China Economic Review 74 (2022) 101830

Contents lists available at ScienceDirect

China Economic Review

journal homepage: www.elsevier.com/locate/chieco

Housing tenure choice and socio-economic integration of migrants in rising cities of China

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ARTICLE INFO

Keywords:
Housing tenure choice
Socio-economic integration
Digital economy
Migrants
Endogenous

ABSTRACT

Migrants' socio-economic integration is taken as one of important forms for common prosperity. And it is a crucial factor for social harmony and stability. However, the association between housing tenure choice and migrants' socio-economic integration does not receive enough attention. Based on 2017 China Migrants Dynamics Survey (CMDS), it is found migrants' socio-economic integration mainly consists of the following three aspects: Economic integration, socio-cultural integration and psychological integration. Compared with migrant renters, the socio-economic integration of migrants with houses is rather higher, while migrants' level of socio-economic integration, who live in employee's dormitories, is comparatively low, even after controlling the endogenous by using PSM and IV method. Further study indicates that the effect of housing tenure choice on migrants' socio-economic integration partly affects their settlement intention, integration will, local capital and labor supply. Heterogeneity analysis shows that new generation have a negative effect on the role of homeownership on migrants' socio-economic integration, while living in eastern China and the development of digital economy can both strengthen the effect of housing tenure choice on migrants' socio-economic integration.

1. Introduction

Migrants' socio-economic integration is a crucial factor for social harmony and stability (Hainmueller, Hangartner, & Pietrantuono, 2017). At present, it is also taken as one of important forms for common prosperity which is a great goal put forward by China. Research on socio-economic integration of migrants normally focuses on its definition (Forrest & Kearns, 2001; Kearns & Whitley, 2015; Yang, 2015), the theories (Goldstein & White, 1985; Gordon, 1964; Portes & Zhou, 1993), and the influencing factors, such as personal characteristics (Li, 2020; McCaa, 1989; Tian, Tian, & Sun, 2019; Wuthnow & Hackett, 2003; Yue, Li, Jin, & Feldman, 2013), mobility attributes (Chen & Wang, 2015; Robinson, 2010), language assimilation (Remennick, 2004; Musgrave, 2014; Naveed & Wang, 2021), social connection (Letki, 2008; Luan, Lu, Tong, & Lu, 2013; Schwarzweller, 1964; Wang, Zhang, & Wu, 2016) and residential segregation (Bolt, Özüekren, & Phillips, 2012; Checa & Nel Lo, 2021). China experiences a large-scale migration of migrants. And a large number of scholars pay much attention on the issue of migrants' socio-economic integration. In China, they mainly focus on the following factors: Household registration (*hukou*) system (Chen & Wang, 2015), neighbourhood or community (Lin, Wu, & Li, 2020; Zou, Chen, & Chen, 2020; Zou & Deng, 2020) and hometown land (Zou, Chen, & Chen, 2022). While the association between housing tenure choice and socio-economic integration of migrants does not receive enough attention, let alone the internal mechanism

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https://doi.org/10.1016/j.chieco.2022.101830
Received 1 December 2021; Received in revised form 25 March 2022; Accepted 30 June 2022
Available online 4 July 2022

between them. As the "shelter" of migrants in cities, housing is an intermediate mechanism to fill the social division and to accelerate social integration in urban life. It cannot be replaced in the process of migrants' socio-economic integration (Zheng, Liao, Ren, & Cao, 2011).

To bridge the research gap, this paper first conceptualizes and offers a credible framework to explain the relationship between housing tenure choice and migrants' socio-economic integration, including transnational immigration theory, balance theory and utility maximization theory. Further, based on a large national micro-level data from the 2017 China Migrants Dynamic Survey (CMDS), this paper uses the IV method and the PSM to alleviate the endogeneity and makes robustness check for the results. Third, the underlying mechanism of housing tenure choice on socio-economic integration of migrants is explored. It is worth-noted that digital economy is first introduced as a moderating variable affecting the relationship between housing tenure choice and migrants' socio-economic integration.

It is shown migrants' socio-economic integration mainly includes economic integration (11.24), socio-cultural integration (36.79) and psychological integration (73.40). In terms of total socio-economic integration, the highest level is represented by migrants possessing commercial housing. The hierarchy order is followed by migrants who purchase affordable housing. And, migrants who rent private housing jointly is ranked the second from the bottom. Migrants living in the place of employment is the lowest. It is also found that the level of economic integration and socio-cultural integration of migrants who rent public rental housing provided by the government is the second followed by migrants who own commercial housing. While those who own affordable housing occupy the highest level of psychological integration. However, migrants living in the place of employment is the lowest level in terms of economic integration. Migrants who rent private housing jointly is the lowest in terms of socio-cultural integration, while migrants living in unit/employer's house is the lowest in terms of psychological integration. Migrants' socio-economic integration level, who own housing, is higher than those who are renters. While migrants' socio-economic integration level, who live in employee's dormitory, is comparatively lower, even after controlling the endogenous problem. Further study indicates that the effect of housing tenure choice on migrants' socio-economic integration partly affects their settlement intention, integration will, local capital and labor supply. Heterogeneity analysis shows that new generation migrants' socio-economic integration who are homeowners is lower than that of old generation migrants. Living in eastern China and the development of digital economy can both strengthen the effect of housing tenure choice on migrants' socio-economic integration. This is a new finding in the international literature examining the association between housing tenure choice and socio-economic integration of migrants with Chinese cases. It not only helps Chinese government departments make corresponding decisions, but also provides reference for other countries.

The rest of the paper is arranged as follows. Section 2 reviews the existing studies related to migrants' socio-economic integration. Section 3 gives theoretical analysis and research hypothesis. Section 4 presents data, variables and methodology. The empirical findings, robustness check and extended analysis are showed in Section 5. Section 6 concludes with discussion and policy implications.

2. Literature review

2.1. The definition and determinants of migrants' socio-economic integration

With the large-scale increase and mobility of migrants, their integration becomes a major problem to the policymaking all over the world (Goldlust & Richmond, 1974; Goldstein & White, 1985; Hainmueller et al., 2017; Robinson, 2010). However, no agreement has arrived on the definition of migrants' socio-economic integration. Gordon (1964) proposes that socio-economic integration is composed of structural assimilation, cultural exchanges, intermarriage, value conflicts and ethnic identity, prejudice and discrimination. Forrest and Kearns (2001) believe social order, social capital, place attachment and identity constitute migrants' socio-economic integration. Kearns and Whitley (2015) further point out socio-economic integration consists of social relation and community sense, trust reliance and safety. However, the situation may be different in China. According to Zhou (2012), integration is made up of economic integration, structural integration, social adaptation, cultural adaptation, and identity. Wang et al. (2016) note that economic, social relation, cultural and psychological integration can form socio-economic integration. Yang (2015) holds the similar viewpoint that it contains economic integration, social adaptation, cultural acquisition and psychological identity. Also, Lin, Zhang, Chen, and Ling (2017) discuss the issue from the perspective of economy, social insurance, integration willingness, acculturation and social communication. Zou et al. (2020) suggest that economic integration, socio-cultural integration and self-identity are compositions of socio-economic integration. To sum up, socio-economic integration of migrants is the process through which individuals develop their interpersonal networks and involvement in communities (Spencer-Oatey, 2018; Ware et al., 2008). It refers to the integration into local urban society in terms of employment, social culture, lifestyle, customs or values. It also contains the interaction with locals to attain mutual recognition and to narrow the gap (Forrest & Kearns, 2001; Gordon, 1964; Kearns & Whitley, 2015; Yang, 2015; Yue et al., 2013), covering economic integration, cultural integration, social adaptation and psychological integration (Hainmueller et al., 2017; Robinson, 2010; Toruńczyk-Ruiz & Brunarska, 2020).

