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Research on Performance Evaluation of Social Work Development in China

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Abstract

This paper aims to explore efficiency enhancement and resource allocation optimization in the field of social work, a topic that has been underexplored in previous literature but is crucial for its development. Using China, home to the world's largest social work force, as an example, we constructed a multi-dimensional social work evaluation index system. The study evaluates China's social work sector using Meta-frontier Data Envelopment Analysis (DEA) and Malmquist index methods. Based on the results, we propose relevant improvement suggestions, intending to provide a reference for social work practices in other countries and regions.

Keywords

Social work, Efficiency, China, Resource allocation, Data Analysis, Social Developments

Introduction

With the deepening of globalization, all countries are faced with common social problems. Social work plays a crucial role in solving social problems, promoting social development, and improving people's lives. China's social work career has flourished alongside its economic progress. According to data from China's Civil Affairs Development Statistical Bulletin, funding for social work has continued to increase from 322.91 billion yuan to 480.82 billion yuan from 2011 to 2021, and the number of year-end employees in social work has risen from 11.298 million to 16.448 million. However, as one of the most populous countries in the world, China has significant social needs and challenges. The contradiction between the large and complex service users and the limited-service staff and funding cannot be ignored. Coordinating the allocation of the country's limited resources is particularly important, and improving the efficiency of social work has become an urgent problem for the development of social work in China.

However, our survey indicates a relative lack of research on evaluating the efficiency of social work

globally. As a bottom-up and basic livelihood service, the practical achievements of social work should receive wide attention and require the establishment of a scientific and comprehensive indicator system and evaluation method to guarantee the effective development and improvement of all kinds of livelihood work in the future. The history of social work development in China is relatively brief, indicating ample scope for improvement. By assessing and analyzing its progress, we can pinpoint areas for enhancement and offer insights that could benefit not only China's future development but also that of other countries.

Therefore, this paper selects Chinese social work as a case study for efficiency evaluation research. Existing studies have described the development of social work in China in some detail (Chau & Liu, 2001; Law & Gu, 2008; Wang, 2014; Ku, 2020; Gao & Yan, 2015) and summarized the current challenges (Wang, 2014; Lena Dominelli, 2020; Wu et al., 2022). However, the existing evaluation studies mainly focus on describing the development history and dilemmas of social work, lacking in-depth analysis and quantitative research, as well as a scientific indicator system and data support. The conclusions of the studies lack objectivity and credibility. At the same time, the methods of the studies are too simple, which, to a certain extent, limits the in-depth understanding and assessment of the actual effects of social work in China.

Based on the above analysis, this article applies the mature and widely used Data Envelopment Analysis (DEA) method to evaluate social work efficiency. We constructed a multi-dimensional social work evaluation index system. The Meta-frontier DEA method is used to differentiate the efficiencies of different clusters as required by the study. The text categorizes China's 31 provinces—comprising autonomous regions and municipalities directly governed by the central government—into three subgroups: central, eastern, and western regions, based on their economic policies and development status. It measures the frontier efficiencies of the whole and the subgroups respectively to gauge the gap between different provinces. Additionally, the Malmquist Index is used to dynamically track the development of China's social work from 2010 to 2020, exploring its 10-year evolution. This dynamic tracking aims to analyze the development of social work in China comprehensively from both static and dynamic perspectives. It observes the practical achievements of social work in China, summarizes its developmental status, provides direction for future improvements in social work practices, and addresses the shortcomings of existing research.

Literature Review

To the best of our knowledge, there are relatively few papers that assess the effectiveness of social work practice. There is no dispute that evaluating social work practice is important (Blom & Morén, 2012). As the effectiveness and efficiency of social work practice continues to grow, there is increasing interest in the practice and strategies of social work evaluation (Wharton & Kazi, 2012). Wharton and Kazi (2022) note that social workers function in many fields and that governmental oversight brings with it pressure to evaluate their effectiveness and efficiency. They introduce the American Evaluation

Association, which can evaluate the effectiveness of social work practice and is committed to helping develop solid social work practice. However, the current academic research on social work assessment and evaluation is still weak, and there are outstanding problems such as the lack of a targeted indicator system and the long cycle and high cost of existing related evaluations (Zhang et al., 2022). To address this situation, Zhang et al. (2022) explored the construction of a quantitative model for real-time assessment of social work advancement around the world using Internet open-source big data, established a targeted indicator system using specific social work practices in China as a case study, and proposed a fast calculation method for scoring. However, the study suffers from the problems of high noise and insufficient algorithmic precision.

Social work in China faces many challenges (Lena Dominelli, 2020), and Yin (2021) argues that traditional social work services have problems such as inconvenient information flow, irrational resource allocation, and low service efficiency. The development of social work in China has also received attention from scholars and some organizations. Wu et al. (2022) reviewed the background of conducting research on social work practice in China, considering China's social context, the international relevance of social work in China to academia, and the current status of social work research in China. They argued that China's social work practice suffers from uneven geographic development, insufficient professional supervision, and third-party evaluation, and made relevant recommendations. The 2019 China Social Work Longitudinal Study (CSWLS) Baseline Survey collected 979 agency questionnaires and 5965 social worker questionnaires from 56 cities across the country to reflect the development of social work in China in the form of data. This provides a national longitudinal multilevel dataset encompassing a comprehensive set of domains for Chinese government officials, professional leaders, and academic researchers, contributing to the development of social work in China in various ways. CSWLS will also continue to conduct data surveys in the future, making efforts to collect real data, promote scientific research, and accumulate localized knowledge (Yuan et al., 2021).

Scholars emphasize the importance of evaluating social work practice, but current research lacks clear assessment criteria and scientific research methods to measure the actual effects of social work. Some organizations have recognized that data surveys and collection can assist in the development of social work in China (Yuan et al., 2021). However, as a social service covering all levels of units, groups, and fields in China, there is a lack of a systematic and complete performance evaluation index system. Given the weak foundation of current social work evaluation research, it is important and urgent to conduct an in-depth study on the efficiency of social work in China. This paper proceeds from the following aspects: (1) constructing a set of social work evaluation index system based on the current situation of social work in China using the China Civil Affairs Statistical Yearbook; (2) applying Meta-frontier DEA and Malmquist index to comprehensively analyze the development of social work in China from static and dynamic perspectives, and making comparisons of the Decision Making Units (DMUs) with each other; (3) summarizing the achievements of China's social work development and

relevant experiences based on the measurement results, while analyzing the reasons for the gaps and proposing corresponding suggestions for improvement.

Method

DEA model

DEA is a nonparametric estimation method used to evaluate the relative efficiency of a set of DMUs with multiple inputs and outputs. If the efficiency score of a DMU is 1, it is considered relatively efficient; otherwise, it is deemed relatively inefficient (Cook & Seiford, 2009). The method does not require the data to conform to a specific functional form and has been widely applied across various domains (Cui & Yu, 2021; Panwar, 2022).

