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The Transformation Path of Economic Growth Mode under the Perspective of Resource Constraints: Case of Shenzhen Special Economic Zone

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Abstract
Economic transformation is related to long-term sustainable economic growth, which is premise and guarantee for China’s stepping across middle-income trap. The so-called transformation is changing of the extensive mode of economic growth, also it should abandon the traditional mode that relies solely on the resources input which ignore the efficient use of resources. And this needs the joint efforts of all members of society to complete. We establish a transformation model gradually under the framework of evolutionary game theory which can tell us the conditions and internal mechanism that determine economic actors to achieve transformation together. The Purely economic sphere model shows that when economy has developed to a certain height, the using of resources will be difficult to avoid predatory. However, when the model is extended to social norms, the equilibrium of efficient and rational using of resource will be re-implemented. Further, the initiative to establish and comply with social norms needs a non-predatory politics as premise, and a diversified, equitable, non-discriminatory environment for market competition is an effective guarantee to restrict government action. Finally, we use Shenzhen Special Economic Zone which is pioneer of reform and opening up as well as relatively sound market economy as an empirical object to point out the strategic path of economic transformation.

Key Words: Economic Transformation; Resource Constraints; Social Norms; Predatory Political; Shenzhen Special Economic Zone
Since the reform and opening up to the outside world, China's economy has been growing fast and achieved great accomplishments. According to the World Bank's latest standard, China has become one of the middle income countries. However, at the same time, China is also confronted with some new issues such as energy crisis, environmental pollution, increasingly enlarged wealth & regional gap, aging of population and medical & social security. Thus, we should objectively evaluate our economic achievements. Since entering 21st century, particularly, with aggravation of financial crisis in the world, such sudden change in the situation forces the transformation of Chinese economy. Re-adjusting of economic structure is related to the sustainable development of China's economy and society, so as to ensure that China could become one of the high income countries in the future. Thus, the importance of economic transformation is visible. In this case, it is of theoretical and practical significance to discuss the economic transformation. The available documents are sufficient to study the necessity and urgency of transformation. So, this article aims at the economic transformation under resource constraints and discusses the motivation to drive the people's effective and appropriate use of resources. Upon the theoretical basis, we should firstly define the logics and path of transformation. We should give a more clear answer for the path of transformation. China boasts a vast territory and obvious regional gap. So, it is indistinct when the whole country is taken into account. In this case, we choose Shenzhen Special Economic Zone—the window of reform and opening up to objectively validate China's economic growth for the past 30 years. Meanwhile, we will try to demonstrate the superiority, guidance and urgency of developed region in the economic transformation, so that not only the theoretical basis is available for the fine example of Shenzhen in the economic transformation, but the reference is given to the economic development and smooth transformation around China.

I. Theoretical background for the study

As advocated by numerous experts and scholars, the consensus has been reached for the necessity and urgency of economic transformation. However, for the goal of transformation, the World Bank points out that China's future economic growth must be harmonious with the international community, environment and social structure. (the World Bank's 2013 Report on China in 2030: Modern, Harmonious and Creative High Income Society). For other studies, though the expressions are different, the essences thereof are the same. After summary, we think transformation, at the root, intends to realize the continuity and stability of economic growth under the conditions of resource constraints. As a matter of fact, only the long-term and sustainable growth could ensure the rise of a country. This means the harmonious coexistence between the human and nature as well as efficient utilization of input factors. Under such ideological trend, we should rethink not only China's traditional economic growth mode, but the relationship between the industrial civilization and survival of mankind in the long run. Now the voice for the third Industrial Revolution and ecological civilization is increasingly high. This reminds the people of negative effect arising from one-sided economic growth. The prosperity depends on sustainability and stability of economic growth rather than high speed growth which is transient. Therefore, the economic growth should not be simply separated from the specific society and history.

As per the classical economics theory, it seems unnecessary to talk about resource constraints separately because any economic behavior and resolution are the optimization calculation under established constraint conditions. However, one of the concealed points is that all the subjects of decision-making and basic unit should be the individual. For a country or economic entity, it seems that "Commonality" and "Externality" of resource are inevitable. For China, the above point is reflected and further intensified through extensive economic growth. This is the reason why we raise the resource constraints here. Also, we think resource constraints seized the core background and conditions of China's economic transformation. The resource is divided into natural resource and social resource, including various material elements such as material, finance and man power in a country or region. Here, the land, minerals, forest, ocean, oil, labor force, capital, knowledge and information are all within the scope of resources. Therefore, the resource herein refers to all production factors inputted in the production run.
However, it is more important to determine the method and path of transformation. Though the mission and orientation of transformation are clearly defined, it does not mean that transformation could be accomplished in an action. The reform is not achieved automatically. In fact, it may be confronted with a lot of difficulties. Also, in order to solve the current problems, the priority target in the long run is usually neglected, so as to miss the good opportunities for reform. Thus, many deep-seated problems are accumulated. The expert panel from the World Bank raised six strategic measures for China's further reform of the economic system: intensifying the basis of market economy through structural reform; accelerating innovation; grasping the opportunity of green development; complete basic insurance to promote equal opportunity; establishing the sustainable fiscal system corresponding to the change of government function; establishing the win-win solution with the world. Meanwhile, Fan Gang and Wang Xiaolu, et al. (2011) estimated China's marketization index over the years through creation of indicator system. The scholars from Shanghai University of Finance and Economics (2013) estimated transformation development index in China in 2010 and 2011. These studies are helpful for us to properly evaluate the dynamic change of economic transformation in various places as well as know the aspects to be improved in the course of transformation. For most studies, the transformation looks like a self-explanatory concept. It seems that the economic transformation could be thoroughly realized if the key link and open question in the course of reform are sorted, particularly, change of traditional government functions and public governance structure via political restructuring. However, the key of the problem is that the vested interests are unwilling to make change. Thus, in theory, a centralized frame should be available, so that the role of government could be fused into the model of economic transformation to further discuss the key point and method of transformation.

II. Theoretical model for transformation of economic growth pattern

(i) The frame for transformation under closed economy

If the transformation of economic growth pattern is defined as the efficient and sustainable use of resource, all or most of social members should work together to achieve such goal. So, How to drive the participants in the economy to realize the transformation? According to the bargaining model of Young (1993 and 1998) and Aoki (2001) under competition frame, we firstly point out that without the rational design of the third party, the participants who are selfish and under bounded rationality (between the governments in different regions or different types of enterprises in the same region) compete the scarce resources as well as spontaneously form the appropriate order for use of resources. Meanwhile, the reason for breaking such balance is described.

