

# **SURPLUS LABOUR AND PRODUCTIVITY IN CHINESE AGRICULTURE: EVIDENCE FROM HOUSEHOLD SURVEY DATA.**

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## **Summary**

This paper investigates whether the concept of surplus labour adequately characterises the labour conditions facing rural Chinese households, and whether, therefore, it affects household labour allocation decisions. Using household survey data from one rural county, the variation in and determinants of household labour productivity are explored. Marginal products of labour in agriculture are close to zero, consistent with the existence of surplus labour at the household level. By contrast, the returns to labour in non-agricultural household production are almost identical to the non-agricultural wage. However, even households with off-farm employment receive low returns to labour in agriculture, suggesting that they continue to employ excess labour on the farm. The results reveal the importance of village and household characteristics in determining a household's capacity to transfer labour out of agriculture, suggesting that local development strategies, particularly the promotion of off-farm employment, will be more effective strategies for assisting poor households than relaxing institutional constraints on labour mobility.

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## 1 INTRODUCTION

Among the most striking labour market developments to have occurred in China during the past two decades has been the unprecedented speed of the transfer of labour out of agriculture. Between 1978 and 1992, approximately 80 million rural workers entered the rural collective industrial sector, while current estimates of the 'floating population' of migrant rural labourers range from 60-100 million people. This labour transfer is generally interpreted as evidence that China is a classic labour surplus economy (Knight, 1995).<sup>1</sup> As yet, however, there is little empirical evidence which examines whether the concept of surplus labour accurately characterises the conditions facing rural households, and how, therefore, it affects household labour allocation decisions.<sup>2</sup> This paper is an attempt to fill this gap in the literature. The results of a household-level analysis can illuminate the dynamics underlying the emergence of a labour market in rural China, and the implications of this process for the welfare of China's farmers.

Using household survey data from one county in Shandong Province, this paper explores the variation in, and determinants of, labour productivity among rural households. The second section of the paper provides a conceptual framework within which to analyse surplus labour and labour productivity at the household level. The third section describes the survey site and data. The subsequent two sections contain the empirical analysis. Based on estimation of household production functions, the returns to labour in household agricultural and non-agricultural production are calculated, and the determinants of labour productivity investigated. The results are consistent with the view that surplus labour is a major feature of the rural economy and that households are constrained in moving labour out of agriculture. Village and household characteristics, including demographic composition and political status, are important determinants of labour productivity. The policy implications of these results are discussed in the concluding section.

## 2 SURPLUS LABOUR AND HOUSEHOLD LABOUR ALLOCATION

The classical view of the dual economy, characterised by an inexhaustible supply of labour and disguised unemployment (Lewis, 1954), would appear to be an accurate description of the Chinese economy, recent commentaries on which focus on the 'tides' of migrants flooding into the cities. The simplest definition of surplus labour is that labour can be transferred out

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<sup>1</sup> Early methodology and estimates of surplus labour are reviewed by Taylor (1988). Sabin (1995) provides the most comprehensive recent review, and estimates surplus labour in 1992 to be 168 million or 38 per cent of the rural population.

<sup>2</sup> Studies which have examined labour productivity and labour supply at the county and township levels include Putterman (1993) and Meng (1990).

of the agricultural sector without reducing the volume of farm output. This definition implies the existence of some point at which the marginal product of labour becomes zero.<sup>3</sup> A broader definition of surplus labour, utilised in the following analysis, is that the reservation wage ( $w_r$ ), that is the minimum level of compensation required to induce labour to leave the farm, may be greater than zero but is substantially below the wage rate ( $w$ ) in the non-agricultural labour market ( $0 < w_r < w$ ), so that the agricultural sector is characterised by the absence of clearance in the labour market. Under such circumstances, we would expect to see a larger transfer of labour out of agriculture than actually occurs, raising questions about the characteristics of the labour market, households or individuals which prevent the optimal allocation of labour.

When analysing the transfer of labour out of agriculture, the usual assumption is that the reservation wage ( $w_r$ ) is equal to the average product of labour in agriculture which is greater than the marginal product. This is because an individual who remains part of the farm household consumes the average product of the agricultural household, even if her/his marginal contribution to household production is close to zero, and thus must be compensated accordingly if s/he leaves the household. However, in the Chinese context, where off-farm employment is generally locally-based and does not involve the worker leaving the household, a better measure of the reservation wage is the marginal revenue product of labour in agriculture. In empirical work, for those in wage employment the marginal revenue product of labour is generally assumed to be the actual wage received; for individuals engaged in household production, whether agricultural or non-agricultural, it needs to be determined within the household (Singh et al., 1986; Jacoby, 1993). In a standard model of the agricultural household, the first order conditions for labour supply are  $U_l/U_c = w$  and  $f_l = w$ . An empirical test of whether surplus labour exists at the household level is therefore whether  $0 \leq f_l < w$ .