CCR (Charnes, Cooper and Rhodes, 1978) and BCC (Banker, Charnes, & Cooper, 1984) are two commonly used models in DEA analysis. The former models the efficiency of DMUs assuming constant returns to scale, while the latter evaluates efficiency with variable returns to scale.

From a policy perspective, it is important to distinguish regional differences in average efficiency levels and determine whether regions share common characteristics (Battese et al., 2004). Due to geographic location, history, and resource distribution, there are evident regional differences in economic, social, and cultural aspects among central, eastern, and western China. By dividing China's 31 provinces (autonomous regions and municipalities directly under the central government) into three subgroups: central, eastern, and western, this paper can achieve a detailed analysis of each region and conduct an in-depth study of the level of development of social work in different regions, as well as the problems that exist in each region. Through horizontal and vertical comparative analyses, it can reveal the differences and similarities in the development of social work among the different regions and track the changes and development trends of social work in each region. Ultimately, this approach will enable a more accurate understanding of the unique needs and problems of different regions, leading to the proposal of corresponding policy programs.

Common frontier DEA model

Rao (2003) utilized the concept of a common frontier function to study regional differences in production technology. The common frontier DEA model introduces the concept of common frontier and group frontier based on DEA.

Assume that all DMUs are divided into k (k>1) clusters, and the set of common technologies for the kth group of DMUs is:

$$T^k = \{ (x, y): x \geq 0, y \geq 0, x \text{ could produce } y\}$$

$$k = 1,2, \ldots, k \quad (1)$$

The input-output relationship for the kth group is:

$$P^k(x) = \{y: (x, y) \in T^k\} \quad (2)$$

The common set of techniques for all DMUs is:

$$T = \{(x, y): x \geq 0, y \geq 0, x \text{ could produce } y\} \quad (3)$$

The corresponding production possibility set is:

$$P(x) = \{y: (x, y) \in T\} \quad (4)$$

Then,

$$T = \{T^1 \cup T^2 \cup \dots T^k\} \quad (5)$$

The frontier determined by $P^k(x)$ is the group frontier, and the collective frontier formed by all $P^k(x)$ is the common frontier, meaning the group production possibilities are a subset of the common production possibilities.

The directional distance function of the DMU from the common frontier is:

$$\begin{cases} \min[\theta - \varepsilon(\hat{e}^T s^- + e^T s^+)] \\ \text{s. t.} \sum_{j=1}^{n} \lambda_j x_j + s^- = \theta x_0 \\ \sum_{j=1}^{n} \lambda_j y_j - s^+ = y_0 \\ \lambda_j \geqslant 0; j = 1,2, \cdots, n \\ s^+ \geqslant 0; s^- \geqslant 0 \end{cases} \quad (6)$$

where $x_j \in X_j$ and $y_j \in Y_j$ are the input and output variables of region $j(j = 1,2, \dots, n)$, s^- and s^+ are the slack variables of inputs and outputs of the *j*th DMU, λ is the vector of weights, θ is the value of efficiency, ε is the non-Archimedean infinitesimal, $\hat{e}^T = (1,1, \dots,1) \in E_m, e^T = (1,1, \dots,1) \in E$. When $\theta = 1$, it indicates that the DMUs are located on the common frontier.

If the DMU belongs to the *k*th group, the directional distance function of the DMU from the frontier of the *k*th subgroup is:

$$\begin{cases} \min[\varphi - \varepsilon(\hat{e}^T s^- + e^T s^+)] \\ \text{s. t.} \sum_{j=1}^{n} \lambda_j x_j^k + s^- = \varphi x_0 \\ \sum_{j=1}^{n} \lambda_j y_j^k - s^+ = y_0 \\ \lambda_j \geqslant 0; j = 1,2, \cdots, n^k \\ s^+ \geqslant 0; s^- \geqslant 0 \end{cases} \quad (7)$$

Among them, x_j^k and y_j^k are the input and output variables of region $j(j = 1,2, \dots, n^k)$ in the *k*th group, respectively; φ is the efficiency value. When $\varphi = 1$, it indicates that the DMU is located on the group frontier.

Rao (2003) expressed the technology gap ratio (TGR) under the definition of output-oriented technical efficiency (TE).

$$TGR_0^k(x, y) = \frac{TE_0^*(x, y)}{TE_0^k(x, y)} \quad (8)$$

The ratio of the common frontier to the group frontier is expressed as TGR, and there is a $\theta \leq \varphi$ relationship between the common frontier and the group. Therefore, the efficiency gap ratio TGR is

defined as:

$$TGR = \frac{\theta}{\varphi} \ TGR \in (0,1) \ (9)$$

A larger TGR value indicates that the group frontier is closer to the common frontier. If TGR equals 1, it means there is no gap between the group frontier and the common frontier.

Malmquist index

The Malmquist index, proposed by Malmquist (1953), was combined with the DEA method by Fare (1994) to establish a model that uses panel data to examine changes in total factor productivity (TFP). This model can address the static but not dynamic evaluation limitations of the DEA method. The Malmquist index model is as follows:

$$M(y_{t+1}, x_{t+1}, y_t, x_t) = \sqrt{\frac{d^t(x_{t+1}, y_{t+1})}{d^t(x_t, y_t)} \times \frac{d^{t+1}(x_{t+1}, y_{t+1})}{d^{t+1}(x_t, y_t)}} \ (10)$$

where x_t and x_{t+1} represent the input variable in periods *t* and *t*+1, and y_t and y_{t+1} represent the output variable in periods *t* and *t*+1. Additionally, $d^t(x_t, y_t)$ denotes the output distance function of the production point in period *t* with respect to the contemporaneous technological frontier, while $d^t(x_{t+1}, y_{t+1})$ represents the output of the production point in period *t*+1 with respect to the contemporaneous technological frontier distance function. Furthermore, $d^{t+1}(x_t, y_t)$ signifies the output distance function of the production point in period *t*+1 relative to the technology frontier in period *t*, and $d^{t+1}(x_{t+1}, y_{t+1})$ indicates the output distance function of the production point in period t relative to the technology frontier in period *t*+1.

