



Economic Growth and Structural Transformation

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Abstract:

This paper studies structural transformation in China. Structural transformation is defined as the reallocation of economic activity across the three sectors of economy viz, primarily, manufacturing, and services that complement the modern economic growth. We present China's different Sector Database including time series of value added by different sectors and employment during the period 1991 to 2016. During the referenced period, China's economic average growth rate was about 10% and is followed by a decrease in the share of agricultural output and employment. We have used different economic concepts and theories to explain the phenomena of structural transformation of China's economy from 1990-2016.

Keywords: Structural transformation, GDP growth rate, China, Productivity, Employment, Sectors, Agriculture, Non-agriculture

Introduction:

The term "structural transformation" with its diverse importance and elucidation is broadly utilized in growth economics. Structural transformation is characterized as the reallocation of economic resources over the three expansive areas of economy viz, agricultural, industrial, and service sector that goes with the economic growth of the economy. Structural change is characterized as the progress of an economy from low efficiency and labour abundant agricultural to higher profitability service sector. Economic structure change is a long haul move in the major structure of an economy and for the most part impacts the economy's growth and development. In growth economics, the structure change is characterized as a procedure of combining economic growth with changing offer of various sectors in (GDP) and share of the workforce in different sectors of the economy. All the supported scenes of economic growth of the world are supported by major fundamental changes after some time. Structure change prompts the rise and extension of new industries, which thus causes the movement of the labour force from the old businesses to new and present day ones (**United Nations Human Settlements Programme, UN-Habitat**). Generally the example of structure change in research of developed nations has pursued an arrangement of the move from primarily to secondary and afterward to the tertiary sector. In this pattern, developing economy is described by an abundance share of primarily sector of economy, while with economic development the share of non-primarily sector increases and that of primarily decreases and accordingly in the wake of achieving a sensible state of improvement, the tertiary sector accomplishes significance by turning into the prevailing segment of the economy. These auxiliary changes have been watched both in the general offer of total national output and in the workforce of the economy. (**Chenery, S.Robinson and Syrquin,1986**). The main impetus behind the structural change is the difference in productivity in the non-agricultural sector. It is likewise portrayed by the development of the workforce from

unskilled labour dominant to skilled ones. The transfer of workforce is extremely influenced by the presence of opportunities in the skilled sector on the grounds that, regardless of whether these opportunities exist, work may possibly move to another work only if it is absorbed by that sector. The existing work force would in this manner require essential training before moving to the new work.

The model of Structural change is generally helpful to developing nations because of the presence of structural heterogeneity which backs off their advancement. The presence of a negative connection between different sectoral efficiency has been demonstrated by **Mc Millan and Rodrik (2011)**. The casual relationship between structural transformation and economic growth (regardless of whether economic growth decides structural change or vice-versa) isn't completely replied by various economists. To address this inquiry, many economists have attempted to incorporate structural change into formal growth hypothesis like, **Kongsamut et al. (2001)**, **Ngai and Pissarides (2007)**, **Bonatti and Felice** and many more. The issue with these models is that they take an assumed connection between these two factors. In any case, one can conclude the cause and effect relationship between economic growth and structural change from Engel's law. This law predicts that economic growth is causing structural change because of adjustment in the production process due to demand side changes and that a higher rate of economic growth builds the speed of structural change. On the other hand, changes in the structure of the economy additionally impact the economic growth due to sectoral contrasting efficiency grains. However the rate of structural change isn't the same over all the sectors of the economy. (**Sheik Bilal**)

Literature Review:

Deepak Kumar Behera¹ and Mitali Tiwari, structure change in India appeared to have started since post-Reforms period (1987). The change is driven by the development of the Service sector and is not industry-driven. If the present patterns proceed, the rural agricultural laborers may decay considerably in the coming two decades. Notwithstanding, there are some constraints in this change. The structural change is seen significant only in primarily sector and unorganized non-primarily sector. There is a negative change in the organized sector.

