Poverty Alleviation Index and Space Analysis Based on Endogenous Power

Ping Li, Zuotie Wang[*]
College of Business, Quzhou University, Quzhou, Zhejiang, China
*Corresponding Author.

Abstract:

Under the backgroud of Poverty alleviation work, it is should focus on the endogenous power under the new era that ensure economic growth in poverty-stricken areas and income increase of the poor groups. The paper defined the concept of endogenous power for poverty alleviation, clarify the subject, object and carrier of the endogenous power for poverty alleviation, further more to construct a poverty alleviation evaluation index system, which aim to draw on multi-dimensional measurement of poverty alleviation from innovative research perspectives. The poverty alleviation space model based on the decomposed poverty alleviation index according to the endogenous power factors, which can be seen as a method innovation, could locate the spatial distribution of poverty alleviation in different regions accurately. In conclusion, the maintenance strategy, the single-element input strengthening strategy and the dual-element coordinated strategy are respectively adopted for the poor areas in different quadrants. Specific paths are also given to the investigated poor cities and counties to comprehensively improve the level of poverty alleviation endogenous power, from the subject, object, and carrier, even the factor synergy of poverty power.

Keywords: *Endogenous power, Poverty alleviation index, Poverty alleviation space, Index analysis, poverty areas.*

I. INTRODUCTION

In 2021, poverty alleviation battle has achieved a comprehensive victory in China. Under the current standard, 98.99 million rural people, 832 poverty-stricken counties, and 128,000 poverty-stricken villages were lifted out of poverty. The regional and overall poverty alleviation was resolved, China has created another miracle in the whole world.The latest forecast data of the World Bank shows that due to the impact of the new crown pneumonia epidemic, the incidence of global poverty alleviation will increase after 2020, and 40-60 million people may fall into extreme poverty, and the global extreme poverty alleviation rate may increase by 0.3-0.7 percentage points [1]. Continuing the critical period of effective connection between comprehensive poverty alleviation and rural revitalization, the sudden epidemic has brought a certain impact on China's poverty alleviation work, the progress of poverty alleviation industrial projects and infrastructure construction in poverty alleviation areas have been delayed [2], and the risk of unemploymenti ncreases, income growth slows down, the risk of returning to poverty also increases. So it

is necessary to consolidate the achievements of poverty alleviation. From the perspective of international poverty reduction experience, the reduction and elimination of poverty mainly rely on two means, one is to by raising income, and the other is to through income distribution [3]. Therefore, consistently improving the endogenous power to ensure economic growth in poverty-stricken areas and increase the income of poverty-stricken groups, that is still an important way to reduce the risk of returning to poverty. Therefore, based on the above research, the innovation of this paper lies in the following aspects. Firstly, the paper clarified the composition of the endogenous power, and describe the current poverty alleviation status objectively. Secondly, this paper constructed a poverty alleviation evaluation index system, which aim to draw on multi-dimensional. Thirdly, this paper built a poverty alleviation space model based on the decomposed poverty alleviation index according to the endogenous power factors. The specific content of the paper is as follows.

II. LITERATURE REVIEW

First, the economic growth theory depicts the mechanism of poverty generation from the macro level, and the endogenous power can be traced back to the process of economic growth. The essence of the emergence and the escape from the poverty trap is the stagnation and persistence of economic growth. The vicious circle of poverty [4], balanced growth [5], and critical minimum effort all emphasize that poverty stems from economic development falling into a low level of equilibrium [6]. Solow's research on stable growth paths provides an economic explanation for the existence of poverty traps [7]. Therefore, poverty alleviation also revolves around economic growth, and elements such as human capital, technology, and innovation are gradually added to the economic growth model [8, 9], which provides an opportunity to explore the source of endogenous power. Paul Schultz emphasized the role of human capital in economic growth and poverty reduction [10]. To sum up, scholars have found that human capital accumulation, technological progress, and knowledge spillovers are more important than physical capital accumulation to change a region's low-level economic growth.

