprehensive Capital Exchange

Trade-offs under the framework of capital exchange theory.

The research finds that purchasing school district houses, or not, to some degree the process of neighborhood choice is similar to the framework of capital exchange. Both are supported and limited by fixed economic capital and engage in the trade-offs between objectified cultural stock capital and institutional cultural incremental capital. For instance, the interview materials of F1 show that with the limitation of economic capital, in order to obtain a capital increase powered by a school district house, she yielded some of her original objectified cultural capital, such as “pastoral decoration” and “closed-off management”.

“(Our previous house) was decorated in a pastoral style with closed-off management... Yet the current house has no door security, let alone a compound... You can see the illegal construction and advertisements all over the walls... If not for the school, no one would buy such an old house...

Of course, I can only afford such a house.” (F1, May 1, 2017)

Meanwhile, the interview materials show that the process for purchasing non-school district houses also reflects a trade-off among different forms of cultural capital. For example, M6, who purchased a 100m² house built in 2001 outside of North 5th Ring Road, said that though “affordable” school district houses can bring opportunities of institutionalized cultural capital increase, they are “unlivable” because of their low objectified cultural capital. Yet he cannot afford to buy “desirable” school district houses that exceed his upper limit of economic capital. So, he had to make a trade-off between different forms of cultural capital.

“I looked at several (school district houses), the affordable ones are unlivable and the desirable ones are too expensive... Unlivable houses are poorly built. So I finally chose a big new house with better quality.” (M6, May 1, 2017)

Replenishment of transfer capital after exchange.

However, further analysis shows that in China, the process of capital exchange based on neighborhood choice is more comprehensive and complex. Especially, after choosing a neighborhood, the families of interviewees continued exchanges between the forms of stock capital and the incremental capital, and replenish capital centering on their yielded capital forms. With limited economic capital, such a sustained process of capital recombination is happening repeatedly in various forms. For families of interviewees that purchased school district houses, they use the following two strategies to improve living environments and tastes.

First, decoration and renovation. Among the 10 interviewees who purchased school district houses, 7 have finished decoration and renovation of their houses, or plan to do so. For instance, the interview materials of F5 show that she wants to pay a low cost of economic capital to make up for the too low objectified cultural capital and ensure “not too much difference” between the living environment of new houses and school district houses that are old, shabby, and small.

“One good thing about a small house is that you do not need too much money for decoration, and a little bit of decoration and transformation will make a new, cozy house.” (F5, August 6, 2017)

Second, renting a house in a new community. Another three families purchasing school district houses hope to improve their living environments and lifestyles by renting another house. The interview materials of M3 show that he pays relative lower economic capital, namely making up the difference of rent. He chooses to live in a newly-built community nearby with two “livable bedrooms” to avoid the loss of objectified cultural capital.

“I will rent out this one and decide to add a little money to rent a livable two-bedroom house in XX Jiayuan, which is more agreeable.” (M3, May 14, 2017)

Meanwhile, families purchasing non-school district houses have not abandoned the opportunity to approach institutionalized cultural capital, either. They give full play to their initiative and use the following two strategies to make up for the loss of quality educational certification opportunities with economic capital.

The first is attending extracurricular training courses. Most interviewees choosing non-school district houses agree that attending courses of off-campus educational agencies can substitute for key primary schools to some degree, adding to the opportunities of their offspring acquiring institutional certifications in the future. Taking F8 as an example, who purchased a non-school district house outside of the North 5th Ring Road. She believes that there is no difference between attending off-campus training and studying in a key primary school, since they are the “same roads” leading to an increase of institutionalized cultural capital.

“I’ve made some inquiries and I learned that even for students in key primary schools, many of them attend off-campus training... We also plan to choose off-campus training for my kid. There are many training agencies nearby... As long as you keep attending the courses, the effects are the same.” (F8, August 19, 2017)

The second is active parental participation. Some interviewees choosing non-school district houses also stressed the indirect role of objectified cultural capital, such as the interior and exterior environments of the houses, in the acquiring of institutionalized cultural capital for offspring. For example, F7 chose a 140m² house with a study in a new community near her work place. She stressed that the sound interior and exterior environment of the house and a short commute time will make her more “energetic” and “be in the mood” to participate in and monitor her kid’s study.

“We can own an independent study, fill the study with books, and read through the books. There is a running track and various kinds of plants in the compound residential complex... We can go downstairs to exercise and learn about the plants. It takes me less than half an hour to commute. Going home, I will be more energetic and be in a mood to care for his study... In my opinion, parental participation, words and deeds are more important for a kid’s growth than teachers.” (F7, July 2, 2017)

Factors Affecting the Formation of the Motivations for purchasing School District Houses

Western experience tells us that the amount of social capital stock in residential neighborhoods is the key factor determining whether to purchase a school district house. Yet, my research for this study finds that amid the background of China with its changing social structure, the atomization of living styles leads to weaker neighborhood social capital (Pan, 2008, pp. 104-110). Therefore, compared with horizontally stationary neighborhood social capital, two vertical dynamic factors have become the main reasons leading to neighborhood choice differences among people with similar economic capital. The factors are, first, the role of quality educational resources in personal experience on the acquiring of personal education and social and economic status, and second, the prognosis of how future institutionalized cultural capital will affect the acquisition of social and economic status.

First, because of differences in personal experience, there is a dispute over whether school district houses can increase the odds of acquiring a quality educational certification. Interviewees

choosing school district houses stressed the key role of school district houses in acquiring a quality education. As a representative of these people, M4, based on his own experience, believed that school district houses can enable an overall capital increase, including institutional certification and social relations.

“I attended an ordinary primary school, and then a key junior middle school, where I got to know many classmates who graduated from key primary schools... Then I realized the great gap, which means not only scores, but also phased goals and the methods to realize those goals... They do not compete with others purposely. Rather, they are naturally affected by their learning – minded classmates.” (M4, May 30, 2017)

On the contrary, interviewees choosing non-school district houses are skeptical of the effects of school district houses. Among these people, M8, who graduated from a top university, with his own experience, believed that acquiring institutionalized cultural capital rests on personal endeavors, namely “whether you have the talent or not” rather than the quality of educational resources made available through school district houses. He believed that the role of school district houses is “exaggerated”.

“I attended quite ordinary schools since I was young, yet was still enrolled by a top university. I have never thought of it as a difficult issue... Primary schools in Beijing are much better than my primary school... Talent is much more important, and the role of a house is exaggerated.” (M8, July 23, 2017)

Second, based on personal predictions, there is a lack of consensus on the importance of institutionalized cultural capital to the acquiring of social and economic status. Generally, interviewees choosing school district houses believe that institutionalized cultural capital, namely the certification of a quality education, is becoming more important for the acquiring of social and economic status. The interview with F3, who works in a state-holding enterprise, is more typical. With a prognosis of “A rising tide lifts all boats” in terms of recruitment standards, she stressed that education degrees and university grades will lead to a great difference in “income” and “career prospects,” namely the ever-increasing importance of educational certifications to acquiring social and economic status and capital accumulation.