Jayasooriya (2017) uncovered a presence of unidirectional causality toward agricultural to the industrial sector, and bidirectional causality among agriculture and territory sector wording of Sri Lanka's economy. The impact of the Gregory-Hansen co-integration test asserted a long-run nexus in primary sector positively related to secondary and territory development.

Herrendorf, Berthold and Valentinyi (2006) relative Total Factor Productivity (TFP) differences in territory sector are small compared to the other secondary and primarily sector.

Gollin et al. (2002) compared to the US, most developed and developing are the least productive in primarily and territory sector.

El-hadj M. Bah (2007) in comparison with the United States, developing countries are least productive in the primary sector, followed by the industrial sector and then service sector of the economy.

Objectives:

Some of the objectives of the study are as under:

1. To analyze the effect of structural transformation on the growth of the economy.
2. To determine the composition of output in the key sectors of the state economy.
3. To determine the effect of structural transformation on the productivity of employment in different sectors of the economy
4. To examine whether china’s economy follows the output and employment path of standard structural transformation theory of output

Sources of data:

In order to analysis the growth and structural transformation of China for the reference period of 1991-2016 in accordance with the objectives of the present study. The data for necessary variables have been obtained from different published official sources especially from “world bank development indicators”

Structural transformation of China:

China’s economic growth since the economic reform¹ has been very fast, even surpassing the East Asian Tigers. China's GDP development from 1991 to 2016 is an average of 10% per year. This noteworthy rise over the past 50 years is a standout amongst the most striking instances of the effect of opening an economy up to worldwide markets. The development rate amid the referenced period was primarily because of the productivity of factors of production. The share of the primary sector in GDP in China has declined from around 27 percent in 1990-91 to 14 percent in 2000-01 and further declined to 9 percent in 2015-16. That of non-agriculture expanded from 74 to 81 and spans to around 91 percent. The greater part of this change was towards the service sector of the economy. The contribution of industry sector towards GDP was close to service sector as appeared in table 1.

Table.1. The share of Labour force and GDP in primarily and Non-primarily Sector (In percentages)

Year	Labour force share (percentages)				Shift in Labour force away from Agriculture	GDP share (percentages)			
	Primarily	Non-primarily				primarily	Non-primarily		
		Industry	Services	Total			Industry	Service	Total
1990-91	54.9	19.4	25.7	45.1		26.58	41.04	32.38	73.42
1995-96	50.2	21.8	28	49.8	4.7	19.6	46.75	33.65	80.4
2000-01	49.5	19	31.5	50.5	0.7	14	44.70	41.30	86
2005-06	42.5	21.8	35.7	57.5	7.0	11.64	47.02	41.34	78.36
2010-11	34	24	42	66	8.5	9.53	46.45	44.02	90.47
2015-16	27	24	49	73	7	8.55	39.80	51.65	91.45
Total (primarily+ non-primarily) = 100						Total (primarily+ non-primarily) = 100			

Source: compiled by the authors from the World Bank data base

¹ Economic reforms presenting market principles started in 1978 and were done in two phases. The main stage, in the late 1970s and mid-1980s, included the de collectivization of agriculture, the opening up of the nation to foreign investment, and authorization for entrepreneurs to start new companies. In any case, most industry remained state-possessed. The second phase of change, in the late 1990s, included the privatization and contracting out of much state-claimed industry and the lifting of value controls, protectionist approaches, and guidelines, in spite of the fact that state imposing business models in segments, for example, banking and petroleum remained

The increasing speed in the growth of GDP in China isn't joined by a similar development in employment which is additionally apparent from the information (see Table.1). Be that as it may, there is some expanded increase in the structure change over the most recent 15 years decades since 2000, as 22.5 percent moved away from the primary sector. This is a lot higher extent of a move to the non-primarily sector with the before years. In the following three decades, on the off chance that this rate of change continues, at that point the share of the labour force in the primary sector may fall below 10 percent, an element much the same as developed countries. It is the service sector that assimilated more work than the industrial sector as appeared in table1.