In order to simplify the analysis, we assume that only person A and person B (all the participants who compete for economic growth, e.g. local government and enterprise) use resources competitively. At the period of \( t \), person A hopes to use the resource of unit \( x \), while person B hopes to use the resource of unit \( y \). The total resources are regenerated as per certain speed to keep the sustainability of resources. However, when \( x + y \) exceed certain quantity \( c \), the normal cycle of resources will be destroyed, so that the ecological balance and natural environment will be affected, so as to be harmful for both sides. Under extreme case, the violent dispute may be raised to affect the harmonious coexistence of both sides. When \( x + y \leq c \), both sides could obtain their expected quantity of resources. At this moment, the utility functions for person A and person B are respectively \( u(x, y) \) and \( v(y, x) \), which are concave functions. The slope \((u') \) of utility function changes with the usage amount of resources; for
the increase and decrease of utility of both sides, the increase of resource usage amount could rapidly improve the individual utility level as the economic development level is low; however, when the economic development reaches certain level, the resource amount for the individual utility level is decreased. The curvature of utility function \(-u''/u' \& v''/v'\) could measure both sides’ preference for dispute risk. Certain resource input is necessary for each side, so as to form

\[ u(0 : y_j) = v(0 : x_j) = 0. \]

The competitive economic characteristics for the growth determine that

\[ y_i \leq y_j \quad \& \quad x_i + y_i \leq c, x_j + y_j \leq c \quad u(x_i : y_i) \geq u(x_j : y_j), \]

among which

\[ i, j = 1, 2, ..., t; i \neq j; \]

also, when

\[ x_i \leq x_j \quad \& \quad x_i + y_i \leq c, x_j + y_j \leq c, \quad v(y_i : x_i) \geq v(y_j : x_j). \]

The lifetime of both sides is not considered. Suppose the successors of both sides have the same utility function and repeat the same competition. In this competition model, due to the bounded rationality, everyone is unable to find out the other’s utility function. The sole basis for decision-making depends on the collection of previous information, including the other side’s use of resource and risk preference in the past period. Due to the incompleteness of data, everyone has to obtain the inaccurate information of period \(m(k)\) in the past period \(t\). \(f(k) = m(k)/t\) refers to the individual \(k(k = A, B)\)’s ability to collect the information. Various participants are available in the complicated economic system. Thus, the above assumption is appropriate for the use of approximate resource characters without loss of generality. According to the estimation on the probability distribution for the other side’s use of resource, A and B are respectively calculated to realize the maximized use of resource, i.e.

\[
\max \sum_{0 \leq y \leq x} \frac{n(y : A)}{m(A)} u(x : y); \quad \max \sum_{0 \leq x \leq y} \frac{n(x : B)}{m(B)} v(y : x)
\]

Among which \(n(y : A)\) and \(n(x : B)\) respectively refer to the records of B’s quantity of resources \(y\) used by A in \(m(A)\) as well as records of A’s quantity of resources \(x\) used by B in \(m(B)\). When both sides’ abilities to collect information are insufficient (no more than 1/2), the random sequence of resource use \(\{x_i, y_i\}\) will reach the balance after repeated competition due to the random collection of previous information, so as to be restrained in \((x^*, y^*)\), among which \(x^* + y^* = c^*\). Unless violate stochastic disturbance occurs, this balance will be kept stable within certain period. Any side is unwilling to break such balance, so that sustainable utilization of resource could be achieved.

Obviously, it is impossible to fix the utilization of resource at certain balance sequence \((x^*, y^*)\) forever. With the gradually improving of economic development level, the utilization of resource is also increased, so as to cause the resource constraints. This means continuously breaking of

\[ \begin{array}{l}
\text{Aoki, 2001 offers the brief certification on this conclusion. Suppose } m(A) = m(B) = m, \text{ and within the period from 1 to } m, \text{ A and B always choose the same sample, which forms } (2m < t) \text{ through the data between period } 1 - m \text{ and period 0. The resource use of both sides is respectively } X \text{ and } Y; \text{ next, within the period of } m + 1 - 2m, \text{ A and B always choose the samples from previously period } 0 - m. \text{ Then, A and B’s optimal resource usage amount is respectively } C - X \text{ and } C - Y; \text{ from period } 3m + 1 \text{ to period } 3m + k, \text{ A only has the sample } C - X \text{ from period } m + 1 \text{ to period } 2m; \text{ B only has the sample } x \text{ from period 1 to period } m. \text{ Then, after period } 2m + k + 1, \text{ A and B’s optimal resource usage amount is respectively } x \text{ and } C - x, \text{ which refers to the realization of certain balance. If } t \text{ is enough long, the positive probability of } 1 > p > 0 \text{ occurs. During the period } f(2m + k), \text{ the probability of balance failure is } (1 - p)^t. \text{ When } t \text{ tends to the infinity, such probability will tend to 0.}
\end{array} \]
balance and form of new balance in the model. Meanwhile, \( x^* + y^* \) is more and more close to the limit value \( c \). Actually, even though violent stochastic disturbance does not occur, the participants in the economy may make mistakes. The accumulation of mistakes for a long period will also cause balance breaking, so as to form the different time series for balance, which is called by Young. H.P. 1998 as the balance of “Similar Stability”. In such dynamic course of evolution, the realization of balance is commonly decided by both sides’ risk preference and information collection ability. Specifically,

During the period \( t \), if the person A and person B reached \((x^*, c-x^*)\) for the utilization of resource, person A wants to obtain more resources in the period \( t + 1 \) due to such factors as firstly economic take-off. For example, \( x^* \) is increased to \( x^* + 1 \). In order to let B accept this new resource arrangements, i.e. \( c - x^* - 1 \), person A has to conduct the boundary adjusting and test for many times to change person B’s information collection sample, so that person B has to accept such adjustment finally, i.e.

\[
v(c-x^*-1:x^*+1) \geq (1-\frac{p}{m(B)})v(c-x^*:x^*)\ , \text{ among which } p \text{ is min. number of tests conducted by A.}
\]

Calculated as \( p \geq -m(B)[v(c-x^*-1:x^*+1)-v(c-x^*:x^*)] / v(c-x^*:x^*) \); further adjustment to arrive at

\[
p \geq -m(B)\nu(c-x^*:x^*) / v(c-x^*:x^*)
\]

Among which \( \nu \) refers to decrease of utility when B’ resource use is reduced by 1 unit. According to the symmetry, as A’s resource usage amount is decreased by 1 unit, i.e. from \( x^* \) to \( x^* - 1 \), B’s min. number of tests: \( p \geq -m(A)u'(x^*:c-x^*) / u(x^*:c-x^*) \).

When the dynamic equilibrium is reached, the balance should be reached accordingly when A makes adjustments to both positive and negative directions, so as to arrive at \( m(A)u'(x^*:c-x^*) / u(x^*:c-x^*) = m(B)\nu'(c-x^*:x^*) / v(c-x^*:x^*) \);

Both sides of the equation are divided by \( t \) and then arriving at:

\[
\hat{x} = \arg \max u(x^*, c-x^*)^{i(A)} \times v(c-x^*, x^*)^{i(B)}
\]

The above formula defines both A and B’s resource distribution under dynamic equalization. The party who enjoys good insight, risk preference and information collection ability could obtain more resources. Meanwhile, such balance maximizes the overall social welfare. Thus, such resource usage will be accepted by all the social members. The utilization of resource will be dynamically optimized and adjusted in the long run.

