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1. Introduction

The industrialization of rural areas is essential to further develop the Chinese economy. It is a powerful means of moving production plants from the eastern coastal region, where wages have recently been rising, to inland rural areas. However, plants and production divisions have only limited decision-making power in determining management strategies. Thus, although attracting many plants helps boost employment and capital in rural areas, it does not necessarily lead to sustainable development of such areas. Hence, it may be necessary to establish new enterprises to promote rural industrialization and development.

Several resources as well as suitable conditions and environments are needed to establish new enterprises. The most important resource is entrepreneurship *à la* Schumpeter, which may induce a resident in a rural area to leave farm work and create her/his own business. In this study we focus on self-employment (个体户/自营户), which many researchers have considered to be the realization of entrepreneurship in rural China (Ma 2001, Mohapatra, Rozelle and Goodhue 2006, Démurger and Xu 2011).

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We use data collected through two sample surveys that the Academy of Hinterland Development at the Henan University conducted in the rural area of Zhongyuan (equivalent to Henan province in a narrow sense) in the 2014 and 2016 summers. The Henan province is in the central region, mainly south of the Yellow River. The agricultural sector is still important in the Henan economy: the dependence on agriculture is so significant that industrialization of its rural area is critical for the province development.

The remainder of this paper is structured as follows. In the second section, we briefly review the literature on self-employment, and investigate the recent trend in rural China. The third section offers an overview of the survey data used in our study. In the fourth section, we estimate probit models to examine the determinants of the occupational choice. The final section presents our tentative conclusion.

2. Related literature and trend of self-employment

2.1 Related literature

Zhang et al. (2006) point out the role of self-employment in the economic development of rural China. In this respect, there are two opposite views: some researchers consider self-employment as an involuntary choice following the loss of the chance to obtain employment in formal sectors; on the other hand, other researchers have a more positive view, conceiving it as the realization of entrepreneurship contributing to rural areas' development and modernization.

In their quantitative analysis, Zhang et al. (2006) support the latter view. Specifically, they use data collected through a sample survey conducted in 2000, covering 1,199 households in 60 villages of 6 provinces. The remarkable advantage of this survey is that it includes in-depth information on the characteristics of self-employment.

An analysis using the same data is attempted by Mohapatra, Rozelle,

and Goodhue (2006). In order to examine the determinants of self-employment, the authors classify it by difference in productivity. The results indicate participants in high productivity self-employment have more years of education and take training for skills. Their conclusion also supports the positive view on self-employment in rural areas.

The outcomes of these studies may somewhat reflect the increasing trend of self-employment at the time they were conducted. However, this trend changed around the year 2000, when migration to urban areas increased rapidly and the number of participants in self-employment stagnated. In correspondence with this change, Wang et al. (2011) run an analysis using data collected in 2008 as a follow-up of Zhang et al. (2006). The results indicate that, although the trend changed, the characteristics of participants in self-employment basically remained the same. Hence, they conclude that, although young residents opt to choose migration to urban areas to access higher wages, self-employment still contributes to the development of local rural areas.

In a recent study, Wang, Li, and Lien (2016) conduct an original household survey in six prefectures of the Shaanxi province in 2010. One of the main results from the estimation of their occupational choice model is that self-employment in local off-farm market relies mainly on vocational skill rather than formal education.

Different from these studies using household survey data, Li and Zhao (2011) conduct a panel estimation using annual data at the provincial level over the period 1999 to 2008. They aim to explain the differences in the regional self-employment rate defined as the proportion of self-employed individuals in the total non-agricultural employment. Their result indicates that the self-employment rate is smaller in the province in which the gross regional product per capita is higher. Accordingly, the authors opt for a skeptical view on the contribution of self-employment to the regional

development.[1]

The relationship between self-employment and economic development is the research topic of interest in the study by Pietrobelli, Rabellotti, and Aquilina (2004) as well. By using panel data including 64 developing and 19 developed countries, they econometrically investigate the determinants of the self-employment rate in manufacturing sectors. The main result of their regression analysis is the negative relationship between GDP per capita and self-employment rate, leading them to conclude that self-employment would be a "sponge" providing subsistence for those who could not find better alternatives, which declines with economic development.[2]

2.2 Trend in self-employment

Before conducting our econometric analysis on survey data in Section 3, we use publicly available aggregate data from the *China Statistical Yearbook* 2016 to confirm the trend of self-employment in rural China. Figure 1 shows the number of self-employed individuals and its proportion with respect to total employment (our self-employment rate) in rural areas in the country.[3] The figure indicates that both number and proportion of self-employed individuals increased almost continuously through the 1990s, but decreased greatly in 2000 and began to increase again after 2008.

