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**Preschool Quality and Women's Off-Farm Labor
Force Participation: Evidence from China**

by Shaoping Li, Chengfang Liu, Kevin Chen, Renfu Luo,
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Preschool Quality and Women's Off-Farm Labor Force Participation: Evidence from China

Shaoping Li¹, Chengfang Liu^{1*}, Kevin Chen^{2,3}, Renfu Luo¹, Yanying Yu², Xinyu Wang¹

Abstract

We study the impact of preschool quality on off-farm work participation among women. We first develop a theoretical model that predicts higher qualities of preschools increase the likelihood of women's off-farm labor force participation. This prediction is then empirically verified by using data from rural China. Our results suggest that policies aimed at increasing the quality of preschools in rural China might help not only improve the education quality of preschool children but also increase women's off-farm labor force participation, both of which are of great importance for China considering its aging population and growth model shifting from high-speed growth to high-quality development.

Keywords: Preschool Quality; Off-Farm Work Participation; Women; Rural China

JEL: J13, J18, J21

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1. Introduction

Previous studies linked the low female labor force participation to the cost of childcare. Since the 1970s, many theoretical models have been developed to understand the impact of childcare on women's labor force participation (Gronau, 1973; Heckman, 1974; Heckman and Willis, 1977; Rosenzweig and Wolpin, 1980). Later empirical studies have also verified the prediction of theoretical models with a negative relationship between the cost of childcare and women's labor supply (Blau and Robins, 1988; Connelly, 1992; Mason and Kuhlthau, 1992; Ribar, 1992; Kimmel, 1998; Lefebvre and Merrigan, 2008; Givord and Marbot, 2015; Song and Dong, 2018). Informed by these research findings, many countries have introduced subsidies for free or low-cost preschool to increase female labor force participation.

However, the evidence on whether such kind of subsidy programs work to increase female labor force participation is mixed. On the one hand, both the introduction of free preschool education in Spain in the 1990s and reforms expanding free pre-primary school education in Germany in the 1990s had significant impacts on maternal labor force participation (Nollenberger and Rodriguez-Planas, 2015; Bauernschuster and Schlotter, 2016). On the other hand, in Sweden and Norway, the reforms that considerably reduce the cost of preschool had no impact on the employment of mothers (Lundin et al., 2008; Havnes and Mogstad, 2011).

One possible explanation for the mixed evidence is that preschool quality sometimes may be more important than the cost of preschool. The argument is that mothers presumably make their decisions to work and send children to preschool based on the expected impact of their decision on their children as well as on themselves (Michalopoulos et al., 1992; Card and Krueger, 1992a, b; Krueger, 1999). Moreover, recent evidence has suggested that poor quality services of preschool may deliver few benefits or even have adverse effects on children (Rosero and Oosterbeek, 2011; Engle et al., 2011; Britto et al., 2011; Araujo and Schady, 2015; Ichino et al., 2019; Andrew et al., 2019). To the best of our knowledge, however, few studies have empirically examined the impact of preschool quality on maternal employment¹.

Whether preschool quality affects women's off-farm labor force participation are salient questions for rural China. Off-farm employment has become an increasingly important source of income for rural households in China (Zhang et al., 2018), accounting for more than 40 percent of their disposable income in 2017 (National Bureau of Statistics of China, 2018). However, there exists an obvious gender gap in off-farm labor force participation. Roughly 49 percent of China's rural labor force is female. Yet rural women are lagging behind their male peers in participation in off-farm work. The statistic shows that women account for only about 35% of migrant workers from rural China in 2018 (Figure 1).

Some studies have linked the lower rural women's off-farm labor force participation to the lack of access to affordable childcare in rural China (e.g. Song and Dong, 2018). Although the preschool enrollment rate in China as a whole has increased to 80% in 2018,

the access to and quality of preschool remains a big concern, especially in rural areas (Ministry of Education of China, 2019). Liu (2015) observed that the class size is as big as 180, and the average student-teacher ratio is 43:1 in some preschools in poor rural areas. Moreover, it is not uncommon that when rural people migrate into cities in search of work, they do not have access to publicly subsidized preschools which is only available to the people who have *hukou* in local cities. The price of private preschools is also too expensive for migrant parents who are usually employed in low-paying sectors (Chang et al., 2011). Therefore, a large number of rural women with young children have to stay on the farm and take care of their children.

We contribute to this literature by studying preschool quality and maternal labor force participation. Using data from rural China, we estimate the impact of preschool quality on female off-farm labor supply. In this way, we are able to estimate directly the effect of preschool quality on mothers' decisions to participate in off-farm work. Both results from our theoretical and empirical analysis show that improving the quality of preschools in rural China could help increase its female off-farm labor supply. These research findings imply that those policies aimed at improving the quality of preschools might also be a useful strategy to tackle the problem of falling female labor force participation in off-farm employment (Zhang et al., 2018), which has become a challenge that China is facing during a time of aging population (Cai and Zhao, 2012; Eggleston et al., 2013; National Bureau of Statistics of China, 2019b).

The remainder of this paper is organized as follows. Section 2 presents a model of childcare and maternal labor force participation in off-farm employment, followed by a reduced form of the model. Sampling and data collection are described in Section 3. Section 4 presents the estimation results. Finally, we conclude in Section 5.

2. The Model

Following Ribar (1992), we assume that a mother with N children has preferences over her hours of leisure, L , market goods, C , and the average quality of children, Q . Let those preferences be represented by a strictly concave utility function, $U = U(C, Q, L)$. We further assume that her utility is increasing in L , C , and Q . It is implicitly assumed that the labor force participation of the father is predetermined and, hence, exogenous².

