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Off-farm employment and time allocation in on-farm work in rural China from gender perspective

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ABSTRACT

This paper sheds light on how the growing number of off-farm employees affects the labor allocation of female and male left-behind farmers in the Chinese agricultural sector. We find no direct effect of off-farm employment on left behind workers' total working time in farming, nor do we observe a gender difference in this respect. However, we do find that increasing off-farm work is associated with fewer days worked on staple crops, and in the harvesting and sales stages of the production process. Hiring labor and buying agricultural services also impact left behind workers' time allocation. Moreover, we find that in China, contrary to several other developing countries, there is no trend towards a feminization of agriculture, but rather a tendency in the reverse direction.

1. Introduction

Rapid development of industrialization and urbanization has created growing off-farm employment opportunities for the agricultural households, and as a consequence, more and more farmers have moved to work in off-farm employment. Thus, there have been unprecedented changes in the allocation of agricultural households' labor between the agricultural and non-agricultural sectors. Several studies document that off-farm employment has reduced the labor input in agriculture (Pfeiffer, López-Feldman, & Edward Taylor, 2009; de Brauw, 2010).

The focus of this paper is on how the increase in off-farm employment affects the time allocated to farming and components thereof by the left behind members of households in rural China. We also examine whether the impacts differ between men and women.

The reason for the growth in off-farm employment in rural China is straightforward: the worker moves when her/his contribution to the household income is higher in off-farm employment than if s/he stays and works on the farm. Earlier studies (e.g., Cai & Wang, 2010) have shown that Chinese farms have been overstaffed and hence, at least the first movers to off-farm jobs are likely to add more to the household's total income than the value lost by their absence in production on the farm.

The income from outside sources can also be used to pay for hired labor, to invest in fixed agricultural capital and for buying agricultural services from local firms. These additional factors of farm production can increase further the value of a household member's off-farm income relative to value of working at the farm, and hence, lower demand for their labor input at the farm.

Traditionally female farmers have made large contributions to agricultural output, but there have also been some differences in the type of tasks performed by males and females (Alesina, Giuliano, & Nunn, 2013; Hansen, Jensenz, & Skovsgaard, 2015). Thus,

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males do physically heavy tasks like plowing or loading up harvest for transportation, whereas females do other less heavy but time intensive tasks related to cultivation and harvesting. Moreover, females are mainly responsible for the production of non-staple crops. The traditional division of labor means that men as household heads are in charge of management and sales.

Due to strong traditional gender roles, male members of rural household have had more options to work outside the farm. Several studies have found that women are less likely to participate in off-farm work than men and hence they are more likely to be left-behind and to spend more time working in agriculture (e.g., Fan, 2003; Mendola & Carletto, 2012). Originally, the majority of off-farm jobs were typically "male jobs" (in manufacturing) and consequently the increase in off-farm employment meant an increase in the absence of male workers from the farm. More recently, economic development, and in particular the expansion of the services sector, has increased also the off-farm employers' demand for female workers, and for young female workers in particular (Zhang, de Brauw, & Rozelle, 2004). Women's status in agricultural households is by tradition inferior to that of men, and so, it is possible that females' time allocation will be affected differently than that of men.

A trend towards an agricultural feminization has been documented for other developing countries, such as in studies of a number of African countries (Lokshin & Glinskaya, 2009; Stecklov, Carletto, Azzarri, & Davis, 2010; Palacios-Lopez, Christiaensen, & Kilic, 2015) and Mexico (Amuedo-Dorantes & Pozo, 2006), and it is often attributed to the changed status of women in households' decision-making and changes in labor market discrimination by gender. Notably, studies for China by Zhang et al. (2004), de Brauw, Li, Liu, Rozelle, and Zhang (2008) and de Brauw, Huang, Zhang, and Rozelle (2013) found that agriculture has in fact been gradually defeminized since the mid-nineties.

Recent empirical research of the impact of off-farm employment on the labor reallocation of left-behind females in agricultural households has attracted widespread attention. According to these studies, off-farm employment has led to left-behind household members increasing their time spent in on-farm work and this has been especially pronounced for the left-behind women (Amuedo-Dorantes & Pozo, 2006; Binzel & Assaad, 2011). Démurger and Li (2012) and Mendola and Carletto (2012) find evidence of household members with migration experience playing a significant role in inspiring the left-behind women to work as self-employed rather than in on-farm and domestic work. Some empirical studies have also shown that there is a gender difference in the time allocation of the left-behinds (Mu & van de Walle, 2011). Using data of CHNS from the period of 1997–2006, Chang, MacPhail, and Dong (2011) find that the impact of off-farm employment differs by gender. The increase in working time has being greater for elderly women and young girls than for elderly men and boys. Other studies have looked at the empowerment of left-behind females, their farming burden and leisure time (Wang, 2013; Murard, 2015). On the basis of these empirical studies, it has been concluded that off-farm employment has contributed to the trend towards feminization of agriculture. However, it should be noticed that these studies have only to a limited extent examined actual changes in the agricultural labor input by gender in the context of increasing off-farm employment.

This paper takes a closer look at the link between off-farm employment and the left-behinds' time allocation in agricultural labor input by gender in rural China. To the best of our knowledge, there are three earlier papers related to our analysis: Mu and van de Walle (2011), Chang et al. (2011), and Démurger and Li (2012). These studies suggest that increasing off-farm employment is associated with a feminization of agriculture. However, they do not examine how the impact of off-farm employment on agricultural feminization differs with respect to different farming activities. In addition, with the notable exception of Meng, Zhao, and Liwu (2014), previous studies do not account for the joint decision nature of the labor allocation of females and males in the household. Treating spouses' time allocation in agriculture as completely independent decisions appears to be a rather strong and unappealing assumption.

Hence, this paper contributes to the literature in two ways. Firstly, we will explore whether the feminization of agriculture varies with respect to time allocated to farming of different types of crop production (staple crops and other crops) and to different stages in the farming process (cultivation, management of the farm, harvest and market sales). Secondly, we estimate the determinants of time spent on on-farm work within the framework of a joint decision model by left-behind female and male farmers. By exploring the effect of off-farm employment on female and male labor supply in the agricultural sector, this paper also contributes to the literature of gender equity and the welfare of women in the Chinese farming sector.

The remainder of the paper proceeds as follows. Section 2 provides a brief description of the data used. This is followed by a descriptive analysis of the recent situation and trends in off-farm employment and time spent in agricultural work by gender in Section 3. Section 4 describes the econometric methodology used in the analysis of the impact of off-farm employment on the joint decision on time allocated to on-farm work by females and males. Section 5 presents the results while Section 6 concludes.