Second, the theory of "capacity poverty" emphasizes the multidimensional poverty of individuals at the micro level, and the multidimensional poverty index provides a scientific means to objectively describe the endogenous dynamic state of poverty alleviation. Amartya Sen advocated the use of multiple indicators representing individual well-being to measure poverty, and he put forward the theory of ability poverty to promote the integration of welfare economics and development economics [11, 12], which laid the theoretical foundation for multidimensional poverty measurement. H-M index [13], HDI index, HPI index, etc. [14] have been proposed successively based on the above theoretical development. Alkire and Foster put forward the measurement method of FGT index [15, 16] adjustment based on the "Multidimensional Poverty Index" (UNDP-MPI, also referred to as MPI) developed by UNDP (United Nations Development Programme), which has become a modern method. It provides an effective tool for considering the poverty alleviation state based on endogenous power under the multidimensional index system, and gradually become a mainstream research method.

Third, the concept of targeted poverty alleviation is rooted in China, and relying on endogenous power

to get rid of poverty has enriched the theory of poverty alleviation. In 2013, the targeted poverty alleviation strategy has been proposed, and the whole country made a decision to "win the battle against poverty" in 2015. In 2017, China emphasized that the poor should join the people of the whole country to enter a well-off society once again. Precision poverty alleviation enters a new era. Domestic scholars have carried out research on poverty alleviation strategy selection [17], multi-dimensional poverty measurement [18, 19], relative poverty standards [20]. Through the above research, insufficient endogenous power for poverty alleviation are theoretically extended to wider social dimensions such as system, environment, and cultures [21, 22]. According to the changes in the pattern of rural poverty in China, the strategy and policies for poverty reduction in rural areas are constantly adjusted.

To sum up, it is relatively mature to explore the mechanism of poverty and poverty alleviation, and relying on economic growth and income increase to reduce poverty has been corroborated by the practice of poverty alleviation. The existing research shows that there are many research achievements in poverty measurement, but the evaluation and measurement of poverty alleviation are insufficien, and the correlation between endogenous power and poverty alleviation has not been established.

The development plan of the poverty-stricken counties should put sustainable and long-term poverty alleviation as the goal that have been lifted out of poverty in 2020. Focusing on the above research gaps, this paper will build an evaluation index system for poverty alleviation based on endogenous power, supported by field research data, and use poverty alleviation indices of different dimensions to construct a space for poverty alleviation, so as to provide a reference for the improvement of the endogenous power level of poverty alleviation in the surveyed sample areas. The innovation of this paper lies in two aspects, firstly, scientifically define the endogenous power for poverty alleviation, and divided into three parts, subject, object and carrier, and revealed the specific content of each part. Secondly, build a poverty alleviation evaluation index system, which based on the multi-dimensional poverty index measurement method adjusted by the FGT index, and decompose the poverty alleviation index according to the element composition. Thirdly, based on the decomposed poverty alleviation index, establish a spatial model, locate the spatial distribution of the survey sample areas, and design a specific path to improve the endogenous movtivation.

III. COMPOSITION AND DATA SOURCES OF ENDOGENOUS POWER

3.1 Composition of Endogenous Power

Under relatively stable external conditions, the endogenous power is formed by subject and object acting together in a certain carrier. The subject of the endogenous power is affected by individual health status, ability and willingness to lift out of poverty, and the object of endogenous power can be represented by household livelihood capital, which is subdivided into The material capital, natural capital, financial capital and social capital with pro-poor nature, the endogenous power carrier refers to the poverty alleviation industry with a pillar role and the poverty alleviation project with the platform role. The subject of the endogenous power dominates the objects enters the carrier of poverty alleviation together, providing

a source of power for post-poverty development. The components and relationships of the endogenous power are shown in Figure 1.
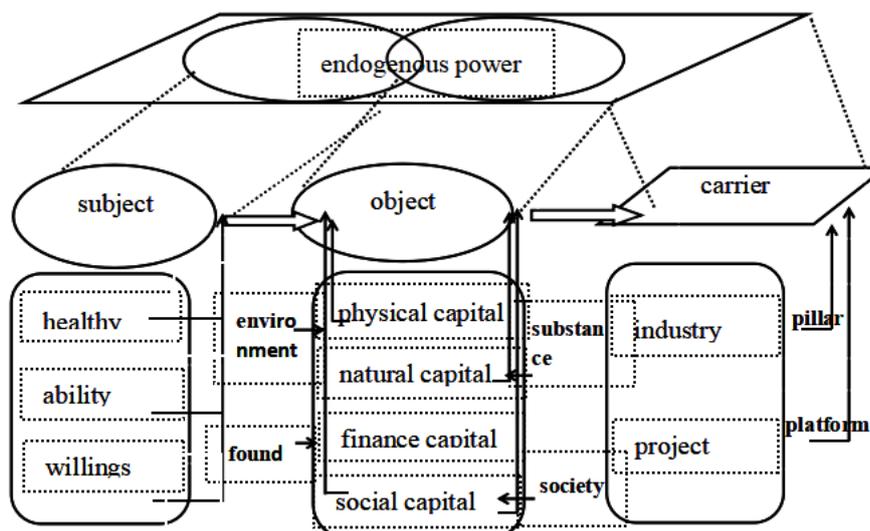