Total factor productivity change (TFPCH) can be calculated as the product of comprehensive technical efficiency change (EFFCH) and the technical progress index (TECHCH). EFFCH can be further broken down into scale efficiency change (SECH) and pure technical efficiency change (PECH). The expression is as follows:

$$tfpch = effch \times techch = sech \times pech \times techch \#(11)$$

$$M(y_{t+1}, x_{t+1}, y_t, x_t) = \frac{d^{t+1}(x_{t+1}, y_{t+1})}{d^t(x_t, y_t)} \times \sqrt{\frac{d^t(x_{t+1}, y_{t+1})}{d^{t+1}(x_{t+1}, y_{t+1})} \times \frac{d^t(x_t, y_t)}{d^{t+1}(x_t, y_t)}}$$

$$= \frac{d^{t+1}(x_{t+1}, y_{t+1}|VRS)}{d^t(x_t, y_t|VRS)} \times \left[\frac{d^{t+1}(x_{t+1}, y_{t+1}|CRS)}{d^{t+1}(x_{t+1}, y_{t+1}|VRS)} \times \frac{d^t(x_t, y_t|VRS)}{d^t(x_t, y_t|CRS)}\right]$$

$$\times \sqrt{\frac{d^t(x_{t+1}, y_{t+1})}{d^{t+1}(x_{t+1}, y_{t+1})} \times \frac{d^t(x_t, y_t)}{d^{t+1}(x_t, y_t)}} \ (12)$$

Where EFFCH, TECHCH, SECH, and PECH > 1 represent improved technical efficiency, improved production technology, improved scale efficiency, and improved pure technical efficiency. The opposite is regression, and equal to 1 indicates no change.

Input and output indicators

This paper selects four indicators from three aspects for input indicators: capital, personnel, and facility input. The input-output indicators are depicted in Table 1. Specifically, financial allocations for social

work is chosen for financial input, reflecting the degree of government financial support for social work. The number of employees at the end of the year is chosen for personnel input, reflecting the construction of the social work talent team. The input of facilities includes the number of facilities and institutions and the number of beds at the end of the year, reflecting the degree of support for the material carriers of social work.

Regarding output indicators, the China Civil Affairs Statistical Yearbook categorizes social work into two types: those providing accommodation and those that do not. This paper selects the number of adoptions at the end of the year to reflect the development of social work that provides accommodation. The indicators for social work that does not provide accommodation include the number of elderly people receiving old age allowance, the number of employed persons with disabilities, the number of orphans in centralized rear, the number of people with urban and rural minimum living allowance, the number of urban and rural persons in special difficulty receiving assistance and support, and the number of people receiving temporary assistance. These indicators reflect the provision of social work for the elderly, people with disabilities, children, and the needy, totaling seven output indicators.

Table 1. List of Inputs and Outputs

Type	Variable declaration	Abbreviation
Input	Financial allocations for social work	X1
	Number of employees at the end of the year	X2
	Number of facilities and institutions	X3
	Number of beds at the end of the year	X4
Output	Number of adoptions at the end of the year	Y1
	Number of elderly people receiving old age allowance	Y2
	Number of employed persons with disabilities	Y3
	Number of orphans in centralized rear	Y4
	Number of people with urban and rural minimum living allowance	Y5
	Number of urban and rural persons in special difficulty receiving assistance and support	Y6
	Number of persons receiving temporary assistance	Y7

Case studies

Descriptive statistical analysis

This study utilizes panel data spanning 2011 to 2020 from the China Statistical Yearbook and the China Civil Affairs Statistical Yearbook, with China's 31 provinces (autonomous regions, and municipalities directly under the central government) as the DMU. These 31 regions are categorized into three groups based on geographical location: central, eastern, and western. Detailed information on decision-making

units and groupings can be found in S1.

Table 2 presents the descriptive statistics for the input-output indicators discussed in this paper. It was observed that the average of X1 financial allocations for social work increased annually from 2011 to 2017. However, the Program for Deepening the Reform of Party and State Institutions, released in 2018, stipulated the removal of funds for preferential pension, retirement and resettlement, and natural disaster living assistance from the special funds for civil affairs from 2018 onwards, resulting in a sudden decrease in civil affairs fees in 2018. Subsequently, the fee increased annually from 2018 to 2020. Similar trends were observed in the averages, standard deviation (SD), maximum (Max), and minimum (Min). Additionally, the mean, SD, Max, and Min for the number of employees at the end of year X2 and the number of facilities and institutions in X3 showed yearly increasing trends. The indicator for X4, the number of beds at the end of the year, reached its highest value in 2014 but decreased by 18.47% in 2015.

The indicator for the number of adoptions at the end of the year Y1 shows a decreasing trend annually. Conversely, in response to the increase in China's aging population, the mean, SD, and Max the number of elderly people receiving old age allowance in Y2 have increased year by year. Additionally, the indicators for Y3, the number of employed persons with disabilities, Y4, the number of orphans in centralized rear, and Y5, the number of people with urban and rural minimum living allowance, decrease year by year. For Y6, the mean, SD, and Max of the number of urban and rural persons in special difficulty receiving assistance and support decrease annually, while the Min increases gradually. In Y7, the indicator for the number of persons receiving temporary assistance shows larger mean, SD, and Max values in 2011 and 2020, gradually increasing from 2012 to 2019, while the Min shows the opposite trend.

Table 2. Summary Data on Input and Output Indicators

Year	X1	X2	X3	X4	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Mean											
2011	1038640	41786	363463	124327	93559	284857	71	2489	2445981	183603	338372
2012	1185073	44016	368394	144980	99644	405707	71	3073	2415505	179208	203159
2013	1375095	50325	385288	169887	75765	502540	71	3029	2403939	176094	225206
2014	1416535	53737	402387	197910	107748	554714	70	3017	2285254	173109	209905
2015	1584145	56860	421070	126820	74707	695169	68	2987	2130530	168895	211420
2016	1749540	56230	398493	133546	76547	759804	29	2823	1957002	163205	274419
2017	1905080	58666	435951	135358	73794	865237	30	2713	1711994	158797	313002
2018	1310986	60451	471859	131654	68385	958795	30	2250	1459707	155685	357418
2019	1376487	64923	497190	150400	74711	955774	28	2080	1392342	151170	320378
2020	1547303	73886	529011	166266	75997	1001434	28	1903	1427697	154006	445057

