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The Approach to Transforming the Traditional Agricultural Economy: China's Case

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Title/Titel:

The Approach to Transforming the Traditional Agricultural Economy: China´s Case

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Abstract/Zusammenfassung:
Transforming traditional agricultural economy into modern economic growth path is the main theme of economic development. Through theoretical and empirical analysis, we find that the key of transformation is to raise the economic value of people, to improve human capital investment and to match the stocks of physical and human capital. China's rural economy is on the edge of economic takeoff, and different zones may pursue different paths for transformation. The source of rural poverty is not the scarcity of income or consumption, but the deficiency of education, social security, medical care and opportunity, which we define as "capability poverty".

Keywords/Schlagwörter:
economic transformation, transformation path, capability poverty

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The Approach to Transforming the Traditional

Agricultural Economy: China's Case

Zou Wei

Introduction[1]

During the past two centuries, the discussion on the causation and sources of economic growth has been one of the most intriguing and fascinating fields in mainstream economic theory, while the practice of transforming traditional agricultural economy into modern economy also differed drastically around the world. In short, the modern economic growth means the economy enjoys the increasing capability of providing more and better goods and services for household, and the increasing capability is based upon the corresponding change in institutional foundation and ideology. In other words, the key to economic growth lies in the sustainable improvement of living standard and welfare through constant technological and institutional innovation.

Kuznets (1973) specified six characteristics for modern economic growth: high growth rate for per capita GDP; high input-output ratio; fast transform in economic structure; fast change in social structure and ideology; technological change and diffusion; The coexistence of few developed economies and a huge number of less developed economies, where more than 3/4 of world population living in the situation much lower than the level permitted by the technology possibility. We also observed, most LDCs are still involved in the framework of traditional agricultural economy, and suffering from the very low level of per capita GDP and living standard. The transform from the traditional agricultural economy to modern economic growth path includes transform from agricultural to non-agricultural activities, transform from separated agricultural to integrated non-individual economy, and transform of the statue of traditional peasants.

Yet, as Schultz (1993) said: "The economic growth starting from traditional agricultural economy is rather costly." The traditional agricultural economy has existed for hundreds or even thousands of years, while the history of modern economy is much shorter. Actually from the viewpoint of make full use of the available opportunity and resources, the peasants in traditional agricultural economy are much closer to "optimum" and "steady-state" than those in modern economy, because the modern peasants (farmers) have to adjust frequently to the changing technology and market situation. The traditional economy usually stagnates in poverty, while the modern economy is growing constantly. In short, the traditional economy is stable and near equilibrium, while the modern economy is unstable and out of equilibrium.

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What is more, the "equilibrium" of traditional economy is surely to be broken, the transform into modern economy or industrialization is the theme of economic development.

How to transform traditional economy? The question has been hotly discussed in literatures. Some regard the main point of transform as the accumulation of physical capital; some others think it is more important to coordinate population growth and economic growth. In this paper, I think the key to transforming traditional economy lies in increasing the economic value of people, increasing investment in human capital, and matching the physical capital and human capital. The source of rural poverty in China is not the shortage of income or consumption, but the "capability poverty" induced by the scarcity of education, social insurance, health, medicare and economic opportunity in rural China.

1. The Literature

During a long period, on the one hand, the growth level and growth rates differ across economies, some economies stay as leaders, some surpass the former developed economies, some stagnate and lose the prosperity. On the other hand, all the now developed economies were once in under-developed stage. Rostow (1960) describes the society into five different kinds: traditional, pre-take off, take off, moving to maturity and mass consumption. "Take-off" is the most important stage and milestone, which means "the hindrance and pressure of stable growth has been overcome", "growth has become the normal situation". Yet take-off is rather abnormal, because the beginning of take-off can always be reduced to an extremely strong stimulus, which means "If you desire an economic success, the resources involved in development program should reach a minimal level. To push an economy into self-sustaining growth is just like to push an airplane into sky. A critical minimal speed is necessary for a successful take-off" (Rostow, 1960). However, how to endow an economy such a push that is strong enough for a take-off, is still unsolved and under investigation.

One influential point stresses the importance of physical capital accumulation. Rostow (1960) puts forward three basic conditions for a take-off: the first is to raise the ratio of productive investment to GDP from about 5% or less to more than 10%; the second is to set up one or more fast-growing manufacturers; the third is to form market-friendly political, social and institutional structure. Generally, the premise of take-off lies in the initial capability of rearranging domestic savings, internalizing the externality of investment and remaining high

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marginal saving rate, while the sharp increase of productive investment is regarded as the most fundamental condition and criteria for take-off. Lewis (1955) also mentions there was little difference between an expanding and a shrinking economy in their income distribution, yet how much of the wealth has been invested productively makes a big difference.

The Big-Push theory (Rosenstein-Rodan, 1943) deserves emphasizing. It says, the East and East-south Europe countries (then less developed) should not depend on slow self-satisfied industrialization; on the contrary, they could push a large-scale one-shot industrialization based upon the international specialization and the complementary effect among industrial sectors. Strange as it seems to be, the theory is based upon the famous theory of increasing returns and the indivisibility of investment (Allyn Young, 1928). If several sectors of an economy adopt increasing-return technology simultaneously, the income generated by each sector will provides demand for other sectors, thus expands the reciprocal market, therefore industrialization will be realized through "an integrating simultaneous big-push". Nurkse (1953), Scitovsky (1954) and Fleming (1955) develop similar theories; their main idea can be summarized as: an economy can benefit from industrialization through a jump towards the developed situation; the process of industrialization may not depend on any exogenous endowment and technology progress, it can be pushed only by investing in all sectors. Murphy,Shleifer & Vishny (1989) formulates the above idea and points out while taking up increasing-return technology, the spill-over effect of aggregate demand will induce an expansion of market scale, and result in a big-push style industrialization. Although the big-push theory seems to be perfect, the problems come from real world. The big-push strategy and high, wide-ranged investment may last as long as 20-25 years to fulfill industrialization, which sounds rather impractical for capital-lacking LDCs.

Another approach to transform starts from Malthusian theory of population trap. The point is the reason for poverty in LDCs lies in the low per capita GDP and insufficient capital formation, thus there is so-called "the trap of low level equilibrium" and "the vicious cycle of poverty". To break the stalemate, what is needed is not only an increase in per capita GDP, but also an increase large enough to surpass some "critical minimal effort" level (Leibenstein, 1954). Galor & Weil (2000) combines economic growth, population and technological progress into a formal model. The growth path is regarded as three stages: the first is Malthusian stage which is specified as slow technological progress and stable extremely low level of per capital income. The second is post-Malthusian stage which is specified as slowly increasing technology and per capita income. The third is modern growth stage which is specified as low and even negative population growth and high increase in technology and per capita GDP.

