Do neighbourhoods have effects on wages? A study of migrant workers in urban China

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Abstract

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Do Neighbourhoods Have Effects on Wages?
A Study of Migrant Workers in Urban China

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Abstract: Rural-to-urban migrant workers have contributed enormously to the Chinese economy and society in the past three decades. Many of them have concentrated in disadvantaged neighbourhoods and physically and socially suffered from poor residential environment. However it is unclear how the neighbourhoods—as the provision of shelter, social and public services, and community organizing—influence migrant workers' labour market outcomes. To fill this gap, this paper explores the way in which urban neighbourhoods have affected migrant workers' wages. Factors such as housing quality, social interaction and trust, and neighbourhood organization and participation were examined. Results show that five of eight neighbourhood characteristics had statistically significant effects on wages. Robustness tests were conducted to address endogeneity problems of self-selection and unobserved individual ability. Test results demonstrated that our main findings were generally robust, and thus the causality was solid.

Key words: China, migrant workers, neighbourhood effects, wage

Introduction

China has experienced massive rural-to-urban labour migration since the 1980s. By the end of 2010, nearly 16 million rural-to-urban migrant workers (hereafter 'migrant workers') lived and worked in towns and cities (Ministry of Labour and Social Security 2012). They contributed approximately 21 percent of China's GDP growth between 1978 and 1998 (Cai and Wang 1999). In addition, their remittances to the countryside have significantly alleviated rural poverty and developed rural economy (Du *et al.* 2005; Taylor *et al.* 2003).

Many prior studies have focused on migrant workers' socio-economic conditions such as wages, poverty and inequalities (Lu and Song 2006; Guo and Cheng 2010; Wang and Wu 2010). Recently there is a growing body of literature on other aspects such as their spatial distribution and concentration (Chen *et al.* 2011). Some argue that the state and its institutions, and the Chinese culture created these socio-spatial divisions in urban China (Madrazo and van Kempen 2011). Migrant workers have experienced longstanding housing difficulties due to low income and lack of urban *hukou* (household registration) status, a precondition to access to subsidized or public housing (Wang and Murie 2000). They have tended to live in low-income, inferior or deprived housing areas usually in the forms of factory dormitories, migrant enclaves and urban villages (Wu 2004; Ma and Xiang 1998; Song *et al.* 2008). Some of them have even lived in temporary dwellings at construction sites where they worked (Shen 2002). Cheap rent, short distance to workplace, and convenient access to public transportation were among the major reasons for living in poor housing areas—or 'neglected corners'—of booming metropolises (Gu and Shen 2003; Wu 2008; Zhou and Cai 2008). Higher rates of crime and social conflicts were recorded in some migrant-concentrated housing areas (Wang *et al.* 2009; Pannell 2002).

Consequently many migrant workers are socially and/or residentially segregated from locals (Li and Huang 2006; Wu *et al.* 2010b). It is clear that poor, segregated and marginalised residential conditions have strong negative impacts on migrant workers and the society in general (Wong *et al.* 2007; Nielsen *et al.* 2010; Wang 2004). But improvement to the residential environment for migrant workers has been insufficient, and public services and social support are more likely to attach to better housing areas (Wong and Leung 2008).

It is generally agreed that migrant workers' socio-economic conditions affect their residential choices. But how would, if at all, the residential factors affect their socio-economic conditions? We raised this question because the nature of residential environment, as manifested in the social and physical form of neighbourhood, not only provides shelters and generates (un)neighbourly feeling, but also plays an influential role in determining one's wellbeing (Sampson 2009). Within the theoretical framework of the so-called neighbourhood effects, the ways in which physical, behavioural, attitudinal and psychological features of neighbourhoods affect residents (controlling for residents' individual characteristics) have been studied extensively in the West (Friedrichs *et al.* 2003). Poor neighbourhoods systematically disadvantage residents by isolating them from life chances and opportunities (Wilson 1987), and/or spreading anti-social norms and culture of poverty through peer effects (Crane 1991).

This question is worthy of exploration in the context of transitional cities in China where rapid urbanization occurs, and where poor people have tended to concentrate in particular neighbourhoods such as former state-owned enterprise compounds (Wu 2007; Cheng and Beresford 2012). Indeed the neighbourhood effects on the creation of poverty were found to be small but not insignificant: living in

impoverished neighbourhoods increases the probability of falling into poverty (by official income poverty line) by a steady percentage (Wu *et al.* 2010a). However the neighbourhood effects on broader socio-economic measures are unrevealed in their study. Actually the low official poverty line, which is usually set at only 20 to 40 percent of minimum wage depending on the financial capacity of local authorities, may only cover a relatively small proportion of households in extreme poverty, but exclude those who are marginally poor, or non-poor by official income standard but still suffering from consumption hardship due to such as medical or educational expense. Therefore it is necessary to extend our understanding of neighbourhood effects on not only the narrowly defined official income poverty, but also other socio-economic outcomes of individuals and households.

Indeed there is a proven relationship between neighbourhood characteristics and residents' labour market outcomes (such as employment, occupation and pay) in Western countries. For example, significant neighbourhood effects on unemployment outcomes were found among Australian youth: the positive effects of living in a high-income neighbourhood diminish by the age of 21 while the negative effects associated with low-income neighbourhoods persist (Andrews *et al.* 2002). Another study on the United States suggests that whites who lived in highly segregated metropolitan areas in 1979 earned 20 percent higher wages in 1990 than whites who grew up in less segregated areas (Dickerson 2008). These studies provide evidence that residential segregation contributes to sustaining inequality between social groups, which has important public policy implications for officials wrestling with critical questions such as how to channel the disadvantaged into high-tier labour market and how to distribute low-income housing in urban planning.

