

Off-Farm Jobs and On-Farm Work in Periods of Boom and Bust in Rural China¹

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Our overall goal is to help increase our understanding of labor supply on labor supply decisions in China during times of recession. This paper describes labor shifts in response to China's cycles of boom and bust and explores the farmer's decision to enter or exit the off-farm labor force. Using our own household data set, we present evidence that the agricultural sector has played an important stability-increasing role in the nation's development in

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the reform era. When layoffs increased and hiring slowed in the early 1990's, those who lost their jobs returned to the agricultural sector. Increased labor use in agriculture has reduced the income fluctuations that would have occurred if there had been no on-farm work available. *J. Comp. Econ.*, September 2001, **29**(3), pp. 505-526. Center for Chinese Agricultural Policy, Institute of Geographical Sciences and Natural Resource Research, Chinese Academy of Sciences, Beijing, China; and Department of Agriculture and Resource Economics, University of California, Davis, California 95616. © 2001 Academic Press

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1. INTRODUCTION

One of the agricultural sector's least explored roles in a rapidly industrializing economy is the provision of work for rural laborers who lose their off-farm jobs. Although researchers have explored intersectoral labor linkages between agriculture and the rest of the economy, e.g., Hirschman (1970) and Johnston and Mellor (1961), such studies focus on the movement of labor out of rural areas into urban areas and ignore the reverse flow of labor during recession times. However, in many nations, agriculture also provides employment during economic contraction. Hence, the agricultural sector may not only contribute to development by supplying labor to the industrial and service sectors during economic expansions, but also help to stabilize the economy by providing employment when workers lose their off-farm jobs.

Despite the lack of formal study, agriculture's ability to create jobs during downturns is a commonly observed phenomenon. Historically, as economic growth has slowed and workers from rural areas have been laid off their off-farm jobs, agriculture has absorbed labor in the 19th century United States, in post-World War II Japan, and in Taiwan and Korea during their eras of miracle growth of the 1960's and 1970's (Todaro, 1976; Nafziger, 1997; Jia, 1991; Jayasuriya and Shand, 1986; Misawa, 1971; Takeya, 1991; Christiansen, 1990; and Abey et al., 1981). More recently, when economic recession has created unemployment, labor markets have facilitated labor movement back into rural areas during recessions in Peru, Korea, and Thailand (Lee, 1980; Laite, 1985; Stretton, 1985; Vanderkamp, 1972). Even as recent as the economic crisis in Asia during the late 1990's, large numbers of laid off urban workers returned to rural areas, where individuals subsisted by rejoining the agricultural labor force (Richberg, 1998).

Agriculture's ability to assimilate labor is an implicit assumption in many labor movement models. Conventional economic models, including Todaro's and the Fei-Ranis revision of the Lewis model, typically assume that excess labor in rural areas can find sustenance and employment waiting for opportunities in the off-farm or urban sector (Gillis et al., 1996). Traditional analytical frameworks also implicitly assume that small family farms support family members by employing them on the farm when they are laid off or when they have not yet found employment in the off-farm economy (Rosensweig and Binswanger, 1993).

Understanding whether the agricultural sector can provide employment for those left in the rural sector, or for those unable to find employment during a recession, is especially pertinent to present-day China. The nation has a large, landed rural population, a rapidly expanding mobile labor force, and a fluctuating economy. Faltering growth rates of rural enterprises in recent years and ongoing labor restructuring in state-owned enterprises and the government bureaucracy raise the prospect of rising levels of industrial and urban unemployment and fewer jobs for rural workers. Concerns that a repeat of the Asia crisis will someday occur in China make it important to understand agriculture's capacity to provide employment to laid off off-farm labor. If unemployed rural workers can support themselves by moving back to the countryside or by postponing migration, there may be less risk of political and social unrest as a result of current or future economic fluctuations.

Despite the potential importance of the linkage between the agricultural and nonagricultural labor markets in China and elsewhere in the developing world, there is relatively little research on how off- and on-farm employment outcomes are affected by economic fluctuations. The overall goal of our paper is to increase our understanding of the labor response of rural households and individuals in times of economic boom and bust. First, we establish that rural workers participated less in the off-farm sector, exited the sector more frequently, and earned lower wages in China's economic recession of the early 1990's. Next, we illustrate that, during this same time period, households and individuals allocate increasing labor to the on-farm sector, in part, at least, in response to the loss of a family job or their own job off the farm. Finally, we demonstrate that different groups of individuals exhibit different labor supply behavior in times of economic boom and bust.

However, space constraints and data limitations have forced us to narrow the focus of our inquiry in several ways and our relatively localized data set limits the generalizations that can be drawn from the study. First, while an important part of the ability of agriculture to employ and allow labor to exit involves labor demand, we focus on labor supply or the employment outcomes of households and individuals. Second, although our results have implications for how households buffer income and consumption during economic downturns, we do not examine explicitly the impact on either total or sectoral income or household consumption.² Finally, it is beyond the scope of our paper to try to explain the boom and bust cycles of China's economy; after showing that these cycles exist, we focus on how rural households respond to them. Moreover, because meeting our objectives requires examining behavior over time, we need household time allocation data that cover both bust and boom periods. We have collected one of the only data sets suitable for this purpose in northern Jiangsu in 1988, 1992, and 1996. While the

² If we show that on-farm labor supply increases during recessions, and if it is assumed that on-farm labor contributes positively to output in that its marginal product of labor is positive, our results would imply that the provision of employment by the agricultural sector during recession also buffers income against declines that are linked to falling off-farm employment.

local nature of the sample limits attribution of the findings to the rest of China, the data's high quality and the unique feature of following the same households and individuals over a 9-year period allow us to examine many interesting questions of labor supply in times of both economic expansion and stress.³ We also exploit the panel nature of the data in our econometric work.

To meet our goals, the next section describes patterns of boom and bust and shifting employment in the on-farm and off-farm sectors that occur in response to the cycles. Section 3 delineates our hypotheses and develops the specification of the empirical model. Section 4 presents the results; the final section concludes.