Household or individual choices about labour allocation thus depend on market prices or the wage rate,  $w$ , which is set in the external labour market. If all households face similar prices and wages, we would not expect to see systematic variation in the returns to labour among households, controlling for individual characteristics, such as age and education. On the other hand, when markets are imperfect in certain ways, households may face different prices

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<sup>3</sup> The precise condition that the marginal product of labour is equal to zero does not, in fact, have to hold for output to remain constant. Sen (1966) resolved this apparent conflict by distinguishing between labour and labourers. In the surplus labour case, the marginal contribution of a labourer may not be zero, but as one labourer moves out of agriculture into other employment, his/her share of agricultural work will be done by other (under-employed) household members so that output may remain constant, as predicted by the Lewis model.

for the same goods, in which case shadow prices will depend on household characteristics.<sup>4</sup> If the labour market in rural China is accurately characterised by segmentation or by rationing of jobs or goods, then households will not have equal access to preferred types of employment, and the returns to labour will vary systematically among households (Strauss, 1986; Sicular, 1995). Unequal access to resources or employment may arise from village-level locational features or at the household level, from demographic characteristics or political connections. For example, if political connections determine access to wage employment, and households with such access move labour out of agriculture, therefore also raising the marginal returns to farm labour for the household, we should see the returns to labour varying according to household specific characteristics.

Among the possible constraints on optimal household labour allocation is the need to command sufficient labour during the busy agricultural season to ensure a certain level of crop production in order to fulfil taxes and quotas and for household consumption. Given the per capita allocation of land and obligations to the state, the demographic composition of the household, in terms of age and gender, are potentially key determinants of a household's ability to move labour out of agriculture.<sup>5</sup> Off-farm labour frequently needs to be sufficiently flexible to return to the farm during the busy season, at which time households cannot generally hire in labour. If households face a labour surplus, it is likely to be seasonal and, where the labour of all household members is not homogenous and is thus not perfectly substitutable, may be limited to certain types of labour.

Based on the preceding discussion, the conditions predicted by the neo-classical model can be tested and the implications explored. First, we can test whether the marginal revenue product of labour in household production is equalised across activities and equal to the wage rate in the labour market (that is whether  $f_{lj}=w$ , where  $j$  is the type of activity undertaken within the household). Marginal revenue products of labour below the wage rate would be consistent with the existence of excess labour in agriculture. Second, we can explore variation among households in the marginal product of labour and identify the factors which determine this variation.

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<sup>4</sup> Chayanov (1925, 1986) showed that, in the absence of a labour market, the main factor influencing a household's labour supply decision was its demographic structure. Sen (1966) also demonstrated the role played by household demographic factors by showing that, with limited labour market opportunities, large families apply more labour to a farm of a given size than do small families. By contrast, Benjamin (1992) uses data from Indonesia to test for separation between household production and consumption decisions. He is unable to reject the null hypothesis that farm labour allocation decisions are independent of household structure,

<sup>5</sup> Household labour use, particularly its gender aspects, have been discussed by Judd (1994), Parish et al. (1995) and Entwistle et al. (1995).

### 3 THE LABOUR USE OF FARM HOUSEHOLDS IN ZOUPING COUNTY

The data used in this paper were collected in a survey of 257 households in 16 villages in Zouping County and cover the calendar year 1990. Zouping County is situated in the centre of Shandong Province, part of China's east coastal region which was an early beneficiary of the country's 'open door' policies. The area covered by the survey includes 11 of 17 townships in the county, varying geographically and economically from the relatively prosperous county seat to the fertile but flood-prone river plains and poorer, less accessible mountain villages.

Key economic indicators presented in Table 1 indicate that conditions in Zouping are comparable with the national average. Rural per capita income of 702 yuan in 1990 was close to the national average of 686 yuan. Agriculture remains the primary income source, although the county has experienced rapid growth and diversification of the economy particularly since the late 1980s. Households are shifting production out of staple crop cultivation (wheat, corn and cotton<sup>6</sup>) and into commercial agriculture (such as vegetable and fruit production, raising chickens and livestock) and non-agricultural employment.

Among the households surveyed, 97 per cent of individuals in the labour force undertook some agricultural work, while 66 per cent were engaged solely in agriculture; 24 per cent had wage jobs and 10 per cent worked in household non-agricultural activities or enterprises (table 2). Only 7 per cent of workers undertook agricultural labour exclusively in the busy season. Households appear to allocate their labour to a variety of different activities, possibly as a risk diversification strategy. Thus the percentage of households with some off-farm employment (66 per cent) is almost double the percentage of individuals undertaking some non-agricultural work (34 per cent). Among the 257 households sampled in 1990, only one household received no income from agriculture, while fewer than 40 per cent of households depended solely on agriculture. Almost 50 per cent had members in non-agricultural wage employment and 18 per cent had members engaged in household enterprise production.

Whether households have the flexibility to reallocate labour among activities is determined in part by the gender and age composition of the work force, and the ability to command sufficient labour, particularly during the busy season in agriculture, to fulfil grain taxes and quotas. As illustrated in figure 1, there are significant differences in the types of activities undertaken by gender. In terms of reported hours worked, men report slightly higher total labour hours - 1938 hours compared with 1663 for women. However, domestic work is not

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<sup>6</sup> Cotton is treated as a staple crop because the government retains monopsony control over the marketing of cotton and quotas or area targets for the production of cotton still operated in 1990. See Sicular (1993).

included here which would significantly raise women's total working hours. Women undertake most agricultural labour with 71 per cent of their total reported hours spent in crop cultivation compared to 61 per cent for men. The breakdown of hours by season and gender suggests the dependence of most households on male labour during the busy season. Of the time spent by women in cultivation, 42 per cent takes place during the off-season and 29 per cent during the busy season, compared to 34 per cent and 27 per cent respectively for men.