We denote the mother's hours spent on off-farm work by T_w , and her hours devoted to caring for children by T_c . The mother's time can be divided among leisure, off-farm work, and childcare. Assume that the total amount of time that is available to the mother is T , such that

$$T = L + T_w + T_c \quad (1)$$

Due to data availability, we further assume the hours of maternal childcare to be a fixed proportion of leisure. Thus, L is redefined to include maternal care, and the mother's time constraint can be rewritten as

$$T = L + T_w \quad (2)$$

Besides the care they receive from their mothers, children can also receive care from preschools. We denote the preschool care and maternal care allotted to child i by S_i and L_i , respectively. Let q_i , m_i represent the productivity (quality) of preschool care and maternal care for child i , respectively. With such a setup, the quality of child i can be expressed as

$$Q_i = q_i S_i + m_i L_i \quad (3)$$

And the average quality per child of mother is given by

$$Q = \frac{\sum_{i=1}^N q_i S_i + m_i L_i}{N}$$

We measure the price of paid childcare in terms of consumption goods, C . Let p_i represent the unit cost of preschool care that child i received. Letting w represent the hourly wage rate that is available to the mother, assume the budget set is convex and can be expressed as

$$C = wT_w + V - \sum_{i=1}^N p_i S_i \quad (4)$$

where V denotes non-labor income. The earnings of other members in the household aside from the mother are included in V and taken to be exogenous. Notice that preschool care enters the model in two ways. In one way, it enters as an input to the

production of child quality. In another way, preschool care is also assigned an explicit

cost, $\sum_{i=1}^N p_i S_i$, in the budget constraint.

The family's decision can now be modeled as a standard utility maximization problem.

Let the choice variables be T_w , S_i , and L_i . The problem becomes

$$\max_{T_w, S_i, L_i} U = U(wT_w + V - \sum_{i=1}^N p_i S_i, \frac{\sum_{i=1}^N q_i S_i + m_i L_i}{N}, T - T_w) \quad (5)$$

subject to non-negativity constraints for each of the choice variables and

$$\sum_{i=1}^N L_i = L = T - T_w.$$

One implication of the assumptions underlying these constraints is that a mother will choose either all farm work or all off-farm work or not work. In other words, there can be corner solutions. Hence, in this model, the mother has three possible options: do farm work and purchase child care; do off-farm work and purchase child care; not work and provide maternal care. In reality, however, taking derivatives of Equation (5), the first-order condition with respect to T_w can be used to produce an expression for the mother's reservation wage. Specifically, substituting $T_w = 0$ into the first-order condition and expressing the condition as equality would yield the following

$$w_R = \frac{U_L}{U_C} \Big|_{T_w=0} + \frac{\sum_{i=1}^N m_i U_Q}{N U_C} \Big|_{T_w=0} \quad (6)$$

Conditional comparative static results can be derived for the mother's reservation wage. Holding preschool care utilization constant, we can infer from Equation (6) that the mother's reservation wage is decreasing in preschool care productivity and the marginal utility of consumption. However, the mother's reservation wage increases with household non-labor income and the marginal quality of child. These conditional results are similar to the predictions generated by Blau and Robin (1988).

We can also derive an expression for the reservation marginal cost of preschool care for child i from Equation (5). Specifically, substituting $S_i = 0$ into the first-order condition with respect to S_i and expressing the condition as equality would produce the following

$$p_{iR} = \frac{q_i U_c}{NU_c} \big|_{S_i=0} \quad (7)$$

Holding work effort constant, Equations (5) and (7) jointly imply that preschool care utilization increases with preschool care quality, non-labor income, total income, and the marginal utility of child quality. In the meantime, they also imply that preschool care utilization is less likely if the quality of maternal care is high or/and if preferences for consumption are strong.

The solutions to the preference maximization problem in Equation (6) for the mother's off-farm labor supply (T_w^*) and preschool care utilization (S_i^*) of child i are functions of the wage rate available to the mother, the number of children, nonlabor income, maternal care productivity, as well as the utilization, quality and cost of preschool care. In other words, we have

$$T_w^* = T(w, V, q_1, \dots, q_N, m_1, \dots, m_N, N, p_1, \dots, p_N, X) \quad (9)$$

$$S_i^* = S(w, V, q_1, \dots, q_N, m_1, \dots, m_N, N, p_1, \dots, p_N, X) \quad (10)$$

Without other restrictions, the model may lead to a zero solution for preschool care utilization (namely, families use only maternal care) when the price of preschool care p_i is high enough or/and the quality of preschool care q_i is poor enough.

3. Empirical Specification

Based on the models that we developed above, we empirical specify maternal off-farm labor force participation as follows

$$T_w^P = \alpha + \beta q + \gamma' H + \varepsilon \quad (11)$$

where T_w^P is a dummy variable that is equal to 1 if the mother participated in off-farm employment and 0 otherwise³. q is the quality of preschool care; β is the coefficient of interest; H is a vector of characteristics that affect the production function of child quality as in Equation (3), including the marginal rate of substitution between goods and time, household economic status, and the number of children. ε is the error term. As the dependent variable is a dummy variable, we estimate the results by using two models: linear probability model (LPM) and Logit model. We are safer if the coefficient of interest is robust to different models. We cluster the standard errors at the class level.

4. Data

The data used in this paper are drawn from a preschool survey conducted by the authors themselves in September 2018. The preschool survey was carried out in two nationally

designated poverty counties in Xiangxi Autonomous Prefecture, Hunan Province in the south-central region of China. In the two counties, 26 preschools from 15 townships were included, among which 10 preschools were from Longshan county while the remaining 16 were from Yongshun county. All children aged 3 or 5 years who came to preschools on the survey day are included in the survey. The total number of surveyed preschoolers is 1,334.

