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A coupled and coordinated analysis in livelihoods of poverty alleviation migrants from a just transition perspective

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Introduction: From 2016 to 2020, China resettled 9.6 million poor people for the purpose of poverty alleviation. While this policy achieved the goal of eliminating absolute poverty, it also caused massive displacement and problems related to achieving a "just transition". This study considers the "coupled coordination model" of resettlement, and examines livelihood capital and livelihood stability, from the perspective of "just transition".

Methods: This study is based on survey data gathered in Lanping County, Yunnan Province from 235 resettled people that belong to "ethnic minority groups directly-entering-socialism", making use of the livelihood capital assessment index system of farm households which is based on China's poverty alleviation resettlement policy and background-established a "coupled coordination degree model" which coordinates and combines livelihood capital and livelihood stability analyzes how accumulation of livelihood capital affects livelihood stability.

Results: Results indicate that (1) resettlement and supportive measures increased the coupling and coordination of migrants' household livelihood capital and livelihood stability.; (2) This type of coupled coordination led to a change from "dysfunctional decline type" to a "transitional development type", thus reflecting "just transition"; (3) Although livelihood capital had an important positive impact on the coupling and coordination of migrants livelihood coupling and coordination, different livelihood strategies influenced livelihood coupling and coordination in different ways.

Discussion: This requires that government decision makers focus on facilitating a "just transition" as migrants become urbanized citizens. Disposing of natural resources such as farmland for migrants, promoting the implementation of land circulation policies, considering the contribution of different types of livelihood capital to different families, improving the precision of employment training, and promoting sustainable livelihood development.

KEYWORDS

poverty alleviation relocation, the directly-entering-socialism ethnic group, coupling coordination model, livelihood capital, just transition

1. Introduction

Since the 2015 adoption of the Sustainable Development Goals, the world has taken different approaches to poverty eradication. In this endeavor China has contributed the "Chinese model" for eradicating poverty. Over the past four decades, according to the World Bank, China reduced domestic poverty by ~800 million people which accounts for 75 percent of global poverty reduction over the same period as per the World Bank's absolute poverty standard of $1.90 per person per day (World Bank Group, 2022).

China's Poverty Alleviation and Relocation (PAR) policy is one of the fundamental solutions to absolute poverty. In the 5 years (2016–2020) it took to relocate 9.6 million

poor people living in poverty-stricken areas that lacked adequate conditions for subsistence, "ethnic groups directly-entering-socialism"[1] were disproportionately affected compared to other groups.

Resettlement is inherently a process of resource redistribution. In this long-term process of structural transformation, relative poverty is prolonged due to inter-personal and inter-regional differences in pre-resettlement resource bases, affecting just transformation. Additionally, some of the population that move out of poverty are still at risk of impoverishment in the short term.

This study views relative poverty of migrants from a "just transition" perspective for two reasons: First, resettlement is a major psycho-sociocultural and economic process involving the destruction, repair, adjustment, rehabilitation, and reconstruction of very complex population- resource- environment- social and economic interactions, exchanges, and arrangements (Downing and Downing, 2009). Due to the traditional employment opportunities have been lost (Yan et al., 2017, 2018; Reddy, 2018), it can also lead to short-term relative poverty among resettled people and their communities (Chen et al., 2020; Shi et al., 2022; Zhang et al., 2022). Ethnic minority groups directly-entering-socialism with insufficient resource bases are likely to face risks to "just transition" in the process of social transformation toward "common prosperity".[2] Secondly, the just transition perspective was utilized in this study because PAR is categorized as voluntary; i.e., identified persons had the right to not be resettled and were free to make their own choice and prior and informed consent was gained before resettlement (Cernea, 2008; Wilmsen and Wang, 2014; Wu et al., 2015; Nguyen et al., 2017).

Because this kind of resettlement forces poor farmers to become urban citizens, this process inevitably leads to the loss of assets and jobs, social and food security, credit, labor exchanges, networks, social capital, and kinship collapse (Kittinger et al., 2010; Wu et al., 2019). Migrants also face energy transitions, changes in agricultural production methods, changes in consumption, changes in transportation, and other lifestyle changes. On an individual basis migrants also have different requirements for energy consumption and the security of their energy supply may differ which particularly affect "just transition."

Due to inequality in resources initially held by migrants before resettlement, it is clear that ethnic minority groups directly-entering-socialism are less able to safeguard basic livelihood capital compared to other groups. When there is a high cost of living after resettlement, inequitable distribution of benefits to affected people, and disparities in their abilities to transform their livelihoods, the State should establish a bottom-line principle to ensure that a just transition is achieved. With this as a backdrop, China's "No. 1 Central Document" for 2022 proposes an increase in support for relocation to centralized resettlement areas and establishment of a safety valve poverty reduction on a large scale. Combining poverty eradication and promoting rural revitalization is one of the core tasks espoused by China's 14th Five-Year Plan for National Economic and Social Development. Although there are studies on the sustainable development of migrants' livelihoods, the relationship between poverty and the stability of livelihoods of relocated households from a just transition perspective has rarely been explored.

This study makes use of the livelihood capital assessment index system of farm households which is based on China's poverty alleviation resettlement policy and background. This study establishes a "coupled coordination degree model" which coordinates and combines livelihood capital and livelihood stability and analyzes how livelihood capital accumulation affects livelihood stability and helps rural migrants better experience a just transition to a post resettlement context that insulates them against impoverishment.

2. Conceptual and theoretical framework

2.1. The concept of just transition

The concept of just transition can be traced back as far as the 1970's (Newell and Mulvaney, 2013). The term "just transition" was first championed by the North American labor movement to describe a range of measures to secure workers' rights and livelihoods in the wake of government-led environmental legislation and regulations that could have labor impacts (Smith, 2017), Starting with Mazzochi, the concept of a just transition was used to discuss and address the implications of broad environmental protection requirements on employment (Tony, 1993; Zhang and Wang, 2018).

Over time, as the number of institutions and experts concerned with just transition has increased, scholars have interpreted and defined the concept of just transition based on individual understandings and their particular fields of research. Ultimately this has led to the extension and expansion of what defines a just transition. At present, dozens of international institutions have published studies on just transition each providing their own definitions and goals of just transition (United Nations Environmen Programme, 2008; ILO, 2015; Smith, 2017; Hugman and Selvaratnam, 2020).

The concept of just transition, draws attention to the equity and justice issues associated with efforts to address energy and climate problems and is increasingly recognized as an important component of low-carbon transition regimes (Wang and Kevin, 2021). Academics are beginning to identify concepts related to climate change-related research and climate governance that are closely related to just transition, such as climate justice, energy justice, etc. (Okereke, 2010; Bond, 2012; Swilling and Annecke, 2012; McCauley and Heffron, 2018).

1 "The directly-entering-socialism ethnic groups" refers to Chinese ethnic minorities that after the founding of New China, without democratic reform, directly transitioned from primitive societies across several social forms to become part of China's socialist society. The subject of this article are partly concerned with the directly-entering-socialism ethnic groups.

2 Common Prosperity refers to achieve shared prosperity for everyone.Realizing common prosperity are the essential requirements of socialism.The 19th National Congress of the Communist Party of China proposed by the end of the 14th Five-Year Plan period (2021-2025), we will have made solid progress toward bringing prosperity to all, while gaps between individual incomes and actual consumption levels will gradually narrow. By 2035, we will have made more notable and substantive progress toward common prosperity.

After decades of development, the focus of just transition has broadened from the protection of labor rights to refer to the fair treatment of all socially disadvantaged people. According to the Just Transition Alliance (2020), "just transition" is both a principle, a process and a practice states that "a just transition is only possible if the overall goal is human well-being within a sustainable world" (Swilling et al., 2015). However, relatively little research has been done on how a "just transition" can contribute to poverty alleviation. Some scholars have extended the definition of just transition from relating specifically to climate change issues to include larger ecological and social crises suggesting that a just transition is not merely about justice in oil and energy issues (Irina and Stefania, 2020). Burgess and Whitehead, for example, directly link just transition to poverty by examining how the Personal Carbon Account, established in 2012 in the UK, affects the behavior of people living in poverty (Martin and Mark, 2020).