2. BOOM AND BUST CYCLES IN REFORM CHINA

China's reform period is characterized by remarkable economic growth in both agriculture and industry. Measured in real 1996 terms, national GDP rose from 896 billion yuan in 1986 to 6.9 trillion yuan in 1996 (State Statistical Bureau, 1997). The credit for much of the growth is attributed to a series of agricultural and rural industrial reforms beginning in 1978 (Naughton, 1995). The reforms provided new opportunities for farmers, allowing them to respond to market signals instead of central planning commands. Agricultural production shifted to the household responsibility system and as farm families also took greater control of labor allocation decisions, production increased in response to the new incentives (Lin, 1992). Led by the rapid growth of township and village enterprises and expanding urban labor markets, many farmers and their family members began to supply their labor to off-farm activities, resulting in the rise of non-farm employment from 67 million to 130 million between 1985 and 1996 (State Statistical Bureau, 1997).

However, China's economy has not grown at a uniform pace over time. Although scholars agree on this fact, the causes for the fluctuations remain controversial (Naughton, 1995; Yusuf, 1994; Zhu and Brandt, 2001). Whatever the cause, the economy surged ahead in the mid and late 1980's, slowed following the retrenchment of 1989, and, after recovering slowly in the early 1990's, boomed again in the mid 1990's (Fig. 1A). Employment has risen and fallen with economic growth. After increasing in the 1980's, both off-farm and urban employment growth rates fell during the 1989 to 1991 recession and then climbed again in the mid 1990's (State Statistical Bureau, 1997). Construction, one of the largest and most cyclical employers of rural labor, exhibited employment growth in the 1980's and decline as GDP growth declined in 1989 and 1990 (Fig. 1B). Construction employment grew once GDP growth rates recovered in the mid 1990's.

The economic growth of Jiangsu Province has followed the same general trends found in China. Growth averaged more than 20% in the mid 1980's before dropping in the early 1990's (Fig. 2A). The province experienced its highest growth in 1993

³ We also note here that our work covers only one and a half segments of a boom-bust cycle. Hence, caution must be exercised in extrapolating these results to all periods of boom and bust.

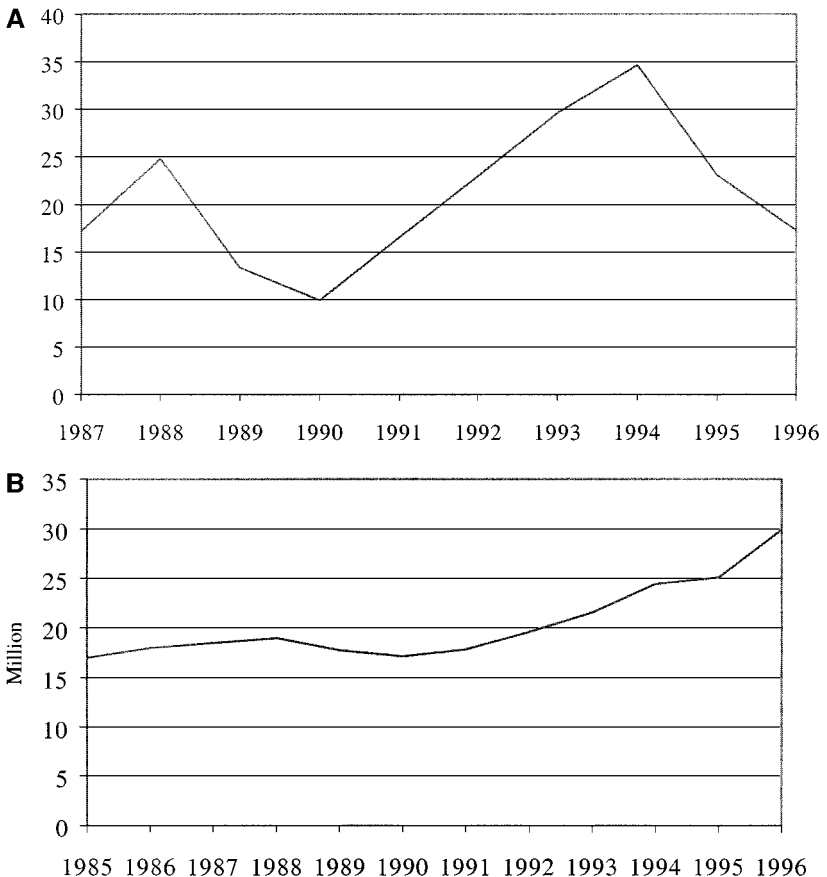


FIG. 1. Employment trend in construction sector and growth of real gross domestic product in China. (A) Growth of gross domestic product (current value). (B) Construction employment trends. *Source.* State Statistical Yearbook (1997).

and 1994. As shown by Rozelle and Jiang (1995), the cyclical trends are even more pronounced in the northern part of the province, where our sample villages are located. Northern Jiangsu growth rates in boom times exceed those of the south, in part because the north's economy started at a lower level. However, growth rates fell further and recovered later, making an even more exaggerated boom and bust cycle in the north. As in the case of China, Jiangsu's off-farm employment trends mirrored those of GDP, especially those of construction employment (Fig. 2B). If construction employment trends are indicative of general off-farm employment trends, as they are in the national data, we may conclude that the recession hit off-farm employment in Jiangsu with substantial force, especially in the north (Rozelle and Jiang, 1995).

