

Impact of female non-agricultural employment on the Family resilience : A case study of relocated Families in poverty alleviation relocation

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ABSTRACT

In developing nations, economic vulnerabilities often impede family resilience, particularly when gender disparities in non-agricultural employment are pronounced. Our research, leveraging data from the China Family Panel Studies (CFPS), investigates the impact of female non-agricultural employment—facilitated by Chinese poverty alleviation initiatives—on family resilience. Employing a Markov model to gauge resilience and a Difference-in-Differences approach to evaluate female employment's influence, we also utilized a mediation model to uncover underlying dynamics. Results indicate that post-relocation non-agricultural employment among women enhances family resilience, with asset accumulation and elevated female literacy correlating with increased income and resilience. Decreasing family size correlates with heightened female participation in non-agricultural sectors, further bolstering resilience. This underscores the importance of advocating for women's non-agricultural employment to bolster family resilience and gender parity in developing contexts.

KEYWORDS

Family Resilience; Non-agricultural employment; Relocation; Poverty Alleviation and Resettlement Area; Women in Families

1 Introduction

In developing countries, family resilience post-relocation is vulnerable to myriad uncertainties, potentially leading to entrenched poverty. To address this, China has initiated a poverty alleviation relocation program aimed at addressing poverty deeply rooted in inadequate natural and economic conditions (Rostow, 1991; Praag and van Stel, 2013). The program constructs communities for displaced families to facilitate their transition to new modes of production and lifestyle. However, challenges such as limited employment skills, the difficulty of reestablishing livelihoods, increased living costs, and imprudent consumption patterns can impede asset accumulation and lead families to leave resettlement areas. This underscores that resettlement area establishment is only one phase of the relocation project (Ye and Douwe et al., 2019), necessitating considerations for the long-term development and sustainability of relocated families.

This study aims to elucidate effective strategies for relocated families to ascend to higher echelons of development post-relocation. A comprehensive approach is imperative, considering the multifaceted nature of family structures, including labor force characteristics, familial assets, and income. Family resilience, defined as the capacity to preserve integrity and functionality amidst external perturbations (Folke, 2006; Stephan and Rist et al., 2014), is crucial. Scholarship has concentrated on recalibrating livelihood strategies, optimizing capital structure through external interventions, or the realms of education and healthcare (Garcés-Velástegui, 2022; Zhang and Hu et al., 2024). There is an exigent need to reduce vulnerability to poverty and mitigate the opportunity costs associated with relocation (Cernea, 2003). Empirical evidence suggests that relocated families may experience economic stagnation, thereby diminishing their resilience. In this context, family resilience is conceptualized as the ability to recuperate and enhance economic status following external shocks.

Research has focused on the impact of non-agricultural employment on women's rights and occupational choices, fostering economic independence and social value. This is achieved through the transformation of family labor force structures, enhancement of educational resources for progeny, and elevation of familial resource endowment (Elliott and Bachman, 2023). Women's engagement in non-agricultural employment is posited to augment literacy and impact trade openness, benefiting agricultural production and familial resources. Such participation can balance familial decision-making power, refine resource allocation, and embolden women to pursue parity within familial and societal domains (Zverová, 2012). Molina's research indicates that regions with elevated female employment rates exhibit reduced gender disparity in the labor market and more equitable treatment of women in employment (Molina and Usui, 2023).

However, women often bear the brunt of familial caregiving responsibilities, which can curtail income and career advancement, thereby constraining autonomy and self-development time (Shen and Zhang, 2023). Market policies frequently lack incentives for women to engage in non-agricultural employment (Xi-Guang and Peng et al., 2018). Shen's study reveals that the expansion of financing behaviors and policies can erode women's mobility within the labor market and diminish demand for female labor. In China, women dedicate significant time to household chores, with 56.1% considering these duties burdensome, exacerbating traditional gender roles and undermining family resilience (MacPhail and Dong, 2007).

The restructuring of livelihoods among relocated families significantly influences family resilience. The transition of women from agricultural labor to non-agricultural employment and its impact on household resilience has received limited attention, particularly from a gendered perspective. This study seeks to contribute to existing research by employing a Markov model to quantify family resilience, examining the impact of women's non-agricultural employment on family resilience, and elucidating the mechanisms through which this impact is mediated.

2 Theoretical Background and Analytical Framework

2.1 Constituent of Family Resilience

Family resilience is based on three key aspects: the ability to handle stress (buffering capacity), the ability to work together (self-organization capacity), and the ability to learn new things (self-learning capacity). When women work in non-agricultural jobs, it helps families in several ways: it brings in more income, reducing reliance on one source; it improves how the family works together and communicates; and it encourages everyone to keep learning and growing. This shows that women working outside agriculture is important for building a strong, adaptable family.