Existing study explores a few factors affecting migrants' socio-economic integration, such as individual characteristics, mobility attributes, language assimilation, social relationship and residential segregation. Wuthnow and Hackett (2003) observe that education background, income level, senior positions, and cultural consciousness are significantly and positively associated with migrants' integration. Married status also significantly and positively influences migrants' integration (McCaa, 1989). Robinson (2010) also stresses that education, employment status, speaking dialects and mobility time are positively correlated to migrants' socio-economic integration. Li (2020) identifies a large number of individual and social factors may contribute to Chinese students' difficulties in economic and social integration. Language assimilation is another important factor improving migrants' socio-economic integration (Piller & Takahashi, 2011). Remennick (2004) emphasizes the crucial role of language learning in mainstream society in the process of

socio-economic integration of migrants. Musgrave (2014) also holds the point that linguistic and cultural diversity will strengthen cross-cultural communication to advance migrants' integration. Besides that, local residents' inclusive attitude towards migrants are also helpful for migrants' socio-economic integration (Naveed & Wang, 2021).

In addition, social relationship is a vital element affecting migrants' socio-economic integration. For example, frequent communication and interaction with parents may impede young rural migrants' integration (Schwarzweller, 1964). However, social trust among different groups can intensify migrants' socio-economic integration (Letki, 2008). Furthermore, migrants' residential segregation is also an important cause for migrants' integration. For instance, Bolt et al. (2012) propose that residential concentration may hinder the integration of migrants. Compared with geographical location, urban-rural gap or settlement scale, residential segregation can well explain social inequality and regional spatial living conditions (Checa & Nel Lo, 2021).

2.2. The existing study related to Chinese internal migrants' socio-economic integration

In recent years, in addition to the above-mentioned personal characteristics (Chen & Wang, 2015; Tian et al., 2019; Yue et al., 2013), social relations or capital factors (Luan et al., 2013; Wang et al., 2016; Wei & Gao, 2017; Zou & Deng, 2020), the role of registration (*hukou)* system, neighbourhood type and rural land on migrants' socio-economic integration is still under hot discussion.

In China, *hukou* system is normally regarded as a main institutional barrier to migrants' socio-economic integration (Afridi, Li, & Ren, 2015; Niu & Zhao, 2018). Due to the restriction of household registration, migrants are considered as marginal people since they cannot enjoy the same public service as local residents in terms of occupation, wage, children's education and housing subsidies (Chen, 2011; Démurger et al., 2009; Knight, Deng, & Li, 2011). It is empirically evident that *hukou* restrictions negatively impact the social integration of floating population greatly (Liu, Huang, & Zhang, 2018; Ouyang, Wang, Tian, & Niu, 2017; Shi, Liu, Musterd, & Cao, 2017).

Besides, the association between neighbourhood and migrants' socio-economic integration is another important topic. Lu, Zhang, and Wu (2018) believe that residents have high place attachment in a closed community. Similarly, Lin et al. (2020) also observe that migrants who live in commercial housing feel more attached to the local city, compared with those who live in urban villages. Migrants living in local-resident dominant neighbourhoods and in commodity housing neighbourhoods, are more likely to participate in community affairs, which will lead to forming a host city identity (Lin, Wu, Liang, Li, & Guo, 2022). In contrast to migrants living in informal neighbourhoods, those migrants, living in formal neighbourhoods, occupy comparatively higher level of socio-economic integration, including commercial properties, work unit and affordable housing (Zou et al., 2020). However, Zheng, Song, and Sun (2020) propose that migrants' level, living in the affordable housing communities, is higher than those migrants living in other communities. While the owner-occupied affordable housing do not show a significant impact on migrants' social integration.

Recently, the role of rural land is another issue to be discussed. For example, The insecurity of land use rights and restrictions on land leasing will reduce migrants' migration intention (Giles & Mu, 2018; Mullan, Grosjean, & Kontoleon, 2011). However, the increase of cultivated land can improve the migration intention of immigrants (Xiao & Zhao, 2018). In addition, owning farmland and housing land reduces the willingness of migrant workers to modify their agricultural *hukou* (Gu, Ling, Shen, & Yang, 2020; Hao & Tang, 2015). Hometown land is also a vital factor influencing migrants' integration intention. It is estimated that the possession of farmland tends to promote rural migrants' integration intention while the possession of housing land has a negative effect (Zou et al., 2022).

2.3. Digital economy and migrants' socio-economic integration

It is obvious that digital economy extends a large impact on the labor market. The technological revolution represented by digital economy promotes greatly capital accumulation efficiency (Acemoglu & Restrepo, 2019). In essence, digital economy cannot totally replace capital or labor, however, it can relatively replace capital or labor according to allocation efficiency (Agrawal, Gans, & Goldfarb, 2019). The progress of technology and the improvement of workers' skills can change the structure of labor supply and demand, which will then promote the efficiency of market-oriented allocation (Zhao & Guo, 2018). Therefore, the global efficiency of China's labor resource allocation has been promoted by the development of digital economy (Cong & Yu, 2020). By stimulating the entrepreneurial behavior of rural population, digital inclusive finance has significantly increased rural low-income population' family income and promoted China's economic growth (Zhang, Wan, Zhang, & He, 2019). It can also improve migrants' economic integration (Zou & Deng, 2022). However, Bai and Zhang (2021) note that the development of digital economy weakens the relative income right of low skilled workers, but it can improve their relative welfare effect.

In conclusion, a great property of research focuses on the socio-demographic characteristics, mobility attributes, language assimilation, social connection, residential segregation, *hukou* system, neighbourhood type and rural land. While the underlying mechanism of housing tenure choice on migrants' socio-economic integration needs to be explored. Therefore, we discuss this topic in the following section.

3. Theoretical analysis and research hypothesis

According to transnational immigration theory, migrants from different countries tend to maintain connections with their hometown and their destination (Chiquiar & Hanson, 2005; Fawcett, 1989; McKenzie & Rapoport, 2010). Like transnational immigrants, Chinese migrants also have connections with their hometowns and their local cities. After moving into the destination, migrants face a rather new environment. Many factors in the environment may affect migrants' socio-economic integration. Most of migrants rent housing in peri-urban areas with limited integration into the local urban society (Huang & Tao, 2015; Wang & Fan, 2012). It is

found that the main purpose of migrants living in employee's dormitories is to obtain higher economic income. They have their own houses in their hometown. As a consequence, their willingness to settle in the city is weaker than the rental group. Meanwhile, based on the poor living environment and the exclusion from the mainstream groups, these migrants' willingness to integrate is also relatively low.

Heider (1958), a psychologist, puts forward the "balance theory" of changing attitudes, which is also known as the "p-o-x theory". The premise of this theory can be summarized as: individuals always strive to pursue cognitive coherence and meaning, which is a state of balance. Once people have imbalance and disharmony in cognition, they will have nervous anxiety in psychology, which will promote the transformation of their cognitive structure to the direction of balance and harmony. Homeowner migrants are more likely to reduce attachment to hometown. In order to achieve their psychological balance, they need to strengthen their attachment to the local society, that is, they will increase their willingness to settle and integrate, which make them more integrated in the mainstream society. Therefore, the hypothesis 1 is proposed.

Hypothesis 1. Compared with migrants renting house, the level of migrants' socio-economic integration, who are homeowners, is higher level. While socio-economic integration level of those living in employee' dormitory is lower. Housing tenure choice partly affects migrants' socio-economic integration through changing their settlement intention and integration will.

