



Recent progress in *hukou* reform and labor market integration in China: 1996–2022[☆]

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ABSTRACT

To investigate the household registration system (*hukou*) reform in China, it is important to quantify the thresholds of obtaining *hukou* in urban areas at the city level. We build a new index to measure the likelihood of obtaining urban *hukou* for migrants in each destination city, termed the “settlement probability”, based on individual information of floating population from the population census and *hukou* policies of 332 cities from 1996 to 2022. We find that the average settlement probability has been steadily increasing since 1999, reaching 91% in 2022, and 15 provinces have achieved low thresholds. We further build a simple general spatial equilibrium model with the factor of settlement probability to investigate the impacts of *hukou* reform. The empirical analysis shows there is a mismatch between settlement probability and settlement intentions. Moreover, we find that higher settlement probability is significantly correlated with more migrants' inflow, lower migrants' wages and higher urban housing prices, especially in more developed cities. Therefore, *hukou* reform is crucial for enhancing the integration of China's labor market.

1. Introduction

The reform of China's household registration system (*hukou*) is pivotal in reducing the urbanization rate gap between registered and permanent population, and developing a unified national labor market. Firstly, the urbanization rate of the registered population in China was approximately 18 percentage points lower than that of the permanent population in 2021. Narrowing this gap or preventing further divergence necessitates further reductions in the registration barriers. Secondly, China has expressed the need to expedite the creation of a unified national market, aiming at breaking down regional protectionism and eradicating market segmentation. This goal hinges on mitigating the impediments to economic circulation and facilitating the smoother flow of goods, factors, and resources across a broader spectrum. Among these impediments, *hukou* is widely recognized as a major obstacle to labor mobility. Therefore, to construct a unified national labor market, it is crucial to further lower the threshold for obtaining local *hukou*.

Considering the substantial space heterogeneity in the progress of *hukou* reform, it is essential to conduct quantitative analysis at

[☆] All the data related to the probability of settling down in urban areas in the article come from the processed data of the micro dataset provided by the National Bureau of Statistics - Peking University Research Data Center. The content of the article is purely the authors' personal opinion and does not represent the opinions of the National Bureau of Statistics - Peking University Research Data Center and the National Bureau of Statistics.

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the city level.¹ There are mainly two broad categories of methods of studying city-level *hukou* reform. The first category is based on observed outcomes in population data to deduce the probability of obtaining local *hukou* in different regions. Using the 2013 *hukou* migration data from the Public Security and Household Registration Departments, Hou (2017) analyzes the admission thresholds for urban *hukou* in cities of different levels. Liu and Li (2017) calculate migration probabilities for each city using the Sixth National Population Census data in 2010. Zi (2022) and Wu and You (2023) employ the proportion of population born in other areas who obtained local *hukou* as a proxy to calculate the settlement probability in different regions. However, there may be endogeneity issues in inferring the threshold for settling down in different regions based on the observed outcomes, and a better approach is to analyze it based on the policy documents for settling down in different regions.

The second category of research uses policy documents to describe and quantify *hukou* reform in China. Zhang and Chen (2016) and Song (2020) describe the reforms without quantification. Some studies focus on the timing of the introduction of *hukou* policies in different regions without examining the intensity of policy enforcement. See for instance, Sun et al. (2011), Ning and Duan (2017), Chen et al. (2020), Wang et al. (2021) and Jin and Zhang (2023). There are some papers quantifying the *hukou* thresholds at the city level considering both the timing and intensity of policy documents, for example, Wu and Zhang (2010), Zhang and Tao (2012), Liu (2016), Sun (2017), Kinnan et al. (2018), Fan (2019), Zhang et al. (2019), Sun et al. (2020), Wang et al. (2023) and Tian (2024). However, these studies have various limitations such as a short panel, a limited city sample size, inadequate incorporation of policy details, and the omission of the post-2016 *hukou* policy.

This paper introduces a novel quantitative approach to quantify the threshold for obtaining household registration as Zhang & Chen, 2024. More specifically, we build a panel of the annual settlement probability for 332 cities from 1996 to 2022, which is comprehensive, more objective, and more accurately quantified. This index can reflect the dynamic progress of China's *hukou* reform, particularly highlighting the developments since 2016 and the recent developments of *hukou* reform in 2022. Furthermore, it sheds light on the progress of the construction of China's unified national labor market.

This paper also contributes to the existing literature related to the impact of the *hukou* reform using the existing indexes on various aspects. He and Luo (2020), Zhang et al. (2020), and Tian and Qian (2022) used existing threshold indicators to explore the possible impacts of the *hukou* reform, including the impact on the nanny market, return migration and the marriage market. Gu and Zhao (2024) use the index of Zhang et al. (2019) to evaluate the *hukou* values when revisiting the influence of amenities on migrants' *hukou* transfer intentions. An et al. (2024) used the index constructed by Zhang et al. (2019) and Fan (2019) to investigate whether the *hukou* threshold index in various cities had undergone similar trends between 1997 and 2010. Tian (2024) endogenized the migrant friendliness corresponding to the *hukou* reform from the perspective of international trade and tariff changes. In addition, Song (2021) and Sieg et al. (2023) built structural models to study the possible impacts of the *hukou* reform, factors such as registration cost and migration cost are incorporated in the structural estimation, but they lack the quantification of specific settlement thresholds. Fan (2019), Tombe and Zhu (2019) and Wu and You (2023) conducted structural analysis based on quantitative entry thresholds or entry probabilities. However, the quantification of Fan (2019) and Tombe and Zhu (2019) overlooked many details of entry policies, and Wu and You (2023)'s quantification method was not based on entry policies but on actual population data which may suffer from endogeneity problems. No matter the existing research or the future more in-depth research, there is an urgent need for a better and more comprehensive city-level quantitative indicator to reflect the settlement threshold, and the indicator constructed in this paper can just meet such needs.

The evolution of the index shows that the average settlement probability at the city level in China has been increasing year by year since 1999, and has reached 91% by 2022. Moreover, 43% of cities have achieved a complete zero threshold, and 85% of cities have a settlement probability of over 80%. However, there are still 14 cities with a settlement probability of <50% in 2022. Overall, the higher the city level, the lower the settlement probability and the slower the increase over time. The settlement probabilities in first-tier cities remain low, while other cities have shown significant increases since 2014.

