

# BIG DATA, PLATFORM ECONOMY AND MARKET COMPETITION

## A Preliminary Construction of Plan-Oriented Market Economy System in the Information Era

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**Abstract:** Whether the planned economy, as one of the two main economic systems, can be reconstructed in the era of big data is an extremely important proposition in theory and reality. With the great debate on the feasibility of the planned economy in the 1930s, Lange model of centralized planning and market simulation came into being. After the information revolution in 1970s, the thought of planned economy characterized by market democracy and model of “democratic planned participatory socialism” rose in the west and the plan-oriented market economy system is expected to build in the era of big data. This kind of economy system should coordinate centralized planning and democratic planning, take big data as technical condition, platform economy as institutional and organizational conditions, to forming the big data-based and state-owned enterprises leading operated Internet platform economy in the field of competition, which can achieve to “make the market play a decisive role in the allocation of resources and the state play the leading role,” and achieve the comprehensive goals of reflecting consumer preferences, playing a role of law of value, highlighting the guidance of industrial planning, strengthening macro-control and reducing the cost of bureaucracy.

**Key words:** big data; platform economy; plan-oriented market economy system; centralized planning; democratic planning

## 1. Introduction

Can the planned economy come back in the big data era? The concept of big data came forward clearly in 2012, provoking centurial debate on the feasibility of the planned economy. As one of the two main present economic systems, the planned economy with its intensive allocation of resources and institutional advantages of proportional production can be realized by big data in theory. Since Oskar Ryszard Lange proposed the trial and error procedure through computer technology to simulate market in the middle of the 20th century, it is most possible to realize the plan economy through the new technology at present. However, is it possible to rebuild planned economy with big data technology? Obviously the economic operation is different from the weather changes. If it depends on massive data analysis, mining and forecasting only, it will ignore human subjectivity and the complexity of social law. After all, the real economic system is always formed in a certain social system environment and operated depending on some form of social economic organizations; thus, it presents various forms of realizations. Without the institutional and organizational innovation, big data technology will only get progress in the amount with no qualitative difference compared with computer technology in mid-20th century.<sup>1</sup> The planned economy in big data times still cannot respond to the doubt of “computer Utopia” (Loebl 1971).

Based on reviewing the thought of planned economy, this article analyzes the two basic conditions of constructing the plan-oriented market economy system and puts forward preliminary scheme in the information era.

## 2. From Lange Model to Plan-Oriented Market Economy System

The debates on the feasibility of planned economy began in the 1920s, one of which was economic computing problems associated with price formation. In 1920, Ludwig von Mises, representative man of the Austria school, liberal economist, raised questions first. He put forward that in the market transaction, the market price is the basis for the accurate economic calculation of various commodities and labor employment; with the free market abolished in the socialist countries, the pricing mechanism will no longer exist; without the pricing mechanism, the supply and demand of the products cannot be calculated, and it is impossible to implement the rational allocation of resources and products (Mises 1990, 25). In response to Mises’s questioning, American economist Fred M. Taylor proposed a theoretical scheme of economic calculation under the socialist system in 1928. On

the demand side, when the socialist countries ensure that individuals receive certain monetary income which can purchase goods freely produced in the country, it is equivalent to authorize residents to “currency vote” to guide the type and quantity of goods produced by the state. On the supply side, the cost of the economic factors that constitutes the selling price of goods can be calculated by the “trial and error” method, That is to say, “if overvalued, the elements excess will exist; if undervalued, the elements shortage will exist,” then the reasonable price will be determined by checking repeatedly (Taylor 1929). With Taylor’s theory, by the mid-1930s, the focus of the debate on the feasibility of planned economy turned into practical feasibility from theory feasibility, and the group of Mises retreated to second. One of Mises’ students, Austrian liberal economist, Friedrich August von Hayek inherited the basic idea of Mises. He believed that the reasonable allocation of resources in planned economy only works logically, but it is not feasible under the socialist economic system of public ownership of means of production. The British liberal economist, Lionel Robbins denied directly the feasibility of “trial and error” method from operational level. He pointed out that this method requires collection of millions of data, the solution of millions of equations and millions of calculations. The dynamic change of information will cause the economic calculation to fall into constant recalculation and tend to collapse (Lange 1936, 56). Hayek and Robbins’s opinion essentially repudiated that socialist economy has the function of allocation of resources only by trial and error method like market (Lange 1936, 56). The Polish economist Oskar Ryszard Lange made a systematic and effective response to that. He criticized that Mises misused special price to negate the feasibility of the planned economy and reviewed how to achieve a balanced subjective and objective conditions and establish economic equilibrium by trial and error method in competitive market; thus, he believed the similar balance can be achieved in socialist economy. In the theoretical arguments, Lange put Taylor’s “trial and error” method into the operation of the socialist economy, building the socialist economic model simulated market, namely “Lange model.” The model assumed a socialist system in which the consumer goods market and the labor service market exist. If the subjective equilibrium conditions of the consumer goods market are the same as those in the competitive market, and production decisions are made in accordance with the rules prescribed by Central Planning Board, so the fixed price is the premise of achieving the subjective balanced conditions in a socialist economy. In a competitive market, the price is an objective result formed through competitions. How does the objective price structure form in the socialist economy? Lange method is that

the Central Planning Board has to fix prices and see to it that all managers of plants, industries, and resources do their accounting on the basis of the prices

fixed by the Central Planning Board, and not tolerate any use of other accounting. (Lange 1936, 63)