Utility maximization theory suggests that individuals behave in the way maximizing their well-being and responding to opportunities that will improve welfare (Becker, 1992). Aguilera and Massey (2003) demonstrate that migrants' social capital can improve the effectiveness of their job search process and can provide them crucial information about good jobs. Meanwhile, migrants can learn more about the local culture, customs and languages through communication with local residents (Zou & Deng, 2021). In addition, living with children in the city will facility migrants' identity integration (Zou et al., 2020). At the same time, formal housing frees up time by alleviating the demands of work in the home (Franklin, 2020). Therefore, migrants who are homeowners have enough time to invest and construct relationships in the neighbourhoods (Liu et al., 2018). And such relationships will accelerate their economic and socio-cultural integration. However, living in employees' dormitory is generally a common choice among manufacturing migrants and construction migrants, since their income level is relatively low and they mainly rely on labor supply to increase their income. However, simply increasing the working time can only bring in a small amount of increase in revenue, and it also reduces the interaction with other residents, thus it doesn't maximize migrants' utility. Therefore, rather than simply increasing the supply of labor, migrants prefer neighbourhood interaction and family interaction that maximize their utility. Therefore, the hypothesis 2 is proposed.

Hypothesis 2. The effect of housing tenure choice on migrants' socio-economic integration is partly through changing their local capital and labor supply.

There are obvious intergenerational differences among migrants. With a population of >100 million, new-generation migrants have now become the major migrant labor force in urban China. They are different from previous migrants in the following aspects: They are more educated, materially better off, and are more likely to work in cities for personal development rather than simply higher income (All-China Federation of Trade Unions, 2010). New generation migrants who are homeowner have more pressure and do not have enough time or weak willingness to communicate with the locals. Besides that, they do not accumulate enough resources. As a result, their socio-economic integration is lower than those old generation who are homeowners (Chen & Wang, 2015). Since the reform of the real estate system, China's house price grows rapidly. House prices in the eastern China are significantly higher than those in central and western China. For migrants, owning a house is considered as a manifestation of self-identity and a strong sense of pride (Liu et al., 2018), especially in eastern China; Meanwhile, their income level is commonly higher than those in central and western China. Therefore, compared with migrants in central and western China, the level of migrants' socio-economic integration in eastern China who are homeowners is comparatively higher. However, migrants living in employee's dormitory in eastern China can access to more economic and other resources than migrants living in central and western China. Therefore, migrants living in employee's dormitory in eastern China also have higher level of socio-economic integration.

The substitution effect or compensation effect of digital economy on employment is under deep discussion. Since the fourth industrial revolution, major countries in the world are transforming from employment economy to digital economy. It is obvious that the impact of digital technology on the labor market is strong (Autor & Dorn, 2009). Digital economy is conducive to promote the improvement of migrant skills and labor resource allocation efficiency (Agrawal et al., 2019; Zhao & Guo, 2018; Cong & Yu, 2020), which will then promote economic growth. It can also reduce the income gap between urban and rural areas (Kim, 2016; Levine, 2005). Digital economy can significantly improve the household income of rural low-income groups and promote the inclusive growth of China's economy (Zhang et al., 2019). In addition, it can also improve the convenience of participating in various activities greatly (Zou & Deng, 2022). Therefore, the following hypothesis is proposed.

Hypothesis 3. The effect of housing tenure choice on migrants' socio-economic integration exists heterogeneity in intergenerational, regional and development of digital economy.

4. Data and methodology

4.1. Data and variables

Our data mainly come from the 2017 China Migrants Dynamic Survey conducted by the National Health Commission, which is the

annual large-scale national sample survey data of migrants. It refers to the basic information of the floating population and its family members, the scope and trend of migration, employment and social security, housing, public health services, marriage and family planning service management, etc. The probability proportionate to size (PPS) sampling method is used to select interviewees. Participants are migrants over the age of 15 who do not have local *hukou* and have lived in the local city for >1 month. After deleting some samples with missing variable values, the number of sampling is 131,847.

Socio-economic integration. Following the previous study (Chen & Wang, 2015; Lin et al., 2017; Wang et al., 2016; Zou et al., 2020), this paper chooses the following variables for factor analysis, containing occupational categories, monthly personal income, access to medical insurance, the number of social activities attended, local advice and suggestion activities, love for the city, attention to the city, integration intention, acceptance intention, local discrimination perception, differences in customs, differences in health habits, self-identification, applying social security card, applying temporary resident permit/resident permit. See section 5.1 for the measurement process and results of migrants' socio-economic integration.

Housing tenure choice is measured by one question in the survey, i.e. 'What is the property right of the house in which you currently live?" The survey divides the housing property into the following eleven categories: (1) Company/employer's house (excluding workplace); (2) public rental housing provided by the government; (3) self-purchasing commercial housing; (4) self-purchasing affordable housing; (5) self-purchasing housing with small property rights; (6) borrowed from others; (7) places of employment; (8) self-built housing; (9) other informal houses; (10) renting private housing-whole rent; and (11) renting private housing-joint rent. Migrants belonging to (3), (4), (5) and (8) are considered as homeowners, and those belonging to (2), (10) and (11) are considered as renters, (1) and (7) are classified as employees' dormitory. The other data are dropped due to its small sampling size and lack of typicality.

To better understand the association between housing tenure choice and socio-economic integration of migrants, other mediators are introduced, including settlement intention, integration will, local capital and labor supply, which can be obtained from the dataset. Among them, settlement intention is measured by two questions in the survey, i.e., 'Do you intend to stay here for some time in the future?', 'If you intend to stay here, how long do you expect to stay here?' Those who answer "yes" and "intend to settle down" are recorded as 1, and others are recorded as 0. Integration will is measured by the question 'I am willing to integrate into the local people and become one of them.' Those who answer "agree basically" and "agree fully" are recorded as 1. Local capital is measured by the question 'Who do you socialize with most locally in your spare time?' Those who answer "villager from the same hometown (*hukou* moved to local area)" and "other local people" are marked with 1, others are marked with 0. Labor supply is measured by two questions in the survey, i.e., 'Have you ever worked for more than one hour with income (including family or self-employed) in the week before

Table 1
Descriptive statistics of variables.

Variables		Percentage(%)
Gender	Male	51.69
	Female	48.31
Age	<25	13.28
	25–35	38.40
	35–45	26.60
	>45	21.72
Education	Junior high school and below	60.70
	High school	21.90
	College and above	17.40
Hukou	Non-agricultural Hukou	22.02
	Agricultural Hukou	77.98
Occupation	Irregular employment	2.48
	Service personnel	33.98
	Manufacturing worker	24.06
	Manager & technician	11.84
	Businessman	27.64
Parter_present	Not live in destinations	26.82
	Live in destinations	73.18
Child_present	Not live in destinations	48.39
	Live in destinations	51.61
Length of stay	≤1 year	17.25
	1 year-10 years	61.83
	>10 years	20.92
Longmove	Intra-provincial mobility	49.29
	Inter-provincial mobility	50.71
Hometown landholdings	Without any land	36.68
	With farmland holdings only	6.69
	With housing land holdings only	18.97
	With both types of land	37.66
Homeownership	Tenant	58.30
	Homeowner	29.49
	Employee's dormitory	12.20
Total		100%

May 1st in 2017?', 'How many are working hours this week?'