However, with the further economic development, one side (e.g. A)’s wealth is gradually increased, so that the risk tolerance thereof is strengthened accordingly. Meanwhile, the information processing capability could be enhanced through the investment on knowledge and study. In this case, A may seek more resources. So, the constriction of dynamic equalization is difficult. Thus, B has to enhance the predatory use of resource, to eventually cause the dilemma in sustainable utilization of resource. It could be seen that due to the competition for growth and lack of the third party’s governance, increase of economic development level could improve the utilization of resource within the certain period, so as to optimize the resource allocation.
However, when the economic development reaches certain level, the sustainable utilization of resource will be hindered. It means that the growth via competition is not feasible in any way. Thus, the economical growth mode should be changed. For the developed regions, they are more eager to realize the transformation economic growth as well as lead the transformation thereof in other regions. This point will be discussed in the future. Now we should firstly expand the above competition model, so that the utilization of resource could be extended from the economic environment to social background. Thus, the more relevant discussion could be made for such issues as economic growth and transformation under resource constraints.

(II) Framework for transformation under open economic conditions

The economic activities could not do without the real society. In the above section, we have already indicated that with the self-evolution of economic system, the resource constraints will eventually limit the continuous implementation of existing growth mode, particularly, it is inevitable to cause the predatory development of public resource. Therefore, many scholars gave the solution for the "Public Tragedy" from such aspects as privatization, population control, pollution fees, surveillance and discipline. It is mentionable that Garret Hardin, 1968, the proposer for the concept of "Public Tragedy", extended the public resource to the field of morality \[6\], so as to provide us with the new way to discuss sustainable utilization of resource, i.e. based on the social norm, the local government and enterprises are required to use the resource intensively and change the economic growth mode positively. In the theoretic model, it means the connection of related competition to the economic sphere and social field. As the model in the above section is expanded, we will try to explain that the interaction between economic sphere and social field could loose the constraints on transformation of economic growth mode, so as to further boost the economic transformation.

According to the empirical fact, the developed region or advanced enterprise pays more attention to its own social responsibility as well as has the economic conditions to actively feedback the society. Therefore, such economic participant could be more closely related to the community. When taking an active part in the social activities, the economic participant could improve its own image as well as be well accepted by the public, so as to accumulate more social capitals\(^1\) and economic interests. Let's take the case of Shenzhen Special Economic Zone as an example. It is honorable for the local government, officials and citizens in Shenzhen to act as the bellwether, test field and window for deepening the reform of the economic system as well as reform and opening up.

Suppose \(k\) \((k = A, B, ..., )\) economic participants are available, they also seek the economic transformation, so as to intensively use the resource (competition 1) and social life (competition 2). Meanwhile, the competition is repeated infinitely. Competition 1 causes each participant to pay high cost \(C_{kt}^1\) \((t = 1, 2, ..., \) is the number of periods for competition\) for transformation to assist the realization of economic transformation, which will bring more economic interests to everyone. Every participant could obtain the income of \(R_{kt}^1\) at each period. If \(n(n \subseteq k)\) participants do not cooperate, the income is reduced into \(R_{kt}^1 - nd_{kt}\). For competition 1, each participant may not

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\(^1\)"Social Capital" was firstly raised by the sociologist Coleman, 1990. Similarly, Granovetter proposed the concept of "Social Embedability". Through the endeavor of the tolerable sociologists, the sociology of economics is gradually formed, so as to initiate the communication between sociologist and economist as well as fusion of subjects. Also, the school of economics for new system was born at the right moment. Under their common efforts, many traditional economics-related issues are further answered. For the Chinese scholars, Zhou Xueguang (2003) and Zheng Yongnian (2000) et al made great contributions in the relevant fields.
cooperate potentially, so as to save the cost of transformation as well as enjoy the benefits from successful transformation, i.e. the external characters of economic transformation. It refers to $C_{it}^1 > d_{it}$ & $kd_{it} > C_{it}^1$. For competition 2, the social exchange may also cause the cost of $C_{it}^2$ as well as achieve the income of $R_{it}^2$, among which the income is the non-decreasing function of the number of people who participate in such competition. It means that not every participant is necessary for the social activities, i.e. $k \in {k}$, so that $R_{it}^2 > 0$ is available for $n$ which meets $k \leq n \leq k$. When the number of participants reaches certain level, the increase of number of participant may not produce more effect accordingly. As the cooperative condition in competition 2 is $C_{it}^2 < \delta [R_{it}^2 - C_{it}^2] / (1 - \delta)$, $C_{it}^2 < \delta R_{it}^2$ is sorted out, among which $\delta$ is the time discount rate. Such condition means that the discount of total incomes in the future for social activities should be more than the cost consumed for social activities. Obviously, regardless of incomes, the people will actively observe the social norm if they pay sufficient attention to the future. Otherwise, the participants will be expelled by the community owing to their non-cooperation and violation of social norm.

Further, we put competition 1 and competition 2 under the same framework for consideration. Each participant harmonizes these two competitions simultaneously. If the participant did not cooperate in these two competitions at previous period, they could still choose not to cooperate at the current period or cooperate in these two competitions. If the participant did not cooperate in competition 1, such participant will be expelled by the others regardless of cooperation in competition 2. The reason is that when the number of participants who did not cooperate in competition 1 is less than $(k - k)$, other participants in competition 2 will not cooperate with the above participants. On the other hand, if the participants do not cooperate in competition 1, it is impossible for them to improve the income in future competition. In case the participants choose to cooperate in the previous competition, they could continuously cooperate in the competition if the discounted present value of current and future incomes is more than the costs consumed in these two competitions, i.e. $C_{it}^1 + C_{it}^2 < \delta R_{it}^2 + d_{it}$, after sorting, $C_{it}^1 < \delta R_{it}^2 - C_{it}^2 + d_{it}$ is made available. The incentive compatibility in competition 1 is compared, so that $C_{it}^1 > d_{it}$. However, if $C_{it}^1 < \delta R_{it}^2 - C_{it}^2 + d_{it}$ is met, the cooperation will be continuously made to realize the economic transformation. It could be seen that the combination of social field with the economic sphere could boost the realization of economic transformation. Also, it’s worth noting that the strong social forces are the prerequisite for meeting the above conditions. The people should have enough driving force and enthusiasm to expel those bad enterprises and governments which lack the social responsibilities. Thus, not only the economic returns at the moment but also the harmonious social environment and stable eco-resources should be taken into account. We think as compared with the backward region, the developed region pay more attention to the latter. This is the theoretical value for construction of civil society as well as the theoretic basis for better realization of transformation in the developed region.

\[\footnote{For the developed area with better ability to realize the economic transformation, many scholars arrive at the similar conclusions from other aspects. Shi Lei and Liu Weiming (2012) created the three-party mathematical model, i.e. central government, local government and representative resident, among which the central government was the neutral government, the local government concerned its own promotion and representative resident’s utility is jointly determined by the income level and environmental quality. The local government could choose to directly accelerate the economic growth ($e_{i1}$) or offer the good environmental quality to boost the economic growth indirectly ($e_{i2}$). The local government’s effort level and goal determined the}\]
(III) Framework for economic transformation which accommodates the political factors

As per stated above, the role of government is key to the economic growth and transformation process. Such situation is very obvious in the process of economic development in China and many East Asian countries. Meanwhile, the previous competition implies the homogeneous assumption on the participants, so that the types of participants were not classified. Therefore, the theoretic model herein is further extended to the political field, so as to study the influence of interaction between the government and enterprise to the growth and transformation of economy.