SD											
2011	482561	28687	234747	99392	79445	397622	52	2223	1659448	148050	439113
2012	569962	29963	233896	116760	84418	544826	54	2063	1695874	147826	202781
2013	660968	35866	248691	136324	64154	608924	55	2077	1724062	146355	252228
2014	687730	39423	270805	157945	91048	588021	54	2002	1672028	145206	270179
2015	750253	41643	281990	97276	59838	769709	53	1946	1571065	142608	126858
2016	826476	40708	254666	103846	60909	758796	19	1798	1399486	137262	185631
2017	917297	41842	309050	103384	55816	910973	19	2041	1207490	137463	220589
2018	588850	42571	330846	100498	51451	942325	19	1530	1028356	136118	376928
2019	626156	45633	354165	110506	54277	905166	17	1408	1002481	135341	365295
2020	736284	50864	375982	122174	54945	1018325	17	1333	1033315	136929	703582
MAX											
2011	2168768	133456	866932	356718	276642	1666065	198	8541	6144115	527123	1832989
2012	2375722	133737	896270	435256	301486	1926607	217	9808	6208660	519544	913538
2013	2880631	148894	955434	504647	247083	2179545	222	9823	6230287	516336	1164417
2014	2917858	151665	1095220	571327	345885	2163510	222	10052	5987734	506094	1581290
2015	3152460	155339	1144679	404939	246167	3202633	224	9924	5618289	494722	469362
2016	3486434	153151	978408	428412	245474	2696666	86	8860	5126247	489119	701500
2017	3723481	160048	1394482	432979	223611	4041278	89	9741	4847194	508589	1134223
2018	2631090	160261	1305510	412652	196208	3237402	88	7525	4336224	502151	1621239
2019	2826465	169678	1364758	442316	203156	2957455	83	6778	4305855	498727	1560682
2020	3112303	214001	1622253	457971	205386	3794557	81	6506	4410291	502019	3702044
Min											
2011	130280	6157	33998	4897	3771	7789	6	0	187437	3341	0
2012	155074	6222	33677	9610	4282	14078	3	318	172722	3184	6925
2013	156075	6391	35590	10494	3736	12282	2	273	163257	2859	3290
2014	136790	6447	38625	10698	7277	18302	1	318	140459	2714	5892
2015	175034	6606	40972	7727	3483	9464	2	333	133710	2599	16588
2016	235821	6189	39782	7816	3514	6667	2	336	128661	2496	3765
2017	273338	6182	39961	9450	4861	17097	2	285	122373	3039	22054
2018	221187	6205	43472	4438	1686	17903	2	222	105016	3374	14891
2019	201015	6167	36228	6168	2266	17970	2	250	103094	3578	13019
2020	235166	7564	46869	9644	3754	6134	2	226	109692	3932	9806

Analysis of results

The result of Common frontier

The common frontier efficiency results discussed in this section are detailed in Table 3. Overall, the

10-year average efficiency value for the 31 provinces is 0.8275. It can be concluded that there is still room for improvement in China's social work by 17.25%, indicating that there is more to be done in the future. From Table 3, it is evident that the efficiency value of each province is above 0.5 every year. Further analysis reveals that only HA has a ten-year efficiency value of 1, while XZ, QH, and SC have efficiency values very close to 1, and SN, AH, GX, SH, HN, and JL have an efficiency value of 0.90 or more. The three provinces with lower efficiency are BJ, TJ, and LN.

The regional efficiency results have been divided into four parts for comparison: G1 (Group1, eastern), G2(Group2, central), G3(Group3, western), and national. Figure 1 clearly shows a decreasing trend in their efficiency values. Among them, the average efficiency values of G2 and G3 are higher than the national average, and the efficiency values of G3 and G2 are very close to each other. This indicates that the development level of social work in the central and western regions is relatively high and similar, with G3 slightly higher than G2. In 2017 and 2018, the efficiency value of G2 is higher than that of G3. However, the efficiency value of G1 is the lowest and lower than the national average, indicating that social work in the eastern region still has more room for improvement. Therefore, there should be a focus on analyzing the reasons for the low efficiency of social work in the east and strengthening and improving it.

Table 3. Common frontier efficiency values for 2011-2020

DMU	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Mean
BJ	0.8450	0.7969	0.6737	0.7013	0.6708	0.6758	0.7087	0.5104	0.5293	0.5126	0.6533
TJ	0.8301	0.8029	0.6662	0.7032	0.6600	0.6588	0.6704	0.6119	0.5821	0.4759	0.6589
HE	0.8861	0.7328	0.6679	0.6620	0.6868	0.5868	0.6032	0.9176	0.7818	0.6247	0.7072
LN	0.9281	0.7149	0.6166	0.6626	0.6702	0.6550	0.6473	0.6019	0.5998	0.5793	0.6618
SH	0.8408	0.9700	0.7735	1	0.7933	1	1	1	0.9389	1	0.9273
JS	1	1	0.8883	1	0.9356	0.8238	0.7349	0.7768	0.8461	0.7732	0.8725
ZJ	1	0.8301	0.6835	0.8126	0.5986	0.5558	0.5218	0.7269	0.6279	0.5102	0.6715
FJ	1	0.8641	0.7079	0.6742	0.6755	0.5839	0.5772	0.6171	0.5646	0.5296	0.6666
SD	1	0.9614	0.7935	1	0.7613	0.7197	0.5963	0.7063	0.6685	0.5063	0.7542
GD	0.9734	1	0.9444	1	1	0.8094	1	0.8338	0.7208	0.6746	0.8871
HI	1	0.9290	0.7377	0.7516	0.8139	0.8313	0.9583	1	1	0.9598	0.8925
G1	0.9340	0.8671	0.7353	0.8026	0.7426	0.7073	0.7110	0.7381	0.6995	0.6285	0.7521
SX	0.8169	0.8103	0.6975	0.6565	0.6826	0.7069	0.7681	0.7241	0.6372	0.5382	0.6991
JL	0.8955	0.8647	0.9769	1	0.8489	1	0.9835	0.8458	0.7785	0.8437	0.9006
HL	0.9659	0.9479	0.7373	0.7904	0.7935	0.7914	0.7686	0.8439	0.8463	0.8334	0.8290
AH	1	1	1	1	1	1	0.9318	1	0.8950	0.7817	0.9581
JX	1	0.9897	0.8748	1	0.8228	0.9690	0.8940	0.8705	0.7598	0.6175	0.8712

HA	1	1	1	1	1	1	1	1	1	1	1
HB	1	0.9905	0.7285	0.8011	0.7891	0.7465	0.7148	0.7106	0.6812	0.5749	0.7640
HN	1	1	1	1	1	0.9070	0.8941	0.9081	0.7907	0.7435	0.9197
G2	0.9575	0.9478	0.8673	0.8961	0.8598	0.8823	0.8635	0.8568	0.7913	0.7271	0.8625
IM	0.9020	0.7937	0.8014	1	0.7323	0.7049	0.6921	0.6157	0.6253	0.6723	0.7455
GX	1	1	0.8093	0.8184	1	0.9871	0.9806	1	1	0.9336	0.9500
CQ	0.9474	0.8874	0.7525	0.7669	0.7395	0.7739	0.7554	0.7186	0.6950	0.6703	0.7667
SC	1	1	1	1	1	1	1	1	0.9095	1	0.9906
GZ	1	0.9417	0.8065	0.7364	0.7566	0.6815	0.6697	0.6910	0.6292	0.5975	0.7414
YN	1	1	1	1	1	0.9581	0.7976	0.7680	0.6672	0.6091	0.8665
XZ	1	1	0.9805	1	1	1	1	1	1	1	0.9980
SN	0.9404	1	0.9905	0.9675	1	1	0.9459	1	0.9868	1	0.9829
GS	1	0.8401	0.6892	0.7224	0.8158	1	0.9912	1	1	0.9389	0.8916
QH	0.9969	1	1	1	1	1	0.9776	1	1	0.9799	0.9954
NX	1	1	1	0.9592	0.8696	0.7431	0.5806	0.5767	0.6327	0.6939	0.7870
XJ	0.9849	0.9241	0.8045	0.7915	0.7869	0.8216	1.0000	1	0.8737	1	0.8943
G3	0.9804	0.9462	0.8787	0.8895	0.8843	0.8797	0.8517	0.8465	0.8186	0.8239	0.8787
Mean	0.9579	0.9177	0.8221	0.8593	0.8252	0.8148	0.8017	0.8088	0.7674	0.7247	0.8275