Family resilience is contingent upon buffering and learning capacities, with post-relocation employment changes reflecting the latter and asset accumulation the former. Asset accumulation, pivotal for resilience, is constrained by income, impeding risk buffering. Families with limited assets and skills face challenges in securing stable non-agricultural employment and saving for contingencies, thus struggling to transition from agriculture. The urban-rural divide exacerbates job market competition, necessitating more non-agricultural opportunities. Skill gaps also hinder relocated families' access to such jobs. Human capital, including age and education, significantly influences employment prospects, with older workers often experiencing discrimination and educational deficits limiting job acquisition in non-agricultural sectors. Family size also impacts the workforce's ability to secure non-agricultural employment (Figure 1).

2.2 Non-Agricultural Employment

Studies since 2000 initially saw non-agricultural income as just replacing agricultural income (Ferreira and Lanjouw, 2001). However, it's now clear that non-agricultural income is growing among Chinese rural residents, replacing agricultural income. Factors like land transfers, education, and gender differences have been influencing this trend (Kelly and Huo, 2013). The end of China's agricultural tax and changes in farming led to more rural workers moving to non-agricultural jobs, with cities offering training to improve job quality. Non-agricultural jobs are now a key income source for rural families.

This shift has led to problems like high work intensity, low income, and job instability. There are also concerns about left-behind children and social integration challenges. Local non-agricultural jobs are seen as cost-effective and more stable, helping to address these issues (Neven and Odera et al., 2009). Researchers support promoting local employment for rural workers, using the transfer of the workforce to small towns to keep families close to non-agricultural jobs, reducing opportunity costs (Bloom and Canning et al., 2009).

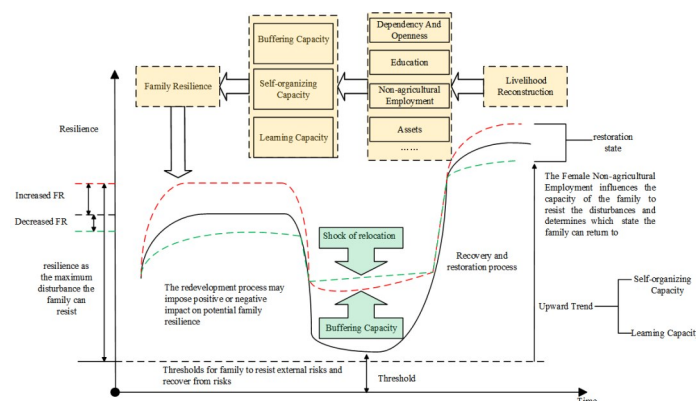


Figure 1 Family Resilience Framework

3 Data and Methods

3.1 Data collection

This research utilizes data from the China Family Panel Study (CFPS), a longitudinal survey capturing multilevel data

across China's 25 provinces. The CFPS offers insights into societal and economic facets of China. Employing data from 2016, 2018, and 2020, the study assesses the influence of family characteristics on post-relocation resilience. Participants were selected based on personal identification and migration status, with data harmonization via family identification. The analysis, excluding urban dwellers and incomplete cases, focused on 192 relocated families with complete data, to scrutinize employment patterns and resilience.

3.2 Family resilience measurement

According to Chinwe Ifejika Speranz, resilience is a variable that reflects the ability of a system to maintain its systems and structures after a shock. However, resilience as a property of the system itself, along with the changes in the various elements within the system and how the resilience exists, needs to be considered in measuring resilience. The differences in the economic behavior of relocated families in different periods lead to differences in the resources that relocated families can obtain, which in turn lead to differences in the characteristics of families in different periods. We define that family i has an anti-risk ability in period t , which is represented by $W_{i,t}$ and $W_{i,t}$ is a parametric expression, thus obtaining equation (1):

$$W_{i,t} = g(W_{i,t-1}, N_{i,t-1}) + \gamma N_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where $W_{i,t}$ stands for t -period risk resilience, $W_{i,t-1}$ is $t-1$ -period risk resilience, and j stands for the order of the higher-order center distance. $N_{i,t}$ is the family characteristic variable; $\varepsilon_{i,t}$ is the random perturbation term, and γ are the coefficients to be estimated. $N_{i,t}$ composition is shown in Table 1.