The relationship between employment and income is illustrated in the data presented in figure 2. For the whole sample, about 70 per cent of income comes from agriculture, over 20 per cent from earned non-agricultural sources, with the remainder being unearned income such as government transfers, remittances and gifts. The poorest households remain heavily dependent on crop agriculture with households in the bottom quartile receiving over 85 per cent of their income from agriculture. Further disaggregation shows that crop cultivation (primarily wheat, corn and cotton) accounts for virtually all agricultural income in the lowest quartile. Only households in the top quartile have successfully diversified into other agricultural activities. These households receive most of the income from more remunerative, specialised agricultural activities, such as animal husbandry (mainly chicken and cattle raising) or fruit production. Income from household non-agricultural activities as a share of total household income increases by income quartile. However, the most dramatic result is that approximately 70 per cent of income from household non-agricultural enterprises and sidelines accrues to the top income quartile. Wage income is somewhat more equitably distributed with larger shares going to the middle quartiles.<sup>7</sup>

In summary, the poorest households are dependent almost entirely on crop agriculture, wage income is relatively evenly spread among the middle deciles, while households in the upper range of the income distribution appear to have a greater ability to diversify out of agriculture into private income-generating activities. Successful enterprises are predominantly non-agricultural but households in the upper quartile also engage in more remunerative, specialised agricultural activities. This pattern raises important questions about the determinants of variation in activities and labour productivity. Do the poorest households, which remain heavily dependent on crop agriculture, retain surplus labour on the land and, if so, what constrains them from moving this labour into more remunerative activities? Do households with members engaged in non-agricultural activities have higher returns to labour

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<sup>7</sup> These patterns of wage and enterprise income are similar to those found by Hare (1994) but contrast with Khan's (1993) finding that 62 per cent of wage income goes to the top 10 per cent of the population. In this sample in 1990 only 13 per cent of wage income went to the top 10 per cent of the income distribution while approximately 80 per cent went to the top 50 per cent.

in agriculture, or is there evidence of excess labour in agriculture even among these households?

#### 4 ESTIMATION OF THE RETURNS TO HOUSEHOLD LABOUR

The empirical methodology involves estimating production functions for household agricultural and non-agricultural production. Variation in labour productivity and determinants of differences in estimated marginal returns are then explored. Cobb-Douglas production functions are estimated in the general form

$$\log(\text{gross output value}) = \alpha + \beta * \log(\text{inputs}) + \varepsilon$$

for both agricultural and non-agricultural household production.<sup>8</sup> The dependent variable is the gross value (in RMB yuan) of household production for agriculture and household enterprise or sideline activities. Agricultural output value consists of crop and non-crop (primarily livestock) production valued at the actual price at which it is sold (whether market or state) or, if retained for home consumption, at the market price.<sup>9</sup> The output value of household non-agricultural production or sideline activities is the reported revenue from the activity, including sales, retained production and gifts.<sup>10</sup>

The key inputs into agricultural production are labour, land and other intermediates. The labour input is measured as the number of hours worked in each activity by all adult household members (aged 16-65) and by any non-household member who worked for the household.<sup>11</sup> The total number of hours worked is divided by eight to provide a standard measure of days worked. Male and female labour are not expected to be perfect substitutes in production, due to gender based differences in responsibilities within the household, and to

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<sup>8</sup> The Cobb-Douglas specification was tested using the Ramsey regression specification error test (RESET) for left out variables. The results did not reject Cobb-Douglas as the appropriate functional form. In addition, translog production functions were estimated and the results compared (see footnote 15). The specification of the agricultural production function is similar to that used by Sicular (1995) in an investigation of the impact of quotas on household production using the same data.

<sup>9</sup> While the production processes are clearly not the same for all crops or activities, it is impossible to completely separate inputs into different types of agricultural production. The discussion below focuses primarily on the results for all agricultural production which includes crop and fruit cultivation and animal husbandry.

<sup>10</sup> This value is likely to be subject to greater measurement error than the agricultural production variables and the results must therefore be treated more cautiously. Measurement problems associated with data on self-employment include error in recall and the difficulty of defining precisely what should be measured. If capital inputs are not fully accounted for, the estimated returns to labour may include rents and thus be biased upwards.

<sup>11</sup> Only 3 households hire non-household labour, while 25 exchange labour. While household and non-household labour may not be perfect substitutes, the amount of non-household labour used is too small to provide significant results.

the more limited opportunities for women to engage in non-agricultural work outside the household. To control for potential productivity differences by gender, the share of total labour hours undertaken by men is included in the regression. Seasonal differences in the intensity of labour input are controlled for by including the share of hours undertaken in the busy season.

Cultivated land is allocated to the household by the collective on a per capita basis. A few households either contract or bid for additional land from the collective or recontract their original land to other households.<sup>12</sup> Two measures of land quality are included: the number of plots captures potential diseconomies from land fragmentation, and the percent of cultivated land which is flat as opposed to hilly or mountainous provides a proxy for land productivity. The intermediate inputs into crop production include seeds (both bought and retained), pesticide, fertiliser, fuel (all valued in yuan) and fees paid for the services of animal- or machine-driven farm equipment. Animal husbandry costs include feed, veterinary services and other related expenses.<sup>13</sup>

An attempt is made to capture differences in production functions among crops through the inclusion of a variable measuring the share of land planted to wheat and cotton. As corn is usually inter-cropped with wheat, the land share devoted to these crops is similar. Wheat and cotton are also crops which continue to have quotas attached to them, so these variables may reflect policy constraints on household production decisions. Village fixed effects are included to control for variation in factors such as location, market access, soil quality, irrigation and village leadership.

