Peer Effects and Neighborhood Effects in Family Migration or Residence Decisions under the Background of Smoke-free Environment

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Under the background of smoke-free environment, based on the survey data of CMDS 2013 and 2018, this study explored the differences in family migration and residence decisions of migrants living in different neighborhoods, and analyzed the influence of family migration scale on residence decision by using the hierarchical linear model (HLM). The results show that: Peer effects exist in same neighborhoods, while neighborhood effects exist in different neighborhoods, but the effect sizes and directions of various neighborhood factors are different; Family income level is still an important factor affecting the family migration and residence decisions, and the family migration scale has a positive effect on residence decision; There are significant inter-generational differences in family migration and residence decisions, but the conditions for the differences are different; Good neighborhood smoke-free environments and abundant neighborhood activities are helpful to strengthen the family migration and residence decision of migrant workers.

INTRODUCTION

The construction of neighborhood environment should be conducive to physical and mental health, which will help migrant workers to make family migration or residence decisions, and a good smoke-free environment is undoubtedly a part of neighborhood environment construction.

A large number of studies have confirmed the harm of tobacco to health.[1,2] China is the world's largest tobacco producer and consumer, with more than 300 million smokers and 740 million people being harmed by secondhand smoke. Every year, more than 1 million people die from diseases caused by smoking. The Outline of "Healthy China 2030" proposed that by 2030, the smoking rate of people over 15 years old would be reduced to 20%. The "Opinions of the State Council on Implementing the Healthy China Action" proposes that tobacco control actions will be implemented to promote individuals and families to fully understand the serious hazards of smoking and secondhand smoke exposure. "Healthy China" must be a smoke-free China, because only by building a smoke-free environment can we share a healthy life.[3,4]

At the same time, although the increasing trend of the total number of migrant workers in China has

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declined in recent years, the integration of a large number of migrant workers in cities where they work has been puzzling government officials and scholars. Family migration is undoubtedly one of the effective ways to solve the problems, but how to guide the group of migrant workers who have no intention to return to their hometown for the time being to "family migrate and residence in the city" is still an important issue to be solved urgently.[5]

With the rapid development of urbanization in China, the distribution of labor resources in different regions is unbalanced, and the migration of labor also has the characteristics of periodic migratory birds and continuous trends. The restriction of household registration system restricts the free migration of labor force. Recently, with the weakening of income effect, the migration subject has gradually changed from individual to family.[6,7] The factors affecting migration decision have become more complicated,[8,9] and the trend of migration have undergone some new changes. On the one hand, the regions into which a large number of people migrate are not only limited to the first-tier megacities such as Beijing, Shanghai, Guangzhou and Shenzhen, but also gradually spread to the surrounding areas of these cities, which makes the urban circle around these core cities develop rapidly. The regional choice of labor migration has an obvious trend from point to area. On the other hand, with the layout and implementation of the Rural Revitalization Strategy, the allocation of public resources is no longer only inclined to big cities, and the shift in the direction of labor migration caused by the allocation of public services is obvious. The phenomenon of labor return has been paid close attention by the government policymakers and scholars. At the same time, due to the rapid development of technologies such as the internet, big data and artificial intelligence, virtual agglomeration has been born as a new industrial agglomeration method, and the extended population agglomeration mode has gradually emerged.[10]

In the current labor migration modes, the "migratory bird" individual migration mode is quite different from the family migration mode. Under the background of the continuous promotion of new urbanization, the family migration mode is undoubtedly more in line with the people-oriented goal of urbanization. To some extent, it means that the problems such as "left-behind children" and "left-behind elderly" are expected to be improved, and the survival quality of hundreds of millions of migrant workers will be truly improved in the process of urbanization.[11]

Therefore, based on the perspective of neighborhood structural differences, this study empirically analyzes whether there are peer effects, neighborhood effect and inter-group differences between migrant workers' family migration and residence decisions, starting from individual and family factors and neighborhood factors, so as to explore the structural impact of different community public service allocation on family migration decisions, and the impact of migrant workers' family migration size on residence decisions, aiming at providing ideas and reference for supporting policy formulation to improve the effectiveness and accuracy of public service resource allocation.

LITERATURE REVIEW AND HYPOTHESES
Individual Factors
The research on labor location selection, migration and residence decision originated from economists' thinking on the phenomenon of international migration, and the continuous contributions of many scholars made great progress in the research on labor location selection, migration decision and residence willingness,[12-14] and the results of these studies have laid a good foundation for current related research.

Family income factor
Theoretically, the classic model of labor migration under dual structure is Lewis-Ranis-Fei model and Harris-Todaro model, in these classic models, the main reason for labor migration is the income gap, and the expectation that non-agricultural employment in cities will get higher income than traditional agricultural labor leads to the occurrence of labor migration behavior. Classical migration theory reasonably explains the phenomenon of labor migration between rural and urban areas, but family factors are ignored in these models.