“(In terms of recruitment standards), a rising tide lifts all boats. Education background is more and more important. Previously my institution recruited graduates with an undergraduate degree. Now, for the common workers, the minimum requirements are a graduate degree. There are also overseas returnees with PhDs and postdoctoral studies who apply for the posts. Plus, my institution only recruits those who graduated from top universities.” (F3, June 3, 2017)

On the contrary, interviewees choosing non-school district houses believed that the importance of institutionalized cultural capital is on the decline. For instance, from the perspective of starting a business, F6 judged that social demands are not equal to degree requirements, “now society no longer blindly values degrees”, and “what the society really needs” is hard work and working experience.

“When I started a business, I found that I cared more for ability. Society is a real school and

does not blindly value degrees... Unlike the case in the past, when a degree from a good university would ensure a good job, now experience matters more and more... After struggling in the society for years, I now know what is truly needed” (F6, July 1, 2017).

Conclusion and Suggestions

As exploratory research, this study compares and analyzes the motivations for purchasing or not purchasing school district houses and the factors affecting motivation formation, and finds that, first, the motivations for purchasing school district houses are not limited to what the domestic literature stresses, namely an increase in economic capital, but show a diversified trend of pursuing different forms of increasing cultural capital and social capital. In contrast, the motivations for not purchasing school district houses are more towards the increase of economic capital and materialized cultural capital. Second, the relationship between the process for purchasing school district houses, or not, and class reproduction has exceeded the previous linear connection of using economic capital to compete for quality educational resources, and challenged the western theoretical framework with its internal cultural capital exchange as the core, showing a more comprehensive and complex purchasing process in the Chinese context. Third, factors affecting the purchasing of school district houses are different from the horizontal neighborhood stock of social capital based on western experience, and more of a dynamic vertical understanding and judging of the prospects for acquiring an excellent education.

Theoretically, the neighborhood-based cultural capital theory can explain the motivations, processes and determinants of school district houses purchasing to some degree, yet in China, the path of neighborhood choice and hierarchical reproduction, including school district houses and non-school district houses, is more diverse, dynamic, and complex. This means that on the macro level the relationship between house choice and class in China has not been shown to be a solidified congruent relationship like that in the West, and is still in a fuzzy state (Nie & Fang, 2017, pp. 64-70); on the micro level, individuals with economic resources have more possibilities and a greater initiative to pursue greater accumulation of family capital and class reproduction through housing choice.

In practice, this research offers the following policy suggestions for resolving the mania for school district houses and realizing educational equity and balanced development. In the short term, attention should be paid to equity at the starting points, the spatial monopoly of school district houses over quality educational resources should be removed, and a spatial balance should be pursued through means like famous schools running branch schools, strengthening the construction of poor schools and the flow of teachers. In the medium term, process equity should be given attention to. From the perspective of capital, efforts should be made to check the inequality of economic capital on housing purchases. Continued efforts should be made to expand the middle-income group and narrow the income gap between groups, and policies like “Tenants enjoy the same rights as home buyers”, “encouraging both housing purchasing and renting” and “one school being allocated into different districts” should be pursued to allow families lacking in economic capital to have access to

quality educational resources, and prevent houses from becoming the passage and amplifier leading to unequal transmission of various kinds of family capital. Tradition should be valued to consider the construction of neighborhood social capital, so that families can benefit more from original communities with close links, high degrees of trust, and harmony and mutual assistance, thus avoiding the perceived need to leave their original communities to purchase school district houses. In the long term, more attention should be paid to fairness of outcomes and expanding the channels of upward mobility. Stress should be put on the results of acquiring an education. From the perspective of employers, efforts should be made to gradually change China's higher education and talent assessment institutions and break the practice of degree-centered recruitment. From the perspective of individuals, more attention should be paid to the enhancement of capacity rather than focusing only on degrees to achieve educational and career planning oriented towards social demands.

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Lifestyle and Time Use: The Impact of Retirement on Health

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Abstract: Based on the data from the China Health and Retirement Longitudinal Study (CHARLS) in 2011 and 2013, this paper studied the impact of retirement on male and female workers' health and its impact mechanism under the mandatory retirement age system in China by using Fuzzy Regression Discontinuity Design (FRDD). The results indicated that retirement increased the probability of men assessing themselves as "healthy" by 25 percentage points and lowered the probability of suffering from chronic diseases for women by 26 percentage points. In terms of mechanism analysis, it was found that the remarkable increase in social interactions after retirement was the main reason for the improvement of health for male retirees, but not the reason for the lower probability of having chronic diseases for female retirees. The findings serve as important references for formulating policies regarding postponing retirement age and flexible retirement.

Keywords: retirement, health, mechanism, lifestyle and time use, Fuzzy Regression Discontinuity

Introduction

To postpone the mandatory retirement age is a common measure adopted by various countries in the world in response to an aging population. According to the latest data released by the National Bureau of Statistics of China in 2018, as of the end of 2017, there were 241 million people aged 60 and above in China, accounting for 17.3% of the total population, and 150 million

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people aged 65 and above, accounting for 11.4% of the total. The UN estimates that by 2030, people aged 60 and above in China will surpass 300 million, or 21% of the total population, suggesting an aging population is an irreversible trend. The aging population poses a serious challenge for the sustainable development of China's pension insurance system; therefore, the policy of postponing the retirement age has been put on the government's agenda. As early as 2005, the then Ministry of Labor and Social Security of China conducted research on delaying the retirement age. Later in 2012, The Outline of the the 12th Five-Year Plan for Social Security again put forward the policy of flexibly delaying the age for receiving pension benefits, and in 2013, the "Decision of the Central Committee of the Communist Party of China on Some Major Issues Concerning Comprehensively Deepening the Reform" floated the idea of postponing the retirement age in progressive steps. As of today, however, an implementation program for postponing the retirement age has yet to be announced. Another factor that poses a challenge to the pension insurance system is the change in economic growth. In 2011, China's GDP growth rate entered a single-digit growth era and began to fall in 2012. The aging of the population and the slowdown in economic growth have brought many uncertainties and risks to the financial sustainability of China's pension insurance. It is imperative to delay the retirement age in order to ease the pressure on pension payments. China's current mandatory retirement ages — 60 and 50 for male and female workers, respectively; and 55 for female cadres — are much lower than those of major developed and developing countries in Organization for Economic Co-operation and Development (OECD) (Su & Li, 2014). Plus, it's incompatible with China's economic, social and demographic developments. As a result, delaying the retirement age is on the horizon. Also, delaying the retirement age will increase the labor supply and output and improve the efficient utilization of human capital; furthermore, it will shorten the time pensions need to be paid thus improving the ability to pay pensions to the ever increasing number of retired people. Because health capital is an important part of the value of human capital, the formulation of the retirement age policy should take the impact of retirement on health into account. If retirement has a negative impact on health, delaying retirement can improve the ability to pay for pensions, while reducing medical expenses and enhancing welfare of residents. Conversely, if retirement has a positive impact on health, the expected benefits of delayed retirement may be offset by the increase in medical spending (Sahlgren, 2017). When formulating the policy of delaying the retirement age, the government should weigh the costs and benefits, and adjust the health behavior and working hours of older workers by considering the impact of retirement on health. Therefore, studying the impact of retirement on health and the mechanism behind it will provide important decision-making references for the policy of delaying retirement age.