2.2. The concept and application of sustainable livelihoods framework

The sustainable livelihoods idea was first introduced by the Brundtland Commission on Environment and Development as a way of linking socioeconomic and ecological considerations in a cohesive, policy-relevant structure (Karki, 2021). In 1992, the United Nations Conference on Environment and Development (UNCED) introduced the concept into the action agenda, advocating sustainable livelihoods as the primary goal of poverty eradication. Since the 1980s, the World Bank and scholars have developed several models to address income reduction and other poverty risks due to involuntary migration, including Cernea's IRR model (Cernea, 2000; Duffield, 2000; Reddy, 2018), Scudder and Colson's "stage" model (Scudder and Colson, 1980; Scudder, 2005), Downing and Garcia-Downing's "Routine/Dissonant Culture" and psycho-socioculture model (Downing and Downing, 2009), Shi's five-stage resettlement system evolutionary model (Zhu and Shi, 1995) and applied framework for assessing the relative deprivation (Zhang et al., 2022). Among these models, the sustainable livelihoods framework (SLF) is the most widely used (Smyth and Vanclay, 2017).

The Sustainable Livelihoods Framework is a tool for understanding the complexity of poverty and the resources and strategies that poor communities use to improve their livelihoods. It is described in the context of vulnerability of affected households and integrates four components: livelihood assets, transition structures and processes, livelihood strategies, and livelihood outcomes (Zhao et al., 2016; Liu et al., 2020; Jiang et al., 2021; Natarajan et al., 2022). Livelihood capital is regarded as a sustainable livelihood capacity and is classified into five types: natural, physical, financial, social and human capital. Farmers choose livelihood strategies that incorporate their own individual livelihood capital. Differences in migrants' livelihood capital endowment in turn leads to differences in the selection of livelihood strategies (Lan et al., 2021; Li et al., 2021; Lian et al., 2022).

This analytical framework is commonly applied to the resettlement of migrants due to large-scale development projects, such as the construction of dams, fisheries, agriculture and livestock projects (Scudder, 1962; Colson, 1971; Scudder and Colson, 1980; Colson and Scudder, 1988; Smith, 1994; Shi et al., 1996), as well as resettlement due to ecological degradation (Tony, 1993; Choy, 2004; Tilt et al., 2009; Shi et al., 2012, 2021; Downing et al., 2021; Zaman et al., 2022) and can be applied in climate migration (de Sherbinin, 2011; Hossain, 2017; Liang et al., 2023) and government responsible poverty alleviation induced migration (Shi et al., 2019; Gou et al., 2022). In China livelihood studies focus on resettlement for poverty alleviation has only emerged in recent years. Unlike other places where resettlement is a byproduct of development projects, resettlement in China has become the primary means of poverty alleviation practices to achieve the goal of eradicating absolute poverty (Lo and Wang, 2018; Rogers et al., 2020; Gou et al., 2022; Chen et al., 2023). "The abilities to relocate, to settle down, and to prosper" (搬得出, 稳得住, 能致富)[3] are the strategic targets of resettlement in China. Although these measures have been shown to increase the overall incomes of migrants (Xue et al., 2013; Rogers et al., 2020; Natarajan et al., 2022), migrants have to leave the land they have been living on for generations. Urban resettlement leads migrants to no longer have the land for cultivation. Migrants face disruption to their livelihoods, higher costs of living, and lack of new employment skills to quickly adapt to their new urban environment. Many migrants are vulnerable to higher expenses and the loss of sustainable incomes (Xu et al., 2021) and go into debt (Xue et al., 2013). Based on this synthesis of relevant literature, additional research perspectives that analyze interacting factors and systems that influence the livelihoods of migrants need to be further explored, and policy mechanisms to enable them to achieve sustainable livelihoods need to be explored.

2.3. A theoretical research framework on coupling and coordinated development of livelihood and factors influencing PAR

"Coupling" is a concept from physics that describes the interaction between two or more related systems and their degree of interaction, "Coordination" refers to the degree of benign coupling in the coupling interaction relationship, which can reflect the quality of coordination. (Kassel, 2017). The "Coupling and Coordinated Development Model" (CCD model) has been used in various fields, such as tourism, finance (Liao et al., 2018), poverty alleviation, energy conservation, ecological protection (Su and Wu, 2019; Guan and Zhang, 2022), water governance and tourism (Geng et al., 2020). It is considered that the stock and attribute differences between livelihood capital will affect its internal coupling, the highly coupled coordination of livelihood capital helps to reduce the vulnerability of livelihoods and enhance the poverty reduction effect and poverty alleviation effect. However, there is little accurate systematic analysis describing the degree

3 搬得出, 稳得住, 能致富: After the 18th National Congress of the Communist Party of China, the relocation project was included in the "Five-pronged Poverty Alleviation Measures"(developing production, relocation, ecological compensation, development of education, securing basic needs through social security)for poverty alleviation. The concept of "The abilities to relocate, to settle down, and to prosper" has become an important concept of poverty alleviation.

in which PAR farm household livelihood capital and livelihood stability are coupled and coordinated, which is important for the sustainability of farm household livelihoods.

The research objective of this paper is in part related to ethnic minority groups directly entering socialism. The transition to life in towns for relocated ethnic minorities, referred to as "leap forward a thousand of years in a single step"[4], greatly impacts their livelihoods. Livelihood capital of this group of people is weak before resettlement. The reshaping of their livelihoods after the move is a process of integrating resources, and their livelihood coupling coordination is affected by various aspects. Different families differ in their perceptions and utilization of relevant policies, their ability to cope with livelihood shocks, and their ability to adapt to productive life adaptation to productive, also affect the accumulation of livelihood capital after relocation.

Livelihood coupling coordination describes the degree of coupling between migrants' livelihood capital and livelihood stability. This model is an effective tool to assess the development of livelihoods held by people being resettled due to poverty alleviation resettlement initiatives. Based on previous studies, this paper focuses on factors influencing livelihood coupling coordination among relocated ethnic minority migrants in Lanping County including livelihood capital, family factors (Tang et al., 2021), policy factors (Zou et al., 2019; Rogers et al., 2020), and productive life factors (Pan et al., 2021) (Figure 1).

3. Materials and methods

3.1. Study area

Yunnan Province is located in the southwestern border of China and is adjacent to Vietnam, Laos, and Myanmar. Yunnan Province is home to many ethnic groups that live in poor mountainous areas. Officially there are, 88 impoverished counties and 27 counties with deep poverty. These groups comprise the largest number of impoverished counties in China. Yunnan Province is considered the "main battlefield" for poverty alleviation and relocation in China. Nujiang Prefecture is one of the "three regions and three states" and "the directly-entering-socialism ethnic groups," located in the combination of China, Myanmar, Yunnan and Tibet, with a 449.5 km-long national border, and is the autonomous prefecture with the largest ethnic composition and the largest number of less populous ethnic groups in China. In 2018, the poverty rate of the state was 32.52%.The Lamping Bai Pumi Autonomous County of Nujiang Prefecture is located in the core area of the world natural heritage site at the confluence of the Nujiang, Lancang, and Jinsha rivers in southwest China. It is also considered a "border area, ethnic minority area, ethnic minority groups directly entering socialism area, mountainous area and impoverished area." At the national level, Lamping Bai Pumi Autonomous County in Nujiang Prefecture is characterized by a wide range of poverty and a high rate of poverty. Lamping County is located at the confluence of three rivers; the geological strata of the area relatively fragmented, the erosion of rivers strong, and landslides, mudslides and other disasters occur frequently. The geographical location of Lanping County is shown in Figure 2.