More importantly, to study the effects of *hukou* reform, this paper builds a general spatial equilibrium model where we have urban labor markets and housing markets and incorporate the factor of settlement probability. In the empirical analysis part, we test the theoretical predictions and show that there exists a mismatch between the settlement probability and migrants' settlement intentions. The main factor affecting "being willing to settle but unable to settle" is the high threshold, and the main factors affecting "being able to settle but unwilling to settle" are long migration distance, agricultural *hukou*, low education level, and absence of medical insurance. In addition, we find that settlement probability is positively correlated with the migrants' inflow and the urban housing prices, especially in higher-tier cities, negatively correlated with the wages of migrants, which are consistent with the theoretical predictions. This also implies that it is important and effective to promote labor market integration in China through *hukou* reform.

The remaining of the paper is organized as follows. In Section 2, we provide the institutional background knowledge of the household registration system in China. In Section 3, we describe how we quantify the *hukou* policy, show the dynamics of the newly constructed settlement probability and describe the status quo in 2022 by city and province. Section 4 builds a general spatial equilibrium model to help investigate the possible impacts of *hukou* reform. Section 5 provides corresponding empirical evidence between settlement probability and settlement intentions, migrants' inflow, migrants' wages and urban housing prices. Section 6 compares *hukou* reform and other urbanization policies such as residence permits and urban land policies. We conclude in Section 7.

¹ In this article, cities include urban areas and towns in four municipalities directly under the central government, as well as urban areas and towns in prefecture-level cities, regions (*Diqu* in Chinese), autonomous prefectures (*Zhou* in Chinese), and leagues (*Meng* in Chinese).

2. *Hukou* reform: from central to local governments

The *hukou* system in China was gradually established from 1949 to 1956 (Song, 2020). It was the most powerful means of controlling population mobility during 1956–1980. On September 27, 1980, the issuance of the “Notice of the Central Committee of the Communist Party of China on Further Strengthening and Improving the Responsibility System for Agricultural Production” marked the beginning of the relaxation of the strict *hukou* system, which allowed a few individuals who requested to engage in individual business to obtain approval from the relevant authorities, sign contracts with production teams, and hold certificates for labor and business activities. Since October 1984, when restrictions on settling down in small towns (excluding county town centers) were relaxed, *hukou* reforms have been staggeringly implemented and the *hukou* thresholds continue to lower in cities.

Early *hukou* reform was top-down, led by the central government and implemented by local governments. Before 1993, there were very few *hukou* reform documents issued by local governments. In June 1993, the “Decision of the State Council on *Hukou* Reform” suggested delegating the authority of migration plans to local governments (Song, 2020). Since then, the authority was not reclaimed by the central government. From then on, the central government offers general guiding principles, while local governments autonomously develop reform policies tailored to their specific circumstances. The pilot program of *hukou* reform was implemented in small towns in 1997. Local governments, in alignment with the central government's directives, subsequently introduced a series of policy documents. The timing and intensity of *hukou* policies vary across different levels of government. In reality, the city-level *hukou* policy has the most significant and straightforward impact on the local economy and society. Therefore, it is necessary to study the process of *hukou* reform at the city level in detail.

Some studies directly infer local policies based on central government policy directives (see for instance An et al. (2024) and Dong et al. (2023)). However, there have been two unresolved issues related to city classification: first, the population size standards for different city levels have changed over time. The “Urban Planning Law of the People's Republic of China”, which came into effect on April 1, 1990, defined “large cities” as cities with a non-agricultural population of over 500,000 in the urban and suburban areas, “medium cities” as those with a non-agricultural population of over 200,000 but <500,000, and “small cities” as those with a non-agricultural population of <200,000 in the urban and suburban areas.² It wasn't until October 29, 2014, that the “Notice of the State Council on Adjusting the Criteria for Classifying City Sizes” adjusted the criteria for city size classification, using the “urban area's permanent resident population” as the statistical basis.³ Cities were then classified into five categories and seven tiers. Second, the permanent resident population of urban areas is an indicator that was only publicly disclosed with the 7th National Population Census in 2020. The use of “urban population” data from the “China Urban Construction Statistical Yearbook” is often used to classify different cities. According to this classification, cities like Beijing, Shanghai, Nanjing, Chengdu, Wuhan, Chongqing and Zhengzhou are all mega and super mega-cities and are treated with the strictest household registration control, which does not align with policy reality. Ignoring specific city-level policy documents will likely lead to estimation bias.

To gain a more accurate understanding of the historical progress and intensity of *hukou* reform, it is essential to focus on the city-level *hukou* policies and subject them to quantitative analysis. Although there are such city-level settlement threshold indexes as shown in Table A.1 in Appendix A, they have different limitations: (1) Limited Panel Data: The current indexes have relatively limited panel data. For example, Wu and Zhang (2010) and Liu (2016) developed indexes that reflect *hukou* reform for a single year. Zhang et al. (2019) captured the threshold for two specific periods. While Fan (2019), Sun et al. (2020), and Tian (2024) created panel data, the overall time span remains relatively short, with the most recent data extending only up to 2016.

(2) Subjectivity and Complexity of Construction: The assignment rules about specific registration conditions are different in various studies, resulting in a certain degree of subjectivity. In addition, these construction methods are complex, which poses challenges for replication by other researchers in subsequent years.

(3) Inability to Quantify Point-Based Settlement: Existing literature largely lacks quantification of point-based settlement thresholds. Our method offers a straightforward approach to quantify.

(4) Lack of Consideration for Complex Reform Details: These construction methods do not fully consider the intricacies of *hukou* reform. For instance, different districts or counties within the same city may have different settlement conditions. Furthermore, various demographic groups, such as genders, ages, agricultural vs. non-agricultural *hukou*, and intra-provincial *hukou*, may face varying settlement conditions within the same city.

More specifically, with regard to lowering the household registration threshold, excluding investment-based and dependent-based household registration, various regions have implemented different approaches in their household registration system reform targeting the working-age population. These approaches include the following:

- i. Some cities exclusively employ a point-based *hukou* with annual quota limitations like Beijing, while others have no quota restrictions. Certain cities implement a dual-track system comprising both point-based and conditional *hukou* systems like Chengdu, while some cities have transitioned to a purely conditional *hukou* system.
- ii. Some cities have incorporated various quantitative requirements, while others have removed such restrictions. These quantitative constraints can include factors like length of residence, duration of employment, years of social security contributions, age requirements, educational qualifications, housing area and purchasing amount requirements. Some cities even impose

² http://www.npc.gov.cn/zgrdw/npc/zt/2007-04/24/content_364537.htm

³ https://www.gov.cn/gongbao/content/2014/content_2779012.htm

distinct upper-age limits for different genders or different educational backgrounds. Reduction or elimination of these quantitative requirements naturally lowers the registration threshold.

