

Research on the Influencing Factors and Strategies of Motivating Volunteers in the "Time Bank" of Community-based Elderly Care

Qin Cao*

Management Department, Jiangxi Agricultural University Nanchang Business School, Jiujiang, China

*Corresponding author: moonqin6800@163.com

Abstract

Against the backdrop of global population aging, China is faced with severe challenges in elderly care. As an innovative mutual-aid elderly care model, the development of the "Time Bank" for community-based elderly care is restricted by insufficient volunteer participation. This study selected six cities in Jiangxi Province, distributed 800 questionnaires, and retrieved 726 valid questionnaires. The Cronbach's α coefficient was used to test the reliability of the questionnaires. Through descriptive statistical analysis, correlation analysis, and a multiple linear regression model, this study delved into the influencing factors of volunteer motivation. The study found that the young group is the main force of volunteers, with a relatively large proportion of students and retirees, and most volunteers having a bachelor's degree. Social recognition has the most prominent impact on volunteer motivation. Service experience, organizational support, educational attainment, and policy support also have significant positive effects, while the influence of age is relatively small. This study provides a strong basis for the government to formulate elderly care policies and for communities to optimize the incentive mechanism.

Keywords

Time Bank, Volunteer Motivation, Multiple Linear Regression.

1. Introduction

Global population aging has become one of the most remarkable social changes in the 21st century. According to the United Nations' "World Population Prospects 2022" report, by 2050, the proportion of the global population aged 65 and above will increase from the current 10% to 16%, and the aging rate in the East Asian region is particularly prominent. As the country with the largest elderly population in the world, China is facing unprecedented pressure in elderly care. Data from the National Bureau of Statistics shows that in 2023, the population aged 60 and above in China had reached 280 million, accounting for 19.8% of the total population, and it is expected to exceed 400 million by 2035[1]. Against this backdrop, the traditional family-based elderly care model has gradually weakened due to factors such as the low fertility rate and population mobility. As an important supplementary form, community-based elderly care has increasingly highlighted its strategic status.

The "Time Bank", as an innovative community-based mutual-aid elderly care model, has been promoted globally since it was first practiced in Japan in the 1980s.[2] This model, through the mechanism of "service storage - time exchange", encourages healthy younger elderly people to provide services for older elderly people, and the service time is deposited into individual accounts, which can be exchanged for the services of others when needed. Theoretically, this mutual-aid model can effectively alleviate the problem of insufficient supply of elderly care services and, at the same time, promote the accumulation of social capital among community

members[3]. However, practice shows that approximately 42% of time bank projects worldwide have stagnated due to insufficient volunteer participation. This phenomenon reveals the systematic defects in the current incentive mechanism of the time bank, which urgently requires in-depth research.

Existing research on the motivation of time bank volunteers mainly focuses on three dimensions[4]. At the individual motivation level[5], research based on self-determination theory points out that intrinsic motivation can promote the continuous participation of volunteers more effectively than material rewards. In terms of institutional design[6], scholars have found that the flexibility of the time exchange mechanism and the perfection degree of the trust system significantly affect the willingness to participate. Research on technological empowerment[7] focuses on the application of emerging technologies such as blockchain, attempting to solve the problems of transparency and security in time credit storage. However, most of the existing research is based on the Western cultural background and lacks consideration of the particularity of East Asian societies.

This study aims to deeply explore the influencing factors and strategies of motivating volunteers in the "Time Bank" of community-based elderly care. On the one hand, it provides a basis for government departments to formulate elderly care policies, and on the other hand, it provides solutions for community organizations to optimize the incentive mechanism. Against the backdrop of addressing the global aging challenge, this study has positive significance.