The geographic terrain in Lanping County is undulating. To realize the goal of "resettle the poor to pull poverty out by the root"[5] guiding policy, The PAR in Lanping County mainly implements the relocation of poor farmers scattered in the mountainous areas to the county seat or market town, which is the landless resettlement for urbanization. The total population of Lamping County is 218,000, and the scale of resettlement for poverty alleviation in Lamping County during the 13th 5-Year Plan was 11,818 households and 44,541 people. To improve the livelihoods of resettled people in Lanping County, the path of "job development + poverty alleviation workshop + skill training + labor export" was taken. The first step was to actively implement the follow-up support plan, such as industrial employment, vigorously carry out labor skills training, increase the transfer of employment to other ears, and organize and manage integration of resettled people to promote the relocation of people's income. The second step was to ensure that relocated households achieve employment of at least "one person per household" through the provision of public welfare jobs, such as environmental rangers, river managers, cleaners, security wardens, etc. The third step was to introduce enterprises to create poverty alleviation workshops, industries, and other projects to drive increases in income and wealth of resettled people.

3.2. Data collection

This study was conducted in August 2019 in the deeply impoverished area of Lanping County, Nujiang Prefecture, Yunnan Province included resettled that had been relocated for approximately one and a half years. Income, demographic structure, and livelihood status of the relocated migrants were investigated through questionnaires, participant observation, and semi-structured interviews. According to the specific conditions of the county area of relocation for poverty alleviation in Lanping County, the resettlement site in the northern part of Lanping County (Yong'an community) and the resettlement site in Tongdian town, Lanping County, were selected to be sampled. A total of 250 questionnaires were distributed according to the principle of one questionnaire per family; 235 questionnaires were returned; amounting to a questionnaire recovery rate of 94%. Among them, 169 questionnaires were collected from the resettlement site in the northern part of the county town of Lamping County (Yongan community), accounting for 71.9%; 66 questionnaires were collected from the resettlement site in Yimengyi, Tongdian Town, accounting for 28.1%.

Among the 235 valid survey samples, 140 respondents were male and accounted for59.6% of the total. 95 respondents were female which accounted for 40.4% of the sampled total. The age of the survey respondents was mainly 30–50 years old, accounting for a total of 124 people (52.8%). In terms of education level, the overall education level of migrants was low, with 205 people with junior high school education or below, accounting for 87.2%

4 Leap forward a thousand of years in a single step refers to the directly-entering-socialism ethnic minority groups direct transition from primitive society directly into socialist society.

5 "Resettle the poor to pull poverty out by the root" is proposed in the China's National Development and Reform Commission issued the 13th Five-Year Plan for alleviate poverty relocation in 2016.

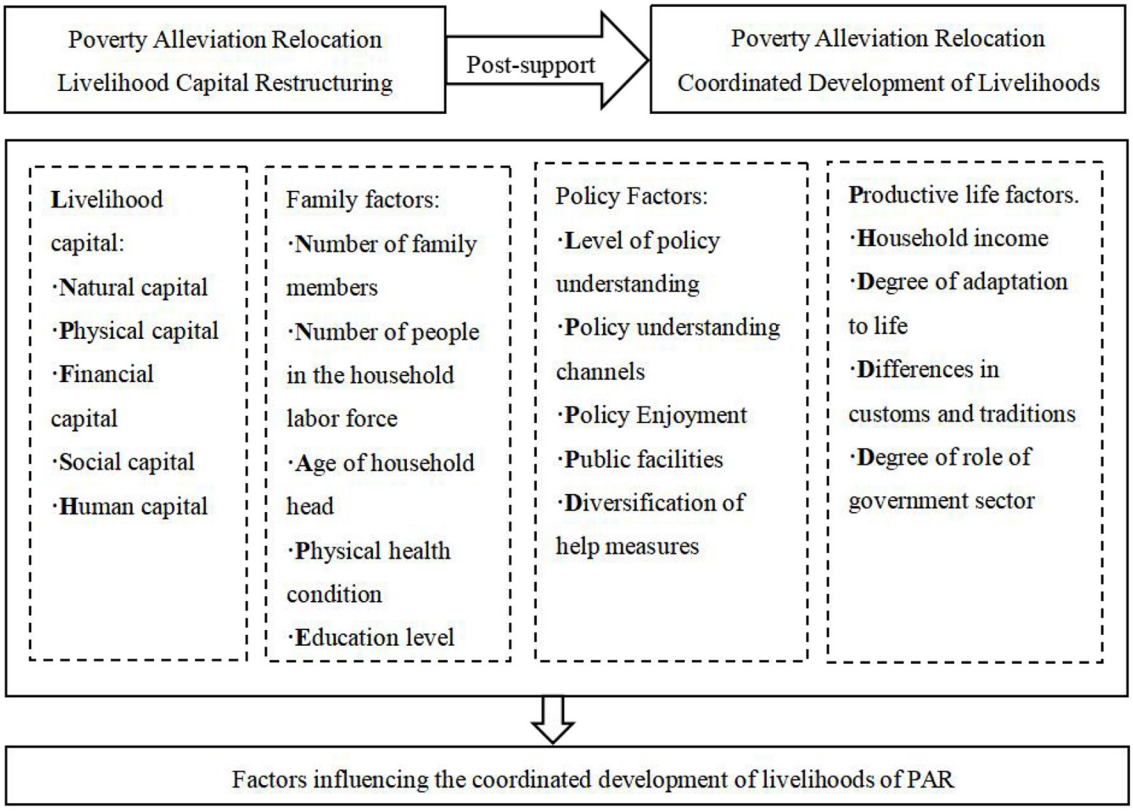

FIGURE 1
Analysis framework.

(including 60.8% with elementary school education or below), and only 12.8% with high school education or above. In terms of ethnic composition, 97.9% of the immigrant households were ethnic minorities, including the Bai, Lisu, Pumi and Yi, covering the Lisu and Dulong ethnic groups.

3.3. Methods

3.3.1. Measurement of livelihood capital

This paper investigates the coupling relationship and influencing factors of resource elements within the resettlement system *via* the coupling coordination degree model of livelihood capital and livelihood stability. By referring to previous studies (Department for International Development, 1999; Liu et al., 2018; Li et al., 2021) 17 indicators were selected to represent the livelihood capital of relocated migrants (Table 1).

(1) Due to the different measurement units of specific indicators, this paper adopts the method of extreme difference standardization to standardize the individual livelihood capital indicators of resettelers. The formula of extreme difference standardization is as follows.

$$Z_{ij} = \frac{Xij - X_{j\min}}{X_{j\max} - Xj_{j\min}}$$

In this formula, Zij represents the standardized value of the jth indicator for the ith immigrant, Xij represents the actual variable value of the jth reflection indicator for the ith immigrant, Xjmin represents the minimum value of the jth indicator, and Xjmax represents the maximum value of the jth indicator. By this method, data of different nature and categories are in the range of 0–1 and therefore comparable.

(2) Calculate the comprehensive level of single indicators of the livelihood capital of migrants relocated to alleviate poverty, which is calculated by the formula.

$$Y_j = \frac{\sum_{i=1}^{n} Z_{ij}}{n} = \frac{\sum_{i=1}^{n} X_{ij} - nX_{j\min}}{(X_{j\max} - X_{j\min})n} = \frac{\bar{X}_j - X_{j\min}}{X_{j\max} - X_{j\min}}$$

In this formula, Yj represents the standardized value of the Jth indicator in the single livelihood capital of the n poverty alleviation relocation resettelers, and j represents the average value of the Jth indicator in the livelihood capital of the reservoir resettelers.