They also investigate the reason for transform from one stage to another. One reason is the increase of population and average education level stimulate knowledge accumulation and technological progress. Another reason is technological progress creates a non-equilibrium situation which makes the return to human capital relatively higher, and induces people to improve the quality instead of quantity of their offspring, that is the growth of population decreases while the accumulation of human capital increases. Hansen & Prescott (1998) also wants to formulate the transform towards modern economy. They think as long as the TFP is positive, the transform will be inevitable. There is one product, two technologies in their model. One Malthusian technology needs labor, land and capital as inputs, another Solow technology does not need land. During the earlier stage, only the Malthusian technology is used, growth rate stagnates for a long time due to the decreasing returns and population growth. Then comes the stage in which both technologies are used, per capita income increases slowly as a result. In the end, only Solow technology is used economy-wide, and high sustainable growth can be observed. Therefore the transform from traditional agricultural economy to modern economy is a natural evolution.

Another approach to analyzing the transform in LDCs concentrates on the multiple possible equilibria and the determination of final equilibrium. Once the increasing returns and positive externality are taken into account, the economic growth will differ from traditional model. Ethier (1982a, 1982b) prove the externality makes the form of international trade changeable, returns from trade uncertain, and the monopolistic competition in intermediate goods market will result in externality in final goods market. Romer (1986) thinks the possible existence of externality makes it unnecessary to separate the factor contribution and technology contribution in growth; he also extends the idea that increasing return will push accumulated growth across sectors, and set up an endogenous growth model. Krugman (1981, 1987) formulate the "unbalance-growth" model based upon externality, where the world economy is endogenously separated into rich and poor groups. The specialization induced by some history accidence will be "lock-in" through learning, thus occur multiple equilibria. The next problem is what kind of equilibrium will be chosen? Some think history does matter that is the initial situation will determine the final choice. Some others emphasize the importance of expectation. They think once people have set up some expectation about future, the expectation will be self-fulfilling. Krugman (1991) introduces externality and adjustment costs into growth model, and concludes that history and expectation will play relatively important role across economies. Matsuyama (1991) proves that because of the increasing returns in manufactures, the multiple equilibria can not by explained only by history. If people can coordinate

their expectation properly, then industrialization may occur as a result. On the one hand, the self-fulfilling optimistic expectation can make take-off possible; on the other hand, even if the initial situation is acceptable, the self-fulfilling pessimistic expectation may result in *de-industrialization*. Moreover, Mulligan & Sala-I-Martin (1993) analyzes the dynamic transition within a two-sector model. Xie (1994), based on Lucas (1988), set up a practical calculation and simulation, express the multiple equilibria and the divergence in growth explicitly.

However, we must admit that the evolution of traditional agricultural economy has made full use of the resources available. On one hand, the experience and production techniques accumulated by the peasants make them efficiently adjusted to their limited living environment. On the other hand, because the traditional economy is relatively static, knowledge learned from school education is of little economic value for peasants, thus there is little incentive for peasants to invest in human capital and get involved in creative activities. Therefore, the only feasible way to break the low level equilibrium of traditional economy and realize the transform to high level equilibrium is to raise the economic value of human, increase human capital investment and make it match the accumulation of physical capital.

2. The low level equilibrium of traditional economy and possible paths for evolution

Before industrialization, traditional economy was banded with land-based agriculture. Most population were involved in agriculture, whose living location was determined by whether the area was favorable for agriculture. There was little mobility of labor or any other resources. Simply speaking, we regard traditional economy as complete agricultural economy. Because of the limitation and non-productivity of land, traditional economy is subject not only to decreasing returns to production factors, but also to decreasing returns to scale. Suppose the land is normalizing to 1, population L increases at n annually, i.e. $L_t = L_0 e^{-nt}$. Suppose the production function is of the fixed-proportion form, and subject to constant returns to scale:

$$Y=\min(AK,BL) \qquad (1)$$

Where the ratio of capital to labor is fixed as B/A. The aggregate production function can be also written as the per capita form:

$$y=f(k)=\min(Ak,B) \qquad (2)$$

The production function can be represented as the following diagram:

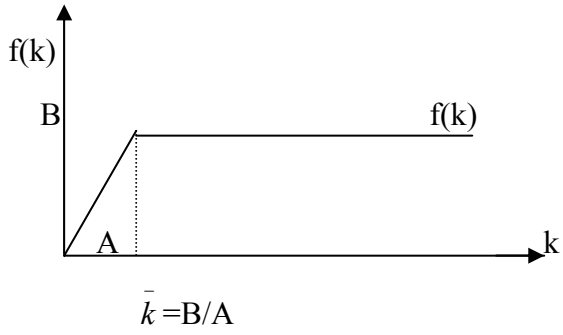


Figure 1

If s is saving rate, δ is depreciation rate, then the capital accumulation function will be as follows:

$$\dot{k}=sf(k)-nk-\delta k \qquad (3)$$

Therefore the equilibrium of the traditional economy will be determined by the Golden Rule:

$$\gamma_k=\dot{k}/k=[sf(k)/k]-(n+\delta)=0 \qquad (4)$$

There may be different equilibria of traditional economy. In Figure 2, no matter how much the per capita capital, there will always be $\gamma_k<0$, that is the per capita capital decreases, which may comes from too fast population growth. In the end, equilibrium per capita capital will converge to 0.

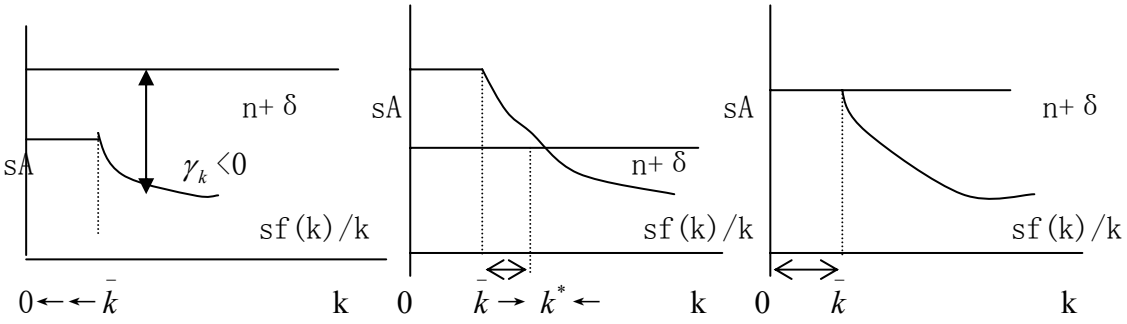


Figure 2 Figure 3 Figure 4

In Figure 3, equilibrium per capita capital is k^*. Because the production is of fixed proportion, (k^*-$\bar{k}$) will be wasted. Under this situation, instead of letting the capital unemployed, the traditional economy will produce more population, i.e. the (n+δ) line will move up, so that the equilibrium capital stock will be converge to $\bar{k}$.

In Figure 4, (n+δ) line is coincident with sA segment, the equilibrium capital can be any value between 0 and $\bar{k}$. The economy will stagnate; the productivity will be constrained by

the shortage of capital. In fact, the smaller A is compared with B, the lower the per capita capital used in production is. That is, the lower sA, the higher $\bar{k}$, which means the stagnating segment in traditional economy will be even larger.