The core of Lange model is Central Planning Board and a set of systems operating around it. “The Central Planning Board performs the functions of the market,” whose basic function is regulating the rules and price, which make it possible that planning replaces the market’s function.<sup>2</sup>

After the great debates in the 1930s, the information technology represented by the mainframe arose in the 1940s, which accelerate the process of data processing automation. Lange realized the great potential of information technology in economic management and pointed out that the computer technology is very suitable for making plans but it cannot replace the complex market. The electronic computer and the market are two accounting tools for contemporary socialist economic managers (Lange 1967, 158–61). It should be said that the development of information technology is only ushered in its first ray of light in the era of Lange. After 1970s, large-scale commercial applications of mini-computers and microprocessors expedited the technological revolution for information revolution as the core. The technological revolution not only greatly enhanced the level of automation, economic efficiency and concentration of economic activity in the production process, but also nurtured a new element—“planned commodity production” (Botington 1973, 110) and the ideological trend of democratic plan in the Western capitalist economy. Stephen Botington, a British scholar, predicted that the possibility of monitoring the entire economy and the potential for effective dissemination of information brought about by the computer and information revolutions will inevitably lead to new regulation and control measure (Botington 1973, 116). Unlike the centralized plan of the Central Planning Agency in the “Lange Model,” Botington’s so-called “regulation and control measure” is essentially a market-based democracy program with new information technology: as the “TV Planning Economy” in his imagination, under the participation of many different individuals and groups, the issue of coordinating and planning new socio-economy is openly discussed on the two-way information flow channel system (Botington 1973, 208). After the mid-1980s, the rise of Internet technology overcame the real-time two-way interactive information interaction problem of media technology, which had a profound impact on the form of production organization and social life. Distributed, small-lot and customized production was rapidly developed, and network democracy, network consumption and other emerging things continued to spring up. In 1997, Andy Pollak, an American scholar, published the article “Self-management of Information Technology and Socialism,” argued that

1. Supercomputers have already been equipped with the parallel processing capability to comprehend millions of equations to simulate proportion relations of social production, exchange, consumption, and distribution the four links to further achieve the planning of modern socialist economic society.
2. The masses can participate in the enterprise and socio-economy management through the Internet: linking local area network (LAN) within different companies and form an inter-company network system to promote inter-company planning and computer shopping in this network system, and ultimately the whole economy planning will be realized.
3. Electronic money will be used to support the socialist economic accounting. Thus, he asserted, “An immediate transition to democracy and efficient planning using the Internet” (Pollak 1997, 33).

In addition to the technical route of combining information technology with planned economy, an important theoretical exploration in the institutional route of the democratic plan is the “DPPS” (Democratic Planned Participatory Socialism) advocated by Western Marxist scholars and other left-wing scholars. Since the mid-1980s, some socialist economic models, different from the Soviet model and obviously different from the capitalist socio-economy system (especially the capitalist market economy), have entered the theoretical horizon one after another. They have the following general characteristics: economic planning rather than market forces guides economic activity, democracy characterizes political and economic institutions, and wide participation in decision-making (Kotz 2002). Among them, the “Democratic Plan for Participatory Socialism” model is the most representative one, which was built by Pat Devine (1988), Michael Albert and Robin Hahnel (1991), Paul Cockshott and Allin Cottrell (1993). This model made a severe criticism for “Market Socialism”: Devine (1988) advocated the use of the “Negotiated Coordination” between stakeholders instead of the market; Albert and Hahnel (1991) provided theoretical model of decentralized planning process; Cockshott and Cottrell (1993) suggested replacing the money with the equally distributed Labor Tokens, and created a new “Neo-Athenian Democracy” socio-economy model. David Kotz (2000) further argued, “marketization is not a socially neutral mechanism,” “market socialism would reproduce many of the problems of capitalism, including inequality, macro-instability, and environmental destruction”, so he believed, “a democratic state and a participatory planning system represent the basis of a viable socialism” (Kotz 1998).

The concept of planned economy proposed after the popularization of the Internet is called the “new planned economy” (Tao 2009), which is relative to the traditional planned economy. The profound experience of the traditional planned economy is the Soviet model under the background of Ford Industrialism. After

the October Revolution, the Soviet Union chose the planned economy under State Socialism for the sake of the rapid industrialization of the country and the need to strengthen centralized and unified leadership (Fang 2009). This economic system burst out of great productivity and amazing growth rate in the industrial era due to the advantages of accumulation of capital and the allocation of scarce resources. Similarly, in the socialist countries of Eastern Europe and South-Eastern Europe, the characteristic planned economy also successfully drove this traditional “international depression region” to industrialization (Rosenstein-Rodan 1943). An important feature of the traditional planned economy in USSR and Eastern Europe was the widespread adoption of a centralized plan led by the bureaucracy. In the complex and volatile information age (from 1970s to 1980s), the traditional planned economy of centralized planning became rigid due to challenging circumstances such as more diversified consumer demands and fast changing commodity prices. In the case of the Soviet Union, the new productivity of the information revolution was constrained by the centralized planned economic system, which not only failed to bring about an industrial revolution, but also appeared a technical crisis: “When technological innovation accelerated in the West, during the 1970s and early 1980s, the Soviet Union increasingly relied on movements of machinery and technology transfer for its leading industrial sectors . . .” (Castells 2010, 34–35). In this regard, the American scholar Manuel Castells criticized that the core of the Soviet technical crisis was the logic of nationalism itself, one of which was the fundamental logic of the statist system (Castells 2010, 36–37). Joseph Nye also believed that a highly centralized planned economy was in conflict with informatization (Tao 2007, 60–64). On the surface, the “information explosion” in the information age makes the central planning bureau’s economic computing power struggle, but this is only a matter of technical conditions, which can be alleviated with the appearance of faster computers and networks. And then the deeper contradiction has two aspects:

1. Undemocratic nature of the Soviet-style rationing and the trend of the information age democratization. Lange explicitly indicated, “In a socialist system where freedom of choice in consumption and freedom of choice of occupation is non-existent . . . also rational economic accounting is possible, only that the accounting reflects the preferences of the bureaucrats in the Central Planning Board, instead of the consumers” (Lange 1936, 68). While Taylor earlier put forward that one of the two prerequisites for the rational allocation of resources by the socialist economy was that “insure that the peculiarities of tastes and needs characteristic of each individual would not be sacrificed to some standard of consumption set up by an all-powerful state” (Taylor 1929, 5).

2. The bureaucratization of socialist economic life and the requirements of economic governance improvement in information age. This, in Lange's view, was "the real danger of socialism," but it is as serious as the bureaucratization at the time of monopoly capitalism. On the issue of bureaucratization, Lange did not develop because of involving in the theoretical categories of sociology, and the main focus was on "the efficiency of public officials as compared with the entrepreneurial manager of production" (Lange 1937, 127). Today, the development of "Organizational Theory" provides us with the theoretical support from the core organization of central planning bureau to study bureaucratization issue.

Compared with the traditional planned economy, the Western new planned economy advocates democracy program, which seems to be more in line with the information age characteristics and trends. However, as Pollak (1997, 32–50) worries, "who will control information technology?": How can information technology rid itself of its original intention as a tool for finding new ways of squeezing surplus value, how to change the anarchy of the Internet so as not to be controlled by private capitals represented by large-scale information technology companies, and how to avoid the economic downturn and recession as information technology shortens the capital turnover time. This problem is essentially determined by the ownership of the means of production. In socialist countries in which the means of production are public, it is a viable option to dominate (rather than directly intervene) information technology and networks with state power.

To sum up, through the discussion of the Soviet-style planned economy, the Lange-style planned economy and the Western new planned economy, we try to construct a plan-oriented market economy system in the competitive field. We advocate the "market-based, plan-driven" economic system, rather than the theoretical line of "democratic planning participatory socialism." There are three basic reasons: First, the democratic plan proposed by the "democratic plan participatory socialism" needs to be run at a global level (Callinicos 2003, 90–122). However, a single state in the world market with "Laissez-faire" is just a limited individual under the context of capitalism that attempts to establish a "unified world market" and "supranational global governance" through globalization (Weiss 2000). The centralized plan based on the aggregation and representation (rather than replacement) of domestic interests of different social classes is consistent with the democratic plan of "Democratic Plan for Participatory Socialism" at the global level. Second, "A state directed strategy is the only effective way to undertake economic transition or economic development" (Kotz 2005). Every country in the globalization universally uses national activism (State Activism) to participate in global competition (Weiss 2005a), and as one of the few socialist countries, in the face of

the capitalist weakening of state power and the attempt to achieve global domination of capital (Weiss 2005b), it is also necessary to resist this trend with the reverse of state-augmenting. It is particularly necessary to adhere to the principle of state ownership rather than social ownership, with the state leading the operation and development of the national economy. Third, the “participatory socialism in a democratic plan” may be slower in innovation than in capitalism (Kotz 2002). In the “world market” value law, innovative lagging countries will fail in the competition. Regrettably, the market economy is by far the most innovative economic system. Under the reality of the capitalist system’s dominance in the world, although it is costly (Kotz 2000), in order to survive and compete with the capitalist countries, the socialist countries still have to develop market economy.

Therefore, the plan-oriented market economic system we have constructed should adhere to the organic integration of the democratic plan and the centralized plan, and achieve a high degree of unification of “making the market playing a decisive role in resource allocation and playing a leading role in the country,” which can also reflect consumers’ preference, play the part in the law of value, highlight the guidance of industrial planning, strengthen macro-control regulation, reduce bureaucratic costs and other comprehensive objectives. Its core thought originated in the important theory proposed by the famous Marxist political economist Professor Enfu Cheng. In 1992, in view of the choice of the direction of China’s economic system reform, Professor Enfu Cheng (1992) pointed out that “one of the economic characteristics of the primary stage of socialism is the organic integration and unification of the planned economy and the commodity economy,” so he proactively advocated the establishment of a planned socialist market economy system. This kind of economic system is expected to become a reality today in virtue of big data and platform economy.

### **3. Two Basic Conditions of Plan-Oriented Market Economic System**

Technological innovation and institutional innovation are the codetermination of economic system evolution. The construction of plan-oriented market economic system in the information age also needs to rely on a new generation of information technology and emerging economic form, while the big data and platform economic structure have become the two basic conditions for the development of plan-oriented market economy system under current development stage.