2. Research Methods and Model Construction

2.1. Construction of the Evaluation System

The questionnaire designed in this study mainly focuses on dimensions such as volunteers' basic information (age, occupation, volunteer service experience, etc.), motivation for participating in the "Time Bank", satisfaction with existing incentive measures, and expectations. Six cities, including Nanchang, Jiujiang, and Ganzhou in Jiangxi Province, were selected, covering both urban and rural communities. A total of 800 questionnaires were distributed, and 726 valid questionnaires were recovered, with an effective recovery rate of 90.75%. To ensure the validity of the questionnaire data, the Cronbach's α coefficient was used to test the reliability of the questionnaire. The formula is as follows:

$$\alpha = \frac{k}{k-1} \left(1 - \sum_{i=1}^k \sigma_i^2 / \sigma_T^2 \right) \quad (1)$$

where k is the number of questions in the questionnaire, σ_i^2 is the variance of the score of the i -th question, and σ_T^2 is the variance of the total score of the questionnaire.

After calculation, the Cronbach's α coefficient of this questionnaire is 0.82, indicating that the questionnaire has high reliability.

2.2. Descriptive Statistical Analysis

This study uses the descriptive statistical analysis method to systematically process the data of the recovered questionnaires. It aims to present the demographic characteristics, behavior patterns, and cognitive distribution of the samples through quantitative indicators, laying a data foundation for subsequent in-depth research. Through calculating the measures of central tendency (mean, median, mode), measures of dispersion (standard deviation, variance), and frequency distribution, this analysis systematically depicts the characteristics of volunteers and managers in dimensions such as personal attributes, project cognition, and participation behavior.

In the dimension of personal basic information, by calculating the mean and median of age, the characteristics of the age distribution of the samples are revealed. Combining with quantile analysis, the proportions of the younger, middle-aged, and older age groups can be further clarified. The analysis of the occupational structure calculates the frequency distribution of different occupational types, and combines with percentages and pie charts for visualization to intuitively present the characteristics of the occupational composition of the volunteer group. For the analysis of educational attainment levels, cumulative frequencies and bar charts are used to quantitatively display the distribution differences of different educational levels.

Regarding the cognition and participation in the "Time Bank" of community-based elderly care, attitude variables measured by the Likert scale are used. By calculating the mean and standard deviation, the central tendency and degree of dispersion of the cognitive level are evaluated. For example, the standard deviation of the service willingness score can reflect the degree of consistency of the attitudes of the samples, while the mean reveals the overall attitude tendency. The analysis of service duration uses the interquartile range and box plot to identify outliers and present the distribution characteristics of service duration. Combining with the skewness and kurtosis indicators, the shape of the data distribution can be judged.

2.3. Correlation Analysis

The Pearson correlation coefficient r was used to analyze the degree of association between various factors and volunteer motivation. The formula is as follows:

$$r = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \sum_{i=1}^n (y_i - \bar{y})^2}} \quad (2)$$

where x_i and y_i are the observed values of the two variables, respectively, and $\bar{x}$ and $\bar{y}$ are the means of the two variables, respectively. The value of r ranges from -1 to 1.

The closer the absolute value is to 1, the stronger the correlation; the closer the absolute value is to 0, the weaker the correlation. By calculating the Pearson correlation coefficient between each factor and volunteer motivation, variables with significant correlations were selected for subsequent regression analysis.

2.4. Multiple Linear Regression Model

In this study, a multiple linear regression model was employed to explore the quantitative relationships between influencing factors and volunteer motivation in the "Time Bank" of community-based elderly care in Jiangxi Province.

(1) Model Construction

The multiple linear regression model is formulated as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \varepsilon \quad (3)$$

Here, Y represents the dependent variable, which is the volunteer motivation level. It is operationalized as the comprehensive score of incentive satisfaction obtained from the questionnaire. The independent variables $X_1, X_2, \dots, X_k$ are categorized into three main dimensions: personal factors (such as age, occupation, and volunteer service experience), organizational factors (including aspects of organizational management, training, and communication), and social factors (such as social recognition, policy support, and cultural atmosphere). Each X_i is a specific variable within these dimensions that is hypothesized to influence volunteer motivation. β_0 is the intercept term, representing the value of Y when all X_i are zero. The coefficients $\beta_1, \beta_2, \dots, \beta_k$ indicate the change in the dependent variable Y for a one

- unit change in the corresponding independent variable X_i , assuming all other variables remain constant. ε is the random error term, which captures the unobserved factors and measurement errors that affect Y .

