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# Training, Skill-Upgrading and Permanent Migration: Evidence from China

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# **Training, Skill-Upgrading and Permanent Migration: Evidence from China**

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## **Abstract**

The massive rural-to-urban migration is one of the most important features of China's labor market during the past decades. The recent pattern of return migration and migrant wages increases the cost of firms in urban areas and negatively affects urbanization. It is therefore important to understand the determinants of permanent migration. Human capital acquired via training is general overlooked, although extensive studies work on this topic. Using data from the Rural Urban Migration in China, we close this gap in the literature and find that migrants are more likely to choose permanent migration after receive training provided by firms. The effect is larger for females, high school dropouts, and wage earners. These findings suggest that training may complement the inadequacy of human capital of migrants and upgrade their skills. Therefore, training in cities may act as an instrument moderating the return migration and transforms a temporary migrant to permanent.

**Keywords:** Human capital, migration, skill-upgrading, training

**JEL classification:** J61, J24

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## 1 Introduction

China's labor market has experienced important changes since the economic reform in late 1970s. The changes include the emergence of entrepreneurs and small businesses in rural areas, the shift of employment from state to private sector, and massive rural-to-urban migration (Meng, 2012). The rapid growth in the number of migrant workers is marked as a historical phenomenon with strong Chinese features in the past decades. China had more than 150 million migrant workers in 2010. Internal labor mobility is associated with great changes of the economy in both sending and receiving communities in rural and urban China.

Migration improves labor market efficiency by shifting the abundant labor from agricultural sector in rural areas to the manufactory and service sectors in urban areas. In this sense, migration contributes to China's rapid economic growth during the past decades.

Chinese migrants differ from their counterparts in other countries from the aspect of duration of stay. The internal labor migration is restricted due to the *hukou* registration system in China although barriers to migration have been gradually relaxed in line with the deepening of reforms and the subsequent rapid growth and vast demand for labor in urban areas (Au & Henderson, 2006; Poncet, 2006). The segregation of rural and urban *hukou* makes it challenging for the majority of migrants originated from a rural community to obtain an urban *hukou*, without which migrants may have little access to social security, including health insurance, housing subsidy and pension, public education of their children and social benefits. Prior studies have identified these factors are key barriers that hinder migrants from staying permanently in cities. Therefore, a majority of migrants return to hometown in rural areas when they get old or have accumulated the target wealth during migration.

In addition to the institutional reason, individual characteristics also affect migrant's duration of stay in the city. Although there has been extensive research on determinants of

return migration including human capital, training and the associated upgrading of human capital, skill and earning ability is largely overlooked in the literature (Dustmann, 2001; Hu, Xu, & Chen, 2011; Zhao, 2002). Little research has explicitly examined the effects of obtaining job training on earnings and return migration. Similar to education and years of schooling, training has been identified as a crucial mechanism for skill upgrading. It's more relevant to investigate the potential effect of training on migrant's behavior because the education level is fixed for the majority of migrants. In contrast, their human capital could be altered through job training in the city.

In this paper, we examined the effects of job training on subjective migration duration, which is a reasonable proxy for permanent migration or reversely return migration. In addition, we compared the differential effects of training and education on migrant's subjective duration of stay. The later question allows us to identify the underlying mechanism of training, i.e., the specific human capital adaptive to urban jobs and life.

Empirical analysis is conducted using a rich dataset from the Rural Urban Migration in China (RUMiC). To preview the results, we find that training provided by firms has a significant and positive effect on migrant's subjective duration of stay in a city. In contrast, education has little impact on permanent stay. We also find training significantly increases the wage of trainees. In contrast, training provided by other agents such as government, neighborhood, or agricultural training has little effects. All these findings support the hypothesis that training provides specific skills to migrants, increases their human capital and enables them to have a high expected income in the future and a higher subjective duration of migration.

Findings in this paper have important policy implications. First, the skill-upgrading and enhanced adaption to work and life in urban areas imply a potential increase in the

economic well-being and social economic status of migrants and their families. Prior research has identified that migrants tend to originate from families with low social economic status and have a lower propensity of consumption (Chen, Lu, & Zhong, 2015). We expected that the inequality in income, labor supply, job tenure, consumption and other aspects between migrants and natives in urban areas could be alleviated if training programs are accessible to migrants. Second, the provision of specific skill and human capital through job training could be an effective method to retain the labor force and reduce the mismatch and misallocation of labor in migrant's labor market. In this sense, training and skill-upgrading may contribute to the rapid urbanization and economic growth. Thus, this paper contributes to the literature by adding evidence that specific human capital is more important than general human capital in explaining migrant's subjective duration of migration. This is the first evidence to our best knowledge.