Fig 1: components of endogenous power for poverty alleviation

3.2 Data Sources and Representative Analysis of Samples

For truly reflect the precise poverty alleviation situation in impoverished counties, this paper designs a questionnaire and conducts field research based on the components of the endogenous power. Through research, on the one hand, we can obtain multi-dimensional microscopic poverty alleviation data based on endogenous power to provide data support for the calculation of poverty alleviation index. On the other hand, we can solve the problem of insufficient statistical data at the poverty-stricken counties, villages, and households, and enrich the construction of poverty alleviation databases to facilitate poverty alleviation.

The field research is mainly based on a structured household questionnaire survey, supplemented by semi-structured interviews, taking into account factors such as the distribution of impoverished areas, the characteristics of the impoverished population, and the level of regional economic development, and adopts a three-stage sampling method combining random and non-random. First, the poverty alleviation counties are randomly selected according to the coverage rate of more than 80%; secondly, the typical villages are selected in the sample frame of the poverty alleviation counties; finally, the survey objects are selected according to the equidistant sampling method in the sample villages. The field survey covered 9 cities in Heilongjiang Province, where 28 poverty alleviation counties were concentrated, and 23 poverty alleviation counties were randomly selected, with a coverage rate of 82.14%. A total of 840 questionnaires were distributed and 822 were recovered. After screening, 789 valid questionnaires were obtained, and the sample efficiency rate was 95.99%. Based on statistical analysis, the database for this study was formed.

IV. MEASUREMENT OF POVERTY ALLEVIATION INDEX

4.1 Selection of Eevaluation Indicators and Determination of Critical Values

Combining the components of the endogenous power and the basic poverty alleviation requirements proposed by the state, the poverty alleviation evaluation index system covers 5 core contents, of which the 3contents sourced from subject, object, and the carrie rof the endogenous power. The other 2 contents are derived from the basic poverty alleviation requirements. The above items constitute the first-level indicators for evaluating poverty alleviation. Under each first-level indicator, 1-3 second-level indicators are selected. The specific index selection instructions are as follows.

The evaluation index system consists of 5 first-level indicators, 13 second-level indicators and 16 observation variables, including labor capacity, education level, agricultural machinery ownership, amount of arable land, housing construction, school-age children's education, and natural villages. These 7 indicators are derived from the UNDP multidimensional poverty index measurement system. There are 5 indicators refer to the literature research of many domestic scholars, which are participation in skills training, willingness to get rid of poverty, loan amount obtained, occupation of relatives and friends, and participation in poverty alleviation projects. The other 4 indicators, including skills, whether to take the initiative to obtain loans, engaged in industries, and the annual income of poor families, refer to the policy orientation and practical needs of poverty alleviation. The thresholds of poverty alleviation for each indicator are set with reference to the thresholds of deprivation of the UNDP multidimensional poverty indicators. Among them, indicators have ajusted such as education level, participation in poverty alleviation projects, and income of poor families in terms of ability, which based on the research of scholars Zhang Quanhong [19], Dong Xiaolin [23], Tang Jin [24] and others. In addition, indicators such as skills and housing construction have been adjusted refer to the actual production and living conditions in poverty-stricken areas in Heilongjiang Province. The threshold value of poverty alleviation for indicators such as the number of arable land draws on the practice of the United States, the OECD and the European Union, that is, it is determined as 50% of the median per capita income [25], see Table I for details.