Can Structural transformation lead to economic growth? Lewis (1954) proposed an original hypothesis of dualistic economic advancement for over-populated economies with tremendous measures of surplus agricultural work for which he was later to be granted the 1979 Nobel Prize. Economic development in such an economy can be accomplished by fast capital collection in the non-primarily (industrial and service) area, encouraged by attracting surplus work from primary sector. In the Lewis hypothesis, an economy travels from the primary, labour surplus stage to labour scare phase of development. China is the most populated country in the world. With such a high growth performance during the last half century, the percentage share of the labour force in total GDP has continuously decreased from 55% 1990-91 to 27% in 2015-16. The decrease in percentage share in labour share is followed a tremendous increase in productivity of agricultural labour from 626.79 in 1990-1991 to 3871.42 in 20015-16 (about 16%) as shown in table 2. This implies a highly negative inverse relationship between labour share and productivity in the agricultural sector. Table 2 also shows a positive relationship between non- agricultural employment and their productivity. It can be concluded from table 2 that transferring labour from agricultural to non-agricultural causes productivity increase in both primarily and non- primarily sector and hence economic growth of a country.

Table 2: GDP growth rate, employment share, and productivity levels of China (1990-2016)

Years	GDP growth rate	Primarily Sector Employment (%)	Primarily Sector Productivity (Rs)	Non-Primarily Sector Employment (%)	Non-Primarily Sector productivity (Rs)
1990-91	9.29	54.9	626.79	45.1	3.16
1995-96	10.94	50.2	864.04	49.8	4.10
2000-01	8.41	49.5	916.65	50.5	5.18
2005-06	11.39	42.5	1328.78	57.5	7.59

2010-11	10.63	34	2279.48	66	9.49
2015-16	7.0	27	3871.42	73	10.69

Source: compiled by the authors from the World Bank data base

Structural Change Index of Chinese Economy:

A commonly utilized technique for estimating structural transformation in output (and labour force) is the rate of coefficient of structural change, regularly known to as an SCI. The SCI for output might be characterized as the absolute half of difference aggregate of the total output over a period of time. The computation is given by the equation:

$$SCI = (\sum |x_{i(T)} - x_{i(T-1)}|) / 2$$

Where $x_{i(T)}$ and $x_{i(T-1)}$ represents each sectors share of total GDP at a time (t) and (t-1), respectively. The utilization of absolute values guarantees that positive and negative changes in industry share don't offset each other when the vales are summed crosswise over various areas of economthe y. The SCI is bound somewhere in the range of 0 and 100, with 0 speaking to no auxiliary change while 100 shows a total basic change. The SCI of China's Economy from 1990-2016 is give in below table 3:

Table 3 Occupational Structural Shifts in the key Sectors of China's Economy (1990-2016)

Sector	1990-91	2015-16	Change in %pt.	SCI
Agriculture	24.03	8.55	-15.48	17.12
Industry	41.48	39.81	-1.67	
Service	34.49	51.64	17.12	
Total	100	100	0	

Source: compiled by the authors from national data of the country

During the entire period of our study (1990-2016) structural change in output across three sectors of china's economy is equal to 17.12 per cent of which resources shift from primary to the tertiary sector is 90.3% while as from secondary to tertiary sector is of 9.6%. The table shows all the output of the primary sector is shifted towards the tertiary sector while the output share of the secondary sector of China remains near constant throughout the reference period. Therefore, it becomes amply clear that the structural change of output for the entire reference period does not match with the structural change theory of output as resource shift from primarily to non-primarily (secondary and tertiary sector) has taken place in 50:50 ratio, which violates the norm of most: least ratios of resource allocation from primary to secondary and tertiary sector respectively.