The new economic migration theory raises the decision-making subject of migration from individual to family, and holds that the migration of some members of the family is the result of maximizing the

benefits of the family, the main reason driving migration is still the income gap.[15,16] So, under the current background, will it affect the family migration decision of migrant workers? Based on this, we propose the following research hypotheses.

H1a: Family income level has a significant positive impact on migrant workers' family migration decision;

H1b: Family income level has a significant positive impact on migrant workers' residence decision.

Intergenerational differences

Some early studies focused on the influence of individual and family endowments on the decision-making of migration and residence, among which factors such as gender, age, income gap between agriculture and non-agriculture, and the distance between outflow place and inflow place all have significant influence on the decision-making of migration and residence of labor force. At present, many scholars' studies have confirmed that there are intergenerational differences in migrant workers' migration decisions and residence intentions.[17-22] Therefore, we propose the following research hypotheses.

H2a: There are significant intergenerational differences in migrant workers' family migration decisions;

H2b: There are significant intergenerational differences in migrant workers' residence decisions.

Neighborhood Factors

By combing the many influencing factors of family migration decision and residence intention, it is not difficult to find that the migration decision of migrants living in the community is influenced by the heterogeneity of personal and family endowments as well as the homogeneity of community factors. There are two factors that can't be ignored within the community: first, the influence from the external conditions of the community where you live, such as living environment, community scale, urban and rural attributes, community public services, etc., that is, community effect; Second, the interaction between individuals or families

from within the same community, namely peer effect.

Neighborhood effects

Migrant workers living in different communities are in different external conditions, and the differences of external conditions such as urban and rural attributes, location environment, public services and management level among communities have different influences on the decision-making and residence willingness of migrant workers in family migration, which makes community factors become the focus of attention in the field of labor migration in recent years.[23-28] Studies have found that social and psychological integration factors, such as community participation, local people's acceptance perception and happiness compared with their hometown, have a positive impact on the long-term residence willingness of migrants across provinces in Xinjiang, Beijing and Guangdong,[29] while differences in public service resources in communities[30] and differences in urban and rural attributes[31] will even have an impact on family migration. Therefore, we propose the following research hypotheses.

H3a: Migrant workers' family migration decisions in different neighborhoods are significantly different due to the influence of neighborhood factors, that is, there are neighborhood effects of family migration decision in different neighborhoods;

H3b: Migrant workers' residence decisions in different neighborhoods are significantly different due to the influence of neighborhood factors, that is, there are neighborhood effects of residence decision in different neighborhoods.

Peer effect

Although the income gap is the main reason driving the migration, it still can't give a convincing explanation for the behavior that migrant workers will still undergo family migration after individual migration meets the needs of maximizing family benefits, that is, why some families choose family migration, but some families never make family migration decisions. In order to better explain the low-level equilibrium in economy and society, many scholars have focused on the Peer Effects in labor migration decision-making.

Peer effect originated from the related research in the field of pedagogy, and the peer effect and community effect in the process of education have always been a hot research field, and then it has been widely concerned in the fields of economics and sociology. Because of information asymmetry, risk

aversion, psychological preference and mutual influence between people, individuals in the group will have imitation behavior, which means they tend to imitate the behavior choices of most people in the peer group. In the community scene, peer effect means that the behaviors of neighbors will influence each other, which is characterized by interdependence and linkage. Some foreign scholars have found that peer effect,[32,33] and studies by domestic scholars have confirmed the existence of peer effect in the process of migration decision-making and psychological adaptation.[34,35] Peer effect embodies an endogenous social interaction in decision-making among individuals.[36] So, is there a peer effect in the decision-making of migrant workers' family migration living in the same community at present? Thus, we put forward the following research hypotheses.

H4: There are significant differences in the influence of different neighborhood types on the migrant workers' family migration decisions, that is, there are peer effects in same neighborhoods.

The Impact of the Scale of Family Migration on Residence Decisions

Some scholars have found that the migration of migrant workers' spouses has a significant positive impact on the migration of their children and the number of children who are studying in cities.[37] One-time family migration has become the main mode in the process of family migration of floating population, and the proportion of family migration of floating population has obvious spatial differences[38] There are significant differences in the migration characteristics of migrant workers' core families in cities of different scales,[39] and family migration has a significant impact on the settlement willingness of floating population in small and medium-sized cities.[40] Based on this, under the premise that the large sample data covers communities in different regions and cities, this study puts forward the following research hypothesis.

H5: The family migration scale has a significant positive impact on migrant workers' residence decisions.

3. MATERIALS AND METHODS
Data and Sample

The data of this study is derived from China Migrants Dynamic Survey of 2013 and 2018. In CMDS 2013, the data were collected from individual data sets on social integration and neighborhood data sets of migrants. In CMDS 2018, the data were used for comparative study, and the individual data sets and neighborhood data sets of migrants were used. Among them, the individual data in 2018 corresponds to the research samples selected from 8 sampling cities (or subordinate districts of municipalities) on social integration in 2013. Eight cities selected the eastern, central and western regions and areas with different city sizes, specifically Songjiang in Shanghai, Suzhou in Jiangsu, Wuxi in Jiangsu, Quanzhou in Fujian, Wuhan in Hubei, Changsha in Hunan, Xi 'an and Xianyang in Shaanxi.