The preschool survey collected rich information. This study draws on information mainly from two questionnaires: household questionnaire and preschool questionnaire. From the household questionnaire, we draw on three types of information to measure the characteristics of the preschooler's mother, the preschooler herself/himself and the preschooler's family.

Preschooler's mother. A key variable of our interest is the participation in the off-farm labor force of the preschooler's mother. Based on the type of her main job in the past year, we constructed an off-farm work dummy variable that is equal to 1 when the mother had off-farm work in the past year and 0 otherwise. We also collected information on the mother's perception about the quality of the preschool that her child attended by asking the question "How would you rate your child's preschool on a zero to 10 scale with 0 being the worst and 10 being the best". Based on her response to this question, we construct a variable called "*subjective quality of preschool*" which is equal to the score that the mother gives to the preschool. Besides, we also collect information about the basic characteristics of the preschooler's mother, such as age, education and self-reported health status.

Preschooler characteristics. Three types of information about preschooler characteristics are used in the survey. The first type is the demographics of preschoolers, including age and gender. The second type is the health status of preschoolers. We focus on four health indicators: anemia, height-for-age z-scores (HAZ), weight-for-age z-scores (WAZ), and Body Mass Index (BMI)-for-age z-scores. Anemia is determined based on finger-prick blood analysis for hemoglobin. Hemoglobin levels were measured on-site using HemoCue Hb 201+ systems. Following WHO (2006, 2009), we define anemia as hemoglobin <115 g/L for children aged more than 61 months whereas hemoglobin <110 g/L for children aged less than 61 months.

Height and weight measurements were also taken on site, following the WHO standard protocol. The children were measured in light clothing without shoes, hats or accessories. Body height was measured using a standard tape measure. Registered nurses were trained to ensure that the weighing station was set up on level ground to ensure the accuracy of the equipment. Two nurses manned each measurement station, with one responsible for preparing preschoolers for measurement (removing shoes, offering instruction, reassuring parents, positioning children, etc.) and the other responsible for conducting and recording the measurements. Following WHO (2006, 2009), using data on height and weight, we constructed height-for-age z-scores (HAZ), weight-for-age z-scores (WAZ), and Body Mass Index (BMI)-for-age z-scores.

Family characteristics. The information on preschooler's family characteristics includes demographics of preschooler's father, presence of children aged 0-2 years, presence

of children aged 3-5 years, distance to preschool from the house, and the socioeconomic status of the household.

In the preschool questionnaire, we collected two types of information: preschool characteristics and teacher characteristics. Following the literature, we focused on those characteristics of teachers that may be correlated with his/her teaching quality. Specifically, we include whether he/she got a college degree or above, whether he/she majored in preschool education, and his/her teaching experience (Rivkin et al., 2005; Liu, 2015; Bernal et al., 2016). At the preschool level, we include whether preschool is public, how much is the preschool fee, whether the preschool provided school bus service, preschool enrollment, student-teacher ratio, and the status of preschool infrastructure (Card and Krueger, 1992a, b; Amjad and MacLeod, 2014; Bernal et al., 2011).

Combining information about the characteristics of preschools and their teachers, we can measure the *objective quality of preschools*. This measure is a vector of six variables, including ownership of preschool, availability of school bus service, school enrollment, student-teacher ratio, school infrastructure index and preschool fee.

Since this paper focuses on the impact of preschool quality on maternal off-farm labor force participation, we exclude those households where the information on preschooler's mother is missing. In our original 1,334 samples, 20 mothers did not report their job types; 107 households lost contact with the mothers of the sample preschoolers⁴; 100 mothers did not report their perceptions about the quality of the preschool that her child attended.

Therefore, in total, our final sample size is 1,107. The definitions and summary statistics of the variables used in the empirical analysis are found in Table 1.

5. Results

Results from descriptive analyses

Our data show that only 65 percent of mothers of sample preschoolers participated in off-farm work. This means that in the study sample, even all mothers sent their children to preschool, 35 percent of them still chosen to stay on the farm. There are many reasons for this. One possible explanation is that mothers might be so concerned about the quality of the preschools that they have to choose to stay on the farm to take care of their children themselves.

Results from descriptive analysis do confirm that those mothers who give higher subjective quality scores of their children's preschools are more likely to participate in off-farm work. Specifically, if the subjective quality scores of children's preschools were the lowest 1/3, the probability of mother participating in off-farm work was only 59 percent. The probability increased to 63 percent if mother's subjective quality scores of children's preschools increased to the middle 1/3. In addition, the probability of off-farm work participation of mothers further increased to 72 percent if mothers were more satisfied than their peers with their children's preschool (Figure 2).

When we look at the characteristics of preschools and their teachers, our data show the quality of preschools in the study area is relatively low. We find that only 19 percent of

preschools are public, which is much lower than the national average (38 percent) (Ministry of Education of China, 2019). Fifty-four percent of preschools provide school bus services. The average student-teacher ratio is 22.8, which is more than three times of national average (7.4) (Ministry of Education of China, 2019). The average preschool fee is 1,740 yuan RMB (or 260 US Dollars) per preschooler per semester. The proportions of preschool teachers with tertiary education and majoring in preschool education are 27 percent and 36 percent, respectively. Those figures were consistent with other literature (Liu, 2015; Hu et al., 2016).