Table 1 Definition and Descriptive Statistical Analysis of Variables in risk resilience

Dimensions of resilience	Indicators
Buffering Capacity	Dependency Ratio
	Health Condition
Self-organizing Capacity	Trust
	Reliance on own resources
Learning Capacity	Extension Platform
	Openness

The process can be modeled as a first-order Markov process due to the continuous nature of the family period within families in relocation resettlement areas. Regarding the Markov process, the anti-risk ability in the lag period (i.e., period t) is affected by the anti-risk ability in the previous period (i.e., period $t-1$) in the future as a continuous existence. At the same time, as a state variable that persists for a family, the anti-risk ability summarizes all prior states, implying that only one lag is necessary. Using a lagged term also simultaneously addresses possible autocorrelation in panel data errors.

Afterwards, E is used to represent the expected value, and $\wedge$ is inserted as the predicted value. Assuming that the random error term $\varepsilon_{i,t}$ is the zero mean (i.e. $E(\varepsilon_{i,t})=0$), the mean condition of anti-risk ability for family i at time t can be obtained, as shown in (2):

$$\varepsilon_{i,t} = E[W_{i,t}|W_{i,t-1}, N_{i,t}] = g(W_{i,t-1}, N_{i,t}) + \gamma N_{i,t} \quad (2)$$

Referring to Just and Pope (1979) and Antele (1983), the second-order center-to-center distance can be expressed as the square of the predicted first-order center-to-center distance residuals, as shown in (3):

$$\varepsilon_{i,t}^2 = \sum_{j=1}^k \beta W_{i,t-1}^2 + \gamma \Delta N + \varepsilon_{i,t} \quad (3)$$

Substituting (2) into (3) yields (4):

$$E^2[W_{i,t}|W_{i,t-1}, N_{i,t}] = \sum_{j=1}^k \beta W_{i,t-1}^2 + \gamma \Delta N + \varepsilon_{i,t} \quad (4)$$

Equation (4) delineates the expected distribution of anti-risk ability across periods, with the actual equation capturing the lagged anti-risk ability and characteristics from period $(t-1)$. This indicates that multi-period anti-risk ability is influenced by past resilience and family characteristics. The inter-period relationship is modeled as a Markov process, maintaining a stable transition probability distribution. The primary impact in period (t) is the change in family-specific characteristics, denoted as ΔN . An increase in $|\Delta N|$ correlates with a larger variance in expected value distribution, signifying greater changes in risk resilience over time, reflecting family resilience strength in response to internal changes.

In accordance with the Markov chain model, the evolving distribution of the family's anti-risk capacity of the relocated families in the poverty alleviation relocation area can be defined as follows (5):

$$W_{i,t} = \sum_{i=1}^n W_{i,t-1} P_{i,t} + \mu_{i,t} \quad (5)$$

In (5), t denotes time, $W_{i,t}$ denotes the anti-risk ability of the family at time t , $\mu_{i,t}$ is the error term. The transition probability $P_{i,t}$ denotes the probability of transition from scale i at period $t-1$ to period t , satisfying $\sum P_{i,t}=1$ and $0 \leq P_{i,t} \leq 1$.

Determining the transition probability is the key to the Markov chain model. The determination of the transition probability represents a fundamental aspect of the Markov chain model. By establishing an objective optimization model with the objective of minimizing the discrepancy between the actual transition probability and the estimated transition probability, it can be concluded that, as illustrated in (6) and (7):

$$\eta = W_{i,t} - \widehat{W}_{i,t} = W_{i,t} - \sum_{j=1}^n W_{i,t-1} P_{i,t} + \mu_{i,t} \quad (6)$$

$$\begin{aligned} \min |\eta| &= \min \left| W_{i,t} - \sum_{j=1}^n W_{i,t-1} P_{i,t} \right| \\ \text{s.t. } \sum_{j=1}^n P_{i,t} &= 1, i = 1, 2, \dots, n \\ P_{i,t} &\geq 0 \end{aligned} \quad (7)$$

Following the calculation of the conversion probability, it was observed that the distribution of family resilience is uneven and fluctuates in multiple periods. In accordance with the analytical framework proposed by Barrett and Constanas (2014), a distribution form of resilience is presented in (8):

$$\bar{p}_{i,t} = [P_{i,t} [\sum_{j=1}^n W_{i,t-1} P_{i,t} + \mu_{i,t}] dt > \sum (\frac{\lambda_i - \lambda'}{\lambda'})^2 \lambda] \quad (8)$$

In Equation (8), $p_{i,t}$ represents the probability density function the λ represents the World Bank poverty line. The probability of $p_{i,t}$ remaining on the threshold line is indicative of family resilience.