As studying the role of government in the economic development, we will firstly face such political paradox: if the government is strong enough to protect the property right and contract implementation, such government is also powerful to deprive the citizen's properties. However, up to now it is still not clear about certain role of government (Weingast, 1995)\[^7\]. Shleifer and Vysny (2004) concluded the "Hand of Supporting" model, "Invisible Hand" model and "Hand of Pillage" model as analyzing the role of government\[^8\]. Similarly, Aoki, 2001 divided the type of government into democracy, pillage and collusion. More and more documents abandoned the viewpoints in the neoclassical economics, i.e. the role of government is defined as the perfect night watchman. In fact, the government is the strategic participant who has its own goal and private interest. Thus, respecting the private interest, boosting or hindering the economic growth or transformation are all related to the self-interest of governmental official.

As referring to the model established by Weingast (1997)\[^9\], there are two types of enterprises, i.e. A and B in the economic system (citizens, organizations and interest groups which participate in the economic activities). Under normal conditions, the government \((G)\) treats A and B equally without discrimination; \(T_{k_t}\) is levied at each period. Meanwhile, the enterprises are provided with the public goods and services such as infrastructure, so as to keep the normal running of economic system. Thus, the enterprises could obtain the positive utility \(U_{k_t}\), among which \(k = A, B, G; t = 1, 2, \ldots\). At the beginning of certain period \((j)\), the government tries to increase tax levy (equivalent to the tax levy decrease of another type of enterprise, or more favorable right of development is given) on certain type of enterprises (assumed as A), to obtain additional incomes \(\alpha\). For such infringement act, A and B could accept or boycott. The cost of boycott is \(c_{k_t}\). If both A and B choose to boycott, the government’s infringement act is unable to succeed. Meanwhile, the cost \(c_{k_t}\) should be borne. In case one side rejects, such infringement act will

\[\frac{\partial U_{k_t}}{\partial Y} > 0, \quad \frac{\partial^2 U_{k_t}}{\partial Y^2} < 0, \quad \frac{\partial U_{k_t}}{\partial G} > 0, \quad \frac{\partial^2 U_{k_t}}{\partial G^2} < 0.\]
prevail. Also, the enterprises lose confidence on the government and economy in the future, so that the overall economy suffers from loss. Both A and B bear the loss . If both sides give up boycotting, the cost of boycotting is saved, but both A and B should bear their loss .

As per the above description, when , both A and B accept such infringement act due to the over high boycott cost. After repeatedly competition, the enterprises always fail to boycott the government’s infringement act. Also, such balance will be maintained for a long period of time till the economic situation is worsened to certain level, i.e. the discounted present value of extraneous incomes from infringement act is unable to make up the utility decrease caused by the economic efficiency loss due to the infringement.

When , both A and B’s boycotting will meet both sides’ interests. However, when , the government could provide B with certain benefits to obtain B’s acceptance. Thus, the government and B jointly encroach A’s legal interest; when , A will accept the government’s infringement act while B wants to cooperate with A to boycott such infringement act. For the enterprise with the sense of social responsibility and concerning the future development, it will rise up though the government’s infringement act does not directly damage its interest. However, neither side could believe that the other side would surely boycott, so that it is unable to ascertain whether the government’s infringement act could prevail. As per above the competition model related to economic sphere and social field, B could make certain efforts to establish or maintain the closely social norm, which will help both sides to boycott the government’s infringement act. Here, B’s should meet , where

When both A and B accept the government’s infringement act, A will not immediately exit market if the economy is just starting and booming. Only when , the fast economic growth will provide A with sufficient utility increase value to make up the government’s infringement act and efficiency loss in the future. However, when the economic development encounters the bottleneck, so as not to meet such conditions, thus, continuous implementation of discriminatory policy and other predatory behaviors will further worsen the economic situation.

Moreover, if the cost paid by the government for infringement is very low, the government will continuously make infringement even though the previous infringement failed. Therefore, it is crucial to effectively constraint the government, so as to avoid the predatory act thereof.

Next, why does the government’s infringement act aim at A rather than B? or, are A and B randomly chosen for pillage? Actually, the government often classifies the enterprises as medium and large-sized enterprises, small and micro enterprises, state-owned and private enterprises, foreign invested and domestic enterprises, strategic emerging enterprises and sunset enterprises. If the former is called as enterprise A and the latter is called as enterprise B. Before the civil society is established, the government, in most cases, will infringe the interests of enterprise A under the same condition, enterprise A’s cost of boycotting is much higher than that of enterprise B (the reason for ). Generally, enterprise B has the better ability to establish and maintain the social norm. So, the government’s infringement act is realized due to easy distinguishing between enterprise A and enterprise B. If all the enterprises could make fair competition and enjoy the same right of free development, or the types thereof are diversified, so that the government is unable to distinguish the types of enterprises successfully for the infringement in the future. In this case, the government has to randomly choose A or B for pillage. Thus, infringement rate for A and B is . When one side is infringed by the government, the
other side does not boycott. Then, when it is also infringed, the opposite side will not boycott. Otherwise, they will jointly boycott such government’s infringement act. So, the government has to respect each side’s right, or the government may randomly infringe one side. Suppose the government randomly chooses one party through the rate of 1/2, the other side’s total loss of discounted present value in the future will be $\frac{1}{2} \times \frac{\delta (a + 2\Delta)}{1 - \delta}$ due to failure of boycott. If boycotting is conducted, the current cost will be $c_{lt} - \Delta$. The condition for jointly boycotting is $\frac{1}{2} \times \frac{\delta (a + 2\Delta)}{1 - \delta} > c_{lt} - \Delta$, so as to sort out: $\delta > \frac{2(c_{lt} - \Delta)}{2c_{lt} + a}$. As you can see, when $\delta > \frac{2(c_{lt} - \Delta)}{2c_{lt} + a}$ is met, the government’s attempt to exploit enterprise A with enterprise B is unable to realize though $\Delta > c_{At} \geq c_{Bt}$ and $\Delta - c_{Bt} < a$. Here, both A and B will jointly boycott the government’s infringement. In this case, a sustainable economic system will be formed. Such process should be boosted by the government with different types of enterprises. The fair competition of all enterprises should be the precondition to achieve the above process because in this case the government is unable to easily choose the subject for infringement. +

(IV) Summary

As per stated above, with the economic development, the use of resource will be close to the critical point thereof. Thus, it is inevitable to cause the overuse of resource under the traditional economic growth. It is impossible to gradually form the spontaneous order which could appropriately use and effectively use of the resource. Therefore, if the economic activities are fused into the social life, the realization of balance could be further boosted, so as to accelerate the cooperation among economic subjects and achieve the sustainable use of resource and transformation of economy. However, the major factor for the economic subject's positively establishing and maintaining of social norm depends on its anticipation in the future. A predatory government will sap the people's long-term expectation. Also, the major factor for determining the government's infringement is related to distinguishing of utility function characters for different types of enterprises. The government's infringement act could be effectively prevented through establishing of the fair market competition, so as to form diversified marketing systems. On this basis, the power of various social organizations should be enhanced to establish the strong civil society and foster the economic subject's awareness of master, so as to force the economic transformation, change of economic growth mode and sustainable utilization of resource.