The remainder of this paper is organized as follows. Section 2 briefly reviews China's massive migration and labor market and the related literature. Section 3 introduces the data, variables and empirical strategy. Section 4 presents the empirical results. Section 5 concludes with discussions on the status of the paper in the extant literature and policy implications.

## **2 Background and Literature Review**

### **2.1 Rural-to-urban migration**

China's labor market has been characterized by a careful government planning during the past three decades between 1949 and 1979 (Wang, 2014). Meanwhile, the strictly implemented household registration system (*hukou*) since early 1950s retains individuals to work only in the local labor market where his or her *hukou* was registered. Moving between rural to urban areas was challenging. Adults in rural areas worked in the agricultural sectors. A large number of surplus labor in the agricultural sector was created due to the land scarcity.

In urban areas, however, the government assigned a life-time job to every abled working age adults. The *hukou* system along with the planned labor market creates a segregated labor market in China.

Since 1979, Chinese government has gradually initiated a series of policies to increase the vitality of the economy. In 1986, the formal labor contract was introduced in state-owned enterprises (SOEs) to increase competition in the labor market. The SOEs experienced a gradual privatization in the early 1990s because of their low productivity and lack of efficiency. The government began privatizing small and medium sized SOEs while retaining only the large SOEs (Cai, Park, & Zhao, 2008; Cao, Qian, & Weingast, 1999). Meanwhile, employers were allowed to hire and fire employees in a more market-oriented way. As a consequence, the dominance of public sector employment was replaced by a more balanced employment in public sector, private sector, and self-employment. In light of the changes in economic condition and labor market, the government relaxed the restrictions on household registration and facilitated the massive internal migration from rural to urban areas in early 1990s. Millions of prime-aged working adults who were redundant workers in agricultural sector in rural areas moved to cities for jobs. The population of inter- and intra-provincial migration reached 210 million in Census 2010.

Migrants and urban residents are different in several aspects of characteristics. Migrants in urban areas tend to be younger, less educated, and more likely to be employed since employed migrants may return to rural areas. They also exhibit quite different employment patterns. Migrants are much more likely to be self-employed, less likely to work as employees in state sector and more likely to work as employees in private sector. The difference in employer's ownership may be due to gaps in human capital, *hukou* status or other types of labor market discrimination. As to occupation, migrants are more likely to work as sales workers and production workers and less likely to work as professional workers

and clerks (Meng, 2012). The labor market performance of migrants has improved during the past decades. Lu (2012) estimated that the wages of migrant workers increased by 10 percent per year up to 2010. However, their wages are still lower than urban residents and the relative wage gradually decreases.

## **2.2 Literature review**

### **2.2.1 Determinants of migration and return migration**

It is popular for migrant workers to return. The majority of women return home between 25-35 years old and men return in their mid-30s (Meng, 2012). Return decision is simultaneously determined by push factors of urban working condition and push factors including family issue, marriage market, and working condition in hometown (Zhao, 2002). The average stay in cities of migrant workers is 7 years (Meng, 2012). Prior literature has documented a variety of explanatory factors from the aspects of both institution and individual.

Institutional factors are usually considered as major impediments to migrant workers' willingness to stay in cities. The inadequate access to social insurance for migrants, education for their children and housing ownership are among the top concerns of migrants (Hare, 1999; Wang & Zuo, 1999; Wu, 2004). Research has found that, compared to other institutional factors, *hukou* is the most important factor that inhibits migrant workers' settling in cities through various mechanisms (Chan, 2001; Hare, 1999; Lu & Song, 2006; Wu, 2004; Yang, 2000; Zhao, 2005). Ownership of land in countryside is also an important factor that influences stay or return decisions (Hare, 1999; Hu et al., 2011; Zhao, 2005). In addition, income differentials between developed and underdeveloped countries (Borjas, 1987; Dustmann, 2003; Todaro, 1969), or urban and rural regions (Zhang & Song, 2003), can also influence stay or return decision, adjusted by self-selection process (Borjas, 1987; Borjas,

Freeman, & Katz, 1996; Chiquiar & Hanson, 2005; Dustmann, 2003; Kaestner & Malamud, 2014).

Individual factors, such as gender, age, marital status, vocational status, social capital, and human capital also influence the settlement decision of migrants. Research has found that male migrants have stronger willingness to settle with the recipient city than do female counterparts, because they are more ambitious in careers and better at dealing with pressure (Zhao, 1997). In contrast, other studies show that females have stronger settlement willingness since females are more likely to achieve their goals to settle in a city by marriage (Fan & Huang, 1998).