Comparatively, little research has been done on China as to whether neighbourhood characteristics affect migrant workers' labour market outcomes, in particular their wages. Therefore this study aims to fill this literature gap by investigating the following question embedded with the purpose to broaden the lens to identify a set of underlying causes in the Chinese context:

> *To what extent do neighbourhood characteristics affect the wages of migrant workers after controlling for other factors?*

This question has strong implications, due to the importance of migrant workers to China's economy, governance, and social and public policy. If poor residential environment remains common, migrant workers' contributions to economic growth will certainly be deterred in the long term (Zheng *et al.* 2011). Answering this also contributes to the study of neighbourhood effects in the context of transitional China by looking into the relationship between dwelling conditions, social interaction and inclusion, neighbourhood participation, and migrant workers' wellbeing.

The rest of the paper is set out as follows. To establish an analytical framework for empirical analysis, the next section reviews literature about the neighbourhood effects on labour market outcomes in the West, and links them with the Chinese context. It is followed by a section introducing data and methodology, and a section presenting empirical results from the original model and the robustness tests designed to validate the causality. The final section provides conclusions.

Analytical Framework

Although there are varied arguments concerning the causes and effects in the extant studies of neighbourhood effects, the evidences for the positive socio-economic impacts of better residential environments are overwhelming. As Lawton (1988) states, residential environment has three basic functions, namely stimulation, maintenance, and support. For example, in the formation of neighbourhood effects, residential environment (for example, housing, safety and neighbourhood organization) influences residents' socio-economic outcomes through individual accumulation of social capital (e.g. via social networking, communication and interaction) and human capital (for example, via education, training, and health). Also, through behaviour, happiness, and life and job satisfaction, residential environment influences residents' wages (Pischke 2011). Four principal or key effects in relation to physical, human and social capital as revealed in prior research were brought to our attention.

The first key effect is generated by physical residential environment. For example, poor, overcrowded and temporary housing conditions have a negative impact on residents' physical and mental health, and their educational attainments (Goux and Maurinc 2005; Evans 2003). These factors in turn influence residents' current or future performance in labour market. Poor educational attainment is commonly linked with a future of low earning capacity, poverty and social exclusion. In the United Kingdom, taking a university degree would make a 16-year-old individual nearly 1 million pounds better off over working life than an individual who does not (Friedman 2010).

As aforementioned, housing poverty, especially overcrowding, is a serious problem for migrant workers (Wang *et al.* 2010). But some studies suggest that migrants did not necessarily live in poorer housing conditions than non-migrants in urban areas (Jiang 2006), and some migrants were willing to pay the same per unit of space, or higher rent than, local residents (Zheng *et al.* 2009). Therefore, it is important to consider both objective and subjective measures of housing quality in order to effectively appraise the impacts of housing conditions on wages.

The second key effect is associated with social structure—the pattern of social ties between individuals, which plays an important role in determining labour market outcomes (Montgomery 1991). In particularly, interpersonal social interaction positively impacts labour market outcomes in cities where the pace of human capital accumulation is accelerated (Glaeser and Maré 2001). Specifically, interacting with, and trust towards, others urban residents (such as neighbours, colleagues and friends) help people obtain information about employment opportunities (Zenou 2008). Adversely, living in deprived or segmented neighbourhoods, where social interaction is limited, negatively affects residents' access to job information (Wilson 1991).

In Chinese society, interpersonal relationships are crucial to access jobs and acquire individual social power (Bian 1994). For migrant workers, kinship and friendship networks with other migrants are the predominant resources they utilise in order to gain employment. These informal job networks, however, are inconsistent in supplying better job opportunities to individuals because their relatives and friends— the information nodes of social networks—are largely concentrated in the low-tier job market. In addition, social interaction with, and trust towards, their neighbours (especially with urban locals who in general have better qualifications and jobs) are important to workers' health and labour market outcomes, as revealed by some studies (Barefoot *et al.* 1998; Subramanian *et al.* 2002). Unfortunately the relationships between migrants and locals are usually strained, and trust—as an important element of

social capital necessary to boost productivity and innovation (Granovetter 2005)—has significantly declined in China, where high social trust was once recorded as common (Newton 2001).

Keeping migrant workers' positive expectations focused on future incomes is an important factor in maintaining China's socio-economic stability (Gao and Smyth 2010). But the lack of role models and positive peer groups, due to neighbourhood deprivation and infrequent inter-group social interaction, may cause residents to hold low expectations of what they believe they can achieve (Manski 2000). These factors affect residents' ability to make crucial decisions, such as whether to attend occupational training or university, and may subsequently affect their career development and prospects. More importantly, these factors deter or inhibit their socio-economic mobility, because these residents are less likely to have access to social networks beyond their current social groups and neighbourhoods.

In policy practice, creating a balanced socio-economic mix in neighbourhoods has been widely applied in Western countries, in order to tackle negative neighbourhood effects such as geographical pooling and generational transfer of socio-economic disadvantages. However, in China, the authorities have institutionally discriminated against migrant workers (Chan 1996), and many urbanities have displayed suspicious attitudes and even demonstrated outright hostility towards migrants (Roberts 2002; Nielsen and Smyth 2009). Indeed, migrant workers have experienced various forms of stigmatisation including labelling, stereotyping, separation, status loss and discrimination especially in the contexts of job seeking, wage negotiation, and access to workplace and health benefits (Li *et al.* 2007).

The third key effect is created by the non-physical dimension of residential environments, such as the degree of neighbourhood safety. In China, perceived fear of crime among the working population has threatened social stability and the course of market reform (Curran 1998). Public safety can be seen to influence personal health and safety, quality of life, household behaviour, and so on. Following the same logic, it is clear that poorer public safety ultimately negatively affects residents' labour market outcomes. Therefore, it is rational to consider the effects of public safety on wages, because of the positive correlation between poor neighbourhood and criminality (Kubrin and Stewart 2006), the relatively high proportion of criminal suspects among 'floating populations' in China (Ma 2001), as well as the decline of actual and perceived public safety in China in recent years (Nielsen and Smyth 2009).