Following the previous study (e.g. Wang et al., 2016; Wang & Fan, 2012; Zou et al., 2022), we construct a series of control variables, including socio-demographic characteristics, household composition, mobility attributes, hometown land and province dummies. Gender, age, education, household income and composition are included into the model, as these variables may affect migrants' socio-economic integration. Mobility attributes, such as trans-provincial migration may affect migrants' socio-economic integration, since short-distance migrants tend to encounter less difficulties in getting familiar with local culture and customs (Chen & Wang, 2015). Flowing time in the local society may also affect migrants' socio-economic integration (Robinson, 2010). Hometown land is still an important factor influencing migrants' integration intention through the asset effect, security effect and emotional attachment effect (Zou et al., 2022).

Table 1 displays a descriptive statistics results of the variables. Among them, 48.31% of migrants are female and 51.68% of them are <35 years old. Their educational level is relatively low, about 60.70% receive junior high school education and below, and only 17.40% finish college education and above. Meanwhile, 58.04% are manufacturing workers or service personnel, and 27.64% are businessmen. Many migrants bring their families to the local cities. 73.18% live with their mates and 51.61% live with their children in the host city. Regarding residential time, 82.75% of migrants have stayed in the local cities for more than one year. 49.29% of migrants move across provincial boundaries. In addition, more than half of migrants live in rented housing, and 12.2% of migrants live in company/employer's house or place of employment. However, the homeownership rate accounting for 29.49% has increased a lot, compared with 9.93% in 2014 reported in the previous study (Zou et al., 2020). It implies that the living environment of migrants has been gradually improved. (See Figs. 1 and 2.)

4.2. Methodology

First, we need to analyze the effect of housing tenure choice on migrants' socio-economic integration. As the socio-economic integration of migrants is a continuous variable, OLS model is chosen as the baseline regression model, which is as follows.

$$Integration_i = \beta_0 + \beta_1 Housing_i + \alpha_i X_i + \varepsilon_i \tag{1}$$

$Integration_i$ represents migrants' socio-economic integration. $Housing_i$ is the housing tenure choice of migrants, X_i is the control variables, and ε_i is the error term.

However, housing tenure choice may be a self-selection behavior of migrants, and the result may be biased. The most common method is to use PSM developed by Rosenbaum and Rubin (1983). The core concept of this method is to build a counterfactual control group to examine the effect of changes on key outcomes. Specifically, a logit model is used to estimate the regression coefficients of the migrant explanatory variables on housing tenure choice and then to estimate the propensity score (PS) values of migrants according to the regression coefficients obtained. Then, we utilize three matching approaches (nearest neighbor matching, radius matching and kernel matching) to examine the average effect of the treatment on the treated (ATT).

In addition, there may exist endogenous problems. For example, housing tenure choice and socio-economic integration of migrants may affect each other. Better socio-economic integration will increase migrants' housing tenure choice (Zou, Chen, & Wang, 2017), which is a reverse causation. In addition, some unobservable variables may affect both migrants' housing tenure choice and socio-economic integration, making housing tenure choice endogenous.

A suitable method is to identify instrumental variable to alleviate the above problems (Gallant, 1987). The existing study commonly use community or village level indicators with the IV method for individual-level indicators (Wang & Zhang, 2017; Xu, Liang, & Lai, 2019). However, it is hard to establish such an IV in this article. Following the previous study (Zong, Liu, & Zhou, 2015; Zou & Deng, 2021), we apply the proportion of other migrants' homeownership rate and the ratio of other migrants living in employee's dormitory within their groups as IVs to correct the estimation errors. The calculation is shown in below:

$$Housing_i = \alpha_0 + \alpha_1 Other\_ratio_i + \gamma_i X_i + \epsilon_i \tag{2}$$

$$Integration_i = \beta_0 + \beta_1 \widehat{Housing}_i + \theta_i X_i + \mu_i \tag{3}$$

Eq. (2) and (3) are regression estimates of the first and the second stages, respectively. $Other\_ratio_i$ represents the proportion of other migrants' homeownership rate and the ratio of other migrants living in employee's dormitory within their groups. $\widehat{Housing}_i$ is the fitting value of $Housing_i$ in the first stage, and the other variables of the two equations have the same meaning as those in Eq. (1). ϵ_i *and* μ_i are error terms.

In general, group variables should conform to exogenous standard. The group variables commonly used are gender, age, education and region. Accordingly, householders are grouped into four groups according to their gender (male and female), educational background (junior high school and below, senior high school, college and above), and another four groups according to their age (<25, 25–35, 35–45, and >45 years), and three regions (eastern China, central China, and western China). Therefore, 72 groups are identified in total. For migrant i, we calculate the proportion of other migrants' homeownership rate and the ratio of other migrants living in employee's dormitory within their groups, and we estimate them as IVs. That is, the IVs can affect migrants' housing tenure choice. It is worth-nothing that they will not directly affect migrants' socio-economic integration.

Furthermore, we need to test the intermediary effect conducted by Wen, Zhang, Hou, and Liu (2004) to analyze the internal mechanism of housing tenure choice on migrants' socio-economic integration. The detailed steps are as follows:

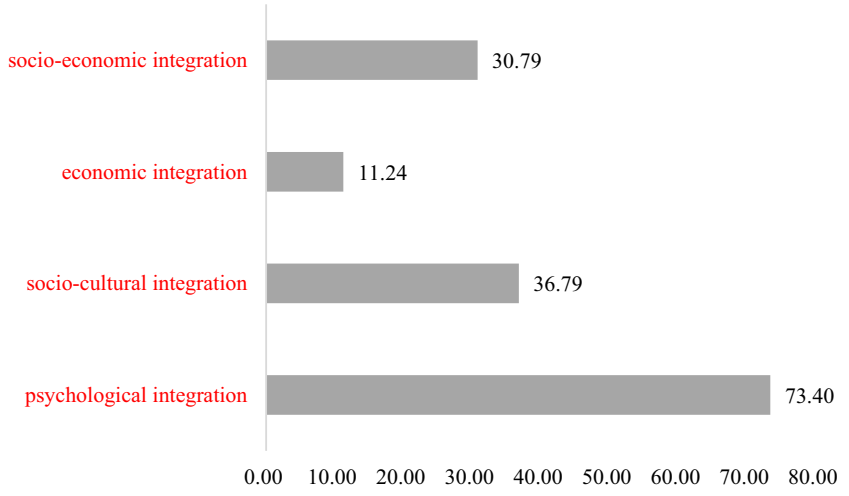

Fig. 1. Migrants' socio-economic integration in urban China.

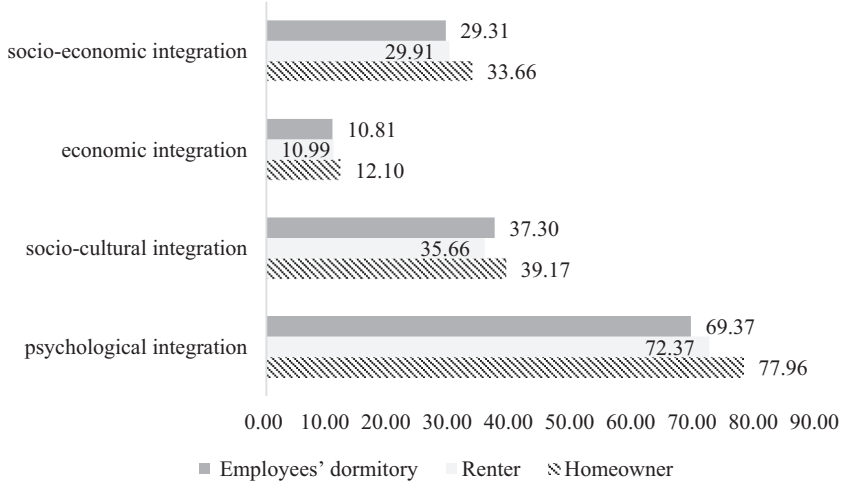

Fig. 2. Migrants' socio-economic integration in different housing choices.

$$Intermediary\_var_i = \gamma_0 + aHousing_i + \rho_i X_i + \sigma_i \tag{4}$$

$$Integration_i = \delta_0 + c' Housing_i + bIntermediary\_var_i + \delta_i X_i + \omega_i \tag{5}$$

Where $Intermediary\_var_i$ includes settlement intention, integration will, local capital and labor supply. Eq. (1) represents the total effect of housing tenure choice on socio-economic integration of migrants; Eq. (4) represents the effect of housing tenure choice on settlement intention, integration will, local capital and labor supply; Eq. (5) represents the impact of housing tenure choice on migrants' socio-economic integration through the above intermediary variables.