- iii. Some cities have exhibited discrimination in their *hukou* policies based on *hukou* origin. Migrants from the same city, or the same province, or other provinces may face varying registration conditions. As the *hukou* reform advances, discrimination based on *hukou* origin is gradually being phased out.
- iv. Some cities' *hukou* policies demonstrate evident distinctions based on the type of original *hukou*. Agricultural or non-agricultural *hukou* holders may face different settlement requirements.
- v. Within cities, *hukou* policies may differ between urban districts and counties. Typically, urban districts generally have higher *hukou* thresholds than counties or county-level cities.
- vi. Regarding residential requirements, some cities mandate legal housing ownership, while others restrict renting to public or affordable housing. In contrast, certain cities permit renting a private house for registration.
- vii. In terms of employment requirements, some cities necessitate contributions to the pension insurance system or the signing of labor contracts, sometimes specifying particular occupations or industries. Others only require employment or economic income, without pension insurance or labor contract stipulations.
- viii. For talent-based *hukou*, educational qualifications or professional titles are typically required. These qualifications range from doctoral graduates to high school graduates. Lower educational requirements mean a lower settlement threshold. In some cities, the threshold may differ based on the type of educational institution or whether the graduate attended a local university.
- ix. Some cities require the simultaneous fulfilment of multiple criteria. Taking residence, employment, and educational qualifications as an example, some cities mandate meeting all three criteria, while others only require two (e.g., residence and employment). Some cities might require only one of these criteria, and a few have eliminated all conditions, effectively reducing the threshold to zero.

In summary, existing quantitative methods are hard to account for the full scope of *hukou* reform accurately. Building upon existing research, this paper introduces a novel approach to address the limitations of current quantitative methods. It aims to offer an objective and comprehensive reflection of the progress and intensity of *hukou* reform at the city level from 1996 to 2022. Moreover, it is adaptable to future use, capable of reflecting point-based household registration thresholds and accommodating a broader range of details from household registration system reform efforts.

3. The quantification of urban settlement probability

3.1. Data

In this study, we systematically collect urban *hukou* policy documents for each city during 1996–2022 mainly from the PKULaw database, official city government websites, and public security bureau websites.⁴ We gathered all the available documents ranging from the central government down to the provinces, autonomous regions, and then to the prefecture-level cities. If documents were not available for certain years, the city's settlement requirements were quantified based on the most recent previous document. Regarding policy continuity, if a document stated “all previous documents are null and void”, it signified the abolition of the previous settlement conditions. Otherwise, the previous policy remained in effect. If no relevant documents were found at the prefecture-level city, we referred to provincial policy documents for timing and requirements. If provincial-level documents were also unavailable, mainly the 2001 policy for small towns, we used the timing and requirements of central policy documents in 2001. Given that the 1997 policy pilot for small towns covered a very limited number of small towns, and only a few towns within a county participated in the pilot, we do not quantify the 1997 pilot policy.

In conjunction with this, we used microdata from the 2000, 2010, and 2020 censuses, along with 1% population sample data in 2015 provided by the National Bureau of Statistics and the Microdata Experiment Lab at Peking University. The use of microdata allowed us to identify the stock of floating population (both intra-city and inter-city migrants) and access information such as residence type (urban area, town, or rural area), employment information, housing information, educational background, reasons for migration, and the time they left their registered residence. By combining this information with the settlement conditions from local city-level *hukou* policies, we can identify the proportion of the floating population meeting the settlement requirements. This proportion can serve as a proxy indicator for *hukou* thresholds: a higher value indicates a higher settlement probability and a lower threshold, and a lower value signifies a higher threshold.

3.2. Data processing and quantitative methods

Firstly, it's necessary to establish spatial boundaries. For *hukou* policies, some cities differentiate between districts and counties, especially when distinguishing urban districts (*Shixiaqu* in Chinese) and counties (or county-level cities). They may tailor household registration conditions to local circumstances. In the data, only the 2020 census provides six-digit administrative codes for districts and counties, while other waves only offer four-digit codes. For the sake of consistency, this paper applies the following criteria to the

⁴ The website for PKULaw database is <https://www.pkulaw.com>.

microdata used.

According to “How Urban and Rural Areas Are Defined in Statistics” issued by the National Bureau of Statistics, “urban districts” refer to areas within city districts and cities without districts where residential committees and other regions are directly connected to the actual construction.⁵ “Township areas” refer to areas outside of urban districts and counties where county governments are located and other townships, with government headquarters directly connected to the actual construction of residential committees and other regions. “Rural areas” refer to regions outside the defined urban areas in this regulation. Therefore, in the context of *hukou* policies that apply to counties, county-level cities, and small towns, this paper aligns them with “township areas”. For urban districts, they are aligned with “urban areas”. If a reform document includes household registration conditions for both “urban districts” and “counties (or county-level cities)”, the determination of whether to use samples from “urban areas” or “township areas” is made based on whether the policy primarily applies to urban districts or counties (or county-level cities). For instance, Qingdao and Dalian have policies that fall into this category. If a policy document only specifies *hukou* policies for “urban districts” and does not mention counties, it is considered that the policies for urban districts and counties (or county-level cities) are the same, given that urban district policies are generally more stringent.

Next, we combine the historical *hukou* policy documents with microdata from population censuses to calculate the settlement probability $hkprob_{ct}$ for each city c in year t from 1996 to 2022 as in Eq. (1) and the corresponding settlement threshold is $(100\% - hkprob_{ct})$:

$$hkprob_{ct} = \frac{Q_{ct}}{M_{c,t_0}} \times 100\% \quad (1)$$

M_{c,t_0} represents the stock of floating population residing in urban areas (comprising city districts and townships, excluding rural areas) as of the initial census year t_0 . This population includes both intra-city agricultural migrants, defined as individuals with rural *hukou* who reside within the same city and have been away from their registered residence for >6 months, and inter-city migrants with either agricultural or non-agricultural *hukou*, defined as individuals who have moved between cities or provinces and have been away from their registered residence for >6 months. Furthermore, the total floating population for a certain city c as of t_0 is estimated using the approximate sampling ratio calculated from population sampling data.⁶ For example, if the sample population in 2015 accounts for 0.1% of the total floating population, then dividing M_{c,t_0} by 0.1% provides an approximate estimate of the total floating population for city c as of t_0 . Using the stock of floating population aligns with the central government's *hukou* reform policy that emphasizes the importance of prioritizing the existing floating population and driving incremental floating population.⁷

The sample includes individuals aged 15 to 64, as those aged 14 and below and 65 and above are often able to relocate with minimal restrictions, especially for immediate family members. Individuals with pending *hukou* are excluded. Individuals with an educational status “currently enrolled in school” are excluded. Given that *hukou* typically requires stable and legal employment or residence, the analysis retains individuals who have migrated primarily for employment-related reasons, including work, business, and demolition or relocation, while other migration reasons such as accompanying family, study, and training, reuniting with relatives, and temporary registration are not considered.⁸ Fig. B.1 in Appendix B illustrates that work or business, and demolition or relocation are the primary migrating reasons among individuals aged 15 to 64.