(2) Parameter Estimation:

The least squares method was used to estimate the regression coefficients $\beta_0, \beta_1, \dots, \beta_k$. The core principle of this method is to minimize the sum of the squared residuals,

$$SSE = \sum_{i=1}^n (y_i - \hat{y}_i)^2 \quad (4)$$

where y_i is the observed value of the dependent variable for the i -th sample, and $\hat{y}_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_k x_{ik}$ is the predicted value. By solving the normal equations derived from taking the partial derivatives of SSE with respect to each β_j ($j = 0, 1, \dots, k$) and setting them equal to zero, then obtain the optimal estimates of the coefficients. Mathematically, this involves solving a system of linear equations:

$$\begin{cases} \frac{\partial SSE}{\partial \beta_0} = -2 \sum_{i=1}^n (y_i - \beta_0 - \beta_1 x_{i1} - \beta_2 x_{i2} - \dots - \beta_k x_{ik}) = 0 \\ \frac{\partial SSE}{\partial \beta_1} = -2 \sum_{i=1}^n x_{i1} (y_i - \beta_0 - \beta_1 x_{i1} - \beta_2 x_{i2} - \dots - \beta_k x_{ik}) = 0 \\ \dots \\ \frac{\partial SSE}{\partial \beta_k} = -2 \sum_{i=1}^n x_{ik} (y_i - \beta_0 - \beta_1 x_{i1} - \beta_2 x_{i2} - \dots - \beta_k x_{ik}) = 0 \end{cases} \quad (5)$$

These equations can be solved using matrix algebra or statistical software (such as SPSS, R) to obtain the estimated coefficients $\hat{\beta}_0, \hat{\beta}_1, \dots, \hat{\beta}_k$.

After estimating the regression model and conducting significance tests, the results were used to identify the key influencing factors on volunteer motivation. The magnitude and sign of the estimated coefficients provided insights into the nature and strength of the relationships. For example, a positive coefficient for a certain independent variable indicated that an increase in that variable was associated with an increase in volunteer motivation, while a negative coefficient suggested the opposite. The relative magnitudes of the coefficients also allowed for a comparison of the importance of different factors in influencing volunteer motivation. Through this process, it's able to screen out the factors that have a significant impact on volunteer motivation in the "Time Bank" of community - based elderly care in Jiangxi Province, which provided a basis for formulating targeted incentive strategies.

3. Results

The results of the descriptive statistical visualization are shown in Figure 1. In terms of age distribution, the age groups of 25-28 years old and 19-24 years old account for a relatively large proportion, indicating that the young group is the main force of volunteers. This may be attributed to their abundant energy as well as the publicity and encouragement from schools and communities. However, the proportions of the age groups of 15-18 years old and over 28 years old are relatively small, which are affected by academic pressure and work-family affairs respectively.