How to emerge from the trap of low level equilibrium? One approach is to raise saving rate in economy, and remain the high saving rate for some period, which means the curve sf(k)/k shifts up in above figures. Another approach is to decrease population growth, and remain low population reproduction, which means the (n+δ) line moves down in above figures. Yet in traditional economies, most output has been used for subsistence consumption, the output that could be used for saving or capital accumulation is rather limited, which means the former approach is hard to realize. On the other hand, per capita capital is low and stable, in production function; A is small relative to B, which means people are more induced to reproduce more population, so it will also be rather difficult to decrease population growth.

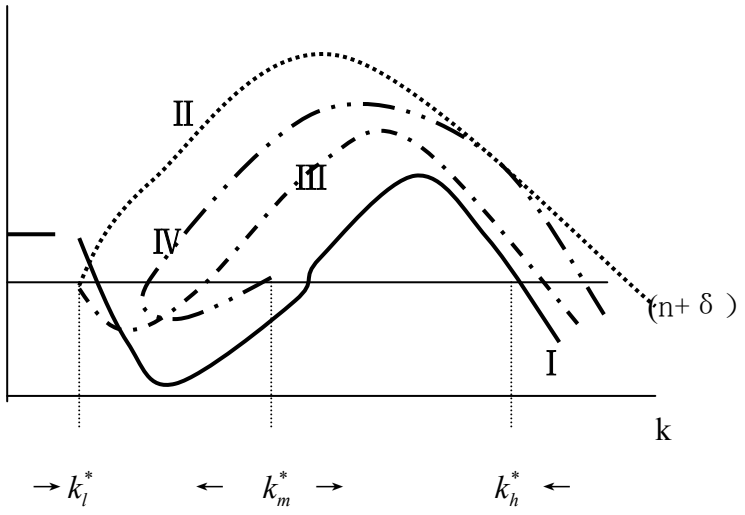


Figure 5

The key to getting rid of the trap of low level equilibrium is to introduce new factors into aggregate production function, so that the production can overcome the traditional decreasing return effect and can even be embedded with increasing return effect. Therefore with the same saving rates, output will grow increasingly as the capital input increase, i.e. there will be a increasing segment in the f(k)/k curve, then it will return to the normal decreasing segment. As Path Ⅰ in Figure 5, the low level equilibrium of traditional economy is k_l^*, where not only per capita GDP , but also per capita capital are very low, technology is stagnant, the output and population grow at the same rate. This is a stable situation, and may last for a long period.

Yet the situation is surely to be broken up sooner or later for a higher level of equilibrium, thus is called as the "Malthusian pseudo steady state" (Galor & Weil, 2000).

As capital increases, the curve f(k)/k moves to upward sloping segment, getting closer to k_m^*. But this is not a saddle point equilibrium, because on its left, population grows faster than GDP, per capita capital level will drop back to k_l^* level. Only when per capita capital accumulation surpasses k_m^*, it can approach to high-level equilibrium k_h^*. Therefore with per capita capital located in $[k_l^*, k_m^*]$, capital accumulation and technology progress will accelerate, yet before it surpass some critical level, the economy can not be tuned into a sustainable growth path. Here the k_m^* level acts as the "critical minimal level". At last, with per capita capital higher than k_m^*, the economy will move to sustainable growth path until the higher equilibrium level k_h^* is reached, which specifies the modern economic growth equilibrium.

What factors determine the evolution from low-level equilibrium to high-level equilibrium? The most important is human capital accumulation. As human capital increases, the knowledge accumulates, technology progress accelerates, which can overcome the decreasing returns of physical capital. On the contrary, the transition will raise the returns to human capital; people will be induced to replace population quantity with higher quality. Several possible paths have been depicted in Figure 5. The situation corresponding to Path Ⅱ is an economy whose per capita physical capital is quite low as k_l^*, while the stock of human capital is high (Germany and Japan after WWⅡ are examples, with physical capital destroyed by war, while human capital well preserved). In this situation, as long as the economy can increase physical capital (via high saving rate, or foreign capital etc.), it can take off quickly. Actually, k_l^* and k_m^* are coincident, pushing the economy jumping out of low level equilibrium.

Path Ⅲ corresponds with the situation when per capita physical capital is k_l^*, yet human capital is relatively more abundant. For example, some countries are rather poor, but per capita education level is quite high due to history, custom, etc. This kind of economy can balance its accumulation of physical and human capital, approaching to critical level. Because of the substitution and complementness between physical and human capital, the critical level k_m^* is closer to k_l^* compared with Path Ⅰ, which means a faster take-off.

Path Ⅳ is the situation when per capita physical capital is approaching to but has not reached k_m^* level, while human capital is much lower (there are may be lots of reasons, such as education is strictly limited by religion, or human capital is destroyed by natural disasters or epidemic diseases). In this case, more physical capital accumulation will not lead to a take-off. On the contrary, a feasible approach is to relatively decrease physical capital accumulation, while increasing human capital accumulation significantly, take-off may occur when the ratio of two capital stocks get appropriate. In sum, it is not the stock of physical capital, but the proportion between the stocks of physical capital and human capital, that determines whether an economy can take off.

3. The Transition in Agricultural Economy: China's Characteristics

It is rather hard to give judgment where an economy is located on its transition path. Kuznets (1971) summarizes several important criteria based upon the long-run growth experience of developed countries. Two criteria deserve special attention. One is the level of per capita income. Most developed countries reached a higher per capita income on the verge of take-off. For example, per capita income of British and Swede was $217-227, per capita income of pre-European Colony countries was $474-760 (1965 US$). The other is the share of agriculture in GDP. The share of agriculture in GDP used to be as high as 40-60%, as Germany in the 19th century, Denmark in 1970s, Italy in 1960s, USA in 1940s, Japan in 1980s. However, after its take-off, the share decreases sharply until it was lower than 10%. China's economy is a typical dualist economy under transition, how to transform traditional agriculture is the key to take-off. We will focus our attention to China's agriculture and rural area.

(1) Per capita output for peasants is still low, the share of agriculture in GDP is decreasing, yet still not enough compared with the take-off criteria.

Although China's GDP surpasses 10 trillion RMB in 2002, per capita GDP is about $900 (current price). Yet only when per capita income in rural area reaches take-off level, can the whole economy tune into modern growth path. Table 1 summarizes the recent situation of per capita income in rural China. Until 2001, per capita income in rural China is just around $190, much lower than what we observe in the history of developed countries. Actually the gap is even larger if we take into account the price difference.