III. Retrospection of the "Miracle of Shenzhen": the truth for high speed growth of Shenzhen Special Economic Zone

As per the above theoretic model, simply seeking the fast economic growth is not sustainable. For the developed region, it will firstly reach such critical point, so as to cause the deficiency of resource nationwide. Thus, the economic transformation must be conducted. In order to validate this evaluation, the measuring model will be adopted here. The resource herein generally refers to all factors inputted in the production run. So far, we all know the non-renewable property of natural resources such as energy and the damage caused by the overuse of resources to eco- and natural environment. However, we should still pay attention to the non-sustainability of social resources such as capital and labor (including labor and skill preference). The gradually exhausting of demographic dividend indicates that it is difficult to continue the growth through labor intensive mode. It seems that additional issue of currency could make up the capital. However, the inflation and incorrect capital allocation
caused hereby will also produce the non-sustainability of capital. Thus, more and more small and medium-sized private enterprises face the credit constraints due to the above reason. In addition, it is difficult to properly distinguish the above two types of resources, which are actually interlaced. The use model of one type of resource will surely cause the improper use of another. In order to simplify the measuring analysis, we highlight the role and contribution of two types of resources, i.e. capital and labor in the process of economic growth, so as to validate the non-sustainability of conventional resources investment. Meanwhile, we choose the case of Shenzhen Special Economic Zone, the epitome of national economy as the example. Due to the earliest starting of market economy, most complete market system and most successful experience in the construction of special zone, the conclusion made from Shenzhen will be the most representative.

(I) Overall performance of Shenzhen Special Economic Zone for the past 30 years

China's economic special zones have been established for over 30 years. The small fishing villages in the remote areas have mushroomed to the modern cities, among which Shenzhen achieved exceptional accomplishments. The "Speed of Shenzhen" continuously refreshes the miracle of modernization construction and urban development in both the world and China. The growth of Shenzhen in the past three decades was outstanding. At the very beginning of establishing, Shenzhen is almost negligible in terms of economic aggregate. However, soon afterwards Shenzhen grew much faster than the other special zones. In the middle of 1980s, Shenzhen rapidly surpassed Shantou and Hainan in terms of economic aggregate. In 1990s, Shenzhen took a large lead in terms of economic aggregate. Afterwards, it kept high speed growth. Shenzhen enjoy the high annual average growth rate of nearly 40% and 23% respectively in 1980s and 1990s. Also, Shenzhen still kept the annual average growth rate of 14% since 21st century, so as to realize the amazing transit of local economy. In a long time, Shenzhen has enjoyed 60% of economic aggregate. Thus, Shenzhen is always chosen as the example in many researches. Since the new century, the annual average growth rate of Shenzhen has been slowing down. However, as a whole there is still large gap between Shenzhen and other special zones. The convergent tendency among special zones is not obvious (figure 1 and figure 2).

![Figure1: changes in GDP](image1.png)

![Figure2: changes in per capita GDP](image2.png)

So, what are the factors for the success of Shenzhen Today? Does the "Speed of Shenzhen" really break through the traditional economic growth mode? Here, the measuring tool should be used to answer these questions through measuring the contribution of resources to the growth as well as change of full-factor productivity.

(II) Model and parameter estimation
1. Selection of production function; in order to accurately measure the influence of resource to economic growth in Shenzhen, we need to estimate various factors which contribute to the economic growth in Shenzhen. There, we should firstly establish the production function models, among which Cobb-Douglas function is most widely adopted for such question. The form of function is \( Y_t = A(t)L_t^{\alpha_L}K_t^{\alpha_K} \), among which \( A(t) \) refers to the technical level in Shenzhen at \( t \) year; \( Y_t \) refers to economic output in Shenzhen at \( t \) year; \( L_t \) refers to the quantity of labor force in Shenzhen at \( t \) year; \( K_t \) refers to the capital amount in Shenzhen at \( t \) year; \( \alpha_L, \alpha_K \) represent the elastic coefficients respectively for labor and capital. Here, the time series data for the past three decades in Shenzhen are used. So, we adopt the time trend items as the technical progress. The digitized function is listed as below:

(1) Cobb-Douglas function: \( \ln(Y_t) = a_0 + \alpha_L t + \alpha_L \ln(L_t) + \alpha_K \ln(K_t) \)

When the output features constant returns to scale, \( \alpha_L + \alpha_K = 1 \), so that function 1 could be changed as

(2) C-D function with constant returns to scale: \( \ln(Y/L)_t = a_0 + \alpha_L t + \alpha_K \ln(K/L)_t \)

Also, in order to reflect the interaction between variables, we use the trans-log production function:

(3) Trans-log function:

\[
\ln(Y) = a_0 + \alpha_L t + \alpha_L \ln(L) + \alpha_K \ln(K) + \frac{1}{2} \alpha_{LL} \ln^2(L) + \frac{1}{2} \alpha_{KK} \ln^2(K) + \alpha_{LK} \ln(L) \ln(K) \]

At this moment, output elasticity of labor and capital is respectively \( a_L = \alpha_L + \alpha_{LL} \ln(L) + \alpha_{LK} \ln(K) \) , \( b_K = \alpha_K + \alpha_{KK} \ln(K) + \alpha_{LK} \ln(L) \) ; after standardized process, it includes:

\[
A_L = a_L / (a_L + b_K) ; \quad B_K = b_K / (a_L + b_K) 
\]

Both function (1) and function (2) include the neutral assumption on technical progress. In fact, the technical progress is always inserted into the capital or labor, so called as the reflection of technical progress. The data size is strictly limited in Function (3). Therefore, trans-log function (4) is chosen to replace function (3):

\[
\ln(Y_t) = a_0 + \alpha_L t + \alpha_L \ln(L_t) + \alpha_K \ln(K_t) + \alpha_{Ld} \ln^2(L_t) + \alpha_{Kd} \ln^2(K_t) + \alpha_{Ld} \ln(L_t) + \alpha_{Kd} \ln(K_t) + \alpha_{Ld}^2 t^2 
\]

Also, the above functions all include 100% technical efficiency, i.e. under given technique and input, the output is maximized. It means the economy in Shenzhen should be based on the frontier technique. Thus, this assumption seems to be over strict. When the technical efficiency is inadequate, the total factor productivity could be further divided into technical progress and technical efficiency. However, the technical efficiency will be discussed at the next section. Here, we will offer the stochastic frontier function (5) for estimating the technical efficiency:

\[
\ln(Y_t) = a_0 + \alpha_L t + \alpha_L \ln(L_t) + \alpha_K \ln(K_t) + u_t + v_t 
\]

Among which \( u_t < 0 \), which represents the non-technical efficiency. When \( u_t = 0 \), the enterprise is under production-possibility frontier. Then, the technical efficiency could
be defined as $TE(t) = e^{\nu_t}$ = actual output/highest possible output. $\nu_t$ is random variable, which refers to the random factor in the productive process.