To control for differences in human capital among households, and particularly as a proxy for a "management effect" in household production, measures of education were included in the regressions. The reported variable is the number of years of schooling of the most educated adult in the household.<sup>14</sup> While education is generally expected to increase productivity,

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<sup>12</sup> Land area is measured in *mu* where 1 *mu* = 1/15th of a hectare.

<sup>13</sup> Ideally a measure of the value of capital inputs would also be included. A measure was constructed consisting of the value of draft animals and agricultural implements such as pumps, small tractors and threshers. There are two problems involved in this measure: first, that of separating inputs into different activities and second, of measuring the value of the "services" or actual input into the production process. The variables were entered in the regressions using 10 per cent, 20 per cent and 100 per cent of their value. The results did not vary greatly and were not statistically significant.

<sup>14</sup> Yang (1994) discusses the appropriate measures to use in estimating the returns to education in household agricultural production, and provides a justification for using maximum years of education as a proxy for the management effect in agriculture. Other possible measures are the average level of education and the education of the household head. The alternative measures did not yield significantly different results.



other evidence from rural China suggests that this is frequently not the case (Yang, 1994; Hare, 1994; Khan, 1993).

The independent variables in the estimation of household non-agricultural production include the value of input costs reported by the household, labour hours measured in 8 hour days, the proportion of labour undertaken by men, and the number of years of education achieved by the most educated household member. As only 44 households report such activities in 1990, with several villages reporting none, village fixed effects are not included in this regression. An important question for understanding household enterprise production concerns when and how a household started an enterprise. Households with good political connections at decollectivisation are often thought to have benefited from the allocation of collective property, or to have been well-placed to take advantage of new opportunities through their connections beyond the village. This early advantage and subsequent experience may well affect current productivity. To capture this situation, variables measuring political status on the eve of reform, and years of experience working in household enterprise production were included. The latter was not significant and was dropped from the final model.

The results of the Cobb-Douglas production functions for agricultural production, with and without village fixed effects, are presented in table 3.<sup>15</sup> A model for crop production alone was also estimated. In both models, land and input costs have coefficients which are significant at the 5 per cent level and together explain a large proportion of the variation in income. Consistent with the nature of the production activities, land is more important for crop production than agricultural output, whereas the coefficient on input costs is larger for agricultural production. Variation in land quality within villages, measured by the share of land which is flat, does not significantly affect crop or agricultural output whereas plot fragmentation significantly reduces output in both cases.

The third main input, labour, has a positive but not statistically significant coefficient in the model with village fixed effects; without village effects, the coefficient is negative and significant at the 10 per cent level. These results are discussed further below. The share of labour hours undertaken by male household members is not statistically significant in either regression.

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<sup>15</sup> A translog model was also estimated to test the Cobb-Douglas specification. When only the key inputs are included, the Cobb-Douglas model does not provide an appropriate fit; however, with the full model specification, the Cobb-Douglas functional form cannot be rejected at the 10 per cent and 5 per cent significance levels for the models without and with village fixed effects respectively. The translog model yields marginal products of labour of 0.575 and -0.168 without and with village fixed effects, which are comparable with the Cobb-Douglas results. The Cobb-Douglas functions are therefore used for ease of calculation.

The coefficient on the education variable is negative and statistically significant, with a doubling in years of education leading to a 22 per cent reduction in income. If the education level of the household head is included instead, the coefficient is small and negative, but not statistically significant. These findings are at odds with the hypothesis that education improves farm management skills, but are consistent with other findings in rural China. One possible explanation is that the skills acquired through education are not directly relevant to agricultural activities, particularly in a context where opportunities for the introduction of new technologies are limited. A more plausible explanation is that households with better educated heads are more likely to move their most productive members into off-farm employment, leaving agricultural work to less healthy or elderly household members, a phenomenon which has been observed in parts of China where off-farm employment is plentiful (Christiansen, 1992; Taylor, 1988).

The coefficients on the village fixed effects are not reported separately but are jointly significant. Village-level differences which explain a large amount of the variation among households in agricultural production (reflecting differences in land endowments, location and village leadership) will be explored further below.

The household enterprise production functions were estimated to provide a comparable measure of the returns to labour in non-agricultural household activities. Intermediate input costs and labour explain most of the variation in output value, with coefficients of 0.49 and 0.33 respectively, both significant at the 5 per cent level. The proportion of hours undertaken by male household members has a positive sign as anticipated but is not significant. The measure of education has a strong, positive effect on household production, consistent with the explanation given above that the better educated households shift labour into non-agricultural activities where the returns to education are higher.

Village fixed effects were not included in the regression due to the small sample size which provides insufficient within-village variation to obtain significant results. The measure of pre-reform political status operated in the opposite direction to that anticipated, significantly reducing enterprise productivity.<sup>16</sup> It is important to reiterate that the variables in this regression are likely to be subject to greater measurement and recall error than those for agricultural production. The results provide useful estimates for comparison with the

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<sup>16</sup> There are however explanations for this result, including the fact that households with landlord or entrepreneurial members, or overseas relatives, were classified as having a 'bad' class background; thus certain skills or business acumen may have been passed on, or connections with overseas relatives capitalised on. See Cook (forthcoming) for further discussion.

estimates of agricultural productivity and the wage rate, but they need to be interpreted with greater caution.

