



Analysis on Diversity of Service Modernization: A View Based on Second Modernization Evaluation

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Abstract: Based on the second modernization theory, this paper has established an evaluation model for the level of service modernization, and has used this model to evaluate the level and stage of service modernization of 131 countries in the past 30 years (1980-2010). The results suggest that the world service modernization shows diversity in five aspects, i.e., the overall progress, development level, indicator development, speed, and geographical location. China is currently a preliminarily developed country in terms of service sector, and is at the development period of the first service modernization.

Keywords: service modernization, diversity, second modernization theory, evaluation model

The term diversity originates from biology. In 1995, the United Nations Environment Programme (UNEP) published the Global Biodiversity Assessment, which gave a simple definition on biodiversity: total diversity and variability of living things and of the systems of which they are a part¹. Many scholars argue that biodiversity is an extensive and complicated concept, and its derivative meaning extends profoundly to all aspects of human life and activities. Nowadays, diversity is increasingly applied to various fields beyond biology; for example, cultural diversity², civilization diversity, world diversity, democracy diversity, geographical diversity, environmental diversity, landscape diversity, etc. The modernization study also often borrows the concept of diversity as a perspective for analyzing problems, so can service modernization study.

Service modernization(SM) refers to a profound change of the service sector and service economy since the 18th century; it covers the two shifts from traditional service to mechanized and electrified service, and from mechanized and electrified service to knowledge-based and green service, as well as various changes such as the continuous increase of the ratio of service sector to national economy, changes of service mode and view, improvement of service technological level, service workers' quality, and the international competitiveness of the service sector, as well as the changes in the structure and international status of the service economy. It is a historical process in that the service modernization from the 18th century to the end of the 21st century covers two periods, i.e., the first service modernization and the second service modernization; it is also an international competition in which countries endeavor to catch up with, reach, and keep up with

the world's advanced level in service; it also covers the changes of domestic service content, quality, structure, system, and mindset.

I. Evaluation Model for Service Modernization

The evaluation of the level of service modernization is conducted via service modernization indexes, which reflect the actual progress of service modernization and the relative gap between different countries and the world's advanced level. Based on the signal indicators of the progress of service modernization, we can judge the development stages of service modernization. Development levels are not equivalent to development stages. According to the second modernization theory, and taking into consideration the progress of service modernization, this paper has selected some key indicators that can represent the typical characteristics of service modernization, and established an evaluation model for service modernization,³ which includes two parts: level evaluation and period evaluation.

1. Level Evaluation

The evaluation of service modernization level covers service content, service quality, and service governance (Table 1). The mathematical model is as follows,

$$\left\{ \begin{array}{l} SMLI = (I_C \times I_Q \times I_M) / 3 \\ I_C = (\sum C_i) / N_C \quad (i = 1, 2, \dots, N_C) \\ I_Q = (\sum Q_k) / N_Q \quad (k = 1, 2, \dots, N_Q) \\ I_M = (\sum M_j) / N_M \quad (j = 1, 2, \dots, N_M) \end{array} \right.$$

Wherein, SMLI is the service modernization index; I_C is the service content index, I_Q is the service quality index, and I_M is the service governance index; C_i is the index of the i^{th} indicator for service content, i is the serial number of the evaluation indicator for service content, and N_C is the total number of the evaluation indicators for service content; Q_k is the index of the k^{th} indicator for service quality, k is the serial number of the evaluation indicator for service quality, and N_Q is the total number of the evaluation indicators for service quality; M_j is the index of the j^{th} indicator for service governance, j is the serial number of the evaluation indicator for service governance, and N_M is the total number of the evaluation indicators for service governance. The values of all indexes are less than or equal to 120, the actual values of all indicators are their actual values, and the standard value is the average value of the indicator across high-income countries in that year.

