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The massive flow of labor into the off-farm sector has brought new prosperity to millions of rural households during China's economic reform era. The proportion of the rural labor force that has entered the labor force has risen from around 22 percent in 1988 to 34 percent in 1995 (Rozelle et al., 1998). The rise in wage earnings and income from self-employed activities has created most of the increase in rural incomes in the late 1980s and 1990s (Parrish, Zhe, and Li, 1995; Rozelle, 1995).

The rise of working off the farm, however, also brings new uncertainties with it: the risk of unemployment and the risk of fluctuating wages. In many other countries around the world, the risks associated with wage earning jobs have been shown to be important sources of household risk (Kochar, 1999). Giles (1999) demonstrates that in rural China, the risks of unemployment in regional and local labor markets constitute the largest component of overall rural household risk. The risk from unemployment and wage risk also is the fastest growing source of risk.

Understanding how rural residents can best shield themselves from the risks of rural off-farm work is increasingly important to both policy makers and the households themselves, especially with the nation's large rural population, its rapidly expanding mobile labor force, and a stop and go economy. China's growth in the past 20 years has been characterized by boom and bust cycles (Zhang et al., 2001). And there are reasons to believe that more macro-level fluctuations will occur in the future. Faltering growth rates of rural enterprises and the government's announcements of proposed layoffs in state-owned enterprises and government bureaucracy raise the prospect of rising levels of urban unemployment (Kwang, 1998). Worries that the Asian crisis could repeat itself and spread even more deeply into China, valid or not, also raise interest in understanding how rural household's deal with risk. If some types of rural laborers are better able to function in China's economy in the future and such features can be provided to more workers, there may be less risk of political and social unrest as the result of the current or future economic fluctuations. At the household and individual level, those farmers who cope with risk better or face less risk, may be willing to engage in such activities, which may lead to greater reward.

Despite the potential importance of identifying the characteristics of rural households that help them face the uncertainties embodied in China's emerging labor markets, almost no work has been done on how off- and on-farm employment outcomes are affected by economic fluctuations and which types of individuals are affected the most. In this paper, we intend to focus on one important characteristic of rural individuals: education. After establishing that rural China over the last 15 years has indeed experienced periods of expansion and recession and that these have affected the employment of rural laborers, we seek to examine the role of education in helping farmers

take advantage of opportunities for employment and avoid the dangers of unemployment. Specifically, we seek to answer a number of questions: In China's emerging labor markets, does education facilitate access to jobs and entry into the labor market? When rural laborers are more educated are they less likely to be laid off during economic downturns? How does education affect wages? And, when rural residents are not working off the farm and must rely on farming for their income, how does education affect labor response in agriculture? More generally, we are also interested in understanding if the role of education is becoming more important as a determinant of off-farm employment and wages as labor markets have developed and matured during the reform era. If education can be shown to a.) increase the probability of working off the farm; b.) increase the probability of entry during periods of boom; c.) decrease the probability of becoming unemployed during periods of recession; d.) raise the wage rate of the individual; and e.) increase the supply of on-farm labor when the individual is working on the farm, then we can establish the importance of education in decreasing the risk that have emerged with the rise of the importance of off-farm labor in rural China during the reform era.

To meet this goal, our paper first describes patterns of shifting employment that occur in response to China's cycles of boom and bust. Second, we explore the decisions of individuals and families to enter or exit the off- and on- farm labor forces when the economy is good and when it is bad, and assesses how the level of education of the individual affects their performance in the labor market. We also examine the impact of education on wages. Finally, we provide a summary of the implications of our findings.

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, our study focuses on education and labor supply behavior of the individual and does not consider a number of other traits or institutions that might affect the risk faced by rural residents during times of boom and bust. Second, although our results have implications for how households buffer income and consumption during economic downturns, we do not explicitly examine the complete impact on either total or sectoral income or household consumption.[1] Finally, it is beyond the scope of our paper to try to *explain* the up and down cycles of China's economy; after showing that cycles exist, we center our attention on how rural households respond to them. Moreover, because meeting our objectives requires examining data over time, we need household time allocation data that cover both bust and boom periods. One of the only such data sets we know of was collected by the authors in northern Jiangsu in 1988, 1992, and 1996. While the local nature of the sample limits casual attribution of the findings to all of China, the data's relatively high quality and its unique feature of following the same households and individuals in the households over a 9-year period allow us to examine many interesting questions of labor supply in times of economic

expansion and stress.[2] We also exploit the panel nature of the data in our choice of econometric techniques.