### Shadow wages

The most important results for the purposes of this discussion are the coefficients on labour, from which the marginal revenue product of labour, or shadow wage, is calculated. The Cobb-Douglas specification of the production function yields the elasticity or output share ( $\beta$ ) which, when multiplied by the average product of the factor of production, gives the marginal product of that factor. If households allocate their labour in the optimal way, for individuals engaged in household production, the shadow wage should equal the marginal returns to labour. Here we are interested in whether the marginal product of labour in agriculture is significantly lower than in other activities.

In agricultural production, the coefficient on labour is small (.07), implying that changing the amount of labour employed in agriculture, holding other factors constant, has little impact on output. Based on this coefficient, the shadow wage is 0.92 yuan per 8 hour day.<sup>17</sup> In the regression of household enterprise production the coefficient on labour is larger (0.33) and statistically significant, yielding a marginal product of labour in household enterprises of 6.6 yuan per 8 hour day. Interestingly, this result is almost identical with the average wage rate for non-agricultural wage labour of 6.75 yuan per 8 hour day (table 4). Thus the returns to labour in agriculture are well-below the returns to other non-agricultural activities ( $0 < w_r < w$ ), as predicted, while the returns to off-farm self- and wage employment are virtually equalised, suggesting the emergence of competitive wage determination mechanisms in the non-agricultural labour market.

Tests for the difference in means between the marginal product of labour in each activity confirm that the differences between the returns to agricultural and non-agricultural labour are statistically significant. If sufficient labour is moved out of agriculture into higher paying activities we would expect the marginal returns to household labour which remains in agriculture to increase. A test of differences in the returns to labour in agriculture between households with and without off-farm employment found this difference to be significant at the 5 per cent level. Thus moving labour out of agriculture does increase the returns to labour in agriculture. However, this increase does little to erode the magnitude of the difference between the returns to labour in agricultural and non-agricultural activities.

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<sup>17</sup> The coefficient is not significantly different from zero at conventional levels ( $p=0.26$ ).

Finally, the assumption of the neo-classical model that, with well-functioning markets, households equalise returns across activities is also tested and rejected.<sup>18</sup>

To summarise the above results, the shadow wages derived from the coefficients in the estimated models reveal the large gap between the returns to labour in agricultural and non-agricultural employment, a result which is consistent with the story of surplus labour in agriculture. The shadow wages obtained in agricultural production are a fraction of those derived from non-agricultural private enterprise activities or from wage employment. These findings support the hypothesis that households are constrained in moving labour off the land into more productive employment. Furthermore, having household members working off the land, while slightly raising the returns to agricultural labour, did not significantly reduce the gap between the returns to labour across activities, suggesting that even households with non-agricultural opportunities employ excess labour on the land.

## 5. VILLAGE AND HOUSEHOLD LEVEL DETERMINANTS OF LABOUR PRODUCTIVITY

Clear differences in labour productivity between agricultural and non-agricultural activities emerge from the above analysis. If such differences are real, why is there not even more movement of labour out of agriculture? What factors explain the variation in productivity among households? Among the possible explanations for this situation are that households retain more than the efficient level of labour on the land during the year in order to guarantee sufficient labour during the busy season, and that they face high costs or risks in moving labour out of agriculture. Both village and household level factors may influence these outcomes.

### Village level variation

As was apparent from the data and regression results, variation exists among villages in the activities undertaken and the returns to labour. Village level factors which are expected to affect labour productivity include local agricultural conditions, infrastructure, access to markets and leadership. Involvement in non-agricultural employment appears to be associated with two contrasting sets of conditions, with different implications for incomes. On the one hand, easy access to urban markets and infrastructure facilitates the development

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<sup>18</sup> Following Jacoby (1993, p.915), for households with members engaged in wage work, a regression was run with the marginal product of labour from household agricultural or non-agricultural activities as the dependent variable and wages as the independent variable. If households equalise returns to labour across activities, as predicted by theory, then the coefficient on wages should be 1. In the regression of the marginal product of labour in household sideline production on wages, the hypothesis that the coefficient on wage is equal to 1 is rejected at the 99 per cent significance level.

of both collective and private enterprise providing more remunerative employment opportunities. On the other hand, poor agricultural conditions push people off the land, often into low paid casual wage labour or marginal sideline activities.

To explore the importance of village specific characteristics in determining the variation in labour productivity, the 16 survey villages are categorised into four groups according to features which are expected to affect the supply and demand for labour. The key features of these village groups are summarised in table 5. The production functions were re-estimated with interaction terms between the four group categorical variables and the main inputs into production - land, labour and intermediates.<sup>19</sup> The marginal returns to labour were then estimated for each group. The results of this analysis are presented in table 6.

The results again illustrate the low returns to labour in agricultural production. Only the second group has a positive marginal return of 4.8 yuan, which is consistent with what is known about the categories. Group 2 is composed of villages in which many households specialise in non-crop agricultural activities, particularly chicken farming. In other groups, the returns to agricultural activities are similar to those for crop cultivation.

In household sideline production, group 2 again has returns which are higher than those for other groups, at 8.3 yuan per day. However, only 4 households in this group engage in sideline activities. Interestingly, the marginal products for groups 1 and 3 are very close to the average wage rate (table 4). Villages in these groups, located closest to the county seat or market towns, have greater access to wage employment and markets than others in the survey. By contrast, the marginal returns to sideline activities in group 4, the most remote villages, are negative, possibly reflecting the difficulty households face in moving labour into more productive activities in the poorer villages, where off-farm employment opportunities are limited.