At last, the interaction term is used in the heterogeneity analyses section.

5. Empirical findings

5.1. Socio-economic integration of migrants in Chinese cities

Before factor analysis, we use the extremum method to standardize the data. The KMO is 0.7902 and the *P* value of the Bartlett test of sphericity is 0.000. It can be concluded that the scale's reliability and validity is good. We use the varimax method in factor rotation. Finally, five components are extracted, which will explain 57.92% of the total variance. Table 2 shows the result of the rotated component matrix in socio-economic integration of migrants. Three dimensions are extracted according to the five components' loadings. Occupational categories (X1), individual monthly income (X2), medical insurance participation (X3), apply for social

security card (X14) and apply for a temporary residence permit or residence permit (X15) constitute the first dimension which is named "economic integration". Number of activities attended (X4), local suggestions (X5), local discrimination perception (X10), custom differences (X11) and differences in health habits (X12) are correlated to "socio-cultural integration". In addition, love of the city, city concern, integration intention, acceptance willingness, and self-identification are classified as "psychological integration".

According to the above factor analysis, the total integration and its sub-dimensions are calculated. To visualize the features, the measurements are translated into scores between 1 and 100 based on standardized formula[1] (He, 2010). In general, migrants' socio-economic integration is not very high (30.79), which is lower than that (31.83) in 2013 (Zou & Deng, 2021). In terms of three sub-dimensions, economic integration level is the lowest (11.24), socio-cultural integration is at the middle level (36.79), and psychological integration is the highest (73.40).

In order to analyze the relationship between housing tenure choice and migrants' socio-economic integration, migrants are further divided into homeowner, renter and those living in employee's dormitory. The result shows that homeowner migrants' socio-economic integration level is the highest in the economic integration, socio-cultural integration and psychological integration. In addition, the samples are divided into specific housing choices. And the result is shown in Table 3. In terms of total socio-economic integration, migrants who possess commercial housing occupy the highest level (34.11), followed by those who purchase affordable housing (33.62). Migrants who rent private housing jointly is ranked the second from the bottom (28.93), and those who live in place of employment occupy the lowest level (28.83). It is also found that the level of economic integration and socio-cultural integration of migrants who rent public rental housing provided by the government is the second followed by migrants who own commercial housing. While those who own affordable housing occupy the highest level of psychological integration. Franklin (2020) also finds that government housing significantly and positively extends impact on household earnings. However, migrants who live in the place of employment display the lowest level of economic integration, and migrants who rent private housing jointly occupy the lowest level of socio-cultural integration, while migrants' psychological integration level living in unit/employer's house is the lowest.

5.2. Baseline regression results

First, the OLS model is employed to perform the baseline regression analysis. And socio-demographic characteristics, household composition, mobility attributes, hometown land and province dummies are gradually put into the model, as shown in Table 4. Compared with migrants who are renters, the level of migrants' socio-economic integration, who are homeowners, is higher. While migrants living in employee's dormitory display a lower level of socio-economic integration. These results are inconsistent with Zheng et al. (2020). According to Zheng et al. (2020), migrants living in rental units in affordable housing program communities exhibit a much higher level of social integration than that of migrants living in other rental units. However, owner-occupied affordable housing communities do not show a significant effect in improving social integration, compared to other owner-occupied housing communities. The reason may be the usage of different measurement of socio-economic integration and data, and the sample comparison object is different. Housing tenure status in cities can affect migrants' socio-economic integration, for homeowners may be more willing to integrate (Forrest & Yip, 2007; Wang et al., 2016; Zhu, Breitung, & Li, 2012) and settle. Homeowners are more likely to invest time and construct relationships in the neighbourhoods (Liu et al., 2018), and consequently they reduce their working time. Therefore, their socio-economic integration is higher than that of renters. By contrary, living in the factory dormitory or other working places are generally the common choices among manufacturing migrants and construction migrants. These migrants' income level is generally not high, and they live in a relatively unitary and weak environment. As a result, their socio-economic integration is lower than renters.

As for personal characteristics, female migrants' socio-economic integration is significantly lower than that of male migrants, which is different from the result in Zou and Deng (2021). They find socio-economic integration of female migrants is higher than that of male migrants in 2013. The following two factors may illustrate the difference in results. First, the data used are different. Our data come from 2017 CMDS, but their research data come from 2013 CMDS. Second, it is shown that with changing times, the various pressures faced by female migrants are gradually increasing, resulting in the reduction of their socio-economic integration. Compared with migrants aged <25, those over 25 exhibit a higher level of socio-economic integration. Education attainment is significantly and positively associated with migrants' socio-economic integration. The reason may lie in the fact that older and better-educated migrants accumulate more capital and resources. Household monthly income is also positively associated with migrants' socio-economic integration (see Zou & Deng, 2020), as it can improve migrants' economic integration. Agricultural *hukou* negatively impacts socio-economic integration of migrants, which is in line with the previous study (Afridi et al., 2015; Niu & Zhao, 2018; Wang & Fan, 2012). The reason may be that the rural *kukou* strengthens migrant's attachment to the hometown and reduces its right to access basic equal public services in local cities.

Referring to household composition, migrants with mates in the local cities are less socially and economically integrated, which is not consistent with the previous study (Xiao, Zhu, & Lin, 2020; Zou & Deng, 2021). According to Xiao et al. (2020) and Zou and Deng (2021), family migration or joint spouse migration is more conductive to socio-economic integration of migrants. The difference may be due to the different sample data and the measurement of family migration. The reason for the negative impact may be that the cost effect of spouse migration is greater than the income effect, forcing migrants to work more and feel a great life pressure. Migrants with children in cities display a higher level of socio-economic integration. With children around, migrants are more willing to

[1] Standardized formula: Factor value after conversion = (factor value + B) × A; A = 99/[MAX(factor value) − MIN(factor value)]; B = 1/[A − MIN(factor value)].

Table 2
Results of the rotated component matrix in socio-economic integration of migrants.