2. Data description

We employ two datasets, both of which were collected by the Center for Chinese Agricultural Policy (CCAP) of Chinese Academy of Sciences (CAS). The first dataset is the China Hundred Villages Survey (CHVS) which was collected as a random, nationally representative sample of 101 rural villages in five provinces (Jiangsu, Sichuan, Shaanxi, Jilin and Hebei) in years 2005, 2008 and 2012. For more details on the exact method of sample selection and survey process, see Zhang, Zhang, Rozelle, and Boucher (2006) and Li, Huang, Luo, and Liu (2013).

This dataset provides detailed information on households' demographic and socioeconomic characteristics, and individuals' job occupations and employment histories during the year preceding the survey. In our analysis we include all working-age men and women who are not in school, retired or disabled. This yields a final sample size of 781 households for 2005, 1935 households for 2008, 1982 households for 2012, respectively.

We use these data to summarize the development of the agricultural labor input at the national level. The CHVS did not, however, ask about specific agricultural inputs. In particular, the survey lacks key information on individuals' time allocation to on-farm work. Therefore, we use another dataset (second dataset) for our analyses of left-behind farmers' time spent on on-farm work and to estimate how this is impacted by off-farm employment.

The second dataset is the Jiangsu Agricultural Household Survey (JAHS) which has been conducted in six rounds and we make use of the last three rounds in four villages of Jiangsu Province in years 2003, 2007 and 2011, respectively.[1] After excluding households without any farming activities, we have a three-wave sample of 115 agricultural households in 2002, 115 agricultural households in 2006 and 111 agricultural households in 2010. Although the survey is small and concentrated to the coastal region of one province, we nevertheless believe the results from the effects analysis are comparable to the CHVS dataset because the JAHS asked almost the same set of questions as the CHVS, but has more detailed information on agricultural inputs and for each left-behind farmers time allocated specifically to on farm work.

Regarding time allocation in the agricultural sector, the JAHS asked how many days each left-behind individual worked on farm in four farming stages (cultivation, management, harvest, market sales) and by type of crops. The survey distinguishes between staple crops and other crops (green house crops, fruit garden crops, vegetable crops, forestland crops, livestock activities, fishing and other crop types). One advantage of the JAHS is that it asked exactly the same questions about farm labor in each wave of the survey in the same set of villages, and so, the data consistently describes how farm labor allocation has changed over time. Besides time allocation in the agricultural sector, the JAHS also collected information of the use of other agricultural inputs such as the household's area of farmland, days of hired labor, expense on agricultural services (for example, machinery services for cultivation and harvest), and agricultural fixed assets (which include draft animals, agricultural machines and transportation vehicles).

The study sites of the JAHS are typical type of rural areas in eastern and central China that have a well-developed agricultural infrastructure and a rapidly developing rural industrial base. Off-farm employment opportunities are good as there are a large number of industrial firms in Jiangsu Province.

3. Development and trends of off-farm and on-farm employment in rural China

As a background for our analysis of the determinants of time allocation decisions in the agricultural sector, we first describe how the agricultural sector's share of the labor force, by gender, and by different farming activities has changed over time.

Using the employment history information of the CHVS, we show the trends in the proportions of full-time employment in the agricultural and non-agricultural sectors. As can be seen from Fig. 1, the share of the full-time labor force in on-farm employment decreased from about 67% in 1995 to almost 37% in 2011. During the same period, the share in full-time off-farm employment increased from about 13% to 33%. The decline in full-time on-farm employment is faster than the increase in full-time off-farm employment, which suggests that more and more people work in the agricultural sector on a part-time basis. Both trends, i.e. changes in proportions of full-time employees in agricultural and non-agricultural sectors have phased out since 2008.[2] A possible explanation for this phenomenon is the global financial crisis and subsequent recession as discussed by Zhi, Huang, Huang, Rozelle, and Mason (2013).

A closer inspection of the proportion of farm work done by women across provinces over time does not give evidence of agricultural labor feminization. Using the employment history data, we estimated the proportion of farm work done by women overall and for the individual provinces. As shown in Table 1, >50% on-farm employees are females (column 2), which seem to support the common perception of agricultural feminization. However, there is a slightly falling trend in the share of female on-farm employment over time. The proportion of female on-farm employees varies from province to province. The proportion of female on-farm employees in Jiangsu remains the highest among the five provinces. All in all our findings are consistent with those of de Brauw et al. (2008), who show that agriculture has in fact been gradually defeminized since 1995.

The proportions of farming time by females observed in the JAHS also yield little support for the feminization of agricultural labor hypothesis. As shown in Table 2, the proportion of farming time by females fell significantly from 61.2% in 2002 to 47.5% in 2006 and picked up a little in 2010 to 53.3% but still far below the level in 2002 (row 1). Thus, in Jiangsu Province feminization of agriculture has weakened over time, which mirrors the findings from the CHVS data in Table 1. As for time allocated to on-farm work by crop type and stages of farm production, the trends by gender are more mixed. Women spend more time working on staple crops than on other crops. Moreover, they also spend more days working on non-staple crops than men. A de-feminization trend is observed for time worked at all stages of farming, and this in particular pronounced in the cultivation and the harvesting stages. There is thus little evidence of a trend towards feminization of agriculture in terms of the time allocated to on-farm work.

4. Econometric analysis of determinants of time allocation in on-farm work

According to the agricultural household model, female and male family members' time allocated to on-farm work is a joint decision. The same is true for the decision regarding who should work on-farm and off-farm, respectively (Singh, Squire, &

[1] The very first round was conducted as early as in 1988. For more details on the exact survey process, see Ye and Rozelle (1994).

[2] The province level trends (not shown here, but available from the authors on request) in the proportion of non-farm labor showed the similar decreases. We cannot exclude the possibility that agricultural households hire labor from the local labor market to replace their decreasing on-farm labor input. However, according to the survey data of Che, Zhang, and Linhui (2015), only 5.6% of households hired farm labor and hence, we conclude that this is of minor importance.

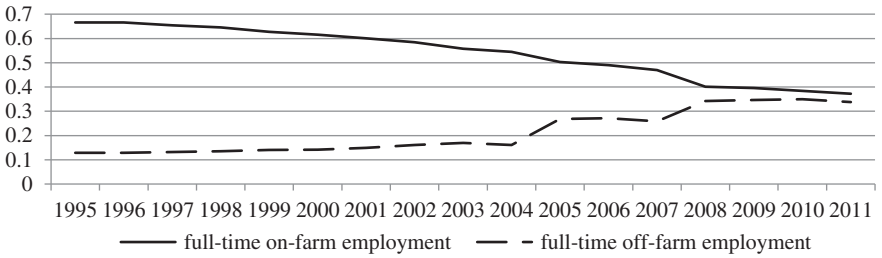

Fig. 1. Shares of full-time work in farm and non-farm sectors in rural China, 1995–2011.
Source: CHVS

Strauss, 1986). So, we should account for this in the estimation of models of the determinants of time allocated to farming activities by females and males.