3.3 Model Design

3.3.1 Benchmark regression model

DID, or Difference in Difference, is a standard methodology used in social science research to estimate the effects of interventions and even dispositions.

In order to verify the impact of multiple family characteristics on family resilience in the resettlement area, the study uses the DID model to verify that due to some differences in the primary status of the specific employment of each family in different years, the specific model is set up as follows, and this paper uses the triple-difference model:

$$\rho_{i,t} = \beta_0 + \beta_1 U_{i,t} T_{i,t} G_{i,t} + \beta_2 U_{i,t} T_{i,t} + \beta_3 U_{i,t} G_{i,t} + \gamma_1 X_{i,t} + \mu_i + \nu_t + \varepsilon_{it} \quad (9)$$

where $W_{i,t}$ represents the explanatory variable for family i in period t , i.e., the calculated family resilience; $U_{i,t}$ is a dummy variable representing the family's mode of placement; $T_{i,t} = 1$ if the respondent participates in non-agricultural employment outside the home, and $T_{i,t} = 0$ if the respondent chooses to participate in non-agricultural employment; $G_{i,t} = 1$ if the respondent is a female, and $G_{i,t} = 0$ if the respondent is a male; $X_{i,t}$ denotes the control variable; and μ_i and ν_t stand for the individual fixed effect and the year fixed effect, respectively.

3.3.2 Parallel Trend Test

The triple difference model must satisfy consistency, i.e., the treatment and control group trends in the model should be the same without any intervention. In addition, the baseline regression model reflects the average treatment effect of the different interventions on family resilience. The empirical results of the enhancement need to be disaggregated according to the process before and after the relocation. The following model is constructed for this purpose:

$$\rho_{i,t} = \theta_0 + \sum \theta_k U_{i,t+k} + \sum \theta_k U_{i,t} + \mu_i + \nu_t + \varepsilon_{it} \quad (10)$$

3.4 Variable Selection

3.4.1 Dependent variable: Family resilience

The dependent variable is the family resilience of relocated families in the resettlement area, calculated according to formula (8) above.

3.4.2 Core explanatory variable: Women's participation in non-agricultural employment

This study examines the impact of female non-agricultural employment on family resilience without exacerbating gender inequality. It utilizes two binary variables: one for gender (1 for female respondents, 0 otherwise) and another for non-agricultural employment (1 for those engaged, 0 for those not engaged), derived from dataset analysis.

3.4.3 Control variables

Based on Chinwe Ifejika Speranza's study on resilience in his research, this paper mainly controls for respondents' personal characteristics variables and household characteristics variables as shown in Table 2.

Table 2 Descriptive Statistical Analysis of Control Variables

Variable	Mean	Variance
Education (E)	1.5166	1.2120
Employment Status (ES)	0.0730	0.2602
Placement modalities (PM)	0.6439	0.4790
Family size (FS)	4.8494	2.7660
Financial assets (FA)	53569.28	163288.9
Household housing (HH)	245641.4	653277.2
Land assets (LA)	36915.59	133863
Wage income (WI)	27232.66	46860.29
Operating income (OI)	9059.223	36984.75
Transfer income (TI)	13136.01	100018.9
Property income (PI)	1352.873	7770.883
Living expenses (LE)	6483.136	14465.31

4 Result

4.1 Measurement result of family resilience

In the Figure 2a, 2b, and 2c collectively depict the resilience dynamics of 192 families from 2016 to 2020.

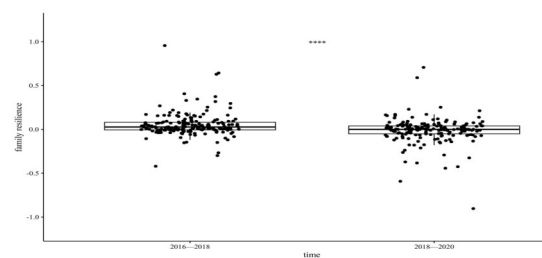


Figure 2a Family Resilience Framework

In Figure 2a, box-and-line plot shows resilience values on the vertical axis against three time periods, with a stabilization in family registration and employment shifts, especially among females, leading to enhanced resilience over time.