The individual and neighborhood data of two years are matched one by one according to the coding characteristics of sample points, and the nested structure data of individual and neighborhood is obtained. The new data set includes both individual level information and neighborhood level information. As the object of this study focuses on migrant workers' families living in urban and rural neighborhoods, the samples whose registered permanent residence is agriculture and rural migration are selected from the data set, and the samples whose main variables have missing values are deleted. Finally, the number of valid samples at individual level is 12,169 in 2013 and 10,363 in 2018, and the number of valid samples at neighborhood level is 745 in 2013 and 614 in 2018, respectively. According to the urban and rural attributes of sample points, 745 neighborhoods in 2013 included 469 urban neighborhoods and 276 rural neighborhoods, and 614 neighborhoods in 2018 included 435 urban neighborhoods and 179 rural neighborhoods.

Variables
Dependent variable

The study focuses on the migrant workers' family migration and residence decisions. Therefore, the migrant workers' family migration decision (named *YA*) and their residence decisions (named *YB*) in urban and rural neighborhoods are taken as the dependent variables of the two-part study.

The family migration decision (*YA*) is measured by the score of the item "Do you intend to bring your family to the local area in the next three years" in the

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2013 questionnaire. Combining a small number of options with uncertain answers, the score grades from 1 to 4 are finally obtained to express the decision strength of family migration. The specific scoring rules of each score are as follows: 1 = not moving family members to the local area, 2 = moving some family members to the local area, 3 = moving all family members to the local area, and 4 = moving family members to the local area. The higher the score, the greater the power of family migration decisions.

The residence decisions (*YB*) is measured by the scores of the comprehensive items in the 2018 questionnaire, "Are you going to stay here for some time in the future?" and "If you are going to stay here, how long do you expect to stay here?" By integrating the options of the two items, the scores from 1 to 7 are finally obtained to express the intensity of residence decisions. The specific scoring rules of each score are as follows: 1 = not planning to stay, 2 = not thinking about whether to stay, 3 = wanting to stay but uncertain residence time, 4 = planning to stay locally for 0~4 years, 5 = planning to stay locally for 5~9 years, 6 = planning to stay locally for 10 years or more. The higher the score, the stronger the respondents' residence intensions.

Independent variables at individual level

The independent variables of individual level select the related indicators of individual and family: family income level (*Inc*) and intergenerational (*Gen*). The research of data in 2013 also selects the main neighbor type (*Neig*), and the research of data in 2018 also selects the scale of family migration (*FamMigr*).

Family income level (*Inc*), as an index variable representing family economic status, is one of the core independent variables at individual level. The related items in the questionnaires in 2013 and 2018 are "total monthly household income in local area". In the formal model, "total monthly household income in local area", which is divided into five levels after binning, is used as an orderly variable representing the household income level.

Generation (*Gen*) is an index variable representing the birth cohort. In the past research, the intergenerational division of migrant workers is usually called the old generation of migrant

workers born before 1980, and those born after 1980 are called the new generation of migrant workers. However, there are significant differences between the 90' s and 90' s among the new generation of migrant workers and the 80' s in the traditional sense in terms of cognitive style, thinking mode and psychological characteristics, as well as the 70' s and 70' s among the old generation of migrant workers. Therefore, the migrant workers born in and after 1990 and before 1970 were separately distinguished from the new generation and the old generation of migrant workers. According to the birth sequence, the samples were divided into four groups with a value of 1~4: 70 before (born in and before 1969), 70 ~ 80 (born in 1970 ~ 1979) and 80 ~ 90 (born in 1980 ~ 1989).

The neighbor type (*Neig*) adopts the data of the item "Who is your neighbor mainly" in the questionnaire as the category variable, and is divided into three categories: outsiders, local citizens and two types of population. In this study, foreigners as the main neighbor type were taken as the control group, and the differences between the other two types and the control group were compared. The classified data entered the model in the form of virtual variables.

The variable value of family migration scale (*FamMigr*) comes from the item "the number of family members living together" in the data of 2018. Considering that the family scale of 5-9 people is relatively small as a whole, the scores from 1 to 5 are finally obtained to represent the orderly variables of family migration scale. The scoring rules of each score are as follows: 1 = migrate alone, 2 = 2 people migrate in the family, and 3 = 3 people.

Independent variables at neighborhood level

Five independent variables of community level are selected in the research of family migration decision-making: Urban and rural attributes of neighborhood (recorded as *urban*), neighborhood location environment (recorded as *env*), employment service (recorded as *Job*), health education (recorded as heal) and Neighborhood management participation permission (recorded as perm). In the part of the study of residence decisions, four items are selected: *Urban*, *Env*, *Heal*, and Live. The scores of the items related to various factors in the neighborhood questionnaire are summed up separately. The higher the score, the more favorable of the neighborhood location environment is for employment, the richer the employment services provided, the more popular the health education, the higher the permission for

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migrants to participate in neighborhood management, and the greater the density of migrants in the living environment.