Li and Zhao (2011, Figure 1, p. 51) revealed that a similar trend exists until 2008. However, two differences emerge: first, their data are the total of

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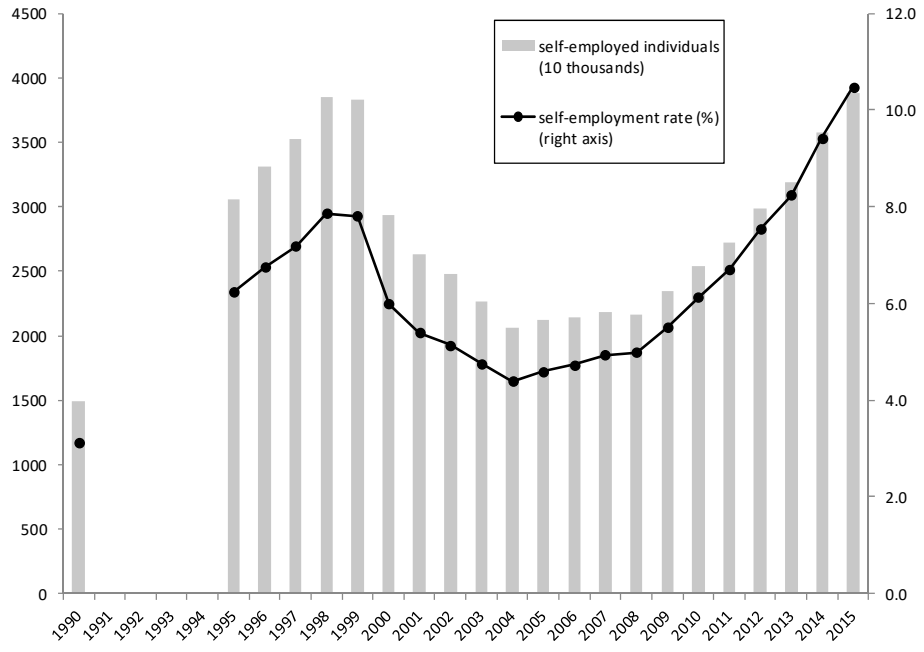
[1] Gaobo (2011) also attempts to estimate the determinants of the self-employment rate at provincial level.

[2] Matsumoto, Kijima, and Yamano (2006) estimate an occupational choice model by using a multinomial probit model for African countries. Our study refers to this article for the analytical method.

[3] For the purpose of this study, we should not show the number of self-employed individuals, but rather the number of self-employment activities. However, the number of self-employment activities by region (urban and rural) is not available in the *China Statistical Yearbook* after 2000. Although the average number of self-employed individuals per a self-employment activity slightly increases from 1995 to 1999, this number is stable at about two people. Thus, the trend in the number of self-employment activities is almost the same as the trend in the number of self-employed individuals showed in Figure 1.

Figure 1 Trend of the number and the proportion of self-employed individuals in rural China (1990-2015)



Source: author 's creation based on *China Statistical Yearbook*, 2016.