Items	Components					Communalities
	F1	F2	F3	F4	F5	
X1 Occupational categories	0.0132	0.0415	−0.2321	0.1585	0.6321	0.5195
X2 Monthly personal income	0.0084	0.0638	0.1232	0.1309	0.6799	0.5013
X3 Medical insurance participation	0.0700	0.0626	0.8205	0.1258	0.0289	0.3014
X4 Number of activities attended	0.0700	0.0217	0.1303	0.7935	0.0507	0.3454
X5 Local suggestions	0.0724	0.0169	0.1102	0.8030	0.0432	0.3357
X6 City liking	0.8044	0.0302	0.0353	0.0053	0.0264	0.3500
X7 City concern	0.8000	0.0188	0.0495	0.0626	0.0572	0.3500
X8 Integration intention	0.8314	0.0897	0.0545	0.0462	0.0097	0.2955
X9 Acceptance willingness	0.7834	0.1601	0.0154	0.0647	−0.0162	0.3560
X10 Local discrimination perception	0.2376	0.7055	−0.0394	0.0510	−0.0320	0.4406
X11 Custom differences	−0.0374	0.6602	0.1626	−0.0326	0.0522	0.5326
X12 Differences in health habits	0.1598	0.7294	0.0497	0.0344	0.0190	0.4384
X13 Self-identification	0.6111	0.1503	−0.0241	0.0606	−0.0707	0.5947
X14 Apply for social security card	0.0310	0.0303	0.7892	0.1111	0.0027	0.3629
X15 Apply for temporary resident permit/resident permit	0.0584	−0.1217	0.1914	−0.2160	0.5565	0.5888
Eigenvalue	3.0687	1.5494	1.4687	1.4103	1.1902	
Variance contribution rate	0.2046	0.1033	0.0979	0.0940	0.0793	
Cumulative variance proportion	0.2046	0.3079	0.4058	0.4998	0.5792	

Table 3
Migrants' socio-economic integration in specific housing choices.

Housing types	Economic integration	Socio-cultural integration	Psychological integration	Socio-economic integration
Self-purchasing commercial housing	12.56	39.79	77.81	34.11
Self-purchasing affordable housing	11.36	39.37	79.11	33.62
Self-purchasing housing with small property rights	10.78	37.79	78.83	32.63
Self-building houses	10.07	35.73	77.94	31.20
Public rental housing provided by the government	12.05	39.60	74.00	32.43
Renting private housing - whole rent	11.05	35.77	72.66	30.09
Renting private housing - Joint rent	10.63	34.87	70.93	28.93
Unit/employer's house	11.03	37.54	69.08	29.44
Place of employment	9.98	36.43	70.42	28.83

communicate and interact with residents and are easy to feel the warmth of family.

Regarding mobility attributes, migrants' staying length in the local area will assist them to accumulate human capital and social capital, thus promoting their socio-economic integration (Zou & Deng, 2020). Intra-provincial mobility is not beneficial for migrants integrating into the host society, because this mobility is possible to encounter cultural chocks (Chen & Wang, 2015). As for rural land, migrants with housing land are less integrated in the local society, as it is also regarded as an emotional attachment (Zou et al., 2022).

Furthermore, Table 5 indicates the different dimensions of migrants' socio-economic integration. No matter for migrants' economic integration, socio-cultural integration, and psychological integration, homeownership rate will significantly and positively extend impact on all of them. Compared with migrants renting house, migrants owning a house display roughly 0.139 standard deviation increase in their socio-economic integration. While migrants living in employees' dormitory shows 0.013 standard deviation decrease in their socio-economic integration. In terms of coefficients, housing ownership rate is the greatest positive impact on migrants' psychological integration, followed by socio-cultural integration, and the least impact on economic integration of migrants.

5.3. Alleviating the endogenous problems

The baseline regression presents the basic result. However, housing tenure choice of migrants is self-selection behavior. The unobservable factors may affect the estimation result, and reverse causality may exist in the methodology as we mentioned. Therefore, we use PSM and IV to alleviate these problems. Table 6 indicates that homeownership rate shows a significant and positive effect on migrants' socio-economic integration, while living in employees' dormitory significantly and negatively influences migrants' socio-economic integration. Therefore, the conclusion is robust.

Table 7 shows the estimated result of the first stage using the proportion of other migrants' homeownership rate and the ratio of other migrants living in employee's dormitory within their groups as IVs. The F statistic are 708.93 and 412.40, which are significantly higher than 10 (Staiger & James, 1997). Thus, the possibility of weak IV is excluded. The regression results also show that the proportion of other migrants' homeownership rate and the ratio of other migrants living in employee's dormitory within their groups are significantly positive correlated with migrants' housing tenure choice. In addition, an endogenous test is also carried out. The DWH

Table 4
The baseline regression results.

Variables	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	OLS
	Socio-economic integration	Socio-economic integration	Socio-economic integration	Socio-economic integration
Housing tenure choice				
Renter (ref.)				
Homeowner	0.186***	0.161***	0.158***	0.139***
	(0.003)	(0.003)	(0.003)	(0.003)
Employees' dormitory	−0.027***	−0.016***	−0.015***	−0.013***
	(0.004)	(0.004)	(0.004)	(0.004)
Female	−0.042***	−0.043***	−0.044***	−0.046***
	(0.002)	(0.002)	(0.002)	(0.002)
Age				
<25 (ref.)				
25–35	0.060***	0.044***	0.044***	0.047***
	(0.004)	(0.004)	(0.004)	(0.004)
35–45	0.094***	0.062***	0.062***	0.063***
	(0.004)	(0.004)	(0.004)	(0.004)
>45	0.080***	0.041***	0.042***	0.039***
	(0.005)	(0.005)	(0.005)	(0.005)
Education				
Junior high school and below (ref.)				
High school	0.125***	0.122***	0.121***	0.117***
	(0.003)	(0.003)	(0.003)	(0.003)
College and above	0.288***	0.287***	0.285***	0.275***
	(0.004)	(0.004)	(0.004)	(0.004)
Household monthly income	0.140***	0.146***	0.148***	0.150***
	(0.002)	(0.002)	(0.002)	(0.002)
Agriculture hukou	−0.096***	−0.092***	−0.081***	−0.066***
	(0.003)	(0.003)	(0.004)	(0.004)
Parter_present	−0.037***	−0.044***	−0.043***	−0.041***
	(0.003)	(0.003)	(0.003)	(0.003)
Child_present	0.059***	0.043***	0.044***	0.037***
	(0.003)	(0.003)	(0.003)	(0.003)
Length of stay				
≤1 year (ref.)				
1 year-10 years		0.089***	0.088***	0.083***
		(0.003)	(0.003)	(0.003)
>10 years		0.169***	0.167***	0.164***
		(0.004)	(0.004)	(0.004)
Longmove		−0.044***	−0.044***	−0.054***
		(0.002)	(0.002)	(0.003)
Hometown land				
Without any land (ref.)				
With farmland holdings only			−0.004	−0.001
			(0.005)	(0.005)
With housing land holdings only			−0.027***	−0.023***
			(0.004)	(0.004)
With both types of land			−0.019***	−0.014***
			(0.003)	(0.003)
Province dummies	No	No	No	Yes
Constant	−1.320***	−1.403***	−1.409***	−1.400***
	(0.019)	(0.019)	(0.019)	(0.021)
Observations	131,847	131,847	131,847	131,847
R-squared	0.193	0.204	0.205	0.237

Note: ***,** and * represent significance at 1%, 5% and 10% level, respectively; standard errors in parentheses. Same in the rest tables.

results reveals that an endogenous relationship exist between housing tenure choice and socio-economic integration of migrants. As for sub-dimensions, it can be seen from the DWH result that except for no endogeneity between housing tenure choice and socio-cultural integration of migrants, the rest groups exist endogeneity.

Moreover, we compare the result of Table 7 and with that of Table 5. It can be found that after using IV estimation, homeowner is still significantly positive associated with migrants' socio-economic integration. And living in employee's dormitory is still significantly negative associated with migrants' socio-economic integration. By comparing the estimated result with and without IV, it is found that the estimated coefficients of housing tenure choice are larger than those when the endogenous problems are not addressed. This indicates that if endogenous problems are not alleviated, the effect of housing tenure choice on migrants' socio-economic integration will be underestimated.