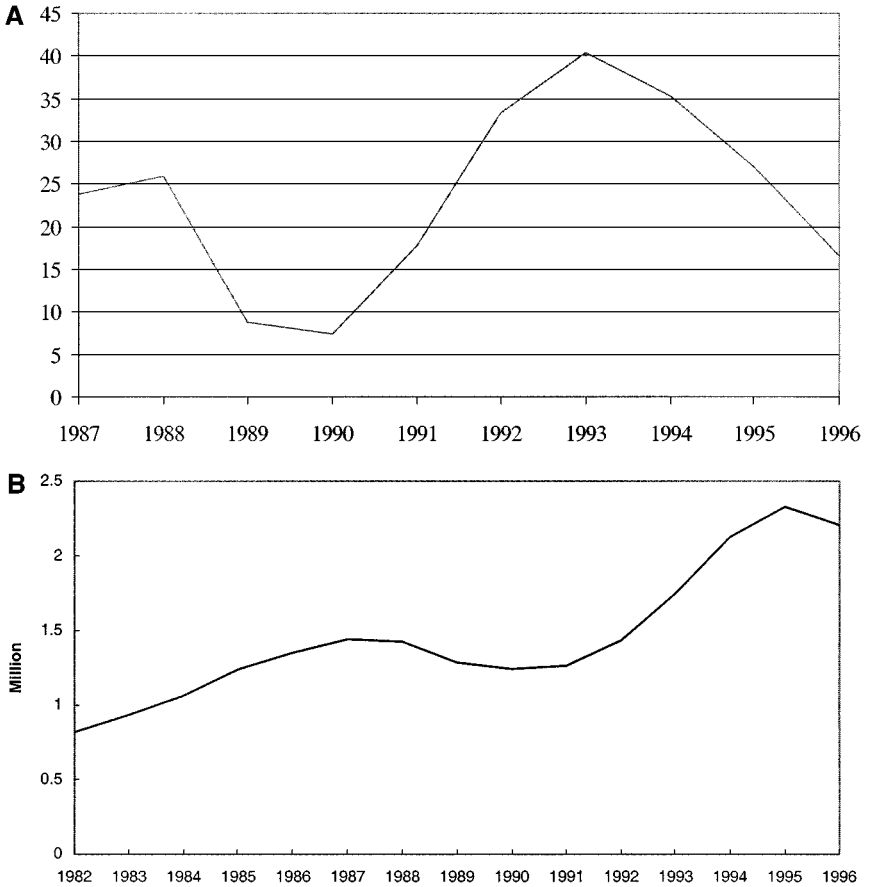


FIG. 2. Construction employment and growth of real gross domestic product in Jiangsu Province. (A) Growth of gross domestic product (current value). (B) Construction employment trends. *Source:* Jiangsu Statistical Yearbook (1997).

Not all sectors employing rural labor have grown or contracted at the same rate (Fig. 3). Rural employment growth rates in some major industrial and transportation sectors experienced the same cyclical pattern as construction. However, the rise and fall of employment in the retail and service sectors were less sharp. Employment in some types of firms had strong growth throughout the late 1980's and 1990's despite the recession (State Statistical Bureau, 1996). For example, employment in firms funded by foreign direct investment grew 25% per year before 1998, 19% between 1988 and 1992, and 18% in the mid 1990's. These patterns suggest that employment opportunities for those workers most likely to find jobs in various sectors may differ overtime. Respondents in our sample villages confirmed

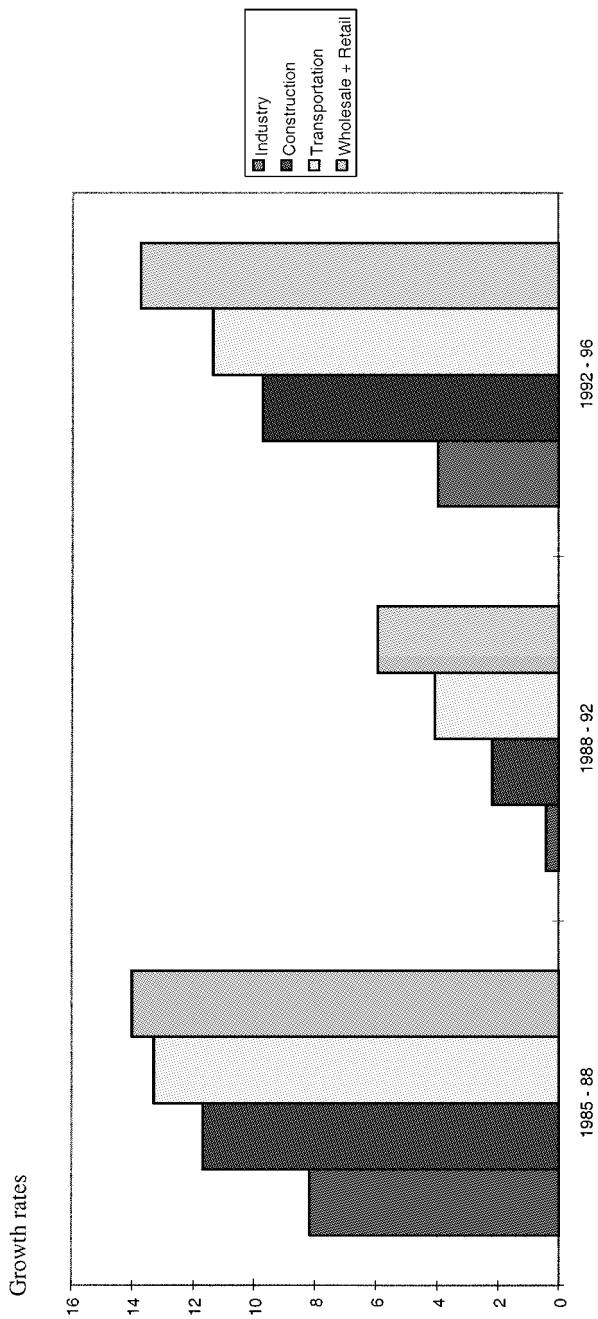


FIG. 3. Employment growth cycles in China, 1985 to 1996. Source: State Statistical Bureau (1997).

that by the early 1990's, jobs in export-oriented foreign and domestic firms could be found more easily, despite difficulties faced in other sectors.

The sponge-like feature of the rural economy is characterized by a pattern that shows labor leaving the farm during boom times and returning during recessions. Rural employment growth rates of industry and agriculture in China between 1986 and 1996 are clearly countercyclical (Fig. 4). During the recession of the early 1990's, labor that was forced out of some slow growing off-farm sectors may have been able to shift back into agriculture. In contrast, during times of rapid growth in the late 1980's and mid 1990's, labor appears to have shifted out of agriculture into the off-farm sector.