There are three main econometric issues concerning model estimation. The first is the fact that farming times are censored at zero. As this may cause biases if usual linear regression models are used, a Tobit model is adopted for this reason.

A second issue is the possible endogeneity of off-farm employment decision due to intra-household labor allocation decisions regarding on- and off-farm work, respectively. To control for possible simultaneity bias, we make use of an instrumental variable, the migrants' network of the household. This has also been employed by previous studies (Démurger & Li, 2012; Hu, 2012) and is defined as the average number of the other households in the same village with members that are away from home in off-farm employment two years prior to the survey. We assume that the migrants' network is correlated with off-farm employment at the household level, but that it has no direct effect on the household's time allocation to farming activities.

Lastly, the time spent on farming by females and males in the household is likely to be inter-dependent (that is, decided within the household), which makes it necessary to estimate their determinants jointly (Meng et al., 2014). More precisely, we allow the coefficients of the explanatory variables to differ by gender and use a seemingly unrelated regression estimation procedure that accounts for the fact that the error terms (picking up common unobservable) can be correlated. Taking these econometric issues discussed above into consideration, we estimate the gender differential effect of off-farm employment on the time allocated to farm work of left-behind female and male household members using pooled cross-sectional data and employ an instrumental variable bivariate Tobit model technique. Moreover, we take possible interdependent factors into account (Pailhé & Solaz, 2008).

We specify the following the bivariate Tobit model:

$$Y_f = \max\left(Y_f^*, 0\right) \tag{1}$$

$$Y_m = \max\left(Y_m^*, 0\right) \tag{2}$$

$$Y_f^* = \alpha_f + \gamma_f OFF + \beta_f X + \varepsilon_f \tag{3}$$

$$Y_m^* = \alpha_m + \gamma_m OFF + \beta_m X + \varepsilon_m \tag{4}$$

where Y_f and Y_m are dependent variables for days of farming activities of females and males and are defined as follows: (i) the respective total amount of days worked on-farm by females and males in the household; (ii) the respective total amount of days of the on-farm work of females and males by crop type and farming stage. Y_f^* and Y_m^* denote the associated latent variables. The subscripts f and m denote the female and male family members working on-farm, respectively. In this study, we especially focus on off-farm employment, measured by the number of off-farm workers and denoted by *OFF*. The error terms ε_f and ε_m are assumed to be normally distributed with $E[\varepsilon_f] = E[\varepsilon_m] = 0$ and $Var[\varepsilon_f] = \delta_f^2$, $Var[\varepsilon_m] = \delta_m^2$, and $Cov[\varepsilon_f, \varepsilon_m] = \rho\delta_f\delta_m$. The correlation coefficient is denoted by ρ.

We include a vector X to control for differences in household characteristics. The first is the number of children under age 16, which is expected to have a negative effect on time allocated to farming by females while it has no effect on males' farming time. The number of household members with at least junior high school education is likely to reduce time allocated to agricultural work for both genders. Remittances from off-farm employees will improve possibilities to invest in new agricultural machinery,

Table 1
Proportion (%) of females in on-farm employment, 2002–2010.Source: CHVS.

Year	Total	Jiangsu	Sichuan	Shaanxi	Jilin	Hebei
2002	52.90	56.21	54.92	51.64	48.53	53.52
2006	52.83	54.20	53.17	53.14	50.47	53.31
2010	52.66	54.87	54.81	50.94	50.93	51.53

Note: Proportion of on-farm labor = computed full-time on-farm labor/total number of employees.

Table 2
Proportion (%) of farming time of females by crop type and farming stage in Jiangsu Province, 2002–2010.Source: JAHS.

	2002	2006	2010
Total	61.19	47.49	53.30
By crop type			
Staple crops	57.28	46.72	50.25
Other crops	51.90	43.87	43.97
By farming stage			
Cultivation	58.24	47.51	43.97
Management	65.99	46.53	56.13
Harvesting	54.31	45.90	45.34
Market sales	48.44	37.88	40.19

which will reduce working time spent in farming. Days of hired labor can be a substitute for the time allocated to farming. Agricultural fixed assets and expenditures on agricultural services are also potential substitutes for labor and may reduce time spent in work on the farm. Given the strong traditional division of labor by gender in Chinese rural households, an interesting question is whether these investments affect male and female tasks in agricultural production equally. The area of arable land is expected to be positively correlated with the time allocated to farming, for both males and females.

Detailed definitions and descriptive statistics for all variables used in the regressions are given in Table 3. To account for time-invariant unobserved village characteristics and time trends, we also add dummy variables for the four villages and enter three year dummies into Eqs. (3) and (4). The analysis of the time allocated to on-farm work by female farmers in the previous section suggests that there is only weak (if any) evidence of feminization of agriculture in China, but earlier studies did not control for household level factors which may affect the proportions of farm-work done by men and women. The year dummy estimates pick up trends of de/feminization not related to changes in off-farm employment.

From Table 3 we note that the number of household members in off-farm employment has increased considerably during the period. On average, the number of off-farm workers in the household has grown from 1.41 persons in 2002 to 2.08 persons in 2010 (row 15). Consequently, the magnitude of remittances has also increased significantly over time (row 18).

Table 3
Summary statistics.Source: JAHS.

Variables	2002		2006		2010	
	Mean	S.D	Mean	S.D	Mean	S.D
Dependent variables						
Days of female work on farm (days)	95.43	63.74	62.91	57.55	66.93	101.0
Days of male work on farm (days)	67.50	68.41	64.54	65.89	56.06	93.11
Days of female work on staple crops (days)	47.77	29.18	52.44	47.12	44.45	77.01
Days of male work on staple crops (days)	36.53	29.86	51.18	42.49	39.56	71.06
Days of female work on other crops (days)	47.89	53.66	10.47	33.77	22.71	52.57
Days of male work on other crops (days)	31.04	58.18	13.40	49.23	16.59	54.05
Days of female work on cultivation (days)	15.29	9.59	13.55	13.68	7.19	14.79
Days of male work on cultivation (days)	11.35	9.13	13.95	14.72	8.29	15.21
Days of female work on management (days)	58.77	48.48	35.02	38.70	49.32	71.50
Days of male work on management (days)	36.68	48.20	34.23	38.92	36.02	65.50
Days of female work on harvest (days)	19.22	14.98	11.73	16.99	9.68	33.58
Days of male work on harvest (days)	16.77	15.06	13.17	18.33	10.60	34.50
Days of female work on market sales (days)	2.33	7.75	2.64	8.23	0.79	1.29
Days of male work on market sales (days)	3.17	14.54	3.19	7.89	1.19	2.02
Independent variables						
Number of off-farm employees	1.41	0.95	1.86	1.08	2.08	1.11
Household characteristics						
Number of children (age < 16)	0.46	0.53	0.50	0.61	0.46	0.61
Number of members with at least of junior high school education	0.46	0.74	0.66	0.84	0.62	0.85
Remittances (yuan)	4197	4735	6926	10,110	7137	13,827
Days of hired labor (days)	1.14	3.35	6.01	34.33	4.27	41.09
Agricultural fixed assets (yuan)	1946	14,922	3286	15,188	2897	11,672
Expenditure on agricultural services (yuan)	537.9	301.8	1092	1488	1070	643.0
Farm size (mu)	5.79	4.08	7.83	9.00	6.89	8.51
Number of observations	115		115		111	