#### Household variation

As discussed earlier, controlling for individual human capital, the shadow wage should not vary systematically among households if markets are perfect and labour is being allocated optimally. However, if markets are imperfect, the demographic composition of the household or privileged access to resources, for example through political connections, may affect labour allocation and productivity. Differences in shadow wages by household characteristics can be investigated by regressing the marginal product of labour on household

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<sup>19</sup> Group or village dummy variables were also included to allow the intercepts to vary.

demographic characteristics and endowments, measures of market access and political variables.

Regressions are estimated with the dependent variables being the estimated marginal products of labour in agricultural and non-agricultural production. The independent variables are household allocated land, the dependency ratio in the household, the number of male workers, the value of draft animals and other productive assets, indicators of political status (party membership, family class background and current cadre status) and whether the household engages in off-farm employment. In the agricultural production function, village fixed effects are included. The results of these regressions are reported in table 7.

Increasing the amount of land available to the household does not have a significant impact on productivity. The dependency ratio and number of male labourers are significant and operate in the expected directions in the case of agriculture, that is, a higher dependency ratio reduces labour productivity while an increase in male labour share raises productivity. These results show that household demographic structure influences labour allocation decisions, supporting the hypothesis that markets are imperfect so that shadow prices depend on household characteristics instead of being exogenously determined. Having household members engaged in non-agricultural employment does not significantly affect the returns to labour in agriculture, controlling for other characteristics,<sup>20</sup> again supporting the notion that even such households employ excess labour on the land.

Political connections affect the returns to labour in both types of activities, supporting previous evidence that shadow prices are determined by household characteristics. The marginal returns to labour in agricultural production are significantly affected by whether or not the household contains a member of the Communist Party. Party membership increases the marginal product of labour by 0.3 yuan per day, or approximately 30 per cent of the average shadow wage. Furthermore, Communist party membership also has a statistically significant effect on the returns to labour in household non-agricultural activities, leading to an average increase in the shadow wage of almost 5 yuan per day. On the other hand, having a government official or cadre in the household operates in the opposite direction, leading to a reduction in the shadow wage in household non-agricultural activities of approximately 5 yuan per day.<sup>21</sup>

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<sup>20</sup>As discussed above, a small difference was found in the returns to labour between households with and without non-agricultural employment, not controlling for other factors.

<sup>21</sup> A more detailed discussion of the effects of political status or connections can be found in Cook (forthcoming).

## 6 CONCLUSION

The empirical findings presented above provide strong support for the hypothesis that a rural labour surplus affects household labour allocation decisions, with various factors constraining their ability to transfer labour out of agriculture. The daily shadow wage in agriculture, at less than one yuan, is a fraction of the shadow wage in non-agricultural activities of approximately 7 yuan. Interestingly, the marginal returns to non-agricultural household enterprises are almost identical to the non-agricultural wage rate, suggesting the emergence of a competitive market for off-farm labour. The higher rates of return to education accruing to households which undertake non-agricultural activities (whether self- or wage employment) reinforces the evidence that market forces play some role in the allocation of labour outside agriculture. At the same time, households are unable to transfer labour out of the agricultural sector to the 'optimal' level predicted by theory. Instead, households face different shadow prices for labour, as illustrated by the fact that demographic composition influences agricultural labour productivity. Even for households with members engaged in off-farm employment, a large gap remains between the marginal returns to agricultural and non-agricultural activities, suggesting that excess labour continues to be employed in agriculture.

These conditions of surplus rural labour and barriers to labour mobility in turn create conditions under which non-market mechanisms, such as political connections, become critical for allocating economic resources, including jobs and capital. Jobs in township and village enterprises, for example, are frequently allocated at least in part on the basis of personal connections, and generally only to people from within the same village or township. Thus village of residence and political status affect employment outcomes.

Possible explanations for the retention of excess labour in agriculture include the lack of an agricultural labour market in most areas, obligations associated with contract land, the household registration system, and local variation in off-farm employment opportunities. The lack of flexibility in the reallocation of household labour may in part be imposed by the grain tax and crop quota system which necessitate that households retain a certain amount of labour in agriculture to fulfil their obligations to the state. In particular, a priority of rural households is the need to ensure a sufficient supply of labour in the busiest agricultural season, when hiring of agricultural labour is difficult. Any inefficiency arising from these requirements must, however, be weighed against the benefits of the land allocation system which guarantees a basic source of income to rural households and thus serves as a social safety net in the absence of other collective or state support. For this reason, households may be reluctant to give up their land for riskier off-farm ventures despite the potential for higher

returns. Only households with sufficient labour, capital and connections are able to make this move while also retaining the capacity to farm their land.

Another widely-cited potential source of labour market rigidity is the household registration (*hukou*) system which is generally considered to act as a constraint on labour mobility and to increase the costs of migration.<sup>22</sup> However, given the seasonal variation in household labour use, discussed above, it is unlikely that this system acts as a binding constraint on the transfer of labour out of agriculture, and it is therefore unclear to what extent relaxing the regulations would affect the rural-urban labour transfer process.