The fourth key effect is imposed by neighbourhood institutions. In recent years, the administrative power of urban neighbourhoods in China has been shifted from work units to multiple organizations. These include non-governmental organizations and branches of governmental agencies and affiliations, such as sub-district offices (*jiedaoban*) and neighbourhood residents' committees (*juweihui*)—the grassroots units governing neighbourhood affairs. There has been substantial progress in the establishment of urban communities and the enhancement of neighbourhood participation. For example, some community volunteers' associations provide social services to urban residents (Luova 2011), and residents are gradually being allowed to express their views and concerns in the construction process of urban civility through neighbourhood activities organized by these bodies (Min 2011). Contacts with these organizations, and participation in their activities, improve migrants workers' sense of community, satisfaction towards their sense of neighbourhood, and more importantly, their social and human capital (Xu *et al.* 2010; Palmer *et al.* 2010). Again, all these are potentially important factors that have influences on migrant workers' labour market outcomes.

It is important to note that this is not an exhaustive list of possible effects of neighbourhood on wages

and the mechanisms through which they take place. These effects do not operate separately, but in an intertwining and evolving manner in shaping neighbourhoods that influence residents and their labour market outcomes.

Data and Methods

Funded by the Chinese Ministry of Education, the questionnaire survey data used in this study was collected in the fall of 2006 through a National Key Research Project entitled Social Policy for Rural-Urban Labour Migration at Nankai University in Tianjin, China. To maximize representativeness while meeting the budget constraint, a stratified random sampling framework was adopted through four steps.

The first step was to select cities as the representatives of major inland and coastal destinations for migrant workers. The selection included five large cities across different economic geographical regions, namely Shanghai municipality (in the eastern region), Tianjin municipality (in the eastern region), Guangzhou (the capital of Guangdong province in the southern region), Shenyang (the capital of Liaoning province in the north-eastern region), and Kunming (the capital of Yunnan province in the south-western region), and two medium-sized cities, namely Weihai (in Shandong province in the eastern region) and Yibin (in Sichuan province in the south-western region). These cities are located in the most economically dynamic regions in China: Shanghai is the leading city in the Yangtze River Delta Economy; Guangzhou is the leading city in the Pearl River Delta Economy; Tianjin, Shengyang and Weihai are important economic hubs in the Bohai Rim Economic Circle; and Kunming and Yibin are located in the less developed but fast growing western region which has been benefiting from the national policy preference under the Western Development Strategy since early 2000s. The designed sample sizes were 500 for large cities and 250 for medium-sized cities. The second step was to compile a list of districts with high concentration of migrant workers in each city based on the official labour statistics reported by the local governments. Then two districts were randomly selected from the list. The third step was to stratify industries according to their share of GDP in the city. Then in each industry in the district, two to three companies were randomly selected from a list of registered companies in order to pick interviewees. If sufficient interviewees could not be possibly drawn from the two or three initially selected companies, additional companies were again randomly selected from the list. The fourth step was to randomly select and interview migrant workers at the selected companies.

The project finally received 3,024 valid responses, which are divided approximately as follows: 17 percent each in Shanghai, Tianjin, Guangzhou, and Shenyang, 16 percent in Kunming, and 8 percent each in Weihai and Yibin. The questionnaire collected information on demographics, housing, employment, education and training, health, neighbourhood participation and so on.

Information on migrant workers' labour productivity (that is, the ratio of output to the input of labour), which is a preferred measure over wage level, is not available in the dataset. Nonetheless, according to neoclassical economics, assuming migrant workers' wages are exogenously determined by perfectly competitive markets, their marginal wage rate equals the marginal productivity of labour, because a maximizing firm will not pay its workers more than it will earn in profits from its labour. This assumption is reasonable in the context of a reformed and increasingly competitive labour market in urban China (Knight and Yueh 2009; Meng and Zhang 2010; Knight and Song 2005). From policy and applied perspectives, wage level has stronger relevance than labour productivity because migrant workers and the labour authorities are more concerned with the former.

The Mincer earning function, the first analytical innovation in human capital studies, lays the foundation for the principle that earnings are the sum of a linear function of years of education and a quadratic function of years of potential work experience in the standard form (Mincer 1974), or also other factors in various extended forms (Heckman *et al.* 2003). Following this intellectual tradition, we model whether, once other characteristics are controlled for, migrant workers' wages are determined by neighbourhood characteristics in the form of:

$$log\ (WAGE_i) = \beta_0 + \beta_1 NEIG_i + \beta_2 INDI_i + \beta_3 EMPL_i + \beta_4 CITY_i + \varepsilon_i$$

where subscript *i* denotes the *i*th migrant worker, the dependent variable is monthly wage taking logarithm, *NEIG* is the core independent variable for neighbourhood characteristics, *INDI* is a vector of individual characteristics, *EMPL* is a dummy variable for employer characteristics, *CITY* is a dummy variable for sampled cities, and ε is the error term. Descriptive statistics and configurations of variables are shown in Table 1. Neighbourhood characteristics were scored on scales, except for *Space* which was continuous (see Table 2). Key information from descriptive statistics was summarised as below.