Note: 1 mu = 1/15 ha.

Table 4-1
Impact of off-farm employment on days of work on-farm by gender.Source: JAHS.

Variables	(1)		(2)	
	Females	Males	Females	Males
Number of off-farm employees	−11.849 (24.430)	−21.056 (24.657)	1.336 (52.658)	−38.782 (37.547)
Number of children	11.011 (19.018)	4.349 (17.803)	4.807 (27.584)	12.617 (21.982)
Number of members with at least of junior high school education	0.871 (8.961)	−0.075 (13.032)	−6.207 (20.343)	6.708 (16.428)
Remittances (1000 yuan)			0.288 (1.031)	1.009 (0.915)
Days of hired labor (days)			0.779*** (0.323)	−0.253*** (0.093)
Agricultural fixed assets (1000 yuan)	−0.079 (0.256)	−0.003 (0.184)	−0.200 (0.403)	0.050 (0.215)
Expenditure on agricultural services (1000 yuan)			−19.593* (12.247)	−25.535*** (9.140)
Farm size (mu)	4.631* (2.651)	5.404** (2.086)	3.464** (1.655)	8.534*** (0.930)
Year of 2006	−40.793*** (7.358)	−3.728 (9.883)	−36.825*** (10.253)	9.836 (10.965)
Year of 2010	−30.090 (29.688)	−5.377 (21.424)	−29.840 (27.648)	14.509 (23.103)
Constant	78.050** (37.825)	59.900* (31.570)	82.377 (55.388)	67.815** (31.573)
ρ	0.468***		0.464***	
Number of observations	341		341	

Note: (1) In brackets: robust standard errors clustered at the village level; (2) ρ is the correlation coefficient of error term in Eqs. (3) and (4).
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

The days of hired labor make up a small share of the total agricultural labor input (row 19). Average expenditures on agricultural services are high, and have grown from 537.9 yuan in 2002 to 1070 yuan in 2010 (row 21). The low average number of days of hired labor and high average expenditures on agricultural services suggest that purchase of agricultural services are preferred to hired labor to compensate for the insufficiency of agricultural labor. This is also found by Ji, Yu, and Zhong (2012) and is likely impelled by policies subsidizing investments in agricultural machinery that in turn increases the supply of agricultural services.

5. Estimation results

We estimate the model in two steps. First, we compute the predicted value of the off-farm employees from a Tobit regression of off-farm employment using the migrants' network as the instrumental variable (see Appendix, Table A-1). Next, we estimate the bivariate Tobit model with the predicted values of off-farm employment as the key explanatory variable.

The second stage bivariate Tobit model estimates are found in Tables 4-1 to 4-3. In these, the first two columns include a host of control variables besides the number of off-farm employees in the household. The estimations are carried out separately for males and females.[3] In the third and fourth columns we enter three additional regressors in order to shed some lights on potential channels through which off-farm employment may affect days of on farm work. The first channel is remittances, which could contribute to fewer days spent on farming because the income from remittances makes it affordable. The second mechanism is days of hired labor which the household now can afford to pay for as a result of the income from off-farm work. Finally, we enter expenditures on agricultural services that again can be bought by the additional income from off-farm employment. Both days of hired labor and agricultural services are expected to substitute for the household members' labor input to work on the farm.

From Table 4-1, we can see that off-farm employment has the expected negative impact on the total number of days spent working on the farm for males, whereas the impact is positive for females. However, both estimates do not differ significantly from zero (row 1). Thus, the growth in off-farm employment during the period under study has not so far led to a decrease in the agricultural labor input. Farm work is still essential for the households and especially the left-behind, typically older workers whose means of subsistence during old age is poorly secured. As the left behind are considerably older than those in off-farm employment, their productivity is likely to be lower and has to be compensated for by working longer hours.

For both male and female expenditures on agricultural services attach a negative and significant coefficient (row 7). It should of course be noted that this variable could also have a negative and significant effect also for farms where there are no off-farm employees. Also days of hired labor carry significant estimates: a positive for females and a negative for males (row 5). The gender differential is not easily explained and it should be noted (see Table 3) that only a small proportion of households hire outside labor. Remittances have no direct significant effect on days worked on the farm.

Tables 4-2 and 4-3 contain corresponding estimates where farm work is divided into days worked on staple and other crops, respectively. Here we observe a gender differential in the impact of off-farm employment: men spend less time working on staple crops when there are more members of the household working off the farm (row 1). Time spent working of non-staple crops production, which is mainly women's responsibility, is not affected by off-farm work. Thus, it seems that off-farm work affect

[3] We have also estimated the models in Tables 4.1–4.3 and 5.1–5.4 with gender interactions instead of estimating them separately by gender. These are found in Appendix B. In the main we obtain qualitatively similar results as above.

Table 4-2
Impact of off-farm employment on days of work on staple crops by gender.Source: JAHS.