#### **3.1. Big Data: The Technical Conditions of Plan-Oriented Market Economic System**

The economic calculation of the planned economy requires a lot of information gathering and high-frequency information processing and the quantity and quality



of information seizing and the processing capacity of information codetermine the calculation results. With the rapid development of processor performance under the Moore's Law and the updating of super computer systems and Cloud Computing, the information processing capability has been greatly improved, while the technological progress in the field of information collection has been relatively slow. In the Internet age, any access for the sites, search engines, e-commerce, and financial services will be presented with massive data. According to the International Telecommunication Union (ITU), there had been 3.174 billion global Internet users at the end of 2015.<sup>3</sup> Hence, a huge amount of data would be generated at some time, even if a very small percentage of users above-mentioned are online simultaneously. The arrival of the Internet of Things era also means that in addition to computers, smart phones, GPS devices, industrial equipment, wearable electronic equipment, living facilities, and intelligent vehicles will become network terminals, which constitute the "material connected to material Internet." People and goods into the Internet of Things are always the users and producers of information, and then information will increase at an unprecedented rate. However, the traditional information collection technology can only use the trace information, and the vast majority of information resources are ignored, idle and waste. It is difficult to fully obtain, record, store and calculate the information, which are the very technical reasons that the traditional planned economy cannot fully reflect and accurately calculate the supply and demand of the information age.

Based on cloud computing distributed processing, distributed database, cloud storage and virtualization technology, the big data technology came into being. In 2007, American scientist Jim Gray predicted that data-intensive science was being separated from computational science to become the fourth paradigm of scientific research (Hey et al. 2009, xvii). In the same year, American scholar Duncan J. Watts in the *Nature* magazine published that the data-intensive science once applied into the field of social sciences, it could be a complete record of personal activity trajectory, generating in very rich data for refined calculation and accurate prediction (Watts 2007, 489). At the World Economic Forum in Davos in 2012, a report titled "Big Data, Big Shock" came out, formally proposing the conceptual framework of the big data economy.

How can big data become the technical condition of the plan-oriented market economy system? This is mainly dependent on the following characteristics:

1. Big data can find and use tacit knowledge. Hayek believes that fragmentation is the main form of knowledge, and there are a lot of tacit knowledge, such as local customs and consumption habits, which are unorganized and implied in social life (Hayek 1937). Accordingly, he attacks whether the highly centralized planned economy can furthest master necessary economic information

so as to make a scientific plan of the national economic system (Hayek 1935, 208–9). While the “interconnection” of the Internet has built up a huge network information pool, which partly solves the problem of “Division of Knowledge,” but at the same time, it produces more tacit knowledge in the individual network interaction process. This kind of tacit knowledge has individual characteristics, and frequently has group effect and self-evidence prophecy effect, which seems very complex. As a kind of data set, big data have the characteristics of large capacity, many types, fast access speed and high application value. It can collect, store and analyze the data with large quantity, scattered sources and diverse formats. Today, e-commerce sites can carry through network custom marketing on the basis of customers’ purchase records, browsing records, travel trajectory and so on over the years, which is on account of customers’ consumption habits forecast for big data technology. Along with the developmental logic of big data, the full data revolution will be realized in the future (F. Wang 2015). It is expected that the information will be sequenced, obtained complete sample, stored, and analyzed, which will create conditions for discovery and utilization of tacit knowledge.

2. Big data make Now Casting be possible. In addition to the completeness of the information the plan relies on, the time lag of the plan has also been widely criticized. This time lag makes the plan fall behind the development of economic activities, and even produces errors due to the loss of information in the transmission of information. Compared with traditional technology, big data greatly reduce the time of information collection and treatment on the basis of massive information storage, cloud computing and Internet applications. More importantly, big data do not emphasize the prior theoretical setting, do not rely on the high quality requirements of information, do not pay attention to the causal relationship between variables, the internal logic is “data-driven theory” (D. Wang 2015), “data is fact,” “data is decision” (Zhou 2013), which can find problems, amend to plans, macro-forecast (Liu and Xu 2015) and strengthen supervision in real time.
3. Big data can promote personalized, diversified supply and demand. Hayek’s artificially design and compulsory preference of criticizing traditional planned economy deny human freedom, and consider that the market is compatible with human reason (Hayek 1944, 91–104). In fact, in the era of small data, consumer preferences can only be subdivided into certain groups and cannot be accurately quantified to individuals, companies often implement mass production for the target, and provide homogeneous products, and the market is flooded with wave consumption. So the so-called “freedom of choice” is relatively limited, a large number of personalized, small, fragmented “singularity”

consumer demands are annihilated in the “long tail” of the demand curve (Ren and Xin 2015), and ignored by the “cost-benefit law.” True preferences are forced to abandon; there are limited choices in a number of homogeneous products “supplied” by the market. The rise of big data gets rid of the technical bottleneck of solving the demand “long tail.” Once the production and supply can be planned according to individual preferences, the blindness of the market itself can be overcome and the advantages of rational allocation of resources in the planned economy can be brought into full play.