TABLE I. Poverty alleviation evaluation index and threshold

FIR-LEVEL INDICATOR	SEC-LEVEL INDICATOR	VARIABL-ES	THRESHOLD
SUBJECT (A)	health (A1)	ability (a11)	If the main labor has full or partial labor ability, the value is 1, otherwise it is 0
	ability (A2)	training (a21)	If the main labor has participated in skills training, the value is 1, otherwise it is 0
		education (a22)	If the education level is above junior high school, the value is 1, otherwise it is 0
		skilled (a23)	If the main labor has two or more skills, the value is 1, otherwise it is 0

	will (A3)	willings (a33)	If the main labor is willing to lift out of poverty, the value is 1, otherwise it is 0
OBJECT （B）	physical capital(B1)	machinery (b11)	If the agricultural machinery is owned by collective, the value is 1, otherwise it is 0
	natural capital(B2)	land (b21)	If the amount of farmland exceeds the median50%, the value is 1, otherwise it is 0
	financial capital (B3)	loan initiative (b31)	If the family obtain loans, the value is 1, otherwise it is 0
		loan amount (b32)	If the family has obtained special loans, the value is 1, otherwise it is 0
	social capital(B4)	occupation of friends(b41)	If the family has friends with stable income, the value is 1, otherwise it is 0
CARRIER(C)	industry(C1)	working industry(c11)	If family members work in more than 2 industries, the value is 1, otherwise it is 0
	project(C2)	projects (c21)	If the family participated in poverty projects, the value is 1, otherwise it is 0
INCOME(D)	income(D1)	income (d11)	If the annual income is more than 13,100 yuan, the value is 1, otherwise it is 0
SOCIAL SECURITY(E)	housing(E1)	husing (e11)	If the family has simply decorated or above, the value is 1, otherwise it is 0
	educate(E2)	education (e21)	If the children have received secondary education, the value is 1, otherwise it is 0
	medical(E3)	health center (e31)	If there are health centers in natural villages, the value is 1, otherwise it is 0

4.2 Calculation Method of Poverty Alleviation Index

The calculation of the poverty alleviation index refers to the AF double boundary method [26], and the process starts from the sample database of the relevant evaluation index system. First, input the sample data matrix, go through the first limit discrimination, and identify the single-dimensional index poverty alleviation matrix. Second, apply scientific methods to determine the weights of different indicators, and obtain a multi-dimensional indicator poverty alleviation matrix through the dimension discrimination of the second limit. Third, according to the multi-dimensional poverty alleviation rate and the average poverty alleviation dimension share, the poverty alleviation index is obtained, and the poverty alleviation index can be decomposed according to different indicators according to the research purpose. The specific calculation method of the poverty alleviation index is as follows.

Based on the first limit discrimination, that is, each individual i gets rid of poverty matrix G^0 on the index G^0, Set the level of dimension k as the second limit threshold. Define a n dimensional column vector $C = (c_1, c_2, \cdots c_n)^T$, the elements $c_i = (\max\{0, d_i - k\})^0$, represent whether the individual is a

multi-dimensional poverty alleviation individual. When $d_i > k$, c_i value is 1, which means that the individual relies on endogenous power to get out of poverty; when $d_i \leq k$, the c_i value is 0, which means that the individual poverty alleviation index is singl, and the endogenous power for poverty alleviation is not strong. The comprehensive index of poverty alleviation is recorded as p_0^k, and its calculation formula is:

$$p_0^k = \frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{d}\left(\max\left\{0,\frac{y_{ij}-z_j}{z_j}\right\}\right)^0 \left(\max\{0,d_i-k\}\right)^0 \tag{1}$$

Considering the weights ω_j, vectors C, and the first threshold discriminating index of different indicators, the calculation formula of the comprehensive index of poverty alleviation based on endogenous power can be further converted into:

$$p_0^k = \frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{d}\omega_j g_{ij}^0 c_i \tag{2}$$

In the above formula, let $h = \frac{1}{n}\sum_{i=1}^{n}c_i$ denote the incidence of poverty alleviation by endogenous power, let $a = \sum_{i=1}^{n}\sum_{j=1}^{d}\omega_j g_{ij}^0$ denote the average poverty alleviation share, and the comprehensive index of poverty alleviation can be further simplified as:

$$p_0^k = h \times a \tag{3}$$

Referring to the generalized formula of poverty alleviation rate, the formula of post-promoted poverty alleviation index p_α^k can be obtained:

$$p_\alpha^k = \frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{d}\left(\max\left\{0,\frac{y_{ij}-z_j}{z_j}\right\}\right)^\alpha \left(\max\{0,d_i-k\}\right)^0 \tag{4}$$