Table 1 Output, Population and per capita income in Rural China

	1990	1995	2000	2001
First sector output (Bil.RMB)	501.70	1199.30	1462.81	1460.99
Rural population (10 thousand)	89590.3	91674.6	92819.7	93382.9
Per capita income(RMB)	559.99	1370.8	1576.3	1564.2
Per capita income(US$)	68.29	159.5	192.2	190.7

Sources: China Agriculture Yearbook 2002, p.15 ,31

Figure 6 GDP and first sector output□1952-2001

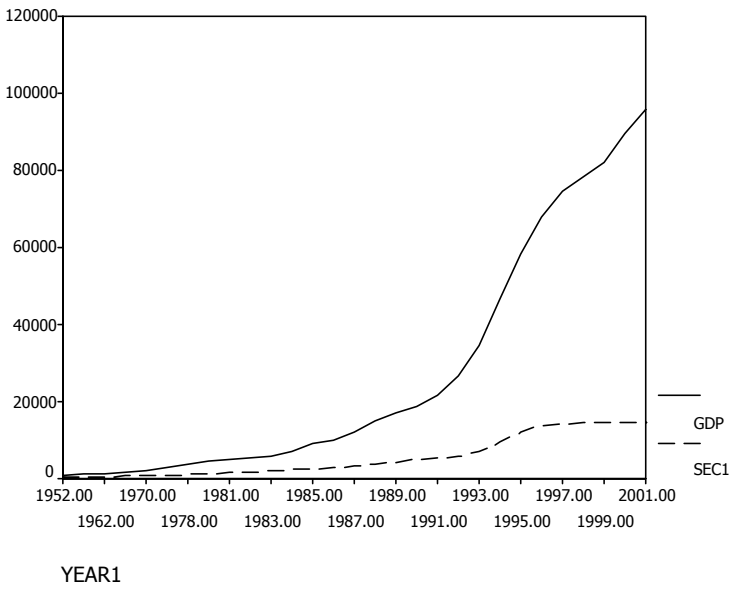
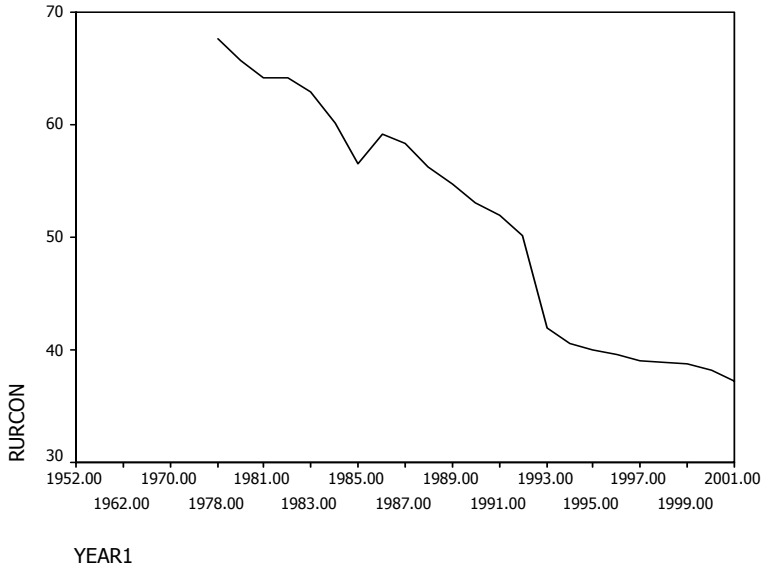


Figure 7 The share of rural consumption in the national consumption

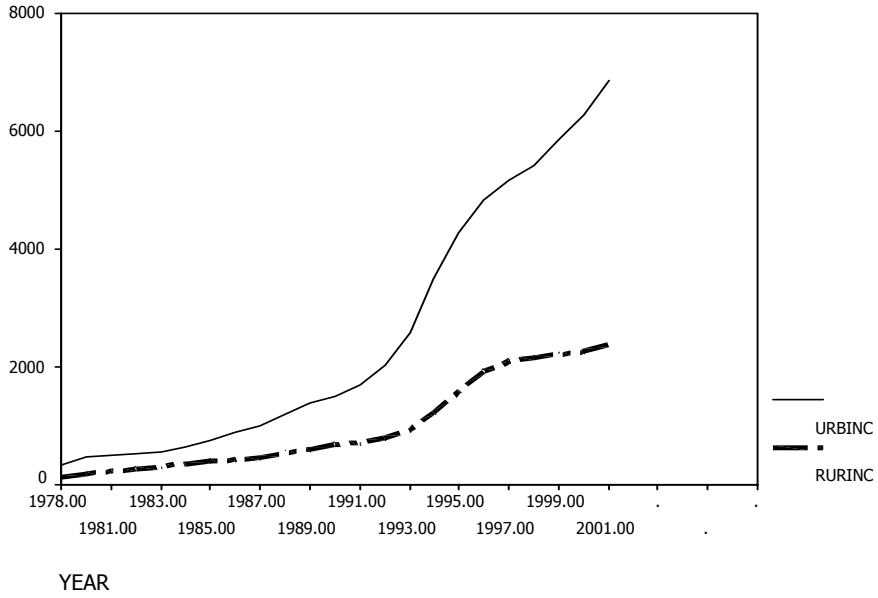


From Figure 6, it is easy to see that both GDP and first sector output grow very slowly during 1952-1978. Due to the household responsibility system, the first sector output increases faster and gains 4 more percentage share in GDP during 1978-1984[2]. 1985-1993 witness a slow-down in agriculture, and its share in GDP decreases 8.5 percentage as a result. With the price reform for agriculture goods, the share of the first sector in GDP increases again up to 20%. Since 1997, the share has been decreasing constantly with a share of 15.2% in 2001.

In the same period, the share of rural consumption in national consumption has been decreasing generally, with 1985-1988 as an exception. 1988-1993 witnesses the fastest decrease, after which the decreasing rate declines (see Figure 7). In general, agriculture is getting more and more unimportant in national economy. Yet the decrease of its share in output and consumption is not stable or monotonic, the first sector still stands for a share much larger than 10% in GDP. We conclude that China's rural economy is changing and almost on the verge of its take-off, yet it has not reached the critical level as showed by Path Ⅰ in Figure 5.

[2]Except special notation, the data come from China Agriculture Yearbook 2002 and China Peasant Investigation Yearbook 2002.

Figure 8 Urban and rural per capita income:1978-2001



(2)There are still sharp gaps between urban and rural residents from the view point of their income and consumption, the poverty is especially serious in rural China.

Figure 9 Urban and rural consumption (with rural residents normalized as 1)

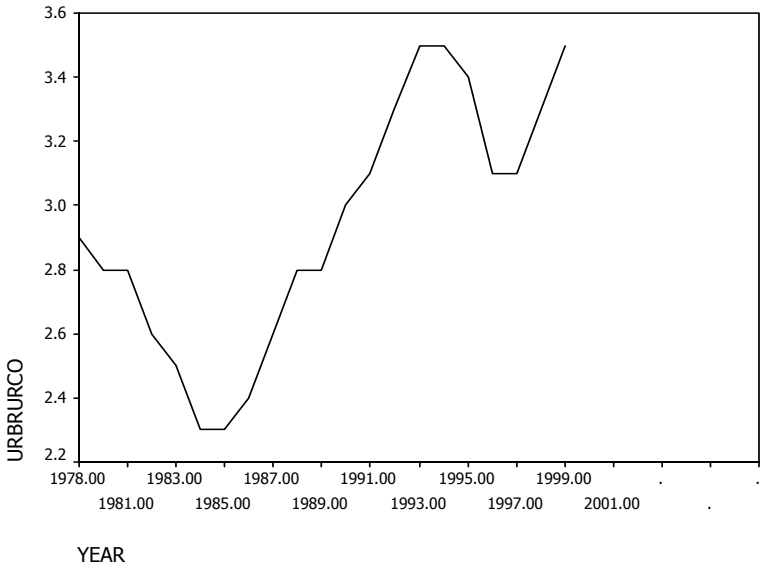


Figure 8 is the time series change of per capita disposable income of urban and rural residents. In 1978-1985, per capita income of rural residents grows faster than that of urban residents, leading to a smaller gap with the later. Yet the gap has been increasing ever since, especially after 1996, when there is little increase in peasants' income, while income of urban residents increases significantly. Figure 9 describes the consumption gap between urban and