Secondly, if a city c introduces a *hukou* policy in year t that specifies conditions for obtaining local urban *hukou*, then Q_{ct} represents the number of individuals satisfying the *hukou* requirements for year t (for cities implementing a point-based *hukou* system, Q_{ct} is further explained later). This is achieved by fully utilizing information from the population census data, such as the type of residential area (urban area, town, or rural area), employment status, housing information, educational background, migration reasons, and the duration since leaving their registered residence. The following assumptions and conditions are made:

- (1) Age Limit for Fresh Graduates: Considering that “graduates from vocational and technical colleges who have not secured a job within the job-seeking period (as defined by the state, typically two years) are treated as fresh graduates”, this study sets age limits for fresh graduates as follows: fresh vocational school graduates are categorized as such until the age of 20, fresh college graduates until the age of 23, fresh university graduates until the age of 24, and fresh postgraduate graduates until the age of 28. If the policy explicitly requires graduates to be from the same year, e.g., as in the case of Xuzhou City's 2001 *hukou* policy, the age limits for fresh graduates are adjusted accordingly: 18 for vocational school graduates, 21 for college graduates, 22 for university graduates, and 26 for postgraduate graduates.
- (2) Legal and Fixed Residence: If the policy does not specify requirements on the residence, individuals are assumed to meet the legal and fixed residence requirement by either owning self-built housing, purchasing a house or renting a public rental or affordable housing.
- (3) Registration Policy with Multiple Conditions: When dealing with policies that have multiple conditions, the union of different conditions is used. In other words, for the stock of floating individuals M_{c,t_0} , we calculate the total number of floating individuals that meet either condition A or condition B, denoted as Q_{ct} .

⁵ <https://www.stats.gov.cn/sj/pcsj/rkpc/5rp/html/append7.htm>

⁶ The data come from <http://nrrdc.ruc.edu.cn/wgsj/syzt/2d1c014920a944d592a0f951c4a1255a.htm>.

⁷ The government document named “14th Five-Year Plan for National Economic and Social Development and the Long-Range Objectives Through the Year 2035 of the People's Republic of China”.

⁸ Therefore, policies related to kinship-based registration are not included.

- (4) For cities that implement a point-based *hukou* system, such as Beijing, Q_{ct} equals the actual number of individuals who obtained *hukou* through point-based criteria in that year, which is approximately 6000 people. If the number of point-based registrations is subject to an overall quota, even if it varies from year to year, but the differences are not significant, therefore one can choose any representative year. However, if there is significant variation, the year with the largest increase in point-based registrations can be selected as the representative year. If there is no overall quota control, the actual number of registrations after the relaxation of restrictions is used. In cases where a city implements a dual-track system involving both point-based and criteria-based *hukou* policies, the approximate estimate of Q_{ct} is obtained by adding the actual number of point-based registrations that year and the number of individuals who meet the *hukou* requirements, divided by the sampling ratio. The actual number of points registered comes from publicly available online information.

To address potential issues related to selection bias in *hukou* reform policies, we utilize pre-policy census data to assess the settlement probability reflected by the policies in the following years after each wave of census.⁹ Specifically, we use the 2000 census microdata to quantify settlement probability for the period from December 2000 to November 2010 in various cities, and similarly, the 2010 census microdata for the period from December 2010 to November 2015.¹⁰ The 2015 census microdata quantify probabilities for the period from December 2015 to November 2020, and the 2020 census microdata for the period from December 2020 to November 2025. Regarding policies before November 2000, due to the lack of housing information in the 1990 census data, we use the 2000 census and exclude individuals who had their *hukou* in other counties but had been living in the current town or street since 1999 or later, which helps calculate the stock of floating population in 1998 and is used to quantify the settlement probabilities from 1999 to 2000. Before 1999, there were no city-level policies except for pilot policies in some small towns which will not be considered as previously stated, then we set the settlement probability from 1996 to 1998 to be all zeros.

Constrained by the availability of microdata from population censuses and policy documents, this quantification method may overestimate or underestimate the real settlement probability. On the one hand, there is a certain degree of underestimation because the method does not account for policies related to obtaining *hukou* through kinship, investment or entrepreneurship, professional titles, or immediate family members. On the other hand, there is a certain degree of over-estimation because we do not consider those strict requirements such as labor contracts, social insurance, landlord's permit for a renting house and so on due to data availability in the census data. *Hukou* requirements like legal and stable employment often require the signing of labor contracts or contribution to social insurance.

Additionally, *hukou* requirements often pertain to legal and stable residences (including rental properties), with conditions typically requiring housing to be registered and approved by the housing authorities, and with the landlord's consent. Furthermore, the approximation of residence duration was necessary due to the lack of information on employment duration, social insurance duration, and property purchase duration in the data. The assumption was made that the number of years residing in the current city is approximately equal to the number of years since leaving the registered residence. This approximation tends to result in higher settlement probabilities. Moreover, this study did not collect *hukou* requirements implemented in the real world, which may differ from the one issued. There may also exist hidden thresholds at the policy implementation level, which can lead to an overestimation of settlement probabilities.

Overall, this method provides a relatively objective and accurate quantification of *hukou* policies. What's more, we conduct correlation analysis between the new index and existing indexes in the literature in Table A.2 in Appendix A and show that our index is valid.