(3) The integrated index method is used to calculate the total level of single livelihood capital for poverty alleviation relocation, which is calculated by the following formula.

$$Y = \sum_{j=1}^{m} Y_j W_j$$

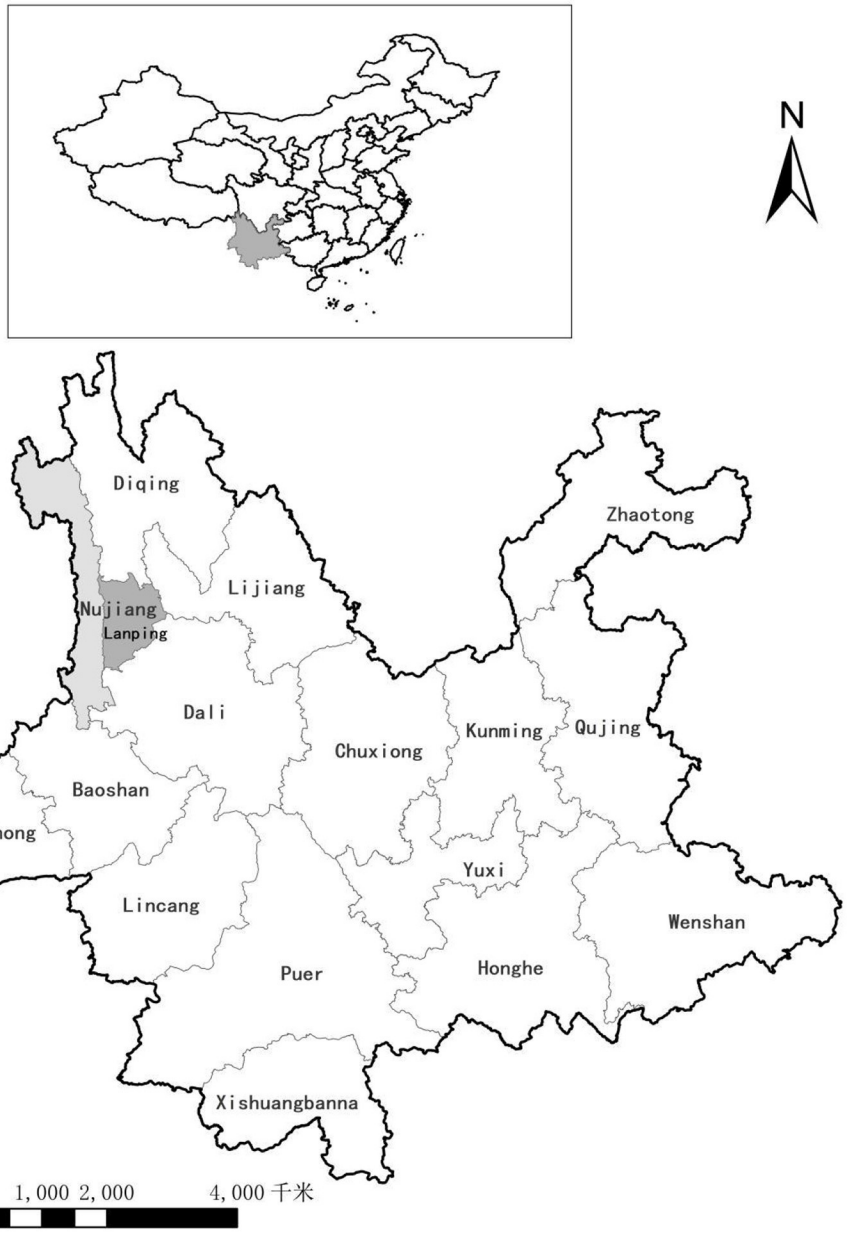

FIGURE 2
The geographical location of Lanping County.

In the formula, Y represents the total level of single livelihood capital of the poverty alleviation relocation re-settelers, and Wj represents the weight of the jth indicator. By this method, the m indicators that have been standardized can be combined to produce a comprehensive index between 0 and 1. This value is the amount of single livelihood capital of migrants in Lamping County.

3.3.2. The coupled coordination degree model of livelihood capital and livelihood stability

The current status of livelihood development and recovery of relocated migrants is more accurately reflected by livelihood stability (Li et al., 2020). Indicators of family asset diversification, interpersonal trust, and number of non-farm employed population were selected to constitute livelihood stability (Fan and Wan, 2021; Ma et al., 2021) and to construct a coupled coordination model of livelihood capital and livelihood stability of resettled people. In this context, coupling refers to the relationship between different elements that affect each other and interact with each other (Guan and Zhang, 2022). The degree of coupling coordination can reflect coordination and interaction between different systems and internal elements (Guan and Zhang, 2022); the larger that the degree of coupling coordination is, the higher the degree of coupling coordination between

TABLE 1 Types and values of subsistence capital indicators.

Type of capital	Specific measurement indicators (secondary indicators)	Symbols and weights	Assignment (tertiary measures)
Natural capital	Arable land area (mu)	N1, 0.5	Paddy land area, dry land area, forest land area
	Ecological environment of the place of residence	N2, 0.25	Likert's scale method: very bad, bad, fair, good, very good are assigned a score of 1–5 respectively
	Quality of arable land	N3, 0.25	Likert's scale method: very bad, bad, fair, good, very good are assigned a score of 1–5 respectively
Physical capital	House area (square meters)	P1, 0.3	Settlement house area (square meters)
	Home equity	P2, 0.4	Motorcycle, car, TV, washing machine, refrigerator, LPG stove, running water, one count 1, maximum 7 points, minimum 0 points
	House structure	P3, 0.3	Civil engineering, brick, tile and concrete are assigned 1–4 points, respectively
Financial capital	Annual income per capita (yuan)	F1, 0.6	Annual household income/number of family members
	The ability to take out a loan	F2, 0.13	Can you get a loan from a financial institution (bank, credit union), Yes responses assigned a value of 1, No responses assigned a value of 0
	The ability to borrow money	F3, 0.13	Can you borrow money from relatives or friends, for Yes responses assign a value of 1, No responses a value of 0 was assigned
	Have bank deposit or not	F4, 0.13	Whether there are deposits in financial institutions (banks, credit unions),Yes responses were assigned a value of 1, No responses were assigned values of 0
Social capital	Interpersonal	S1, 0.25	Likert's scale method: very bad, bad, fair, good, very good are assigned a score of 1–5 respectively
	Interpersonal expenses (yuan)	S2, 0.25	The total amount of expenses for attending red and white ceremonies in a year
	Number of interpersonal contacts	S3, 0.25	Number of weddings and funerals attended in a year
	Interpersonal trust	S4, 0.25	Likert's 1–5 scale method: very distrustful, relatively distrustful, generally trustful, relatively trustful, and very trustful assigned a score of 1–5
Human capital	Whether to receive relevant skills training	H1, 0.4	Receive relevant skills training assigned a Yes value of 1, for No, a value of 0 was assigned
	Whether to participate in rural cooperatives	H2, 0.3	Received the relevant skills training to assign a value of 1, for No, a value of 0 was assigned
	Household Non-farm employment	H3, 0.3	Number of non-farm employees in households

different systems.

$$C = \left(\frac{s_1 \cdot s_2}{\left(\frac{s_1+s_2}{2}\right)^{\frac{1}{2}}} \right)^{\frac{1}{2}}$$
$$T = \sqrt{C \cdot (a_1 s_1 + a_2 s_2)}$$
$$D = \sqrt{C \cdot T} = \sqrt{C \cdot (a_1 s_1 + a_2 s_2)}$$

where C is the coupling degree, S_1 is the total value of livelihood capital, obtained by weighting the values of livelihood capital secondary indicators, S_2 is the combined value of livelihood stability, obtained by weighting the values of each indicator, T is the combined value of total value of livelihood capital and total value of livelihood stability, and D is the coupling coordination degree (Guan and Zhang, 2022). In the model, livelihood capital and livelihood stability are equally important; a_1 and a_2 are 50%, respectively. The classification of coupling coordination types is detailed in Table 2.