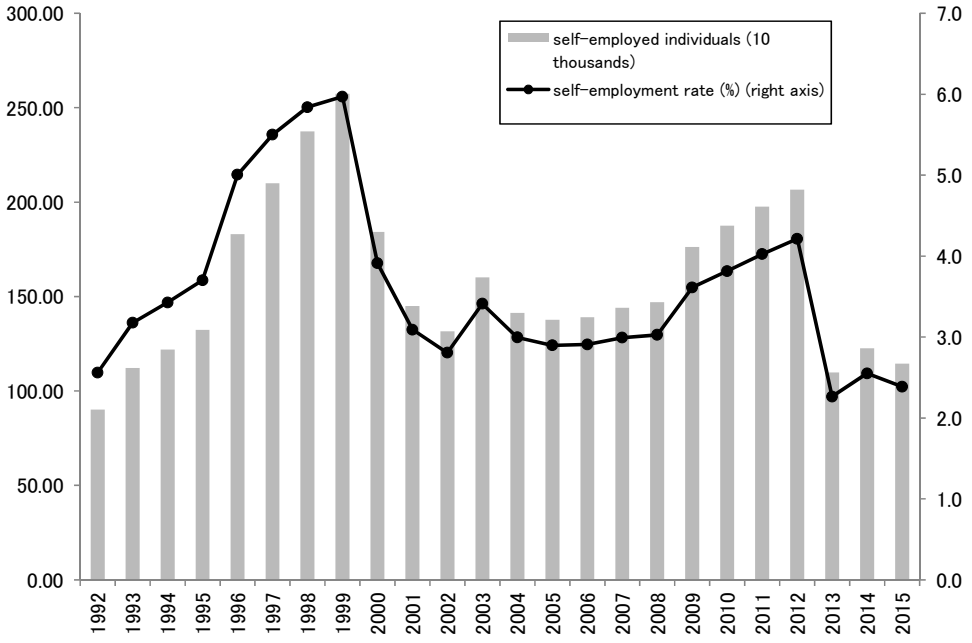
urban and rural areas, while we only consider the rural area's one; second, in calculating the rate, they use non-agricultural employment as the denominator, while we use total employment including agriculture in rural areas because data on non-agriculture employment in rural areas are not published in the *China Statistical Yearbook*.

Despite these differences, the authors' explanations (p. 52) for the significant drop in self-employment after the peak in 1999 can be applied also to our case: first, in the sectors where self-employment was concentrated, competition gradually became intense and profitability decreased; second, with the increased protection of property rights, many entrepreneurs tended to register their businesses as "private enterprises" ("私营企业") instead of self-employment to extend their business opportunities; third, the fast-growing export industry is labor intensive, drawing people away from self-employment. As for this last point, in our case the increase in migration to urban areas can also be included.

As our figures show, both the number of self-employed individuals and self-employment rate began to increase again after 2009 that isn't covered in Li and Zhao (2011). It is unclear whether their explanations can also be applied to this new trend.

Figure 2 indicates the number of self-employed individuals and the self-employment rate in the Henan province. Similar to the national trend, both number and rate increased greatly in the 1990s, decreased rapidly in 2000, and remained low until 2009, when an increasing trend started again. In the Henan's case, however, a significant drop also occurred in 2013, and the trend has kept low up to present.

Figure 2 Trend of the number and the proportion of self-employed individuals in rural Henan (1992-2015)



Source: author 's creation based on *China Statistical Yearbook*, various years and *Henan Statistical Yearbook*, 2016.

Compared with 2012, the number of self-employed individuals decreased by 968 thousands (47 percent) in 2013 in the Henan province. The Hebei province also experienced a rapid decrease in 2003 (1,139 thousands, 62 percent). Different from the trend in these provinces, Figure 1 indicates

that, at the national level, the number of self-employed individuals increased in the same period (2,078 thousands and 7 percent).

The existence of such a significant difference in trends is one of the main reasons because we try to analysis that puts its focus on the situation of the Henan province in present study.

3. Data

3.1 The sample survey

The main purpose of this study is to estimate the determinants of self-employment choice in rural areas. For this estimation, we use data from a sample survey conducted in the Henan province within the research project initiated in 2014 by the Academy of Hinterland Development at the Henan University and still ongoing.

This survey covers 390 villages in all 130 prefectures of the Henan province. Specifically, the survey consists of two parts: a village survey conducted every 3-5 years and a household survey conducted once a year. The latter covers four households per village. Random sampling is applied for the selection of villages. The households in each village are then selected in consideration of various factors, implying no random selection in a strict sense.

The village survey collects information on variables such as population, land, and economic condition. The household survey collects information about individual characteristics of head (occupation, gender, age, education, etc.) and situation of the household (contracted land, size, etc.). In this study, we use cross-section data from the village survey conducted in the 2014 summer and the household survey conducted in the 2016 summer. The maximum sample size for the household survey is 1,294.