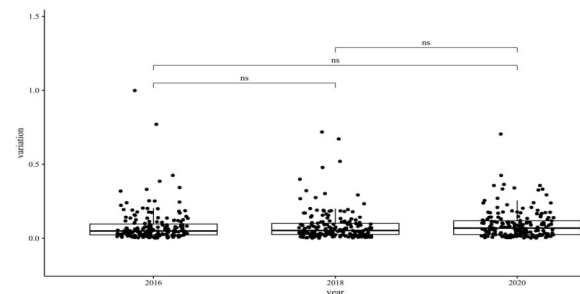


Figure 2b Family Resilience Framework

In Figure 2b, box plots indicate a trend towards stability in family resilience shifts pre- and post-relocation, with a smaller gap in resilience changes in 2018-2020 compared to 2016-2018, and a noticeable increase in resilience post-relocation.

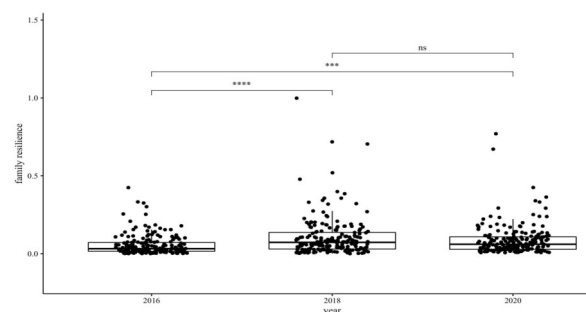


Figure 2c Family Resilience Framework

In Figure 2c, highlights the impact of women's employment shifts on family resilience, showing an increase in the median value in 2020 compared to previous years, suggesting that family resilience increased following changes in women's employment patterns.

4.2 Benchmark Regression Results

Table 3 presents regression analysis on family resilience. Column (1) shows that women's non-agricultural employment in resettlement areas positively impacts resilience ($p < 0.05$, coefficient 0.050). As controls are added in columns (2) to (5), the effect intensifies, becoming highly significant at the 1% level, with coefficients increasing from 0.068 to 0.080. This robustly indicates that women's employment substantially enhances family resilience. The study suggests that women's engagement in non-agricultural work increases family income, buffers against post-relocation challenges, and fosters resilience, promoting developmental activities that elevate the family's long-term capabilities.

Table 3 Benchmark Regression Results

	(1)	(2)	(3)	(4)	(5)
	OLS	FE	FE	FE	FE
G*PM *E	0.050** (0.028)	0.068** (0.037)	0.074*** (0.036)	0.081*** (0.036)	0.080*** (0.036)
G*MS	-0.022* (0.013)	-0.048*** (0.015)	-0.056*** (0.015)	-0.058*** (0.015)	-0.059*** (0.015)
MS*E	-0.016 (0.015)	-0.026 (0.032)	-0.036 (0.032)	-0.033 (0.032)	-0.033 (0.032)
G	0.009 (0.010)	0.024** (0.012)	0.030** (0.012)	0.031*** (0.012)	0.032*** (0.012)
Control variables	YES	YES	YES	YES	YES
Adj. R ²	0.000	0.134	0.168	0.195	0.194

4.3 Parallel Trend Test

To verify the parallel trend assumption of the double difference model, this paper estimates equation (8). Figure 3 displays the estimation results, and it can be seen that the policy is significant at the 90% confidence interval within 2016–2018, and the toughness level increases. The resilience level decreases between 2018–2020, and there is a difference in the change of resilience level at different policy implementation times.

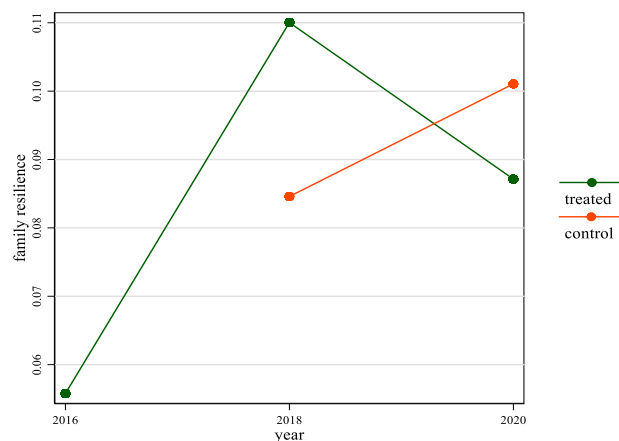


Figure 3 Time Trend of Family Resilience

5 Conclusion

Women's participation in non-agricultural employment post-relocation enhances family resilience, particularly in smaller families, by increasing income and assets. The study highlights three policy implications: encouraging women's non-agricultural employment in poverty reduction programs, especially for those previously not in the workforce; providing social security and development aid to relocated families to overcome challenges; and empowering women in family employment decisions. Raising awareness of the benefits of non-agricultural employment for women and securing family support are key.

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