Previous studies on the impact of retirement on health failed to reach consistent conclusions. A majority of the past studies focused on both subjective and objective health indicators. Sahlgren's research found that retirement had a negative impact on subjective self-assessed health and objective health (Sahlgren, 2012). Lei Xiaoyan studied the impact of retirement on self-assessed health and found that retirement had a negative impact on men's health, but has no effect on women's (Lei,

Tan and Zhao, 2010). Some researches revealed that retirement cut off the social contact between individuals and their friends, making individuals feel “neglected” and “old” mentally and emotionally, which would harm health (Bradford, 1979). But Coe and Zamarro’s (2011) research concluded that retirement should have a significant positive impact on health, as retirement was the beginning of a healthy lifestyle, and the reduction in stress and anxiety after retirement should have a positive impact on health (Ekerdt, Bosse & Locastro, 1983, pp. 231-236).

Some scholars who studied mental health also drew different research conclusions. Lindeboom, Portrait and Van used a fixed-effects model to analyze the impact of retirement on mental health and found that retirement had no statistical impact on health (Lindeboom, Portrait & Berg, 2002, pp. 505-520). Lee and Smith (2009) came to a similar conclusion that retirement had little to do with subsequent depression. Dave, Rashad and Spasojevic et al. (2008) found that unprepared retirement had a negative impact on health; Belloni, Meschi and Pasini (2015), on the contrary, believed that retirement, as a relief, improved men’s mental health, especially for the blue-collar workers in the areas heavily hit by the economic crisis. The above-mentioned contrary conclusions are derived from different measurement methods and research samples, in addition to the varied driving mechanisms behind the health of different sample groups. The theoretical mechanisms of retirement’s impact on health is represented by Grossman, whose health capital demand model shows that the increase in leisure time after retirement reduces the opportunity cost of health investment. However, since the income of pension insurance does not depend on health level, people are seldom motivated to invest in health after retirement and the health effects of retirement rest with the comparison between the two (Grossman, 1972). More recent research has focused on the impact mechanisms from the changes in post-retirement lifestyle, as retirement has transformed people’s way of exercise, social interactions, sleep, smoking, drinking, etc. Research of Heide, Van Rijn and Robroek in Japan revealed that after retirement, older people, under the influence of peers, reduced their cigarette and alcohol consumption, and spent more time exercising and sleeping on weekdays (Heide et al., 2013, pp. 1-11). Retirees will do healthier activities because they have more leisure time (Insler, 2014). Studies in Australia showed that changes in risky lifestyles brought about by retirement promoted health transformations after retirement (Ding et al., 2016). Holdsworth et al. (2016) also studied the influencing mechanism of retirement to promote or deteriorate health, and concluded that the promotion was mainly due to lifestyle changes and the deterioration due to future health-related anxiety and fear. To analyze the impact of retirement on health and its impact mechanisms, most scholars focused their research on developed countries, and therefore the research in China was relatively limited. Following the people-oriented development concept, the reform of the retirement system should fully consider the health effects of retirement. Based on the data of the China Health and Retirement Longitudinal Study (CHARLS), this paper uses Fuzzy Regression Discontinuity Design (FRDD) to analyze the impact of China’s retirement system on the health of urban workers and its impact mechanism, enriching the research on the impact of retirement on health in China, and providing an empirical reference supporting a government policy postponing the retirement age.

Our study found that retirement increased the probability of male workers assessing themselves as “healthy” by 25% and reduced the probability of women suffering from chronic disease by 26%. In terms of impact mechanisms, retirement has significantly increased the social interaction (e.g. making friends and engaging in recreational activities in parks) probability of males by 38%, and this lifestyle change has raised the probability of men assessing themselves “healthy” by 6%, indicating that lifestyle change after retirement leads to a change in the male group’s health status; although retirement has significantly improved female’s social interaction probability, the impact of retirement on health has not changed greatly after the variable “social interaction” is controlled, so more social activities do not cause the change in women’s health status. Compared with the existing literature, our paper makes contributions in the following three aspects: First, based on the more accurate CHARLS micro-database, and using FRDD, the research alleviates the endogenous problem between retirement and health, and at the same time, conducts robustness tests from various aspects to deliver more rigorous analysis results. Second, the research is more comprehensive as it covers both subjective and objective health indicators and mental health indicators, and the mechanism research encompasses the five indicators of exercise, social interaction, sleep, smoking and drinking, enriching the research on the impact of retirement on health. Third, we revealed that the impact mechanism of retirement on health varies by gender, which means that a gender-differentiated retirement policy should be developed considering the impact of retirement on health.

This paper is structured as follows: Part 2 introduces the background and research methods of the retirement system. Part 3 describes data sources and the definition of variables. Part 4 empirically examines the impact of retirement on health and the mechanisms of action. Part 5 describes the robustness test. Part 6 lays out the conclusions and policy implications.