4. Big data are driving profound changes in business organizations and business models. The early application of information technology in the enterprise results in enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM) and other information systems, which has changed the mode of operation, and promoted the automation, embedding and planning of enterprise inside. The new generation of network technology, represented by large data, will further promote the evolution of enterprise organization from centralized hierarchical organization to distributed networked organization, which makes it easier for enterprises to realize a high degree of integration of internal and external knowledge, effective link between production chain and consumption chain (Jin et al. 2013), and efficient integration of manufacturing and service. In foreign countries, some big data-based business models have emerged one after another, such as in a new pricing “trial and error method” social trial, the site provides real-time network product prices for consumers, enhances the consumers’ bargaining power in full information, so as to more accurately set the price.<sup>4</sup> With the development of big data technology, the accumulation and circulation of data within the enterprise is moving into external data services, and big data are more and more public. As the development trends for network technology from the LAN connectivity into the Internet, in the near future, the integration, management and application of big data will inevitably be required at the industry level as well as the macro level, and big data will become important national strategic resources.

### **3.2. Platform Economy: Institutions and Organizational Conditions of Plan-Oriented Market Economic System**

Big data provide technical preparation for plan-oriented market economic system and also creates the operating environment. In the promotion of network technology and big data, social production, circulation and consumption have shown an unprecedented informatization, flatization and unboundedness (Zhang and Ma 2015). How can the plan-oriented market economic system adapt to the new environment and achieve effective operation? In this article, we introduce the new

variables of “platform economy.” “Platform economy” will be taken to show the concrete economic form of the plan-oriented market economic system, and “platform economic organization” will replace the central role of the central planning bureaus in the traditional planned economy.

A platform is essentially a trading space or place that facilitates transactions between two or more customers and receives appropriate fees to gain profit (Xu 2007, 1). As an emerging economic form, the platform economy is the master of globalization, informatization and networking (Li et al. 2013). It is widely used in various industries, including airport, exchange, shopping mall, credit card system, new supply, marketing system and other offline platform economy and e-commerce, financial service, social networking and other online platform economy. The basis of the platform economy is the so-called two-sided market. Unlike traditional markets, bilateral markets are composed of parties that interact through the same platform, of which one side depends on the numbers of the other side on the platform (Armstrong 2006). Take mobile application marketing for example, mobile phone manufacturers generally use direct marketing or pre-installed bundled software sales ways for the target group in the traditional market or as purveyors in the bilateral market to create an “application stores” (such as Apple, Huawei and other companies) such as a supermarket. Mobile phone applications with varieties of features and uses provided by the third-party application developers will be available for the brand of mobile phone consumer. The more application download rates, the more favorable rates, and other consumers will be more inclined to buy, and then there are more profitable developers, while mobile phone manufacturers will increase market share due to their provision of value-added services. This cross-side or ipsilateral network externality of bilateral market is actually the interest bundle of both transaction parties. To attract consumers, suppliers have to develop a wide range of products and services according to their preferences, and take the slope pricing strategy especially for the major customers. Accordingly, consumers with similar preferences will obtain a reasonable purchasing price through group purchase and order, and so forth. In this way, it is effective for the pricing mechanism to guide suppliers’ production and service. Thus, the potential market demand hidden in the Long Tail—a neglected non-dominant part of statistical distribution in business—can be fully exploited (Li 2015). Under the new normal of Chinese economy, the imitative large-scale consumption has ended, and the personalized and diversified consumption has come. The seller’s market has been gradually changed to the buyer’s market, then to the bilateral market.

The platform economy is characterized by a planned economy. This is because:

1. Platform economy has a unique business ecosystem. The commercial ecosystem of platform economy is generally composed of leading groups, key

groups and supporting groups (Huang and Zhou 2013). As platform providers, the leading groups building the platform and acting as the transaction intermediaries can be divided into three types: Market Makers, Audience Makers and Demand Coordinators (Evan 2003). Key groups are the supply and demand sides traded in the platform system, which subjects are the participants who provide heterogeneous supply and demand in different locations in the bilateral market, which codetermine the scale and quality of the platform. The support groups include service providers such as marketing, technology, consulting, and so forth, which rely on the platform's own operation and service providers such as logistics, finance and telecommunications, and government regulators, which are derived from platform trading. In the platform of the business ecosystem, platform operators have centralizing information, matching supply and demand, implementing regulation, providing value-added services and other functions, which play a core role of central planner, strategist and supervisor in platform economy.

2. Platform economy has natural monopoly. With the self-enhancing effect of network externality, the platform with more participants can attract new entrants, reduce overall cost and improve technical level, and the market will expand faster. When the total number of participants and transactions reaches a certain scale, the platform occupies a mature network market, and the "siphon effect" of the key groups, supporting groups and various elements are increasing. The platform has been transformed from the technical strategy to the standard strategy (Shapiro and Varian 1999), restricting competition with exclusive access criteria and consolidating monopolies, leading to widespread "winner-take-all" or "winners" in the platform economy (Fu et al. 2014). The state is on behalf of the public interest to play the role of super-monopoly, leading platform economy, which is more legitimate and rational.