Table 1 Evaluation structure for service modernization indexes

Item	Service modernization evaluation	Evaluation indicator
Evaluation objective	Service modernization progress	
Evaluation dimension	Service modernization index	
Service content	service value-added as a percentage of GDP	Services, value added (% of GDP)
(scale, structure)	service employment a percentage of total employment	Employment in services (% of total employment)

	Per capita knowledge-based services*	Per capita R&D, education, and health expenditure
	Per capita producer services*	Per capita air transport, freight (million ton-km)
Service quality (efficiency, quality)	Service labor productivity	Service labor productivity
	Per capita service value-added	Per capita service value-added
	Per capita service trade	Per capita service trade imports and exports
	Per capita international travel revenue	Per capita International tourism, receipts
Service governance (resource, capability, innovation)	Cultural quality of labor force	labor force with tertiary education (% of total) **
	Service infrastructure	Fixed broadband subscriptions (per 100 people) ***
	Government governance capacity	Average time to clear exports through customs (days)
	Service innovation capacity	Percentage of R&D expenditure in GDP

Note: * Due to limited access to statistical data, the per capita knowledge-based service is replaced by per capita science and technology, education, and health expenditure, and the per capita manufacturing-based service is represented by per capita air freight. ** The percentage of labor force receiving higher education in 1980 is replaced by the data of 1990. *** The Internet broadband penetration rate in 1980 is replaced by phone penetration rate.

2. Period Evaluation

Period evaluation for the first service modernization. The first service modernization is the process of service mechanization, electrification, and automation. The share of service value-added, share of employment in service industry, ratio of service value-added to agricultural value-added, ratio of service labor force to agricultural labor force, and service modernization index can be used as the signal indicators for the first service modernization.

Table 2 Signal indicators and judging criteria for world service modernization progress

Signal indicator		service value added (%GDP)	Employment of SM (%total employment)	service value-added /agricultural value-added	service labor force /agricultural labor force	SM index
The second	Maturity	≥80%	≥80%	≥80	≥80	
	Development	≥70%, <80%	≥70%, <80%	≥35, <80	≥35, <80	
	Start-up	≥60%, <70%	≥60%, <70%	≥15, <35	≥15, <35	≥60
The first	Transition	≥50%, <60%	≥50%, <60%	≥10, <15	≥5, <15	≥50
	Maturity	≥40%, <50%	≥40%, <50%	≥5, <10	≥3, <5	≥40
	Development	≥30%, <40%	≥30%, <40%	≥2, <5	≥1, <3	≥20
	Start-up	≥20%, <30%	≥20%, <30%	≥1, <2	≥0.5, <1	
Traditional service		<20%	<20%	<1	<0.5	

Note: (1) Four signal indicators are used to judge whether a country is in the first or second service modernization stage. This stage division is consistent with the stage division for world modernization. (2) The criteria for judging whether the second service modernization has been started are: share of service value-added ≥60%, share of employment in service industry ≥60%, and the other indicators are used as amendatory indicators. (3) The service modernization index is used as an amendatory value for stage division; the start-up period of the second service modernization: service modernization index ≥60; transition period of the first service modernization: service modernization index ≥50; maturity period of the first service modernization: service modernization index ≥40;

development period of the first service modernization: service modernization index ≥ 20 . (5) The criteria for completion of the first service modernization are: share of service value-added $\geq 50\%$, share of employment in service industry $\geq 50\%$, service modernization index ≥ 60 .

The evaluation model for the development stages of the first service modernization and period-dividing standards for signal indicators (Table 2).

$$P_{fsm} = \sum (P_{Share\ of\ service\ value-added}, P_{Share\ of\ employment\ in\ service\ industry}, P_{Ratio\ of\ service\ to\ agricultural\ value-added}, P_{Ratio\ of\ service\ to\ agricultural\ labor\ force}, SMLI)$$

$P_{Share\ of\ service\ value-added} = (4, 3, 2, 1, 0)$, the development stage and the assigned value are determined according to the comparison between the actual value and the standard value