As for age, migrant workers' settlement willingness subjectively decreases and they are objectively more difficult to find satisfactory jobs in cities as age increases. This explains a negative correlation between willingness to settle in cities and age (Zhao, 1997). However, some researchers find that as migrant workers' age increases, they are more adapted to city lives and have stronger settlement willingness. Furthermore, other researchers find non-linearity such as inverted U-shape between age and settlement willingness (Zhu, 2002).

In addition, the majority of studies find that single people have stronger settlement willingness because they have less pressure of child care and elderly care (Hu et al., 2011; Zhou, 2004). Situations of left-behind children also influence return migration decisions (Démurger & Xu, 2015). In light of vocational status, in general, extant literature tends to reach an agreement that better vocational status brings stronger settlement willingness, since a satisfied job is the premise of stable income and adaption to city lives among migrant workers (Hu et al., 2011). In contrast, strong social connection back in hometown helps the return migrants secure better entrepreneurial opportunities (Ma, 2001).

### **2.2.2 Human capital and migration**

Social capital accumulated through work experience in cities also plays an important role in migrant workers' settlement decision. Migrant workers tend to have stronger settlement willingness as they spend more time in cities and keep less connection with previous contacts.

Human capital is one of the most important factors that influence migrant workers' decision on whether to stay in a city (Dustmann, 2001) permanently. In the related literature, migrants typically obtain human capital through years of schooling and training after graduation. Individuals with higher human capital can have better job opportunities, more adaption to city lives, and higher social economic status; therefore, more willingness to stay (Cai & Wang, 2008; Hu et al., 2011).

Labor market training includes classroom training and on-the-job training provided by firms, the government and other sectors. Traditional theory of human capital indicates that firms shoulder the full cost of specific training and employees shoulder the cost of general training (Becker, 1964). This theory does not explain why many modern firms provide free general training as well. The more recent phenomenon was theorized by the assumption of imperfect contract and information asymmetry in Acemoglu (1997).

Empirically the effects of training programs are difficult to estimate for the following reasons: (1) selection into training programs, that is those whom the firm regards as its best employees are the ones who are likely to participate in the training and gauge the benefits from it (Goux & Maurin, 2000; Heckman, LaLonde, & Smith, 1999; Leuven & Osterbeek, 2008); and (2) the negative lock-in effect in the short run and the positive human capital augmentation effect in the medium and long runs may cancel out on average. In the short run, the job finding probability of program trainees is reduced due to the participation and time spent on training programs. For these reasons, the empirical studies on the training programs generate mixed results. Overall, studies using data from European countries provide

supportive evidence on the effectiveness of training programs on improving the employment opportunity and wages of trainees (Bjorklund, 1994; Dolton & Treble, 1994; Fersterer, Pischke, & Winter-Ebmer, 2008; Lechner, Miquel, & Wunsch, 2011; Main & Shelly, 1990).

In contrast, the studies using data from the U.S. show that the effect of training is very modest, even for the target disadvantaged group of women and youth. The evaluations of training programs do not produce an impressive balance sheet, i.e., the cost per trainee largely exceeds the return per trainee on average. One well-known exception, however, is the success of the largest education and job training program for disadvantaged youth, the Job Corps. This training program effectively yields earning gains among trainees and reduces their usage of other social welfare programs and crime (Schochet, Burghardt, & McConnell, 2006).

Other research has obtained contrary findings. For example, due to better job opportunities in the hometown job market, migrants with higher education may prefer to returning rather than staying in cities (Zhao, 1997; Zhu, 2002), or better business opportunities attract better-educated migrant workers to return to their hometown and start own business (Ma, 2001). Wage premium earned by return migrants (Campos-Vazquez & Lara, 2012) may be subtly sensed by those who obtained higher human capital through on-the-job training. Especially in the situations where return migration has been planned as part of an optimal life-cycle relocation sequence (Borjas & Bratsberg, 1996), human capital accumulated through on-the-job training may be more enlightening for the migrants to make return decision.

In the extant literature, little has been done on the impact of on-the-job training on migrants' decision on settlement with the city or return to the hometown. The present study attempts to fill the gap. We study the effect of on-the-job training, and compare the effect with years of schooling for migrants' decision on settlement with the cities. As migration

decision is made after the evaluation of costs and benefits (Simmons & Xie, 2013), return migration decision is also weighed over by migrants on the costs and benefits, especially comparing the opportunity costs by staying in the more developed host location (Borjas & Bratsberg, 1996), and the facilitative effect to pursue occupational opportunities back to the hometown with improved skills and entrepreneurial abilities (Ma, 2001). In balance, we predict that in the present China the rural migrants with stronger on-the-job training in cities have stronger preferences to stay in the cities.