[Table 1 here]
[Table 2 here]

Migrant workers' mean living space was 7.4 square meters. In fact, more than half of them had less than 5 square meters and only approximately a fifth of them had more than 10 square meters. Comparatively, the figure for urban residents was 36 square meters in 2006 (National Bureau of Statistics of China 2008). This further confirmed previous findings that migrant workers experienced significant residential overcrowding (Huang 2003). Interestingly, compared with locals, only approximately half of migrant workers perceived poorer housing quality. This might be due to the fact that migrants perceived locals living in the same (poor) neighbourhoods as the reference group. About half of the surveyed subjects thought their neighbourhoods were safe, while the other half perceived unsafety or unsureness. But only a third of them believed that the majority of neighbours were trustworthy. Their social interaction with locals, contact with neighbourhood organizations and participation in neighbourhood activities were infrequent. Approximately 27 percent of them had almost no (after work) social interaction with locals. In addition, around 6 percent of them lived in neighbourhoods with almost no local people in near proximity. A majority of them did not have contact with, or even know anything about, neighbourhood organizations. Only a tiny proportion of them had occasionally (4 percent) or frequently (1 percent) participated in neighbourhood activities. Most of them never (56 percent) or seldom (7 percent) participated, although they were aware of these activities. One third of them were entirely unaware of these activities. The majority of migrant workers were satisfied with, or at least did not have negative perceptions towards their neighbourhoods.

Empirical Analysis

Results

Ordinary least squares (OLS) regression with robust standard errors was used to reduce heteroscedasticity in analysing the cross-sectional data. The reported and reference scales for the ordinal

core variables in the regression are presented in Table 2. Because residential environment is represented by multidimensional neighbourhood characteristics, each time only one core variable was included in regression in order to test the effect of each individual variable and to avoid multicollinearity.

[Table 3 here]

Table 3 presents the estimated effects of eight core variables and seven controlled variables on monthly wages. The models are statistically fit and the signs of coefficients for all eight regressors meet our expectations. Five of them, namely *Space*, *Quality*, *Interaction*, *Organization* and *Satisfaction* are statistically significant while *Trust*, *Safety*, and *Participation* are insignificant.

The results the five significant regressors are in line with the theoretical assumptions discussed above. For example, they imply that wages would increase if migrant workers had more extensive living space and better relative housing quality, *caeteris paribus* (the same condition applies hereafter). Experience in the West shows the mechanism through which these factors take effect may be complex and the consequences may take a relatively long period to emerge. In the case of China, one element of the mechanism may be that one's personal well-being (such as health) affected by housing conditions may spill over to labour market performance. In these neighbourhoods, the two dimensions of housing quality have some relatively direct and immediate effects on migrant workers' wages, implying that the issues brought by poor residence where they live in are more urgent in Chinese cities. This proves the first assumed key effect as discussed in the last section and the usefulness of both objective and subjective measures of housing quality in capturing the impacts of housing conditions on wages.

The second and fourth assumed key effects are partially supported by the results, and some points generated by the models are worthy of note. For instance, infrequent or no social interaction with locals and lack of contact with neighbourhood organizations are observed to have had negative effects on wages. Results also show that lower levels of satisfaction towards neighbourhoods decreased wages, confirming that a lower level of individual subjective well-being deters better economic outcomes (Oswald 1997). This implies that better performance in these measures will help migrant workers generate better outcomes in urban labour market through channels such as better social networking and institutional support, which may subsequently lead to the access to such as hidden job information and employment opportunities.

Meanwhile, trust towards neighbours and participation in neighbourhood activities are two insignificant coefficients in explaining wages; thus their results do not support relevant assumptions stated in the second and forth key effects. The insignificant coefficient of neighbourhood participation may be due to the poor participation in, or the nature and purpose of, those activities (for example, they are not directly related to employment). Nevertheless we hold the view that social services provided to migrant workers and neighbourhood participation will improve social and human capital for the cohort and neighbourhoods in general. Therefore we will test this factor again in the robustness test in the next section.

The third assumed key effect is not supported by the result relating to the perception of safety. One possible reason may be that safety was not the top concern of migrant workers from their own perspective. But it may be interesting to test this factor again if crime rate or relevant information at the neighbourhood level is available in other datasets.

For the controlled variables, the positive and statistically significant coefficients for age, and negative coefficient for age square, showed that wage level increased at first as age increased, and then decreased as worker got older, demonstrating an inverted U-shaped trend. According to the life cycle theory, younger workers new to the labour market usually lack relevant work experience and have lower wages. After accumulated substantial work experience, workers have some advantages in terms of human capital and labour productivity. In return, they obtain higher wages than younger workers. As they get older, their health and physical strength decrease. As a result, their wages decrease after reaching a certain threshold. This is particular obvious for migrant workers who work in demanding, dirty and dangerous positions (Roberts 2001).

The results also show that the longer time a worker remained in the city after migrating from rural areas, the higher wage he or she could earn. Two key reasons, among others, predominated in accounting for this causality. First, workers obtained more experience and better skills over a longer period, which were useful to them in obtaining higher wages. Second, they were more likely to establish social networks with colleagues and friends during their stays. Both reasons would help them to find better positions in the labour market.

Males were more likely to have higher wages than females. This was due to the explicit gender discrimination in China's wage and managerial systems, as widely observed in other studies (Liu *et al.* 2000; Maurer-Fazio *et al.* 1999; Maurer-Fazio and Hughes 2002; Shu and Bian 2003). As expected, educational experience was positive and statistically significant, indicating that better education led to higher wages. Approximately three fourths of the migrant workers had education only at, or lower than, junior high school, and only 2.6 percent of them had college education. In fact, approximately 58 percent of the interviewees considered low educational level made them difficult to find better jobs. In addition, only one third of migrant workers had participated in occupational training. Therefore, there is a huge scope to improve their on-the-job accumulation of human capital, which will eventually increase their wages.

A labour contract system was recently established to legally formalise employment relations. The results showed that labour contract helped increase wages. In reality, however, less than one fourth of workers signed labour contracts due to their poor awareness of the system and employers' non-compliance. The authorities will need to compulsorily implement the labour contract system to protect the workers' benefits and rights.