3.3. The dynamics of settlement probability

The simple average annualized probability of obtaining local *hukou* in the destination cities is shown in Fig. 1.¹¹ On average, the probability of obtaining *hukou* has been steadily increasing since 1999, starting from 1.4%. Then there was a significant increase of almost 10% in 2001 when small-town and township *hukou* was completely liberalized. Afterwards, the probability exhibited a slow and steady rise. With the issuance of the “Opinions of the State Council on Further Advancing the *Hukou* Reform” in 2014, local governments promptly adopted the reforms, leading to a remarkable increase of over 15% in the average settlement probability from 2014 to 2015.¹² As the *hukou* reform continued to advance, the average probability of obtaining *hukou* continued to incrementally rise, surpassing 90% by 2021. The dynamics of the index using weighted average is shown in Fig. C.1 in Appendix C.

Fig. 2 displays the distribution of settlement probabilities for 332 cities at five-year intervals from 2000 to 2020. The kernel density plot of settlement probabilities in 2020 exhibits a nearly “mirrored” or “reversed” pattern when compared to the year 2000. This suggests that *hukou* reforms have significantly improved the settlement probability.

⁹ Considering that previous population censuses used midnight on November 1 of the census year as the standard timing, and taking into account the time lag between policy issuance, policy implementation, and public awareness, a lag of one month is used in this paper.

¹⁰ The 1% population sample data in 2005 is unavailable in the laboratory, and therefore census in 2000 is used for the period from December 2000 to November 2010 as later stated. Between 2005 and 2010, the central government did not issue any *hukou* reform documents, and the progress of *hukou* reform was relatively slow compared to other time periods.

¹¹ Due to data unavailability, prefectures including Turpan (Tulufan), Changdu, Linzhi, Danzhou, and Sansha have been excluded from the analysis. We will keep updating and revising the data. More information is available upon request by email: chen Zhu@smail.swufe.edu.cn.

¹² https://www.gov.cn/gongbao/content/2014/content_2729568.htm

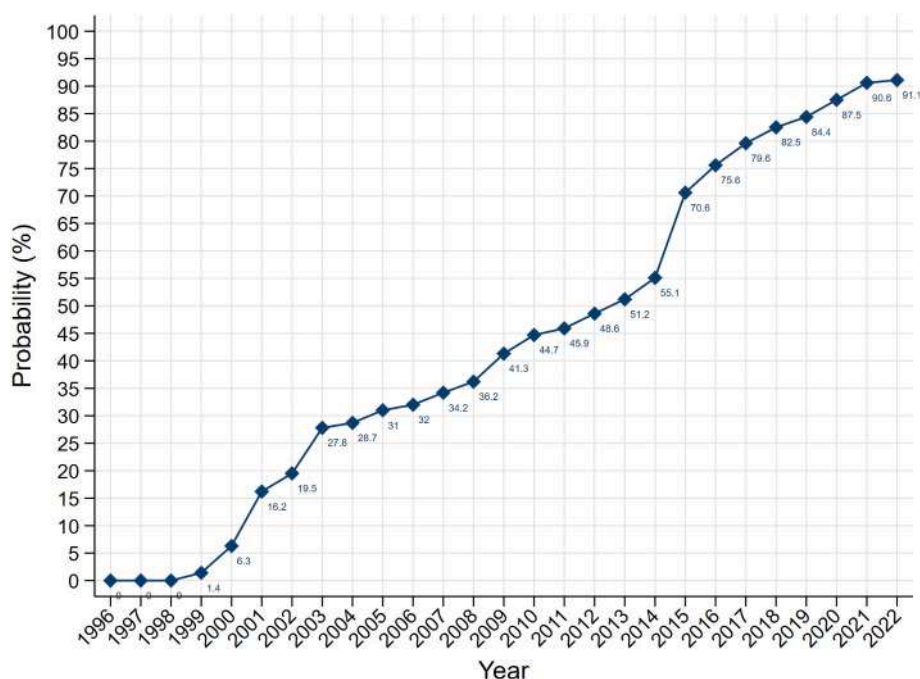


Fig. 1. Average Settlement Probability in All Chinese Cities from 1996 to2022.

Then we explore how settlement probability evolves over years across the classification of cities. The National Bureau of Statistics classified 70 major and medium-sized cities when compiling housing price indexes. More specifically, Beijing, Shanghai, Guangzhou, and Shenzhen are labeled as first-tier cities, 31 provincial capitals and vice-provincial capitals (excluding Lhasa) are categorized as second-tier cities, and the remaining 35 cities are third-tier cities. Fig. 3 displays the temporal evolution in average settlement probability for these three city categories. First-tier cities have little improvement in settlement probability while provincial capital and sub-provincial cities have moderate increases and other cities have the largest improvement. Another classification of city type is based on the First Financial Weekly's classification of Chinese cities in 2016 which is the one widely recognized categorization as Zhang (2020) has summarized. Relevant results are shown in Fig. C.2 in Appendix C.

Even with the general increasing trend of settlement probability, a few cities experienced a decrease in *hukou* approval rates in certain years. The issuance of the “Notice on Actively and Prudently Advancing the Reform of the *Hukou* Management System” by the State Council in 2011 stated that “some places, regardless of the local economic and social development situation, single-mindedly pursued urbanization speed; some places, without distinguishing between different types of cities and ignoring the comprehensive carrying capacity of cities, blindly relaxed the conditions for urban *hukou*”.¹³ This suggests that some cities had policies that fluctuated between being more leniently and strictly due to various reasons including: (1) The elimination of housing purchase requirements for obtaining *hukou*, as seen in cities like Dalian, Suzhou, and Nanjing. (2) The removal of relatively relaxed policies, particularly for counties or county-level cities. (3) The introduction of additional restrictions on obtaining *hukou*, such as Nanjing in November 2014, which restricted *hukou* issuance to fresh graduates and certain categories, or imposed restrictions on rural-to-urban migrants.

3.4. Recent progress in *hukou* reform in 2022

The labor market in China is segregated as Sun et al. (2020) points out. Institutional factors including *hukou* openness, the minimum wage system, and state-owned enterprises all contribute to the segmentation. Among these factors, *hukou* openness is considered to be the most significant factor, which accounts for 4/9 of the overall weight in the labor marketization index.

We then use the constructed settlement probability as a proxy of the *hukou* openness to provide an overview of the latest developments in *hukou* reform across various cities and provinces, and show the current progress toward establishing a unified labor market in China.