$P_{Share\ of\ employment\ in\ service\ industry} = (4, 3, 2, 1, 0)$, the development stage and the assigned value are determined according to the comparison between the actual value and the standard value

$P_{Ratio\ of\ service\ to\ agricultural\ value-added} = (4, 3, 2, 1, 0)$, the development stage and the assigned value are determined according to the comparison between the actual value and the standard value

$P_{Ratio\ of\ service\ to\ agricultural\ labor\ force} = (4, 3, 2, 1, 0)$, the development stage and the assigned value are determined according to the comparison between the actual value and the standard value

$SMLI = (4, 3, 2)$, the development stage and the assigned value are determined according to the comparison between the actual value and the standard value

Wherein, P_{fsm} stands for the development stages of the first service modernization, $P_{Share\ of\ service\ value-added}$ stands for the development stage determined according to the share of service value-added, $P_{Share\ of\ employment\ in\ service\ industry}$ stands for the development stage determined according to the share of employment in service industry, $P_{Ratio\ of\ service\ to\ agricultural\ value-added}$ stands for the development stage determined according to the ratio of service to agricultural value-added, $P_{Ratio\ of\ service\ to\ agricultural\ labor\ force}$ stands for the development stage determined according to the ratio of service to agricultural labor force, and SMLI stands for the development stage determined according to the service modernization index.

The evaluation model for the development stages of the second service modernization:

$$P_{ssm} = \sum (P_{Share\ of\ service\ value-added}, P_{Share\ of\ employment\ in\ service\ industry}, P_{Ratio\ of\ service\ to\ agricultural\ value-added}, P_{Ratio\ of\ service\ to\ agricultural\ labor\ force}, SMLI)$$

$P_{Share\ of\ service\ value-added} = (7, 6, 5)$, the development stage and the assigned value are determined according to the comparison between the actual value and the standard value

$P_{Share\ of\ employment\ in\ service\ industry} = (7, 6, 5)$, the development stage and the assigned value are determined according to the comparison between the actual value and the standard value

$P_{Ratio\ of\ service\ to\ agricultural\ value-added} = (7, 6, 5)$, the development stage and the assigned value are determined according to the comparison between the actual value and the standard value

$P_{Ratio\ of\ service\ to\ agricultural\ labor\ force} = (7, 6, 5)$, the development stage and the assigned value are determined according to the comparison between the actual value and the standard value

$SMLI = (7, 6, 5)$, the development stage and the assigned value are determined according to the comparison between the actual value and the standard value

Wherein, P_{ssm} stands for the development stages of the second service modernization, $P_{Share\ of\ service\ value-added}$ stands for the development stage determined according to the share of service value-added, $P_{Share\ of\ employment\ in\ service\ industry}$ stands for the development stage determined according to the share of employment in service industry, $P_{Ratio\ of\ service\ to\ agricultural\ value-added}$ stands for the development stage determined according to the ratio of service to agricultural value-added, $P_{Ratio\ of\ service\ to\ agricultural\ labor\ force}$ stands for the development stage determined according to the ratio of service to agricultural labor force, and SMLI stands for the development stage determined according to the service modernization index.

3. Evaluation Standards

The service modernization evaluation takes the average value of the indicator across high-income countries in that year as the standard value (Table 3).

Table 3 Standard values of the evaluation indicators for service modernization level

Indicator and unit		1980	1990	2000	2010	2013
Service content	service value-added (%GDP)	58.1	69.3	70.5	73.6	73.9
	service employment (%total employment)	58.2	60.1	66.8	72.4	70.6
	Per capita knowledge-based services (US dollars)	612	2795	3818	6892	7455
	Per capita air freight (ton/kilometer/person)	20.5	40	79.8	108	101
Service quality	Service labor productivity (\$)	23943	42716	48686	70705	77435
	Per capita service value-added(\$)	5635	13385	14388	23097	24874
	Per capita service trade (\$)	586	1234	1973	4532	5343
	Per capita international travel revenue(\$)	-	179	268	515	628
Service governance	labor force with tertiary education (% of total)	24.6	24.6	28.1	32.7	34.5
	Fixed broadband subscriptions (%)	25.1	0.23	1.6	23.8	27.3
	Average time to clear exports through customs (days)	-	-	14.1	13.4	12.7
	Percentage of R&D expenditure (%)	1.6	2.0	2.3	2.4	2.4