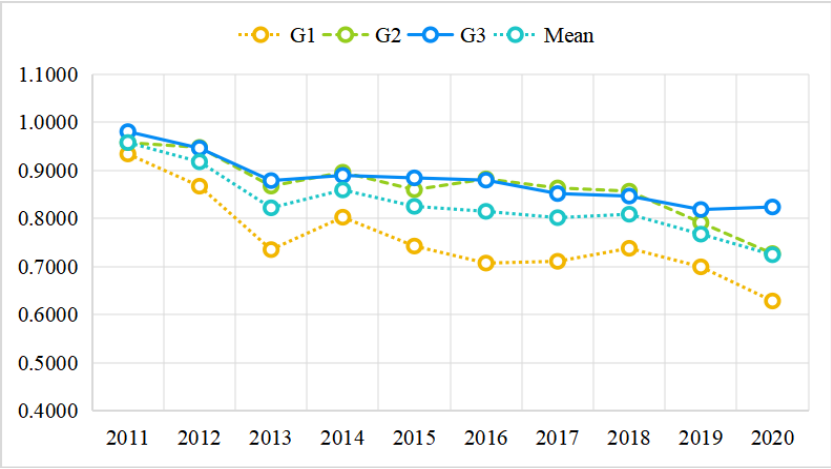

Figure 1. Subregional Common Frontier Efficiency Values

Note. G1:Group1, eastern; G2:Group2, central; G3:Group3, western; Mean: national average. The result closer to 1 indicates higher efficiency. Source: The authors

The result of Grouping frontier

The results of the grouping frontier efficiency are detailed in Table 4. In terms of grouping frontier efficiency values, more provinces have reached an efficiency value of 1 compared to the common

frontier efficiency value. In the G1 region, the average efficiency value of provinces over the past 10 years is 0.8970. Eleven provinces have an average efficiency value of 0.7 or above, with SH having the highest value of 0.9833, and ZJ the lowest at 0.7029. For the G2 region, the average efficiency value over the past 10 years is 0.9798, with all 8 provinces having an average efficiency value above 0.95. Notably, in 2011, 2012, and 2018, the efficiency values of these 8 provinces reached 1, and HA has maintained a ten-year efficiency value of 1. In the G3 region, the average efficiency value of each province over the past 10 years is 0.9035, with 12 provinces having an average efficiency value above 0.75. XZ has the highest efficiency value at 0.9980, while GZ has the lowest at 0.7539. Figure 2 shows that the G2 region has the highest efficiency value of the grouped frontier, while the average efficiency value of the G1 and G3 regions is generally lower than the national average.

Table 4. Grouping Frontier Efficiency Values for 2011-2020

DMU	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Mean
BJ	1	1	0.9089	1	0.9349	0.8889	0.8515	0.5999	0.5996	0.5880	0.8191
TJ	1	1	0.8430	1	0.9563	1	0.9952	0.7927	0.7882	0.7960	0.9122
HE	1	1	1	0.9768	1	0.9847	0.9410	1	1	0.8788	0.9774
LN	1	1	1	1	1	1	0.9703	0.8718	0.9396	0.8222	0.9584
SH	1	1	0.9430	1	0.9487	1	1	1	0.9448	1	0.9833
JS	1	1	1	1	1	1	0.8913	0.9100	0.9814	0.9767	0.9751
ZJ	1	0.8630	0.7213	0.8282	0.6374	0.6125	0.5806	0.7347	0.6439	0.5329	0.7029
FJ	1	0.9649	0.8397	0.7587	1	0.7448	0.7255	0.7763	0.6471	0.5881	0.7928
SD	1	1	1	1	1	0.8140	0.6846	0.8209	0.8052	1	0.9049
GD	1	1	0.9444	1	1	0.8352	1	0.8884	0.7801	0.7300	0.9122
HI	1	1	0.9766	0.9730	0.9312	0.9158	1	1	1	1	0.9792
G1	1	0.9835	0.9208	0.9542	0.9395	0.8811	0.8634	0.8450	0.8167	0.7907	0.8970
SX	1	1	1	0.9071	0.9537	1	1	1	0.9170	0.8108	0.9568
JL	1	1	1	1	1	1	1	1	0.9631	1	0.9962
HL	1	1	1	1	0.9089	0.9067	0.8701	1	1	1	0.9673
AH	1	1	1	1	1	1	0.9694	1	1	1	0.9969
JX	1	1	0.9729	1	0.9601	1	1	1	0.9468	0.8830	0.9756
HA	1	1	1	1	1	1	1	1	1	1	1
HB	1	1	0.8962	1	1	1	0.9608	1	0.9435	0.8405	0.9626
HN	1	1	1	1	1	1	1	1	0.9037	0.9390	0.9837
G2	1	1	0.9830	0.9879	0.9773	0.9878	0.9741	1	0.9586	0.9311	0.9798
IM	0.9689	0.8512	0.8924	1	0.8122	0.7838	0.7687	0.6743	0.6662	0.7128	0.8057
GX	1	1	0.8618	0.8835	1	0.9885	0.9808	1	1	0.9813	0.9683

CQ	1	1	0.8944	0.9659	0.7946	0.8954	0.8886	0.7991	0.7400	0.7145	0.8636
SC	1	1	1	1	1	1	1	1	0.9231	1	0.9920
GZ	1	0.9514	0.8276	0.7516	0.7756	0.7030	0.6851	0.6921	0.6377	0.6081	0.7539
YN	1	1	1	1	1	0.9581	0.7976	0.7686	0.7139	0.6328	0.8758
XZ	1	1	0.9805	1	1	1	1	1	1	1	0.9980
SN	0.9996	1	1	1	1	1	0.9696	1	1	1	0.9969
GS	1	0.8512	0.7014	0.7352	0.8158	1	0.9912	1	1	0.9410	0.8961
QH	1	1	1	1	1	1	0.9864	1	1	1	0.9986
NX	1	1	1	0.9634	0.8704	0.7670	0.6344	0.6534	0.6987	0.7628	0.8227
XJ	1	1	0.8718	0.8163	0.7888	0.8292	1	1	0.8815	1	0.9148
G3	0.9973	0.9695	0.9143	0.9206	0.8995	0.9038	0.8815	0.8697	0.8423	0.8479	0.9035
Mean	0.9990	0.9823	0.9339	0.9495	0.9332	0.9165	0.8979	0.8925	0.8614	0.8474	0.9202