Recessions and Expansion in Reform China

China's reform period is characterized by remarkable economic growth in both agriculture and industry. National GDP rose from 896 billion yuan (1997 value) in 1986 to 6.9 trillion yuan in 1996 (State Statistical Bureau, 1997). Much of the credit for this growth goes to a series of agricultural and rural industrial reforms implemented 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 as farmers responded to the new incentives (Lin, 1992). Led by the rapid growth of township and village enterprises (TVEs) 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).

China's Stop and Go Economy

China's economy, however, has not grown at a uniform pace over time, a fact that scholars agree on, but the causes of which remain controversial. Naughton (1995) describes a complicated cycle of reform and retrenchment. Yusuf (1994) details a policy and inflation cycle. Zhu and Brandt (1995) blame financial and fiscal policy. Whatever the cause (the explanation is beyond the scope of this paper), the economy surged ahead in the mid- and late 1980s, slowed following the retrenchment of 1989, and after recovering slowly in the early 1990s, boomed again in the mid-1990s.

This period of rapid development followed by recession followed by rapid development most clearly manifests itself in employment. During these years, employment has risen and fallen with economic growth (Figure 1). After increasing in the 1980s by more than 8 percent, employment in the manufacturing sector fell to nearly zero during the 1989-91 recession and then climbed again in the mid 1990s. Construction employment, one of the largest employers of rural labor, displayed a similar pattern of employment, rising in the 1980s, slowing as GDP growth declined in 1989 and 1990, and finally growing again once GDP growth rates recovered in the mid-1990s.

The economic growth of Jiangsu Province has followed the same general trends found in China. Growth averaged more than 20 percent in the mid-1980s, before dropping in the early 1990s (Jiangsu Statistical Yearbook, 1997). The province experienced its highest growth in 1993 and 1994. As shown in Rozelle and Jiang (1995), the cyclical trends are even more pronounced in the northern part of the province, the location of our sample villages. Northern Jiangsu growth rates in boom times exceed those of the south, in part because the north's economy started at a lower level. Growth

rates, however, fell further and recovered later making an even more exaggerated boom and bust cycle. Just as in the case of China, Jiangsu's off-farm employment trends mirrored those of GDP. Construction employment in the province, rose in the 1980s, fell in the early 1990s, and recovered in the mid-1990s (State Statistical Yearbook, 1997).

Incomes of our sample households followed the same up-down-up pattern that characterized those of China and Jiangsu Province from the late 1980s to the mid-1990s. Deflated per capita family income fell by nearly 30 percent between 1988 and 1992, and 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 percent between 1988 and 1992 and grew from 16 to 167 percent between 1992 and 1996. A large part of the fall in total income arose due the fall in off-farm income; off-farm income fell sharply between 1988 and 1992 before recovering and expanding between 1992 and 1996.

Off-farm employment opportunities for rural households followed similar patterns, displaying evidence that they were responding to macro-economic pressures. As the economy sagged in the early 1990s, total off-farm labor employment of our respondents fell by about 20 percent, from 104 to 84 days per year. The opposite employment patterns occurred when the growth of the economy picked up again in the mid-1990s; off-farm labor rose although less than it had originally fallen (Table 1, row 2). In contrast, average agricultural labor use for the total sample jumped 63 percent during the recession period, increasing from 51 to 83 days per person (row 3). Between 1992 and 1996, when the economy was booming, household labor input into agriculture fell by about 30 percent.