Note: The values are the average values of high-income countries or the top 20 developed countries in service in the year. Fixed broadband subscriptions in 1980 is replaced by phone penetration rate. The percentage of labor force with tertiary education in 1980 is replaced by the data of 1990.

II. Results of Service Modernization Evaluation

The signal indicators are used to judge the world service modernization progress from 1980 to 2013. A total of 131 countries are evaluated, and the overall evaluation results are shown in Table 4.

The coordinates of world service modernization in 2013 are shown in Figure 1.

In terms of service modernization index, in 2013, 21 countries including Belgium and Switzerland belong to developed countries in service sector, 23 countries including Estonia and Italy belong to moderately developed countries in service sector, 29 countries including Argentina and Dominica belong to preliminarily developed countries in service sector, and 58 countries including Namibia belong to underdeveloped countries in service sector (Table 4).

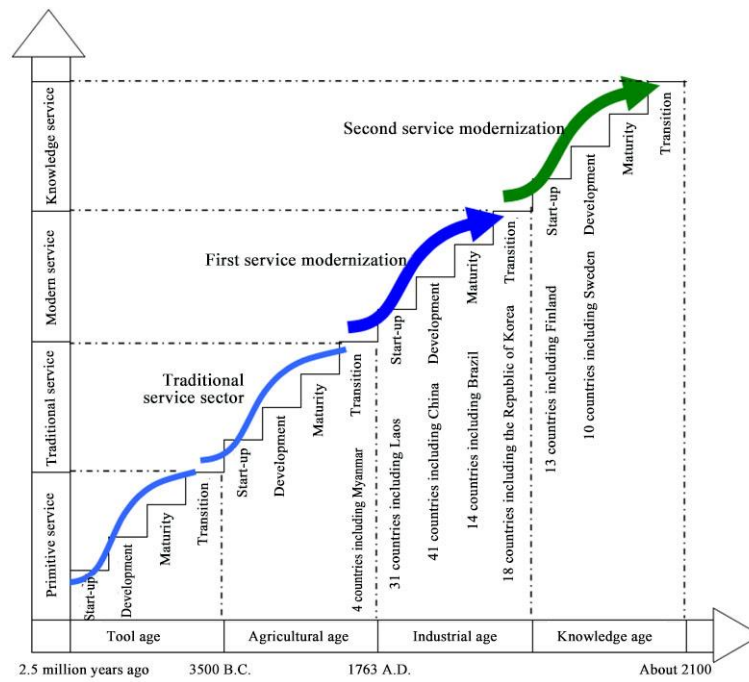


Figure 1 Coordinates of world service modernization in 2013

Table 4 Development stages and development levels of world service modernization from 1980 to 2013