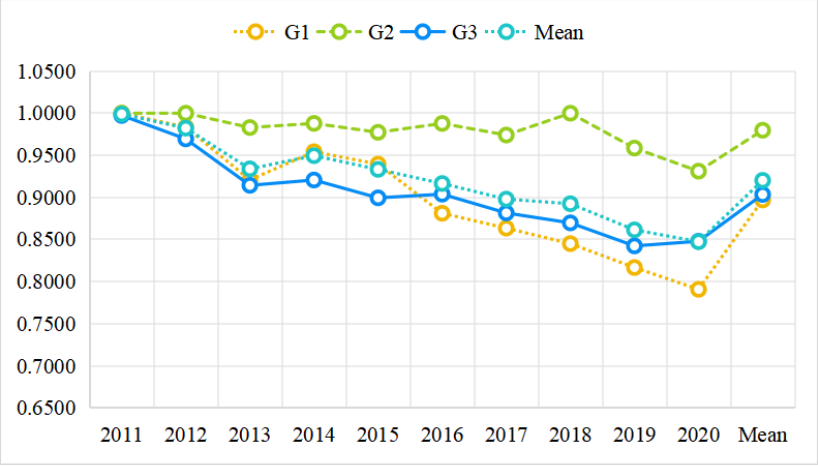

Figure 2. Subregional Grouping Frontier Efficiency Values

Note. G1:Group1, eastern; G2:Group2, central; G3:Group3, western; Mean: national average. The result closer to 1 indicates higher efficiency. Source: The authors

The result of Meta-Frontier

The TGR is calculated to compare the gap between the common frontier and the grouping frontier, analyzing the overall development of social work in China and the regional gap situation. The larger the TGR, the smaller the gap between the grouping frontier and the common frontier. Table 5 presents the results of comparing the ten-year TGR values of each province (G3>G2>G1). Specifically, G3 represents the western region where the level of social work is closer to the national level. In G1, the TGR value of GD is 0.9724, indicating that the level of social work in GD is closer to the national level, while the TGR value of LN is 0.6905, showing that there is still more room for improvement compared to the national level. In G2, the TGR values of HA provinces are all 1 in 10 years, indicating that their

social service work has been at the forefront of the country. Overall, G3 is in a better position, with the TGR of all provinces above 0.9, except for CQ with a TGR of 0.8878, of which the TGR value of province XZ is 1 in all 10 years. Observation in Figure 3 reveals that G3 has always been at the forefront, while the TGR values of G1 and G2 have shown a clear downward trend, and the gap between them and G3 has gradually widened. Before 2018, the development curves of G1 and G2 were basically similar, but G1 surpassed G2 in 2018.

Our measurements reveal a different picture from the common perception that the East and Central regions have a higher level of economic development and, correspondingly, more developed social work. Instead, our data show that the western region has a higher level of social work. We attribute this to the Chinese government's commitment to promoting the development of the western region and the adoption of a series of policy measures to advance the region's economic and social progress. Firstly, the government has implemented the strategy of developing the western region, investing significant funds and resources in infrastructure construction, education, healthcare, and other social undertakings. This has provided substantial support and development opportunities for social work in the western region, leading to a significant enhancement of the region's social service capacity. Secondly, the government has introduced a series of poverty alleviation policies aimed at addressing the long-standing poverty problem in the western region. Through measures such as improving infrastructure and providing education and employment opportunities in impoverished areas, the government has enhanced social security and welfare for residents in the western region, further elevating the level of social work.

Table 5. Technology Gap Ratio for 2011-2020

DMU	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Mean
BJ	0.8450	0.7969	0.7412	0.7013	0.7175	0.7602	0.8324	0.8509	0.8828	0.8718	0.7975
TJ	0.8301	0.8029	0.7904	0.7032	0.6902	0.6588	0.6736	0.7719	0.7386	0.5979	0.7223
HE	0.8861	0.7328	0.6679	0.6777	0.6868	0.5959	0.6410	0.9176	0.7818	0.7109	0.7235
LN	0.9281	0.7149	0.6166	0.6626	0.6702	0.6550	0.6671	0.6904	0.6384	0.7046	0.6905
SH	0.8408	0.9700	0.8203	1	0.8362	1	1	1	0.9937	1	0.9430
JS	1	1	0.8883	1	0.9356	0.8238	0.8245	0.8537	0.8621	0.7917	0.8948
ZJ	1	0.9619	0.9477	0.9812	0.9392	0.9073	0.8986	0.9893	0.9751	0.9574	0.9552
FJ	1	0.8955	0.8430	0.8886	0.6755	0.7840	0.7956	0.7949	0.8725	0.9005	0.8408
SD	1	0.9614	0.7935	1	0.7613	0.8841	0.8710	0.8604	0.8303	0.5063	0.8335
GD	0.9734	1	1.0000	1	1	0.9691	1	0.9385	0.9241	0.9240	0.9724
HI	1	0.9290	0.7554	0.7724	0.8740	0.9078	0.9583	1	1	0.9598	0.9114
G1	1	0.8817	0.7985	0.8411	0.7905	0.8027	0.8234	0.8734	0.8565	0.7949	0.8385
SX	0.8169	0.8103	0.6975	0.7237	0.7158	0.7069	0.7681	0.7241	0.6949	0.6638	0.7307

