Factors Affecting Farmers’ Agricultural Training Participation Decision in Rural China: An Approach Using Geographically Weighted Regression

Mei Wang and Yacheng Xiao

ABSTRACT

Agricultural training is a vital part of human resource development policy in rural China. However, low participation rates limit the effectiveness of training programs. This study employs a geographically weighted regress-based (GWR-based) technique to explore the determinants of farmers’ willingness to participate in agricultural training programs using the latest micro-data collected in 2014 from a nationwide sample. GWR results show that gender and family expenditure on education/training have significant local effects on the frequency of participation in training programs. The study suggests that the regional difference between training participation decision and the impact factors should be considered in the design and implementation of the training programs in the regions.¹

INTRODUCTION

Developing modern agriculture ultimately relies on well-trained farmers who have professional knowledge and skills. Farmer development training is a free program administered by the government that helps those who are willing to work in agriculture access production skills, management and operation capabilities for modern agriculture. To achieve this goal, the central government invested RMB 1.39 billion Yuan to train one million professional farmers in 2016. In 2017 it

¹Mei Wang, Yacheng Xiao, College of Economics and Management, Southwest University, Chongqing, China, 400715.
invested up to about RMB 1.5 billion Yuan. With the increasing expenditure on public training program for agriculture, policy makers are aware of the importance of systematic evaluation processes. Despite the increased expenditure, there are low levels of participation in agricultural training programs. On the basis of the China Family Panel Studies (CFPS 2014), only 2.6 percent of the samples of farmers were training attendees. Very low rates of participation by farmers in training limits the effectiveness of training programs towards improving the efficiency of the agricultural sector. Thus, it is particularly important to study the factors that affect the willingness of farmers to participate in agricultural training. OLS is commonly used in this kind of study. However, conventional regression analysis can only produce average and global parameter estimates. GWR can assess local impacts, allowing for a spatial shift in parameters and a more appropriate fit. Our results provide direction for how to encourage farmers’ participation in agricultural training and how to design the training program locally to improve the effectiveness of training program.

THE SELECTION OF PREDICTOR VARIABLES

The frequency of farmers’ training participation and its determinants was taken as the dependent variable. Predictor variables that might have effects on the farmers’ training participation decisions include 12 average initial demographic characteristics, including personal characteristics (age, gender, educational background, marital status, health status, and political status), household characteristics (family expenditure on education/training, household size, and per capita household income), and community characteristics (distance to nearest county, agricultural labour force proportion, and agricultural GDP share).

DATA AND METHODS

Data

This evaluation applies micro-data from CFPS 2014, funded by 985 Program of Peking University and carried out by the Institute of Social Science Survey of Peking University, China. For analysing factors influencing farmers’ willingness to participate in agricultural training, our analysis information is merged from part of adult-level, family-level, and community-level. Information for Children is excluded. To restrict the sample to farmers, we exclude the samples of the non-agricultural labour force, leaving 10375 individuals linked to agricultural production for analysis. After excluding those with missing data, the final sample size is 5763.
Modeling Methods

The GWR-based training frequency model is applied to investigate factors that influence the frequency that a farmer participates in agricultural training. In GWR models, both dependent variables and predictor variables are summarized and analysed at the province level. A step-wise linear regression (for spatial variable means) was applied to select significant explanatory variables. We keep variables in the model on the basis of statistical significance. To avoid multicollinearity we calculate the coefficient (VIF) among the variables and drop those variables with high correlation coefficients. In this study, we used GWR to make location-wise coefficient estimates of local variables with distance-decay weights, so that the spatial heterogeneity can be well modelled via varying coefficients across space (Fotheringham, Brunsdon et al. 2002, Wang, Liu et al. 2010, Hu, Li et al. 2012). With the potential predictor variables, the GWR model can be formulized as:

$$ y = \beta_0(u) + \sum_{t=1}^{n} \beta_t(u)X_t + \epsilon $$

Where $y$ is the observation of training frequency at the location $u$, $X_t$ is the value of independent variable $t$ at the location $u$, $\beta_t(u)$ is the regression coefficient, and $\epsilon$ is the random error with mean 0 and variance $\sigma^2$.