Similarly, results from descriptive analysis also show that mothers whose children attend preschools with better objective quality are more likely to participate in off-farm work (Table 2). Specifically, the proportion of teachers with tertiary education among students' mothers participating in off-farm work was 28 percent, which was higher than that of teachers among students' mothers without off-farm work (26 percent). The proportion of teachers who majored in preschool education was also higher among children whose mothers participated in off-farm work than that of teachers among students' mothers without off-farm work (37 percent vs 34 percent). In addition, the likelihood of preschool providing school bus service was higher in preschools in which children whose mothers participating in off-farm work enrolled than that of preschools where children's mothers were less likely to participate in off-farm work (53 percent vs 48 percent). Furthermore, if the children's preschool has better infrastructure, mothers were also more likely to participate in off-farm work (0.04 vs -0.04).

Our results from descriptive analysis also show that mothers with off-farm work and those without are different in some dimensions. Our data show that mothers with off-farm jobs are younger and more educated than those without off-farm jobs (Table 3). Also, mothers of girls and children with lower Body Mass Index (BMI)-for-age z-scores are more likely to participate in off-farm work. Moreover, women whose husbands are off-farm employed or are younger, and whose families do not have children aged 0-2 years are also more likely to have off-farm jobs than their counterparts.

Results from multivariate analyses

Before we move onto multivariate analyses, one point needs to be noted. If a mother believes the quality of preschools is too low in either a subjective or objective sense, she may not even enroll her child into preschools. Our sample is a truncated sample since all of our sample children are enrolled in preschool already. This implies that the coefficients we obtain using our data would be a lower-bound. In other words, the coefficients are lower than they would have been in estimates using a sample of both enrolled and un-enrolled preschool-aged children.

Subjective quality of preschool and maternal off-farm labor force participation

To understand the effect of subjective quality of preschool on maternal off-farm labor force participation, we estimate a regression model in which maternal off-farm labor force participation is a function of the subjective quality of preschool and other control variables. The results appear in Table 4. The first two columns are results from the linear probability model (LPM) whereas columns (3) and (4) are results from the Logit model.

Our estimation results from LPM show that the subjective quality of preschools has a positive impact on maternal off-farm employment participation. Specifically, holding other things constant, as the subjective quality of preschools increases by one point, the maternal off-farm labor force participation rate will increase by 2.4 percentage points (Column 1). This estimated coefficient increases to 2.9 percentage points if we control for the characteristics of preschooler's mother, preschooler, and family. Moreover, these above results change little when the Logit models are used (Column 3-4). Given the fact that the proportion of mothers with off-farm employment is 65 percent, these results imply that on average, a one-point increase in the subjective quality of preschools can increase maternal off-farm labor force participation by 4 percent ($2.9/65$).

Consistent with results from descriptive analyses, results from multivariate analyses also show several other factors are important determinants of maternal labor force participation. For example, we find that mothers' participation in off-farm employment is positively associated with their education and the father's participation in off-farm employment. In contrast, we also find that mothers are less likely to participate in off-farm employment if the child is a girl, the child's father is elder or in poorer health status, or there are children aged 0-2 years in the family.

Objective quality of preschool and maternal off-farm labor force participation

In this subsection, we report results from estimating the effect of the objective quality of preschool on maternal participation in off-farm work. Table 5 presents the results. Similarly,

the first two columns are results from the linear probability model (LPM) whereas column (3) and (4) are results from the Logit model.

Our results show some dimensions of the objective quality of preschools matter in explaining maternal off-farm participation but others do not. Specifically, we find that providing school bus services for preschoolers increases maternal off-farm work participation by 7.3 percentage points or more than 11 percent (6.8/65). And this effect size increases to 8.9 percentage points when the Logit model is used. This result suggests that those policies providing preschool bus services will also help to increase female off-farm labor participation. Additionally, we also find that if the preschool infrastructure index increases by one standard deviation, the likelihood of maternal off-farm labor force participation will increase by about 2 percentage points. This result suggests that those policies aiming to improve the infrastructure of preschool can not only promote the development of children but also increase maternal off-farm labor supply (Liu, 2015). In contrast, our data provide little evidence that preschool teacher's characteristics have any impact on maternal off-farm labor participation

Heterogeneous effect of preschool quality on maternal off-farm labor force participation

We finally examine whether preschool quality had differential effects on maternal participation in off-farm employment depending on the background of the preschoolers and that of their households. We find that effects vary significantly by a preschooler's gender (Table 5). Specifically, compared with their boy peers, our data show that girls' mothers are less likely to be affected by preschool quality. One possible reason is that rural

mothers care more about the development of boys than that of girls. In the last four decades, China has made tremendous success in economic development, however, cultural values and norms concerning gender roles and traditional family structures still influence the values attached to sons and daughters (Zhang et al., 2007), and the vast majority of mothers still expected to rely on sons for old-age support (Hannum et al., 2009). However, we find that this effect does not vary significantly by household social-economic status, as measured by the pieces of durable assets that a household possesses (Table 6).

6. Conclusions

In this paper, we have explored the extent to which preschool quality impact maternal off-farm labor force participation by a structural model. Our model predicts that the improvement in preschool quality can increase maternal labor force participation in off-farm work. We verify this prediction by drawing on data from rural China. The results suggest that preschool quality does influence maternal off-farm labor supply: a one-point increase in subjective quality of preschool increased maternal off-farm labor force participation by 3 percentage points, and a one standard deviation increase in objective quality of preschools (as measured by preschool infrastructure index) increased maternal off-farm labor participation by 2 percentage points. Given the fact that the proportion of mothers with the off-farm job is 65 percent in the study area, those above results mean that a one-point subjective quality of preschool can increase maternal off-farm labor

participation by 4 percent. Similarly, providing school bus services for preschoolers can also increase maternal participation in off-farm work by more than 11 percent.