JL	0.8955	0.8647	0.9769	1	0.8489	1	0.9835	0.8458	0.8083	0.8437	0.9040
HL	0.9659	0.9479	0.7373	0.7904	0.8730	0.8729	0.8834	0.8439	0.8463	0.8334	0.8570
AH	1	1	1	1	1	1	0.9612	1	0.8950	0.7817	0.9611
JX	1	0.9897	0.8992	1	0.8569	0.9690	0.8940	0.8705	0.8025	0.6993	0.8931
HA	1	1	1	1	1	1	1	1	1	1	1
HB	1	0.9905	0.8129	0.8011	0.7891	0.7465	0.7440	0.7106	0.7220	0.6840	0.7937
HN	1	1	1	1	1	0.9070	0.8941	0.9081	0.8749	0.7918	0.9349
G2	1	1	0.8823	0.9071	0.8797	0.8931	0.8865	1	0.8255	0.7808	0.8803
IM	0.9310	0.9324	0.8980	1	0.9017	0.8993	0.9003	0.9132	0.9386	0.9433	0.9253
GX	1	1	0.9390	0.9263	1	0.9986	0.9998	1	1	0.9515	0.9811
CQ	0.9474	0.8874	0.8413	0.7940	0.9306	0.8644	0.8501	0.8992	0.9391	0.9382	0.8878
SC	1	1	1	1	1	1	1	1	0.9852	1	0.9985
GZ	1	0.9898	0.9745	0.9798	0.9755	0.9695	0.9775	0.9984	0.9868	0.9827	0.9834
YN	1	1	1	1	1	1	1	0.9992	0.9345	0.9626	0.9894
XZ	1	1	1	1	1	1	1	1	1	1	1
SN	0.9407	1	0.9905	0.9675	1	1	0.9756	1	0.9868	1	0.9859
GS	1	0.9870	0.9825	0.9826	1	1	1	1	1	0.9978	0.9950
QH	0.9969	1	1	1	1	1	0.9910	1	1	0.9799	0.9968
NX	1	1	1	0.9957	0.9991	0.9688	0.9152	0.8827	0.9056	0.9096	0.9565
XJ	0.9849	0.9241	0.9228	0.9697	0.9975	0.9908	1	1	0.9912	1	0.9777
G3	0.9831	0.9760	0.9611	0.9661	0.9832	0.9733	0.9662	0.9733	0.9718	0.9717	0.9725

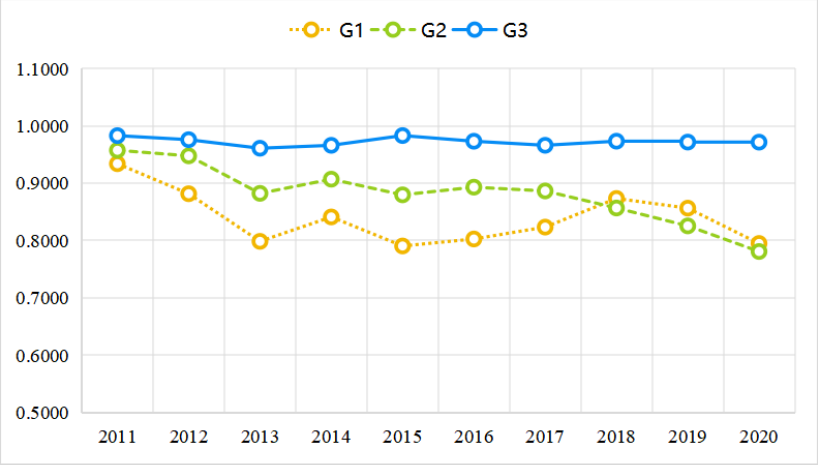

Figure 3. Subregional Technology Gap Ratio

Note. G1: Group 1, Eastern; G2: Group 2, Central; G3: Group 3, Western. The larger the TGR, the smaller the gap between the grouping frontier and the common frontier, with TGR ≤ 1. Source: The authors

The result of Malmquist index

The Malmquist Index results reflect the changes in social work performance over time, encompassing the impact of technological advances and efficiency gains. Based on the analysis of the Malmquist Index results for social work from 2011 to 2020 in Table 6, the following conclusions can be drawn: during this 10-year period, the performance of social work in China's 31 provinces (autonomous regions and municipalities directly under the central government) was 0.9695, indicating a decline of about 3%. This decline is attributed to a combination of technological regression and declining efficiency.

In the G1 East region, the tfpch is 0.9569, indicating a 4.31% decline in total factor productivity. Among them, SH is one of the few regions that made progress, with a 1.95% performance improvement, resulting from the combined progress of techch (1.0124) and effch (1.0069). SH is also the only province in the country where techch has progressed in the measurement period. In the central region of G2, the tfpch is 0.9699, techch is 0.9694, and the effch is 1.0005, indicating a 3.01% decline in total factor productivity, attributed to technological regression offsetting improvements in resource allocation and management efficiency. HA in the central region has a tfpch of 1, indicating no significant progress or regression; however, the remaining seven provinces have a tfpch of less than 1, all due to a decline in techch. In the G3 region, total factor productivity declined by 1.91%, mainly due to technological regression. SC, XZ, SN, and XJ maintained their current levels with minor progress. The remaining eight provinces also experienced technological regression. Overall, these results indicate a trend of declining performance in social work in China over the past decade, with technological regression being the most significant cause. These findings help us propose measures and policy recommendations to improve social work performance.

Table 6. Malmquist Index Results 2011-2020

DMU	2011 -2012	2012 -2013	2013 -2014	2014 -2015	2015 -2016	2016 -2017	2017 -2018	2018 -2019	2019 -2020	Mean
BJ	0.9432	0.8453	1.0410	0.9565	1.0074	1.0488	0.7202	1.0370	0.9684	0.9460
TJ	0.9672	0.8298	1.0555	0.9385	0.9982	1.0176	0.9128	0.9513	0.8175	0.9400
HE	0.8270	0.9113	0.9912	1.0376	0.8543	1.0280	1.5212	0.8519	0.7992	0.9619
LN	0.7703	0.8625	1.0745	1.0115	0.9773	0.9882	0.9299	0.9965	0.9659	0.9490
SH	1.1537	0.7975	1.2928	0.7933	1.2606	1	1	0.9389	1.0651	1.0195
JS	1	0.8883	1.1257	0.9356	0.8805	0.8920	1.0571	1.0891	0.9139	0.9718
ZJ	0.8301	0.8234	1.1889	0.7367	0.9284	0.9388	1.3931	0.8638	0.8126	0.9280
FJ	0.8641	0.8192	0.9524	1.0020	0.8645	0.9884	1.0691	0.9150	0.9380	0.9318
SD	0.9614	0.8253	1.2603	0.7613	0.9453	0.8285	1.1845	0.9465	0.7574	0.9272
GD	1.0273	0.9444	1.0589	1	0.8094	1.2354	0.8338	0.8646	0.9358	0.9601
HA	0.9290	0.7941	1.0188	1.0829	1.0215	1.1527	1.0436	1	0.9598	0.9955