3.3.3. Livelihood coupling coordination degree model construction

The coupled coordination model of relocated migrants' family livelihoods is extended on the basis of the coupled coordination degree model of livelihood stability. Relevant variables, such as family factors, policy factors, productive life factors, geographical factors, human, social, physical, financial and natural capital indicators were introduced, and the model was constructed as follows.

$$\begin{aligned} \text{Lciy} = {} & \beta 0 + \beta 1\text{FamF} + \beta 2\text{PolF} + \beta 3\text{PdlF} + \beta 4\text{FF} + \beta 5\text{HC} \\ & + \beta 6SC + \beta 7PC + \beta 8NC + \beta 9Geo + \varepsilon \end{aligned}$$

Among them, **Lciy** denotes migrant household livelihood coupling coordination, and the explanatory variables are overall classification: **Geo** denotes regional dummy variables, and the questionnaire survey involves 2 townships, so a total of 1 dummy variable was included; **FamF** denotes family factor group, **PolF** denotes policy factor group, **PdlF** denotes productive life factor group, **HC** denotes human capital, **SC** denotes social capital,

TABLE 2 Classification and types, and degree of coupling coordination.

Numerical value of the coupling coordination.	[0, 0.3]	[0.3, 0.5]	[0.5, 0.8]	[0.8, 1]
Coupling coordination type	Dysfunctional decline type	Stable recovery type	Transitional development type	Coordinated development type

PC denotes physical capital, **NC** denotes natural capital, and **FC** denotes financial capital (Table 2 for details).

Regression of livelihood coupling coordination is based on the total sample and different livelihood strategies. Based on the model of livelihood coupling coordination of migrant households, the least squares (OLS) method was used to estimate the model coefficients. First, the household factor (Model 1), livelihood capital factor (Model 2), policy factor (Model 3), and production life factor (Model 4) were put in the total sample to estimate the effect on the livelihood coupling coordination degree, and then the household factor, livelihood capital factor, policy factor, and production life factor were included in the sample of the agricultural-oriented labor-supporting type. Geographical factors (Model 6); family factors, livelihood capital factors, policy factors, and production life factors were included in the sample of labor-dominant agriculture-dependent types. Geographical factors (Model 7); family factors, livelihood capital factors, policy factors, and productive life factors were included in the sample of diverse livelihood types. Geographical factors (Model 8) and the impact of livelihood coupling coordination under different strategies were estimated, and the results are shown in Table 6. Meanwhile, the livelihood strategies of migrants were included in this paper, and the livelihood strategies were classified into agriculture-based work-supported type, work-based agriculture-supported type, and livelihood diversified type. Work type of agriculture-oriented work support mainly refers to planting and farming, supplemented by work nearby and work out of the home; the type of agriculture-oriented work support is mainly nearby and out-of-home work, is supplemented by planting and farming; this type of diversified livelihood includes more than two types of livelihoods.

3.3.4. Variable settings

What factors affect the degree of livelihood coupling coordination is an important goal to explore in this research, which is very important for sustainable livelihood development. After referring to the relevant research results. This paper takes livelihood coupling coordination as the independent variable and analyses the contribution and impact of five dependent variables, migrant family factors, livelihood capital factors, policy factors, productive life factors, and geographic location factors on livelihood coupling coordination. It further analyzes the contributions and influences of livelihood coupling coordination under different livelihood strategies to explore the extent of contributions of household, livelihood capital, policy, productive life, and geographic location on the livelihood coupling coordination of migrant households, with the main variables involved as follows.

(1) Dependent Variable: Degree of livelihood coupling coordination. The degree of coupling coordination of livelihoods of migrant households was calculated by the coupling coordination degree model of livelihood stability. The greater the degree of coupling coordination, the higher the degree of coupling coordination between different systems (Guan and Zhang, 2022). In subsequent regressions, the degree of livelihood coupling coordination was used as the explanatory variable.

(2) Independent Variable 1: Household factors include the household size, labor force, age of household head, physical health status, and education level. In the livelihood development of migrant households, the number of people in the household and number of people with working capacity, are key to livelihoods and household size has a significant negative effect on farm household income (Liu et al., 2020). Non-farm labor has an important impact on the transition of household livelihoods after relocation and, age, physical health and education of the household head are relevant to livelihood development.

(3) Independent Variable 2: The impact of livelihood capital on livelihood coupling coordination of migrant households: According to the sustainable livelihood framework, the livelihood capital of migrant households was divided into five categories of capital, and five categories of capital were adopted to measure the impact of each type of livelihood capital on the coupled coordination of migrant households' livelihoods. Among them, natural capital refers to the natural resources that migrants' livelihoods depend on directly available (Department for International Development, 1999), including the area of household arable land, the quality of arable land and the ecological/environmental state of the location. Physical capital includes the infrastructure and means of livelihood production needed to maintain and develop livelihoods (Department for International Development, 1999), generally including the structure and size of housing and total household assets. Financial capital mainly refers to liquidity, savings and access to financial resources (Department for International Development, 1999), and is generally measured by household income, bank deposits and borrowing capacity (Xu H. et al., 2022; Xu Y. et al., 2022). Social capital refers to social resources (Department for International Development, 1999), mainly social networks and social organizations is generally measured by the degree of interpersonal interaction, the number and cost of interpersonal contacts, and interpersonal trust. Human capital refers to the extent of interpersonal interaction, the number and cost of interpersonal contacts and interpersonal trust. Human capital refers to the skills possessed by household members to sustain livelihood objectives under different livelihood strategies (Department for International Development, 1999) and is measured by the availability of skills training, household off-farm employment population and rural cooperative participation. In addition, because the specific indicators of the five livelihood capitals have different units of measurement, this paper refers to previous research (Liu et al., 2018) and assigns values by objective quantitative and subjective evaluations in a categorical manner and then uses the extreme difference standardization method so that the indicator values

are all between 0 and 1. The composite index method is used to calculate the total level of individual livelihood capital of migrants, which results in a composite index between 0 and 1, and then calculates the livelihood capital values of migrants who have been relocated to alleviate poverty. Then, the livelihood capital values of migrants relocated due to poverty alleviation were calculated.

(4) Independent Variable 3: Production and life factors include family income, degree of adaptation to life, differences in customs and habits, and the degree in which government departments participate. Household income is the direct effect of poverty alleviation relocation (Duan et al., 2015; Jia et al., 2016; Shu et al., 2017), and the degree of adaptation to productive life can reflect the "stability" of migrant households. Relocation leads to changes in production and lifestyle and differences in customs and habits. Changes in customs and habits have an important impact on the improvement of livelihood capital, and the degree in which community management is enhanced has an important impact on migrants' skills training and access to other policies, such as Employment and tax incentives.

(5) Independent Variable 4: Policy factors include the degree of immigrant families' understanding of policies, the channels of understanding policies, the enjoyment of policies, the public facilities in resettlement sites, and the diversity of support measures. It has been shown that there

TABLE 3 Livelihood capital and livelihood coupling coordination degree model variable setting.