### **3 Data, Variables and Empirical Strategy**

#### **3.1 Data**

Data used in this paper are from the 2008 and 2009 Rural Urban Migration in China (RUMiC). It was conducted by the Institute for the Study of Labor in Bonn, Germany. With a large quantity of samples and questions, this survey is one of the most authoritative and detailed high quality surveys on the subject matter in recent years. The entire survey includes 8,278 individuals originated from 5,007 families in 342 cities and 34 provinces. The sample is national representative. This migrant survey targets to create a national represented sample of migrants by selecting over 8,000 individuals who were currently working in major destinations including Guangzhou, Dongguan, Shenzhen, Zhengzhou, Luoyang, Hefei, Bengbu, Chongqing, Shanghai, Nanjing, Wuxi, Hangzhou, Ningbo, Wuhan, and Chengdu. RUMiC contains rich information on migrant's demographic characteristics and the traits of origin households. It also contains information on training history which is essential to the design of the current paper. Therefore, the RUMiC dataset is arguably the best available data set for the topic in focus.

#### **3.2 Variables**

Since the main task of this paper is to examine the direct effect of training on migration duration, we construct the dependent variable as binary indicating a migrant's subjective expectation of permanent stay in cities. This definition is consistent with permanent migration and reversely indicating the subjective expectation of return to hometown. Subjective evaluation of self's status is a well-used measure for individual's well-beings. Therefore, the subjective expectation of migration duration is a reliable proxy for permanent migration or reversely return migration.

The key independent variable of interest is training, as a method of human capital gain for migrants in the host city. Here, we put our main interest to job training provided by firms because this type of training equips migrants with the firm-adapted specific human capital. We speculate that it is this kind of training that provides migrants work-related human capital. The data set allows us to distinguish firm's training and other type of training. Therefore, the training variable is binary and coded as 1 if the respondent migrant indicates he has received any training provided by firms; and 0 otherwise. We also construct variables indicating other types of training for the robustness checks and the analysis on specific skill-upgrading. Another human capital measurement, years of schooling, is constructed based on education information.

We included other individual characteristics such as demographic, psychological, social capital and socio-economic factors as control variables. Gender, marital status and whether having children are all coded as binary variables. Risk attitude ranges from 0 to 10 with a higher score indicating the preference of taking higher risk. Living satisfaction is coded from 12 related questions in the questionnaire, including concentration, anxiety and insomnia, confidence, judgment, nervousness, overcoming difficulties and self-evaluation, with higher scores indicating respondents' higher satisfaction with their lives. As for social capital variables, we choose network size measured by the number of people that a migrant

worker keeps contacts in daily life and sends greetings on holidays, pension insurance, and city marketization level. As for economic factors, we choose family income, living space per capita, and land.

### **3.3 Empirical Strategy**

Identification that is relied on exogenous variation of training is required to interpret the current findings to causality. In practice, the participation status in a training program is not randomly assigned but endogenous determined. Migrants select whether attend any firm's training according to their own situation. Migrants who have a strong preference to city life may invest more in their human capital. This generates the upward bias to the OLS estimates. Similarly, it is possible that workers who attend training just experienced a drop in earnings. To identify the causal effect of training on permanent migration, this paper uses the instrumental variable approach to address the potential bias of OLS estimates caused by the endogeneity and self-selection. In other words, we used a new variable, the training opportunity offered by the companies of other industries in the same city to instrument the corporation internal training.

Corporate internal training is arguably positively correlated to that of other industries. The early definition of competitors refers to firms whose products are substitutes and the cross-elasticity of demand is positive, which is applicable to only horizontal competition. However, Steiner (1985) proposed that, when firms can take margins or market shares from each other, they are competitors as well. This definition works well for a previously omitted type of competition, vertical competition. Actually, the market power of a firm is a function of both its horizontal and vertical competitiveness, and the internal capabilities (Steiner, 2008), which is supported by competition theory and bargaining theory in economy. Unlike horizontal competition, which traditionally arises from the same industry, the latter one, of

which the source are mainly the upstream or downstream firms, may not be ignored for the sake of its importance in bargaining power and overall competence. The vertical restraints, involving complicated contracting arrangements between producers and raw material suppliers or retailers, are among critical considerations for a corporation (Blair & Kaserman, 1983; Caves, 1984; Rey & Stiglitz, 1988). Under the hypothesis that corporate internal training adds to the employee's human capital, the improvement of human resource in either upstream or downstream industries due to more investment in internal training will lead to higher bargaining power among these firms, thus attaching competitive pressure to the enterprise and motivate it to invest more in internal training. Moretti (2004) found the spillover effects of human capital between economically closed industries. It is generally acknowledged that R&D and education has wide spillover effects (Acemoglu & Angrist, 2001; Griliches, 1992). Therefore, we argued that corporate internal training should be of no exception. This effect takes place both in and among industries where once a company benefits from providing internal training to the employees, other companies will imitate this strategy and even the local government may set it as example and create a wave for training, which may explain why training opportunity in some seemingly unrelated industries will also perform certain positive effects on corporate internal training. But it's worth noting that this effect is usually subject to certain geographic scope, for instance, within a city. That is the reason why we defined the instrument in the same city.