Table 5
The baseline regression model for different integration dimensions.

Variables	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	OLS
	Socio-economic integration	Economic integration	Socio-cultural integration	Psychological integration
Housing tenure choice				
Renter (ref.)				
Homeowner	0.139***	0.060***	0.117***	0.229***
	(0.003)	(0.004)	(0.005)	(0.007)
Employees' dormitory	−0.013***	0.004	0.085***	−0.121***
	(0.004)	(0.005)	(0.006)	(0.008)
Personal characteristics	Yes	Yes	Yes	Yes
Family composition	Yes	Yes	Yes	Yes
Mobility attributes	Yes	Yes	Yes	Yes
Hometown land	Yes	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes	Yes
Constant	−1.400***	−3.202***	−0.919***	−0.305***
	(0.021)	(0.029)	(0.032)	(0.047)
Observations	131,847	131,847	131,847	131,847
R-squared	0.237	0.315	0.151	0.094

Table 6
ATT estimation of socio-economic integration of migrants.

Variables	Methods	Matching	Treatment group	Control group	ATT	SE	T-stat
Homeowner	Nearest neighbor matching	Unmatched	0.2182	−0.0753	0.2936	0.0029	101.06 ***
		Matched	0.2182	0.0765	0.1417	0.0045	31.75***
	Radius matching	Unmatched	0.2182	−0.0753	0.2936	0.0029	101.06 ***
		Matched	0.2182	0.0757	0.1426	0.0036	39.09***
	Kernel matching	Unmatched	0.2182	0.0730	0.1453	0.0036	40.19***
		Matched					
Employees' dormitory	Nearest neighbor matching	Unmatched	−0.1123	0.0194	−0.1317	0.0038	−34.95***
		Matched	−0.1123	−0.0853	−0.0270	0.0052	−5.23***
	Radius matching	Unmatched	−0.1123	0.0194	−0.1317	0.0038	−34.95***
		Matched	−0.1123	−0.0746	−0.0377	0.0042	−9.02***
	Kernel matching	Unmatched	−0.1123	0.0194	−0.1317	0.0038	−34.95***
		Matched	−0.1123	−0.0707	−0.0416	0.0041	−10.04***

Abbreviations: SE, standard error. *** represents significance at the 1%.

5.4. The underlying mechanism of housing tenure choice on migrants' socio-economic integration

Table 8 demonstrates the potential mechanism results of housing tenure choice on the socio-economic integration of migrants. Model (1) to Model (4) in Table 8 manifest that migrants' homeownership rate significantly and positively influence their settlement intention and integration will. Living in employee's dormitory significantly and negatively impact migrants' settlement intention and integration will. Furthermore, settlement intention and integration will of migrants are both benefit for their socio-economic integration. Therefore, housing tenure choice impacts migrants' socio-economic partly through impacting their settlement intention and integration will. In addition, Model (5) and (6) imply that migrants' homeownership rate can increase their local capital. But living in employee's dormitory can weaken their local capital. The local capital is significantly positive correlated to migrants' socio-economic integration. Model (7) and (8) in Table 8 imply that migrants' homeownership rate can decrease their working time, while living in employee's dormitory can increase migrants' labor supply, and the labor supply is significantly and negatively associated with migrants' socio-economic integration. It suggests that migrants' housing tenure choice impacts their socio-economic integration partly through changing their local capital and labor supply.

In order to further judge the explanatory power of each intermediary variable, we sort out regression coefficients, as shown in Table 9. For example, the direct effect of homeownership on migrants' socio-economic integration is 0.597, and the intermediary effect of homeownership on migrants' socio-economic integration through migrants' settlement intention is 0.056434. This intermediary effect accounts for 9.45% of the total effect of migrants' homeownership on socio-economic integration. Similarly, settlement intention accounts for 0.41% of the total effect of living in employee's dormitory on migrants' socio-economic integration. And the mediating effect of integration will, local capital and labor supply accounts for 20.33%, 1.39% and 0.14% of the total effect of homeownership on migrants' socio-economic integration, but it only accounts for 12.22%, 0.36% and 0.12% of the total effect of living in employee's dormitory on migrants' socio-economic integration.

Table 7
Instrumental variable (IV) estimation results.

Variables	(1)	(2)	(3)	(4)
	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS
	Socio-economic integration	Economic integration	Socio-cultural integration	Psychological integration
Homeowner	0.556***	1.124***	0.261***	0.349***
	(0.059)	(0.098)	(0.073)	(0.112)
Employees' dormitory	−0.810***	−1.469***	0.084[a]	−1.103***
	(0.111)	(0.185)	(0.137)	(0.211)
Personal characteristics	Yes	Yes	Yes	Yes
Family composition	Yes	Yes	Yes	Yes
Mobility attributes	Yes	Yes	Yes	Yes
Hometown land	Yes	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes	Yes
Durbin Wu-Hausman	70.1317	192.302	1.6486	12.193
P value	0.0000	0.0000	0.1923	0.0000
First-stage regression results				
	(5)		(6)	
Homeowner ratio	0.705***		0.122***	
	(0.031)		(0.026)	
Employees' dormitory ratio	0.319***		0.640***	
	(0.052)		(0.043)	
Control variables	Yes		Yes	
F-statistic	708.93		412.40	
Prob>F	0.0000		0.0000	
Observations	131,937		131,937	
R^2	0.2082		0.1325	

[a] As DWH = 1.6486, and $p = 0.1923$. It shows that there is no endogeneity between housing tenure choice and socio-cultural integration, so it still depends on probit's results in Table 5.

5.5. *Heterogeneity results*

The samples are divided into new generation and old generation, eastern China and non-eastern China, developed and underdeveloped regions of digital economy.[2] Then the heterogeneity of these groups is explored. Digital economy is measured by the urban digital economy index of Digital Economy Research Institute of Xinhua third group and cloud computing and big data Research Institute of China Academy of information and communication, which includes data and information infrastructure, urban service, urban governance and industrial integration. Model (1) in Table 10 shows that the level of new generation migrants' socio-economic integration who are homeowners is lower than that of old generation migrants'. The reason may be that new generation migrants who are homeowners burden more pressure and do not have enough time to communicate with the locals. Besides that, they do not accumulate enough resources. As a consequence, the level of their socio-economic integration is lower than that of old generation who are homeowners. Model (2) in Table 10 indicates that socio-economic integration level of migrants in eastern China who are homeowners is higher than that of migrants in central and western China. Owning houses in eastern China is considered by migrants as a manifestation of self-identity and a strong sense of pride, so as to improve their socio-economic integration (Liu et al., 2018). It also reveals that the socio-economic integration level of migrants living in employee's dormitory in eastern China is also higher, as these migrants can access to more economic and related resources than other migrants living in central and western China. Model (3) in Table 10 implies that the development of digital economy can strengthen the positive effect of housing tenure choice on migrants' socio-economic integration. With the development of digital economy, the income level of migrants increases, and the convenience of participating in various activities improves greatly (Zou & Deng, 2022).

6. Discussion and conclusion

Migrants' socio-economic integration is a crucial factor for social harmony and stability in modern society. In this paper, we use a national survey data from CMDS. Based on this, it is drawn that migrants' socio-economic integration mainly consists of economic integration, socio-cultural integration and psychological integration, which is slightly different from the previous study (Zou et al., 2020). According to them, migrants' socio-economic integration contains economic integration, socio-cultural and self-identity. The difference may be caused by different data used in the research. It is noted that both conclude that the level of migrants' economic integration is low, followed by socio-cultural integration, and the psychological integration or identity is the highest. However, this

[2] We calculated the average score of digital economy in China is 0.369 according to the following urban digital economy index, and defined developed regions of digital economy as "average score of digital economy> 0.369", and the others belongs to underdeveloped regions of digital economy.