[Table 4 here]

Robustness Tests

To testify the robustness of results, three tests were conducted. If the signs and magnitudes of the estimated regression coefficients in the tests are also plausible, they can be reliably interpreted as the true causal effects of the associated regressors, with all that this may imply for policy analysis and economic insight (White and Lu 2010).

In the first robustness test, monthly wage was replaced by hourly wage as the dependent variable, due to the consideration that a substantial proportion of migrant workers have to work overtime (Chan 2002),

and that hourly wage is another reflection of marginal productivity of labour. The results were considerably robust (see Table 4). The signs for the core variables were still in line with expectations and consistent with the results from the original model in terms of statistical significance. For example, variables for *Trust*, *Safety*, and *Participation* were still statistically insignificant while the others were significant. There were no substantial changes to the results of controlled variables either.

[Table 4 here]

Nonetheless, there are two possible endogeneity problems in examining neighbourhood effects and estimating wage function. First, the negative effect of living in a deprived neighbourhood on labour market outcomes may be affected by self-selection (Durlauf 2004). Selecting which neighbourhood to live in is often linked to the labour market situation and employment/earning potential of individuals (Manley *et al.* 2011). In other words, migrant workers choose to live in deprived neighbourhoods because living in affluent ones costs too much. Second, the effect of unobserved individual ability on labour market outcomes may be neglected (Belzil and Hansen 2004). Ability is defined as a time invariant level of skills that exists prior to the start of the human capital accumulation process, and it affects labour market outcomes, even after controlling for acquired human capital. However, as an imperfect measure of labour skills, ability is difficult to observe quantitatively in a short period of time.

Although the unobserved ability biases in OLS estimates of wage function are relatively small (Griliches 1977; Angrist and Krueger 1991), they may still have the potential to bias results in our research context through two channels. First, workers with better ability were more likely to obtain higher wages. Second, workers with better ability might have more active social interaction and so on, which would influence wages as demonstrated earlier in the original model and the first test. As a result, neighbourhoods' effects on wages might be misestimated.

Some studies tried to minimize the bias by using the education level of a worker's parent as the proxy of unobserved ability (Yue *et al.* 2010; Rubinstein and Tsiddon 2004). However parents' education may not properly reflect the ability of migrant workers. For instance, their parents—who were (originally) farmers—might not have a strong desire for education. In addition, many rural students left schools or did not attend post-secondary education due to poverty, or the perceived low rewards of pursuing education in rural employment (Liu 2005). This implies that many rural residents—even those with strong individual ability—could not afford to go to school. Therefore, parents' education levels may not properly reflect their unobserved ability.

One way to circumvent the first endogeneity problem is to use longitudinal data (van Ham and Manley 2010). Since this is unavailable, in the third test we used instrumental variable (IV) technique to examine whether IVs help obtain consistent estimates of regressor coefficients; in other words, whether the causal effects could be confirmed as genuine (Angrist *et al.* 1996). Here IVs were used to represent migrant workers' historical neighbourhood characteristics including their economic and housing conditions shortly after they arrived at cities. The four IVs were living area, housing quality, housing expense and monthly wage. The IVs were correlated with current neighbourhood characteristics because presumably migrant workers had living arrangements and patterns similar to those they had at the initial stage of migration. But these living arrangements did not directly influence their current wages.

The combinations of IVs statistically passed all four identification, weakness and endogeneity tests for

the five models with core variables *Quality*, *Interaction*, *Organization*, *Participation* and *Satisfaction* (see Table 5). After amending potential endogeneity, their coefficients were statistically significant, confirming that the results from the original model were robust. It was noted that *Participation* replaced *Space* as one of the significant core variables, implying that neighbourhood participation actually affected wages if potential endogeneity was taken into account and the assumed key effect rejected by the original model should be supported

The third test used fathers' wages to serve as a proxy variable to mitigate omitted variable bias due to unobserved individual ability (Wooldridge 2001). Fathers' monthly wage (in log) was added into the original model as an independent variable (*Father*). The assumption was that a father having a higher wage had stronger ability than others, and his child(ren) was more likely to inherit his ability genetically (Taubman 1977). The samples whose fathers had no income were eliminated from the test. Results showed that *Father* was statistically significant and positive, and the effects of core variables on wages were similar to those revealed in the original model (except *Space*), confirming that better individual ability increased migrant workers' wages (see Table 6). In sum, although the effects are complex, results from the original model were valid and consistent in general, according to three robustness tests.

[Table 5 here]
[Table 6 here]

Conclusions

This paper empirically examines the multidimensional effects of neighbourhood on migrant workers' wages in China. Five of eight core variables of neighbourhood characteristics (namely *Space*, *Quality*, *Interaction*, *Organization* and *Satisfaction*) had statistically significant effects in the original model. These indicate that better housing conditions—measured either subjectively and objectively—helped increase wages. More social interaction with locals, better satisfaction towards neighbourhood, and more contact with neighbourhood organizations could help migrant workers improve interpersonal relationships, extend social networks, and access to employment opportunities and increase wages. In addition, age, gender, education and occupational training, labour contract, and time spent in cities all had expected effects on wages. These findings were consistent with human capital theory and in line with findings from other studies.

To validate the causal effects of neighbourhood on wages, we adopted an alternative measure of wage, applied instrumental variable techniques, and added a proxy variable for unobservable individual ability in three robustness tests. Test results were considerably robust, confirming the existence and direction of causality between neighbourhoods and wages. In the second robustness test employing IVs, *Participation* became significant. This hints that participation in neighbourhood activities increased migrant workers' social capital and consequently improved their labour market outcomes.