G1	0.9283	0.8480	1.0916	0.9253	0.9524	1.0052	1.0381	0.9477	0.8986	0.9569
SX	0.9919	0.8607	0.9412	1.0398	1.0355	1.0866	0.9428	0.8800	0.8446	0.9547
JL	0.9656	1.1298	1.0236	0.8489	1.1780	0.9835	0.8600	0.9204	1.0838	0.9934
HL	0.9813	0.7778	1.0721	1.0039	0.9974	0.9711	1.0980	1.0029	0.9847	0.9837
AH	1	1	1	1	1	0.9318	1.0732	0.8950	0.8734	0.9730
JX	0.9897	0.8839	1.1431	0.8228	1.1778	0.9226	0.9737	0.8728	0.8127	0.9478
HA	1	1	1	1	1	1	1	1	1	1
HB	0.9905	0.7355	1.0997	0.9850	0.9460	0.9576	0.9941	0.9586	0.8440	0.9403
HN	1	1	1	1	0.9070	0.9857	1.0156	0.8707	0.9403	0.9676
G2	0.9898	0.9151	1.0332	0.9595	1.0262	0.9787	0.9922	0.9236	0.9188	0.9699
IM	0.8798	1.0097	1.2479	0.7323	0.9626	0.9818	0.8897	1.0156	1.0752	0.9679
GX	1	0.8093	1.0112	1.2220	0.9871	0.9934	1.0198	1	0.9336	0.9924
CQ	0.9367	0.8480	1.0191	0.9642	1.0466	0.9761	0.9512	0.9672	0.9645	0.9623
SC	1	1	1	1	1	1	1	0.9095	1.0995	1
GZ	0.9417	0.8564	0.9130	1.0275	0.9008	0.9826	1.0318	0.9106	0.9496	0.9444
YN	1	1	1	1	0.9581	0.8325	0.9628	0.8688	0.9130	0.9464
XZ	1	0.9805	1.0199	1	1	1	1	1	1	1
SN	1.0634	0.9905	0.9768	1.0336	1	0.9459	1.0572	0.9868	1.0134	1.0069
GS	0.8401	0.8204	1.0483	1.1293	1.2257	0.9912	1.0089	1	0.9389	0.9930
QH	1.0031	1	1	1	1	0.9776	1.0229	1	0.9799	0.9981
NX	1	1	0.9592	0.9066	0.8545	0.7814	0.9933	1.0970	1.0967	0.9602
XJ	0.9382	0.8706	0.9838	0.9941	1.0441	1.2172	1	0.8737	1.1445	1.0017
G3	0.9650	0.9287	1.0122	0.9942	0.9947	0.9682	0.9939	0.9670	1.0064	0.9809
Mean	0.9581	0.8958	1.0452	0.9603	0.9874	0.9839	1.0089	0.9488	0.9443	0.9695

Conclusions and discussions

Conclusions

In this paper, we conducted an in-depth analysis of the current situation of social services in China and constructed a set of social work evaluation index systems, including multiple dimensions based on data from the China Civil Affairs Statistical Yearbook. In the evaluation process, we used both Meta-frontier DEA and Malmquist Index to comprehensively analyze the development of social work in China from static and dynamic perspectives and compare the gaps between various DMUs to obtain more accurate evaluation results. By comprehensively analyzing the results of the study, we draw several conclusions as follows: (1) There is a 17.25% room for improvement for social work in China as a whole. According to the regions, the efficiency of social work in the eastern region is relatively low, while social work in the central and western regions is more well-developed, especially in the western region, which shows

higher efficiency values; (2) By comparing the TGR values, we find that the level of social service work in the western region of G3 is closer to that of the country as a whole, which may be related to the focus on the development and support policies for the region. However, the development of the G1 eastern region and the G2 central region still needs further improvement; (3) The performance of social work in China's 31 provinces (autonomous regions and municipalities directly under the central government) is 0.9695 from 2011 to 2020, showing an overall decline of about 3%. This decline is mainly caused by a combination of technological regression and declining efficiency. Additionally, the decline in tfpch in each province is also mainly due to technological regression.

Suggestions

In summary, the development of social work in China varies across regions, and the overall level has slightly declined in recent years. Consequently, relevant departments should implement corresponding improvement measures. Firstly, support for the development of social work in the central and western regions should be increased to maintain their development advantages. Simultaneously, a breakthrough is needed for the development of social work in the eastern region, with technologically advanced provinces serving as examples for technical improvement and reference. Secondly, social work organizations should consider updating their production equipment and adopting modern production methods to enhance work efficiency and resource utilization. Additionally, strengthening the application of information technology will help streamline work processes and improve data processing capabilities. Finally, to adapt to the fast-changing environment, social work organizations need to enhance the cultivation and introduction of talents, including providing professional training and opportunities for further studies, and developing advanced technological knowledge and skills among social workers. Moreover, professional social work talents with advanced technological backgrounds should be actively introduced to enhance the technical and innovative capabilities of the organizations.

Prospects and developments

The methods employed in this paper can evaluate not only the efficiency of social work in China but also in other countries and regions. The experiences and challenges of Chinese social work can provide valuable guidance for improving social work in other countries and regions. However, we acknowledge some shortcomings in this paper. Firstly, the indicator system we constructed is mainly based on the data from the China Civil Affairs Statistical Yearbook, and the scope of indicator selection mainly covers both accommodation and non-accommodation provision. To comprehensively and accurately assess social work, we will strive to select and improve the indicator system from a broader perspective in the future. Secondly, there is still room for further depth in this paper for the analysis of regional differences and inefficiencies. We recognize that the analysis of better-performing provinces also needs to be further strengthened, and we will explore these issues in greater depth in future research. Finally, we emphasize the importance of evaluation research on social work efficiency and call for global researchers to focus on this area. We look forward to conducting cross-country comparative studies that will contribute to the progress and development of social work worldwide.

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S1. List of Provincial Information and Abbreviations

No.	Provincial level	Province abbreviation	Category	Group
1	Beijing	BJ	Municipality	1
2	Tianjing	TJ	Municipality	1
3	Hebei	HE	Province	1
4	Shanxi	SX	Province	2
5	Inner mongoria	IM	Autonomous region	3
6	Liaoning	LN	Province	1
7	Jilin	JL	Province	2
8	Heilongjiang	HL	Province	2
9	Shanghai	SH	Municipality	1
10	Jiangsu	JS	Province	1
11	Zhejiang	ZJ	Province	1
12	Anhui	AH	Province	2
13	Fujian	FJ	Province	1
14	Jiangxi	JX	Province	2
15	Shandong	SD	Province	1
16	Henan	HA	Province	2
17	Hubei	HB	Province	2
18	Hunan	HN	Province	2
19	Guangdong	GD	Province	1
20	Guangxi	GX	Autonomous region	3
21	Hainan	HI	Province	1
22	Chongqing	CQ	Municipality	3
23	Sichuan	SC	Province	3
24	Guizhou	GZ	Province	3
25	Yunnan	YN	Province	3
26	Tibet	XZ	Autonomous region	3
27	Shanxi	SN	Province	3
28	Gansu	GS	Province	3
29	Qinghai	QH	Province	3
30	Ningxia	NX	Autonomous region	3
31	Xinjiang	XJ	Autonomous region	3