While we believe that the findings of this study are important, admittedly, the study has several limitations. First, we understand that the decision to purchase preschool care – and the quality of purchased – is made simultaneously with the employment decision of the mother in our theoretical model. This means that a mother may choose not to purchase preschool care and to stay at home to take care of her children when the price of preschool care is high or/and the preschool quality is low. However, in this study, all sample children are already enrolled in preschools. This implies that the coefficients that we estimated might be the lower bound. In other words, the estimated coefficients are lower than they would have been in estimates from data that have both enrolled and non-enrolled preschool-aged children, which provides a complete response. Second, the number of preschools in our sample is relatively small and geographically concentrated, with only 26 schools in two counties. Studies involving a larger sample of preschools and wider geographical coverage would provide further insight into the relationship between preschool quality and maternal off-farm labor supply.

Despite these limitations, however, our results call for strengthened efforts to further improve the quality of preschools in rural China. As a lot of studies have shown, improving the quality of preschools not only helps to improve the quality of children. Our study lends further evidence that improving the quality of preschools also helps to raise female off-

farm labor force participation. The dual impacts of improving preschool quality are of great importance for China with an aging population.

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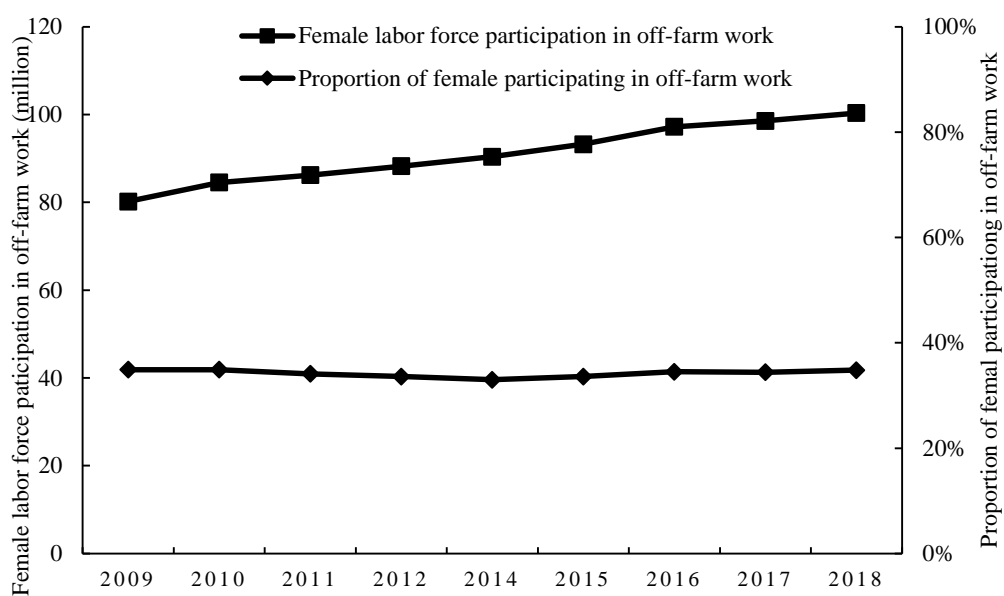
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¹ In fact, Ribar (1991) and Connelly (1992) did include quality of child care in their theoretical models, while both of them did not have data on quality of child care, hence they focused on the impact of the cost of child care on women's labor supply in their empirical studies.

² In fact, whether male labor force participation is predetermined or not is an empirical issue. Hoffman and Lange (1989) find that the off-farm labor supply of the husband (wife) depends on whether his (her) wife (husband) does or does not work off-farm. In contrast, Mroz (1987) provides some evidence that other income primarily from the husband is exogenous to the wife's labor supply.

³ It is easy to obtain that, if $T_W > 0$, then $T_W^P = 1$, otherwise $T_W^P = 0$.

⁴ Most of them left the family due to divorce.



Data source: National Bureau of Statistics of China
Figure 1 Female labor force participation in off-farm work in rural China