Wages of our sample workers also reflect the rising and falling of the economy. Deflated by the rural consumer price index, the daily wage (corrected for 8 hours per day) fell from 6.5 yuan to 4.5 yuan between 1988 and 1992. As the economy recovered during the four years after 1992, the average daily wage of our respondents nearly tripled to 13 yuan.

Labor Markets, Education, and Work in Rural China's Stop and Go Economy

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 off- and on-farm employment opportunities or facilitate them. A debate rages about how well rural labor markets work (Rozelle et al., 1999). Both Cook (1999) and Maurer-Fazio (1999) find evidence of well-functioning labor markets; Cook in the equalization of off-farm labor returns between wage earning and self-employed workers in her rural Shandong sample and Maurer-Fazio in 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, Zhao, and Chen, 1996; Rozelle et al., 1999). On the other hand, Meng (1990; 1995) finds much evidence of non-market labor assignment and allocation behavior in the rural industrial sector. Benjamin and Brandt (1997) and Liu, Carter, and Yao (1998) both describe an inverse relationship between

farm size and labor use, a signal that labor markets do not clear—though this may be confined to on-farm labor. Using a national representative sample of villages from across China, Rozelle, Hughart, and Zhang (1998) also find evidence that labor markets are becoming better, but still are constrained. One way to test the emergence of labor markets would be to examine whether or not hiring, firing, or wage setting decisions reflect the education and experience differentials among workers.

Our survey data clearly show that education affects the ability of the household to take advantage of off-farm employment opportunities in rural China and that this tendency is rising over time. In all three years of our survey—1988, 1992, and 1996—those individuals with a middle school education and above have higher off-farm participation rates (Table 2, rows 1 and 2). Perhaps more importantly, the difference between those with less and more education is expanding sharply over time. In 1988 and 1992 the off-farm participation rates of those with middle school or above exceeded that of those with less education by around 50 percent. By 1996, however, the difference had risen to more than 100 percent. In contrast, those with less education worked more on the farm (rows 3 and 4) in every period. Interestingly, however, during the 1992 recession period, those with education did increase their annual working days by more than 60 percent.

Our household data also show the effect of education on employment behavior as rural China moves into and out of recession, though the impact is more apparent in the later year of the sample (Table 3). From 1988 to 1992, 37 percent of the individuals exited the labor force, more than the 28 percent that entered. Of those, however, those with more education exited somewhat less (35 percent) than those with less education (39 percent). Such a finding would indicate a slight propensity (in our descriptive data) that those with higher education are better able to buffer themselves from the unemployment effects of a recession. During the recessionary period, however, there was almost no difference in entry between those with different amounts of education. In contrast, between 1992 and 1996, as the economy was expanding, those with education were able to take advantage the employment opportunities and keep themselves from being laid off.

While it is unclear whether the more pronounced education effects on labor supply seen in Tables 2 and 3 are due to the fact that education has a more pronounced effect during booms rather than recessions or that education has been rewarded more during later years of reform, the descriptive statistics have raised a series of questions. Does education buffer workers from unemployment during recession? Does it allow workers to take advantage of employment opportunities during booms? Are there any other effects, such as the effects on wages and on-farm labor allocation? In the following sections we use multivariate analysis to examine these questions.

Hypotheses and Econometric Analysis

Our strategy for more rigorously testing the validity of these observations is to undertake a series of empirical activities examining the employment outcomes of individuals when China's economy is experiencing periods of both boom and bust. First, we examine if individuals in our sample were "hurt" (or "helped") in terms of access to off-farm jobs and wages when recession (economic boom) swept through China, in general, and northern Jiangsu Province, in particular, in the early 1990s (in the mid-1990s). Holding other factors constant, we estimate ~~the~~ how education has affected participation in and entry into and exit out of the off-farm sector. Next, we attempt to isolate the effect of education on wages. Finally, we also explore what happened to on-farm employment for the individual, when he/she becomes unemployed.