Variable name	Definition	Mean	Standard deviation
Explained variable (y)	Livelihood coupling coordination	0.4763	0.08177
Family factors	/	/	/
Number of family members	Number of family members	0.3864	0.16336
Number of people in the household labor force	Number of people in the household labor force	0.5543	0.18624
Age of head of household	Age	0.6809	0.31092
Health of head of household	Degree of physical health (1–5)	0.3213	0.29554
Education of head of household	Educational attainment (1–5)	0.3726	0.27826
Livelihood capital factors	/	/	/
Natural capital	Combined numerical value (0–1)	0.0952	0.02713
Physical capital	Combined numerical value (0–1)	0.1193	0.02009
Financial capital	Combined numerical value (0–1)	0.0643	0.04821
Social capital	Combined Numerical value (0–1)	0.0778	0.02395
Human capital	Combined Numerical value (0–1)	0.0624	0.01957
Policy factors	/	/	/
Policy understanding	Extent of knowledge of demolition subsidy, housing subsidy, old house demolition subsidy, land benefit, public welfare jobs, employment subsidy, skill training (1–5)	0.3659	0.17260
Policy understanding channels	Community outreach, neighbors, family and friends, asking others yourself, bulletin boards, brochures, mobilization meetings	0.4011	0.20685
Policy enjoyment	Demolition subsidies, housing subsidies, old house demolition subsidies, land benefits, public service jobs, employment subsidies, skills training, each of these counts as one point	0.2312	0.14608
Public facilities	Folk museums, convenience centers, cultural squares, kindergartens, commercial centers, logistics centers, medical and health rooms, public toilets, garbage removal stations, storage facilities, each of these counts as one point	0.5835	0.19749
Diversification of help measures	Government, business, society, and migrants, each of these counts as one point	0.3830	0.18813
Productive life factors	/	/	/
Log of total household income	Logarithm of total household income ($)	10.0229	1.36167
Adaptation to productive life	Degree of adaptation to productive life (1–5)	0.6106	0.20541
Differences in customs and traditions	Degree of difference in customs and traditions (1–5)	0.4755	0.24826
Role of government sector	Degree of role of government departments (1–5)	0.5641	0.32231
Geographical factors	/	/	/
Urban settlement	Whether to settle in town	0.7191	0.45037

Variables are normalized to values of 0–1 for ease of analysis.

is a direct correlation between the specific implementation of policies and the livelihood coupling coordination of migrant households (Smyth et al., 2015; Rogers et al., 2020). Migrants who have better knowledge of policies are more able to make full use of supportive policies to achieve livelihood development.

(6) Independent Variable 5: Geographic location is another explanatory variable, that is an important factor affecting urban income imbalance (Wan, 2008). Therefore, commune level dummy variables were introduced to measure the effect of geographic factors on the degree of coordination of livelihood coupling among migrant households. This study distinguished between county resettlement and town resettlement, the settings and values of the variables are shown in Table 1.

Since the above variables have different meanings, the units of measurement for setting specific indicators also differ. Therefore, the variables were quantified, and the relevant research methods of scholars were referred to (Liu et al., 2018). The values were categorized and assigned by objective quantification and subjective evaluation, and then the extreme difference standardization method was used such that the values of indicators of different natures and categories were between 0 and 1, which facilitated the model analysis (Table 3).

4. Results

4.1. Analysis of the coupled coordination of livelihood capital and livelihood stability

As shown in Table 4, through model calculation and analysis, the type of coupling coordination between livelihood capital and livelihood stability of relocated migrants in Lamping County is characteristic of the end of a stable recovery. The value of livelihood capital, comprehensive governance of livelihood stability, coupling degree and coupling coordination degree steadily increased, and the difference in coupling coordination between livelihood capital and livelihood stability was small. The survey results show that before relocation, the total value of livelihood capital of migrants in Lanping County was 0.3778, and the coupling coordination degree was 0.46; after relocation, the total value of livelihood capital of migrants is 0.419, and the degree of coupling coordination was 0.48. Along with the promotion of the follow-up support of the relocation project, the infrastructure, education, medical care and household assets in the two relocation sites in Lanping County have been greatly improved compared with those before relocation. The increase in household assets and the number of non-agricultural employees have contributed to the sustainability of relocated migrants' livelihood capital. However, the coupling of relocated migrants still occurred at the end of stabilization and recovery, and a large gap between it and coordinated development was observed. Therefore, it is crucial to investigate factors influencing the coupled coordination of livelihood capital and livelihood stability to improve the livelihood development of migrant households.

4.2. Trend analysis of livelihood coupling coordination type changes

According to Table 5, the coupling and coordination type of livelihood capital and livelihood stability of relocated migrants in Lamping County gradually moved to the transitional development type. The proportion of migrant households of the dysfunctional decline type before relocation was 3.1%, but decreased to 1.5% after relocation. The proportion of migrant households of the stable recovery type before relocation was 69.3%, but decreased to 59.3% after resettlement. The proportion of migrant households in the transitional development type before resettlement was 27.6%, but increased to 39.2% after relocation. Resettlement has gradually shifted the type of coupling and coordination between livelihood capital and livelihood stability of migrant households to the transitional development type.

Resettlement to alleviate poverty in Lanping County was carried out in areas where natural disasters are frequent, transportation is closed, and poverty is widespread. To enhance the livelihood stability of migrants, the government of Lamping County has taken the initiative to link resources from various parties to provide diversified support for migrants. It opened up paths for labor transfers both inside and outside the province, provided public service jobs, and organized free skills training activities to achieve employment for at least one person per household. With the support of the government and society, migrants have taken the initiative to find livelihood paths, which has facilitated the transformation of their household livelihood capital and livelihood stability coupling and coordination type to the transition development type. However, there are still households in dysfunctional decline, and the proportion of the transitional development type is still low. These findings indicate that livelihood stability of relocated migrants in Lamping County still needs to be improved, and it is necessary to investigate the factors influencing the change in the coupling type of migrant livelihood capital and livelihood stability.

4.3. Analysis of factors influencing the degree of livelihood coupling coordination of immigrant households

4.3.1. Analysis of factors influencing the degree of livelihood coupling coordination among immigrant households for the total sample

First, the coefficients of the explanatory variables did not differ significantly from Model 5 when each type of influencing factor was included in the model alone. The coefficients did not change significantly when other variables were introduced, indicating that the regression estimation results were more robust. Therefore, the impact of the coupled livelihood coordination of migrant households in the total sample was analyzed specifically based on the results of Model 5, as shown in Table 6.

(1) Effects of household, policy, productive life and geographical factors on the coupled coordination of migrant household livelihoods: It was proven that the number of family members has a negative effect on the coupled coordination of

TABLE 4 Livelihood capital system and livelihood stability index.

Indicator	Livelihood capital composite (S1)	Livelihood stability composite (S2)	Coupling degree (C)	Coupling coordination (D)
Before relocation	0.3778	0.43855	0.5092475	0.45591896
After relocation	0.419	0.44444	0.53236934	0.47941057

TABLE 5 Changes in coupling coordination types of livelihood capital and livelihood stability.

Type	Before relocation	After relocation
Dysfunctional decline type	3.1%	1.5%
Stable recovery type	69.3%	59.3%
Transitional development type	27.6%	39.2%
Total	100.0%	100.0%

migrant household livelihoods. Due to the special characteristics of ethnic minority areas, migrant families often have a high number of children in order to demonstrate their prosperity but the high number of children and the weight of that burden has negative effects on the development of migrant family livelihoods. Policy enjoyment, total household income, and adaptation to productive life all have positive effects on the coupling coordination of migrant household livelihoods, and geographical factors did not have an effect on the coupling coordination of migrant household livelihoods.

(2) The effect of livelihood capital on the coupling coordination of resettled households' livelihoods. As shown in results detailed in Figure 3, it can be surmised that after controlling for other variables, the effect of subsistence capital on the coupling coordination of migrant households' livelihoods was very significant. The results of this analysis shows that natural capital, physical capital, social capital and human capital all have significant positive effects on the degree of livelihood coupling coordination of immigrant households. Moreover, the influence of human capital is the greatest. However, there was no effect of financial capital on the livelihood coupling coordination of migrant households. This is related to the low availability of financial capital; migrants indicated that most of their available capital was used for home renovations and debt repayment during the field survey.

Heat map makes research results of Table 6 more intuitive, and darker colors indicate greater relevance and impact.

4.3.2. Analysis of factors influencing the degree of livelihood coupling coordination among migrant households with different livelihood strategies

In this paper, the livelihood strategies of migrant households are divided into three types: agriculture-based, labor-supplemented, and diversified income households. The factors influencing the coordination of livelihood coupling among migrant households with different livelihood strategies are also explored.