3.2 Occupational classification

The household survey contains a question about occupations in non-farm activities. The four choices are "manager" ("管理人员/工头"), "engineer or expert" ("技术工人/专业职员"), "general worker" ("小工/普工/服务人员") and "self-employment" ("自营户")[4]. As for the question about work locations, the five choices are "local village," "local prefecture," "local province," "other province," and "abroad."

Table 1 shows the results from the answers to these two questions. Using this matrix, we define four kinds of occupation, showed in different gray color scales (from the lightest to the darkest): "self-employment," "local non-farm," and "migration."

Table 1 Definition of occupation[a]

	Local village	Local prefecture	Local province	Other province	Abroad	Total
Manager	29	21	7	9	0	66
Engineer and expert	39	59	26	29	1	154
General worker	91	159	92	125	0	467
Self-employment	113	37	10	16	0	176
Total	272	276	135	179	1	863

Local non-farm
Migration
Self-employment

a. Numbers are the number of samples.

Table 2 shows the distribution of the number of participants in each occupation: 176 in self-employment (13.6% in proportion), 398 (30.8%) in local non-farm, 289 (22.3%) in non-farm activity by migration, while the other 431 (33.3%) remain engaged in farm activities. Note that this distribution indicates the occupation of the household head, but it could be possible that the other household members choose the other occupations as the main income source of this household.

[4] There was a fifth choice, "president of private enterprise" ("私营老板"), but no respondent chose it.

Table 2 The numbers and the proportion of the participants in each occupation

	Numbers	Proportion (%)
Farm activity	431	33.3
Local non-farm	398	30.8
Maigration	289	22.3
Self-employment	176	13.6
Total	1294	100.0

Table 3 shows the sectoral distribution across each of the three non-farm occupations. Although the questions allowed for multiple choices, multiple answers are actually very limited. Among all non-farm occupations, “construction” accounts for the highest proportion (37.1 %), followed by “life related” (13.6 %), and “manufacturing” (11.5%). As for self-employment, “domestic manufacturing” accounts for the highest proportion (22.2%), followed by “life related” (19.4%), “transportation,” and “commerce” (both 16.7%). In the non-farm occupations as a whole, “domestic manufacturing,” “transportation,” and “commerce,” instead, do not show high proportions.

Table 3 Distribution of industrial sectors by non-farm activities[a]

		Domestic manufacturing	Manufacturing	Travel	Construction	Transportation	Mining	Commerce
Total of non-farm (851)	the number of responses	82	103	27	331	95	16	43
	the proportion (%)	**9.2**	**11.5**	**3.0**	**37.1**	**10.7**	**1.8**	**4.8**
Local non-farm (392)	no.	33	54	7	153	36	6	11
	prop.	**8.1**	**13.2**	**1.7**	**37.5**	**8.8**	**1.5**	**2.7**
Migration (287)	no.	9	40	8	166	29	9	2
	prop.	**3.0**	**13.2**	**2.6**	**54.6**	**9.5**	**3.0**	**0.7**
Self-employment (172)	no.	40	9	12	12	30	1	30
	prop.	**22.2**	**5.0**	**6.7**	**6.7**	**16.7**	**0.6**	**16.7**

		Education	Medicine	Finance	Life related	Government	Others	Total
Total of non-farm	no.	0	22	4	121	22	26	892
	prop.	**0.0**	**2.5**	**0.4**	**13.6**	**2.5**	**2.9**	**100.0**
Local non-farm	no.	0	11	3	56	21	17	408
	prop.	**0.0**	**2.7**	**0.7**	**13.7**	**5.1**	**4.2**	**100.0**
Migration	no.	0	4	1	30	1	5	304
	prop.	**0.0**	**1.3**	**0.3**	**9.9**	**0.3**	**1.6**	**100.0**
Self-employment	no.	0	7	0	35	0	4	180
	prop.	**0.0**	**3.9**	**0.0**	**19.4**	**0.0**	**2.2**	**100.0**

a. Numbers in parentheses show the number of samples.