Background and Empirical Methods of the Retirement System

Background

As a social system, the retirement system not only closely relates to personal welfare and corporate performance, but also is of important significance for the sound operation of a nation’s macro economy and the harmony and stability of society. The system related to the retirement of enterprise employees is basically derived from the Labor Insurance Regulations of the People’s Republic of China in 1953, the Interim Measures for the Retirement of Staff of State Organs in 1955, and the Interim Provisions of the State Council on the Retirement of Workers and Staff in 1958. The three documents stipulate the retirement system for corporate employees by gender and occupation. According to the stipulations, the retirement age is 60 for male employees, and 55 for those engaged in special types of work including high-risk work such as down-hole operations, operations at high temperature and high altitude or for those engaged in work harmful to health; the retirement age is 50 for female employees, 55 for female cadres (generally engaged in management and scientific

research), and 45 for those engaged in high-risk work or work harmful to health, which is similar to that of male employees. The retirement system for employees of government, government agencies and public institutions in China, in addition to inheriting partial provisions of the Interim Measures in 1955, is also derived from the Interim Measures of the State Council on Providing for the Old, Weak, Sick and Handicapped Cadres and the Interim Measures of the State Council on the Retirement and Resignation of Workers promulgated by the State Council in 1978, and the Temporary Regulations for National Civil Servants promulgated in 1993. For civil servants, the retirement age is 60 for men and 55 for women, or 55 for men and 45 for women if eligible. For professional technical staff and management staff in public institutions, the retirement age is 60 for men and 55 for women, or 55 for men and 45 for women if they have lost their ability to work due to work-related disabilities. For logistics workers in government agencies and public institutions, the retirement age is set at 60 for men and 50 for women.

In general, for employees in Chinese enterprises, government, government agencies and public institutions, the normal retirement age is 60 for male workers and 55 for female civil servants and 50 for female workers.

Empirical Methods

The difficulty in studying the impact of retirement on health is to solve the endogenous problem, as the deviations may be caused by omission of variables, some of which (personal preference, health endowment, etc.) are unobservable. At the same time, there is a two-way cause and effect relationship between retirement and health, and studies have shown that the health level and unobservable health impact seriously affect retirement behaviors (Mcgarry, 2004). Traditional ordinary least squares (OLS) and panel data methods have difficulty overcoming the above endogenous problems, leading to biased research results. By controlling the age effect, marital status, and educational background, we have mitigated the deviations caused by the omission of variables due to individual heterogeneity, and by using the Regression Discontinuity Design (RDD), we alleviated the endogenous problem caused by two-way causal relationships. In RDD, like a local random experiment, all variables are similarly distributed below or above the cutoff point. RDD allows a discontinuous change in the probability and expected value of the treatment status given a certain covariate (Lee & Lemieux, 2010). This was necessary under the premise that the impact of age on health varies below or above the cutoff point. Furthermore, considering the mandatory nature of the retirement system and the relative regularity of normal retirement age for both men and women in China, which was consistent with the assumptions of the RDD, we adopted RDD for our analysis.

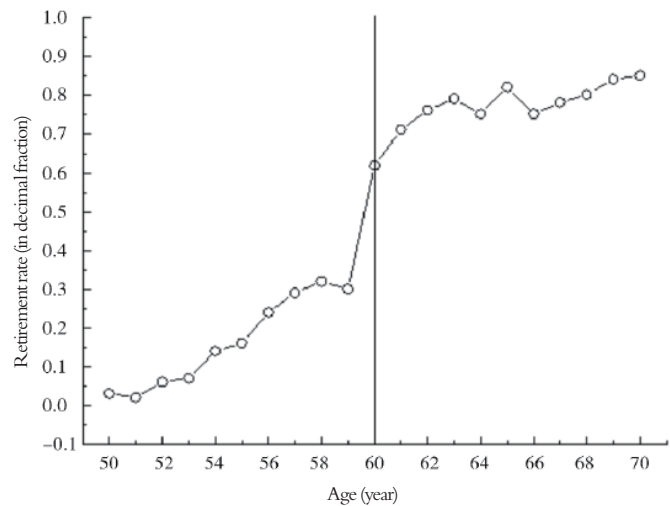
RDD was first used in 1960, but only heeded by economists until 1990 when Hahn and Klaauw provided the econometric theoretical basis for RDD (Hahn & Klaauw, 2001). RDD includes Sharp Regression Discontinuity (SRD) and Fuzzy Regression Discontinuity Design (FRDD). In the former, the probability that an individual is treated at a cutoff point completely jumps from 0 to 1. In the latter, the possibility that a treatment variable is treated only experiences a probabilistic jump. Although

the current retirement system in China stipulates that the mandatory retirement age is 60 for men and 50 for women (55 for female cadres), some workers would retire early out of health issues or some highly educated or high-tech staff would not retire at the statutory retirement age. As a result, the retirement rate of retirees at the cutoff point for retirement age does not jump from 0 to 1 in the strict sense, as shown in Figure 1 and Figure 2, in which the vertical axis indicates the ratio of male (or female) retirees at the corresponding age point to the total number of people of the same age.

According to Figure 1, there is a big jump in the retirement rate of male employees (including those in enterprises, government agencies and public institutions) in China's urban areas, from 30% at the age of 59 to 60% at the age of 60, rather than a complete jump from 0 to 1. In Figure 2, the retirement rate of female employees also jumps^①, to a certain extent, from 10% at the age of 49 to 50% at the age of 50, with the probability of jumping less than 1. It indicates that the impact of the retirement system in China on retirement behavior satisfies the assumptions of the RDD, and furthermore, that the particularity of the retirement behavior of urban employees in China meets the requirements of the FRDD.

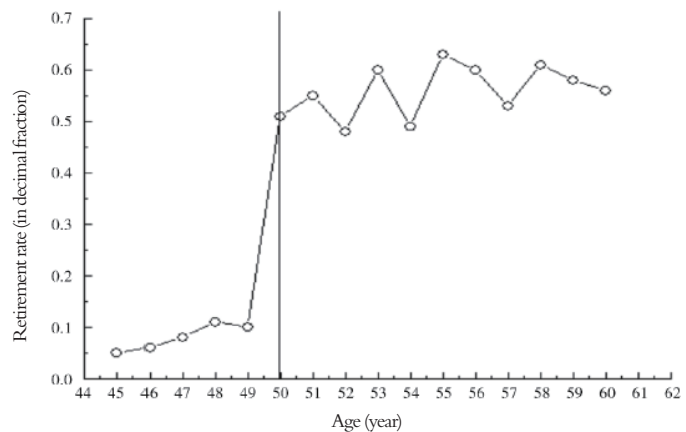
One of the approaches to FRDD is the instrumental variable method. We defined the variables as follows: $T_i = 1 (x_i \geq c_g)$ (c_g stands for cutoff point value, x_i stands for age). T_i is obviously related to D_i (individual retirement behavior), satisfying the correlation of instrumental variables. Meanwhile,

Figure 1. Retirement and Age of Men



Source: Calculated by the authors based on the CHARLS database, the same below.

Figure 2. Retirement and Age of Women



① In Figure 2, the female samples do not have a jump point at the age of 55, since the number of individuals who are cadres in the female samples is small. For this matter, this paper excludes the impact of retirement on health of women who should retire at the age of 55.