Model Specifications

Off-farm work participation

In this study, a probit model is used to estimate off-farm work status determinants. The basic form of the model is:

(1) $Y = aX_1 + bX_2 + cX_3 + dX_4 + cX_5 + \ldots + e$

where, Y is a dummy variable equal to 0 if the individual did not work off-farm and 1 otherwise. The sets of explanatory variables include human capital characteristics (X_1--age and age-squared, education and education squared), family characteristics (X_2--both on the consumption side, such as the number of children under age 6 at home, number of elderly at home, number of working age family members, and on the production side, such as land size), a gender variable (X_3-equaling 1 if the individual was female), villages effects (X_4--to hold constant the differential impact of village characteristics might have on employment participation), and two year dummies (X_1- one for 1992, the recession year, and one for 1996, the second boom year). We measure education by the number of years of schooling attained. A test for the impact of the recession, will be that every thing else constant, we will find a negative coefficient for the year dummy of 1992.

Exit and entry models

The second set of equations is used to identify the determinants of exit / entry of off-farm sector of the sample individuals:

(2) $E_i = aX_1' + bX_2 + cX_3' + dX_4 + eX_5 + \ldots + e$, for i = 1 and 2

where E_1 is a dummy variable equal to 1 if the individual exited the off-farm sector from one period through the next, and where E_2 is a dummy variable equal to 1 if the individual entered. The explanatory variables are similar to those included in participation model, except that dummy variables are included for the early period (1988 to 1992) for the exit equation and for the late period (1992 to 1996) for the entry equation. The sample for the entry analysis is limited to those who in the labor force who do not work off-farm at the beginning of either of our two periods of study;[3] the sample for the exit analysis is limited to all of those in the work force who had off-farm jobs in the beginning

of either of our two study periods. The coefficients can be interpreted as the probability that exit or entry is increased or decreased.

Wage equation

In order to analyze the determinants of off-farm wages, a Heckman two stage least square model is used.[4] The basic logic is that if we only estimate the wage equation in a single equation model, we might have biased results because the sample does not include those individuals that choose not to work since we do not have wage observations on those who do not work off the farm. But, the behavior of non-working individuals includes information that can help identify the determinants of wages. At the wage that they face in the labor market, such individuals do not choose to supply labor to the market (conditional on all non-wage factors that affect their labor allocation decisions). Our estimation allows us to include all individuals in the analysis.

Hence, following Heckman, our specification of the model includes two equations. The first stage of the analysis is similar to equation (1). The second stage wage model is:

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

where, the dependent variable is a measure of the daily wage net of mandatory, work-related expenses; X_1, X_3, and X_5 are matrices of human capital variables, gender, and year effects as in equation 1. In order to examine the impact of education on wages during different periods, we include a set of interaction terms between education and year and age and year (X_6).

Agricultural labor allocation equations

For a direct test of whether or not agriculture helps buffer the effect of a recession, an ordinary least square equation is used to estimate the determinants of individual agricultural labor allocation, measured in standard labor days (8 hours) per year. In the labor response equation, as in the other equations, measures of human capital, household traits, gender, and year effects are included. In addition, a measure of the off-farm work status of the other members of the individual's family and a measure of the individual's off-farm work status are included to estimate the propensity of the individual to increase their on-farm use of labor when layoffs hit its members or him- or herself.[5]

General Performance of the Econometric Models

To implement our testing procedure for the impact of education on employment during times of boom and bust on off- and on-farm employment, we estimate sets of equations for determinants of off-farm work status (Table 3), entry and exit (Table 4), the off-farm wage (Table 5), and the individual's on-farm employment (Table 6). Most of the models perform well in terms of their goodness of fit. The adjusted r-square statistics of agricultural labor supply equation and the wage equations that are estimated by OLS are both above 0.44. The goodness-of-fit measures of the Probit equations for off-farm labor participation and entry and exit of the off-farm labor force show even better precision.

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 for the entire period (Table 5, columns 3 and 4), the year indicator variables show the effect of recession and boom on participation in the off-farm labor force. The negative and significant signs on the gender variables in almost all of the off-farm participation equations are indicative of the unequal access of women to job off the farm, a result consistent with many other works (Meng, 1995; Rozelle et al., 1999; Zhang et.al., 2000).