Control variables

Selecting other factors that affect the family migration and residence decisions of migrant workers in real life, judging according to experience and referring to the methods selected by domestic and foreign scholars, the following control variables are selected: sample gender, inter-provincial migration, time of current migration, and urban and rural attributes of sample points. The data are derived from the corresponding values of corresponding items in the questionnaire, among which gender, inter-provincial migration and urban and rural attributes of sample points are category variables, and all of them are entered into the model in the form of dummy variables.

In addition, because the first part of the empirical analysis needs to examine the peer effect of family migration decision, the perceived acceptance of local residents and participation in

neighborhood activities are also selected as control variables in the 2013 data. Perceived acceptance of local residents refers to the degree of acceptance of local residents felt by respondents themselves. The data of the item "I think local people are willing to accept me as one of them" in the questionnaire is used as an ordered variable. The measurement scale is Likert scale, and the assignment rules are as follows: 1 = totally disagree, 2 = disagree, 3 = basically agree, 4 = totally agree. The higher the score, the higher the degree of acceptance of local residents felt by respondents. Neighborhood participation refers to the frequency of respondents' participation in various activities organized by the neighborhoods. The scores of several related items such as "whether to participate in neighborhood sports activities" and "whether to participate in social welfare activities" in the questionnaire are summed up. The higher the score, the higher the respondents' participation in neighborhood activities.

Descriptive statistics of each index variable are shown in Table 1.

Table 1
Descriptive statistics of variables

Variables	Mean / Sample size	S.D. / Frequency	Variables	Mean / Sample size	S.D. / Frequency
2013 Neighborhood level (N=745)					
Neighborhood environment (0~5)	1.19	1.12	Health education	649	87.1%
Employment service (0~2)	1.14	0.82	Neighborhood attribute: City	469	63.0%
Management participation permission (0~3)	1.47	1.16	Rural	276	37.0%
2013 Individual level (N=12169)					
Family migration decision (1~4)	2.50	1.19	Gender: Male	6346	52.1%
Family income level (1~5)	2.95	1.14	Female	5823	47.9%
Generation (1~4)	2.47	0.91	Education level(1~7)	3.22	0.79
Neighbor type: Migrants	5170	42.5%	Migration Range: Inter-provincial	6736	55.4%
Half each	3677	30.2%	Intra-provincial	5433	44.6%
Natives	3322	27.3%	Perceived acceptance (1~4)	3.29	
Time of current migration (year)	4.59	4.48	Participation in activities (0~7)	0.46	0.87
2018 Neighborhood level (N=614)					
Neighborhood environment (0~5)	1.02	1.10	Health education (0~7)	4.92	1.61
Density of migrants (0~2)	0.77	0.72	Neighborhood attribute: City	435	70.8%
2018 Individual level (N=10363)					
Residence decision (1~7)	4.43	1.81	Gender: Male	5420	52.3%

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Family income level (1~5)	2.80	1.21	Female	4943	47.7%
Generation (1~4)	2.21	0.99	Education level(1~7)	3.43	1.06
Scale of family migration (1~5)	3.11	1.14	Migration Range: Inter-provincial	5243	50.6%
Time of current migration (year)	5.72	5.92	Intra-provincial	5120	49.4%

Data Source: The authors collated data from CMDS 2013 and 2018.

RESULTS

The Hierarchical Linear Model of Family Migration Decision

The hierarchical linear model (HLM) is constructed for empirical analysis. Firstly, in order to test the differences between groups and the homogeneity within groups, the null model of family migration decision is tested, and the random coefficient regression model and the complete model are tested step by step. The following is the empirical modeling process of this study.

Null model

Unconditional null model is used to judge whether hierarchical linear model is suitable for research data. Without adding any independent variables, a null model containing only dependent variable family migration decision (*YA*) is constructed, and the equations of two-level model of individual and community are obtained.

Individual level (level 1):

$$YA = \beta_{0j} + \varepsilon_{ij}$$

Neighborhood level (level 2):

$$\beta_{0j} = \gamma_{00} + \mu_{0j}$$

The regression results of individual level variables of the null model are shown in the corresponding parts of Table 2. According to the analysis and calculation, the variance between groups of sample data is 0.396 and the variance within groups is 1.022, so the correlation coefficient within groups (ICC1) is 0.279, which is higher than the threshold of 0.138 given by Cohen (1988). It means high intra-group correlation, indicating that the differences between groups are significant, which is suitable for analysis by HLM model.

Random coefficient regression model

Random coefficient regression model is used to test whether the influence of individual level variables on dependent variables is significant, which needs to be constructed by using individual level variables. The individual level independent variables family income level (*Inc*), generational (*Gen*) and neighbor type (*Neig*) selected in this study are included in the model, and the control variables are added to obtain the random coefficient regression model of this study.