The poverty alleviation index p_0^k can be broken down by indicators:

$$p_0^k = \frac{1}{n}\sum_{n=1}^{i}\sum_{j=1}^{d}\omega_j g_{ij}^0 c_i = \sum_{j=1}^{d}\frac{\sum_{i=1}^{n}\omega_j g_{ij}^0 c_i}{n} \tag{5}$$

$\dfrac{\sum_{i=1}^{n}\omega_j g_{ij}^0 c_i}{n}$ is the poverty alleviation index of the indicator j, and the contribution rate β_j is

the indicator j in the poverty alleviation index:

$$\beta_j = \frac{\sum_{i=1}^{n}\omega_j g_{ij}^0 c_i}{p_0^k n} \tag{6}$$

4.3 Calculation and Decomposition of Poverty Alleviation Index

4.3.1 Calculation and result analysis of poverty alleviation index

To facilitate statistical analysis and research, each poverty alleviation area adopts the code generated during the survey, A represents the national poverty-stricken county, and B represents the provincial-level poverty-stricken county. The codes of the poverty alleviation areas are shown in Table II.

TABLE II. Codes of poverty alleviation areas in Heilongjiang Province

AREA	YS	BQ	GN	TL	HN	HC	TY	FY	TJ	SB	RH	LX
CODE	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A13
AREA	HL	QG	FY	KD	LJ	BY	YA	DS	BL	SW	DEBT	
CODE	A14	A15	A18	A19	A20	B01	B03	B04	B05	B07	B08	

Referring to the method for determining the deprivation dimension of the UNDP multidimensional poverty index, the poverty alleviation dimension in this paper is determined to be 5. According to the above algorithm, the entropy weight analysis method is used to determine the weight of each indicator of the 23 poverty alleviation cities and counties in the survey sample here [The calculation results of the weight of 16 indicators in 23 poverty alleviation counties are omitted in this paper], the entropy weight analysis method is used to determine the weight of each indicator. On this basis, calculate the poverty alleviation index of 23 poverty alleviation areas in Heilongjiang Province, that can be seen in Table III.

TABLE III. Poverty alleviation index in Heilongjiang Province

AREA	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A13
INDEX	.193	.419	.293	.269	.371	.185	.393	.488	.191	.450	.241	.258
AREA	A14	A15	A18	A19	A20	B01	B03	B04	B05	B07	B08	Provincial
INDEX	.273	.232	.237	.292	.348	.344	.238	.194	.256	.477	.232	.366

A comprehensive survey of 789 samples from 23 poverty alleviation areas shows that the province's poverty alleviation index is 0.366. A08 City has the highest poverty alleviation index with a value of 0.488, and A09 City has the lowest poverty alleviation index with a value of 0.191. There are 6 poverty alleviation areas higher than the province's poverty alleviation index, accounting for 26.09% of the surveyed areas, they are A02, A05, A07, A08, A10 and B07, 5 of which are national-level poverty-stricken counties. From the perspective of the spatial distribution of poverty alleviation cities and counties, the eastern part of Heilongjiang Province is higher than that in the west. In terms of the types of poverty alleviation counties, the national-level poverty-stricken counties is higher than that of the provincial-level poverty-stricken counties. The reasons for the above results may be due to the inclination of the targeted poverty alleviation policy to the deep-poor areas, as well as the poverty alleviation efforts of the local governments.

4.3.2 Decomposition and result analysis of poverty alleviation index

In order to more intuitively show the index levels of the subject, object and carrier of endogenous power in different poverty alleviation areas and their contribution, the poverty alleviation index is decomposed according to the components of endogenous power, which is convenient for horizontal comparative analysis. They are shown in Table IV, Table V and Table VI for details.

TABLE IV. The subjcet index and contribution rate

AREA	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A13
INDEX	.035	.082	.073	.058	.074	.033	.106	.086	.030	.074	.085	.038
RATE%	18.1	19.5	24.8	21.6	19.9	17.9	26.6	17.7	15.7	16.5	35.2	14.8
AREA	A14	A15	A18	A19	A20	B01	B03	B04	B05	B07	B08	PRO
INDEX	.047	.045	.048	.076	.060	.057	.052	.029	.046	.083	.057	.066
RATE%	26.9	19.2	20.3	25.9	17.3	16.5	21.6	14.8	17.8	7.26	24.4	17.93

The calculation results in Table IV shows the subject index of the endogenous power for poverty alleviation in the whole province is 0.066, and its contribution rate to the poverty alleviation index is

17.93%. Overall, the subject index is not quite different, and they are all concentrated in the range of 0.029 (B04) to 0.106 (A07), but the contribution rate of poverty alleviation is relatively large, concentrated in the range of 7.26% (B07) to 35.19% (A11).This shows that among the components of the endogenous power, the subjectivity of people has great potential, and improving the willingness and ability to lift poverty is the core factors, which verifies the scientificity of the poverty alleviation strategy . At the same time, it is also found that the contribution rate of the subject of endogenous power varies greatly in different regions, and there is still a lot of room for the role of the subject elements.