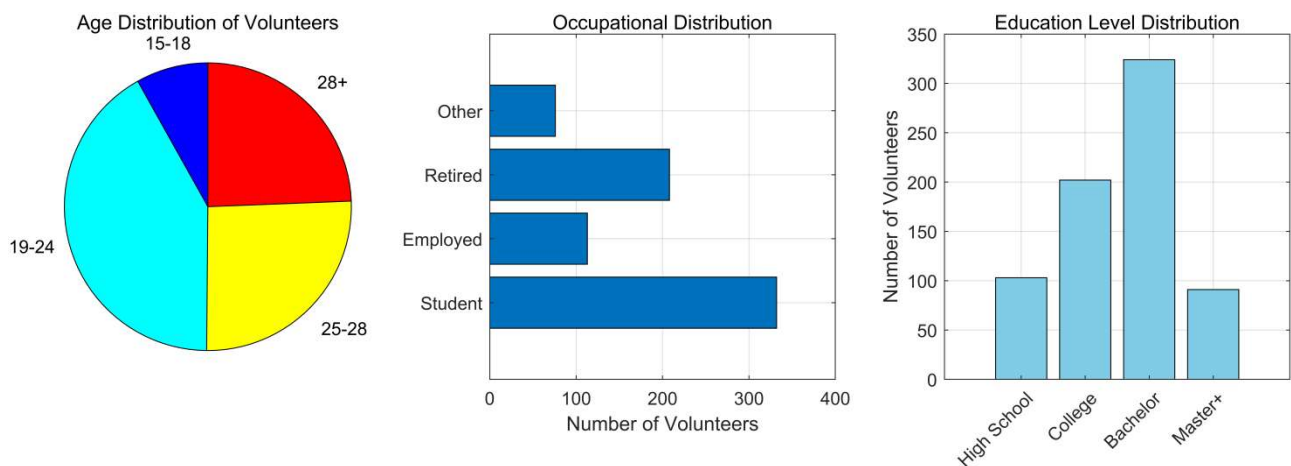


Figure 1. Descriptive Statistics Visualization

Regarding the occupational distribution, the number of students is the largest, indicating that the student group is an important part of the volunteers. This benefits from the advocacy of the spirit of volunteer service in school education, and schools may set practical credit requirements related to volunteer activities, which motivates students to actively participate. The number of retirees ranks second. After retirement, they have relatively abundant time, and some retirees hope to continue to contribute and serve the society, so they are willing to engage in volunteer activities. The number of employed people is relatively small, which may be because employed people are busy with their daily work and have limited time and energy, making it difficult for them to allocate more time to participate in volunteer activities.

In terms of educational level, the number of people with a bachelor's degree ranks first. This is because colleges and universities actively encourage students to participate in various volunteer activities, providing a favorable environment for the increase in the number of undergraduate volunteers. The number of volunteers with a junior college degree ranks second, while the number of volunteers with a high school education or below and a master's degree is relatively small. The small number of people with a master's degree may be due to the heavy academic tasks of this group, or their research directions and energy are more concentrated in the professional academic field, resulting in limited time for participating in volunteer activities. The small number of people with a high school education or below may be related to factors such as the channels for obtaining information about volunteer activities and their level of awareness.

The visualization results of the correlation analysis in Figure 2 reveal the close relationships among various influencing factors. From the heat map, it can be seen that age is positively correlated with educational attainment and service experience, but it has a weak negative correlation with organizational support. This indicates that as people get older, it is conducive to obtaining education and experience, and it has little impact on organizational support. Educational attainment is positively correlated with service experience, organizational support, and social recognition, which shows that volunteers with higher education often have more experience and receive more support and recognition. Service experience is positively correlated with organizational support, social recognition, and policy support, meaning that those with rich experience are more likely to receive support from multiple parties. Organizational support has a strong positive correlation with social recognition and policy support, and social recognition is also highly correlated with policy support, indicating that organizational support can drive the improvement of social and policy support. These correlations provide a key basis for optimizing the incentive mechanism for volunteers in the

"Time Bank" of community-based elderly care. We can start from aspects such as improving education and increasing organizational support to promote better participation of volunteers.