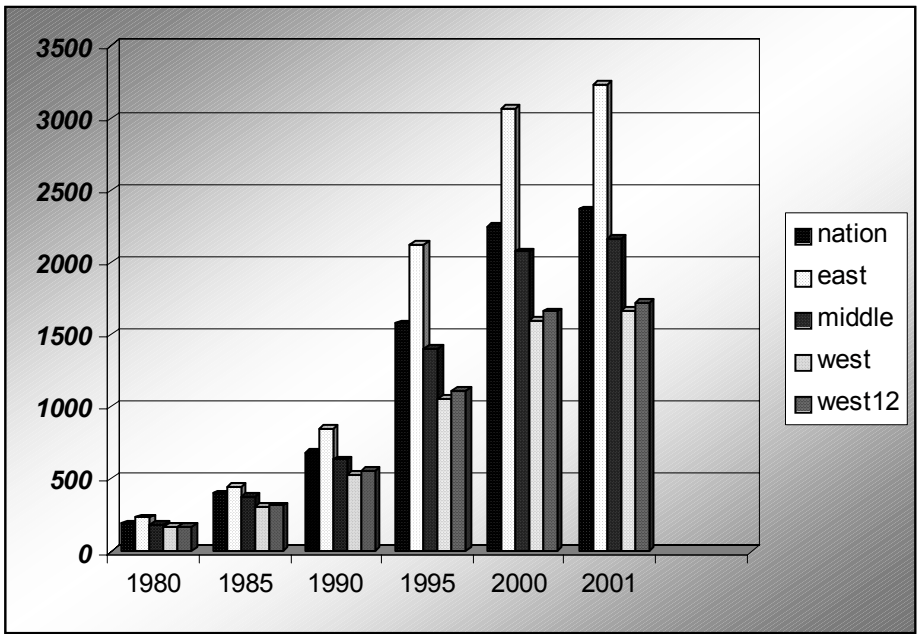
rural residents with rural consumption normalized as 1. The gap decreases during 1978-1984 and 1993-1996, resulting from the household responsibility system and the raise of produce prices respectively. However, in 1985-1992 and the years after 1996, the gap is increasing.

Meanwhile, the poverty is a serious problem in rural area. According to the China's statistics, the annual per capita income is lower than 630 RMB is regarded as "absolute poverty", the accidence rate of absolute poverty is 3.2%, with the poverty population as high as 29.27 million. Actually this poverty criteria is very low, it is only equivalent to daily per capita income no more than $0.22, while the World Bank defines poverty as daily per capita income no more than $1. According to the international criteria, the poverty number in China will be much larger. Moreover, most of the "absolute-poverty" people are located in rural China, especially western rural China. 62.8% of the 581 national "poverty counties" and 53.4% of poverty population are located in the 12 "Big-Development" mid-western provinces. How to relieve the acute and widely-spread poverty is still a serious problem and challenge to transforming traditional agriculture in China.

(3)The income gap within rural areas is widening, which means different areas may realize their transform through different approaches.

Figure 10 the divergence of per capita income:

The Eastern, the Middle, the Western and the 12 "Big-Development" mid-western Region



There are three large regions in China: the Eastern, the Middle and the Western regions[3].In my research, the per capita income diverges significantly across rural China, and there is no evidence that the divergence will shrink. The variances of per capita income across three regions are 26.7, 57.2, 131.21, 445.29, 611.93, 654.85 (RMB) in 1980, 1985, 1990, 1995, 2000, and 2001 respectively. In Figure 10, the Eastern rural area is developing the fastest, while the Middle and Western rural areas are lagging behind further and further away. The situation of the 12 "Big-Development" mid-western provinces is getting better compared with the geographical Western area. The difference and divergence shows the possibility of transforming traditional agriculture through different approaches.

(4)The Engle's coefficient is decreasing in rural China, while the expenditure on medical care, transportation and education is increasing sharply, which may play an increasingly important role in the investment on peasants themselves.

There is a tendency that the Engle's coefficient will decrease with economic development and economic transform. Figure 11 depicts the general decreasing tendency for rural China in 1978-2001. Yet we can also find some increasing segments (such as 1980, 1988-1990, 1991-1995), which represents in some way the fluctuation of economic transform. Figure 12 shows how much the peasants are spending for medical care, transportation and education in the past two decades. We can find a significant increase in the spending on these items, especially on education, which can be interpreted as an increase in the investment on people and an increase in emphasis on human capital accumulation.

[3] The Eastern region includes 12 provinces: Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi and Hainan. The Middle region includes9 provinces: Shanxi (taiyuan), Neimenggu, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan. The western region includes 10 provinces: Chongqing, Sichuan, Guizhou, Yunnan, Xizang, Shanxi (xi'an), Gansu, Qinghai, Ningxia, Xinjiang. Yet

Figure 11 The change in Engle's coefficient in rural China: 1978-2001

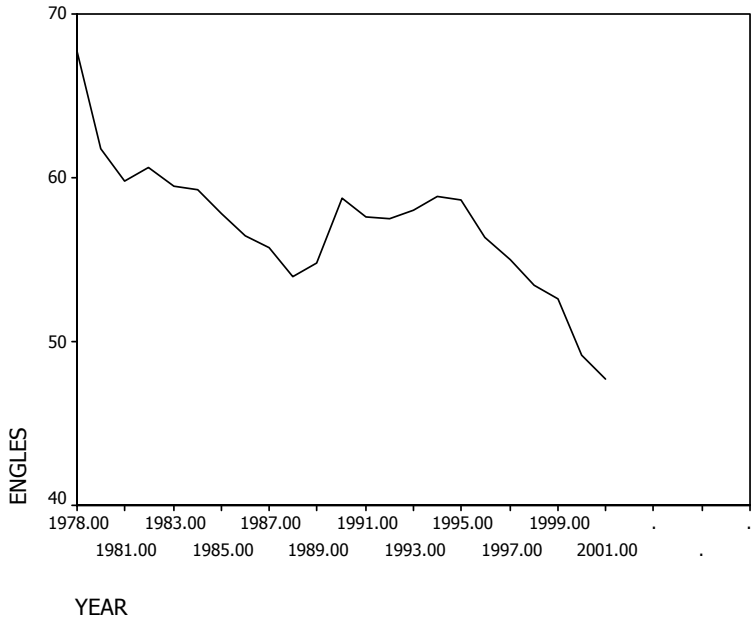
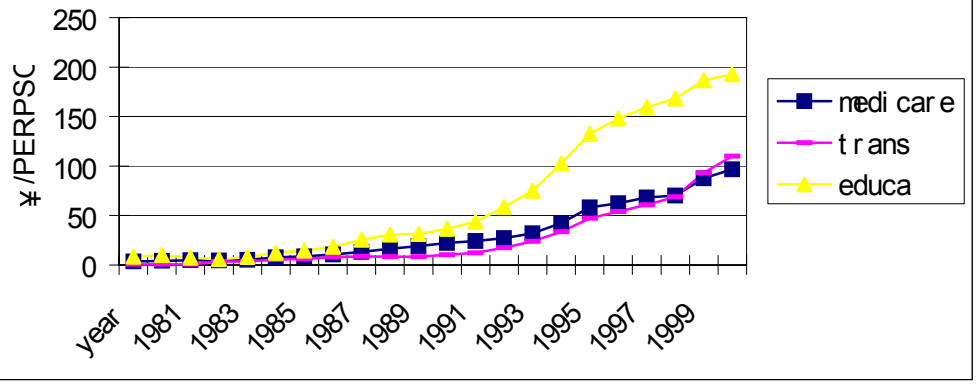