TABLE V. The poverty alleviation object index and contribution rate

AREA	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A13
INDEX	.102	.206	.100	.123	.178	.071	.203	.238	.099	.244	.126	.150
RATE%	52.9	49.1	34.1	45.7	47.8	38.2	51.5	48.7	51.6	54.1	52.3	58.1
AREA	A14	A15	A18	A19	A20	B01	B03	B04	B05	B07	B08	PRO
INDEX	.060	.128	.148	.120	.170	.165	.115	.066	.145	.231	.114	.191
RATE%	34.8	55.1	62.1	41.1	48.9	47.9	48.1	33.9	56.4	48.4	49.2	52.2

The calculation results in Table V shows that there is little difference in the object index, which is concentrated between 0.009 (A09) and 0.244 (A10), and its contribution rate to poverty alleviation is very large, which is concentrated in 34.08% (A03) to 62.12% (A18). The endogenous power object index in most poverty alleviation areas is lower than the provincial level. These areas are concentrated in the southern foot of the Greater Khingan Mountains, indicating that the livelihood capital base of the concentrated contiguous poverty-stricken areas is poor. From the perspective of the whole province, the contribution rate of the object index of endogenous power is as high as 52.2%, far exceeding the contribution rate of the subject index. The main force of the endogenous power also relies on pro-poor capital at the current stage.

Table VI. Poverty alleviation carrier index and contribution rate

AREA	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A13
INDEX	.019	.070	.061	.029	.059	.029	.057	.083	.024	.061	.019	.030
RATE%	5.51	16.6	20.8	10.7	15.9	15.7	14.4	16.9	12.3	1.47	8.00	11.80
AREA	A14	A15	A18	A19	A20	B01	B03	B04	B05	B07	B08	PRO
INDEX	.027	.029	.023	.047	.044	.040	.035	.012	.034	.056	.032	.041
RATE%	15.3	12.5	9.7	16.0	12.6	11.4	14.8	6.06	13.2	11.7	13.7	11.2

The calculation results in Table VI shows that there is little difference in the carrier index of the endogenous power, which is concentrated between 0.012 (B04) to 0.083 (A08), and its contribution rate is not quite different too, concentrated at 1.47% (A10) to 20.89% (A03), the index and contribution rate are at a lower level compared with the subjects and objects. Few areas have the endogenous power carrier index higher than the provincial level, but there are many areas whose contribution rate exceeds the provincial level. Generally speaking, the regions with relatively high endogenous power carrier index have common characteristics, that is, these regions are mostly concentrated in cities with comparative advantages in the development of secondary and tertiary industries.

Overall, in the 23 poverty alleviation areas surveyed, the contribution of the poverty alleviation index decomposed by the components of endogenous power has the following trend: object index contribution > subject index contribution > carrier index contribution. This shows that the contribution of the subject needs to be further improved, and the contribution of poverty alleviation industries and projects needs to be strengthened urgently. Strengthening the willingness of poverty alleviation subjects, enhancing the ability of poverty alleviation subjects, consolidating the foundation of poverty alleviation industries, and enriching poverty alleviation industrial projects are the focus of future poverty alleviation work.

V. SPATIAL MODEL OF POVERTY ALLEVIATION

5.1 Spatial Model Construction

Based on the components of endogenous power, the poverty alleviation index is decomposed to establish a poverty alleviation space with the subject index (X), object index (Y) and carrier index (Z) as the coordinate axes, in order to show the intuitive and comprehensive position of the county in the poverty alleviation space from three-dimensional graphics. Taking the value of the whole province as the spatial origin O, the three-dimensional index of each poverty alleviation city and county is compared with the provincial average, and the data table VII of the poverty alleviation spatial model is obtained.