The core organization of information age plan-oriented market economy system is the platform providers. Compared with the central planning bureau of the traditional planned economy, the platform providers can relieve the distortions of bureaucratism and resources allocation in the organization to a great extent. From the perspective of sociology, the typical characteristics of the bureaucracy include division of functions, rank of power, command and obedience, explicit right and duty, rigorous procedure, and the separation between the public and the private (Zhang 2001). As a bureaucratic organization, central planning bureau inevitably has such bureaucratic phenomena as work slack, irrational decision-making and rent-seeking corruption which were caused by information asymmetry and excessive concentration of power, so that it probably degenerates into privileged and

highly self-serving economic elites, as Kotz (1998) worried. Compared with the tightly organized central planning system, the platform providers have the advantages of flat organization, decentralized decision-making, and can produce differentiation and integration of bureaucratic hierarchies (Yang 2015), which help to reduce the hierarchical structure information loss and top-down, highly centralized decision-making risk, and improve the transparency of information and scientific decision-making. In addition, the hypothesis implied in Max Weber's bureaucratic public organization is elite governance and predictable long-term career returns (Evans and Rauch 1999). Compared with the political status, treatment and unpredictable promotion opportunities that central planning agency provides to the professional officers, the economic stimulation of platform providers is more effective for its direct, flexible and predictable characteristics. Finally, government departments can use information technology to implement embedded monitoring for platform operators, and discover platform operating information and financial information anomalies based on large-scale data, timely preventing bureaucracy and the possible loss. Key groups can engage in social supervision and participatory management in an open and equitable way, in an open and equitable way, as envisioned by the "democratic plan participatory socialism" model, through network communities, coordination of social software, service evaluation, hearings, account ability, and so forth.

#### **4. The Framework of Plan-Oriented Market Economy System**

The plan-oriented market economy system that we want to build is a platform economy based on big data and dominated by state-owned enterprises. In order to be convenient for understanding, we take the real airport as an example to analyze the plan-oriented market economy system formed by state-owned airport. Suppose such an economic system:

1. The economic system is national ownership and state domination. The airport is established by state investment or state-owned enterprises investment, and the state owns all or most of the ownership of the airport through state-owned enterprises. The daily operations of the airport are funded by a state-owned enterprise or invested by professional holding company. The company sets a variety of aviation service standards and non-aviation service standards to regulate the exchange in the airport, maintains and supervises airport orders such as environment, safety and fair trade, expands the non-aviation services market, and eventually becomes a dual platform operator in the aviation service market between airlines and passengers, as well as in the non-aviation service market between retailers and passengers (Jiang and Zheng 2013).

2. The economic system is information-intensive and information-dependent. The airport is an information-intensive place. Airline information, ticketing information, flight information, passenger information, air traffic control information, public media information, business media information, and Internet information are all in real time, real-time collection and real-time interaction. Flight starting and landing height are dependent on air traffic control decisions after the information is integrated, and the airport operation is also highly dependent on the various information flows.
3. From the aspects of the law of value and market competition. Airlines of all kinds of ownership decide whether to enter the airport, add the air routes and provide differentiated products and services based on the passenger flow volumes, the target customer needs and their own business characteristics. In this case, ownership is not a decisive factor in market competition, and its competitiveness depends on the degree of satisfaction of consumer preferences for aviation products and services. The law of value guides the allocation of resources, promotes service innovation and achieves the survival of the fittest, and thus the benign and full competition is formed in the airlines of various ownerships.
4. From the aspects of bilateral market and supply and demand match. The sale of the flight uses pre-sale order system, only the consumers who have matched the flight destination, time, price, model and service will purchase the flight ticket, and the consumers with other preferences will not consume the flight. If the attendance and profitability of routes and flights are higher, there will be more advantages in the take-off schedule, model selection, service configuration and other aviation products properties. Thus, the consumers will be attracted to choose the route and flight. So there is the basic characteristic of the bilateral market.
5. Centralized plan and democratic plan. In the bilateral market of aviation products and services, there are a variety of planning forms: flight departure and landing time resource allocation and route layout are based on the mandatory plan of Civil Aviation Authority Air Traffic Control Bureau and other departments; airport operators have the functions of summarizing flight information and passenger information, guiding the airlines to participate in market competition and consumer product selection and promoting the aviation service market transactions through the concentration of the number and type information of suppliers and buyers; flights are generally fixed, the decision of airline increase or decrease is on the basis of the last period (rather than the current period) flight attendance; consumers can increase flights through buying and chartering and other forms in addition to holidays and other shipping peaks. Consumers cannot usually be real-time

- guided airlines products and services supply through purchase behaviors and historical records, so aviation services centralized plan is better than the democratic plan for the sake of the resource allocation and aviation safety.
6. Macro guidance and public regulation. The safe operation of an airline's air route and flight are guided and supervised by the CAAC's Air Traffic Control Agency. The airport management company is responsible for the national investors about the operational safety and operational performance of the airport. The operation of the airport management company is in accordance with the law supervision of the relevant government executive departments. The airport economic development of airport area is incorporated into the local government development planning, guided by the local government. Airport service capacity and service level are in the majority of passengers' network supervision. Obviously, a similar economic system prevails in the current economic life of our country. It has the basic characteristics of the plan-oriented market economy system, such as the dominance of state-owned enterprises, centralized plan and democratic plan, multi-sector and multi-agent coordination, and full competition in bilateral market.