3.4.1. By city

Table 1 displays the distribution of settlement probability in 332 cities in China for the year 2022. There are 283 cities (about 85% in total) with the settlement probability equal to or >80%, which is defined as a low settlement threshold in this paper. Therefore, the

¹³ http://www.gov.cn/zhengce/zhengceku/2012-02/23/content_1097.htm

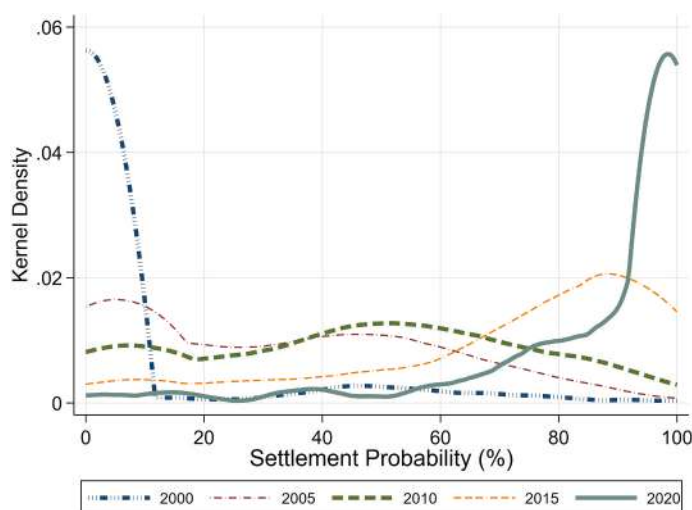


Fig. 2. Distribution of Settlement Probability in 332 Chinese Cities, 2000–2020.

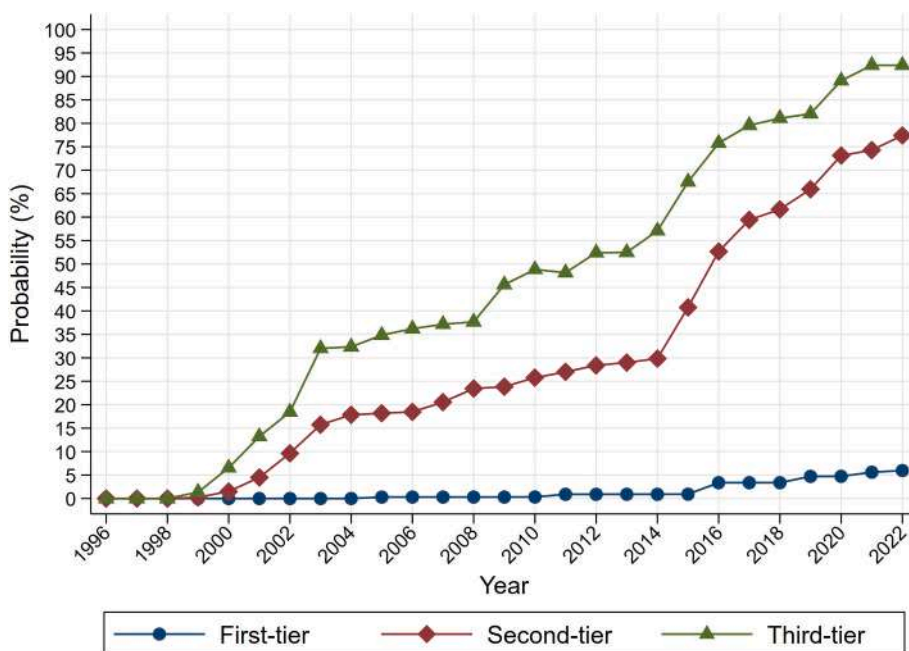


Fig. 3. Average Settlement Probability for Three Types of Cities from 1996 to 2022.

hukou is no longer a significant barrier to building a unified labor market in these areas. 43% of cities have achieved 100% settlement probability, indicating a zero threshold. Additionally, nearly 69% of cities have a settlement probability of 95% or higher. Furthermore, over 95% of cities have a settlement probability exceeding 50% and more details are shown in [Appendix D](#).

However, there are still 14 cities where the settlement probability remains below 50%. They are Beijing, Shanghai, Tianjin, Guangzhou, Suzhou, Hangzhou, Shenzhen, Xiamen, Zhuhai, Nanjing, Hefei, Zhongshan, Zhoushan, and Shantou, the first seven of them have settlement probability even below 20%.¹⁴ By examining the latest *hukou* acquisition policies in these cities, the relatively high *hukou* acquisition barriers in these 14 cities can be attributed to one of the following three factors: (1) Point-based *hukou* policies: Eight cities still implement point-based *hukou* acquisition policies or relatively strict household conversion policies (such as Shanghai).

¹⁴ Other than Beijing, Shanghai and Tianjin, other cities are distributed in provinces: five cities in Guangdong (Guangzhou, Shenzhen, Zhuhai, Zhongshan, Shantou), two cities in Jiangsu (Suzhou, Nanjing), two cities in Zhejiang (Hangzhou, Zhoushan), one city in Fujian (Xiamen), and one city in Anhui (Hefei).

Table 1
Segmental distribution of settlement probability in 332 cities in China in 2022.

Settlement Probability (%)	Number of Cities	Cumulative Number	Ratio (%)	Cumulative Ratio (%)
100	144	144	43.37	43.37
[95, 100)	85	229	25.30	68.98
[80, 95)	54	283	16.27	85.24
[50, 80)	35	318	10.84	95.78
[0, 50)	14	332	4.22	100

(2) Strict qualification-based *hukou* policies: Some cities still maintain strict educational and quantitative requirements, including age and length of residence, such as Xiamen, Zhuhai, and Hefei. (3) Relatively lenient *hukou* acquisition conditions that apply only to district-level counties (or county-level cities) and do not cover most of the floating population in these cities' urban areas, such as Hangzhou and Hefei. The detailed *hukou* acquisition requirements for these 14 cities can be found in Table D.1 in Appendix D. Furthermore, the three municipalities, Beijing, Shanghai, and Tianjin, still have very high *hukou* acquisition barriers, with settlement probability below 5%. Therefore, further deepening *hukou* reform in these cities is necessary to advance the construction of a national unified large market.

Therefore, the construction of a fully unified national labor market in China has not yet been completed, since cities with high thresholds are predominantly economically developed and have substantial permanent populations and a significant influx of intercity and interprovincial migrants. Moreover, they play a crucial role in the national economy since the total GDP of the 14 high-threshold cities in 2000, 2010, and 2020 accounted for 20%–22% of the national GDP. For population share and migrants share, they cover 11.3% of the total population and nearly 40% of the total migrants from other provinces according to the 7th Chinese census in 2020.