Individual level 1:

$$YA = \beta_{0j} + \beta_{1j} \times Inc + \beta_{2j} \times Gen + \beta_{3j} \times Neig + U + \varepsilon_{ij}$$

Neighborhood level 2:

$$\beta_{0j} = \gamma_{00} + \mu_{0j}$$

$$\beta_{1j} = \gamma_{10} + \mu_{1j}$$

$$\beta_{2j} = \gamma_{20} + \mu_{2j}$$

$$\beta_{3j} = \gamma_{30} + \mu_{3j}$$

$$\beta_{4j} = \gamma_{40}$$

…

$$\beta_{10j} = \gamma_{100}$$

Where, *U* is the vector set of control variables whose coefficients range from β_{4j} to β_{10j}. The regression results of individual level variables in the random coefficient regression model are shown in the corresponding part of Table 2. The coefficient estimates of the three independent variables at the individual level are all significant.

The regression results of the fixed effect show that the family income level has a significant positive impact on family migration decision, and the higher the family income level, the stronger the family migration decision, which is consistent with the conclusions of previous studies. Income level is still one of the important factors affecting the decisions of migrants. There are intergenerational differences in family migration decision, and the estimated coefficient of intergenerational variables is only -0.02, which has significant influence but little effect, and the older the family migration decision, the less

powerful it is. Different neighbor types have significant differences on family migration decision. Compared with migrant workers whose neighbors are mainly migrants, more local residents in the neighbors can significantly promote their family migration decision, which well confirms the existence of peer effect in family migration decision. To sum up, Hypothesis H1a, H2a and H4 are accepted.

The regression results of random effects show that the random effects of the independent variables at individual level are all significant at the level of 1%, and the variance components of intercept term and slope term of the model exist significantly, which indicates that the family income level, generations and neighbor types of individual samples living in different neighborhoods are significantly different.

The regression results of control variables show that the longer the time of current migration

to the local area, the greater the power of family migration decision. Relatively speaking, the Intra-provincial migrants have stronger power in family migration decision than those Inter-provincial ones, which may be mainly caused by the distance between the inflow and outflow places and cultural differences, which further confirms the relevant conclusions of existing studies. There is no statistically significant difference in the family migration decision between samples with different gender and educational level. In addition, the local residents' acceptance perception and neighborhood activity participation in the study sample also have a significant positive impact on family migration decision-making. It is felt that the higher the local residents' acceptance of themselves and the higher their participation in neighborhood activities, the greater the family migration decision, which indicates that good acceptance environment and rich neighborhood activities in neighborhoods are conducive to promoting the family migration decision of migrant workers.

Table 2
Regression results of individual level variables in family migration decision model

Family migration decision	Null model		Random coefficient regression model		Complete model	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Fixed effect						
Intercept	2.506***	0.025	1.531***	0.096	1.517***	0.164
Family income level			0.204***	0.011	0.171***	0.037
Generations (Birth sequence)			-0.022*	0.013	-0.022	0.036
Neighbor type (Control group = Migrants)						
Half each			0.087***	0.031	0.080**	0.031
Natives			0.131***	0.031	0.120***	0.031
Control variables						
Perceived acceptance of local residents			0.089***	0.018	0.087***	0.018
Neighborhood activities participation			0.065***	0.016	0.061***	0.016
Time of current migration			0.026***	0.003	0.026***	0.003
Education level			-0.008	0.014	-0.010	0.014
Range (Control group = Intra-provincial)			-0.107***	0.025	-0.102***	0.025
Male (Control group = Female)			0.026	0.019	0.027	0.019
Random effect	Deviance	Variance component	Deviance	Variance component	Deviance	Variance component
Intercept	0.629***	0.396	0.903***	0.816	0.878***	0.771
Family income level			0.175***	0.031	0.173***	0.030
Generations (birth sequence)			0.153***	0.023	0.157***	0.025
Neighbor type (Control group = Migrants)						
Half each			0.364***	0.132	0.364***	0.132

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Natives		0.294 ***	0.087	0.292 ***	0.085
Deviance	36269	35320		35355

Note: ***, **, * indicate significant at level of 0.1%, 1% and 5%, respectively.

Complete model

Complete model is a model used to test the influence of all variables at individual level and neighborhood level on dependent variables, which needs to be constructed by using all variables at two levels. In this study, individual level independent variables, such as family income level (*Inc*), generation (*Gen*) and neighbor type (*Neig*), and neighborhood level independent variables, such as neighborhood attribute (*Urban*), neighborhood location environment (*Env*), employment service (*Job*), health education (*Heal*) and neighborhood management participation permission (*Perm*), were all included in the model, and control variables were added to get the results.