Variables	(1)		(2)	
	Females	Males	Females	Males
Number of off-farm employees	−10.936 (14.191)	−23.568*** (7.267)	31.691 (27.858)	−1.814 (28.888)
Number of children	14.621 (12.608)	9.181 (5.893)	−6.913 (15.307)	−1.376 (15.891)
Number of members with at least of junior high school education	1.825 (6.719)	6.077* (3.572)	−18.021* (10.740)	−4.538 (13.736)
Remittances (1000 yuan)			−0.683 (0.615)	−0.076 (0.789)
Days of hired labor (days)			1.103*** (0.277)	0.815*** (0.148)
Agricultural fixed assets (1000 yuan)	−0.057 (0.103)	0.032 (0.051)	−0.295 (0.192)	−0.118 (0.103)
Expenditure on agricultural services (1000 yuan)			−12.884 (12.221)	−15.079 (12.822)
Farm size (mu)	3.597* (2.157)	3.898* (2.065)	0.518 (1.114)	2.176** (0.980)
Year of 2006	−0.650 (3.907)	17.246*** (6.309)	−7.185 (7.802)	16.950** (8.117)
Year of 2010	−3.235 (9.109)	13.251** (5.895)	−21.960 (13.916)	6.820 (15.826)
Constant	32.631* (16.788)	35.917** (14.155)	22.758 (24.228)	35.143* (20.185)
ρ	0.389**		0.321**	
Number of observations	341		341	

Note: (1) In brackets: robust standard errors clustered at the village level; (2) ρ is the correlation coefficient of error term in Eqs. (3) and (4).
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 4-3
Impact of off-farm employment on days of work on other crops by gender.*Source: JAHS.

Variables	(1)		(2)	
	Females	Males	Females	Males
Number of off-farm employees	12.006 (36.529)	9.816 (37.217)	−5.964 (90.127)	−29.059 (83.460)
Number of children	−9.436 (18.913)	−11.355 (24.572)	−0.652 (45.229)	4.651 (48.637)
Number of members with at least of junior high school education	−3.453 (12.346)	−11.898 (17.607)	4.117 (36.527)	6.808 (37.805)
Remittances (1000 yuan)			0.766 (1.420)	0.962 (1.295)
Days of hired labor (days)			−0.425 (0.335)	−1.872*** (0.552)
Agricultural fixed assets (1000 yuan)	−0.276 (0.471)	−0.354 (0.683)	−0.197 (0.624)	−0.109 (0.640)
Expenditure on agricultural services (1000 yuan)			−18.211 (22.557)	−42.992 (31.862)
Farm size (mu)	1.611** (0.796)	2.862 (2.158)	4.208*** (1.349)	10.520*** (2.272)
Year of 2006	−105.142*** (25.897)	−85.947*** (31.177)	−93.464*** (33.408)	−57.905 (36.768)
Year of 2010	−48.327 (43.501)	−43.725 (39.259)	−30.157 (61.259)	5.270 (48.479)
Constant	14.192 (49.330)	−30.935 (45.711)	22.565 (80.379)	−16.347 (71.158)
ρ	0.726***		0.734***	
Number of observations	341		341	

Note: (1) In brackets: robust standard errors clustered at the village level; (2) ρ is the correlation coefficient of error term in Eqs. (3) and (4).
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

men's time worked on staple crops more than that of women's and furthermore, that there is no impact on time spent working in the more “female” production of non-staple crops. Remittances remain insignificant while agricultural services carry negative estimates for both crop types but they do not differ statistically from zero (rows 4 and 7). In Table 4-2 we saw that there is a declining trend in days of on-farm work for women during the period under study (rows 9 and 10). Estimates in Table 4-3 indicate that this was mainly due to a large decline in the number of days women spent working on the farm growing other crops than staple crops (rows 9 and 10).

We next turn to the estimates of the impact of off-farm employment on the time allocated to different farming stages, which are presented in Tables 5-1 to 5-4. There are some traces of time allocation impacts of off-farm employment at different stages of the production process. For example, off-farm employment impact on time allocated to harvesting is negative for both genders (Table 5-3, row 1) and a small gender differentiated impact was observed with a negative impact for males in market sales (Table 5-4, row 1). Expenditures on agricultural services are associated with fewer days of work on harvesting and sales for males and more days in market sales work for females (Table 5-3, row 7; Table 5-4, row 7). As off-farm employment is likely to provide means to pay for these services, it is possible that these are the two mechanisms behind the negative impact of off-farm employment.[4]

[4] This interpretation is further supported by the fact that the off-farm employment estimate decreases and turns insignificant as days of hired labor and expenditures on agricultural services are added to the model.

Table 5-1
Impact of off-farm employment on days of work on cultivation by gender.Source: JAHS.

Variables	(1)		(2)	
	Females	Males	Females	Males
Number of off-farm employees	1.132 (4.257)	−0.587 (3.523)	0.367 (6.723)	−6.959 (10.346)
Number of children	1.200 (4.069)	−1.420 (2.806)	1.917 (4.180)	2.179 (5.391)
Number of members with at least of junior high school education	−1.852 (2.292)	−1.396 (1.841)	−1.557 (3.092)	1.417 (4.643)
Remittances (1000 yuan)			0.057 (0.135)	0.204 (0.290)
Days of hired labor (days)			0.108* (0.060)	0.015 (0.014)
Agricultural fixed assets (1000 yuan)	−0.030 (0.049)	−0.048 (0.047)	−0.034 (0.069)	−0.025 (0.055)
Expenditures on agricultural services (1000 yuan)			0.512 (2.299)	0.419 (2.268)
Farm size (mu)	0.523** (0.225)	0.612*** (0.225)	0.109 (0.310)	0.582*** (0.199)
Year of 2006	−4.089*** (0.813)	1.912 (2.133)	−3.907** (1.643)	3.621 (3.740)
Year of 2010	−12.638*** (1.667)	−5.041* (2.820)	−12.443*** (3.405)	−1.705 (6.836)
Constant	10.895*** (3.874)	9.190** (4.360)	13.198*** (4.894)	13.616* (7.312)
ρ	0.328***		0.327***	
Number of observations	341		341	

Note: (1) In brackets: robust standard errors clustered at the village level; (2) ρ is the correlation coefficient of error term in Eqs. (3) and (4).
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 5-2
Impact of off-farm employment on days of work on management by gender.Source: JAHS.

Variables	(1)		(2)	
	Females	Males	Females	Males
Number of off-farm employees	8.475 (14.942)	−8.964 (18.164)	25.232 (37.733)	−21.508 (19.461)
Number of children	−0.969 (11.952)	−1.709 (12.699)	−10.048 (19.524)	3.144 (12.068)
Number of members with at least of junior high school education	−7.321 (5.644)	−4.961 (9.689)	−15.307 (14.183)	0.344 (8.164)
Remittances (1000 yuan)			−0.224 (0.765)	0.383 (0.516)
Days of hired labor (days)			0.284 (0.204)	−0.690*** (0.135)
Agricultural fixed assets (1000 yuan)	−0.140 (0.212)	−0.076 (0.243)	−0.226 (0.289)	0.011 (0.184)
Expenditures on agricultural services (1000 yuan)			−9.610 (7.199)	−10.971** (5.350)
Farm size (mu)	2.195** (0.930)	2.816*** (0.989)	1.857* (1.036)	6.187*** (0.820)
Year of 2006	−35.884*** (4.714)	0.975 (9.492)	−36.971*** (5.751)	7.725 (5.834)
Year of 2010	−22.296 (23.864)	1.245 (12.907)	−27.899 (23.048)	12.999 (11.544)
Constant	37.558 (22.831)	27.154 (17.437)	31.440 (40.518)	24.324 (19.750)
ρ	0.379***		0.400**	
Number of observations	341		341	