$T_i = 1 (x_i \geq c_g)$ is equivalent to a local random experiment around the cutoff point, so it only affects the explained variable Y_i (health) through D_i and satisfies the exogeneity. Therefore, it can be used as an effective instrumental variable of D_i and the Two-Stage Least Squares (2SLS) method can be adopted for regression analysis. For the purpose of this study, as the retirement system is exogenous for an individual, we attempted to use the retirement system as an instrumental variable to identify the impact of retirement on health and study its impact mechanism. Identifying whether an individual reaches the mandatory retirement age is a method of quantifying the retirement system, therefore, we used the fact “whether an individual reaches the mandatory retirement age” as an instrumental variable to replace the “retirement system”. However, age itself has a certain impact on health. As age increases, health status deteriorates. In this sense, we needed to control the influence of age on health when conducting regression analysis, and also, drawing on the thinking of instrumental variables, to divide the people around the mandatory retirement age into a control group and a treatment group. In this way, we could borrow the idea of random experiment to test the impact of retirement on health. We set the model as follows:

$$Y_i = \alpha + \sigma D_i + \gamma^1 (x_i - c_g) + \gamma^2 T_i (x_i - c_g) + K_i + \mu_i \quad (1)$$

$$D_i = \beta + \theta_1 T_i + \theta_2 (x_i - c_g) + \theta_3 T_i (x_i - c_g) + K_i + \varepsilon_i \quad (2)$$

In the model, equation (1) is the second-stage formula, and equation (2) is the first-stage formula. Y_i represents health and mechanism variable; D_i refers to individual retirement behavior; x_i means the actual age of an individual; c_g represents the mandatory retirement age under the system, i.e., 60 for men and 50 for women; T_i is an instrumental variable (i.e. binary variable: $T_i = 1$ when $x_i \geq c_g$; $T_i = 0$ when $x_i < c_g$), i.e. the fact that “whether an individual reaches the mandatory retirement age,” K_i is a control variable, including marital status and educational background; μ_i and ε_i are the disturbance terms; α and β are both constant terms; $(x_i - c_g)$ means the normalization of x_i to make it 0 at the cutoff point^①; $T_i (x_i - c_g)$ means the control of the age effect below and above the cutoff point to allow the separate regression of data on both sides of the cutoff point for calculation of the difference between the intercepts on both sides, which avoids regression bias caused by the same slope on both sides. In the model, σ in equation (1) is the core parameter of interest in this paper.

Data and Variables

Data Source

We used the cross-section data from the national baseline data of the China Health and Retirement Longitudinal Study (CHARLS) in 2011 and 2013 for empirical research. CHARLS is currently the only large-scale household survey database that collects nationally representative samples of middle-

① If no normalization is performed here, though the difference between the intercepts of the regression lines on both sides of the cutoff point is measured, it is not equal to the jump distance of the two regression lines at the cutoff point.

aged and elderly people in China. It contains micro-data for households and individuals aged 45 and over in 23 provinces and 5 autonomous regions in China. Adopting a multi-stage sampling method, the CHARLS questionnaire includes personal basic information, health status and function, occupation, retirement, pension and other modules. A nationwide baseline survey started in 2009, followed by a follow-up survey of baseline survey data every two years.

According to China's retirement system, only those who live in cities or have an urban *hukou* (an official document issued by the Chinese government, certifying that the holder is a legal resident of a particular area) can enjoy retirement benefits. Based on this, we chose people who lived in urban communities and had a non-agricultural *hukou* when they were surveyed as our sample data; and because the system differs in terms of males and females, we analyzed the male and female sample groups separately. In addition, in order to reduce the impact of age on health, male samples aged 50-70 and female samples aged 45-60 were chosen.^①

Definitions of Variables

For the purpose of this research, retirement is the independent variable, while health, exercise, social interactions, sleep, smoking, drinking and other mechanism variables are the dependent variables. The variables and descriptions are shown in Table 1.

Table 1. Variables and Descriptions

Type of variable	Symbol of variable	Meaning of variable	Definition of variable
Explanatory variable	D_i	Retirement	"Have you retired?" "Yes" = 1; "No" = 0.
Explained variable	SAH	Self-assessed health	"How do you feel about your health?" "Very Good", "Good" or "Fair" = 1; "Poor" = 0.
	$no\ chronic\ disease$	Objective health	"Having none of the 14 chronic diseases" = 1; otherwise = 0.
	$CES-D$	Mental health	The total score of less than 10 = 1; otherwise = 0.
Mechanism variable	$exercise$	Exercise	"Do you exercise?" "Yes" = 1; "No" = 0.
	$social$	Social interaction	"Have you engaged in the 11 social activities in the questionnaire in a month?" One or more social activities = 1; no activities = 0.
	$sleep2$	Sleep	7-8 h sleep time = 1; otherwise = 0.
	$smoke$	Smoking	"Are you a smoker?" "No" = 1; "Yes" = 0.
	$drink$	Drinking	"Have you drunk alcohol in the recent year?" "No" = 1; "Yes" = 0.
Control variable	age	Age	—
	$marriage$	Marital status	"Married (including cohabitation)" = 1; other status = 0.
	$education$	Educational background	"Junior high school diploma or above" = 1; other level = 0.

① The validity of the regression results can be improved when the bandwidths are the same below and above the cutoff point. But since the CHARLS database sample group consists of people aged 45 and above, the female samples aged 45-60 were chosen here.

Retirement.

Retirement means that individuals voluntarily or involuntarily exit the labor market. In this paper, retirement is treated as a binary variable. According to the survey, if the respondent answers “Yes”^①, a value of “1” is assigned; otherwise, “0” assigned.

Health.

In terms of health, this paper examines three aspects, namely, self-assessed health, objective health and mental health. Self-assessed health (SAH) is favored in the relevant research literature because it represents a comprehensive level of individual health. At the same time, we chose the objective health indicator “chronic diseases” to measure an individual’s health status. A total of 14 chronic diseases are considered, including hypertension, diabetes and heart disease. In addition, compared with the health indicators, mental health status is more sensitive to environmental changes (Coe & Zamarro, 2011). Therefore, we adopted the Center for Epidemiological Studies Depression Scale (CES-D) score to measure an individual’s mental health. CES-D is mainly used for screening subjects with depressive symptoms. If the total score is ≥ 10 , the individual is considered to be depressed. The validity and reliability of this standard to measure mental health indicators has been proven (Andresen, Malmgren, Carter & Patrick, 1994, pp. 77-84). In terms of mechanism, Grossman (1972) pointed out in his model of demand for health capital that health was a function of medical services, lifestyle, etc.; Insler (2014), through studying smoking and exercise, found that retirement may affect health through these channels; in addition, Ding et al. (2016) also concluded that retirement led to changes in lifestyles such as physical activity, diet, and sleep. Since the CHARLS database provides a wealth of lifestyle-related variables, this paper, from the perspective of health-related lifestyles, explored the impact mechanism of retirement on health by using exercise, social interactions, sleep, smoking, drinking and other lifestyles and time use as mechanism variables for analysis. In terms of control variables, we controlled marital status, educational background and age.