Individual level (level 1):

$$YA = \beta_{0j} + \beta_{1j} \times Inc + \beta_{2j} \times Gen + \beta_{3j} \times Neig + U + \varepsilon_{ij}$$

Neighborhood level (level 2):

$$\beta_{0j} = \gamma_{00} + \gamma_{01} \times Urban + \gamma_{02} \times Env + \gamma_{03} \times Job$$
$$+\gamma_{04} \times Heal + \gamma_{05} \times Perm + \mu_{0j}$$
$$\beta_{1j} = \gamma_{10} + \gamma_{11} \times Urban + \gamma_{12} \times Env + \gamma_{13} \times Job$$
$$+\gamma_{14} \times Heal + \gamma_{15} \times Perm + \mu_{1j}$$
$$\beta_{2j} = \gamma_{20} + \gamma_{21} \times Urban + \gamma_{22} \times Env + \gamma_{23} \times Job$$
$$+\gamma_{24} \times Heal + \gamma_{25} \times Perm + \mu_{2j}$$
$$\beta_{3j} = \gamma_{30} + \mu_{3j}$$
$$\beta_{4j} = \gamma_{40}$$
$$\dots$$
$$\beta_{10j} = \gamma_{100}$$

The regression results of individual level independent variables and control variables of the complete model are shown in the complete model section in Table 2, in which the direction and significance of coefficient estimation of control variables are basically consistent with the estimation results of random coefficient regression model, and only the size of coefficient estimation is slightly different, which will not be repeated here.

The regression results of the fixed effect part show that the intergenerational difference of family migration decision in the complete model becomes insignificant, assuming that H2a is not accepted. It is worth mentioning that the influence of family income level and neighbor type on family migration decision is remarkably robust, which shows that the conclusion that there is peer effect in family migration decision is robust, hypothesis H1a and H4 are still accepted.

The regression results of random effects show that the random effects of individual-level independent variables of the complete model are still significant at the level of 1%, and the variance components of intercept and slope terms of the model are both significant, which indicates that the conclusion that the family income level, generations and neighbor types of individual samples living in different neighborhoods are significantly different is robust.

The regression results of neighborhood independent variables to the parameters in the individual hierarchy model are shown in Table 3. Among them, the estimation results of neighborhood variables to intercept items in the individual hierarchy model show that the direct influence of employment service, health education and neighborhood management participation permission is negative but statistically insignificant, so it has no practical significance. Neighborhood attributes have a positive and significant impact on family migration decision, which indicates that migrant workers living in urban neighborhoods are more likely to make family migration decisions than migrant workers living in rural neighborhoods. Neighborhood environment has a negative and significant direct impact on family migration decision, which indicates that the more industrial parks, factories and enterprises, bazaars and other places in the surrounding environment of the residence, the more unfavorable it is for individuals to make family migration decisions, which may be related to the pollution and noise of the living environment. To sum up, the neighborhood effect of family migration decision partly exists, that is, the hypothesis H3a is partly accepted.

The estimation results of neighborhood level independent variables on the slope term of individual level model (i.e. the coefficient of individual level

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independent variables) show that the influence of neighborhood urban-rural attributes, employment services, health education and neighborhood management participation permission on family income level and intergenerational variable coefficient is not significant. It shows that these four neighborhood level variables have no cross-level moderating

effect on family migration decision. Only the neighborhood environment has a significant positive effect on the coefficient value of family income level, which indicates that the neighborhood environment can strengthen the influence of family income level on family migration decision, and its positive cross-layer moderating effect exists.

Table 3
Fixed effect of neighborhood variables on individual level in family migration decision model

Fixed effect	Complete model		
	Coefficient symbol	Estimated value	S.E.
Intercept—Family migration decision			
Neighborhood urban-rural attribute	γ_{01}	0.192^{*}	0.108
Neighborhood location	γ_{02}	-0.199^{***}	0.045
Employment service	γ_{03}	-0.008	0.066
Health education	γ_{04}	-0.085	0.150
Permission of neighborhood management participation	γ_{05}	-0.052	0.046
Family income level—Family migration decision			
Neighborhood urban-rural attribute	γ_{11}	-0.021	0.025
Neighborhood location	γ_{12}	0.030^{***}	0.010
Employment service	γ_{13}	0.007	0.015
Health education	γ_{14}	0.050	0.035
Permission of neighborhood management participation	γ_{15}	0.004	0.010
Generation—Family migration decision			
Neighborhood urban-rural attribute	γ_{21}	0.006	0.027
Neighborhood location	γ_{22}	0.008	0.011
Employment service	γ_{23}	0.002	0.016
Health education	γ_{24}	-0.006	0.038
Permission of neighborhood management participation	γ_{25}	0.008	0.011

Note: ***, **, * indicate significant at level of 0.1%, 1% and 5%, respectively.

The Hierarchical Linear Model of Residence Decision

In order to further explore the influence of family migration scale and community structural differences on residence decision, a hierarchical linear model of residence decision was constructed based on the data of 2018. Still, the empty model of residence decision is used to test the differences between groups and homogeneity within groups, and the independent variables are gradually substituted to test the estimation results of the random coefficient regression model and the complete model. The specific modeling process is consistent with the construction process of the family migration decision model,

so it is not repeated here. The following part only shows and discusses the empirical analysis results.