The prevalence of training outside the industry within the same city should have no impact on the migrant's subjective willingness of staying in a city permanently. This may also answer to the question that why not use training opportunity provided by other companies in the same industry. Although there may be certain positive correlation both through the competitiveness and spillovers, this indicator may directly affect the migrant's

willingness to permanently stay through job-hop within the industry, while this is less possible across industries.

#### **4 Results**

Table 1 presents the summary statistics of all variables used in the analysis with Column (1) for trainees, Column (2) for non-trainees and Column (3) for the differences in selected characteristics between these two groups. Individuals with some training experiences exhibit a higher intention of permanent stay in the city than their counterparts without any training. In other words, trainees are less likely to return. The difference is 0.03 and significant at the 1 percent level. Migrants with training are 8 percent more likely to be female, 4-year-old younger, and 17 percent less likely to be married. A much larger proportion of migrants with training attended high school and obtain a higher degree in formal education than migrants without training (0.47 percent versus 0.29 percent). The majority of both groups have rural *hukou*. Only a negligible fraction of the migrants have urban *hukou*. The following rows show that there is no significant difference in health condition between migrants with and without any training experience. The comparison in employment type between two groups also indicates significant differences in this aspect. 95 percent of the migrants with training are wage workers. Another 5% of them work as self-employed. None works as an unpaid worker. In contrast, migrants without any training have a much higher self-employment rate and a relatively lower rate of wage earner. The prevailing topography of hometown is less likely plain and more likely mountain. Finally, the number of observations collected in the year 2008 and 2009 is balanced between two groups of migrants.

[Insert Table 1 about here]

Table 2 presents the baseline results of the estimated effect of training on subjective expected duration of migration. Consistent with the top row in Table 1, training increases an

individual's expectation on permanent migration by 0.034 (significant at the 0.01 level), which is 43 percent relative to the mean for those without any training experience (Column (1)). This estimated effect decreases as we included more control variables from Column (1) to Column (4). However, the inclusion of control variables does not absorb the effect of training or alter the finding. In all specifications from Column (1) to Column (4), training positively affects a respondent's subjective expectation of permanently stay in a city. Our baseline model is Column (4) shows a training effect of 0.027, which is equivalent to a 34 percent increase relative to the mean.

Several interesting findings on the control variables are noteworthy. First, gender and age appear not determine the probability of permanent migration. The estimated coefficient for being male is negative but insignificant due to the high standard deviation. The estimated coefficient on age is minimal. Marital status positively affects permanent migration. For migrants who are married, the probability of expected permanent stay in city areas is 1.8 percent higher than their counterparts who are single. This result is consistent with the finding that the marriage market in rural areas is more relevant for migrant workers. Surprisingly, having a high school degree or not has no effect on permanent migration. We use high school as a cutoff based on the 9-year compulsory school law. Finally, having a left-behind child in homework significantly decreases migrants' subjected expected permanent stay in cities. This is consistent with the previous literature that children's education is one of the top reasons that restricted migrants working in the city permanently.

[Insert Table 2 about here]

Table 3 presents the estimates that use the prevalence of training opportunity outside the industry in the same city. The first stage F-statistic is large and indicates that this variable is not likely a weak instrument. The second stage estimates in general confirm the OLS

estimates in Table 2. That is corporate training increases a migrant's subjective willingness of staying in the city. Meanwhile, IV estimates suggest an even larger effect of training on permanent migration.

We presented the heterogeneous effects of training on subjected duration of migration in Table 4 to account for the differential responsiveness of different groups of individuals. Columns (1) and (2) present the results for male and female migrations; Columns (3) and (4) present the results for high school graduates and high school dropouts; and Columns (5) and (6) for self-employed workers and wage earners. First of all, similar to the findings in Table 2, gender does not work as a moderator to affect the magnitude of the training effect on permanent migration. The estimated training effect is 2.8 percent for male migrants and 2.6 percent for female migrants. The two coefficients are not statistically significant from each other. Secondly, Columns (3) and (4) indicate a more intriguing finding, that is training has little influence on high school graduates but has a large impact on high school dropouts. The large effect among high school dropouts can be explained by the large gap in high school graduation rate between urban and rural areas. Firm's training to high school dropouts provides them the opportunity to upgrade the human capital to achieve the average level of urban residents. The comparison between self-employed workers and wage earners are consistent with the prediction. That is the training effect is larger among wage earners than self-employed workers.