Two core variables, *Trust* and *Safety*, were statistically insignificant in the original model and the robustness tests, possibly in part due to their stronger subjectivity in measurement than other core variables. They were not necessarily accurate reflections of public security especially in the context of complicated social structure of neighbourhoods in urban China (Guo *et al.* 2001). For example, migrant workers might feel higher safety if there was a higher proportion of migrants with similar backgrounds

in neighbourhoods. Similarly locals might feel lower safety if they had negative attitudes towards migrant workers (Nielsen and Smyth 2006).

Although there has been some progress on improving migrant workers' working and living conditions, Chinese cities, which endeavour to build a 'harmonious society', are still largely reluctant to recalibrate polices to invest more for migrant workers, who are not considered as genuine urban citizens. The most important policy implications from this study, however, are that it is urgent to physically and socially improve the residential environments for migrant workers, in order to maintain a sustainable economic growth and to continually attract and retain them in the context of increasing labour shortage. This means, at the neighbourhood level, that improving housing quality for migrant workers, encouraging their social interaction with locals and neighbours, making them more aware of neighbourhood organizations and activities, and ameliorating their satisfaction towards neighbourhoods will help improve their wages and opportunities at large.

Cities should also provide more and better occupational training, neighbourhood participation and social services, and equal education opportunities to migrant workers and their children, which are less costly than overhauling their residential environment within a short period of time. For instance, allowing migrant workers' children to attend university admission exam in cities—the proposal of which has been under discussion in the past few years—will help offset some of the negative effects of poor residential environment and to avoid transmitting neighbourhood deprivation to employment disadvantage in the long term.

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Table 1: Definitions and explanations of variables

Dependent variables						
Monthly wage per capita (*yuan*)	Mean = 1,064.7 (Standard deviation = 981.3); Taking logarithm in models.					
Hourly wage per capita (*yuan*)	Mean = 3.72 (Standard deviation = 3.24); Taking logarithm in models.					
Independent variables						
Neighbourhood characteristics						
Space: Living area per capita in square metres	Mean = 7.4 (S.D. = 7.1); Taking logarithm in models.					
Quality: Compared with locals', how is the quality of your house?	Scales:	Better	Similar	Poorer	Much poorer	
	Percentage:	6.87	47.67	31.79	13.67	
Trust: How many of your neighbours can trust?	Scales:	Most	Some	Several	None	
	Percentage:	33.52	37.46	22.58	6.44	
Safety: How do you evaluate the safety in your neighbourhood?	Scales:	Very unsafe	Unsafe	Neutral	Safe	Very safe	Unsure
	Percentage:	4.31	13.27	28.47	31.19	18.61	4.15
Interaction: How frequent do you socially interact with locals?	Scales:	Frequently	Occasionally	Seldom	Never	Do not live near locals
	Percentage:	11.26	27.61	28.44	26.71	5.98
Organisation: How frequent do you contact with neighbourhood organizations?	Scales:	Frequently	Occasionally	Seldom	Never	Unaware of organizations
	Percentage:	2.82	7.37	14.74	60.99	14.08
Participation: How frequent do you participate in neighbourhood activities?	Scales:	Frequently	Occasionally	Seldom	Never	Unaware of activities
	Percentage:	0.91	4.33	6.98	56.34	31.46
Satisfaction: How satisfied are you with your neighbourhood?	Scales:	Very satisfied	Satisfied	Neutral	Unsatisfied	Very unsatisfied	Unsure
	Percentage:	11.46	28.26	41.65	10.83	3.69	4.12
Individual characteristics						
Age (years)	Mean = 30.7 (Standard deviation = 10.7); Taking logarithm in models.					
Age square	Mean = 1057.1 (Standard deviation = 751.7); Taking logarithm in models.					
Gender	Female = 40%, Male = 60%					
Labour contract	No = 75.5%, Yes = 24.5%					
Occupational training	No = 67.6%, Yes = 32.4%					
Education	Categories:	Primary school or below	Junior high school	Senior high school	College or above	
	Percentage:	22.6	52.6	22.2	2.6	
Migration duration (months)	Mean = 63.0 (Standard deviation = 63.1); Taking logarithm in models.					
Employer characteristics						
Industry	Categories	Manufacturing	Construction	Retail & wholesale	Hotel, catering & entertainment	
	Percentage	19.1	19.8	14.27	20.1	
	Categories	Other commercial services	Government agency	Transportation & logistics	Other	
	Percentage	15	3.3	1.8	6.6	
Ownership	Categories	State-owned	Foreign-funded	Private-owned	Individual-owned	
	Percentage	12.7	6.6	39.0	28.6	
	Categories	Collective-owned	Non-governmental	Other		
	Percentage	8.5	0.6	4.0		
Regional characteristics						
City	Cities	Shanghai	Tianjin	Guangzhou	Shengyang	Kunming	Weihai	Yibin
	Percentage	17	17	17	17	16	8	8

Table 2: Reference and reported scales for ordinal core variables

Core variables	Quality	Trust	Safety	Interaction	Organization	Participation	Satisfaction
Reference scale	Better	Most	Very unsafe	Frequently	Frequently	Frequently	Very satisfied
Reported scale	Much poorer	None	Very safe	Do not live near locals	Unaware	Unaware	Very unsatisfied