Table 2 gives a statistical description of the samples. From the t-test value, it can be seen that for men and women, in the health indicators such as self-assessed health, chronic diseases and mental health and mechanism indicators including exercise, social interaction and sleep, both the employee group and the retiree group show significant differences. The reason for the results may be the impact of “retirement”, or the impact of age and other factors on the indicators.

Table 2. Descriptive statistics of samples

Variable	Men					Women				
	Employee sample		Retiree sample		t-test	Employee sample		Retiree sample		t-test
	Mean value	Sample size	Mean value	Sample size		Mean value	Sample size	Mean value	Sample size	

1. Health

① Some people will be rehired after retirement. Usually high-tech or highly-educated staff will have the opportunity to return to the workplace, and the general staff will retire after the retirement procedures have been gone through. (Lei, 2010)

Variable	Men					Women				
	Employee sample		Retiree sample		t-test	Employee sample		Retiree sample		t-test
	Mean value	Sample size	Mean value	Sample size		Mean value	Sample size	Mean value	Sample size	
<i>sah</i>	0.57 (0.50)	855	0.54 (0.50)	823	0.38	0.58 (0.02)	905	0.52 (0.02)	556	2.15
<i>no chronic disease</i>	0.37 (0.48)	778	0.26 (0.44)	774	4.69	0.40 (0.02)	846	0.31 (0.02)	517	3.61
<i>CES-D</i>	0.78 (0.02)	763	0.82 (0.01)	702	2.09	0.72 (0.02)	847	0.75 (0.02)	503	1.08

1. Lifestyle and time use

<i>exercise</i>	0.89 (0.31)	297	0.90 (0.29)	336	1.87	0.88 (0.02)	379	0.90 (0.02)	220	0.43
<i>social</i>	0.65 (0.48)	758	0.69 (0.46)	776	0.03	0.58 (0.02)	858	0.72 (0.02)	521	- 5.26
<i>sleep1</i>	0.54 (0.50)	854	0.54 (0.50)	823	0.46	0.49 (0.02)	897	0.57 (0.02)	556	- 2.84
<i>sleep2</i>	0.40(0.50)	854	0.40 (0.49)	823	0.74	0.44 (0.02)	897	0.40 (0.02)	556	1.54
<i>sleep3</i>	0.06(0.23)	854	0.06 (0.23)	823	1.80	0.06 (0.01)	897	0.01 (0.17)	556	2.94
<i>smoke</i>	0.24 (0.43)	583	0.35 (0.48)	553	3.76	0.35 (0.07)	43	0.00 (0.09)	25	0.93
<i>drink</i>	0.37 (0.48)	854	0.47 (0.50)	824	2.28	0.86 (0.01)	904	0.87 (0.01)	555	0.81

2. Control variable

<i>age</i>	54.95 (2.86)	855	64.45 (3.04)	823	28.98	50.69 (0.16)	906	54.88 (0.15)	556	-18.10
<i>marriage</i>	0.95 (0.23)	855	0.93 (0.25)	823	- 2.74	0.91 (0.01)	906	0.90 (0.01)	556	1.05
<i>education</i>	0.78 (0.42)	855	0.60 (0.50)	823	0.02	0.61 (0.02)	906	0.82 (0.02)	556	8.50

Source: Compiled by the authors based on the CHARLS database.

Note: (1) The data in parentheses is the robust standard error. Unless otherwise stated, it has the same meaning hereinafter; (2) For men, “employee sample” and “retiree sample” refer to the sample aged 50-59 and the sample aged 60-70, respectively; for women, “employee sample” and “retiree sample” refer to the sample aged 45-49 and the sample aged 50-60, respectively; (3) sleep1, sleep2, and sleep3 represent normal sleep time of 0-7 (excl.) hours, 7-8 hours and over 8 (excl.) hours at night, respectively.

Analysis of Regression Results

The Impact of Retirement on Health

The regression results concerning the impact of retirement on health are illustrated in Table 3. The data shows that in the first stage of regression, F values are greater than 10, so we can assume the instrumental variable is not a weak one and, as an indicator of “discontinuity of retirement status”, it is very significant. The retirement rate of men aged over 60 increased by about 31% compared with those aged below 59; the retirement rate of women aged over 50 increased by about 43% compared with those aged below 50^①.

The second-stage regression results show that for men, retirement had a significant positive effect on self-assessed health (SAH), and the probability of men assessing themselves as healthy after retirement grew by 25%. This result is consistent with the findings of Deng Tinghe’s research, which concluded that retirement,

① Due to limited space, the results of the first stage regression are omitted here.

at 10% significance level, raised the probability of the elderly men assessing themselves as healthy by 25.9 percentage points (Deng & He, 2016); however, retirement had no significant effect on men's chronic diseases and mental health. On the female side, retirement significantly reduced the likelihood of women getting chronic diseases, lowering the probability of chronic diseases by 26%, yet the impact coefficient of retirement on other health indicators of women was not significant. The above conclusions may be derived from the role effect which matters greatly. In the role assignment of Chinese family members, men have always been responsible for supporting a family. In order to obtain a higher income, men need to bear more pressure from the workplace and work longer hours than women, so the changes toward a healthy lifestyle after retiring, including doing housework and exercise, adjusting sleep time and improving sleep quality, and conducting social activities such as playing chess and cards, interacting with friends, and participating in volunteer and charities activities, will greatly improve men's self-assessment on health. On the other side, women generally bear heavy domestic work, as well as great work pressure, and they spend less time on social life and exercise. After retirement, women are freed from work stress with more free time, so their objective health indicators are improved to a certain extent, leading to a lower probability of suffering from chronic diseases. Changes in lifestyle and time use have a positive impact on health. The specific mechanism of retirement's impact on health will be further explored later.

Table 3. The regression results concerning the impact of retirement on health

Variable	<i>sah</i>	<i>No chronic disease</i>	<i>CES-D</i>
Men:			
Retirement	0.25* (0.15)	- 0.18 (0.16)	- 0.03 (0.13)
Age	- 0.02* (0.01)	- 0.002 (0.01)	0.00 (0.01)
Educational background	0.04 (0.04)	0.05 (0.03)	0.11*** (0.03)
Marital status	- 0.003 (0.06)	0.05 (0.05)	0.14** (0.05)
Constant term	0.40*** (0.07)	0.31*** (0.07)	0.58*** (0.07)
F value	369.32	348.70	367.26
Sample size	1678	1152	1465
Women:			
Retirement	0.18 (0.14)	0.26* (0.14)	0.15 (0.15)
Age	- 0.03* (0.02)	- 0.05*** (0.02)	- 0.01 (0.02)
Educational background	0.00 (0.06)	- 0.03 (0.06)	0.11** (0.05)
Marital status	Constant term	- 0.04 (0.05)	0.14 *** (0.04)
Constant term	0.48 *** (0.06)	0.35 *** (0.06)	0.48*** (0.06)
F value	186.34	174.66	164.90
Sample size	1461	1363	1350

Source: Calculated by the authors based on the CHARLS database, the same below, unless otherwise noted.