The employment transformation for the referenced period can be shown in the following table 4:

Table 4 Occupational Structural Shifts (26 years) in the key Sectors of China’s Economy (1990-2016)

Sector	1990-91 (%)	2015-16 (%)	Change in %pt.	SCI
Agriculture	54.9	27.80	-27.1	27.1
Industry	25.7	48.30	1.39	
Service	19.4	23.90	4.5	
Total	100	100	0	

Source: compiled by the authors from the World Bank database

In this way, it turns out to be evident that the structural change in occupation in the referenced period over its key segments isn't following the way method for the structural change hypothesis of economy which suggests that rate share of labour force in primary sector decreases deliberately as GDP per capita rises while the rate share of both secondary and service sector increases to offset the decline in the primary sector. In any case, this counterbalance happens in such a way, that at first phase of structure change hypothesis in such a way that major share is shifted to industry sector (about 75%) and the rest is allotted to tertiary segment and amid the second phase of structural change hypothesis labour force shifts from agriculture and industrial sector to service sector of economy. But this move happens after the maturity stage of the economy. (i.e., after 50 % share of the economy).

Changing Structural of China and Kuznets Analysis:

Kuznets model of Structural Transformation from primary to non-primary sector states that structural transformation is feasible only if the growth rate of the primary as well as non- primary sector improve to the greater extent with the decrease in percentage share of the primary sector. So far as China’s economy is concerned, the primary contribution share has witnessed a reduction from 24 percent to 8 percent between 1990-1991 to 2015-2016 while as the growth rate in primary sector has increased from 0.51 percent to 1.39 between 1990-1991 to 2014-2016. These results are interpreted using the Kuznets model equation which is as:

$$\frac{P_p \frac{\Delta P_p}{P_p}}{\Delta P} = \frac{1}{1 + \frac{P_n \frac{\Delta P_n}{P_n}}{P_p \frac{\Delta P_p}{P_p}}}$$

P_p = primary sector contribution

P_n =non- primary sector contribution (i.e. industry and service sector)

$\frac{\Delta P_p}{P_p}$ = average annual growth rate of primary sector product

$\frac{\Delta P_n}{P_n}$ = average annual growth rate of non-primary sector product

Table 5 Changing Structural of China’s Economy & Kuznets Analysis:

P_p		P_n		$\frac{\Delta P_p}{P_p}$		$\frac{\Delta P_n}{P_n}$		P_n/P_p		$\frac{\Delta P_n}{P_n} / \frac{\Delta P_p}{P_p}$		$\frac{P_n/P_p^*}{P_n} / \frac{\Delta P_p}{P_p}$		$P_p * \frac{\Delta P_p}{P_p} / \Delta P$	
1990	2016	1990	2016	1990-2000	2001-2016	1990-2000	2001-2016	1970	2016	1990-2000	2001-2016	1990	2016	1990	2016
0.24	0.088	0.76	0.812	0.8	1.2	1.5	3.16	3.16	10.86	1.8	2.70	5.68	29.32	0.32	0.002

Source: compiled by the authors from the World Bank database.

The above table clearly shows various types of correlations explained by Kuznets model of structural transformation from the primary sector to non-primary sector. The table expresses an inverse relationship between the ratio of primary to GDP growth ($P_p * \frac{\Delta P_p}{P_p} / \Delta P$) and the product of ratio of sectoral shares of GDP (P_n/P_p) and the ratio of sectoral growth rates ($\frac{\Delta P_n}{P_n} / \frac{\Delta P_p}{P_p}$).

Table 5 also shows that P_p and $\frac{\Delta P_p}{P_p}$ are weakly inversely related to each other; whereas P_p and $\frac{\Delta P_n}{P_n}$ are also inversely related but strongly.

Analysis of data makes amply clear that non-primary to the primary ratio (P_n/P_p) has largely increased from 3.16 to 10.86 from 1990 to year 2016, which shows 4 times (344 percent increase) increase; while as the growth rate of non-primary to the primary ratio ($\frac{\Delta P_n}{P_n} / \frac{\Delta P_p}{P_p}$) has increased from 1.8 to 2.70 percent from 1991-2000 to 2001-2016. Thus, it becomes clear that (P_n/P_p) and ($\frac{\Delta P_n}{P_n} / \frac{\Delta P_p}{P_p}$) are positively correlated to each other but less than proportional.