TABLE VII. Data of spatial model of poverty alleviation in Heilongjiang Province

AREA INDEX	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A13
X	-.031	.016	.007	-.008	.008	-.033	.040	.020	-.036	.008	.019	-.028
Y	-.089	.015	-.091	-.068	-.013	-.120	.012	.047	-.092	.053	-.065	-.041
Z	-.022	.029	.020	-.012	.018	-.012	.016	.042	-.017	.020	-.022	-.011
AREA INDEX	A14	A15	A18	A19	A20	B01	B03	B04	B05	B07	B08	PRO
X	-.019	-.02	-.018	.010	-.006	-.009	-.01	-.04	-.020	.017	-.009	0

| Y | -.131 | -.06 | -.043 | -.071 | -.021 | -.026 | -.07 | -.12 | -.046 | .040 | -.077 | 0 |
| Z | -.014 | -.01 | -.018 | .006 | .003 | -.001 | -.01 | -.03 | -.007 | .015 | -.009 | 0 |

According to the values in Table VII, determine the coordinate points of each poverty alleviation areas, and use MATLAB (2016a) software to draw the poverty alleviation space, as shown in Figure 2. It shows that the 23 poverty alleviation counties are generally consistent in the poverty alleviation index based on endogenous motvation, surveyed in Heilongjiang Province, and there are some differences in different planes. Different poverty alleviation counties should improve the endogenous power in different ways.
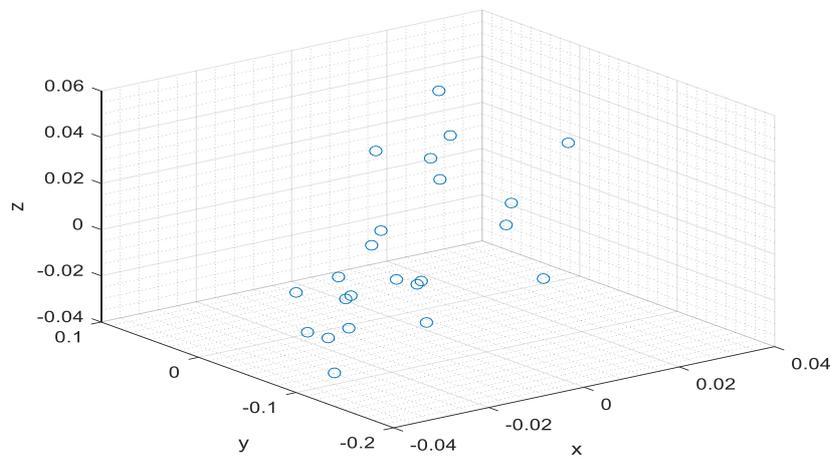
Fig 2: three-dimensional poverty alleviation space in Heilongjiang Province

5.2 Plane Expansion of Poverty Alleviation Space

In order to improve the level of endogenous power of poverty alleviation areas, the subject, object and poverty alleviation carrier elements are coordinated in pairs, and two-dimensional plane analysis is used as a means to design an endogenous power improvement path , which aiming at the synergy of the two elements. Consistent with the previous content, the X-axis represents the subject index of endogenous power, the Y-axis represents the object index, and the Z-axis represents the carrier index, so a two-dimensional plane with synergy between the two elements is obtained finally. The specific distribution of 23 counties is shown in Figure 3 (a), (b), (c), that investigated in Heilongjiang Province.
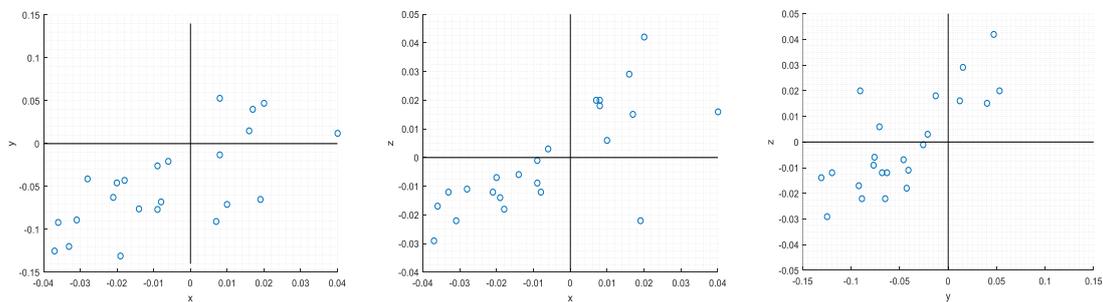
    (a) Subject and object   (b) Subject and carrier   (c) Object and carrier
Fig 3: Two-dimensional plane expansion of poverty alleviation space