Figure 12 Rural Spending on medical care, transportation and education



4. Transforming Traditional Agricultural Economy in China: Empirical Analysis

In this section, we will analyze the determinants for transforming traditional agricultural economy in China through empirical analysis. Both time series and cross section data will be considered. The time series data are focused the period 1978-2001. Because China's rural economy has been growing relatively faster and more stable since 1978, all the statistical data can be consistently obtained. "*The decreasing share of the first sector output value in GDP*" is regarded as one of the most important criteria for transform. We will use this share as inde-

the 12 "big-development" mid-western provinces are: Neimenggu, Guangxi, Chongqing, Sichuan, Guizhou,

pendent variable, i.e. if some independent variable is negatively related with the share, it will regarded as favorable to economic transform; on the contrary, if some variable is positively related with the share, it will be regarded as a hinder to economic transform. The basic regression function is as follows:

$$A = C + \alpha_1 K_1 + \alpha_2 K_2 + \alpha_3 H_0 + \alpha_4 H_1 + \alpha_5 H_3 + \alpha_6 H_5 + \alpha_7 Expen + \alpha_8 Pindex + \alpha_9 Engles + \alpha_{10} Med + \alpha_{11} Trans + \alpha_{12} Educa + \alpha_{13} Dummy$$

Where:

A=The share of the first sector output value in GDP╳100;

K_1 =the rural collective fixed investment (billion RMB);

K_2 =the rural peasant fixed investment (billion RMB);

H_0, H_1, H_3, H_5 =within every 100 rural labor, the number of those whose education can be judged as "illiterate", "primary school", "high school", "College or higher"[4];

Expen =rural resident's consumption spending (without taking account into the price factor, ¥/person,year);

Pindex =price index for rural production factors (with the last year normalized as 100. Because of the change in statistics standards, we can only use "price index for rural industrial goods" instead for 1978-1984);

Engles =Rural Engel's coefficient;

Med =rural spending on medical care (RMB/person, year);

Trans =rural spending on transportation and post services (RMB/person, year);

Educa =rural spending on education (RMB/person, year);

Dummy =0 for 1978-1984; =1 for 1985-2001.

The regression results are summarized in Table 2, with the t-statistics in the parenthesis under each variables.

Yunnan, Xizang, Shanxi (xi'an), Gansu, Qinghai, Ningxia and Xinjiang.

[4] In China's national statistics, the education level of rural labor can be classified into six categories: "illiterate", "primary school", "secondary school", "high school", "specialized technical training school", and "college and above".

Table 2 The time series regression results: 1978-2001

	Reg. 1	Reg. 2	Reg. 3	Reg. 4	Reg. 5	Reg. 6
C	44.752	41.417	41.249	83.194	51.212	36.343
	(7.336)	(0.646)	(7.635)	(1.146)	(0.697)	(0.551)
K_1	-0.671	-1.061	-2.509		0.265	0.337
	(-1.525)	(-2.829)	(-3.914)		(0.436)	(0.619)
K_2	-1.819	-1.122	-3.683	0.994	2.064	1.835
	(-1.690)	(-1.195)	(-3.805)	(0.981)	(3.406)	(3.316)
H_0		0.713		0.070	0.443	0.772
		(1.153)		(0.098)	(0.633)	(1.193)
H_1		-0.178		-0.345	-0.118	0.096
		(-0.345)		(-0.571)	(-0.191)	(0.170)
H_3		-0.100		-0.321	-0.160	0.034
		(-0.217)		(-0.799)	(-0.378)	(0.087)
H_5		-0.002		-0.732	-0.454	-0.189
		(-0.003)		(-0.917)	(-0.547)	(-0.250)
Expen	1.547	1.845	4.956	1.180		
	(1.294)	(2.007)	(4.379)	(1.353)		
Pindex	-0.231	-0.124	-0.202	-0.223	-0.208	-0.215
	(-2.450)	(-1.105)	(-2.445)	(2.470)	(-1.942)	(-2.241)
Engles						-0.190
						(-1.953)
Med			-4.001	0.410	1.035	1.193
			(-4.587)	(0.176)	(1.013)	(1.304)
Trans			2766	0.276	-0.319	-0.855
			(4.705)	(0.445)	(-0.530)	(-1.416)
Educa			1.616	-2.752	-2.863	-2.412
			(1.789)	(-3.766)	(-2.517)	(-2.317)
Dummy				-0.367	-0.399	-0.440
				(-3.498)	(-3.606)	(-4.357)
R^2	0.881	0.961	0.957	0.983	0.980	0.986
F-statistics	33.204	43.349	47.236	56.768	49.378	57.158

The above regression can result in very interesting conclusions. Firstly, if we only consider the role that rural collective and peasant fixed investment play in economic transform, the positive effect is obvious (Regressions 1 and 3); yet when we take into account the education levels of peasants, the effect of physical investment becomes very insignificant (Reg. 2).

If we take into account more factors regarding investment on peasants themselves (such as spending on medical care and education), the physical investment even plays a negative role in economic transform (Reg. 4, 5, 6). The conclusion just testifies our point that with a low human capital stock, increase in physical capital may not be favorable for transforming traditional agriculture economy.

Secondly, in each of the above regressions, the rural consumption expenditure is negatively related with transform in rural areas, while the increase in price index of rural production factors is favorable for transform. It is usually supposed that the rise of prices of rural production factors is unfavorable to peasants, yet from another viewpoint, the price rise actually raises the relative advantages for non-agricultural activities, thus provides more economic opportunities for peasants.

Thirdly, the effect of peasants' education levels on transform is generally insignificant, mainly because education affects economic activities with much longer time-lag compared with other variables. However, we also find out that the extremely low education level ("illiterate" or "primary school") is a hinder for transform; while the higher education level ("high school" or "college and above") is significantly positive to transform.

Fourthly, within rural expenditure, the spending on medical care, transportation and education has diverse effect upon economic transform. Basically, rural medical care expenditure has insignificant negative effect on transform. After the collapse of the former cooperative health system in rural China, peasants have to pay much more than before for routine medical care, many peasants even have to give up going to hospital due to the high medical costs. Thus the medical care spending of peasants may not reflect their invest on health. When taking into account the education levels and transportation spending in rural China, the latter plays a positive actor in transform, which means more mobility, more access to information is helpful for peasants to invest in education and training, therefore helpful for transform. The positive role of rural education spending on economic transform is also significant as we expect.