Estimating the Rate of Structural Transformation in China:

As reported by *Kumar and Mitali, the*) rate of change of structural transformation (RST) can be used to evaluate the dynamics of structural transformation of the economy. If L_T is the total labour force of the country and L_N is the labour force in non-primarily (industry and services) sector, then the share of the non-primarily sector in labothe ur force is given by $\frac{L_N}{L_T}$ which shows measure a of the degree to which a developing country has diversified its production base. The RST may then be defined as the increase in $\frac{L_N}{L_T}$ -ratio per year. Rate of structural transformation of a country is given by:

$$RST = \frac{L_N}{L_T} \left(\frac{\Delta L_N}{L_N} - \frac{\Delta L_t}{L_t} \right) \quad 2$$

² It can be proved with the rules of differentiation like

In this manner the rate of structural change considered as the rate of change of proportion of non-agricultural labour force to all labour force over the period, is the ratio multiplied by the difference between the incremental change in non-agriculture and total labour force. We have assessed the RST for two sorts of change: (a) output change from agriculture to non-agriculture (b) labour force change from agriculture to non-agriculture.

Table 6 Rate of Structural Transformation in China

Sector	From 1990-1991 to 2000-01	From 2000-2001 to 2015-2016	From 1990-91 to 2015-2016
Output Transformation Rate			
Agricultural output to Total Non-agricultural Output	0.23	0.21	1.62
Employment Transformation Rate			
Agricultural Employment to Total Non-agricultural Employment	0.051	0.218	0.321

Source: calculated by the authors

The assessed rate of structural change is given in table 6. The Rate of Transformation as far as output has truly diminished. Compared with the main decade of the referenced period (1990-2000), it has diminished from 0.23 percent to 0.21 percent amid 2001-14. The principle explanation behind this diminishing is the lessening in rate share of the industry sector in Total GDP of the economy. While there is vast development in RST in employment terms. The RST of the agriculture labour force to the nonagricultural labour force has expanded to a great extent from 0.051 to 0.218.

Conclusions:

In the present world, the vast majority of the developed nations have demonstrated a surprisingly comparative structure of their economies. In a large portion of the developed nations of the world, the developing example is characteristic of the way that the primary sector contributes under 5 percent to GDP and labour force share, the secondary sector contributes from 20 percent to 30 percent and service sector around 70 percent. The most striking element is that today the employment structure of most

$$\frac{\partial \frac{L_n}{L_t}}{\partial t} = \frac{L_n/L_t}{L_t^2} \left(L_t \frac{\partial L_n}{\partial t} - L_n \frac{\partial L_t}{\partial t} \right)$$

$\partial T = \Delta T = 1$ year, the above equation can be written as:

$$\Delta \frac{L_n}{L_t} = RST = \frac{\Delta L_n}{L_t} - \frac{L_n \Delta L_t}{L_t^2}$$

$$RST = \frac{L_n}{L_t} \left(\frac{\Delta L_n}{L_n} - \frac{\Delta L_t}{L_t} \right)$$

developed nations is strikingly is like their production structure, subsequently mirroring a high level of inter sectoral balance in their productivity and income levels. Then again, in the Chinese Economy, the agriculture sector is contracting after some time from about 24% in 1990-91 to about 9% in 2015-16. Labour force in agriculture sector likewise diminished from 55% to 27% during the respective period. Yet, the primary worry for arrangement design is that 27% of the labour force of economy just contributes 9% GDP of the economy. Additionally, the primary sector is contracting after some time and at the expense of this shrinkage, the tertiary sector is developing as an overwhelming part followed by the secondary sector as far as its share in GDP. It is fascinating to take note of that in China's Economy, the basic change has happened in violation to the standard relative growth example of agriculture, industry and service sector as devoted by structure change hypothesis. China is being able to transfer from its GDP share from agricultural to non-agricultural, however it has not been able to transfer a share of the industry sector to the tertiary sector. The contribution of the industry sector to GDP share has remained almost above 40% during the referenced period of study. However industry sectors share is showing declining trend during recent years

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