Note: *, ** and *** represent significance at 10%, 5% and 1% level respectively, the same below.

For control variables, as we expected, a high degree of education and being married significantly increased the probability of mental health for both men and women; in addition to causing a remarkable reduction in the probability of men and women assessing themselves as healthy, age

also led to a higher probability of women getting chronic diseases. Regarding the reasons for the corresponding results, people with a higher degree of education tend to have higher benefits or can better arrange life and time after retiring, so the indicator will have a greater role in promoting health; and being married means having a kind of companionship, exerting certain positive effect on mental health because when one spouse encounters distress in life, the other can give comfort and support.

Analysis of the Impact Mechanism of Retirement on Health

The above analyses show that retirement has a positive impact on men's self-assessed health and women suffering from chronic diseases. So, what is the impact mechanism of retirement on health? Assuming "changes in health-related lifestyles and time use after retirement" is a reason for retirement to have an impact on health, we regressed exercise, social interactions, sleep, smoking and drinking as the dependent variables of "lifestyle and time use" to verify the assumptions. Table 4 illustrates the regression results. The results show that retirement increased the social interaction probability of men by 38% and that of women by 48%. This finding is consistent with that of Holdsworth et al. (2016), that is, retirement promotes health mainly in social aspects. However, whether social interactions are the mechanism that affects health will be further analyzed.

Table 4. Regression Results Concerning the Impact of Retirement on Lifestyle and Time Use.

Variable	<i>exercise</i>	<i>social</i>	<i>sleep1</i>	<i>sleep2</i>	<i>sleep3</i>	<i>smoke</i>	<i>drink</i>
Men:							
Retirement	0.03 (0.12)	0.38** (0.17)	0.17 (0.15)	0.15 (0.15)	0.02 (0.07)	0.08 (0.19)	0.07 (0.15)
Age	0.001 (0.01)	-0.03** (0.01)	-0.01 (0.01)	0.01 (0.01)	-0.002 (0.01)	0.02 (0.01)	0.02 (0.01)
Educational background	-0.01 (0.03)	-0.02 (0.04)	0.01 (0.04)	0.01 (0.04)	-0.02 (0.02)	0.02 (0.04)	-0.03 (0.04)
Marital status	0.10 (0.07)	-0.12** (0.05)	-0.10* (0.05)	0.08 (0.05)	0.02 (0.02)	0.09 (0.06)	-0.03 (0.05)
Constant term	0.80*** (0.07)	0.56*** (0.08)	0.55*** (0.07)	0.4*** (0.07)	0.05 (0.03)	0.25** (0.09)	0.53*** (0.07)
F value	143.64	364.72	370.48	370.48	370.48	212.68	369.17
Sample size	633	1534	1677	1677	1677	1136	1678
Women:							
Retirement	0.05 (0.12)	0.48*** (0.14)	-0.18 (0.15)	0.11 (0.14)	0.07 (0.06)	3.96 (5.33)	0.03 (0.11)
Age	-0.03*** (0.01)	-0.03** (0.02)	0.03* (0.02)	-0.02 (0.02)	-0.01* (0.01)	0.20 (0.33)	-0.01 (0.01)
Educational background	0.01 (0.05)	0.01 (0.06)	0.06 (0.06)	-0.03 (0.06)	-0.04 (0.03)	1.79 (2.44)	-0.05 (0.04)
Marital status	0.05 (0.05)	0.06 (0.05)	0.05 (0.04)	0.03 (0.04)	0.01 (0.02)	0.68 (1.23)	0.06 (0.03)
Constant term	0.76*** (0.07)	0.42*** (0.06)	0.58*** (0.06)	0.38*** (0.06)	0.04* (0.03)	0.71 (1.02)	0.79*** (0.04)
F value	68.72	175.29	185.70	185.7	185.7	10.69	186.13
Sample size	599	1379	1453	1453	1453	68	1459

Based on the above analysis, we found that retirement significantly increased the probability of social interactions for both men and women. Then, does retirement affect health through social

interactions? According to Eibich's approach, if retirement affects health through social interactions, then the impact of retirement on health will be reduced after the variable of social interaction is controlled, that is, the regression coefficient of retirement to health will no longer be significant or the absolute value will decrease (Eibich, 2015). On this basis, this paper controlled the variable of social interactions to identify changes in the impact of retirement on health, to further verify that "change in social interaction probability after retirement" was indeed a way for retirement to affect health. Table 5 illustrates the regression results. The results showed that after adding the control variable "social interaction", the coefficient of influence of retirement on men's self-assessed health was no longer significant. At the same time, social interaction boosted the probability of men assessing themselves as healthy by 6% at 5% significance level. Therefore, we concluded that the impact of retirement on men's self-assessed health is indeed caused by the higher social interaction probability after retirement; for women, on the contrary, the significance of the impact of retirement on health did not change after the variable of social interaction was controlled, so the change in the probability of chronic diseases cannot be explained by the change in social life of women.

Table 5. Regression Result Concerning the Impact of Retirement on Health after Controlling the Variable of Social Interaction

Variable	SAH (Men)		Chronic disease (Women)	
	1	2	1	2
Retirement	0.25* (0.15)	0.23 (0.16)	0.26* (0.14)	0.29* (0.15)
Social interaction	-	0.06** (0.03)	-	-0.09** (0.03)
F value	-	310.01	-	143.21
Sample size	-	1533	-	1293

Note: The first column and the second column in the table indicate the regression results without and with the control variable of "social interaction," respectively.

Robustness Test

The previous analysis shows the impact of retirement on the health of urban male and female groups and its impact mechanism. To verify the reliability of the results, we conducted a robustness test.

The validity of the RDD depends on two assumptions. First, control variables other than age should change continuously with age. If the control variable jumps at the cutoff value, then the treatment effect of the cutoff point on dependent variables may be caused by other reasons. Therefore, we first tested the continuity of the control variable at the cutoff point of retirement. During the test, educational background and marital status were regressed as the dependent variables in the same measurement method as before. The results showed that retirement, for both men and women, has no significant effect on the two control variables—educational background and marital status, and thus the changes of the control variables with age are continuous^①.