Note: (1) In brackets: robust standard errors clustered at the village level; (2) ρ is the correlation coefficient of error term in Eqs. (3) and (4).
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

In rural China there is a strong tradition that men predominantly make decisions regarding organization of work, investment in machinery and buying agricultural services. Thus, it is not surprising to find that the increasing purchases of agricultural services from outside negatively affect days worked in staple crops production but not production of other crops that is typically considered to be female work.[5] Regarding traditional male tasks like sales work and management, our results document that off-farm employment and use of agricultural services reduce days in sales work for men, while it is associated with an increase in days in market sales for females, possibly because more (male) household members in off-farm employment leads to sales work being done either by external services providers or because female members increasingly are performing these tasks.

As for the estimates of the other variables, three are worth noticing. The first is farm size which carries the expected positive sign of coefficient. The second is the sizable and negative coefficient carried by the year dummies for females (but not for males). Thus, there seems to be a decrease in females' time spent working on the farm, except for work on staple crops, and this decline is not directly linked to changes in the number of off-farm employees. A third result from the regressions is the strong and positive correlation between the error terms, confirming our expectations that the decisions regarding time spent working on the farm are not independent.

[5] Hiring labor is also associated with fewer days by males in other than staple crops production, management, and market sales.

Table 5-3
Impact of off-farm employment on days of work on harvest by gender.Source: JAHS.

	(1)		(2)	
Variables	Females	Males	Females	Males
Number of off-farm employees	−18.577** (9.022)	−16.434** (6.712)	−12.521 (14.854)	−15.811 (11.743)
Number of children	11.069** (5.263)	7.826* (4.288)	8.373 (7.293)	7.948 (6.211)
Number of members with at least of junior high school education	8.049* (4.771)	6.614* (3.491)	4.711 (6.816)	5.618 (6.089)
Remittances (1000 yuan)			0.202 (0.284)	0.372 (0.253)
Days of hired labor (days)			0.454*** (0.114)	0.364*** (0.085)
Agricultural fixed assets (1000 yuan)	0.084 (0.099)	0.067 (0.077)	0.024 (0.070)	0.030 (0.048)
Expenditures on agricultural services (1000 yuan)			−10.805** (4.227)	−12.305** (3.814)
Farm size (mu)	1.908* (1.084)	2.082* (1.152)	1.195*** (0.365)	1.849*** (0.282)
Year of 2006	−5.206 (4.743)	−1.491 (3.154)	−2.711 (5.266)	2.946 (3.840)
Year of 2010	−1.482 (9.004)	0.996 (6.999)	−0.628 (7.414)	5.426 (5.913)
Constant	23.285** (10.319)	18.988** (8.807)	26.862* (13.878)	24.704* (9.099)
ρ	0.797***		0.728***	
Number of observations	341		341	

Note: (1) In brackets: robust standard errors clustered at the village level; (2) ρ is the correlation coefficient of error term in Eqs. (3) and (4).
* Significant at 10%.
** Significant at 5%.
*** significant at 1%.

6. Conclusions

This study has examined the link between off-farm employment and the time allocated to on-farm work of household members in rural China at household level and gender differences therein. Using detailed information on family off-farm employment and time spent on on-farm work from two survey data sets in the 2000s, we find that while there have been simultaneous decreases in the agricultural labor input and increases in off-farm employment, there is no direct link between these two developments at the farm households level, nor are there differences in this respect between males or females. Instead of an agricultural feminization trend, which has been documented for several developing countries, for rural China we observe a tendency towards de-feminization.

We find some suggestive evidence of indirect impacts of growing off-farm employment. Thus, we find that household members of both genders work fewer days on the farm as the buy more agricultural services, and for males (females) an increase in day of hired labor decreases (increases) the days working on the farm. Both hiring labor and using agricultural services are likely to have increased as a consequence of the higher household incomes have accumulated thanks to off-farm employment.

Unlike earlier studies, we divide time allocated to on-farm work by crop types and stages of farming. As more household members working off-farm, left behind male workers work fewer days on growing staple crops. More off-farm employment is also associated with fewer days worked on harvesting and also on sales work for males. Other stages of farming, which make up the bulk on farm work, are unaffected. Our estimation results document a pronounced process of labor reallocation away from farming for the household members left behind, especially for females. However, there are no gender differences in labor reallocation behavior in the agricultural sector. Thus, our findings differ markedly from those of Mu and van de Walle (2011) who found evidence of feminization of agriculture in rural China. One possible source of the difference is the data sets used. Our data for the estimations come from the developed region of Jiangsu Province. Moreover, our data have more observations

Table 5-4
Impact of off-farm employment on days of work on market sales by gender.Source: JAHS.

	(1)		(2)	
Variables	Females	Males	Females	Males
Number of off-farm employees	1.773 (1.766)	−2.236** (0.960)	−4.095 (2.903)	−7.108** (3.207)
Number of children	−1.106 (2.322)	1.066*** (0.384)	2.189 (2.027)	3.432** (1.471)
Number of members with at least of junior high school education	−1.005 (0.857)	0.539 (0.535)	1.605 (1.308)	2.666*** (1.019)
Remittances (1000 yuan)			0.160 (0.117)	0.147* (0.081)
Days of hired labor (days)			−0.018 (0.040)	−0.109*** (0.041)
Agricultural fixed assets (1000 yuan)	−0.023 (0.027)	−0.004 (0.019)	−0.001 (0.020)	0.021** (0.008)
Expenditures on agricultural services (1000 yuan)			0.822* (0.483)	−1.407* (0.711)
Farm size (mu)	0.080* (0.041)	0.284** (0.131)	0.120 (0.228)	0.817*** (0.249)
Year of 2006	−1.168 (1.994)	1.379* (0.710)	0.226 (1.737)	3.176*** (0.402)
Year of 2010	−4.016** (1.780)	−0.318 (1.074)	−1.061 (1.308)	2.980** (1.368)
Constant	−1.199 (1.582)	1.294 (1.635)	2.411 (1.645)	2.714 (1.845)
ρ	0.188***		0.187***	
Number of observations	341		341	

Note: (1) In brackets: robust standard errors clustered at the village level; (2) ρ is the correlation coefficient of error term in Eqs. (3) and (4).
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

from recent years. Another source is that we measure left behind farmers' time allocation by the amount days in work on farms rather than hours per week. Still another reason could be that we estimate the model of the determinants of workers' working time recognizing that household members' decisions are likely to be interdependent.