3.4.2. By province

We further explore the development of settlement probability at the provincial level. In 2022, three municipalities, Beijing, Shanghai, and Tianjin, still have very high *hukou* acquisition barriers, with settlement probability below 5%. There are 15 regions that have achieved a low threshold of *hukou* acquisition within the region, which can be considered to have largely realized a partially unified large labor market. They are Shanxi, Liaoning, Jilin, Heilongjiang, Jiangxi, Shandong, Guangxi, Chongqing, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Ningxia, and Xinjiang.

Apart from the above 15 cities, there are 3 provinces with some special situation. Inner Mongolia Autonomous Region has achieved a low settlement threshold for most of its cities, with settlement probability exceeding 80%, and in many cases, surpassing 90%. However, the settlement probability for Hohhot, the capital of Inner Mongolia, is only 64.85%. In Fujian and Henan, the provincial capital city has reached the low threshold while some cities within the province yet. In Fujian province, Xiamen's settlement probability is only 27%, and Longyan's is 79% which is near 80%. In Henan province, the settlement probability of Zhoukou, Shangqiu, Luoyang and Jiaozuo are all over 70% and near 80%.

For the remaining 10 provinces, both the provincial capital cities and some of the other prefecture-level cities within the province have not achieved a low settlement threshold. Firstly, in provinces Hebei, Hunan, Hainan, Sichuan, and Qinghai, apart from their provincial capital cities, there are another city without realizing low threshold. Secondly, in provinces Zhejiang, Anhui, Jiangsu and Hubei, apart from their provincial capital cities, there are still two to five cities within each province with settlement probability below 80%. Thirdly, 13 cities out of 21 cities in Guangdong province have not reached a low threshold of *hukou* acquisition. This is primarily due to the high level of population inflow in this province.

Furthermore, to have an idea of the evolution of the settlement probability at the provincial level, we take a weighted average of the settlement probability of cities. The weight is the proportion of the permanent population of each city-level administrative unit to the total floating population of the province. Fig. E.1 in Appendix E displays the settlement probability for each province from 1996 to 2022. Other than Beijing, Tianjin and Shanghai, all other regions experienced a clear increasing trend in the settlement probability.

4. A general equilibrium spatial quantitative model

In this section, we refer to Diamond (2016), Zhang et al. (2017) and Piyapromdee (2021) to build a simple general spatial equilibrium model incorporating settlement probability to help investigate the possible impacts of *hukou* reform.

4.1. Labor market

The total production function in city c is:

$$Y_c = B_c N_c^\alpha M_c^\beta K_c^{1-\alpha-\beta} \quad (2)$$

B_c is the total factor productivity of city c ; N_c is the local urban labor force, assuming that this quantity is fixed; M_c is the number of non-local urban labor force; K_c represents material capital. $\alpha + \beta < 1, 0 < \beta < 1$.

The wages of local and non-local workers are W_c^l and W_c^m , respectively, and the price of capital is p_k . If the product price is standardized to 1, the profit-maximizing problem is:

$$\text{Max } \pi_c = Y_c - W_c^m N_c - W_c^m M_c - p_k K_c \quad (3)$$

Solving this problem, we have:

$$\beta B_c N_c^\alpha M_c^{\beta-1} K_c^{1-\alpha-\beta} = W_c^m \quad (4)$$

$$\alpha B_c N_c^{\alpha-1} M_c^\beta K_c^{1-\alpha-\beta} = W_c^n \quad (5)$$

For migrant i in city c , the utility-maximizing problem is:

$$\text{Max } U_{ic}^m = H_i^m C_i^{m(1-\lambda_m)} A_{ic}^m \quad (6)$$

$$\text{s.t. } R_c H_i^m + C_i^m = W_c^m \quad (7)$$

R_c is housing rent, H_i^m is housing consumption, C_i^m is non-housing consumption, W_c^m is wage. A_{ic}^m represents the actual public services enjoyed, $0 < \lambda_m < 1$. Then it's easy to get:

$$H_i^m = \lambda_m \frac{W_c^m}{R_c}, \quad C_i^m = (1 - \lambda_m) W_c^m \quad (8)$$

Then the indirect utility function is:

$$V_{ic}^m = (1 - \lambda_m)^{1-\lambda_m} W_c^{m(1-\lambda_m)} A_{ic}^m \left(\frac{\lambda_m W_c^m}{R_c} \right)^{\lambda_m} \quad (9)$$

The public services enjoyed by migrants are affected by factors such as the settlement probability and the level of social capital SC_{ic}^m ,

$$\ln(A_{ic}^m) = A_c^{nhk} + \Delta A_c^{hk} hkprob_c + SC_{ic}^m + \varepsilon_{ic}, \quad (10)$$

Among them, A_c^{nhk} refers to public services (such as public transportation) and other exogenous environmental conditions (such as climate) unrelated to registered residence, ΔA_c^{hk} refers to the gap between current residence and registered residence in public services related to *hukou* registration, and the most important is public education. For underdeveloped cities, the proportion of secondary and tertiary industries is relatively low, employment opportunities are also relatively scarce, and there is a trend of loss of high-quality educational resources, with ΔA_c^{hk} being very low or even 0; For more developed cities, ΔA_c^{hk} is relatively large. $hkprob_c$ represents settlement probability. The higher the variable, the higher the probability of obtaining local public services. The impact of other unobservable individual and urban characteristics is caused by random shocks ε_{ic} , which is assumed to have the distribution of type I extreme value, with a probability density function $f(\varepsilon) = e^{-\varepsilon} e^{-e^{-\varepsilon}}$, and the cumulative distribution function is $F(\varepsilon) = e^{-e^{-\varepsilon}}$. Thus, the logarithm form of the indirect utility function is as in Eq. (11).

$$\ln V_{ic}^m = (1 - \lambda_m) \ln(W_c^m) + \lambda_m \ln\left(\frac{\lambda_m W_c^m}{R_c}\right) + A_c^{nhk} + \Delta A_c^{hk} hkprob_c + SC_{ic}^m + \varepsilon_{ic} \quad (11)$$

According to the classical discrete choice model of type I extreme value distribution, the probability of an individual living in city c is:

$$Pr_{ic}^m = \frac{\exp(V_{ic}^m)}{\sum_k \exp(V_{ik}^m)} = \frac{\exp\left((1 - \lambda_m) \ln(W_c^m) + \lambda_m \ln\left(\frac{\lambda_m W_c^m}{R_c}\right) + A_c^{nhk} + \Delta A_c^{hk} hkprob_c + SC_{ic}^m\right)}{\sum_k \exp\left((1 - \lambda_m) \ln(W_k^m) + \lambda_m \ln\left(\frac{\lambda_m W_k^m}{R_k}\right) + A_k^{nhk} + \Delta A_k^{hk} hkprob_k + SC_{ik}^m\right)} \quad (12)$$