Country	No	Development stage					Development level				
		1980	1990	2000	2010	2013	1980	1990	2000	2010	2013
Sweden	1	4	5	5	5	6	A	A	A	A	A
United States	2	5	5	5	6	6	A	A	A	A	A
Finland	3	3	4	4	5	5	A	A	A	A	A
Australia	4	4	4	4	5	5	A	A	A	A	A
Switzerland	5	4	5	5	6	6	A	A	A	A	A
Norway	6	4	4	5	5	5	A	A	A	A	A
Japan	7	4	4	5	5	5	A	A	A	A	A
Denmark	8	4	5	5	5	5	..	A	A	A	A
Germany	9	4	4	5	5	6	..	A	A	A	A
Netherlands	10	4	5	5	5	6	A	A	A	A	A
Canada	11	4	5	5	6	6	A	A	A	A	A
Singapore	12	5	6	6	6	6	A	A	A	A	A
United Kingdom	13	4	5	6	6	6	A	A	A	A	A
France	14	4	4	5	5	5	A	A	A	A	A
Belgium	15	5	5	6	6	6	A	A	A	A	A
Austria	16	4	4	5	5	5	A	A	A	A	A
New Zealand	17	4	4	4	4	4	A	A	A	A	A
Republic of Korea	18	2	3	4	4	4	B	B	B	A	A
Israel	19	4	5	5	6	6	A	A	A	A	A
Italy	20	3	4	5	5	5	B	B	B	A	B
Ireland	21	3	3	4	5	5	B	A	A	A	A
Spain	22	3	4	4	5	5	B	B	B	A	A
Estonia	23	3	2	4	5	4	..	C	B	B	B
Slovenia	24	..	3	4	4	4	..	A	B	B	B
Uruguay	25	4	3	3	3	4	B	C	C	B	B
Russia	26	..	2	2	3	4	..	C	C	C	B
Slovakia	27	..	3	2	4	4	..	C	C	B	B
Greece	28	3	3	4	5	5	B	B	B	B	B
Hungary	29	1	2	4	4	4	C	C	B	B	B
Czech Republic	30	1	3	3	5	4	..	C	B	B	B
Portugal	31	2	3	4	5	5	B	B	B	B	B
Belarus	32	2	1	2	2	3	..	D	D	C	C

Latvia	33	2	2	2	4	4	..	C	C	B	B
Lithuania	34	..	3	3	4	4	..	C	C	B	B
Georgia	35	2	2	1	2	2	..	D	D	C	C
Ukraine	36	0	0	1	2	2	..	D	D	D	C
Bulgaria	37	2	2	2	3	3	C	C	C	B	B
Lebanon	38	1	4	4	3	3	..	B	B	C	B
Kazakhstan	39	..	2	1	2	2	..	D	D	D	C
Poland	40	2	2	2	4	4	C	C	C	B	B
Argentina	41	2	2	3	3	3	B	C	B	B	C
Panama	42	3	2	3	4	5	B	C	B	B	B
Croatia	43	..	4	3	4	4	..	B	B	B	B
Saudi Arabia	44	3	3	3	3	4	A	B	B	B	B
Colombia	45	4	2	2	2	2	C	C	C	C	C
Kuwait	46	5	5	5	5	4	A	B	B	B	B
Chile	47	3	2	3	3	3	B	C	C	B	C
Macedonia	48	..	2	2	2	3	..	D	C	C	C
Azerbaijan	49	2	1	1	2	2	..	D	D	D	C
Moldova	50	1	1	1	2	2	..	D	D	C	C
Romania	51	1	1	2	2	3	..	D	D	C	C
Venezuela	52	3	2	2	2	2	B	C	D	C	C
Uzbekistan	53	..	1	1	1	1	..	D	D	D	D
Dominica	54	2	2	3	3	3	D	C	B	B	C
Armenia	55	..	1	1	2	2	..	D	D	C	C
Paraguay	56	2	2	2	2	2	C	D	D	D	D
Costa Rica	57	2	2	3	3	4	B	C	C	B	B
Brazil	58	2	2	2	3	3	C	C	C	C	C
Mexico	59	2	2	3	3	3	C	C	C	C	C
Botswana	60	2	2	2	2	2	D	C	C	D	D
Peru	61	2	2	2	2	2	C	C	C	C	C
Jamaica	62	2	3	3	3	3	..	B	C	C	C
Jordan	63	4	4	3	4	4	A	B	C	B	B
South Africa	64	2	2	2	2	3	B	D	C	C	C
Turkey	65	2	2	2	3	3	D	C	C	B	B
Ecuador	66	2	2	2	2	2	C	D	D	C	C
Iran	67	2	2	2	2	2	C	D	D	D	C
Mongolia	68	2	2	1	2	2	C	D	D	D	D
Morocco	69	1	2	2	2	2	D	D	C	C	C
Malaysia	70	1	2	2	3	3	C	C	B	B	B
El Salvador	71	2	2	2	2	2	D	D	D	D	C
Egypt	72	2	2	2	2	2	D	D	D	C	C
China	73	0	0	1	2	2	D	D	D	C	C
Algeria	74	1	1	2	2	2	D	D	D	D	D
Turkmenistan	75	..	1	1	1	1	..	D	D	D	D
Tunisia	76	1	2	2	2	2	D	D	C	C	C
Albania	77	0	0	1	2	2	..	D	D	C	C
Kyrgyzstan	78	1	1	1	1	1	..	D	D	D	D
Tajikistan	79	1	0	1	1	1	..	D	D	D	D
Bolivia	80	2	3	2	2	2	D	C	D	D	D
Myanmar	81	1	0	0	1	0	D	D	D	D	D
Philippines	82	1	2	2	2	2	D	D	D	D	C
Thailand	83	1	1	2	2	2	D	D	D	C	C
Namibia	84	2	2	2	2	2	D	C	C	D	D
Zimbabwe	85	1	1	1	1	1	D	D	D	D	D
Honduras	86	1	1	2	2	2	D	D	C	D	D
Nicaragua	87	1	2	1	2	2	..	D	D	D	D
Vietnam	88	1	1	1	2	2	..	D	D	D	D
Kenya	89	1	1	1	2	2	D	D	D	D	D
Sri Lanka	90	1	1	2	2	2	D	D	D	D	D
Republic of the Congo	91	2	2	1	1	1	C	D	D	D	D
Indonesia	92	1	1	1	2	2	D	D	D	D	D
Zambia	93	1	0	1	1	1	D	D	D	D	D
Guatemala	94	1	2	2	2	2	D	D	D	D	D
Mauritania	95	1	1	1	1	1	D	D	D	D	D
Cote d'Ivoire	96	2	1	2	1	1	C	D	D	D	D
India	97	1	1	1	2	2	D	D	D	D	D
Pakistan	98	1	1	1	2	1	D	D	D	D	D
Lesotho	99	1	1	1	1	1	D	D	D	D	D
Cambodia	100	1	1	0	1	1	..	D	D	D	D
Cameroon	101	1	1	1	1	1	D	D	D	D	D
Eritrea	102	0	2	2	2	2	..	D	D	D	D
Syria	103	2	2	2	2	2	C	D	D	C	D
Ghana	104	1	1	1	2	2	D	D	D	D	D