Table 3: Effects of neighbourhoods on monthly wages

	Space	Quality	Trust	Safety	Interaction	Organization	Participation	Satisfaction
Expected sign of core variables	+	-	-	+	-	-	-	-
Core variable: Reported scale	0.067^3	-0.030^2	-0.014	0.004	-0.025^3	-0.020^1	-0.016	-0.020^1
(Ref: see Table 2)	(5.08)	(-2.34)	(-1.15)	(0.42)	(-2.67)	(-1.76)	(-1.24)	(-1.86)
Age (log)	3.801^3	3.881^3	3.945^3	3.946^3	3.870^3	3.890^3	3.936^3	4.087^3
	(5.57)	(5.73)	(5.81)	(5.51)	(5.7)	(5.73)	(5.77)	(5.96)
Age^2 (log)	-0.556^3	-0.564^3	-0.574^3	-0.576^3	-0.563^3	-0.567^3	-0.574^3	-0.598^3
	(-5.62)	(-5.75)	(-5.84)	(-5.55)	(-5.73)	(-5.77)	(-5.81)	(-6.02)
Gender: Male	0.188^3	0.184^3	0.180^3	0.179^3	0.179^3	0.179^3	0.178^3	0.187^3
(Ref: Female)	(8.6)	(8.37)	(8.18)	(7.89)	(8.15)	(8.21)	(8.07)	(8.35)
Education: College or above	0.052^3	0.058^3	0.057^3	0.060^3	0.055^3	0.055^3	0.054^3	0.055^3
(Ref: Primary or below)	(3.43)	(3.79)	(3.65)	(3.8)	(3.57)	(3.57)	(3.5)	(3.49)
Occupational Training: Yes	0.109^3	0.117^3	0.121^3	0.124^3	0.114^3	0.116^3	0.118^3	0.121^3
(Ref: No)	(4.88)	(5.2)	(5.39)	(5.44)	(5.02)	(5.17)	(5.24)	(5.34)
Labour Contract: Yes	0.098^3	0.099^3	0.100^3	0.093^3	0.099^3	0.098^3	0.098^3	0.096^3
(Ref: No)	(4.23)	(4.25)	(4.35)	(3.96)	(4.28)	(4.27)	(4.2)	(4.03)
Migration duration (log)	0.048^3	0.050^3	0.051^3	0.054^3	0.048^3	0.050^3	0.051^3	0.053^3
	(5.86)	(5.99)	(6.18)	(6.24)	(5.8)	(6.05)	(6.09)	(6.25)
Observations	2,334	2,359	2,357	2,272	2,365	2,368	2,353	2,280
Adjusted R^2	0.240	0.232	0.230	0.228	0.233	0.232	0.232	0.243

Source: Authors' calculation using ordinary least squares (OLS) regression.

Notes: 1. Migrant workers who were unsure about neighbourhood safety and satisfaction were excluded;

2. Coefficients for employment and regional characteristics, taken as dummy variables in the model, were omitted due to space limitation. They are available from the authors;

4. Values in brackets are t-statistics;

5. Superscripts 1, 2 and 3 indicate 10%, 5% and 1% significance levels respectively.

Table 4: Effects of neighbourhoods on hourly wages

	Space	Quality	Trust	Safety	Interaction	Organization	Participation	Satisfaction
Expected sign of core variables	+	-	-	+	-	-	-	-
Core variable: Reported scale	0.009[3]	-0.004[1]	-0.002	0.001	-0.004[2]	-0.003[1]	-0.002	-0.003[1]
(Ref: see Table 2)	(4.65)	(-1.95)	(-1.28)	(0.52)	(-2.49)	(-1.92)	(-1.12)	(-1.65)
Age (log)	0.590[3]	0.598[3]	0.609[3]	0.612[3]	0.599[3]	0.600[3]	0.608[3]	0.626[3]
	(5.36)	(5.48)	(5.57)	(5.27)	(5.47)	(5.51)	(5.53)	(5.68)
Age[2] (log)	-0.086[3]	-0.087[3]	-0.089[3]	-0.089[3]	-0.087[3]	-0.087[3]	-0.088[3]	-0.091[3]
	(-5.43)	(-5.53)	(-5.62)	(-5.33)	(-5.52)	(-5.56)	(-5.59)	(-5.75)
Gender: Male	0.028[3]	0.027[3]	0.026[3]	0.026[3]	0.026[3]	0.026[3]	0.026[3]	0.028[3]
(Ref: Female)	(8.14)	(7.95)	(7.8)	(7.56)	(7.77)	(7.84)	(7.71)	(7.96)
Education: College or above	0.008[3]	0.008[3]	0.008[3]	0.009[3]	0.008[3]	0.008[3]	0.008[3]	0.008[3]
(Ref: Primary or below)	(3.30)	(3.65)	(3.51)	(3.69)	(3.43)	(3.40)	(3.38)	(3.36)
Occupational training: Yes	0.017[3]	0.018[3]	0.018[3]	0.019[3]	0.017[3]	0.017[3]	0.018[3]	0.019[3]
(Ref: No)	(4.88)	(5.17)	(5.36)	(5.45)	(4.97)	(5.16)	(5.21)	(5.38)
Labour Contract: Yes	0.015[3]	0.015[3]	0.016[3]	0.014[3]	0.015[3]	0.015[3]	0.015[3]	0.015[3]
(Ref: No)	(4.28)	(4.31)	(4.38)	(3.99)	(4.30)	(4.31)	(4.23)	(4.05)
Migration duration (log)	0.007[3]	0.007[3]	0.007[3]	0.008[3]	0.006[3]	0.007[3]	0.007[3]	0.007[3]
	(5.44)	(5.56)	(5.72)	(5.81)	(5.35)	(5.56)	(5.66)	(5.84)
Observations	2,334	2,359	2,357	2,272	2,365	2,368	2,353	2,280
Adjusted R[2]	0.219	0.213	0.212	0.211	0.214	0.213	0.214	0.226

Source and notes: Same as Table 3.