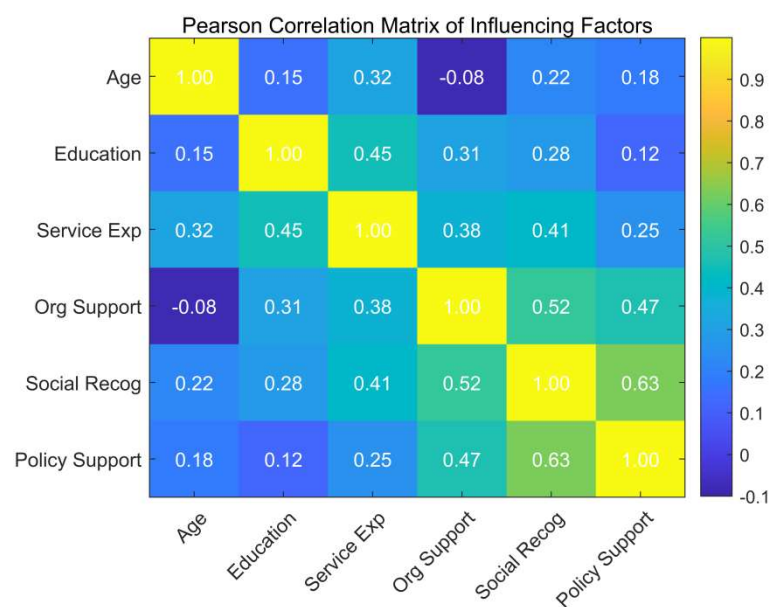


Figure 2. Correlation Analysis Visualization

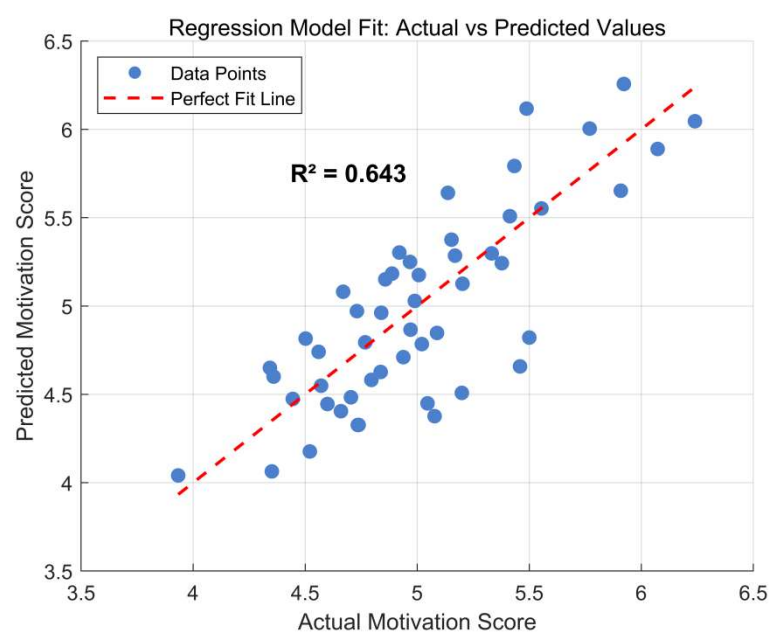


Figure 3. Model Fit Visualization

Figure 3 shows the fitting situation of the regression model. The blue data points in the figure represent the corresponding relationship between the actual motivation scores and the predicted motivation scores, and the red dotted line is the ideal fitting line. With an R^2 value of 0.643, it indicates that this regression model can explain 64.3% of the variation in the volunteers' motivation scores, which means that the model has a decent degree of fitting to the data.