Empirical Results

Taken as a group, the results of the off-farm participation, entry and exit, wage, and on-farm employment equations tell two strong and consistent stories. First, as time has passed since the onset of the reforms, education has been rewarded increasingly. Second, to the extent that the rise of off-farm labor markets have brought new rewards and new risks to rural households, education appears to be playing an important role in buffering the adverse effects and allowing individuals to take advantage of the positive ones.

The off-farm labor participation equations most clearly illustrated the increasing importance that labor market place on human capital in rural China (Table 4). In 1988, the signs on the education variables are insignificant, implying that jobs were given to people in our sample irrespective of their educational level. In contrast, one household characteristic and two village dummy variables show that in 1988 where one lived and the environment in which they lived were more important determinants if individuals had an off-farm job or not. By 1996, however, the situation had reversed. Those with high levels of schooling clearly have a greater probability of getting an off-farm job, whereas village characteristics no longer matter. The results also mean that by the mid-1990s, education is playing a positive role in allowing farmers to enter the off-farm labor market.

The entry and exit analysis provides even more convincing evidence of the importance of education for allowing individuals to buffer themselves against the negative unemployment shocks and take advantage of employment opportunities during boom periods (Table 5). For every additional year of education, farmers have a 5 percent less chances of getting laid off during recessions. Likewise, during times of boom, as education rises, the probability of being able to enter into the off-farm labor force rises rapidly, although the negative sign on the square terms suggests that the pace of entry slows over time (though over the relevant range of education levels, there is always a positive increased probability of entering as schooling attainment rises). Such results are supportive of any policy that promotes rural education. When rural residents are more educated, they are better equipped to withstand the unemployment risks that have emerged with the rise of labor markets.

The results embodied in the wage equations demonstrate that education also affects wages, though the results also show that these effects also only appeared in the mid-1990s (Table 6). The signs of the education variables (that enter in linear and quadratic form) are insignificant, suggesting no general effect of education on wages. However, the coefficients on variable that interacts the 1996 year dummy and education shows that in 1996, the effect of education on wages is appearing. Taken together with the results of the participation equation (Table 4 above), we have evidence of the way that education has come to help buffer incomes during reform. By the mid-1990s, those with higher education receive both higher wages and have a higher probability of being employed than those with lower levels of education.

The results of the agricultural labor response equation also show an alternative way that education helps buffer income during recessions. Assuming that the marginal product~~ive~~ of labor is positive in agriculture (see Ye and Rozelle, 1994; Putterman and Ciacu, 1995- both references are missing from the reference list), when individuals with higher education either get laid off or can not find a job, they clearly return to agriculture (Table 7, row 11; and Zhang et al., 2001). Moreover, when they enter the agricultural sector, ceteris paribus, the greater their level of education, the higher the number of days that they spend working on the farm. Such a finding is consistent with our observations that better educated individuals tend to try more innovative (which may be more time intensive) agricultural activities.

Conclusions

In this paper, we began by demonstrating the employment cycles that have arisen during the reform era in rural China. Fluctuating incomes, employment growth rates, and up and down wage rates are part of the reason why others have found the risks associated with the emergence of labor markets have been the largest and fastest growing source of uncertainties faced by rural households. While the rewards from participating in the off-farm labor markets are most likely to be great, so are the rising uncertainties.

Not everyone in rural China, however, has been able to take advantage of new off-farm employment activities; neither have the risks been born evenly. Our descriptive and multivariate results have shown in a number of ways that those individuals with greater education have benefited more and those with less education have been hurt more. Education increases the propensity of individuals to enter the off-farm labor force, keep their jobs during recessions, and earn a higher wage. In addition, as long as labor has a positive marginal product in agriculture, education also aids the farmer in his/her on-farm activities. In short, education is both reward increasing and risk mitigating. And, the results show that the effect of education is increasingly important as the reforms have proceeded.

As a result, our results are consistent with the policy suggestion that investment in rural education is desperately needed. To the extent that the instability of household and

individual income streams increases the propensity of farmer discontentment, leaders who are concerned about farmer welfare and rural stability now have a new way to rectify the problems of rural households. If our results are generalizable, increasing education attainment will increase both incomes and provide more stability.