(1) The regression results of the livelihood coupling coordination degree of migrant households whose livelihood strategies are mainly agricultural and work-oriented types show (Figure 3 Model 6) that, with other factors held constant, the number of household members has a negative effect on the livelihood coupling coordination degree of migrant households, and its coupling coordination degree decreases by 8.9% for each unit increase in the number of household members. The number of household laborers, the physical health of the household head, policy enjoyment, and all five variables passed the 5% significance level test and had a positive effect on livelihood coupling coordination. Geographical factors had no effect on the degree of livelihood coupling coordination of migrant households. Natural capital, physical capital, social capital, and human capital all passed the 1% significance level test and had a positive effect. However, the financial capital variable did not pass the 10% significance level test. The subjects of this study originally lived in alpine mountainous areas with deep poverty levels and heavy household burdens, which had a negative impact on livelihood development. Due to the homogeneity of relocation policy and population structure, there is no significant impact of county resettlement and urban resettlement on migrants' livelihoods. In contrast to previous studies, surveyed migrant households went into debt in order to acquire fixed assets to adapt to urban life and this resulted in them having little remaining savings; therefore, financial capital did not have a significant positive impact on livelihoods.

(2) The regression results of livelihood strategy for migrant households with labor-oriented agriculture as a supplementary type of livelihood coupling coordination show (Figure 3 Model 7) that family factors, policy factors and geographic factors have no effect on the livelihood coupling coordination of migrant households. In contrast, all five livelihood capital items had a positive effect on migrant households with labor-oriented agriculture as a supplementary type, among which human capital has the highest contribution to migrant households with labor-oriented agriculture as a supplementary type. The contribution of human capital was the highest among the labor-led agricultural households. According to the field survey, resettlement has less impact on long-term labor-oriented migrant households that mainly rely on family labor and have a better economic foundation and are more adaptable. Therefore, family factors and policy factors do not have a significant impact on them.

(3) The regression results of livelihood coupling coordination of migrant households with livelihood strategies as livelihood diversification types showed (Figure 3 Model 8) that the number of household size variables passed the significance level test of 10% and that the coefficient of the number of household sizes was negative. With the other factors held constant, an increase of 1 unit in the number of household sizes decreased the coupling

TABLE 6 Estimated OLS of migrants' livelihood capital and total household income.

Variable name	Model 1	Model 2	Model 3	Model 4	Model 5 (total sample)	Model 6 (agriculture-oriented)	Model 7 (work-oriented)	Model 8 (diverse livelihoods)
Family factors								
Number of family members	0.046				−0.072**	−0.089***	0.016	−0.084*
Number of people in the household labor force	0.080***				−0.008	0.065**	−0.019	−0.003
Age of head of household	0.046**				0.010	−0.055	0.024	0.023
Health of head of household	−0.014				0.005	−0.099**	0.010	0.033
Education of head of household	0.040*				−0.011	0.004	0.008	−0.035
Livelihood capital factors								
Natural Capital		0.758***			0.755***	0.613***	0.604***	0.724***
Physical capital		1.266***			1.439***	1.177***	1.217***	1.396***
Financial Capital		0.608***			0.212	0.142	0.855***	0.180
Social Capital		1.285***			1.015***	1.305***	0.855***	1.105***
Human Capital		2.045***			1.903***	3.28***	2.317***	1.766***
Policy factors								
Policy understanding			0.004		0.017	0.143	0.024	−0.007
Policy understanding channels			0.065**		0.014	0.003	0.030	0.028
Policy enjoyment			0.153***		0.041**	0.195**	−0.025	0.072*
Public facilities			−0.071**		−0.014	0.191**	−0.008	−0.005
Diversification of help measures			0.025		−0.010	−0.049	0.012	−0.008
Production life factors								
Log of total household income				0.030***	0.013**	0.016	−0.020**	0.013
Adaptation to productive life				0.044*	0.026**	−0.104	0.007	0.016*
Differences in customs and traditions				0.022	0.010	0.051	0.022	−0.001
Role of government sector				−0.001	−0.011	0.011	0.002	−0.017
Geographical factors								
Urban settlement	−0.047***	−0.006	−0.049***	−0.033***	0.090	−0.014	−0.005	0.008
Constant term	0.433***	−0.003	0.479***	0.177***	−0.099**	−0.205	0.167*	−0.110
R2	0.135	0.83	0.194	0.318	0.859	0.952	0.759	0.827
F	6.162	162.615	8.946	15.725	49.306	28.921	11.549	15.541

***, **, *denote $p < 0.01$; **$p < 0.05$; *$p < 0.1$, respectively.

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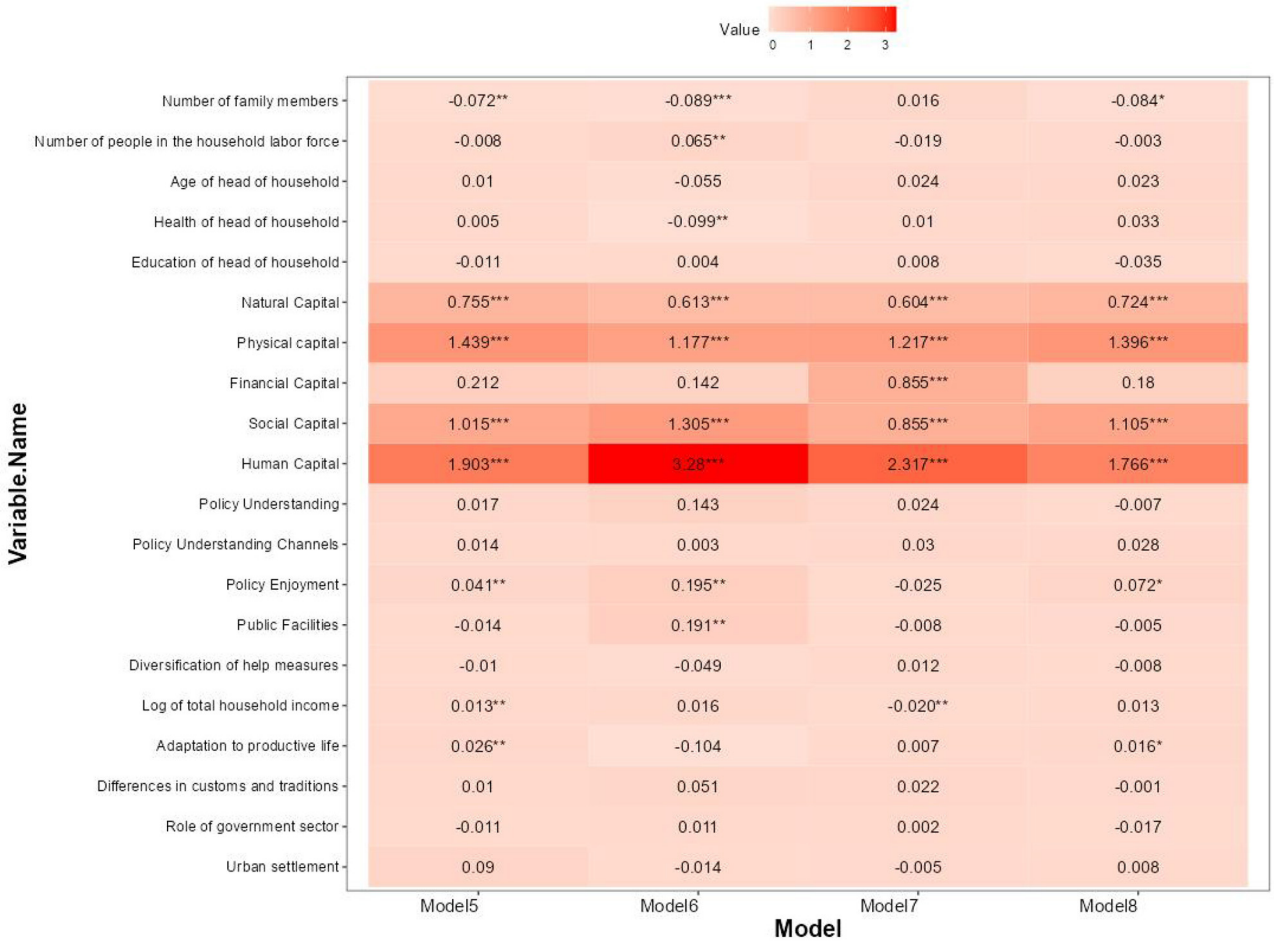

FIGURE 3
Heat map of estimated OLS of migrants' livelihood capital and total household income. ***,**,*, denote $p < 0.01$; **, $p < 0.05$; *, $p < 0.1$, respectively.

coordination of migrant household livelihoods by 8.4%. Policy enjoyment and adaptation to productive life had positive effects, and geographical factors had no effect on the coupling coordination of migrant household livelihoods. Natural capital, physical capital, social capital, and human capital, all passed the 1% significance level test and had a positive effect on the degree of livelihood coupling coordination. Financial capital had no effect on the degree of livelihood coupling coordination of immigrant households. Migrant households with diverse livelihoods had flexibility in their livelihood strategies, but they also faced the same problems as the first two categories.