Table 5: Effects of neighbourhood on monthly and hourly wages with instrumental variables

		Quality		Interaction		Organization		Participation		Satisfaction	
	Core variable	-0.2754^3	(0.002)	-0.2883^3	(-2.80)	-0.5195^2	(-2.50)	-0.9195^1	(-1.77)	-0.3930^3	(-2.34)
	IV tests										
Monthly	*Underidentification*	63.8^3	(0.00)	28.602^3	(0.00)	13.586^3	(0.001)	4.607^1	(0.099)	15.503^3	(0.00)
wages	*Overidentification*	0.94	(0.33)	0.719	(0.396)	0.593	(0.441)	0.613	(0.433)	2.656	(0.103)
	Weak instrument	11.96	(19.93)	14.209	(19.93)	6.727	(19.93)	2.277	(19.93)	7.677	(19.93)
	Endogeneity	9.49^3	(-3.20)	8.540^3	(0.003)	9.711^3	(0.002)	8.861^3	(0.003)	7.566^3	(0.006)
	Core variable	-0.0396^3	(-2.95)	-0.0384^2	(0.009)	-0.0689^2	(0.006)	-0.1196^1	(-1.68)	-0.0609^2	(-2.25)
	IV tests										
Hourly	*Underidentification*	63.84^3	(0.00)	28.602^3	(0.00)	13.568^3	(0.001)	4.607^1	(0.099)	15.503^3	(0.00)
wages	*Overidentification*	0.273	(0.601)	1.045	(0.306)	0.922	(0.337)	0.916	(0.338)	1.376	(0.240)
	Weak instrument	11.9	(19.93)	14.209	(19.93)	6.727	(19.93)	2.277	(19.93)	7.677	(19.93)
	Endogeneity	8.495^3	(0.004)	6.661^3	(-2.57)	7.650^3	(-2.33)	7.041^3	(0.008)	8.004^3	(0.005)
	Instrument variables	Income, living space		Living space, housing expense		Living space, housing expense		Living space, housing expense		Living space, housing expense	
	Observations	2,289		2,293		2,297		2,283		2,212	

Source: Authors' calculation using two-stage least squares (2TLS) regression.

Statistical hypothesis for IV strength tests:

1. Null hypothesis for the underidentification test: The augmented equation system with IVs is underidentified;

2. Null hypothesis for the overidentification test: The IVs are exogenous and acceptable;

3. Null hypothesis for the weak instrument test: The IVs have strong correlation with the endogenous variables;

4. Null hypothesis for the endogeneity test: The potential endogenous variables are actually exogenous.

Notes:

1. Values in brackets for core variables are t-statistics;

2. Values in brackets for weak identification tests are critical values at 10% significance level, and those for other tests are p-values;

3. Superscripts 1, 2 and 3 indicate 10%, 5% and 1% significance levels respectively;

4. Results for other three core variables and those for controlled variables are omitted but are available from the authors.

Table 6: Effects of neighbourhood on monthly wages with proxy variable

	Space	Quality	Trust	Safety	Interaction	Organization	Participation	Satisfaction
Expected sign of core variables	+	-	-	+	-	-	-	-
Core variable: Reported scale	0.064[3]	-0.018[2]	-0.018	0.004	-0.024[1]	-0.052[3]	-0.023	-0.042[3]
(Ref: see Table 2)	(3.68)	(-1.97)	(-0.95)	(0.33)	(-1.73)	(-3.06)	(-1.23)	(-2.61)
Father's wage (log)	0.023	0.028[1]	0.033[1]	0.032[2]	0.031[1]	0.032[2]	0.033[2]	0.029[1]
	(1.43)	(1.74)	(1.94)	(2.00)	(1.92)	(2.00)	(2.00)	(1.74)
Age (log)	4.767[3]	4.868[3]	5.020[3]	5.009[3]	4.922[3]	4.744[3]	4.873[3]	5.126[3]
	(2.97)	(3.09)	(3.16)	(3.17)	(3.11)	(3.03)	(3.07)	(3.24)
Age[2] (log)	-0.694[3]	-0.704[3]	-0.725[3]	-0.723[3]	-0.709[3]	-0.684[3]	-0.703[3]	-0.743[3]
	(-2.86)	(-2.95)	(-3.02)	(3.17)	(-2.96)	(-2.89)	(-2.93)	(-3.10)
Gender: Male	0.156[3]	0.150[3]	0.150[3]	0.150[3]	0.147[3]	0.152[3]	0.151[3]	0.164[3]
(Ref: Female)	(4.85)	(4.66)	(4.65)	(-3.02)	(4.55)	(4.76)	(4.71)	(5.06)
Education: College or above	0.053[3]	0.059[2]	0.054[2]	0.057[3]	0.054[2]	0.047[1]	0.054[2]	0.056[2]
(Ref: Primary or below)	(2.09)	(2.30)	(2.06)	(4.67)	(2.10)	(1.85)	(2.09)	(2.18)
Occupational Training: Yes	0.116[3]	0.121[3]	0.122[3]	0.119[2]	0.115[3]	0.113[3]	0.117[3]	0.116[3]
(Ref: No)	(3.75)	(3.92)	(3.93)	(2.20)	(3.67)	(3.72)	(3.78)	(3.74)
Labour Contract: Yes	0.090[3]	0.092[3]	0.086[2]	0.090[3]	0.090[3]	0.079[2]	0.085[2]	0.085[2]
(Ref: No)	(2.61)	(2.66)	(2.55)	(3.84)	(2.59)	(2.29)	(2.41)	(2.51)
Migration duration (log)	0.065[3]	0.064[3]	0.066[3]	0.066[3]	0.062[3]	0.062[3]	0.066[3]	0.067[3]
	(5.29)	(5.20)	(5.47)	(2.62)	(4.91)	(5.05)	(5.39)	(5.51)
Observations	1,175	1,185	1,187	1,192	1,189	1,191	1,189	1,191
Adjusted R[2]	0.250	0.240	0.240	0.240	0.243	0.246	0.241	0.248

Source and notes: Same as Table 3.