Incomes of our sample households followed the same pattern that characterized those of China and Jiangsu Province from the late 1980's to the mid 1990's. Deflated per capita family income fell by nearly 30% between 1988 and 1992, but had recovered and exhibited healthy new growth by 1996 (Table 1, row 1). Mean per capita family income in each of the villages fell from 5 to 58% between 1988 and 1992 and grew from 16 to 167% between 1992 and 1996. A significant portion of the decline in total income arose from decreases in off-farm income; off-farm income fell sharply between 1988 and 1992 before recovering and expanding between 1992 and 1996.

On- and off-farm employment opportunities for rural households followed similar patterns displaying evidence that they were responding to macroeconomic pressures. As the economy softened in the early 1990's, total off-farm labor employment of our respondents fell by about 20%, from 104 to 84 days per year (Table 1, row 2). Average agricultural labor use for the total sample jumped 63% during the recession as it increased from 51 to 83 days per person (Table 1, row 3). The opposite employment patterns occurred when the growth of the economy resumed in the mid 1990's; off-farm labor rose, although less than it had originally fallen, and the household's labor input into agriculture fell by about 30%. Entering and exiting trends mirror participation rates (Table 1, rows 10 and 15).⁴ These trends are consistent with a picture of the rural economy in which members of rural households lost their off-farm jobs, but were able to work on the farm until they were able to find another off-farm job.

The extent to which different factors affect labor supply decisions depends in part on how well labor markets are operating and on the efficiency of other institutions that either constrain or facilitate off- and on-farm employment opportunities. The literature contains a debate over how well rural labor markets work; see Rozelle

⁴ An enterer is an individual who is in the sample in both periods and does not have a job in the first period, but does have a job in the second period. In contrast, an exiter has a job in the first, but not in the second period. Exiting rates between 1988 and 1992 exceeded those between 1992 and 1996; the propensity of our sample individuals to enter is just the opposite (Table 1, rows 12 and 15). Families in our sample appear to have attempted to cushion the effect of losing off-farm jobs in the early 1990's by increasing on farm labor.

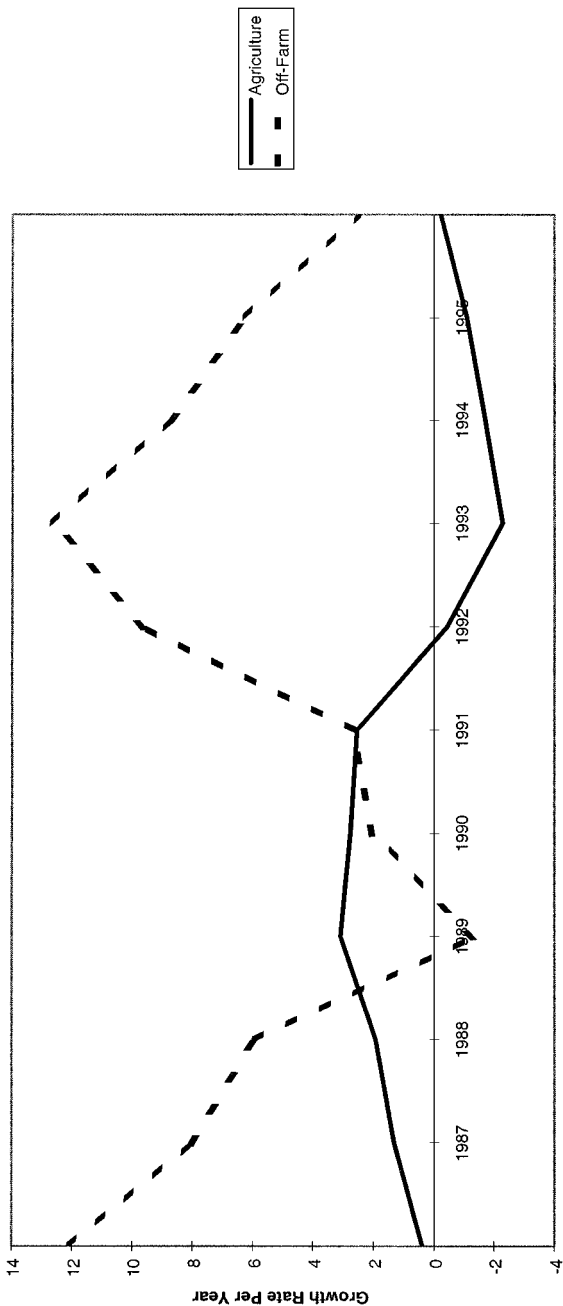


FIG. 4. Rural agricultural and off-farm employment growth rates, 1986 to 1996. Source: State Statistical Bureau (1997).

TABLE 1
Income, Labor Days, Wages, and Entering and Exiting Behavior of Sample Households
in Rural China, 1988 to 1996

Year	1988	1992	1996
Income trends (in 1988 yuan/family)			
Total income	4172	2663	5690
Labor supply trends			
Average total labor days (days/year) ^a			
Off-farm labor days	104	84	88
Agricultural labor	51	83	58
Average male labor days (days/year) ^a			
Off-farm labor	143	107	120
Agricultural labor	47	79	52
Average female labor days (days/year) ^a			
Off-farm labor	61	59	53
Agricultural labor	56	86	65
Wage trends			
Average off-farm wages (in 1988 yuan/day)			
Male labor	6	5	15
Female labor	7	4	10
Exit and entry behavior		1988 to 1992	1992 to 1996
Percentage of on-farm labor who exit			
Total average	41.5		26.4
Male labor	33.3		18.7
Female labor	61.5		47.8
Percentage of off-farm labor who enter			
Total average	14.5		25.7
Male labor	14.8		41.9
Female labor	14.3		11.6

Source. Author's survey.

^a Measured as standard days of 8 hours per person.

et al. (1999) for a survey. Both Cook (1999) and Maurer-Fazio (1999) find evidence of well-functioning labor markets. Cook demonstrates the equalization of off-farm labor returns between wage earning and self-employed workers in her rural Shandong sample. Maurer-Fazio shows the rising significance of education as a determinant of off-farm earnings. Another measure of an expanding labor market is the explosion of rural-urban migration (Zhang et al., 1995; Rozelle et al., 1999). On the other hand, Meng (1990) finds substantial evidence of non-market labor assignment and allocation behavior in the rural industrial sector. Benjamin and Brandt (1997) and Liu et al. (1998) both describe an inverse relationship between farm size and labor use, a signal that labor markets do not clear, although this may be confined to on-farm labor. Using a national representative sample of villages from across China, Zhang et al. (2000) find evidence that labor markets are functioning better, but still remain constrained. Although wages are beginning to

reflect education and experience differentials between workers, which is one measure of relative productivity, the authors find gaps among regions that have grown between the late 1980's and the mid 1990's.