[Insert Table 3 about here]

Finally, we constructed an analogous analysis on the effect of training on the wage of migrants to identify the plausible mechanism of training effect. Results presented in the Columns (1) and (2) in Table 4 show that firm's training is associated with an increase in

average wages. The positive linkage between training and wages provides supportive evidence to the hypothesis of human capital upgrading through training.

The second column in this table presents the estimates from a restricted sample. The dependent variable in this paper is the respondent's subjective expectation of permanent migration and stay in the city. We defined those with ambiguous answers (not sure, or don't know) as return migration in the main analysis. After excluding these respondents from the sample of analysis, the estimated effect of training on permanent migration increases from 0.022 to 0.051, although the IV estimate is not significant.

[Insert Table 4 about here]

## **5 Conclusion**

This paper studies the role of human capital in migrant workers' subjective willingness to settle in the city. We found robust evidence that training has a significantly positive effect on migrants' subjective expectation of permanent migration. The training premium is larger for females, high school dropouts and wage earners. The current research is in line with the broad literature on human capital and return migration. Findings in this paper support the positive effects of human capital on migration duration; that is, migrants with better health condition (Arenas, Goldman, Pebley, & Teruel, 2015) and higher educational attainment and work experiences (Hu et al., 2011) tend to stay longer in the receiving areas.

The finding that training increases the similarity of migrants and natives in urban areas is consistent with the theory of assimilation in migration literature. The theory of assimilation predicts that migrants have disadvantage in labor market outcomes such as labor supply and earnings at the initial stage of migration. The reason is that they are lack of the specific human capital in the host areas such as language or local dialect. Previous empirical work finds that migrants with high proficiency in English tend to outperform other migrants

with low proficiency in English in the U.S. (Bleakley & Chin, 2004). Similarly, speaking dialects rather than mandarin is negatively associated with earnings in China (Chen, Lu, & Xu, 2014; Gao & Smyth, 2011). As the number of migration years increases in the receiving areas, migrants gradually obtain specific human capital which generates positive return to them in the local labor market. This skill-upgrading enables migrants to catch up with local residents. Eventually, migrants may even outperform their native counterparts, since their intrinsic human capital accumulated before migration occurs may be rewarded eventually in the receiving labor market. Our results are consistent with this line of literature by providing the positive relation between training and earnings and duration of migration.

Lastly, we explained the estimated positive effect of training under the framework of human capital and skill-upgrading. Under the geographic difference in education between rural and urban areas, children in rural areas have a much higher dropout rate of high school than children in urban areas. This may lead to the mismatch from the demand and supply in urban labor market. Firm's training may to some extent fill the gap between education levels between migrants and urban residents by providing migrants more skills. These findings have important policy implications. China has made substantive achievement in advancing urbanization and is aiming continuous progress in the long run. Rural-to-urban migration contributes to the rapid urbanization. Increasing migrants' human capital through training can be an effective channel to integrate migrants into cities and harness the potential gains from urbanization.

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Table 1: Summary statistics

	Training=0	Training=1	Difference
Permanent migration	0.08	0.11	-0.03***
	0.00	(0.01)	(0.01)
Training	0.00	1.00	-1.00
	0.00	0.00	0.00
Female	1.42	1.34	0.08***
	(0.01)	(0.01)	(0.01)
Age	32.00	27.97	4.03***
	(0.11)	(0.20)	(0.26)
Married	0.64	0.46	0.17***
	(0.01)	(0.01)	(0.01)
High school or above	0.29	0.47	-0.18***
	0.00	(0.01)	(0.01)
Rural <i>hukou</i>	0.99	0.98	0.01*
	0.00	0.00	0.00
Health=excellent	0.39	0.39	0.00
	(0.01)	(0.01)	(0.01)
Health=good	0.46	0.44	0.02
	(0.01)	(0.01)	(0.01)
Health=average	0.14	0.15	-0.02
	0.00	(0.01)	(0.01)
Health=poor	0.01	0.01	0.00
	0.00	0.00	0.00
Health=very poor	0.00	0.00	0.00
	0.00	0.00	0.00
Self-employed	0.25	0.05	0.21***
	0.00	(0.01)	(0.01)
Wage worker	0.70	0.95	-0.25***
	0.00	(0.01)	(0.01)
Unpaid worker	0.05	0.00	0.04***
	0.00	0.00	(0.01)
Homework topography=plain	0.53	0.46	0.07***
	(0.01)	(0.01)	(0.01)
Hometown topography=hill	0.24	0.26	-0.02
	0.00	(0.01)	(0.01)
Hometown topography=mountain	0.22	0.28	-0.05***
	0.00	(0.01)	(0.01)
Hometown topography=other	0.01	0.00	0.00
	0.00	0.00	0.00
Year=2008	0.62	0.61	0.00
	(0.01)	(0.01)	(0.01)
Year=2009	0.38	0.39	0.00
	(0.01)	(0.01)	(0.01)

Notes: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Sample includes 16-64 years old migrants. In addition, all regressions controlled for city dummies which are not reported in this table.