The specific implication and data source of each function variable are listed as below:

$Y_t$: Economic output in Shenzhen at $t$ year, which could be measured as per GDP in comparable price. The data source is from 1980-2011’s Statistical Yearbook in Shenzhen. The original data of GDP is subject to the price for the indicated year. Therefore, deflator method is used for calculation. Meanwhile, the year of 1980 is used for conversion of constant price.

$K_t$: The capital element input in Shenzhen at $t$ year; China’s statistical department does not carry out the special survey on the annual capital stock. So, it is difficult to obtain the capital stock-related data in the past researches. Also, due to various types of capital stock such as direct capital and indirect capital as well as the fixed capital and floating capital and change of capital cost year by year, it is more difficult to obtain the data on capital stock. In order to compare the capital data from different regions, this article refers to Zhang Jun (2008)’s estimation method on provincial capital stock in China, i.e. Perpetual Inventory. The formula for estimation is listed as below: $K_t = K_{i(t-1)}(1 - \delta_t) + I_t$, among which $i$ refers to the region; $t$ refers to the year; $\delta$ refers to capital depreciation rate; $I_t$ refers to fixed capital investment; the capital stock data at the base year is crucial for calculation. Perkins (1998) estimated that China’s capital output ratio in 1953 was 3, so as to further retrospect the capital stock in 1952. However, Zhang Jun adopted fixed capital amount in each province in 1952 which was divided by 10% to arrive at the capital stock of each province in 1952. Obviously, it is incorrect when the capital stock of the base year (1980) in Shenzhen was calculated as per that in China in 1952. According to the method adopted by Zhou Miaomiao (2004) et al, the following method is adopted herein to calculate the capital stock in Shenzhen for the year of 1980: Capital stock in Shenzhen in 1980=proportion of Shenzhen’s GDP to that of Guangdong Province in 1980 * capital stock in Guangdong in 1980. The capital stock in Guangdong in 1980 could refer to Zhang Jun (2008)’s estimated result. All the data should be converted as per the constant price in 1980. Also, the fixed capital investment should be deducted as per the constant price in 1980. Due to the lack of accurate data for the cost of capital, the current year’s GDP deflator is adopted for deduction. The region under fast economic growth is generally provided with higher rate of depreciation. Thus, the capital depreciation rate herein is set as 10%.

$L_t$: labor factor input in Shenzhen at $t$ year; here, the labor input is actually the total labor input for the whole economy, but the worker is the most heterogeneous individual because the difference of knowledge, quality, skill and labor intensity could cause the difference of labor efficiency. Therefore, the ideal labor input index should take the above factors into account. However, due to the statistic limit, the annual labor input is substituted by the number of social labors at the end of each year.

$t$: time term, unit: year, which refers to the variable of technical progress; the time series herein are from 1980-2011. So, the year of 1980 is set as $t = 1, \ldots, 32$. The year of 2011 is set as $t = 32$. 


1. Interaction between technique and capital refers to the improving of capital quality through technical progress. Here, the technical progress should be Capital Embodied Technological Change. 

2. Interaction between technique and labor refers to improving of labor skill through technical progress. Here, the technical progress should be Labor Embodied Technological Change.

3. Interaction between technical systems refers to overflow and learning effect in the technical progress, i.e. improving of technical level at different levels.

The parameters $a_0, \alpha_L, \alpha_K, \alpha_{KK}, \alpha_{IL}, \alpha_{IK}, \alpha_L, \alpha_K, \alpha_{II}$ are the parameters of constant and relevant variable.

2. Parameter estimation on production function. We firstly use function (1)~(4) to respectively conduct regression. The result shows the imitative effect of function (2) is the best while for other functions, the regression is not obvious or the regression coefficient is negative, or both factors exist, or the function form is only good for imitative effect of some special zones. Thus, horizontal comparison is unavailable. Therefore, the best production function for economy in Shenzhen should be Cobb-Douglas function with constant returns to scale. For the regression result, see table 1.

Table 1: regression results of economic growth in Shenzhen

<table>
<thead>
<tr>
<th>Regressor variable</th>
<th>Function (1)</th>
<th>Function (2)</th>
<th>Function (3)</th>
<th>Function (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant term</td>
<td>0.056(0.074)</td>
<td>0.727(1.258)</td>
<td>-18.806(-1.291)</td>
<td>-3.799(-2.026)</td>
</tr>
<tr>
<td>InK</td>
<td>0.872(11.470)**</td>
<td>4.430(1.277)</td>
<td>1.309(6.990)**</td>
<td></td>
</tr>
<tr>
<td>InL</td>
<td>0.171(2.895)**</td>
<td>-1.176(-0.270)</td>
<td>-0.270(-1.465)</td>
<td></td>
</tr>
<tr>
<td>t</td>
<td>0.029(3.601)**</td>
<td>0.036(14.133)**</td>
<td>0.141(3.758)**</td>
<td>0.807(3.466)**</td>
</tr>
<tr>
<td>ln(K/L)</td>
<td>0.814(12.697)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(K)</td>
<td>-0.146(-0.695)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(L)</td>
<td>0.175(0.464)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(K)/ln(L)</td>
<td>-0.016(-0.030)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t*ln(K)</td>
<td>-0.082(-3.364)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t*ln(L)</td>
<td>0.082(3.040)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tt</td>
<td>0.006(3.144)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observed value</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>R² after adjustment</td>
<td>0.996</td>
<td>0.993</td>
<td>0.999</td>
<td>0.999</td>
</tr>
<tr>
<td>D-W test</td>
<td>0.981</td>
<td>1.998</td>
<td>0.907</td>
<td>1.299</td>
</tr>
</tbody>
</table>

Note: the value in the bracket is the test value t; *** refers to remarkable effect above 1%; ** refers to remarkable effect above 5%; * refers to remarkable effect above 10%.