The nature of the response of rural workers, especially during downturns, is shaped by the unique institutions that have arisen in China during the past several decades. Because of the household residency permit system, when rural workers are unable to find jobs or when they are laid off, they have almost no choice but to return to rural areas.⁵ The recent increase in rural to urban migration in China also means that, even if rural laborers could stay in the cities, their informal support networks are most likely relatively weak, at least in comparison to those that support migration in other nations with longer migration histories during the post-WWII period. Hence, when we observe the reversal of labor flows from rural to urban areas in China when recession begins, the shifts are likely to be more severe than those of other nations, because of the limited options in urban areas for laid off rural workers. In some cities, when the economy slowed in 1989 and migrants began losing their jobs, urban government leaders encouraged workers to return to rural areas (Cheung, 1990).

Hence, while labor markets may not be perfect, field observation and the work of most researchers suggest that the functioning of these markets has improved during the reforms. We believe it is valid to assume that rural individuals and households have been responding to market forces, such as wages, when making their decisions. However, to the extent that labor markets are imperfect, any analysis of labor supply must control for non-market factors and regional differences. For example, if employment opportunities decline, as they did in 1992, even farmers willing to work off the farm may not be able to. In our empirical work, we incorporate both market and non-market factors.

3. HYPOTHESES AND ECONOMETRIC ANALYSIS

Clearly, the economic recession in the early 1990's had a significant impact on households in rural China. However, the impact differs among households and individuals who were participating in different industries and subsectors of the labor market. Most fundamentally, apart from the traditional roles that agricultural sector has been playing, i.e., providing food and industrial labor for the economy, there is evidence that it also provided employment for rural households during economic downturns. Likewise, employment in agriculture falls and off-farm labor employment expands during an economic expansion.

To examine these effects rigorously, we undertake a series of empirical exercises. First, we test to see whether individuals in our sample were hurt or helped in terms

⁵ The residency permit system, or the *hukou* system, is a set of regulations preventing rural workers from access to the employment, housing, and other welfare benefits of their urban counterparts. In the past, these rules effectively kept rural residents from moving permanently to, and setting up a household in, an urban jurisdiction.

of obtaining access to off-farm jobs and wages when a recession or an economic boom swept through China, in general, and through northern Jiangsu Province, in particular, in the early 1990's or in the mid 1990's respectively. Next, we estimate the agricultural labor response of households and individuals by investigating how farm households used their labor in 1992. More importantly, we explore what happened to on-farm employment in the household and for the individual when an individual or an individual's family member lost an off-farm job. Finally, we examine how employment outcomes vary by gender and age.

A probit model is used to estimate off-farm work status determinants. The basic form of the model is

$$Y = aX_1 + bX_2 + cX_3 + dX_4 + eX_5 + \dots + e. \quad (1)$$

In Eq. (1), Y is a dummy variable that is equal to 0 if the individual did not work off-farm and 1 otherwise. The set of explanatory variables includes measures to account for the effects of human capital (X_1) and family characteristics (X_2). The vector, X_1 , contains four variables, age and age-squared and education and education-squared. The vector, X_2 , contains the number of children under age 6 at home, number of elderly at home, number of working age family members, and land size. In addition, Eq. (1) also includes a gender variable (X_3), a series of dummies to account for village (X_4), and year effects (X_5). To test for the impact of the recession, we look for a negative coefficient for the year dummy of 1992.⁶

The second set of equations is used to identify the determinants of the exit and entry decisions in the off-farm sector of the individuals in the sample. We specify

$$E_i = aX'_1 + bX_2 + cX'_3 + dX_4 + eX_5 + \dots + e, \quad \text{for } i = 1 \text{ and } 2. \quad (2)$$

In Eq. (2), the dependent variable, E_1 , is a dummy variable equal to 1 if the individual exited the off-farm sector from one period to the next, or zero otherwise. E_2 is a dummy variable equal to 1 if the individual entered off-farm employment from one period to the next and zero otherwise. The explanatory variables are similar to those included in Eq. (1). However, to examine the propensity of different groups of individuals in the sample to have identifiable and different exit and entry behavior, the age variables are interacted with the gender dummy variable. The human capital vector, X'_1 , includes only education and education-squared. The gender and age vector, X'_3 , includes five terms that interact gender with three age categories with the excluded base category being young males. The age categories are defined in Table 2. The sample for the entry analysis is limited to those in

⁶ In an alternative specification (Zhang et al., 1998), we take advantage of the panel nature of our data, replacing non-time varying household characteristics and village dummies with a set of dummy variables for each individual. The fixed-effects specification eliminates all unobserved latent heterogeneity from the estimation. The basic results of our model are robust to the inclusion of fixed effects.