Table 2: Effects of training on permanent migration: OLS estimates

	(1)	(2)	(3)	(4)
Training	0.0337*** (0.000)	0.0266*** (0.000)	0.0273*** (0.000)	0.0268*** (0.000)
Female		-0.0086 (0.118)	-0.0080 (0.144)	-0.0078 (0.157)
Age		-0.0003 (0.321)	-0.0003 (0.361)	-0.0003 (0.415)
Married		0.0197*** (0.009)	0.0189** (0.012)	0.0181** (0.017)
High school or above		-0.0008 (0.895)	-0.0016 (0.788)	-0.0009 (0.882)
Rural <i>hukou</i>		0.0476** (0.038)	0.0413* (0.071)	0.0393* (0.086)
Good		-0.0060 (0.305)	-0.0043 (0.466)	-0.0035 (0.550)
Average		0.0096 (0.247)	0.0107 (0.199)	0.0114 (0.171)
Poor		0.0385* (0.096)	0.0405* (0.080)	0.0415* (0.073)
Very poor		-0.0820 (0.251)	-0.0716 (0.314)	-0.0691 (0.332)
Wage work		0.0085 (0.232)	0.0101 (0.159)	0.0099 (0.167)
Family work		-0.0051 (0.723)	-0.0047 (0.747)	-0.0074 (0.610)
Hills		-0.0018 (0.787)	0.0016 (0.814)	0.0019 (0.790)
Mountain		0.0187*** (0.005)	0.0167** (0.017)	0.0171** (0.014)
Other		-0.0291 (0.347)	-0.0248 (0.423)	-0.0318 (0.305)
Hometown medical		-0.0053 (0.530)	-0.0088 (0.292)	-0.0093 (0.266)
Hometown wage		0.0003 (0.118)	0.0002 (0.243)	0.0003* (0.080)
Hometown labor force		0.0000 (0.974)	0.0001 (0.548)	0.0001 (0.624)
Child		-0.0324*** (0.000)	-0.0326*** (0.000)	-0.0325*** (0.000)
House		-0.0051 (0.506)	-0.0002 (0.978)	0.0016 (0.840)
Year 2009				-0.0169*** (0.002)
Province			Y	Y
R2	0.002	0.008	0.015	0.016

N	10919	10919	10919	10919
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Notes: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Sample includes 16-64 years old migrants. Default category of health is in excellent condition. Default category of employment type is self-employment.

Table 3: Effects of training on permanent migration: IV estimates

	(1)	(2)	(3)	(4)
Training	0.1317*** (0.000)	0.1145*** (0.008)	0.1725*** (0.000)	0.1695*** (0.000)
Female		-0.0054 (0.343)	-0.0028 (0.630)	-0.0027 (0.645)
Age		-0.0000 (0.913)	0.0002 (0.661)	0.0002 (0.622)
Married		0.0187** (0.014)	0.0178** (0.021)	0.0171** (0.026)
High school or above		-0.0073 (0.285)	-0.0122* (0.081)	-0.0114 (0.104)
Rural <i>hukou</i>		0.0515** (0.026)	0.0471** (0.043)	0.0452* (0.052)
Good		-0.0068 (0.243)	-0.0061 (0.313)	-0.0054 (0.372)
Average		0.0062 (0.470)	0.0053 (0.544)	0.0060 (0.492)
Poor		0.0326 (0.165)	0.0315 (0.184)	0.0325 (0.170)
Very poor		-0.0779 (0.277)	-0.0646 (0.372)	-0.0625 (0.387)
Wage work		-0.0026 (0.772)	-0.0077 (0.413)	-0.0075 (0.423)
Family work		-0.0050 (0.728)	-0.0057 (0.699)	-0.0080 (0.585)
Hills		-0.0043 (0.527)	-0.0007 (0.918)	-0.0005 (0.944)
Mountain		0.0157** (0.022)	0.0144** (0.042)	0.0148** (0.037)
Other		-0.0235 (0.451)	-0.0164 (0.602)	-0.0227 (0.473)
Hometown medical		-0.0039 (0.642)	-0.0063 (0.462)	-0.0068 (0.429)
Hometown wage		0.0002 (0.276)	0.0001 (0.614)	0.0002 (0.315)
Hometown labor force		0.0000 (0.816)	0.0001 (0.323)	0.0001 (0.375)
Child		-0.0296*** (0.000)	-0.0286*** (0.000)	-0.0286*** (0.000)
House		-0.0057 (0.462)	-0.0016 (0.839)	-0.0000 (0.997)
Year 2009				-0.0146** (0.011)
1st-stage F-statistics	447.45	343.15	281.23	279.58
Province			Y	Y

N	10919	10919	10919	10919
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Notes: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. Sample includes 16-64 years old migrants. Default category of health is in excellent condition. Default category of employment type is self-employment.