Looking at the other two occupations, in the local non-farm ones,

"construction" accounts for the highest proportion (37.5%). "Construction" is followed by "life related" (13.7%), and "manufacturing" (13.2%). In migration, "construction" accounts for a very high proportion (54.6%), followed by "manufacturing" (13.2%). In terms of sectoral distribution, there are clear differences across our three non-farm occupations.

4. Occupational choice analysis

4.1 Occupational choice model

In this section, we examine the determinants of the occupational choice through regression analysis. The explanatory variables consist of four categories: individual characteristics of household head (respondent), a household characteristic, and two level's community characteristics (village and prefecture levels). The set of individual characteristics includes gender, age, and years of schooling.[5] [6] The household characteristic is the area of contracted land per capita. As community characteristics at village level, we select net income per capita, population density, and distance to the local town ("集镇"). Lastly, as community characteristics at prefecture level, we include urbanization rate (the proportion of urban residents in total population) and GDP per capita. Definitions, summary statistics and data sources are shown in Table 4.

We estimate three types of probit model: regular, instrument, and multinomial. Firstly, to compare the determinants of the choice to participate in self-employment with the other three occupations, we estimate a regular

[5] The question about education was originally in a choice form. Based on the answers, by allotting 1 (year) to a respondent not obtaining the elementary school degree, 7 to a respondent completing elementary school, 13 to respondent completing high school, and 17 to respondent completing university and above, we built the continuous variable "years of schooling." Considering the historical change in the educational system in China, this method may be too simple.

[6] Hu (2014) shows the individual risk attitudes have a nonlinear effect on the choice of self-employment. Due to data limitation, we cannot include the index of risk attitude as individual characteristics in the model.

probit model. The dependent variable is a dummy variable that takes the value 1 if the household head participates in self-employment, and 0

Table 4 Definitions and descriptive statistics of variables

	Definition	Unit	No. of samples	Average	St. dev.	Min.	Max.	Sources
Individual characteristics								
Gender dummy	male=1, female=0	-	1294	0.943	0.232	0	1	Household survey (2016)
Age	2016-birth year	years old	1288	52.0	10.8	23	88	Household survey (2016)
Years of schooling	not obtaining the elementary school degree=1, completing elementary school=7, completing high school=13, completing university and above=17.	year	1294	10.9	3.9	1	17	Household survey (2016)
Household characteristics								
Area of contracted land per capita	total area of contracted land/no. of family	mu	1142	1.19	3.55	0	86.57	Household survey (2016)
Father's education dummy	completing high school and above=1, otherwise=0.	-	997	0.146	0.354	0	1	Household survey (2016)
Village characteristics								
Net income per capita	2013	yuan	1200	5512	5323	599	50000	Village survey (2014)
Population density	total population/total area	no./mu	1240	0.953	1.115	0.043	10.3	Village survey (2014)
Distance to the local town	2013	km	1170	3.76	3.78	0	30	Village survey (2014)
Prefectural characteristics								
Urbanization rate	2013	%	1284	40.6	15.4	23	100	*Henan Statistical Yearbook* (2014)
GDP per capita	2013	yuan	1284	35847	21030	13931	163433	*Henan Statistical Yearbook* (2014)

otherwise. Secondly, considering the endogeneity of the variable "years of schooling," we attempt to estimate an instrument probit model. In this case, the exogenous instrumental variable is the educational level of the household head father, that is, a dummy variable that takes the value 1 if the father completed high school, and 0 otherwise.

Lastly, we estimate a multinomial probit model.[7] Here, the dependent variable takes the value 1 if the household head does not engage in any non-farm occupation (i.e., only engages in farm activity), 2 if she/he engages in a local non-farm occupation, 3 if she/he is a migrant to urban area, and 4 if she/he participates in a self-employment activity.[8]

[7] Different from a multinomial logit model, the multinomial probit model is not subject to the independence from irrelevant alternatives assumption, which implies that the relative probabilities of any two alternatives only depend on the characteristics of those two alternatives.

[8] The return migrants are more likely to choose self-employment than non-migrants (Ma 2001, Démurger and Xu 2011). In our sample, some individuals engaging in self-employment now may have the experience of migration to urban in the past. However we cannot confirm such a situation from the survey.