TABLE 2
Determinants of Off-Farm Labor Participation in Rural China, 1988 to 1996

	Dependent variables				
	1	2	3	4	5
	Off-farm labor participation, dF/dx^b (probit)	Exit from off-farm labor force, dF/dx (probit)	Entry into off-farm labor force, dF/dx (probit)	Off-farm wages ^a , Heckman-TSLS	Participation equations, dF/dx (probit)
Number of observations	919	221	359	927	927
Human capital					
Age	0.04 (4.37)**	—	—	0.05 (3.6)**	0.09 (4.4)**
Age-squared	-0.00 (5.00)**	—	—	-0.00 (3.4)**	-0.00 (4.5)*
Education	0.06 (4.01)**	-0.7 (0.20)	7.4 (3.64)**	-0.01 (0.4)	0.22 (6.2)**
Edu-squared	-0.00 (2.90)**	0.0 (0.16)	-0.4 (2.73)**	-0.00 (1.1)	-0.01 (3.1)**
Household traits					
No. of kids at home	0.11 (2.16)**	-3.7 (0.53)	1.1 (0.17)	—	0.18 (1.5)
No. of elders at home	0.04 (0.74)	2.0 (0.30)	3.3 (0.85)	—	0.14 (1.2)
Family labor	0.03 (1.55)	-1.4 (0.42)	4.1 (1.58)	—	0.07 (1.1)
Land size	-0.03 (2.85)**	-0.7 (0.40)	-0.4 (0.49)	—	-0.04 (1.8)*
Gender and age					
Female	-0.29 (7.30)**	—	—	-0.13 (1.7)*	—
Middle-aged male	—	23.8 (1.66)	-0.5 (0.04)	—	—
Older male	—	46.5 (3.23)*	1.9 (0.25)	—	—
Young single female	—	12.6 (0.46)	16.6 (0.54)	—	—
Young married female	—	51.0 (3.17)**	3.4 (0.45)	—	—
Older female	—	59.8 (3.77)**	-14.4 (1.76)*	—	—
Year effects					
1992	-0.13 (3.07)**	-21.1 (3.01)**	—	-0.02 (0.2)	-0.45 (4.1)**
1996	-0.01 (0.12)	—	17.3 (3.65)**	0.63 (7.6)**	-0.08 (0.7)
Obs. P	0.45	0.35	0.26	—	—
Pred. P	0.43	0.31	0.20	—	—

Note. (1) All equations control for village effects, except Eq. (4) which controls for sector effects. (2) Z-values or *t*-values are in parentheses. (3) **Statistical significance at the 5% level; *statistical significance at the 10% level. (4) The probit model includes a constant, but the coefficient is not reported.

^a Wages are in log form and the *t*-value of the coefficient of the Inverse Mills Ratio was -1.28, which implies minimal selection bias. Off-farm participation estimates are from regression in column 5.

^b dF/dx may be interpreted as the change in likelihood of exiting or entering the off-farm labor force for a one-unit change in the independent variable.

the labor force who do not work off-farm at the beginning of either of our two periods of study.⁷ The sample for the exit analysis is limited to all in the work force who had off-farm jobs in the beginning of either of our two study periods. The definition of the dependent variables makes the estimation of Eq. (2) nearly equivalent to using a fixed effects framework.⁸

In order to analyze the determinants of off-farm wages, a Heckman two-stage least squares model is used.⁹ The basic idea is that if we estimate the wage equation in a single equation model only, we might get biased estimates because the sample does not include those individuals who choose not to work because we do not have wage observations for those who do not work off the farm. However, the behavior of nonworking individuals includes information that can help identify the determinants of wages. Given the wage that they face in the labor market, such individuals choose not to supply labor to the market, conditional on all nonwage factors that affect their labor allocation decisions. Our estimation allows us to include all individuals in the analysis.

Following Heckman, our specification of the model includes two equations. The first stage of the analysis is similar to Eq. (1). The second stage wage model is

$$\text{Ln(Wage)} = aX_1 + cX_3 + eX_5 + fX_6 \dots + e, \quad (3)$$

where the dependent variable is a measure of the daily wage net of mandatory, work-related expenses. In Eq. (3) the X_1 and X_5 vectors include measures of human capital and year effects as in Eq. (1). X_3 is a gender dummy variable and X_6 is a vector of sector-specific dummy variables, because the wage of an individual will be affected if the job is in a factory, construction firm, or trading enterprises. For the latter, the excluded base category represents all other jobs; this category is dominated by service sector jobs.

⁷ The sample includes all of those in the workforce without off-farm jobs in 1988 who were still present in the workforce in 1992 (period 1) and all of those without off-farm jobs in 1992 who were still present in the workforce in 1996 (period 2).

⁸ A fixed effects model would be estimated by including a dummy variable for each individual or household, which is the same as working with equations that are first-differenced. In the entry and exit model, our dependent variable is in first differences.

⁹ The solution to this problem is to estimate the wage equation in two stages. The first stage is to estimate a probit equation of the choice whether to work, which is similar to Eq. (1). From the first stage of the analysis, the Inverse Mills Ratio, which measures the propensity for a person to participate in the labor market, is constructed. Its inclusion in the second stage, the determinants of wage equation, corrects for the bias that would otherwise affect estimates of the wage equation using the censored sample. To get better identification on the coefficients of the wage equation, i.e., better than just relying on the Mills ratio, one would include variables in the estimation of the participation probit that are significant determinants of the decision to work or not but that have no independent effect on the wage, which is the dependent variable in the second stage of the model. In our case, we assume that land size, family size, the number of children, and the number of elders at home affect labor participation but do not affect the wage rate, which is determined by labor market traits and the individual's human capital.

For a direct test of whether agriculture buffers the effect of a recession, an ordinary least squares estimator (OLS), with and without household fixed effects, is used to estimate the determinants of individual and family agricultural labor decisions, measured in standard labor days of 8 hours per year. In the household labor response equation, a 1992 dummy variable and a measure of the household's off-farm work status of the family's other members are included to estimate the propensity of the family to increase their on-farm use of labor when layoffs occur among members. We also run a similar equation for individual labor responses. While holding the individual's own off-farm work status constant, we include a measure of the percentage of other family members who are working off the farm as a direct test of the buffer effect. Employment in the agricultural sector should rise as the proportion of family members working off the farm declines.

Because the measures of the rest of the family's off-farm labor employment status also depend on the household's and the individual's agricultural labor decisions, we must deal with possible endogeneity. First, we include only a measure of the recession year effect, the 1992 year dummy only. Next, we include both the 1992 dummy and an uninstrumented measure of the family's off-farm work status. Finally, we include an instrumented measure of off-farm work status. We identify off-farm work status with demand side variables that are unrelated to family or individual labor decisions, such as the year effect, the growth of county employment and output, and the total employment in the village-run factories. Unfortunately, although these variables pass the Hausman–Wu exclusion restriction tests and are the best instruments we could find, they explain only a small fraction of the variability of off-farm labor supplied by other household members. As such, their predictions may not be a very good proxy for demand-driven labor shocks to the family.