For the sake of generality, we combine the development trend of information technology, expand this economic system to the whole national economy field, and give a theoretical framework of the plan-oriented market economy system:

1. Institutional structure. The state funds to establish or hold three Internet platform enterprises, which assume the functions of platform operators, respectively, in big data, e-commerce, financial services the three bilateral markets, leading the information flow, goods, services flow and capital flow in the national economy. At the same time, in the three Internet bilateral markets, there exist a large number of ownership and provide differentiated products and services enterprises in the supply, and there are more bulky, consumers with a variety of preferences in the demand side. As a public enterprise, the primary purpose of the three companies is not the corporate profits, but to maintain the smooth operation of the national economy and the continuous enhancement of market size and transaction efficiency. In the main business, the three companies operate independently but connect closely: the big data platform provides data support to the operation of the e-commerce platform and the financial service platform, providing the public data service and the customized data service, respectively, to the supply side and the demand side of the platform. Financial service platform offers investment and financing, respectively, to the supply side and demand side of e-commerce platform and big data platform. Market transactions of



e-commerce platform render services for big data platform and financial services platform. In the capital structure, the three companies participate and exchange shares in order to maintain business contacts and strategic coordination. At the same time, a small amount of shares (or preferred shares) open investment to the social security funds and private capitals (especially high-tech companies with embedded patented technologies), but the two sides do not participate in the platform business decision-making to achieve a unified fair distribution and efficiency distribution “social dividends.”

2. Operating mechanism. The first category is the democratic planning mechanism. Suppliers in the personalized and diversified “long tail market” use the pre-sale internet system, show their public goods and services in the e-commerce and financial services platforms, and publicly promise their performance of goods and services. Consumers purchase orders on demand. Then suppliers arrange the production and provide the services in accordance with the numbers, types and specific requirements of the orders. The democratic planning mechanism is matched by the transaction in the bilateral market, and the direct guidance of consumption is realized in the exchange of specific goods and services. The second category is the centralized planning mechanism. Relying on big data technology, the Internet platform companies in large-scale and homogeneous market gather and integrate consumers’ browsing records, purchase records, travel records, delivery records, revenue and expenditure records, financial management records and other information, to generate and define consumers’ spending habits, to accurately predict demands of the targeting groups, the whole society consumption habits, and the fluctuating of regional and cyclical demand through data mining. The aggregate supply is determined by the aggregate demand of the target group, the target area and the entire national economy; ascertain the monthly, quarterly, annual production guidance catalogs of major commodities and services at different levels of precision degree. Big data are used to track the transaction status of bilateral market; the supply and demand indexes of major commodities and services are instructed and real-time updated, opening to the supplier of various ownership in the platform for the supplier’s production decision-making reference. Suppliers plan the supply type and quantity of goods and services, the technical function and factor combination and the technical performance and market positioning of goods and services based on the flexible production guidance catalogs under big data and the real-time supply and demand index reflecting the satisfaction of the market demand, and further start full competition in the bilateral market supply side. Through the democratic planning

mechanism and centralized planning mechanism, the Internet platform can achieve the whole process of integration of “individual needs,” “accurate planning,” “customized production,” and “supply competition.”

3. State-owned Internet platform enterprise function. As an alternative to the central role of the Central Planning Agency, state-owned Internet platform companies have the following important functions: the first one is transforming central planner into integrated planner. A variety of types of plans in the platform enable the state-owned Internet platform enterprises to have a dual identity, it is both the centralized plan makers of the national economy operation and development, but also the matcher which uses big data technology and platform advantage to receive democratic planning of spontaneous transactions from the market. The second one is the planner of the emerging industry. For the emerging industry that state encourages to develop, the state-owned Internet platform enterprises transform the traditional government policy support, factor support and project support into the market “attention resources” support, through the Internet platform to set the column, give priority to recommend high-tech products and emerging services directly but joint with the market, to advance sale orders, all chips and other ways to accept the preselection of bilateral market demand side, so as to select the goods and services with market potential, and to attract capital, technology and other elements further gathering to the emerging industries. The third one is the provider of big data public services. Modern market is deeply impacted by the information, and the main market players make decisions depending on the anticipation of incomplete information, so mastering the information is to grasp the market trends. The state-owned Internet platform enterprises provide basic big data public services to the bilateral market, which not only make big data directly service to the commodity productions and services, but also to avoid the blindness of the market and speculation, so that the operation of the bilateral market can be more robust. The fourth one is the maker of bilateral market standards. Standard is another strategic resource of modern market competition; the world’s major economies indirectly control the market though monopoly standard. State-owned Internet platform enterprises enhance the control for the market by developing the Internet bilateral market access standards. Leading industries’ technology norms are made and adopted as the common industry standards of the platform supply side and the same kind of enterprises to increase the impact on industrial development. The fifth one is the regulator of the bilateral market. Compared with the traditional market supervision and enforcement, the network supervision of state-owned Internet platform enterprises is more efficient. According to the laws, regulations, and admittance

criterion of bilateral market, they can rely on big data, evaluations of goods and services, and complaints from consumer network, to directly supervise and govern the quality of goods and services, business fraud, labor utilization, environmental pollution, and so on.<sup>5</sup> The sixth one is the performer of macro-control policies. As state-owned enterprises, state-owned Internet platform enterprises are also important national policy undertakers. In theory, the Internet bilateral market can significantly reduce the imbalance between supply and demand brought about by economic fluctuations because of the effectiveness of centralized plan and democratic plan, thereby reducing the use of macro-control policies. However, taking into account the impact of input economic fluctuations, state-owned Internet platform companies must effectively regulate the bilateral markets, at the same time, the macro-control policies are implemented to ensure the scale and status of bilateral markets in national economy, and then to promote economic coordination and healthy development. The seventh one is the organizer of the platform ecosystem. Technology, logistics and other third-party goods and services are embedded in the platform focusing on the state-owned Internet platform enterprises, and the huge “platform + community” industrial system can be formed around the Internet platform economy.