The results of the analysis point to the potential of village and township interventions to promote locally based employment in order to enhance rural incomes. The strong effects of village-level variation, even within a relatively small geographic area, suggest that intra-village differences might be addressed through local development strategies, such as the development of infrastructure, the promotion of local enterprise employment, and collective support for agriculture. Locally based wage employment in particular provides a relatively stable, low-risk alternative to farming while allowing households to retain labour for household use. Growth in the Zouping economy in recent years has provided new, often temporary, employment opportunities particularly for unskilled labour, for example in construction, which are compatible with agricultural work during the busy season and which may also reduce the importance of political connections. For households with labour shortages (whether permanent or seasonal), owing for example to family demographic or life-cycle conditions, collective support for agricultural activities particularly during the busy season provides another mechanism which may allow them to undertake off-farm employment while continuing to farm. Promoting the non-agricultural wage sector, facilitating access to inputs, credit and information, and providing collective support for agricultural activities are thus potential mechanisms through which poorer households can be assisted in transferring labour out of unremunerative agricultural employment in order to increase their incomes.

While the results of such an analysis for any one county, such as Zouping, are of course not generalisable to all of China, Zouping County has features which make it representative of large areas of the Chinese countryside. It is likely that the problems of seasonal labour surplus and shortage are common throughout many regions of China and may be exacerbated in the poorest regions where agricultural productivity is often lower, off-farm employment

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<sup>22</sup> See Cheng and Selden (1994) and Wu (1994) for discussions of the *hukou* system and the classification of rural/urban and agricultural/non-agricultural populations.



opportunities are fewer and labour must migrate further afield in search of jobs. By contrast, in the wealthiest and most industrialised regions, an agricultural labour market has developed with migrant labour undertaking much of the farm work. In contrast to the many studies which have focused either on the poorest regions, or on regions of rapid industrial development (such as Guangdong and Jiangsu), this study of Zouping County provides a picture of a more 'typical' rural county where agriculture remains a dominant source of income, but where the development of local off-farm employment provides an important option through which households can continue to cultivate their allocated land as a basic form of security while undertaking more remunerative non-agricultural activities to increase their incomes.

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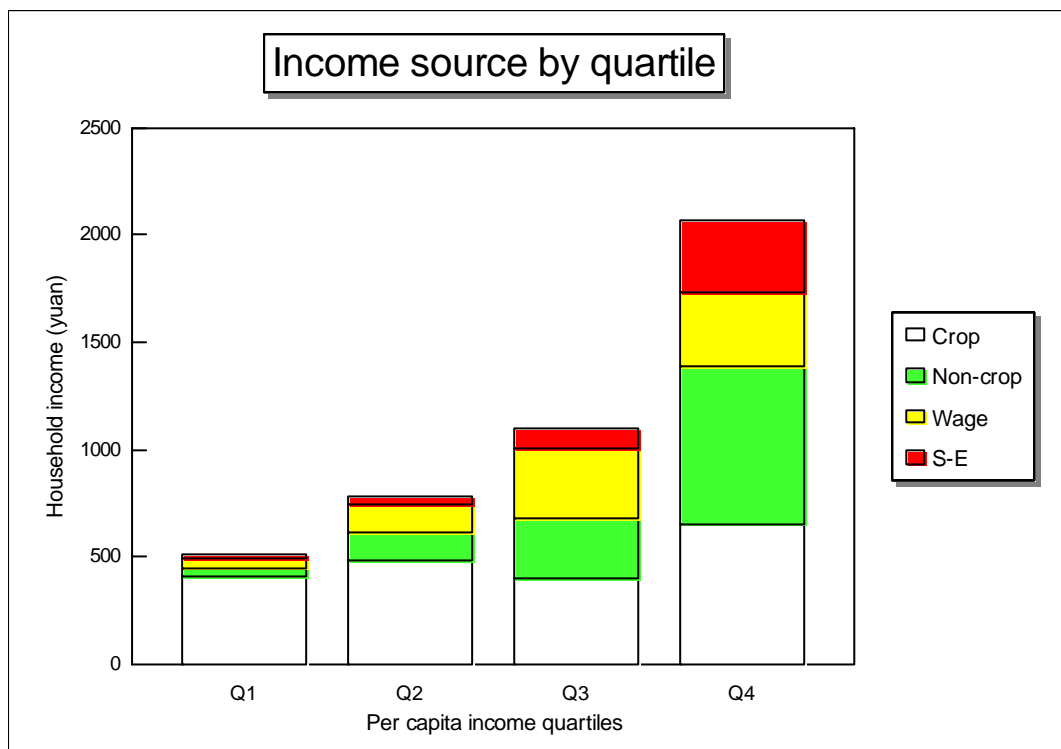
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Figure 1



Figure 2



**Table 1: Economic Profile of Zouping County, 1990**

	<b>Zouping County</b>	<b>Household Survey</b>	<b>National Average</b>
Population	670,571	(n=257)	
Household size	3.96	4.05	3.97
Per capita cultivated land (ha.)	0.11	0.114	0.08
GDP per capita (yuan)	1,280		1,558
Share of agriculture in GDP (%)	54		28
Per capita rural household income (yuan)	702	1162	686

Sources: Zouping Statistical Bureau; State Statistical Bureau; Sicular (1995)

**Table 2: Individual and Household Activities**

	<b>Labour Force<sup>1</sup></b>		<b>Households</b>	
	<b>(n=683)</b>		<b>(n=257)</b>	
	<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>
<b>Agriculture</b>	659	96.5	256	99.6
<b>Agriculture only</b>	448	65.6	102	39.7
<b>Busy Season only</b>	49	7.2	-	-
<b>Self Employment</b>	75 <sup>2</sup>	11.0	46 <sup>3</sup>	17.9
<b>Wage Employment</b>	167 <sup>2</sup>	24.4	124 <sup>3</sup>	48.2

<sup>1</sup> Labor force includes all working adults aged 16-65. Non-workers are primarily the elderly, sick or students.