5. Discussion

(1) In general, the degree of coupling coordination between resettled persons livelihood capital and livelihood stability decreased at the beginning of relocation because of energy transition and new livelihoods that had not yet been established. However, results also showed that coupling coordination between livelihood capital and livelihood stability of migrants in Lamping County were both increasing, and the type livelihood coupling coordination of migrants was gradually shifting to that of a transitional development type.

Lanping County is located in a deeply impoverished area in the southwest of China, and many of the migrants belong to ethnic groups directly-entering-socialism ethnic group had low economic levels before resettlement. In order to improve the livelihood capacities of migrants, the government of Lamping County also took the initiative to link various resources in order to provide diversified support to migrants which has significantly improved their endowment with resources and provided them with livelihood stability. In addition, there is a large gap between the coupling coordination of livelihood capital and livelihood stability of resettled households from ethnic minority groups directly entering socialism and the realization of coordinated development. There is still a need to enhance the post-relocation support of migrants' livelihoods under the concept of just transition.

(2) In the process of just transition, the influencing factors of livelihood coupling coordination vary across different livelihood strategies (Wu, 2016; Su and Wu, 2019). In this study, the number of household members had a negative effect on the livelihood coupling coordination of the agriculture-based type, while the number of household members in the labor-based type of livelihood

strategy had no effect on the livelihood coupling coordination of migrants households. The field observations of the authors revealed that most of the immigrant households whose livelihood strategies were mainly agricultural, were also those with low educational attainment and this was also the group that failed in their livelihood transitions. In addition, the number of people in ethnic minority households in Lamping County are high, household members have a low educational attainment, and their livelihoods are based on traditional agricultural skills. After relocation, if the transition of livelihoods was not timely, it was difficult for these households to meet the expenses of a large family with government subsidized funds and subsidized public welfare employment alone. These households therefore, fell into cycles of poverty. By contrast, the families who had adopted a mainly labor-based type of livelihood strategies after relocation that had relatively high literacy and successful transition of livelihoods, earned better household incomes; thus, they were able to create more livelihoods for a larger number of family members.

(3) Different livelihood strategies require different types of livelihood capital (Liu et al., 2020; Xu and Shi, 2020). Due to the inequality of resources, appropriately chosen livelihood strategies achieve livelihood development goals and achieve a just transition. In terms of their influencing factors, human capital is the highest contributor to the livelihood coupling coordination of all migrant households, and natural capital occupies an important position in livelihood coupling coordination, however, the contribution rate varied for different types of households. This is because the county is a deeply impoverished area where industrial transformation is slow. Therefore, to sustain their livelihoods after relocation, some migrants still commuted between the two areas to engage in agricultural activities. Because human capital is the basis for livelihood development, human capital is the key to achieving sustainable livelihood development for migrants after relocation.

The goals of ecological environmental protection, employment stability, social inclusion, poverty eradication and meeting the inherent construction requirements of an ecologically sustainable civilization were achieved via poverty alleviation resettlement are generally compatible with the concept of just transition. Therefore, under the concept of just transition, government agencies should reflect on the established poverty alleviation measures and institutional system, enhance the fairness and inclusiveness of the migrant livelihood post-support system, and guarantee the process justice and outcome justice of social transition. Based on the findings presented here to achieve a just transition, to safeguard against large scale returns to poverty, and to promote coordinated development of livelihoods of resettled people from poverty-stricken areas, this study proposes the following recommendations:

(1) Human capital is key to coordinated livelihoods of migrant families of ethnic minorities and the contribution of migrant families is highest based on whether or not they are principally engaged in agriculture or work-based livelihood strategies. Therefore, to alleviate poverty, it is necessary to continue to implement employment skills training of project affected households after resettlement. Moreover, for different livelihood strategies for migrant families, diversified and precise employment training should be carried out to increase the driving force for coordinated development of migrants' livelihoods. At the same time, the cultivation of county industries should be promoted. This would increase employment and income opportunities of resettled people.

(2) Natural capital is more important for the coordinated development of the livelihoods of migrant families of ethnic minorities after relocation. Due to the special characteristics of their condition, their relocation has been referred to as "leap forward a thousand of years in a single step." Recognizing that land is one of their main sources of livelihood, it is necessary to strengthen the land transfer policy for relocated people.

(3) Targeted support is necessary for migrant families with different livelihood strategies. Migrant families mainly in agriculture should pay attention to the reconstruction and accumulation of their natural capital and social capital; migrant families mainly in labor should broaden their channels to employment and increase skills relevant to employment.

(4) For ethnic minority families, the fertility structure needs to be optimized and the education levels need to be improved. The burden of family size is an obstacle to the coordinated development of livelihoods of minority immigrant families. A larger family means a higher cost of living. Therefore, it is necessary to enhance the popularity of migrant support policies and improve the utilization rates of migrant post support policies, and include measures that help to bridge the gap between migrant communities and social workers.

6. Conclusion

A just transition is a guarantee that migrants' livelihoods can be sustainable in their new context. This study outlined the impact of China's poverty alleviation and relocation policy on farm households, and analyzed the degree of coupling and influencing factors between migrants' livelihood capital and livelihood stability. The results show that the relocation policy for poverty alleviation enhances the livelihood capital of migrants and their stability, and that farm households maximize equity in the transition to urbanized citizenship by compensating for the adverse effects of energy transition on them via post-support policies. At the same time, equity is not egalitarianism. Households with different livelihood capital bases need different support measures to enhance livelihood stability during the "common prosperity" process of social transformation.

The contribution of this study is has been to construct a coupled coordination model of livelihood capital and livelihood stability, and create a model of factors that influence livelihood coupling coordination. This is a new framework for sustainable livelihood research of poverty alleviation migrants. This study shows that poverty alleviation relocation in China is itself a process of energy transition and subsequent support measures must to heed the needs of migrants who do not make sense of livelihood capital and livelihood strategies to ensure that ethnic minority groups directly-entering-socialism experience a just transition as they transition toward life as urban citizens.

Finally, although China has not created an institutional framework that explicitly considers just transition, government led programs addressing absolute poverty, such as poverty alleviation resettlement, all coincide well with requirements that achieve just transition. As to governance measures that alleviate relative

poverty, we should actively exchange and share our experiences and lessons learned in realizing just transition with other international institutions and countries. In the process of implementing China's poverty resettlement policy, farmers who originally lacked subsistence resources were resettled in better locations and essential livelihood support measures were adopted in order to support and guarantee a just transition could occur. Finally, we believe that some of these experiences and practices are worth exchanging and sharing with the international community.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Written informed consent from the participants was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

ST was primarily responsible for writing the main body of the manuscript and provided the original data and results of the empirical analysis for the research in this manuscript. GS made significant contributions to improve the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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