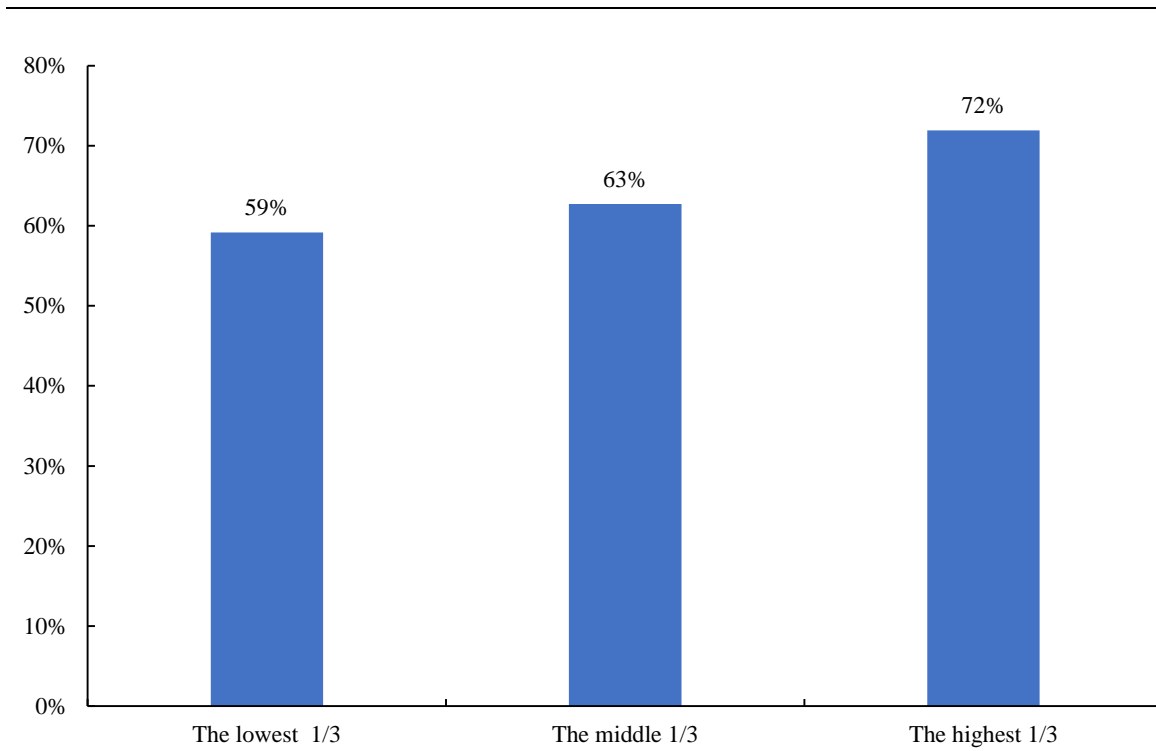


Figure 2 Subjective quality scores of their children's preschools and women participation in off-farm work

Table 1 Summary Statistics

Variable	Definition	Observations	Mean	Standard Deviation	Min	Max
Mather's characteristics						
Maternal off-farm work	=1 if she participated in off-farm work	1,107	0.65	0.48	0	1
Mother's age	Mother's age in years	1,102	29.70	4.95	19	50
Mother's education	Mother's schooling in years	1,087	8.20	2.82	0	19
Mother's health	=1 if mother's self-report health status is "healthy".	1,104	0.72	0.45	0	1
Mother's subjective quality of preschool	=1 if mother's perceived quality of preschool is "good"	1,107	9.23	1.03	2	10
Preschooler characteristics:						
Anemia	=1 if Hemoglobin <115 g/L for preschoolers aged more than 61 months, or hemoglobin <110 g/L for preschoolers aged less than 61 months	1,105	0.33	0.47	0	1
HAZ	Height-for-age z-scores	1,106	-0.85	0.97	-4.32	5.3
WAZ	Weight-for-age z-scores	1,106	-0.54	0.90	-3.39	3.64
BmiAZ	Body Mass Index (BMI)-for-age z-scores	1,106	-0.01	0.93	-3.93	4.33
Age	Preschooler's age in months	1,107	54.41	11.83	22.7	79.87
Girl	=1 if preschooler is a girl	1,107	0.49	0.50	0	1
Duration at preschool	Duration of child at preschool in semesters	1,102	2.78	2.22	0	6
Family characteristics:						
Father's age	Father's age in years	1,102	32.49	5.63	22	56
Father's education	Father's schooling in years	1,100	8.27	2.77	0	17
Father's health	=1 if father's self-report health status is "healthy"	1,102	0.73	0.44	0	1
Father's off-farm work	Father participated in off-farm work	1,107	0.88	0.33	0	1
Presence of children aged 0-2	Presence of children aged 0-2 in family	1,107	0.21	0.41	0	1
Presence of other children aged 3-5	Presence of children aged 3-5 in family	1,107	0.21	0.41	0	1
Number of alternative caregivers	Number of parents who are available for taking care of	1,107	2.08	0.47	0	4

	children					
Household asset index	Index of household durable assets. Constructed using first principal component of motorbike, electrical bicycle, car, van, refrigerator, air conditioning, computer, laundry machine, water heater, and flush toilet	1,107	0.04	0.99	- 2.64	2.2 4
Teacher characteristics:						
Teacher with tertiary education	=1 if teacher has completed college or above	1,107	0.27	0.44	0	1
Teacher majored in preschool education	=1 if teacher majored in preschool education	1,107	0.36	0.48	0	1
Teacher experience	Teacher's years of teaching experience	1,107	6.41	7.52	0.01 9	34
Preschool characteristics:						
Public preschool	=1 if preschool is public	1,107	0.21	0.41	0	1
Preschool fee	School fee per semester, 1,000 yuan	1,107	1.73	0.35	1	2.5 1
Preschool bus	=1 if preschool provided school bus service	1,107	0.51	0.50	0	1
Preschool enrollment	Number of students in preschool	1,107	125. 54	49.37	30	220
Student-teacher ratio	Student-teacher ratio	1,107	22.9 7	6.98	7.86	31. 67
Preschool infrastructure index	Index of school infrastructure constructed using first principal component of air conditioner, activity room, dormitory, number of reading rooms, cafeteria, and playground.	1,107	0.01	1.00	- 0.91	4.3 6

Source: Authors' survey.