4.2 Estimation results

In this subsection, we describe the estimation results. Specifically, we only discuss sign and significance of the estimated coefficients, leaving aside the magnitude of the marginal effects.[9] We first look at the estimation results of the regular probit model. As shown in the first column of Table 5, the estimated coefficients other than years of schooling and urbanization rate do not indicate significance at standard level. An individual who has more years of schooling and resides in a more urbanized prefecture tends to choose self-employment over other occupations including agricultural work.

Then, we move to the estimation results of the instrument probit model, which consider "years of schooling" as an endogenous variable. As shown in the third column of Table 5, no estimation coefficients are significant. Because the test statistic of the Wald test for the exogeneity of the instrumented variables ("years of schooling" in this case) is not significant, a regular probit regression may be appropriate. Overall, the number of statistically significant coefficients are too few to identify enough the characteristic that influences the choice of self-employment over other occupations.

First-stage results of the instrument probit estimation are slightly interesting. The estimated coefficients of gender, age, prefectural GDP per capita, and father's education level are significant over 10% level. Males present more years of schooling than females. The younger generation has more years of schooling. As expected, an individual who resides in a more developed prefecture attends school for more years. We can also statistically confirm that an individual with a more educated father experiences longer schooling.

[9] In the estimation, we take the logarithm of all continuous variables except age and urbanization rate. Furthermore, as the two variables "area of contracted land per capita" and "distance to the local town" often take 0 value, we replace it with 0.00001 before taking the logarithm.

Table 5 Estimation results of probit model[a]

	Probit	Instrument probit[b]	
		Second stage	First stage
Individual characteristics			
Gender dummy	0.232	-0.108	0.720***
	(0.84)	(0.13)	(6.41)
ln(Age)	-0.346	0.115	-0.611***
	(1.39)	(0.15)	(5.24)
ln(Years of schooling)	0.152*	0.709	-
	(1.76)	(0.79)	
Household characteristics			
ln(Area of contracted land per capita)	0.012	0.011	-0.006
	(0.85)	(0.74)	(1.02)
Father's education dummy	-	-	0.143**
			(1.99)
Village characteristics			
ln(Net income per capita)	0.030	-0.031	0.009
	(0.41)	(0.40)	(0.25)
ln(Population density)	0.045	0.052	0.033
	(0.56)	(0.53)	(0.91)
ln(Distance to the local town)	0.007	-0.001	-0.004
	(0.26)	(0.04)	(0.33)
Prefectural characteristics			
Urbanization rate	0.009**	0.008	0.001
	(2.06)	(1.35)	(0.37)
ln(GDP per capita)	-0.208	-0.234	0.166**
	(1.44)	(1.22)	(2.43)
Constant	1.242	-0.578	2.117***
	(0.72)	(0.18)	(2.65)
log of likelihood	-362.82	-1076.04	
the number of samples	948	766	

a. Dependent variable is "self-employment dummy" (self-employment=1, others=0).
Numbers in parentheses are the absolute value of z-statistics.
*** Significant at 1%, ** significant at 5%, * significant at 10%.
b. ln(years of schooling) is treated as endogenous.
Excluded variable is father's education dummy.

Lastly, we show the estimation results of the multinomial probit model that considers all four alternatives for the occupational choice separately

(Table 6). Respondents keeping engaged in farm activities are the base group.

Table 6 Estimation results of multinomial probit model[a]

	Local non-farm	Migration	Self-employment
Individual characteristics			
Gender dummy	0.554*	1.222***	0.749**
	(1.83)	(3.03)	(1.97)
ln(Age)	-3.383***	-4.713***	-3.193***
	(9.22)	(11.96)	(7.75)
ln(Years of schooling)	0.060	0.100	0.210*
	(0.62)	(0.88)	(1.75)
Household characteristics			
ln(Area of contracted land per capita)	0.013	0.001	0.016
	(0.74)	(0.07)	(0.82)
Village characteristics			
ln(Net income per capita)	0.001	-0.092	0.005
	(0.01)	(0.91)	(0.05)
ln(Population density)	0.398***	0.173*	0.258**
	(3.99)	(1.65)	(2.26)
ln(Distance to the local town)	-0.005	-0.014	0.000
	(0.14)	(0.40)	(0.00)
Prefectural characteristics			
Urbanization rate	0.004	0.006	0.014**
	(0.59)	(0.95)	(2.19)
ln(GDP per capita)	-0.002	-0.365*	-0.363*
	(0.01)	(1.83)	(1.73)
Constant	12.686***	21.206***	14.061***
	(5.62)	(8.55)	(5.35)
log of likelihood	-1141.19		
the number of samples	948		