RESULTS

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Predictor variable</th>
<th>Standardized coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>Collinearity (VIF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training frequency</td>
<td>x12</td>
<td>-.629</td>
<td>-3.498</td>
<td>.002</td>
<td>1.223</td>
</tr>
<tr>
<td></td>
<td>x22</td>
<td>-.617</td>
<td>-3.432</td>
<td>.003</td>
<td>1.223</td>
</tr>
</tbody>
</table>

Note: x12: gender, male – 1, female – 0, x22: household education and training expenditure.

Figure 1. Spatial distributions of mean training times (A) and the impacts of predictor variables for mean training times (B and C).
Table 1 reports the statistical outcomes of variables selection by step-wise linear regression. The results indicate that the number of times that farmers participate in agricultural training is significantly correlated (P<0.01) with two variables: gender and household expenditure on education/training.

Figure 1(A) shows the spatial distributions of mean number of training participations in 24 provinces or cities in China. It can be observed that there is a clear spatial variation with more training in the Midwest China, especially in Hubei, Shanxi, Sichuan and Gansu, and less in the north-east and coastal areas of China, except for Shanghai. The number of training times in Shandong, Zhejiang and Jiangxi in east areas are moderate. The training participation rate in Northeast provinces, including Liaoning, Jilin, and Heilongjiang is generally lower than that in eastern coastal, central and western areas.

Figure 1(B) and Figure 1(C) graph the spatial distributions of the impacts of gender and household expenditure on education/training for the mean number of training times, respectively. Both the coefficient of gender and household expenditure on education/training are negative. The spatial distributions of gender for mean training times in 24 provinces or cities of China displays a ladder-step distribution which varies from high in the south to low in the north. In three Northeast provinces, females are likely to participate in more training. In contrast, in the south, especially in Yunnan province, men receive more training. Figure 1(C) shows a trend differing from those of the gender parameters. The parameter estimates display a ladder-step distribution which varies from high in the east to low in the west. While in three Northeast provinces, a ladder-step distribution varies from high in the north to low in the south. It means that in the western areas the training participation decision has the smallest dependence on household expenditure on education/training, while the training participation decision has the greatest dependence on this variable in the eastern coastal areas in China.

DISCUSSION AND IMPLICATIONS OF THE ANALYSIS

The spatial distributions of the mean number of training times reflect the status of agricultural training participation in 24 provinces and cities of China. In 2012, the central government proposed cultivation the new type of professional farmer and in 2013 the Ministry of Agriculture planned produce 100 million farmers equipped with technical and marketing knowledge in 100 pilot counties until 2015. The first batch of pilot regions are Hubei, Shaanxi, Sichuan and Gansu provinces have pursued agricultural training. Moreover, Shanghai, also in the first batch of pilot regions, has been at the forefront of training farmers. The spatial distributions of the mean number of training times reflect the local scale of agricultural labour force. The rural labour force is mainly located in the central and western areas. Not surprisingly, the training participation rate is higher in these regions. Although three northeast provinces, including Heilongjiang, Jilin and Liaoning, form the grain base
of China, the agricultural training participation rate is relatively low as result of population loss and an aging population.

As a result of the large scale of migration of the rural labour force to cities, the gender composition of the agricultural labour force in rural China has changed. More than 260 million persons, especially educated young men, have move from rural to urban areas. Rural China faces labour scarcity (Qin 2010). Women are filling the labour gap in rural areas and this in turn encourages more women to participate in agricultural training. This is particularly the case in Northeast China. The finding of Figure 1 (C) is possibly associated with the disparity in regional development and agricultural training policy. Agricultural training is a free training program administered by the Ministry of Agriculture. There is a disparity in regional development and large income gap between the eastern and western areas. The western region is relatively backward in terms of economic development and income levels. Farmers in western areas are more likely to participate in public sponsored training, while those in eastern are more willing to spend money to participate in their specialist and multiple training courses.

These findings may be useful to help redesign the national agricultural training program to improve targeting and effectiveness. To develop rural labour resources and improve the quality of rural labour, the findings suggest that the regional difference between training participation decision and the impact factors should be considered in the design and implementation of the training programs in the regions.

ACKNOWLEDGEMENTS

The authors are grateful to Yongze Song for the suggestion on modelling and the Southwest University for funding this research project under the Fundamental Research Funds for the Central Universities, No. SWU1509491.

REFERENCES