On the macro-level, investing in rural education may also help reduce the inequality that has risen rapidly in recent years. Benjamin and Brandt (1997) have found that education is one of the most inequality increasing factors in rural China in the last decade. Those with human capital have experienced income increases; those without have not. Hence, providing education to those without will in this also serve to reduce inequality. In a more macro-sense, if inequality also leads to instability, investment in the education of those that have historically attained lower levels of education will help mitigate the trend towards greater inequality.

In short, education has been shows to have high reward. Education has been shown to provide some buffer against the uncertainty of emerging markets. Providing greater investments in rural education, especially in those areas less able to provide for themselves, will likely have an effect on both income growth, equality, and stability.

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Table 1. Income, labor days, and wages in rural China, 1988-1996.

Year	1988	1992	1996
Income trends (real 1988 yuan/family)			
Total income	4172	2663	5690
Labor supply trends			
Average total labor days (days/year)[a]			
Off-farm labor (days/year)	104	84	88
Agricultural labor (days/year)	51	83	58
Wage trends			
Average off-farm wages (in 1988 yuan/day)	6.5	4.5	13

Source: Authors' survey.

[a] Measured as standard days (8 hours) per person.

Table 2. Education and labor market participation in rural China, 1988 to 1996.

	1988	1992	1996
Off-farm Work (percentage in workforce)			
Elementary School	41	33	33
Middle School and Above	62	49	69
On-farm Work (days worked per year)			
Elementary School	67	113	80
Middle School and Above	28	45	29

Source: Authors' survey.

Table 3. Exit and entry behavior of sample households in rural China, 1988 to 1996.

Year	1988-92	1992-96
Percentage of off-farm labor who exit[a]		
Total average	37	22
Elementary School	39	31
Middle school and above	35	16
Percentage of off-farm labor who enter[b]		
Total average	28	43
Elementary School	27	38
Middle school and above	28	46

Source: Author's survey.

[a] Using 1988 off-farm labor force as base.

[b] Using 1992 off-farm labor force as base.

Table 4. Determinants of off-farm labor participation in rural China, 1988-96

	Dependent variable: Off-farm labor participation					
	1988		1992		1996	
	dF/dx[a]	z	dF/dx	z	dF/dx	z
Number of observations	295		332		305	
Human capital						
Age	2.1	(1.31)	4.8**	(3.03)	6.4**	(3.61)
Age squared	0.0*	(1.80)	-0.1**	(3.18)	--0.1**	(3.92)
Education	-1.0	(0.36)	6.0**	(2.24)	14.3**	(4.09)
Education squared	0.1	(0.51)	-0.3*	(1.89)	-0.9**	(3.02)
Household traits						
Number of kids at home	-0.4	(0.04)	19.2**	(3.34)	-12.2	(1.08)
Number of elders at home	-0.1	(0.01)	1.9	(0.36)	5.2	(0.80)
Family labor	3.0	(0.93)	0.9	(0.30)	6.6*	(1.63)
Land size	-6.8**	(3.91)	-0.3	(0.17)	-2.3	(1.51)
Gender						
Female	-40.1**	(5.62)	-15.3**	(2.36)	-32.8**	(4.46)
Village effects						
Village 3	6.3	(0.82)	-14.3**	(2.04)	-9.1	(1.13)
Village 4	-17.6*	(1.69)	-28.8**	(3.36)	3.5	(0.34)
Village 5	-20.1*	(1.88)	-19.2**	(2.24)	-3.3	(0.31)
Obs. P	0.49831		0.39759		0.47213	
Pred. P	0.49798		0.37989		0.42847	

[a] dF/dx may be interpreted as the change in likelihood of exiting or entering the off-farm labor force with a 1 unit change of independent variable.

Notes: 1) ** denote statistically significant at 5%, * denote 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.

Table 5. Impact of economic recession on off-farm employment in rural China, 1992-96.