4. EMPIRICAL RESULTS

To test for the impact of boom and bust on off- and on-farm employment and other labor market outcomes, we estimate sets of equations for determinants of off-farm work status, entry and exit, and the off-farm wage in Table 2, and for the household's and individual's on-farm employment in Table 3. Most of the models perform well in terms of goodness of fit. The adjusted r -square statistics for the labor supply equations and the wage equations that are estimated by OLS are all above 0.27. The goodness-of-fit measures from the probit equations for off-farm labor participation and entry and exit of the off-farm labor force show similar fits.

The signs of the coefficients of many of the explanatory variables also are as expected and significant. For example, in the equations explaining the determinants of off-farm employment status, labor force entry and the off-farm wage in Table 2, most of the coefficients of the human capital variables show that increases in experience (age) and education have a positive, but diminishing, effect on the decision by individuals to move off the farm. Land size, as expected, is negatively correlated with the individual's off-farm employment status.

TABLE 3
Agricultural Labor Supply Response to Recession in Rural China, 1988 to 1996

	Dependent variables: labor days per year				
	1 ^a (Household)	2 (Household)	3 (Household)	4 (Individual)	5 (Individual)
No. of observations	333	333	333	928	927
Human capital					
Age	—	—	—	11.39 (14.8)**	12.12 (16.0)**
Age-squared	—	—	—	-0.13 (12.8)**	-0.14 (14.1)**
Education	—	—	—	1.52 (1.2)	2.65 (2.0)**
Education-squared	—	—	—	-0.23 (2.3)**	-0.29 (3.0)**
Household traits					
No. of kids at home	-18.64 (1.2) ^b	-25.78 (1.3)	-26.06 (1.2)	-8.51 (1.9)*	-6.70 (1.5)
No. of elders at home	8.67 (0.7)	17.29 (0.7)	11.13 (0.4)	0.97 (0.2)	2.16 (0.5)
No. of working age family members	22.90 (4.6)**	20.96 (2.5)**	24.43 (2.9)**	-4.53 (2.7)**	-5.15 (2.6)**
Land size	14.64 (6.6)**	12.87 (4.0)**	12.34 (3.6)**	3.89 (5.3)**	3.50 (4.9)**
No. of family members working off-farm	—	-6.29 (0.8)	—	—	1.94 (0.9)
Instrumented no. of family members working off-farm	—	—	-249.71 (5.9)**	—	—
Work off-farm	—	—	—	—	-24.53 (7.1)**
Gender					
Female	—	—	—	5.22 (1.4)	-1.49 (0.4)
Year effects					
1992	109.77 (9.0)**	105.77 (8.0)**	—	28.12 (7.2)**	25.77 (6.7)**
1996	17.00 (1.4)	14.47 (1.1)	—	-3.23 (0.8)	-3.11 (0.8)
Constant	-19.23 (1.0)	84.84 (1.2)	561.73 (5.2)**	-179.67 (10.1)**	-174.93 (10.0)**
Adjusted R ²	0.44	0.39	0.28	0.41	0.44

Note. (1) **Statistical significance at the 5% level; *statistical significance at the 10% level. (2) Models in columns 1, 4, and 5 control for village effects.

^a All models include fixed effects except the model in column 1.

^b The absolute value of *t*-statistics is given in parentheses.

Our various models of off-farm participation and entry and exit demonstrate that the recession in the early 1990's did affect employment in the China's off-farm sector adversely (Table 2). The negative and significant sign for the 1992 year dummy variable means that, holding all other factors constant, individuals in the sample had a 13% less chance of being employed in the off-farm sector (Table 2, column 1). The results of the exit and entry models also are consistent with our hypotheses (Table 2, columns 2 and 3). Individuals exit, or are laid off, 21.1% more frequently in the 1988 to 1992 period than in the later period from 1992 to 1996, with the negative sign indicating that they exit less often. However, the layoffs appear to have been temporary. In the boom period of the mid 1990's, individuals in our sample's rural households were 17.3% more likely to enter the labor force than during the earlier period. Clearly, the results in Table 2 are unambiguous in their portrayal of 1992 as a year in which off-farm labor employment was lower and workers generally were both laid off in increasing numbers and had difficulty finding new jobs.

In addition to participation effects, our results indicate that periods of boom and bust affect the off-farm wage. Although the coefficient on the 1992 dummy variable in the wage equation (Table 2, column 4) is insignificant, it is negative. However, the real wage in China increased dramatically as the economy recovered between 1992 and 1996. In our sample, the real wage was 63% higher in 1996, a boom year, than in 1992, the recession year. The recession had an effect on both the participation of the household in the off-farm sector and the amount that was earned while working.

When the rest of the economy slumps, household employment patterns demonstrate agriculture's role in absorbing labor (Table 3). At the household level, most of the findings are strong and robust to a different estimators and specifications (Table 3, columns 1 to 3). Employment in agriculture increases dramatically in 1992. Households in rural China provide more than 100 additional days of labor on the farm during times of a downturn (Table 3, column 1). This result is robust to adding a variable that measures the total number of family members that are working off the farm (Table 3, column 2). Given that each on-farm laborer was contributing, on average, fewer than 100 days of labor per year (see Table 1, row 5), this result indicates that families are employing additional laborers during times of economic recession. When an instrumented measure of the family's off-farm labor market participation is included (Table 3, column 3), we see that at least part of the rise of on-farm employment occurs in households that have not been as successful in placing or keeping their members employed in the off-farm sector during the recession.¹⁰

¹⁰This result is important because it indicates that at least one of the reasons for labor to rise systematically on the farm is due to the recession. The variability that is causing the coefficient to be negative is clearly related to the factors that are associated with a recession, specifically the year and growth.