<sup>2</sup> 9 individuals undertake both household sideline and wage employment.

<sup>3</sup> 155 households have members who are engaged in non-agricultural activities: 46 in household sidelines, 124 in wage employment, and 15 in both.

**Table 3: Cobb-Douglas Production Functions**

Variable	Agricultural Production		Household Enterprise
log costs	.6** (.04)	.7** (.04)	.49** (.04)
log labor	-.11* (.06)	.07 (.06)	.33** (.09)
log land	.61** (.07)	.41** (.09)	-
log plots	-.23** (.06)	-.15** (.08)	-
pct. flat land	.01 (.002)	.24 (.29)	-
pct. male labor	-.002 (.001)	.03 (.04)	.001 (.002)
log max. years of education	-.01 (.07)	-.17** (.07)	.42** (.17)
pct. work in busy season	-.004* (.002)	-.00 (.002)	-
share of wheat	-.005** (.001)	-.002 (.002)	-
share of cotton	-.002 (.002)	-.001 (.003)	-
pre-reform status	-	-	-.32** (.12)
constant	3.6** (.44)	1.6 (1.5)	2.2** (5.1)
Village fixed effects	NO	YES	NO
Number of obs.	255	255	45
Adj. R <sup>2</sup>	.74	.82	.81

Data source: Zouping County Household Survey, 1990.

Standard errors in parentheses are corrected for heteroskedasticity using White's method.

\* 10% significance level \*\* 5% significance level.

**Table 4: Marginal and average products of labor (Yuan per day)**

	Marginal Product of Labour <sup>1</sup>				Average Product of Labour <sup>2</sup>
	Mean	Std. Dev.	Min	Max	
Agriculture	.92	.77	.18	7.44	12 (10.6)
Household Enterprise (n=45)	6.6	6.4	.60	28	20.1 (19.5)
Wage (n=166) <sup>3</sup>	6.75	3.3	1.5	24	-
Wage (n=124) <sup>3</sup>	7.04	3.3	2.8	24	-

Notes:

1. The marginal products of labor are calculated by multiplying the regression coefficient on labor (the elasticity) by the average product of labor. All figures are in RMB yuan per eight hour day. The marginal product of wage labor is assumed to be the wage rate (normalised per eight hour day).
2. Standard deviations are given in parentheses
3. The first wage rate (n=166) is the average across all individuals who engage in wage labor. The second (n=124) is the average for all households who have members in wage employment.

**Table 5: Characteristics of villages in Zouping County Household Survey**

<b>Group</b>	<b>Villages</b>	<b>Group Characteristics</b>
1. Central villages	Dongjing Tengjia Liangmao Houshi Baojia	Close to towns of Zouping and Zhoucun; near main roads; good access to wage employment. Per capita land average / below average. Land flat; average yields.
2. North East villages	Xiyanli Diaosong Jiukou Xiaozhao	Variation in per capita land. Poor roads, relatively isolated; little off-farm employment; agricultural specialization - chicken farming.
3. Northern and Western Villages	Xiaozhen Fengjia Chengjia Liujuqiao	Close to good roads but further from larger towns; above average per capita land endowment; flat, good quality land; average or above average yields. Rural industries.
4. Peripheral villages	Dujia Taitou Qingyang	Land poor; agricultural conditions mountainous or remote; less irrigated land; below average yields; poor roads, limited access to markets and off-farm employment.

**Table 6: Estimated marginal products of labor by village group**

<b>Village Group</b>	<b>Agriculture</b>		<b>Household Enterprise</b>		
					<b>n</b>
1	-.16	(.16)	6.0	(6.3)	17
2	4.8	(3.4)	8.3	(5.1)	4
3	-.61	(.32)	7.5	(3.1)	11
4	.71	(.35)	-4.2	(5.3)	13

Note:

These results are calculated from regressions with interaction terms between group dummy variables and land, labor and intermediate input costs. The agriculture regressions also control for village fixed effects while the household enterprise regressions include group intercept terms. Standard deviations are given in parentheses.



**Table 7: Determinants of household variation in marginal products of labor**

<b>Variable</b>	<b>Agriculture n=256</b>	<b>Household enterprise n=45</b>
Land	.01 (.02)	-.41 (.36)
Dependency ratio	-.79** (.22)	.62 (4.6)
No. of male workers	.67** (.32)	1.7 (5.6)
Value of draft animals	.00 (.00)	-.003* (.002)
Value of productive assets	-.00 (.00)	.001** (.00)
Party member	.30** (.12)	4.8** (2.0)
Government Official	-.02 (.12)	-5.4** (2.7)
Poor peasant family background	-.13 (.09)	-.07 (1.8)
Household enterprise	.022 (.14)	-
Wage employment	.13 (.12)	1.4 (2.1)
Constant	.99** (.33)	5.2 (5.0)
Village fixed effects	YES	NO
Adj. R <sup>2</sup>	.28	.33

Note: Coefficients are given with standard errors in parentheses.

\* 10% significance level

\*\* 5% significance level