Chad	105	1	1	1	1	1	D	D	D	D	D
Mozambique	106	0	1	1	1	1	D	D	D	D	D
Guinea	107	1	1	1	0	1	..	D	D	D	D
Republic of Yemen	108	0	1	1	2	2	..	D	D	D	D
Papua New Guinea	109	0	0	0	0	0	D	D	D	D	D
Haiti	110	0	0	1	0	D	D	D	D
Nepal	111	0	0	0	1	1	D	D	D	D	D
Senegal	112	1	1	2	2	2	D	D	D	D	D
Sierra Leone	113	1	0	0	1	0	D	D	D	D	D
Democratic Republic of the Congo	114	1	1	1	1	1	..	D	D	D	D
Laos	115	0	0	0	1	1	..	D	D	D	D
Malawi	116	0	0	1	1	1	D	D	D	D	D
Togo	117	1	1	1	1	1	D	D	D	D	D
Madagascar	118	1	1	1	1	1	D	D	D	D	D
Mali	119	1	1	1	1	1	D	D	D	D	D
Nigeria	120	1	1	1	2	2	..	D	D	D	D
Bangladesh	121	1	1	1	1	1	D	D	D	D	D
Tanzania	122	1	0	1	1	1	..	D	D	D	D
Benin	123	2	1	1	1	2	D	D	D	D	D
Niger	124	0	1	1	1	1	D	D	D	D	D
Angola	125	0	1	1	0	D	D	D	D
Uganda	126	0	0	1	1	1	D	D	D	D	D
Central Africa	127	0	0	1	1	0	D	D	D	D	D
Burkina Faso	128	1	1	1	1	1	D	D	D	D	D
Ethiopia	129	1	0	1	1	1	D	D	D	D	D
Burundi	130	0	0	0	1	1	..	D	D	D	D
Rwanda	131	0	1	1	1	1	D	D	D	D	D
High-income countries	132	4	4	5	5	5					
Middle-income countries	133	1	1	2	2	3					
Low-income countries	134	..	1	1	1	2					
World average	135	2	3	3	3	4					