In order to analyze the cross section data, we adopt the most recent statistical and investigation data from China's National Bureau of Statistics in 2001. We want to find out what determine the transform paths in the 31 provinces up to now. The basic regression function is as follows:

$$A_j = C_j + \beta_1 K_j + \beta_2 N_j + \beta_3 H_{0j} + \beta_4 H_{1j} + \beta_5 H_{2j} + \beta_6 H_{5j} + \beta_7 HOS_j$$
$$+ \beta_8 Expen_j + \beta_9 So\sec_j + \beta_{10} Med_j + \beta_{11} Trans_j + \beta_{12} Edu_j + \beta_{13} Dummy_j$$

Where:

A_j =the share of the first sector output value in GDP for the jth province (j=1, 2,…, 31, as below)╳100;

K_j =the rural fixed investment in the jth province (billion RMB);

N_j =the rural labor force in the jth province (10 thousand);

H_{0j}, H_{1j}, H_{2j}, H_{5j} =in the jth province, for each 100 rural labor, the number of those whose education levels are defined as "illiterate", "primary school", "secondary school", "college and above";

HOS_j = the number of rural hospitals in the jth province;

$Expen_j$ = the rural residents' consumption spending in the jth province (¥/person);

$Sosec_j$ = the rural social emergency fund in the jth province (10thousand);

Med_j = the rural residents' spending on medical care in the jth province (¥/person);

$Trans_j$ = the rural residents' spending on transportation in the ejth province (¥/person);

Edu_j = the rural residents' spending on education in the jth province (¥/person);

$Dummy_j$ = Dummy for regions. =1, if the province is in the Eastern area; =2, if it is in the Middle area; =3, if it is in the Western area.

The basic regression findings are as follows:

Table 3 The main regression finding of cross-section analysis: 31 provinces

	Reg. 1	Reg. 2	Reg. 3	Reg. 4	Reg. 5	Reg. 6	Reg. 7
C	27.423	167.060	32.657	36.788	184.995	46.887	154.883
	(4.517)	(3.808)	(5.073)	(3.913)	(4.029)	(3.038)	(2.745)
K_j	-0.381	-0.579	-0.036	0.449	-0.280	-0.013	0.049
	(1.429)	(-2.534)	(-0.106)	(1.229)	(-0.952)	(-1.411)	(0.120)
N_j	0.402	0.525	1.018	0.735	1.040	0.341	0.889
	(1.670)	(2.591)	(2.605)	(1.779)	(2.977)	(1.211)	(2.231)
H_{0j}		-1.370			-1.597	-0.009	-1.289
		(-2.770)			(-3.063)	(-0.038)	(-2.031)
H_{1j}		-1.009			1.217		-0.959
		(-2.404)			(-2.744)		(-1.748)
H_{2j}		-2.001			-2.154	0.349	-.1709
		(3.323)			(-3.483)	(-1.217)	(-2.371)
H_{5j}		-0.535			-0.557	-0.577	-0.464
		(-1.618)			(-1.722)	(-3.094)	(-1.364)
HOS_j			-0.834	-0.959	-0.727		-0.840
			(-1.961)	(-2.119)	(-1.787)		(-1.732)
$Expen_j$	-0.568		-0.702	-0.723	-0.840		-0.817
	(-2.932)		(-3.457)	(-3.251)	(-2.525)		(-2.129)
$So\ sec_j$			-0.320	-0.408	-0.208		-0.286
			(-1.246)	(-1525)	(-0.955)		(-1.107)
Med_j				-0.410		-0.001	-0.217
				(-2.208)		(-0.005)	(-0.993)
$Trans_j$				-0.053		-0.407	-0.038
				(-0.239)		(-2.085)	(-0.164)
Edu_j				0.206		0.216	0.135
				(1.247)		(1.307)	(0.723)
R^2	0.482	0.713	0.557	0.684	0.755	0.682	0.787
F-Statistic	5.819	6.532	4.810	4.815	5.845	4.757	4.540

Note: t-statistics are in parenthesis. All the regressions include dummy for regions.

From the above cross section analysis, we can draw some interesting results. Firstly, if we only consider physical investment in rural areas, its effect is insignificantly positive (Regression 1). While taking into account physical capital as well as education level of labor, the effect of physical capital becomes even more insignificant (Reg.2). But when we consider

rural spending on medical care, rural consumption etc., the effect of physical capital on economic transform becomes very fluctuating (sometime positive, sometimes negative), and rather weak. We can conclude that physical capital accumulation is not unique factor for rural transform, or even it is not the main factor.

Secondly, the huge amount of rural labor force is the unavoidable hindrance for rural transform. In all the regressions, we find that rural labor force plays significantly negative effect on rural transform. That means it is still a tough task for China to move the huge amount of surplus rural labor out of traditional agriculture, change their statue, employment and living style.

Thirdly, rural consumption expenditure has significant positive effect on rural transform. During the past decade, rural consumption increases sharply in all rural areas with a perceptive change in the structure of spending. In 2001, almost in all the provinces, education becomes the third largest spending for rural peasants (following the spending on food and housing), the rural spending on medical care and transportation also increases, and surpasses spending on clothing and housing equipment, ranking the fourth and fifth for Eastern area. All of these lead to a higher investment in peasants themselves. However, the effect of this kind of spending is not so significant due to the former mentioned time-lag. We also find in regressions 4,6 and 7 that spending on education is even weakly negatively related with economic transform. The reason is that education costs increase faster in rural areas and even becomes a burden for poor peasants. In mid-western poor areas, many peasants can hardly afford the rising education costs, which results in higher rates of drop-offs in some areas (especially for girls). In this sense, the rural education spending may not mean keeping more rural kids in school.

Fourthly, the increase of rural hospitals has positive effect. With the collapse of cooperative health system, how to keep peasants medically healthier is a big problem. Recently there appear lots of private hospitals in addition to collectively held ones, which play helpful role in rural areas. The rural social emergency fund also helps, yet not significant enough. That means unilateral transfer is not enough to pull peasants out of the trap of poverty.

Fifthly, there is significant effect of education levels on economic transform. Generally, an education as high as “primary school” or “secondary school” is significantly helpful, yet the higher education level such as “college and above” has insignificant effect on rural transform (Reg.2,5,7). That is because most peasants with primary or secondary school education will work and live in rural areas, while most peasants (or their children) with college or higher

level education will almost definitely refuse to return rural areas. It seems puzzling that in the above three regressions, we find the number of "illiterate" peasants even has some "positive "effect on transform. What is really going on? Actually, Reg.6 shows that if we only take into account several factors regarding rural education, the effect of the extremely low education level is neglectable, while the effect of high education level is rather significant, and the negative effect of rural education spending is also stronger than in other regressions. The possible reason lie in that higher education is very expensive for peasants, especially for those in poor areas. To raise college tuition, many peasants have to give up other productive spending or cut down primary education for other kids in the same family.