The results of the individual agricultural employment equations also support the findings of the household-level analysis (Table 3, columns 4 and 5). In column (4), when a time dummy variable for 1992 is included, individuals increase their on-farm employment by nearly 28 days, a figure that is consistent with the household level equations because households frequently employ up to three to four of its family members in farming activities. When the individual's own work status is included, the negative correlation between an individual's agricultural employment and off-farm employment is clear (Table 3, column 5). This result is important because it indicates that part of the increase in agricultural employment comes from workers who have been laid off or had their days per month in the off-farm sector reduced. The positive coefficient on the variable representing the number of family members working off the farm suggests that, as members return to the farm and this variable falls, all individuals increase their on-farm employment. However, with the year effect already accounted for and highly significant at 25.77 having a t -ratio of 6.70, the standard error is large relative to the magnitude of the coefficient so that the result is not statistically significant.

While our results show that recession has led to a sharp fall in off-farm employment and the evidence is strong that many of those who were laid off become employed in agriculture, such generalizations do not apply to all segments of the rural sector. Women appear to be more vulnerable to recession than men. While everyone is working in rural China, at least in agriculture, in our sample, participation in the off-farm labor force is significantly lower for women (Table 2, column 1). Even after accounting for differing levels of human capital and the structure of the family, women have a 29% less chance of working off the farm. Moreover, they are 22.4% more likely to exit the labor force in all periods (Table 4, column 1) and 10.3% less likely to enter (Table 4, column 3). For some reason, women are being excluded systematically from the labor market. Perhaps there is some cultural or gender discrimination or other unmeasured factor that is inhibiting women's employment off the farm. However, the cause of our observation is beyond the scope of this paper, but is addressed further in our other work (Zhang et al., 2000).

The recession affects different age groups differently. In the early 1990's when most people were being laid off, young single women and young men were not exiting nearly as fast as older men and married and older women (Table 2, column 2). Moreover, in boom times older women enter less frequently even after all other factors are accounted for (Table 2, column 3). Young women, who are disproportionately employed in what appears to be the more recession-proof service and export-oriented sectors, may be taking advantage of the fact the males in the family have returned to the farm. One explanation of our findings is that, although the family may not find it profitable to send young single and married women to these jobs when men have opportunities to work off-farm, the employment opportunities become attractive as the opportunity cost of having the women leave the farm are lower when men do not have jobs.

TABLE 4
Impact of Economic Recession on Off-Farm Employment in Rural China, 1988 to 1996

	Dependent variables			
	Exit from off-farm sector		Entry into off-farm sector	
	dF/dx^a	<i>z</i> -value	dF/dx	<i>z</i> -value
Number of observations	275		361	
Human capital				
Age	-22.4	(1.23)	2.8**	(2.36)
Age-squared	0.03	(1.18)	-0.0**	(2.52)
Education	-5.36**	(1.93)	8.8**	(4.21)
Edu-squared	2.23	(0.23)	-0.5*	(3.05)
Household traits				
No. of kids at home	-5.30	(0.66)	-0.9	(0.13)
No. of elders at home	-4.02	(0.41)	6.7*	(1.67)
Family labor	2.57	(0.80)	6.0*	(2.37)
Land size	-1.18	(0.06)	-0.8	(0.85)
Gender				
Female	22.4**	(3.57)	-10.3*	(1.94)
Village effects				
Village 3	16.00**	(2.16)	-0.3	(0.06)
Village 4	4.04	(0.33)	3.2	(0.43)
Village 5	19.82*	(1.74)	3.4	(0.48)
Year effects				
1988-1992	8.29	(1.25)	—	—
1992-1996	—	—	16.7**	(3.57)
Obs. P	0.480		0.25485	
Pred. P	0.48161		0.20113	

Note. (1) **Statistically significant at 5%; *statistically significant at 10%. (2) Dummy variable results represent the effect of a discrete change from 0 to 1. (3) Probit model included a constant, but coefficient not reported.

^a dF/dx may be interpreted as the change in likelihood of exiting or entering the off-farm labor force with a one-unit change of independent variable.

5. CONCLUSION

Our paper presents evidence that China's agricultural sector, at least that in the sampled areas in Northern Jiangsu province, has played an important stabilizing role in the nation's development in the reform era. Families and individuals in these areas are making strategic, albeit constrained, labor allocation decisions, taking into account the decisions of other members. When layoffs increased and hiring slowed in the late 1980's and early 1990's, those who lost their jobs returned to the agricultural sector. Instead of being idle and possibly becoming a source of social and political instability, these returning workers found employment in the agricultural sector.

The strength of agriculture's capacity to absorb and release labor has important implications for household incomes. Assuming that individuals work on the farm only when they have a positive marginal product, increased labor use in agriculture has reduced the fluctuation of incomes that would have occurred if there had been no work on the farm. If families can depend on agriculture to support off-farm workers who are laid off or underemployed during recessions, family members may also be more willing to accept the risks of joining the off-farm sector as wage earners or entrepreneurs (Giles, 1997). Hence, if good rural labor markets help absorb laid off workers and buffer incomes during economic downturns, the prospects of continuing uneven employment growth indicate the importance of developing further the on-farm and off-farm labor markets in China.

Not all individuals are affected in the same way during recessions. Our results are consistent with the hypothesis that older and married women and older men are the first to be laid off and the last to be hired back. When women do get jobs off the farm, their wages are lower and their tenure is less secure than that of men. However, not all women are hurt by every recession. Some women actually gained from the recession of the early 1990's. When men in their households returned home and began to increase the amount of farm labor, young married and single women were better able to move into jobs in those industries less hurt by recession. While it is too early to tell, the experience gained by these women may help their status and position in the village, even if they are denied opportunity to work off the farm in the next boom because men find it more profitable to reenter the job market. Work experience off the farm teaches women skills and provides an experience in which they have earned income and contributed to the household in different ways than if they had stayed on the farm.

Apart from the differential effects on different parts of the rural community, our results are highly suggestive of one thing. In an economy that is subject to economic ups and downs, a healthy agricultural sector will be an asset. Agriculture supplies even more than the five services that were discussed by Johnston and Mellor (1961). The sector provides high quality labor for the industrial and service sectors when demand is strong and the economy is growing. When the economy slows, as it inevitably will from time to time, the stronger the agricultural sector, the better equipped it will be to play a role of temporary employer of labor. Hence, our results provide another reason for maintaining investment and developing good overall management in the agricultural sector.

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