	Dependent variable			
	Exit from off-farm sector		Entry into off-farm sector	
	All Years		All Years	
	dF/dx[a]	z	dF/dx	z
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)
Education squared	2.23	(0.23)	-0.5**	(-3.05)
Household traits				
Number of kids at home	-5.30	(0.66)	-0.9	(-0.13)
Number 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				
1988-92	8.29	(1.25)	-	-
1992-96	-	-	16.7**	(3.57)
Obs. P	0.480		0.25485	
Pred. P	0.48165		0.20113	

[a] dF/dx may be interpreted as the change in likelihood of exiting or entering the off-farm labor force with a 1 unit change of independent variable.

Notes:

1. ** denote statistically significant at 5%, * denote 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.

Table 6. Determinants of wages and recession in rural China (no sector effects), 1988-1996.[a]

	Wage equation[b]		Participation equation (Probit)	
		n= 928[c]		
Human capital				
Age	0.11**	(3.82)[d]	0.04	(1.22)
Age squared	-0.00**	(3.33)	-0.00	(1.58)
Education	-0.02	(0.40)	0.01	(0.16)
Edu squared	-0.00	(0.35)	0.00	(0.61)
Household traits				
Number of kids at home			0.23*	(1.72)
Number of elders at home			0.12	(0.90)
Family labor			0.05	(0.96)
Land size			-0.05**	(2.32)
Gender				
Female	-0.13	(0.81)	-0.73**	(7.08)
Village effects				
Village 3			-0.16	(1.50)
Village 4			-0.41**	(2.69)
Village 5			-0.41**	(2.79)
Year effects				
1992	0.77	(0.75)	-2.17**	(2.20)
1996	-0.14	(0.14)	2.28**	(2.23)
Year and human interaction				
Age*year92	-0.06	(1.16)	0.09*	(1.78)
Age^2*year92	0.00	(1.16)	-0.00*	(1.67)
Age*year96	0.02	(0.38)	0.09*	(1.76)
Age^2*year96	-0.00	(0.70)	-0.00	(1.82)
Education*year92	0.02	(0.22)	0.10	(1.12)
$Education^2$*year92	-0.00	(0.08)	-0.01	(1.19)
Education*year96	0.22**	(1.94)	0.32**	(3.02)
$Education^2$*year96	-0.01*	(1.78)	-0.02**	(2.59)
Constant	-0.23	(0.38)	-0.03	(0.04)

[a] Estimated using Heckman Two Stage Least Squared method.

[b]Wage in log form, t-value of coefficient of Inverse Mills Ratio (-0.42) was –1.28, implying minimal selection bias. The R-square of the OLS version of the wage equation was 0.49.

[c]Number of observations.

[d]z- statistics given in parenthesis

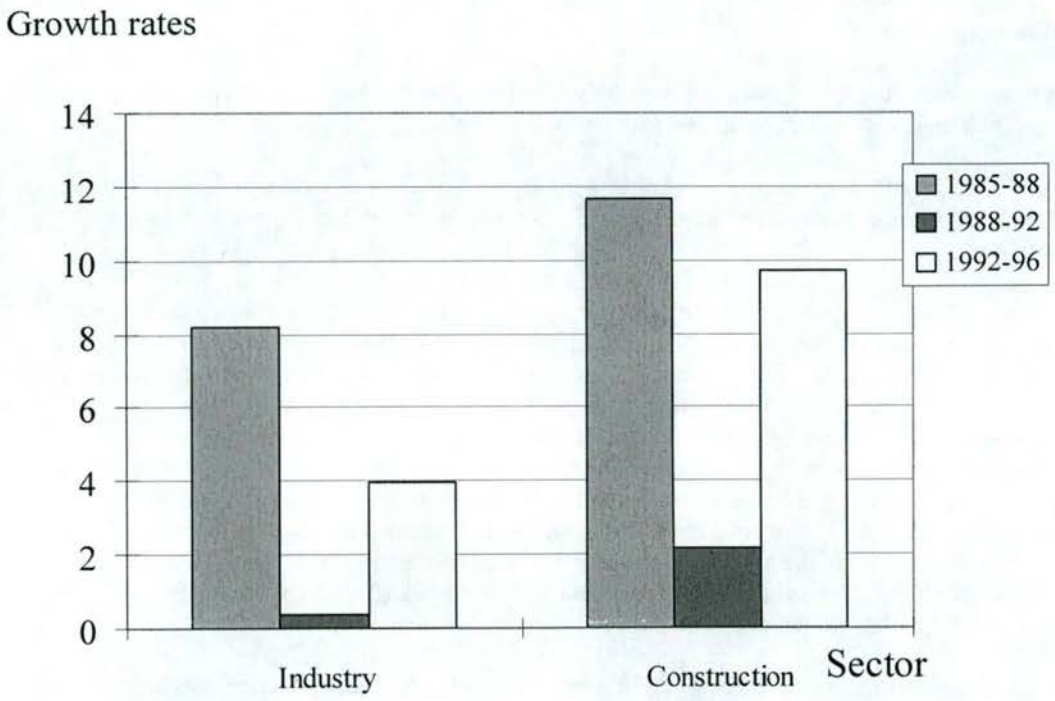
Notes:

1. ** denotes statistically significant at 5%, and * denotes 10% level of significance.
2. Dummy variable results represent the effect of a discrete change from 0 to 1.

Table 7. Agricultural labor supply response of individuals to recession in rural China, 1988 to 1996.

	Dependent variable: Labor days per year	
	(Individual)	
No. of observations	927	
Human capital		
Age	12.12**	(16.0)
Age squared	-0.14**	(14.1)
Education	2.65**	(2.0)
Education squared	-0.29**	(3.0)
Household traits		
Number of kids at home	-6.70	(1.5)
Number of elders at home	2.16	(0.5)
No. of working age family members	-5.15**	(2.6)
Land size	3.50**	(4.9)
No. of family members working off-farm	1.94	(0.9)
Status of individual's off-farm work	-24.53**	(7.1)
Gender		
Female	-1.49	(0.4)
Year effects		
1992	25.77**	(6.7)
1996	-3.11	(0.8)
Constant	-174.93**	(10.0)
Adjusted R squared	0.44	

Notes:
1. ** denotes statistically significant at 5%, * denotes statistically significant at 10%.
2. Village effects controlled for but not shown.



Source: State Statistical Bureau, 1997.

Figure 1. Employment Growth Cycles in China, 1985 to 1996.

Endnotes

[1] If we show that on-farm labor supply increases during recessions, and on-farm labor positively contributes to output (or the marginal product of labor is positive), then we implicitly are showing that the ability of the agricultural sector to provide employment during recession also helps in buffering income against the declines that are linked to falling off-farm employment.

[2] We also want to note here that our work covers only 1 and ½ parts of a boom-bust cycle, and so caution has to be taken in extrapolating these results to all periods of boom and bust.

[3] 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).

[4] 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 or not the individual chooses to work (similar to equation 1). From the first stage of the analysis, one can recover the Inverse Mills Ratio (IMR), which measures the propensity for a person to participate in the labor market. Its inclusion in the second stage, the determinants of wage equation, corrects for the bias that would otherwise affect estimates of the wage equation with the censored sample.

To get better identification on the coefficients of the wage equation (better that is than just relying on the inclusion of the Mills ratio), one also wants to include variables in the estimation of the participation (probit) that are significant determinants of whether or not to work, but have no independent effect on the wage, 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.

[5] Because of the possibility that the measures of the individual's work status is endogenous, we tried several approaches: Include only a measure of the recession year effect (the 1992 dummy); include both the 1992 dummy and an uninstrumented measure of the individual's off-farm work status; and include an instrumented measure of his/her off-farm work status. We identified 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 only explain a small fraction of the variability of off-farm labor supply by other household members, and as such their predictions may not be a very good proxy for demand-driven labor shocks to the family. For brevity, we report only the uninstrumented equation, but since our attention is on the coefficient of the education variable, we are less concerned about the robustness of the coefficient on the off-farm work status variable.