Our empirical analysis of the relationship between off-farm employment and time allocation in on-farm work pertains to the period 2004–11 for which we find that off-farm employment has not decreased the total labor input in farming. However, this may change as the continuing urbanization process lead to more and more young rural household members working off-farm. As a consequence, the situation of the elderly left-behind farmers and the aging support problem become increasingly important issues. Thus, an important area for future research is the study of the impacts of off-farm employment on the on-farm labor supply of left-behind elderly farmers and their wellbeing, especially for the old age support system in rural China. This is an important question as it can inform us about the need to find new pathways to substitute for the decreasing agricultural labor input in order to ensure food security.

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Appendix A

Table A-1
First stage of instrument variable of off-farm employment.Source: JAHS.

	Coefficient	Robust SE
Instrumental variable		
Migrants' network	0.457***	0.167
Household characteristics		
Number of children	0.538***	0.033
Number of members with at least of junior high school education	0.439***	0.038
Remittances (1000 yuan)	0.019***	0.005
Days of hired labor (days)	−0.004	0.005
Agricultural fixed assets (1000 yuan)	0.004***	0.001
Expenditure on agricultural services (1000 yuan)	0.065**	0.026
Farm size (mu)	0.019	0.030
Year of 2006	0.114**	0.054
Year of 2010	0.293*	0.171
Constant	0.011	0.305
Number of observations	341	

Notes: (1) In brackets: robust standard errors clustered at the village level; (2) ρ is the correlation coefficient of error term in Eqs. (3) and (4).
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Appendix B

Table B-1
Gender differential impact of off-farm employment on days of work on-farm.Source: JAHS.

	(1)	(2)
Number of off-farm employees	1.396 (2.960)	2.004 (3.414)
Male	9.080 (17.201)	9.142 (16.939)
Off-farm employees * Male	1.592 (5.110)	1.597 (5.058)
Number of children	−3.675 (9.211)	−3.747 (8.485)
Number of members with at least of junior high school education	−8.307** (4.222)	−9.412*** (3.377)
Remittances (1000 yuan)		0.241 (0.517)
Days of hired labor (days)		0.304 (0.268)
Agricultural fixed assets (1000 yuan)	−0.130 (0.139)	−0.157 (0.224)
Expenditure on agricultural services (1000 yuan)		−24.646*** (7.513)
Farm size (mu)	4.924** (2.173)	5.897*** (1.492)
Year of 2006	−30.015*** (4.717)	−20.280*** (3.902)
Year of 2010	−31.031* (18.444)	−20.508(17.119)
Constant	49.538** (24.628)	55.597*** (19.415)
Number of observations	341	341

Note: (1) Male is a dummy variable (0 = female farmers and 1 = male farmers); (2) Robust standard errors are clustered at village level.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table B-2
Gender differential impact of off-farm employment on days of on-farm work by crop type.Source: JAHS.

Variables	Staple crops		Other crops	
	(1)	(2)	(1)	(2)
Number of off-farm employees	1.469 (1.323)	2.786 (1.987)	−3.683 (3.533)	−3.368 (3.808)
Male	4.549 (11.658)	4.617 (11.353)	12.639 (18.379)	13.592 (18.438)
Off-farm employees * Male	0.463 (3.565)	0.416 (3.510)	8.050 (5.094)	7.502 (5.234)
Number of children	0.501 (5.548)	2.574 (4.179)	−6.925 (9.949)	−11.050 (11.090)
Number of members with at least of junior high school education	−4.916*** (1.254)	−5.681*** (0.806)	−4.276 (5.632)	−4.518 (4.814)
Remittances (1000 yuan)		−0.132 (0.245)		0.526 (0.586)
Days of hired labor (days)		0.916*** (0.220)		−1.063** (0.538)
Agricultural fixed assets (1000 yuan)	−0.108*** (0.029)	−0.153** (0.075)	−0.203 (0.430)	−0.176 (0.433)
Expenditure on agricultural services (1000 yuan)		−12.873 (11.160)		−31.143 (19.532)
Farm size (mu)	3.651* (2.179)	1.520 (1.114)	2.302 (1.425)	7.324*** (2.393)
Year of 2006	0.889 (4.902)	7.970** (3.981)	−92.273*** (23.151)	−82.003*** (21.598)
Year of 2010	−7.805** (3.569)	−1.363 (3.189)	−46.756 (36.311)	−31.357 (34.014)
Constant	16.979 (16.962)	33.576*** (9.254)	−5.637 (24.382)	−16.555 (27.466)
Observations	341		341	

Note: (1) Male is a dummy variable (0 = female farmers and 1 = male farmers); (2) Robust standard errors are clustered at village level.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table B-3
Gender differential impact of off-farm employment on days of on-farm work by farming stage.Source: JAHS.

Variables	Days of work on cultivation		Days of work on management		Days of work on harvest		Days of work on market sales	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Number of off-farm employees	0.784 (0.519)	0.733 (0.560)	3.402 (2.863)	3.552 (2.466)	−1.371 (0.902)	−0.666 (1.322)	−1.435 (1.505)	−1.549 (1.657)
Male	0.087 (2.769)	0.067 (2.755)	14.539 (14.742)	14.617 (14.690)	−0.678 (3.441)	−0.716 (2.914)	−4.973 (3.349)	−4.947 (3.340)
Off-farm employees * Male	0.316 (0.618)	0.316 (0.613)	0.509 (4.220)	0.502 (4.220)	0.162 (1.179)	0.237 (1.033)	1.812 (1.173)	1.808 (1.167)
Number of children	−0.505 (1.823)	−0.324 (1.559)	−3.834 (6.260)	−4.830 (6.059)	−0.449 (2.800)	0.259 (2.263)	0.162 (0.371)	−0.017 (0.401)
Number of members with at least junior high school	−1.936*** (0.457)	−1.982*** (0.453)	−7.858** (3.846)	−8.231** (3.331)	−0.621 (1.198)	−1.207 (1.369)	−0.099 (0.737)	−0.139 (0.720)
Remittances (1000 yuan)		0.050 (0.108)		0.047 (0.319)		0.018 (0.123)		0.059 (0.070)
Days of hired labor (days)		0.069* (0.036)		−0.217 (0.195)		0.442*** (0.099)		−0.054 (0.033)
Agricultural fixed assets (1000 yuan)	−0.042 (0.034)	−0.047 (0.043)	−0.122 (0.167)	−0.110 (0.187)	−0.003 (0.035)	−0.021 (0.037)	−0.011 (0.012)	−0.010 (0.013)
Expenditures on agricultural services (1000 yuan)		0.069 (1.829)		−10.442*** (3.628)		−12.989*** (3.621)		−0.773* (0.469)
Farm size (mu)	0.571** (0.220)	0.327 (0.254)	2.509*** (0.862)	4.115*** (1.024)	1.922 (1.213)	1.434*** (0.363)	0.186*** (0.067)	0.445** (0.208)
Year of 2006	−1.445 (1.189)	−1.422*** (0.504)	−19.779*** (4.130)	−16.174*** (4.711)	−10.181*** (3.568)	−4.073** (2.016)	0.084 (1.272)	0.187 (1.308)
Year of 2010	−9.557*** (1.641)	−9.632*** (0.723)	−14.032 (15.823)	−9.554 (15.198)	−12.495*** (4.366)	−6.015 (3.766)	−2.173** (0.870)	−1.954** (0.882)
Constant	9.319*** (2.530)	10.443*** (2.410)	21.231 (13.044)	17.969 (14.005)	8.891 (11.215)	17.257*** (5.606)	2.650 (2.342)	1.628 (2.074)
Observations	341		341		341		341	