The regression results comply with our intuitive experience. The influence of capital, labor and technical factor to the economic growth in Shenzhen is very obvious. However, the influence levels of different factors are different. Here, the capital produces more influence on the output. The capital input for each unit could bring the output of 0.81 while the output produces much lower level of sensitivity for the labor and technical element. In general, for
the past three decades, the influence of output growth to the capital, labor and technique is from strong to weak, which is subject to that nationwide. According to our previous research results, the elastic coefficient of capital for the whole country is 0.56. The elastic coefficient of labor and that of technique are respectively 0.29 and 0.02 (Yuan Yiming, 2008) [12]. Thus, it could be seen that the economy in Shenzhen depends more on the capital as compared with that in the whole country. Also, the contribution degree of technique for the output is obviously higher than the average level nationwide. This shows that though Shenzhen has achieved great accomplishments for the past 30 years, such accomplishments are still mainly attributed to the release of capital constraints. However, the degree of association between technical progress mechanism and economic growth in the special zone is still very low.

As per stated above, function (1) ~ (4) contain the irrational assumption, i.e. the technical efficiency is 1. Under such assumption, the (residual value) out of the labor and labor contribution is attributed to the total factor productivity, which is also approximated as the contribution from technical progress. Thus, it is obviously inadequate to adopt such method to measure the reason for economic growth in the special zone. Therefore, we need to further resolve the total factor productivity in terms of technical progress and technical efficiency.

(III) Estimation on efficiency of economic operations

The estimation on technical efficiency was firstly proposed by Farrell (1957), the economist from University of Cambridge. He estimated the gap between the actual output and max. output under the enterprise’s equivalent conditions; the larger gap, the lower technical efficiency [13]. However, such method suffered from a lot of drawbacks. Here, the estimation on the stochastic frontier function was established on the small-sized sample and low quantity of observed values. So, the result was seriously influenced due to the quality of data. The parameters estimated through method were not provided with the statistic nature, so that the statistic test was failed (Mao Shiping, 1998) [14]. Afterwards, many scholars enriched and improved the technical efficiency in terms of theory and application. Leibenstein (1966) re-defined the technical efficiency in terms of output and pointed out that the technical efficiency was the proportion of max. output achieved by the actual level of output as the market price and size & ratio of factor input were unchanged. [15] Afriat(1972) established the random production function [16] according to the method of maximum likelihood. So far, estimation of technical efficiency is generally divided into two methods, one is non-parameter method and the other is parameter method. There is no need to estimate the production function for the non-parameter method, so as to avoid the error caused by the incorrect form of function, but a lot of data and strict calculation method are demanded. For the parameter method, each parameter of the production function is firstly estimated to describe the whole production process. Here, Stochastic Frontier Function, SFA are widely used. The above two methods are mature. So, we no longer express the calculation principle of technical efficiency in detail. As per the form of function (5) listed in part III, we could adopt SFA method to directly calculate the technical efficiency of each special zone, i.e. value $u_{it}$

We are unable to directly observe $v_{it}$ and arrive at the value of $u_{it}$ as per model (5). However, the distribution of $\varepsilon = u_{it} + v_{it}$ is directly given by function (5). So, the technical efficiency could be further defined as $TE_{it} = E(u_{it}|\varepsilon)$, i.e. under given $\varepsilon$, the expectation on $u_{it}$. The estimated value of $\varepsilon$, i.e. $\hat{\varepsilon} = \ln(Y_{it}) - a_0 + \alpha_t + \alpha_L \ln(L_{it}) + \alpha_K \ln(K_{it})$; suppose the correlation between
$u_t$ and $v_t$ are unavailable, i.e. $E(u_t, v_t) = 0$, among which $u_t$ is subject to semi-Gaussian distribution; the average value is 0 and variance is $\sigma_u^2$. $v_t$ is subject to Gaussian distribution; the average value is 0 and variance is $\sigma_v^2$. Suppose the variance of $\varepsilon$ is $\sigma_\varepsilon^2$, $\lambda = \sigma_u^2 / \sigma_\varepsilon^2$, $f(\cdot)$ and $F(\cdot)$ are respectively the value of standard normal density function and that of standard normal distribution function. The evaluation point is $\varepsilon_t \sqrt{\lambda} / \sigma(1 - \lambda)$. Then

$$TE_t = E(u_t | \varepsilon_t) = \exp\left[-\left(\frac{\sigma_u \sigma_v}{\sigma} \left(\frac{f(\cdot)}{1 - F(\cdot)} - \frac{\varepsilon_t \sqrt{\lambda}}{\sigma(1 - \lambda)}\right)\right]\right].$$

The software Frontier (Version 4.1) is used to estimate the above model and calculate out the average technical efficiency of Shenzhen at different stages (table 2). Thus, it could be observed that with the further reform and opening up, the technical efficiency of Shenzhen is improved to certain extent. From 1980~2011, the average level of technical efficiency of Shenzhen was improved by 6%. So, as compared with the average level nationwide, the technical efficiency of Shenzhen is still high.

Table 2: Efficiency of economic operations in Shenzhen Special Economic Zone

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shenzhen</td>
<td>0.91</td>
<td>0.88</td>
<td>0.92</td>
<td>0.94</td>
</tr>
<tr>
<td>Nationwide</td>
<td>0.80</td>
<td>0.79</td>
<td>0.82</td>
<td>/</td>
</tr>
</tbody>
</table>

Note: the nationwide data source is from Yuan Yiming (2008).

(IV) Interpretation of economic growth in Shenzhen Special Economic Zone

Through the above analysis, the factors for economic growth in Shenzhen are separated, i.e. capital, labor and total factor productivity (technical efficiency + technical progress). Accordingly, the elementary model for decomposition of economic growth factors could be further changed as function (6):

$$\ln(Y_t) = a_0 + \alpha_t \ln(L_t) + \alpha^T \ln(K_t) + \ln(e^{u_t+v_t})$$

The local derivation is required for time $t$ at both sides of equation, so as to arrive at the specific interpretation model for economic growth (7):

$$\frac{\partial}{\partial t} \ln(Y_t) = \frac{\partial}{\partial t} a_0 + \alpha_t \ln(L_t) + \alpha^T \ln(K_t) + \ln(e^{u_t+v_t})$$

For the contribution of each factor to the economic growth in Shenzhen and growth rate thereof, see table 3. The result shows that the economy in Shenzhen achieved high speed growth in 1980~2011. The annual average growth hereof was over 20%. However, the economical growth was mainly boosted by the input of capital. The dependency on capital was even abnormal. The contribution rate of capital for the economic growth was over 80% while the contribution of labor was much lower. The average value was around 13%. Also, the contribution rate of total factor productivity was very low and not obvious for the economic growth in Shenzhen for the past three decades. In terms of the structure of total factor productivity, the contribution of technical efficiency and technical progress to the economic growth in Shenzhen are positive, among which the contribution rate of technical progress is relatively higher. This means that the economical growth in Shenzhen and improving of total factor productivity mainly depend on the exogenous technical progress. The enterprise’s operating efficiency is not improved obviously. In terms of growth rate of resource input, the annual average growth rate of capital is apparently higher than
the labor and technical element. In recent years, the growth rate thereof has been decelerated but still at a higher level.