Table 8
The underlying mechanism of housing tenure choice on socio-economic integration of migrants.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Probit	IV-2SLS	Probit	IV-2SLS	Probit	IV-2SLS	IV-2SLS	IV-2SLS
	Settlement intention	Socio-economic integration	Integration will	Socio-economic integration	Local capital	Socio-economic integration	Working time	Socio-economic integration
Homeowner	0.406***	0.597***	0.256***	0.602***	0.358***	0.591***	−0.275***	0.600***
	(0.010)	(0.072)	(0.014)	(0.068)	(0.008)	(0.076)	(0.053)	(0.075)
Employees' dormitory	−0.027***	−0.913***	−0.206***	−0.806***	−0.145***	−0.911***	0.350***	−0.919***
	(0.012)	(0.119)	(0.014)	(0.115)	(0.011)	(0.123)	(0.087)	(0.120)
Settlement intention		0.139***						
		(0.008)						
Integration will				0.478***				
				(0.011)				
Local capital						0.023**		
						(0.011)		
Labor supply								−0.003*
								(0.005)
Personal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family composition	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mobility attributes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hometown land	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wald test of exogenity/ DWH		72.6382		69.988		62.6273	16.3678	67.2551
P value		0.0000		0.0000		0.0000	0.0000	0.0000
R^2	0.0595	0.1337	0.0632	0.1359	0.1101	0.1357	0.1311	0.1336

Table 9
Mediation effect analysis.

Predictive variable	M(Mediating variable)	X1 (Homeowner)	X2 (Employees' dormitory)
Direct effect on migrants' socio-economic integration	0.139***	0.597 ***	−0.913***
Direct effect on migrants' settlement intention		0.406***	−0.027***
Through the mediating effect of M on Y		0.056434	0.003753
Proportion of intermediary effect in total effect		9.45%	0.41%
Direct effect on migrants' socio-economic integration	0.478***	0.602***	−0.806***
Direct effect on migrants' integration will		0.256***	−0.206***
Through the mediating effect of M on Y		0.122368	0.098468
Proportion of intermediary effect in total effect		20.33%	12.22%
Direct effect on migrants' socio-economic integration	0.023**	0.591***	−0.911***
Direct effect on migrants' local capital		0.358***	−0.145***
Through the mediating effect of M on Y		0.008234	0.003335
Proportion of intermediary effect in total effect		1.39%	0.36%
Direct effect on migrants' socio-economic integration	−0.003*	0.600***	−0.919***
Direct effect on migrants' labor supply		−0.275***	0.350***
Through the mediating effect of M on Y		0.000825	0.00105
Proportion of intermediary effect in total effect		0.14%	0.12%

Table 10
The heterogeneity results.

Variables	(1)	(2)	(3)
	IV-2SLS	IV-2SLS	IV-2SLS
	Generation difference	Regional difference	Digital economy
Homeowner	0.425***	0.287***	0.170 ***
	(0.062)	(0.047)	(0.058)
Employees' dormitory	−1.038***	−0.682***	−0.475***
	(0.122)	(0.064)	(0.092)
New generation	−0.004		
	(0.020)		
Homeowner* New generation	−0.083**		
	(0.037)		
Employees' dormitory* New generation	0.139		
	(0.091)		
Eastern China		−0.059***	
		(0.018)	
Homeowner* Eastern China		0.253***	
		(0.033)	
Employees' dormitory* Eastern China		0.191***	
		(0.067)	
Digital economy			−0.182***
			(0.030)
Homeowner* Digital economy			0.378***
			(0.031)
Employees' dormitory* Digital economy			0.153**
			(0.067)
Personal characteristics	Yes	Yes	Yes
Family composition	Yes	Yes	Yes
Mobility attributes	Yes	Yes	Yes
Hometown land	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes
DWH	79.048	108.619	42.3666
P value	0.0000	0.0000	0.0000
Observations	131,847	131,847	131,847
R^2	0.2208	0.1683	0.1334

result is quite different from the integration of international immigrants. Their economic integration is higher than their cultural and psychological integration (Remennick, 2004). The reason may be that Chinese migrants do not have so strong ethnic differences and there are relatively few cultural conflicts. However, China's *hukou* system has limited migrants' access to basic public services, and they may be excluded from the labour market, thus impeding their economic integration (Zou & Deng, 2020).

It is also found that homeownership rate significantly and positively affects migrants' socio-economic integration. In addition, some important migrants are also considered, such as manufacturing migrants and construction migrants, who usually live in employees' dormitory. And the level of their socio-economic integration is lower than that of renters. Compared with the existing literature (Lu et al., 2018; Zheng et al., 2020), the advantage of this paper is that the usage of PSM and IV methods partly alleviate the

endogeneity between housing tenure choice and socio-economic integration of migrants, which will lead to a more reliable conclusion. This paper further applies transnational immigration theory, balance theory and utility maximization theory to analyzing the underlying mechanism, which refers to that the impact of housing tenure choice on migrants' socio-economic integration is partly reflected through affecting migrants' settlement intention, integration will, local capital and labor supply. Different from the assimilation and the multi-culturalism of social integration, this is also a new development in theory related to migrants' socio-economic integration.

Heterogeneity analysis shows that the level of new generation migrants' socio-economic integration who are homeowners is lower than that of old generation migrants. Compared with migrants in central and eastern China, the level of migrants' socio-economic integration in eastern China who are homeowners or live in employee's dormitory is relatively higher. It is also revealed the development of digital economy can strengthen the positive effect of homeownership rate on migrants' socio-economic integration, which is a new perspective in the modern society.

The findings in this paper present the following implications. As homeownership rate can improve migrants' socio-economic integration, government should encourage the promulgation of some commercial housing purchase policies suitable for migrants, especially in eastern China and some areas with highly developed digital economy. For example, local government and enterprise departments should provide a certain proportion of housing subsidies to migrants to reduce their housing burden. The housing provident fund system should be reformed to encourage the rational purchase of houses by migrants, such as reducing the proportion of down payment and increasing the loan amount of housing provident fund for migrants. In this paper, some policy implications related to renting are also demonstrated. For example, the development of smaller apartments should be encouraged, and the local government needs to improve the corresponding supporting facilities for public rental housing. In addition, other factors such as *hukou*, education, accompany-migrated children, and mobility attributes are also related to migrants' socio-economic integration. Accordingly, governmental agencies should properly release the restrictions of *hukou* system, improving the vocational skills and education level of migrants, and providing corresponding supporting services for their children, which will make migrants enjoy the benefits brought by the equalization of basic public services locally, and promote their willingness to settle and integrate, so as to improve their socio-economic integration.

Due to the limitation of data, we only discuss the relationship in cross-section data, and future research can be extended to panel data. Similarly, there may be other mechanisms for the impact of housing tenure choice on socio-economic integration of migrants, which need to be further explored. In this paper, we also find digital economy plays an important role in promoting the socio-economic integration of migrants. Its deep mechanism on migrants' socio-economic integration needs to be further empirically tested in the future.

Acknowledgements

The research was funded by the Key Research of Basic Projects of Zhejiang Provincial Philosophy and Social Science (2022JDKTZD12), Natural Science Foundation of Zhejiang Province in China (LQ21G030015), Postdoctoral Research Foundation of China (2021M692844).

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