Figure 3(a) shows that the coordinated development of the subject and object which could be divided into three categories in the 23 poverty alleviation areas, in the survey in Heilongjiang Province.The first category is the poverty alleviation in the first quadrant (X>0, Y>0), Specifically A06, A09 and other 5 areas, these cities and counties are located in the third quadrant, the main index and the object index are higher than the provincial average, the two are in a relatively good state of coordination; The second category is located in the third quadrant (X<0, Y<0) of 14 areas including A01 and A04. The development of endogenous power subjects and objects of poverty alleviation in these areas is lower than the provincial average level; The third category is A03 and A05 and other four cities and counties, which located in the fourth quadrant (X>0, Y<0). These areas are in a good state of endogenous subjcet, and the objects is lower than the average level of the provincial.

Figure 3(b) shows four situations that indicate the collaboration between the subjcet and the carrier in the poverty alleviation areas. Firstly, A02 and A03 and other 8 areas are located in the first quadrant (X>0, Z>0), the subject and carrier index are higher than the provincial average level, and the coordinated development of the two is in a relatively good state. Secondly, there is only one area located in the second quadrant (X<0, Z>0), that is A20, the endogenous carrier in this area is in a good state, and the subject index is lower than the average level of the province. The third category is located in the third quadrant (X<0, Z<0), including 13 areas including, such as A04 etc. The development of the subject and carrier of poverty alleviation in these areas is lower than that of the whole province. The fourth category is located in the fourth quadrant (X>0, Z<0), there is only one area, that is A11, the subject of poverty alleviation is in a good state, and the carrier is lower than that of the whole provincial average.

Figure 3(c) shows three situations of coordinated development of objects and carriers of endogenous power. Firstly, A02 and A07 and other 5 areas located in the first quadrant (Y>0, Z>0), the object and carrier index of poverty alleviation in these areas are higher than the provincial average level, and the coordinated development of the two is in a relatively good state. Secondly, A03, A05 and other 4 areas are located in the second quadrant (Y<0, Z>0), the construction of carrier for poverty alleviation in these areas is in a good state, and the object is lower than the average level of the province. Thirdly, A13, A14, A15

and other 14 areas located in the third quadrant (Y<0, Z<0), the development index of object and carrier is lower than the average level of the province.

Overall, among the 23 poverty alleviation cities and counties in Heilongjiang Province, 21.74% have relatively good coordinated development of the subject and object of poverty alleviation endogenous power, 17.39% are in the middle, and 60.87% are poor, the non-equilibrium state is obvious. 34.78% of the regions have relatively good coordinated development of the subject and carrier of poverty alleviation endogenous power, 8.70% of the middle, and 56.52% of the poor. The disequilibrium between the two poles is obvious, and the number of areas with poor coordination is large.The coordinated development of the object and the carrier is similar to the coordination between the subject and the object.

VI. CONCLUSIONS AND RECOMMENDATION

According to the calculation of the poverty alleviation index and the spatial analysis, different cities and counties of poverty alleviation should adopt different strategies to improve the endogenous power. Combining the two-dimensional plane analysis, the poverty alleviation counties in the first quadrant are in a better state of coordination, which could adopt maintenance strategies. Poverty alleviation areas in the second and fourth quadrants have prominent shortcomings in the endogenous power, which suitable for taking a single-factor strategy of strengthening investment .The poverty alleviation counties in the third quadrant are constrained by two factors, and a dual-factor coordinated development strategy can be adopted. According to the level and characteristics of poverty power in different poverty alleviation areas, adopting targeted and differentiated strategies can increase the marginal output of poverty alleviation resources, reduce the marginal cost, and maximize the effectiveness. Comprehensively improve the level of endogenous power, specific work could carry out in the followings.

The above research only studies the objective state of poverty alleviation from the perspective of the endogenous power, and more rigorous poverty alleviation evaluation index system needs to be enriched, the theory about the endogenous power needs to be further developed, also the constituent elements and mechanism of endogenous power still need to be deeply explored. Drawing on relevant theories of psychology and behavioral science, it is also one of the research directions worth to explore in the future.

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