Note: (1) Country's development stages: 0 stands for traditional service sector, 1 stands for the start-up period of the first service modernization, 2 stands for the development period of the first service modernization, 3 stands for the maturity period of the first service modernization, 4 stands for the transition period from the first service modernization to the second service modernization; 5 stands for the start-up period of the second service modernization, 6 stands for the development period of the second service modernization, and 7 stands for the maturity period of the second service modernization. (2) Development levels: A stands for developed countries in service sector, B stands for moderately developed countries in service sector, C stands for preliminarily developed countries in service sector, D stands for underdeveloped countries in service sector.

It can be seen from Table 4 that in 2013, China ranks the 59th place among 131 countries in the world, belonging to the preliminarily developed countries in service sector and at the intermediate level among developing countries in service sector; its service modernization level is still far from the world's advanced level. China has not yet completed the first service modernization; nor has it entered the second service modernization. In the past 30 years, China's service modernization level has significantly improved, yet it is still remarkably far from the world's advanced level.

III. Diversity Features of Service Modernization

Take the evaluation results in 2013 for example; the diversity and imbalance of service development across countries are very prominent, which are mainly reflected in five aspects:

First, diversity of service modernization process (Table 4). In 2013, 23 countries at the world service frontiers have entered the second service modernization, 102 countries are still in the first service modernization, while 4 countries are still in the traditional service period. If the average annual growth rate from 2000 to 2013 is maintained, by 2020, 37 countries will have entered the second service modernization; by 2030, 58 countries will have entered the second service modernization; by 2040, 74 countries will have entered the second service modernization; by 2050, 97 countries will have entered the second service modernization. China is expected to be entering the second service modernization around 2030.

Second, diversity of service modernization level. The relative gap in national service modernization level is 33 times. There are 18 countries with a service modernization index above 100, which are Belgium, Switzerland, Finland, the Netherlands, the United States, France, Denmark, Sweden, Israel, Singapore, Germany, Australia, the United Kingdom, Norway, Austria, Ireland, Canada, and New Zealand; 37 countries including Haiti have a service modernization index below 20.

Third, diversity of service indicator development. The difference among the indicators is remarkable. None of the countries have all the 12 indicators up to the reference value (average value of high-income countries). The development of service indicators is unbalanced.

Fourth, diversity of service modernization speed. Some countries undergo rapid growth while some undergo negative growth. Compared to 2000, the vast majority of the countries in 2013 have undergone positive growth in service modernization index, except for Chad, which has undergone negative growth. The world average of the annual average growth rate of service modernization index is 3.4%. Among the countries that have not yet completed service modernization, from 2000 to 2013, 69 countries including Georgia and China have moved up in the world rankings of service modernization index, 57 countries including Lebanon have fallen down in the world rankings, while 5 countries including Greece remain unchanged in the rankings.

Fifth, geographical diversity of service modernization. Africa remains the most underdeveloped area. This is consistent with the diversity of world modernization.

References

1. V.H. Heywood. *Global Biodiversity Assessment: Summary for Policy-Makers*. Cambridge University Press, 1995.
2. Ge Guang. From Biodiversity to Cultural Diversity. *Science Technology and Dialectics*, 2007,24(2): 24-32.
3. He Chuanqi. *Modernization Science: The Principles and Methods of National Advancement*.