Null model

Calculating the estimation result of the null model shows that the inter-group variance of the 2018 sample data used for analysis is 0.851, and the within-group variance is 2.487, so the intra-group correlation coefficient (ICC1) is 0.255, which is higher than the threshold of 0.138 given by Cohen (1988). It means high intra-group correlation, indicating that the differences between groups are significant, which is suitable for analysis by HLM model.

Random coefficient regression model

The regression results of the individual level variables in the random coefficient regression model

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are shown in the corresponding parts of Table 4, and the coefficient estimates of the three independent variables at the individual level are all significant. The regression results of the fixed effect part show that the family income level has a significant positive impact on the residence decision, and the higher the family income level, the stronger the residence intention, which is consistent with the conclusions of most existing studies, and the income level is still one of the important factors affecting the residence decision of migrant workers. The intergenerational difference of residence decision is significant, and the influence of intergenerational variables on residence decision is 0.037, which indicates that the older the subjects are, the stronger their residence intention is. The scale of family migration has a significant impact on residence decision, and the larger the scale of family migration, the stronger the residence decision, which proves that the scale of family migration has a positive effect on residence decision. Therefore, hypothesis H1b, H2b and H5 are accepted.

The regression results of random effects show that the variance components of intercept term and slope term of the model exist significantly, and the random effects of family income level and intergenerational variables are significant at the level of 1% and 5% respectively, indicating that the family income level and birth sequence of individual samples living in different neighborhoods are significantly different. However, the random effect of family migration scale is not statistically significant, which indicates that the family migration scale of individual samples has no significant difference in different neighborhoods.

The regression results of control variables show that the longer the migration time and the higher the education level, the stronger the residence decision of migrant workers. Relatively speaking, intra-provincial migrants are more willing to resident than inter-provincial ones, which indicates that the distance between the inflow and outflow places and cultural differences will lead to differences in residence decisions, which is consistent with the relevant conclusions of existing studies. There is no significant difference in residence decision between male and female samples, which indicates that the correlation between gender and residence decision is not high.

Table 4
Regression results of individual level variables in residence decision model

Residence decision	Null model		Random coefficient regression model		Complete model	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Fixed effect						
Intercept	4.482 ***	0.040	4.564 ***	0.068	4.554 ***	0.067
Family income level			0.194 ***	0.018	0.194 ***	0.017
Generations (Birth sequence)			0.037 **	0.020	0.035 *	0.020
Scale of family migration			0.057 ***	0.018	0.059 ***	0.018
Control variables						
Time of current migration			0.220 ***	0.014	0.222 ***	0.014
Education level			0.233 ***	0.020	0.232	0.020
Range (Control group = Intra-provincial)			-0.245 ***	0.041	-0.212 ***	0.041
Male (Control group = Female)			0.029	0.033	0.027	0.033
Random effect	Deviance	Variance component	Deviance	Variance component	Deviance	Variance component
Intercept	0.922 ***	0.851	0.912 ***	0.832	0.827 ***	0.684
Family income level			0.173 ***	0.030	0.154 ***	0.024
Generations (birth sequence)			0.143 **	0.021	0.146 **	0.021
Scale of family migration			0.103	0.011	0.112	0.013
Deviance	40016		39197		39141	

Note: ***, **, * indicate significant at level of 0.1%, 1% and 5%, respectively.

Complete model

The regression results of individual level independent variables and control variables of the complete model are shown in the complete model section in Table 4. The direction and significance of the coefficient estimates of the control variables are basically consistent with the estimation results of the random coefficient regression model, only the size of the coefficient estimates is slightly different, which will not be repeated here.

The regression results of the fixed effect part show that family income level, birth sequence and family migration scale still have significant influence on residence decision in the complete model, which indicates that the influence of individual level variables in the model of family residence willingness is very robust, and hypothesis H1b, H2b and H5 are accepted in the complete model.

The regression results of the random effect part of the complete model are similar to those of the random coefficient model. The direction and significance of the estimated values of the coefficients are consistent with those of the random coefficient model, with only a slight change in the effect. It shows that the income level and birth sequence of migrant workers

living in different communities are significantly different, but the conclusion that the scale of family migration is not significantly different among different neighborhoods is stable.

The regression results of neighborhood level independent variables on various parameters in the individual level model are shown in Table 5. The estimation results of neighborhood variables on the intercept term in the individual level model show that the direct effect of neighborhood urban-rural attributes on residence decision is significant. Compared with migrant workers living in rural neighborhoods, those living in urban neighborhoods have stronger residence decisions. The direct effect of neighborhood location and migrants' density of living environment on residence decision is negative and significant, and the impact of migrants' density of living environment is greater, which indicates that the more noisy the surrounding environment of residence, the more concentrated migrants are, and the weaker the residence intention is, which is consistent with the logic of relevant conclusions of family migration decision model. The direct effect of health education on residence decision is not statistically significant and has no practical significance. In other words, the neighborhood effects of residence decision partially exist, that is, the hypothesis H3b is partly accepted.