a. Independent variable is: farm activity=1, local non-farm=2, migration=3, self-employment=4. The farm activity is base group. Numbers in parentheses are the absolute value of z-statistics.
*** Significant at 1%, ** significant at 5%, * significant at 10%.

In the results on the choice of self-employment, some coefficients show significance over 10% (third column of Table 6). The estimated coefficient of the dummy "gender" shows a significant positive sign (5% level). Males tend to choose self-employment over agricultural work as compared with females. The estimated coefficient of age shows a significant negative sign (1% level). This implies that the younger individuals are more likely to choose

self-employment. The estimated coefficient of years of schooling, although the level is not high (10%), is significant. Compared with those engaging in agricultural work, those who choose self-employment have more years of schooling. This result suggests that formal education is necessary to establish own businesses.

In the set of community characteristics at village level, only population density indicates a significant estimated coefficient with a positive sign (5% level). Because the return of business may be increasing as population becomes dense, this result is as expected. In the set of community characteristics at prefecture level, urbanization rate indicate significance at 5% level. An individual who resides in a more urbanized prefecture tends to choose self-employment over agricultural work.

The estimated coefficient for "prefectural GDP per capita" shows a significant negative sign (5% level). This result is important, as it may suggest that those who reside in a more developed area do not have a tendency to choose self-employment. As mentioned above, Pietrobelli, Rabellotti, and Aquilina (2004) and Li and Zhao (2011) also obtain a similar result, based on which they adopt a skeptical view on the potential contribution of self-employment to rural development.

Next, we comment on the estimated results of the other choices compared with agricultural work. Regarding migration with non-farm activity, the estimated coefficient of the gender dummy is significant (1% level) (second column of Table 6). Males have more incentive to choose migration compared with females. The estimated coefficient of age also shows a significant negative sign (1% level). The estimated coefficient of prefectural GDP per capita indicates significant negative sign (5% level). Similar to the choice of self-employment, the level of economic development negatively influences the choice of migration.

Lastly, we investigate the results regarding the choice of a local non-farm activity (first column of Table 6). In addition to the gender dummy,

the estimated coefficient of age shows a highly significant negative sign (1%), and the same high significance occurs for "population density" (but, positive sign). An explanation for this last result is that the return of local non-farm activities may increase as population becomes dense. In this case, the estimated coefficient for the prefectural GDP per capita does not show statistical significance. Different from the choice of self-employment and migration, the level of prefectural economic development does not have a clear statistical relationship with the choice of local non-farm occupations.

5. Conclusion

Recently, the establishment of own businesses has been strongly promoted in China. After Prime Minister Li Keqiang advocated the slogan "Let's establish own business, let's achieve innovation" ("大众创业，万众创新") at the Summer Davos Forum in September 2014, both central and local governments have proposed several policies. Specifically, to develop rural areas the establishment of new businesses by local residents is expected.

We find that, recently, self-employment has tended to increase in the country. In contrast, the level of self-employment in the Henan province has been stagnant. Furthermore, by estimating a multinomial probit model on new household survey data, we suggest the presence of a negative relationship between economic development at prefecture level and the choice of self-employment. These results support the skeptical view on the contribution of self-employment to the economic development in the Henan rural area.

On the other hand, although the result is not strong, our estimation indicates that an individual who chooses self-employment activities over agricultural work has more years of schooling. In contrast, for individuals who choose migration we cannot confirm the positive effect of schooling. Based on these results, we can expect a role for self-employment in the

development of rural areas.

Table 3 shows that the industrial sectors vary across the three non-farm occupations considered. Our study does not make clear the possible differences in the determinants of the choice among these three non-farm occupations, likely because this sectoral variety is not explicitly addressed. The validity of this conjecture will be investigated in future work.

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