5. Concluding remarks:

Through the theoretical and empirical analysis, we figure out that to transform the traditional agricultural economy, different areas in China actually pursue diverse paths. In the Eastern areas, peasants are traditionally more concerned about investing in themselves, including more schooling, trans-generational transfer of skills and knowledge, more liquidity and mobility, more flexibility in their living style and economic activities, etc. Therefore once the peasants are given opportunity to accumulate physical capital and expend business, a significant take-off and constant economic growth will result. For example, the rural areas in the Yangzi River Delta enjoy abundant human capital which has been accumulated for long, while the rural areas in the Pearl River Delta enjoy abundant human capital which has immigrated from inland China. Both Deltas realize high development during the past two decades, whose approach can be described by Path Ⅱ (Figure 5).

In Middle areas, traditional agriculture are well developed from history, peasants also show passion for investing in human capital. In some provinces (such as Hubei, Hunan, Anhui), rural spending on education has become as high as that in the Eastern areas. In the 1980s, the Middle areas lagged behind partly because of the geographical disadvantage, partly because of the stagnant investment in human capital. As the increase in physical capital accumulation, this area will pay more attention to investment in human capital, and it can pursue a transform path like Path III.

The Western area is located further inland; it is natural resources abundant and notoriously poor. On the one hand, peasants have limited capability to invest in themselves. On the other hand, the existent human capital moves to eastern and middle areas, which makes the lackness of human capital even more serious. Meanwhile, central and local government consistently emphasizes the weakness of infrastructure in the west, and increase physical capital

accumulation as a prescription for poverty. As a result, the limitation of human capital gets even worse, which in turn constrains the possibility of take-off. Therefore, it is better for the Western rural China to pursue the path Ⅳ, i.e. the area can increase human capital investment faster even at the cost of physical capital accumulation, so that there may be better a match between physical and human capital, until it realizes its take-off.

Most poverty counties and poverty population are concentrated in the 12 "Big-Development" provinces, transform traditional rural economy is closely related with the task of poverty relief. The per capita income, per capita consumption of these provinces are not only much lower than those of urban areas, but also much lower than those of rural average levels, which constitute a full picture of income poverty and consumption poverty. However, more attention should by paid to the reason for the perverse poverty. There is a sharp lackness of medical infrastructure, little social insurance in the west; the rural spending on medical care, transportation and education is also much lower than average level, which means limited capability of investing in rural people. On the other hand, the official investment on human capital is obviously inadequate. Take education for example[5], according to national education budget statistics in 1999, in the national poverty counties, the education per primary school student is 65.4% of that of urban average level, 69% of that of rural average level. The corresponding education budget for per secondary school student id 61.2% of that of urban average level, the extra-budgetary education fund per secondary student is only 45.9% of that of urban average level and 70% of the rural average level. Actually, the income or consumption poverty in the 12 "Big-Development" provinces is just an evidence or poverty, while the source for poverty lies in the lackness of capability or incentive to invest on human capital. The poverty regarding education, medical care, social insurance and economic opportunity can be defined as "capability poverty". It is the capability poverty that results in the trap of the low level equilibrium in traditional agricultural economy. The policy implication is obvious. We should pay more attention on human capital accumulation in poverty rural areas, and try to get more human capital involved in the western development (for example, attracting newly graduated college students to work in the western areas for some time or for long). A higher and constantly increasing level of human capital and its match with physical capital is the key to take-off and a successful economic transform.

[5] The original data of the investigation can be referred to Wang Rong: "On the equality of compulsory education in China", China Quartly of Economics, Jan. 2003.

References:

Caballe, J. & Santos, M.(1993) "On endogenous growth with physical and human capital", *Journal of Political Economy*, 101(6),pp.1042-1067.

Ethier, W. (1982) "National and international returns to scale in the modern theory of international trade", *American Economic Review*, pp.389-405.

Fleming, J. (1955) "External economies and the doctrine of balanced growth", *Economic Journal*, June, pp.241-156.

Galor, O. & Weil, D. (2000) "Population, technology, and growth: From Malthusian stagnation to the demographic transition and beyond", *American Economic Review*, Sept. pp.806-828.

Hansen, G. & Prescott, E. (1998) "Malthus to Solow", NBER working paper #6858.

Hendricks, L. (1999) "Cross-country income differences: technology gaps or human capital gaps?", Arizona State University, memo.

Krugman, P. (1991) "History vs. expectation", *Quarterly Journal of Economics*, May, pp.651-667.

Krugman, P. (1981) "Trade, accumulation, and uneven development", *Journal of Development Economics*, pp.149-161.

Krugman, P. (1987) "The narrow moving band, the Dutch disease, and the competitive consequences of Mrs. Thatcher", *Journal of Development Economics*, pp.41-55.

Kuznets, S. (1971) *Economic Growth of Nations*, Harvard University Press.

Kuznets, S. (1973) "Modern economic growth" (Nobel lecture), *American Economic Review*, June,pp.33-56.

Lewis, W. A. (1955) "*Economic Growth Theory*", Richard Owen Publishers.

Lucas, R. (1988) "On the mechanism of economic development", *Journal of Monetary Economics*, July, pp.3-42.

Lucas, R. (2000) "Some macroeconomics for the 21st century", *Journal of Economic Perspectives*, 14, pp.159-168.

Matsuyama, K. (1991) "Increasing returns, industrialization, and indeterminacy of equilibrium", *Quarterly Journal of Economics*, May, pp.617-650.

Mulligan, C. & Sala-I-Martin, X. (1993) "Transitional dynamics in two-sector models of endogenous growth", *Quarterly Journal of Economics*, 108,pp.739-773.

Murphy, K., Sheleifer, A. & Vishny, R. (1989) "Industrialization and big push", *Journal of Political Economy*, 97 (5), pp.1003-1026.

Nurkse, R. (1953) "Problems of Capital Formation in Underdeveloped Countries", Oxford University Press.

Romer, P. (1986) "Increasing returns and long-run growth", *Journal of Political Economy*, Oct. pp. 1002-1037.

Rosenstein-Rodan, P. (1943) "Problems of industrialization of eastern and south-eastern Europe", Economic Journal, 53, pp. 202-211.

Rosenstein-Rodan, P. (1961) "Notes on the theory of the 'Big Push'", in H.Ellis & H.Wallice(eds.) *Economic Development in Latin America*, St. Martin's Publishers.

Rostow, W. W. (1960) *The Stages of Economic Growth*, Cambridge University Press.

Schultz, T. W., (1960) "Capital formation by education", *Journal of Political Economy*, 68(6),pp. 571-583.

Schultz, T. W., (1962) "Reflection on investment on man", *Journal of Political Economy*, 70(5),pp. 1-8.

Schultz, T. W., (1993) *Origins of Increasing Returns*, Blackwell Publishers.

Scitovsky, T. (1954) "Two concepts of external economies", *Journal of Political Economy*, April, pp. 143-151.

Xie, D. (1994) "Divergence in economic performance: transitional dynamics with multiple eqiulibria", *Journal of Economic Theory*, June, pp.97-112.

Young, Allyn (1928) "Increasing returns and economic progress", *Economic Journal*, 38. pp.527-542.

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