Table 2 Comparison of mothers with and without off-farm jobs

	With off-farm work (1)	Without off-farm work (2)	Difference= (1)- (2) [p-value]
Mother's characteristics			
Maternal off-farm work	29.44(4.71)	30.19(5.36)	-0.75[0.046]
Mother's age	8.35(2.70)	7.93(3.02)	0.42[0.064]
Mother's education	0.72(0.45)	0.71(0.45)	0.01[0.630]
Mother's health	9.27(1.03)	9.16(1.03)	0.11[0.103]
Preschooler characteristics:			
Anemia	0.33(0.47)	0.33(0.47)	0.00[0.951]
HAZ	-0.81(0.96)	-0.91(1.00)	0.10[0.212]
WAZ	-0.55(0.87)	-0.53(0.96)	-0.02[0.699]
BmiAZ	-0.06(0.91)	0.07(0.97)	-0.13[0.012]
Age	54.73(11.81)	53.80(11.87)	0.93[0.267]
Girl	0.46(0.50)	0.53(0.50)	-0.06[0.069]
Duration at preschool	2.86(2.25)	2.63(2.16)	0.23[0.101]
Household characteristics:			
Father's age	31.96(5.17)	33.50(6.30)	-1.54[0.001]
Father's education	8.31(2.57)	8.20(3.13)	0.11[0.560]
Father's health	0.72(0.45)	0.75(0.43)	-0.03[0.263]
Father's off-farm work	0.94(0.24)	0.76(0.42)	0.17[0.000]
Presence of children aged 0-2	0.15(0.36)	0.33(0.47)	-0.18[0.000]
Presence of other children aged 3-5	0.22(0.41)	0.21(0.41)	0.01[0.796]
Number of alternative caregivers	2.09(0.44)	2.06(0.50)	0.03[0.200]
Household asset index	0.02(1.00)	0.10(0.98)	-0.08[0.132]
Teacher characteristics:			
Teacher with tertiary education	0.28(0.45)	0.26(0.44)	0.02[0.441]
Teacher majored in preschool education	0.37(0.48)	0.34(0.47)	0.04[0.260]
Teacher experience	6.36(7.10)	6.51(8.29)	-0.14[0.807]
Preschool characteristics:			
Public preschool	0.20(0.40)	0.23(0.42)	-0.02[0.384]
Preschool fee	1.74(0.35)	1.72(0.36)	0.02[0.354]
Preschool bus	0.53(0.50)	0.48(0.50)	0.05[0.136]
Preschool enrollment	125.06(50.11)	126.45(47.98)	-1.39[0.704]
Student-teacher ratio	22.86(7.03)	23.19(6.87)	-0.33[0.487]
Preschool infrastructure index	0.04(1.08)	-0.04(0.84)	0.08[0.318]

Note: Variables are as described in Table 1. Standard deviations are in parentheses. P-values (in brackets) are calculated based on robust standard errors clustered at the class level.

Table 3 Subjective quality of preschool and off-farm work participation among rural married women

	LPM	LPM	Logit (marginal effect)	Logit (marginal effect)
	(1)	(2)	(3)	(4)
Mother's subjective quality of preschool	0.024*	0.029**	0.025*	0.034**
	(0.014)	(0.013)	(0.014)	(0.014)
Mother's characteristics				
Mother's age		-0.000		0.000
		(0.004)		(0.005)
Mother's education		0.011*		0.012*
		(0.006)		(0.007)
Mother's health		0.055		0.064
		(0.036)		(0.042)
Preschooler characteristics				
Age		0.001		0.001
		(0.002)		(0.002)
Girl		-0.050*		-0.058*
		(0.028)		(0.031)
Duration at preschool		0.012		0.014
		(0.010)		(0.011)
Anemia		-0.010		0.011
		(0.029)		(0.034)
HAZ		-0.020		-0.021
		(0.190)		(0.200)
WAZ		0.073		0.078
		(0.289)		(0.305)
BmiAZ		-0.075		-0.082
		(0.194)		(0.206)
Household characteristics				
Father's age		-0.014***		-0.016***
		(0.004)		(0.005)
Father's education		-0.006		-0.006
		(0.006)		(0.007)
Father's health		-0.091**		-0.102***
		(0.035)		(0.038)
Father's off-farm work		0.336***		0.369***
		(0.046)		(0.050)
Presence of children aged 0-2		-0.268***		-0.301***
		(0.037)		(0.041)
Presence of other children aged 3-5		-0.032		-0.036
		(0.035)		(0.041)
Number of alternative caregivers		0.005		0.004
		(0.034)		(0.038)
Household asset index		-0.020		-0.024
		(0.015)		(0.017)
Constant	0.447***	0.558***		
	(0.130)	(0.207)		
Observations	1,107	1,069	1,107	1,069
R-squared/Pseudo R-squared	0.002	0.152	0.000	0.121

Notes: ***p<0.01, ** p<0.05, * p<0.1; Robust standard errors clustered at the class level are in parentheses.

Table 4 Teacher and preschool characteristics and off-farm work participation among rural married women

	LPM	LPM	Logit (marginal effect)	Logit (marginal effect)
	(1)	(2)	(3)	(4)
Teacher characteristics				
Teacher with tertiary education	0.024 (0.033)	0.018 (0.034)	0.024 (0.033)	0.025 (0.039)
Teacher majored in preschool education	0.040 (0.044)	0.049 (0.045)	0.039 (0.043)	0.056 (0.049)
Teacher's experience	-0.000 (0.003)	0.000 (0.003)	-0.000 (0.003)	0.000 (0.003)
Preschool characteristics				
Public preschool	0.034 (0.043)	0.062 (0.038)	0.034 (0.041)	0.070* (0.040)
Preschool fee	0.021 (0.054)	0.028 (0.047)	0.021 (0.054)	0.032 (0.053)
Preschool bus	0.067 (0.042)	0.073* (0.041)	0.067 (0.041)	0.089* (0.047)
Preschool enrollment	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Student-teacher ratio	-0.003 (0.002)	-0.002 (0.002)	-0.003 (0.002)	-0.003 (0.003)
Preschool infrastructure index	0.021** (0.008)	0.021*** (0.007)	0.022** (0.009)	0.025*** (0.009)
Mother's characteristics				
Age		-0.000 (0.005)		0.000 (0.005)
Education		0.010 (0.007)		0.010 (0.008)
Health		0.055 (0.038)		0.065 (0.045)
Preschooler characteristics				
Age		0.001 (0.002)		0.001 (0.002)
Girl		-0.052* (0.027)		-0.061* (0.031)
Duration at preschool		0.011 (0.010)		0.012 (0.012)
Anemia		-0.007 (0.035)		-0.008 (0.040)
HAZ		-0.018 (0.191)		-0.027 (0.199)
WAZ		0.069 (0.296)		0.087 (0.309)
BmiAZ		-0.072 (0.198)		-0.088 (0.208)
Household characteristics				
Father's age		-0.014*** (0.005)		-0.016*** (0.006)
Father's education		-0.006 (0.006)		-0.006 (0.007)