① Due to limited space, the regression results of the robustness test are not listed. The interested readers can request them from the authors.

Second, the grouping variable, i.e. age, is continuous. Because CHARLS uses questionnaires to identify the impact of retirement on health, respondents may lie about their age in order to get pension benefits or continue to work when answering the questionnaires. If the age is optional, this will have an impact on the research. For this reason, the continuity of the grouping variable (age) density function was tested by gender, as shown in Figure 3 and Figure 4.

In Figure 3 and Figure 4, the horizontal axis represents the age, and the vertical axis represents the ratio of the number of individuals to the total number of the sample (by gender) at the corresponding age. According to the graphs, the age density function of the male sample did not jump to a large extent at the retirement age of 60 under the current system, and the age density function was continuous and smooth; the age density function of the female sample was also relatively continuous and smooth at the retirement age of 50 under the current system. The above results also intuitively showed that the research methods we adopted are valid.

Next, we changed the bandwidth to test the validity of the previous regression results. The choice of bandwidth is critical in the use of RDD, and the size of bandwidth affects the stability and accuracy of the regression results. Therefore, this paper limited the age of the male samples to 55-65 years old and that of the female samples to 45-55 years old, to further test the regression results. After narrowing the bandwidth of the samples, the regression results were still significant, proving that the analysis results of the impact of retirement on health and its mechanism in the previous chapters were robust.

Finally, this paper used other values as cutoff points to identify whether a variable has a jump. If there is a jump at other cutoff values, then the assumption that “the jumps of health, life behavior, and time use at the cutoff value are caused by the retirement system” is no longer true, indicating that there are other factors that have contributed to the impact of retirement on health and health behavior. During

Figure 3. Age Density Function of the Male Sample (Aged 50–60)

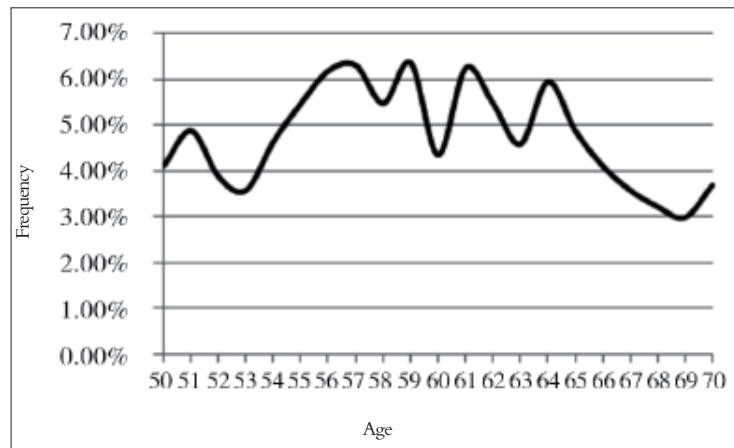
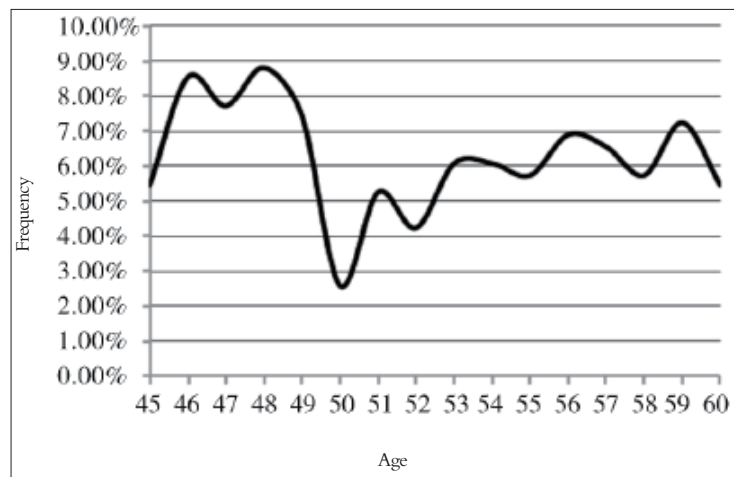


Figure 4. Age Density Function of the Female Sample (Aged 45–60)



the test, one year before and one year after the normal retirement age under the system was selected as the assumed cutoff points. Specifically, the ages of 59 and 61 were chosen as the assumed cutoff values for men, and the ages of 49 and 51 for women. The regression method adopted was the same as before.

The results showed that in terms of health, for the male group, at the ages of 59 and 61, the impact of retirement on self-assessed health was still positive, but no longer significant, and the impact of retirement on other health indicators was not significant either; for the female group, at the ages of 49 and 51, the measurement of the impact of retirement on chronic diseases falls from a significance level of 10% to a “no longer significant” level, and similar to men, other measurements of the impact of retirement on health are not significant either. The above results revealed that although points very similar to the retirement age under the system were chosen, they greatly changed the regression results, which proved that the regression results are reliable.

As for the impact mechanism, for the male group, at the ages of 59 and 61, the regression coefficient of retirement to social interaction is no longer significant. The regression coefficients of other lifestyle and time use variables are still not significant except for sleep time (sleep3), which, however, is excluded here because retirement behavior does not affect it; for the female group, at the ages of 49 and 51, the impact of retirement on social interaction is still significant, indicating retirement is not the only reason for the change in social interaction probability after retirement, which further confirms that social interaction has little to do with the impact of retirement on women's health. In summary, for the male group, the change in social interaction probability after retirement indeed leads to the change in men's health.

Conclusions and Policy Implications

The impact of retirement on health is a factor that must be considered by the government when formulating retirement policies. This paper used CHARLS micro survey data to identify the impact of Chinese urban workers' retirement on their health and its impact mechanisms. Our research found that retirement significantly improved the self-assessed health of men and significantly reduced the probability of suffering from chronic diseases for women, but the impact on other health indicators for both men and women were not significant. A significant increase in social interaction probability after retirement is the reason for the improvement in men's health but has little to do with women's changes in their health after retirement. Based on these findings, we believe that in the process of formulating policies postponing the retirement age, the government should attempt to avoid the possible negative impact of postponed retirement on health, and explore the possibility of a flexible policy to mitigate the adverse effects of postponed retirement on health by shortening the working hours of older workers or providing part-time work to allow more time for them to engage in social activities.

The research in this paper still has certain limitations. First, retirement from different occupations will have different impacts on health. However, this database has not been carefully divided into related occupations, which makes the research relatively incomplete. Second, due to the sample size

limitation caused by the response rate, we did not consider the impact of time and other heterogeneous factors on the regression results, and failed to conclude the impact mechanism of retirement on women's health. These limitations have yet to be overcome in future research.

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