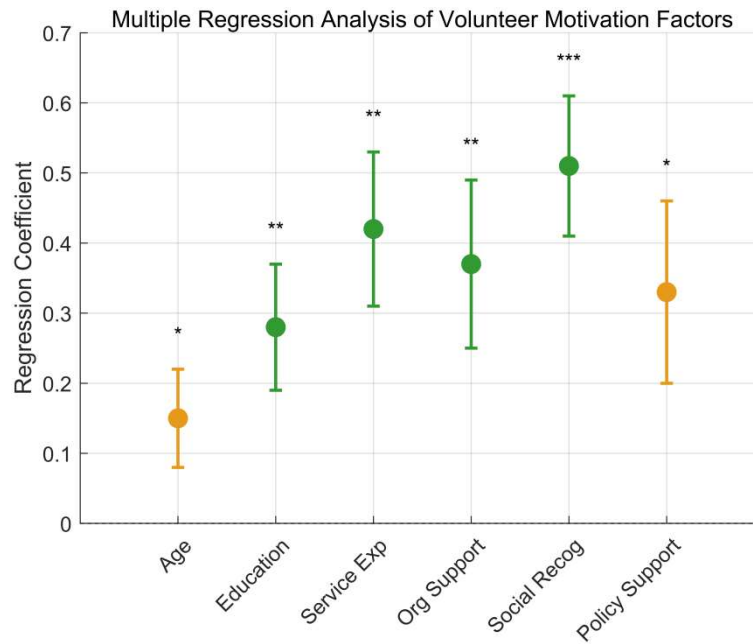


Figure 4. Multiple Linear Regression Visualization

From the visualization results of the multiple linear regression in Figure 4, the degrees of influence and significance of various factors on volunteers' motivation are different. Age, Education, Service Experience (Service Exp), Organizational Support (Org Support), Social Recognition (Social Recog), and Policy Support (Policy Support) are all positively correlated with volunteers' motivation. Among them, the regression coefficient of social recognition is the highest and its significance level is ***($p < 0.01$). This indicates that it has the most significant positive impact on volunteers' motivation, that is, the higher the social recognition, the stronger the enthusiasm of volunteers to participate. The regression coefficients of service experience and organizational support are also relatively high and significant(**, $p < 0.05$), which shows that rich service experience and sufficient organizational support can effectively enhance volunteers' motivation. The regression coefficients of educational attainment and policy support are relatively moderate, with significance levels of [specify the corresponding levels here] and *($p < 0.1$), respectively, which means that they can also positively promote volunteers' motivation, but the degree of influence is slightly weaker. The regression coefficient of age is the smallest, with a significance level of *, indicating that age has a certain positive effect on volunteers' motivation, but its influence is weaker compared to other factors. These results provide an important reference for identifying the key factors that motivate volunteers in the "Time Bank" of community-based elderly care, and are helpful for formulating targeted incentive strategies.

4. Conclusion

This study focuses on the influencing factors of motivating volunteers in the "Time Bank" of community-based elderly care. Through multiple research methods, the following conclusions are drawn: In terms of the characteristics of the volunteer group, young people are the main force, with a large proportion of students and retirees, and most volunteers having a bachelor's or junior college degree. Regarding the correlation of influencing factors, various factors are interrelated. For example, age is positively correlated with educational attainment and service experience, and organizational support is strongly positively correlated with social recognition and policy support. Among the key influencing factors, social recognition has the greatest impact on volunteer motivation, followed by service experience and organizational support.

Educational attainment and policy support have a moderate effect, while age has a relatively weak influence. The regression model has a good fitting effect and can effectively explain the changes in volunteers' motivation scores.

Based on these conclusions, the following targeted suggestions are put forward: Given the significant impact of social recognition, the government, communities, and society should work together. The government should increase publicity and promotion, communities should hold commendation activities, and social media should spread positive stories to enhance the social visibility of the "Time Bank" and the sense of honor of volunteers. In view of the importance of service experience and organizational support, communities should improve the training system, organize experience exchange activities, and optimize organizational management processes to provide more support for volunteers. Considering the role of educational attainment, it is advisable to cooperate with universities and training institutions to provide learning opportunities for volunteers and improve their overall quality. Regarding policy support, the government needs to formulate preferential policies to guide more people to participate. In response to the characteristics of the age structure, volunteer service positions and activity forms suitable for different age groups should be designed to attract more groups to join and promote the sustainable development of the "Time Bank" for community-based elderly care.

Acknowledgments

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