Note: (1) Male is a dummy variable (0 = female farmers and 1 = male farmers); (2) Robust standard errors are clustered at village level.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

References

Alesina, A., Giuliano, P., & Nunn, N. (2013). On the origins of gender roles: Women and the plough. *Quarterly Journal of Economics*, *128*(2), 469–530.
Amuedo-Dorantes, C., & Pozo, S. (2006). Migration, remittances, and male and female employment patterns. *American Economic Review*, *96*(2), 222–226.
Binzel, C., & Assaad, R. (2011). Egyptian men working abroad: Labor supply responses by the women left behind. *Labor Economics*, *18*(S), 98–114.
Cai, F., & Wang, M. (2010). Growth and structural changes in employment in transition China. *Journal of Comparative Economics*, *38*(1), 71–81.

Chang, H., MacPhail, F., & Dong, X. (2011). The feminization of labor and the time-use gender gap in rural China. *Feminist Economics*, *17*(4), 93–124.
Che, Y., Zhang, Y., & Linhui, Y. (2015). The development of farm market in rural China. *China Agricultural Economic Review*, *7*(2), 280–302.
de Brauw, A. (2010). Seasonal migration and agricultural production in Vietnam. *Journal of Development Studies*, *46*(1), 114–139.
de Brauw, A., Li, Q., Liu, C., Rozelle, S., & Zhang, L. (2008). Feminization of agriculture in China? Myths surrounding women's participation in farming. *China Quarterly*, *194*, 327–348.
de Brauw, A., Huang, J., Zhang, L., & Rozelle, S. (2013). The feminisation of agriculture with Chinese characteristics. *Journal of Development Studies*, *49*(5), 689–704.
Démurger, S., & Li, S. (2012). Migration, remittances and rural employment patterns: Evidence from China. *GATE working paper no. 1230*. http://dx.doi.org/10.2139/ssrn.2165790 (Available at SSRN).
Fan, C. C. (2003). Rural-urban migration and gender division of labor in transitional China. *International Journal of Urban and Regional Research*, *27*(1), 24–47.
Hansen, C. W., Jensenz, P. S., & Skovsgaard, C. V. (2015). Gender roles and agricultural history: The Neolithic inheritance. *Journal of Economic Growth*, *20*(4), 365–404.
Hu, F. (2012). Migration, remittances, and children's high school attendance: The case of rural China. *International Journal of Educational Development*, *32*(3), 401–411.
Ji, Y., Yu, X., & Zhong, F. (2012). Machinery investment decision and off-farm employment in rural China. *China Economic Review*, *23*(1), 71–80.
Li, Q., Huang, J., Luo, R., & Liu, C. (2013). China transition and the future of China's rural wages and employment. *China & World Economy*, *21*(3), 4–24.
Lokshin, M., & Glinskaya, E. (2009). The effect of male migration on employment patterns of women in Nepal. *The World Bank Economic Review*, *23*(3), 481–507.
Mendola, M., & Carletto, C. (2012). Migration and gender differences in the home market: Evidence from Albania. *Labor Economics*, *19*(6), 870–880.
Meng, L., Zhao, M., & Liwu, D. S. (2014). Joint migration decisions of married couples in rural China. *China Economic Review*, *38*, 285–305.
Mu, R., & van de Walle, D. (2011). Left behind to farm? Women's re-allocation in rural China. *Labor Economics*, *18*(S), 83–97.
Murard, E. (2015). Consumption or leisure? The welfare impact of migration on family left behind: Theory and evidence from rural Mexico. *Paper presented at 18th IZA European Summer School in Economics, May 25–31* (Inning, Germany). http://www.iza.org/conference_files/SUMS_2015/murard_e21748.pdf.
Pailhé, A., & Solaz, A. (2008). Time with children: Do fathers and mothers replace each other when one parent is unemployed? *European Journal of Population*, *24*(2), 211–236.
Palacios-Lopez, A., Christiaensen, L., & Kilic, T. (2015). How much of the African agriculture is provided by women? *World bank policy research working paper no. 7282* (Available at SSRN: http://ssrn.com/abstract=2613749).
Pfeiffer, L., López-Feldman, A., & Edward Taylor, J. (2009). Is off-farm income reforming the farm? Evidence from Mexico. *Agricultural Economics*, *40*(2), 125–138.
Singh, I., Squire, L., & Strauss, J. (1986). *Agricultural household models: Extensions, applications, and policy*. Johns Hopkins University Press.
Stecklov, G., Carletto, C., Azzarri, C., & Davis, B. (2010). Gender and migration from Albania. *Demography*, *47*(4), 935–961.
Wang, Q. (2013). *Male migration and female force participation: New evidence from the Mexican family life survey.* (Available at SSRN 2232117).
Ye, Q., & Rozelle, S. (1994). Fertilizer demand in China's reforming economy. *Canadian Journal of Agricultural Economics*, *42*(2), 191–207.
Zhang, J., Zhang, L., Rozelle, S., & Boucher, S. (2006). Self-employment with Chinese characteristics: The forgotten engine of rural China's growth. *Contemporary Economic Policy*, *24*(3), 446–458.
Zhang, L., de Brauw, A., & Rozelle, S. (2004). China's rural market development and its gender implications. *China Economic Review*, *15*(2), 230–247.
Zhi, H., Huang, Z., Huang, J., Rozelle, S., & Mason, A. D. (2013). Impact of the global financial crisis in rural China: Gender, off-farm employment, and wages. *Feminist Economics*, *19*(3), 238–266.