## **5. Further Discussion: Several Problems of the Plan-Oriented Market Economy System**

There are four basic problems derived from program above needing to be answered:

1. The problem that adheres to the basic economic system in the basic stage of socialism. In this program, there are large numbers of public ownership and private ownership enterprises in a bilateral market; the two ownership enterprises compete equally and develop mutually. The dominance of public ownership in the national economy is embodied in these facts that state-owned enterprises that operate the Internet platform have major control of intangible economic assets such as big data on Internet, play the leading role in developing the platform economy, and exert great impact on the entire national economy through the bilateral market. In addition, Lange pointed out, “The analogy between the distribution of resources in a competitive capitalist and a socialist economy is, however, purely formal. The formal principles are the same, but the actual distribution may be a quite different one,” the difference is “distribution of incomes and the comprehensiveness of the items entering into the price system” (Lange 1937, 123–25). The plan-oriented market economy system can totally use higher labor standards and

environmental standards to guide the initial income distribution, reflecting the social costs of commodity production and services.

2. The problem of promoting non-competitive areas of economic planning. In the areas of infrastructure construction, basic scientific research, major scientific and technological research, and other large-scale fundamentality investment fields which need large-scale centralized input and long-term return, the fact is that big investment and big push in the socialist system is more efficient than the market-oriented approach, so still the first place is given to the existing “planning–project system,” achieving through the centralized plan of superior government and the project competition between subordinate government and enterprise. In the domain of raw materials and energy which prices make up the fundamental operating costs of national economy, the price formation mechanism regulated by state rules and led by state-owned capital could be run on the basis of capital market when the future markets such as raw oil and gold are growing up in China. This is because today’s “oil prices are no longer dependent on traditional supply-demand relationship, but are controlled by complex financial markets” (Engdahl 2008).
3. The problem of resolving overproduction. In our program, there exists an overproduction problem as well. But the two forms of overproduction should be distinguished: the first one is the failure of products due to the failure to achieve “thrilling” in competition, and the second one is the products yielded by “zombie firms.” The fail product is not without the opportunity to realize the value, and there may be the matching failures of a preference for personalization, diversification at the wrong time and place for the wrong target group, such as the current surplus agricultural products and industrial products. We can destock through big data technology, cross-time, cross-country and regional, cross-industry swap and cross-industry regulate and re-match excess products. The “zombie businesses” refer to the enterprises of insolvent, unable to recover, relying on large banks “false” loan to restructure and to survive in the “lost decade” in Japan (Caballero et al. 2008). The growth of such enterprises is slow (Ahearne and Shinada 2005), occupying and wasting economic elements and policy resources, which are the main source of serious overcapacity in China and needs structural adjustment in the structural reform of supply side. As Lange said, “*Mistakes can be localised, a partial over-production does not need to turn into a general one*” (Lange 1937, 126). In the historical analysis and accurate prediction of big data, the enterprises can timely detect the excess and correct the excess, and which is a progress than the blind production of the deviation from the consumer preferences.

4. The problem of expanding social employment. The development of information technology makes the production more and more automated, intelligentized, and serviced, and the demand for labor continues to decrease. The business ecosystem of the platform economy can transfer the labor force from the production link to the circulation link, from the manufacturing industry to the service industry supporting the operation of the platform economy, such as logistics, technology, finance and other industries. In the information age, the efficiency of expanding social employment in these industries is much higher than in the traditional manufacturing industry.

It should be noted that the program of plan-oriented market economy system of information era we proposed is a transitional program implemented in the primary stage of socialism. The program initially outlines the overall framework of the plan-oriented market economy system and requires further theoretical proof.

## Notes

1. The computer may help bureaucracy to deal with the growing troubles of social management, but it cannot produce a new social structure, let alone provide a better social structure (Botington 1973, 123–24).
2. See also Lange (1936, 64):  
It establishes the rules for combining factors of production and choosing the scale of output of a plant, for determining the output of an industry, for the allocation of resources, and for the parametric use of prices in accounting. Finally, it fixes the prices so as to balance the quantity supplied and demanded of each commodity.
3. The Key 2005–2015 ICT Data for the World is available at <http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>.
4. In 2011, Decide.com, a technology company in Seattle, USA, launched a portal to forecast the prices of goods for countless customers. The price of network products is affected by a number of factors, the price data that company collects are in real time, the information is the users want to know, and will affect the product price. The price setting based on data forecast will undoubtedly improve the competitiveness (Ma 2015).
5. At the beginning of the 21st century, the EU, the United States and China in the competition over the 3G mobile standards respectively formulated exclusive WCDMA, CDMA2000, TD-SCDMA, which were set as admittance criterion for their local markets.

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