Table 5
Fixed effect of neighborhood variables on individual level in residence decision model

Fixed effect	Complete model		
	Coefficient symbol	Estimated value	S.E.
Intercept—Residence decision			
Neighborhood urban-rural attribute	γ_{01}	0.505 ***	0.080
Neighborhood location	γ_{02}	-0.095 ***	0.035
Density of migrants in living environment	γ_{03}	-0.304 ***	0.054
Health education	γ_{04}	-0.013	0.025
Family income level—Residence decision			
Neighborhood urban-rural attribute	γ_{11}	0.159 ***	0.037
Neighborhood location	γ_{12}	0.009	0.015
Density of migrants in living environment	γ_{13}	-0.035	0.024
Health education	γ_{14}	0.007	0.011
Family income level—Residence decision			
Neighborhood urban-rural attribute	γ_{21}	-0.045	0.037
Neighborhood location	γ_{22}	0.015	0.017
Density of migrants in living environment	γ_{23}	-0.040	0.026

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Health education	γ_{24}	0.004	0.011
Scale of family migration—Residence decision			
Neighborhood urban-rural attribute	γ_{31}	0.058	0.035
Neighborhood location	γ_{32}	0.021	0.015
Density of migrants in living environment	γ_{33}	-0.021	0.023
Health education	γ_{34}	-0.013	0.011

Note: ***, **, * indicate significant at level of 0.1%, 1% and 5%, respectively.

The estimation results of neighborhood level independent variables on the slope term in the individual level model show that neighborhood location, migrants' density of living environment and health education have no significant influence on the coefficient values of family income level, generation and family migration scale. Only the urban and rural attributes of neighborhoods have a significant positive impact on the coefficient value of the family income level, which indicates that living in the urban neighborhood is more helpful to strengthen the influence of the family income level on the residence decision, which means that the cross-layer moderating effect exists.

DISCUSSION

Under the background of "smoke-free environment" and "healthy China", the individual data and neighborhood data of CMDS 2013 and 2018 were used to make an empirical analysis on the family migration and residence decision of migrant workers by using the hierarchical linear model in this study. The main conclusions are as follows:

Firstly, different neighbor types have significant differences on family migration decisions, and there are peer effect of family migration decisions within the same community. Compared with the group whose neighbors are mainly migrant workers, there are more local residents in the neighbors who can enhance the research subjects' family migration decision-making. This conclusion is still robust when considering the neighborhood factors. Moreover, the difference of external conditions in neighborhoods has a significant impact on family migration and residence decisions, and there are neighborhood effects of family migration and residence decisions among different neighborhoods. The size and direction of neighborhood effect brought by different types of neighborhood factors are asymmetric. Among them, the direct effect of neighborhood location on family migration decision is significantly negative, but it can positively strengthen the influence of family income level on family migration decision. However, the city attribute of neighborhood has a positive effect on family migration decision, and can strengthen the positive effect of family income level on residence decision.

Secondly, family income level is still an important factor affecting family migration and residence decision, while the scale of family migration has a positive effect on residence decision. The higher the family income level, the stronger the family migration and residence decision, which is consistent with the conclusions of most existing studies. The larger the family migration scale, the stronger the residence decision, which is consistent with the reality logic.

Thirdly, there are significant intergenerational differences in migrant workers' family migration and residence decisions, but the conditions for the intergenerational differences are not the same. There are significant differences in family migration decisions when only individual and family factors are considered, but when the influence of neighborhood factors is considered, the intergenerational differences become no longer significant, so the conclusion is not robust. The intergenerational difference in residence decision is significant, and the earlier the birth age, the stronger the residence decision, and this conclusion is still stable when considering the influence of neighborhood factors.

Finally, it is worth mentioning that the perceived acceptance of local residents and participation in neighborhood activities have significant positive effects on their family migration decision, which is an individual factor, but from another angle, it reflects that a good smoke-free environment and rich neighborhood activities are helpful to promote the

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sense of belonging of migrant workers, thus strengthening their family migration decisions.

CONCLUSIONS

Neighborhood governance should follow the strategies of classified management, integrated demand and differentiated supply. With the continuous advancement of population urbanization, neighborhood governance also presents a more complex differentiation situation. Different types of neighborhoods should be classified and managed. In addition to classifying neighborhoods according to their location differences, the differences in the needs of the demanders can also be used as the basis for classification. At the same time, integrating relevant needs, matching the actual needs of different communities, and implementing differentiated neighborhood public service supply can effectively enhance the sense of acquisition and happiness of migrant workers.

Moreover, since the neighborhood environment has an important influence on family migration or residence decision, and the smoke-free environment is an important component of the neighborhood environment construction, the smoke-free policy of the neighborhood environment should be further promoted. On the one hand, we can encourage the research and utilization of comprehensive means such as taxation and price adjustment to improve the effectiveness of tobacco control. On the other hand, we should further improve the warning content and form of tobacco hazards in cigarette packaging, and improve relevant laws and regulations. Building a smoke-free environment better can effectively strengthen the family migration or residence decisions, thus promoting the healthy life of the vulnerable group of migrant workers' family.

Acknowledgments

Author Declaration

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