In 1980s, i.e. the first 10 years of Shenzhen Special Economic Zone, the economy in Shenzhen achieved very fast growth, accounting for the annual growth rate of nearly 40%. During this process of growth, the contribution of capital input was over 100%. Also, the labor factor contributed to the economy in Shenzhen to certain extent while the contribution of total factor productivity to the economic growth in Shenzhen was negative, but improving of technical efficiency still made contribution to the economical growth in Shenzhen. However, the technical progress did not offer the positive energy to the growth during this period.

As compared with that in 1980s, the economic growth rate in Shenzhen in 1990s was sharply decreased. During this decade, the dependency of economical growth on capital input was lowered. The contribution rate of capital was decreased by nearly 34%. However, the dependency on capital was still relatively high in Shenzhen. Moreover, during this decade, the contribution of total factor productivity was changed from negative to positive. However, as compared with the previous 10 years, the technical progress rather than technical efficiency made more contributions during this period.

Since 21st century, the economic growth rate in Shenzhen has been further lowered. During this period, the dependency of Shenzhen on capital input was decreased. Also, the growth rate of capital input was lowered. Though the contribution rate and growth rate of labor factor were changed, the rangeability is small. The contribution of total factor productivity was substantially increased during this period. Both the technical efficiency and technical progress could be provided with the obviously positive contribution rate. However, the growth rate of total factor productivity was still low and the contribution rate and growth rate of technical efficiency were still lower than those of technical progress. This means that there is still a long way to go for the economic transformation of Shenzhen. The importance attached to efficiency of economic operations is still less than that for exogenous technical progress.

As per the decomposition of economical growth in Shenzhen and rational separation of factor's contribution to growth, the conclusion is made as below:

Firstly, similar to the economic growth mode nationwide, the high speed economic growth in Shenzhen mainly depends on the "Exogenous Growth", which is reflected by the capital input. The release of capital productivity is the main power for fast economic growth in Shenzhen.

Secondly, the technical efficiency and technical progress-based total factor productivity slows down to make small contributions to the economic growth in Shenzhen, among which the contribution rate and growth rate of technical efficiency are lower than those of technical progress. This means that Shenzhen is transferred from "Capital-based exogenous growth" to "technical progress-based exogenous growth."

Thirdly, the contribution rate of traditional factors such as capital and labor to the economic growth is gradually decreased. As the other regions in China catch up with and surpass Shenzhen, the capital flowing into Shenzhen and labor growth rate thereof are obviously decreased, so as to reflect the resource constraint to the developed region under the total resource constraints. Thus, the economic growth rate is also decreased. Meanwhile, the growth rate and contribution rate of technical progress and technical efficiency are still relatively low, so as to indicate that there is still a long way to go for economic transformation in Shenzhen.

Table 3: Interpretation of economic growth in Shenzhen Special Economic Zone

<table>
<thead>
<tr>
<th>Period</th>
<th>Economic output</th>
<th>Capital</th>
<th>Labor</th>
<th>Total factor productivity</th>
<th>Technical efficiency</th>
<th>Technical progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981-2011</td>
<td>24.6</td>
<td>20.3(81.2)</td>
<td>14.3(13.4)</td>
<td>5.5(5.4)</td>
<td>0.6(2.5)</td>
<td>4.9(2.9)</td>
</tr>
<tr>
<td>Year</td>
<td>Growth Rate</td>
<td>Contribution Rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
<td>-------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981-1990</td>
<td>37.0</td>
<td>29.4(106.6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>23.1(22.3)</td>
<td>8.8(-28.9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.7(6.6)</td>
<td>7.1(-35.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991-2000</td>
<td>23.5</td>
<td>20.9(72.7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16.2(12.6)</td>
<td>3.5(14.7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1.0(-3.0)</td>
<td>4.5(17.7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001-2011</td>
<td>14.4</td>
<td>11.5(65.8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.47(6.1)</td>
<td>4.2(28.2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.8(4.1)</td>
<td>3.4(24.1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The figure in table is the annual average growth rate of each factor. The figure in bracket is the percentage of contribution of each factor to economic growth.

IV. Conclusion: Path choice for transformation of special economic zone

According to the result of quantitative analysis in part III, though the private economy is developed and market economy is good in Shenzhen, the main factor for the miracle of Shenzhen still depends on the input of a lot of resources. As we all know first open, favorable policies and geo-advantage (neighboring Hong Kong and Macao) play the important role in the high speed growth of economy in Shenzhen, so that Shenzhen could attract a lot of foreign funds and inland labor. Thus, the sufficient resources are available. However, it is too ambiguous if only the reform and opening up and policies are adopted as the example of successful experience. The real evidence shows that the economic growth mode in Shenzhen still depends on the extensive input of resource. The rate of resource utilization is low. It means that the transformation of market economy system in Shenzhen should be further deepened. Thus, it is more difficult for the economic transformation nationwide.

With the diminishing utility and growth potential of previous growth mode, new system reform and transformation are demanded for the economy in Shenzhen. Otherwise, the sustainability thereof will be interrupted. In this case, the life of special economic zone may be terminated. According to the transformation mode established in part II, the developed cities such as Shenzhen are provided with the inherent advantage in transformation. Meanwhile, continuous decrease of economic growth rate offers the internal impetus to the economic transformation. In terms of transformation path, the opportunity cost for system reform is increased accordingly when the economic development level is high. So, many people with vested interest have the conservative attitude to further reform or even hinder the reform. Also, a lot of market participants who expect the increased individual benefits from the system reform are unable to enjoy the same equivalent treatment as that for the registered population in Shenzhen. Also, the private entrepreneurs gradually face more pressure from pioneering work and operation, including the labor cost, environmental cost, land cost and continuously increased tax burdens. Meanwhile, the withering of real economy increased the investment risk of external capital and risk capital, so that each market participant has to be pessimistic or wait and see the economy. Therefore, the future transformation in Shenzhen should firstly consider all the legitimate rights and interests of the market participants and factor owners, so as to encourage the main market players to participate in the economic activities as well as the industrial division to form the participation-based development and emphasize the people's motility, creativity and heteroplasmy. Thus, self-actualization and value improving could be realized. In this case, the birth of predatory government could be avoided thoroughly. In addition, the expectation on the economic subject in the future could be guaranteed.

Thus, the transformation should further boost the social system reform, intensify the social & civil force and encourage the enterprises, especially the powerful enterprises to participate in the community life to promote the development of various groups & organizations. Here, both the society and citizens could pay attention to the sustainable development of economy as well as the future homeland of the people. Finally, the social norm is available to constrain and encourage the economic subject to effectively and properly utilize the resources, so as to achieve the economic transformation. In addition, the accumulation of social capital will benefit the coordination and complementary action...
among the behavioral agents. The strong social forces could be produced by the civil society which is able to solve its own social problems and internal contradictions. Thus, the self-evolution of social norm is accelerated to lower the serious social conflicts and create the harmonious social environment for the economic transformation.
References