Table 4: Heterogeneity effects of training on permanent migration

	(1)	(2)	(3)	(4)	(5)	(6)
	Males	Females	High school graduates	High school dropouts	Self-employed	Wage worker
	OLS estimates					
Training	0.0280*** (0.004)	0.0260** (0.034)	-0.0019 (0.869)	0.0470*** (0.000)	0.0296 (0.280)	0.0246*** (0.002)
	IV estimates					
Training	0.1373** (0.021)	0.2246*** (0.008)	0.1265* (0.065)	0.2106*** (0.002)	-1.2045 (0.760)	0.1629*** (0.001)
Control variables	Y	Y	Y	Y	Y	Y
N	6428	4491	3434	7485	2866	8059

Notes: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 5: Mechanism and robustness checks

	Mechanism		Robustness Checks	
	Dep Var.: Wage		Dep Var.: Permanent migrant	
	(1)	(2)	(3)	(4)
	OLS	IV	OLS	IV
Training	0.0677** (0.011)	0.5861*** (0.001)	0.0512* (0.095)	-0.1267 (0.617)
Female	-0.2412*** (0.000)	-0.2227*** (0.000)	0.0042 (0.869)	-0.0033 (0.906)
Age	-0.0026** (0.035)	-0.0009 (0.522)	0.0031* (0.058)	0.0026 (0.151)
Married	0.0757*** (0.005)	0.0721*** (0.008)	0.0654* (0.062)	0.0640* (0.069)
High school or above	0.1482*** (0.000)	0.1099*** (0.000)	0.0681** (0.013)	0.0752** (0.010)
Rural <i>hukou</i>	0.0040 (0.960)	0.0257 (0.755)	-0.0012 (0.994)	-0.0346 (0.834)
Good	-0.0082 (0.693)	-0.0149 (0.484)	-0.0686** (0.013)	-0.0647** (0.022)
Average	-0.0715** (0.016)	-0.0914*** (0.003)	-0.0808** (0.025)	-0.0751** (0.043)
Poor	-0.2656*** (0.001)	-0.2982*** (0.000)	0.1218 (0.238)	0.1257 (0.224)
Very poor	-0.3297 (0.191)	-0.3060 (0.232)		0.0000 (.)
Wage work	-0.3072*** (0.000)	-0.3705*** (0.000)	-0.1538*** (0.000)	-0.1275** (0.020)
Family work	-10.7016*** (0.000)	-10.7039*** (0.000)	-0.0653 (0.436)	-0.0658 (0.433)
Hills	0.0444* (0.073)	0.0358 (0.157)	0.0111 (0.734)	0.0161 (0.629)
Mountain	0.0012 (0.962)	-0.0071 (0.779)	0.0036 (0.904)	0.0053 (0.860)
Other	0.0474 (0.666)	0.0805 (0.472)	0.1530 (0.429)	0.1057 (0.606)
Hometown medical	-0.0647** (0.030)	-0.0554* (0.068)	0.0706* (0.088)	0.0674 (0.106)
Hometown wage	0.0010 (0.100)	0.0006 (0.376)	0.0016* (0.088)	0.0017* (0.081)
Hometown	-0.0005 (0.282)	-0.0003 (0.530)	0.0014** (0.014)	0.0013** (0.031)
Child in hometown	0.0138 (0.586)	0.0279 (0.285)	0.0272 (0.514)	0.0256 (0.541)
House ownership in hometown	-0.0074 (0.791)	-0.0132 (0.640)	-0.0185 (0.600)	-0.0152 (0.671)
Year 2009	0.2435***	0.2518***	-0.0268	-0.0275

	(0.000)	(0.000)	(0.316)	(0.304)
Province dummies	Y	Y	Y	Y
R2	0.831	.	0.109	.
N	10919	10919	1502	1502

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Notes: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Sample includes 16-64 years old migrants. Default category of health is in excellent condition. Default category of employment type is self-employment. Dependent variable in Columns (1) and (2) is  $\log(\text{wage})$ . Column (3) and (4) use the restricted sample that excluded the observations with ambiguous answer to return. Column (5) and (6) use the restricted sample that excluded the observations with rural *hukou*.