Father's health		-0.092***		-0.102***
		(0.034)		(0.037)
Father's off-farm work		0.338***		0.372***
		(0.051)		(0.052)
Presence of children aged 0-2		-0.272***		-0.307***
		(0.036)		(0.041)
Presence of other children aged 3-5		-0.028		-0.032
		(0.037)		(0.044)
Number of alternative caregivers		0.010		0.012
		(0.028)		(0.031)
Household asset index		-0.020		-0.024
		(0.014)		(0.016)
Constant	0.624***	0.727***		
	(0.105)	(0.165)		
Observations	1,107	1,069	1,107	1,069
R-squared/Pseudo R-squared	0.008	0.156	0.006	0.125

Notes: ***p<0.01, ** p<0.05, * p<0.1; Robust standard errors clustered at the class level are in parentheses.

Table 5 Heterogeneous effect of preschool quality on off-farm work participation among rural married women, by preschoolers' gender

	LPM	LPM	Logit (marginal effect)	Logit (marginal effect)
	(1)	(2)	(3)	(4)
Subjective quality of preschool*girl	-0.038** (0.016)		-0.043** (0.019)	
Teacher with tertiary education*girl		-0.134** (0.061)		-0.180** (0.081)
Teacher majored in preschool education*girl		0.186** (0.074)		0.185*** (0.063)
Teacher's experience *girl		-0.004 (0.004)		-0.005 (0.005)
Public preschool*girl		0.155* (0.080)		0.160** (0.068)
Preschool fee*girl		0.004 (0.084)		0.008 (0.096)
Preschool bus*girl		0.071 (0.073)		0.066 (0.080)
Preschool enrollment*girl		0.001 (0.001)		0.001 (0.001)
Student-teacher ratio*girl		-0.001 (0.004)		-0.000 (0.005)
Preschool infrastructure index*girl		-0.013* (0.007)		-0.018** (0.008)
Subjective quality of preschool	0.049*** (0.018)		0.056*** (0.020)	
Teacher with tertiary education		0.074 (0.048)		0.097* (0.056)
Teacher majored in preschool education		-0.037 (0.071)		-0.043 (0.085)
Teacher's experience		0.002 (0.003)		0.002 (0.004)
Public preschool		-0.001 (0.058)		-0.004 (0.067)
Preschool fee		0.028 (0.079)		0.031 (0.091)
Preschool bus		0.043 (0.054)		0.063 (0.065)
Preschool enrollment		-0.000 (0.000)		-0.001 (0.001)
Student-teacher ratio		-0.002 (0.003)		-0.002 (0.004)
Preschool infrastructure index		0.021 (0.019)		0.030 (0.028)

Constant	0.379 (0.239)	0.838*** (0.193)		
Observations	1,069	1,069	1,069	1,069
R-squared/Pseudo R-squared	0.154	0.165	0.123	0.133

Notes: All models control characteristics of mother, preschooler, and household. ***p<0.01, ** p<0.05, * p<0.1; Robust standard errors clustered at the class level are in parentheses.

Table 6 Heterogeneous effect of preschool quality on off-farm work participation among rural married women, by household social economic status

	LPM	LPM	Logit (marginal effect)	Logit (marginal effect)
	(1)	(2)	(3)	(4)
Subjective quality of preschool*household asset index	0.008 (0.013)		0.009 (0.015)	
Teacher with tertiary education*household asset index		0.055 (0.044)		0.063 (0.050)
Teacher majored in preschool education*household asset index		-0.007 (0.039)		-0.012 (0.045)
Teacher's experience *household asset index		-0.000 (0.002)		-0.001 (0.002)
Public preschool*household asset index		0.002 (0.037)		0.002 (0.041)
School fee*household asset index		0.043 (0.045)		0.049 (0.051)
School bus*household asset index		-0.025 (0.033)		-0.032 (0.037)
School enrollment*household asset index		0.000 (0.000)		0.000 (0.000)
Student-teacher ratio*household asset index		0.000 (0.002)		0.000 (0.002)
School infrastructure index*household asset index		-0.001 (0.016)		-0.002 (0.021)
Subjective quality of preschool	0.028** (0.013)		0.032** (0.014)	
Teacher with tertiary education		0.015 (0.034)		0.021 (0.039)
Teacher majored in preschool education		0.046 (0.045)		0.052 (0.050)
Teacher's experience		0.000 (0.003)		0.000 (0.003)
Public preschool		0.054 (0.037)		0.061 (0.038)
Preschool fee		0.019 (0.050)		0.022 (0.056)
Preschool bus		0.075* (0.041)		0.091* (0.048)
Preschool enrollment		0.000		0.000

		(0.000)		(0.000)
Student-teacher ratio		-0.002		-0.002
		(0.002)		(0.003)
Preschool infrastructure index		0.021**		0.026*
		(0.010)		(0.014)
Constant	0.570***	0.730***	0.570***	
	(0.209)	(0.172)	(0.209)	
Observations	1,069	1,069	1,069	1,069
R-squared/Pseudo R-squared	0.153	0.160	0.121	0.129

Notes: All models control characteristics of mother, preschooler, and household. *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors clustered at the class level are in parentheses.