For those existing floating population, if the settlement probability changes, then we have:

$$\frac{\partial Pr_{ic}^m}{\partial hkprob_c} = Pr_{ic}^m (1 - Pr_{ic}^m) \frac{\partial V_{ic}^m}{\partial hkprob_c} = Pr_{ic}^m (1 - Pr_{ic}^m) \Delta A_{ic}^n \quad (13)$$

It's common knowledge that ΔA_{ic}^n is larger in more developed cities, while ΔA_{ic}^n is smaller or even zero in less developed cities. Thus, we have proposition 1 as follows:

- (1) In more developed cities, the quality of public services is higher, and the willingness of the existing floating population to settle down is stronger. However, the threshold for settling down in more developed cities is higher, so there may be a phenomenon of "willing to settle down but unable to do so".
- (2) However, in underdeveloped cities, the quality of public services is relatively low, and the willingness of the existing floating population to settle down is not strong. The threshold for settling down in less developed cities is lower, so there may be a phenomenon of "being able to settle down but not willing to settle down".

4.2. Urban housing market

The increase in settlement probability may also affect the flow of population into cities, which will further produce a general equilibrium effect through housing demand while affecting the urban labor market. Therefore, it should be analyzed in combination with the housing market.

Assuming that the local labor force has their own housing and does not need to rent, their demand for housing is constant and their extra housing supply for rent is $H_c^s = H_c$. The demand for housing by migrant labor force i is determined by $H_i^m = \lambda_m \frac{W_c^m}{R_c}$. The total demand for housing by non-local labor force in the entire city c is:

$$H_c^d = M_c \lambda_m \frac{W_c^m}{R_c} = \frac{M_c \lambda_m W_c^m}{R_c} \quad (14)$$

Assuming $P_c = \frac{R_c}{r}$. Then we have housing market equilibrium:

$$\frac{\lambda_m W_c^m}{R_c} = \frac{\lambda_m W_c^m}{P_c r} = \frac{H_c}{M_c} \quad (15)$$

4.3. Spatial equilibrium

Labor market and housing markets simultaneously clear requires:

$$V_{ic}^m = (1 - \lambda_m)^{1-\lambda_m} W_c^{1-\lambda_m} A_c^m \left(\frac{H_c}{M_c} \right)^{\lambda_m} = (1 - \lambda_m)^{1-\lambda_m} W_c^{m(1-\lambda_m)} A_c^m H_c^{\lambda_m} M_c^{-\lambda_m} \quad (16)$$

When the population achieves spatial equilibrium distribution, V_{ic}^m will stabilize and can be considered as a constant u . If V_{ic}^m continues to increase, the corresponding wage level W_c^m will decrease as the inflow population will further increase until it stabilizes. Therefore, we can get the following solutions and the calculation details can be found in Appendix F^{15, 16, 17}.

$$\ln(M_c) = c_1 + \frac{1}{1 - \beta + \beta \lambda_m} (A_c^{nhk} + \Delta A_c^{hk} hkprob_c + SC_{ic}^m) \quad (17)$$

$$\ln(W_c^m) = c_2 + \frac{\beta - 1}{1 - \beta(1 - \lambda_m)} (A_c^{nhk} + \Delta A_c^{hk} hkprob_c + SC_{ic}^m) \quad (18)$$

$$\ln(W_c^n) = \ln\left(\frac{\alpha}{\beta N_c}\right) + \frac{\beta}{1 - \beta(1 - \lambda_m)} (A_c^{nhk} + \Delta A_c^{hk} hkprob_c + SC_{ic}^m) \quad (19)$$

$$\ln(P_c) = c_3 + \left(\frac{\beta}{1 - \beta + \beta \lambda_m} \right) \ln(A_c^{nhk} + \Delta A_c^{hk} hkprob_c + SC_{ic}^m) \quad (20)$$

The comparative static equilibrium analysis results are as follows.

$$\frac{\partial \ln(M_c)}{\partial hkprob_c} = \frac{1}{1 - \beta(1 - \lambda_m)} \Delta A_c^{hk} \geq 0 \quad (21)$$

$$\frac{\partial \ln(W_c^m)}{\partial hkprob_c} = \frac{\beta - 1}{1 - \beta(1 - \lambda_m)} \Delta A_c^{hk} \leq 0 \quad (22)$$

$$\frac{\partial \ln(W_c^n)}{\partial hkprob_c} = \frac{\beta}{1 - \beta(1 - \lambda_m)} \Delta A_c^{hk} \geq 0 \quad (23)$$

$$\frac{\partial \ln(P_c)}{\partial hkprob_c} = \frac{\beta}{1 - \beta(1 - \lambda_m)} \Delta A_c^{hk} \geq 0 \quad (24)$$

Since ΔA_{ic}^n is larger in more developed cities and ΔA_{ic}^n is smaller or even zero in less developed cities, we have proposition 2 as follows.

- (1) For developed cities, hukou reform and the improvement of settlement probability will attract the inflow of people from other places, reduce the wages of migrants, increase the wages of natives, and push up urban housing prices.

¹⁵ $c_1 = \frac{(1-\lambda_m)}{1-\beta+\beta\lambda_m} (\ln(1-\lambda_m)\beta B_c N_c^\alpha K_c^{1-\alpha-\beta}) + \frac{\lambda_m}{1-\beta+\beta\lambda_m} \ln(H_c) - \frac{1}{1-\beta+\beta\lambda_m} \ln u$

¹⁶ $c_2 = \ln(\beta B_c N_c^\alpha K_c^{1-\alpha-\beta}) + (\beta - 1)c_1$

¹⁷ $c_3 = c_1 + c_2 + \ln(\lambda_m) - \ln(H_c r)$

- (2) For underdeveloped cities (such as the fourth- and fifth-tier cities), *hukou* reform and the improvement of settlement probability will have little even no impact on migrants' inflow, wages and urban housing prices.

5. Empirical analysis

The above theoretical model shows that in a unified market, the *hukou* reform will have an impact on migrants, labor wages and housing prices. If empirical evidence can show similar relationships, it indicates that China's labor market is relatively effective and has achieved a certain degree of labor market integration.

5.1. Mismatch between settlement probability and migrants' settlement intentions

We will first test proposition 1. Cheng et al. (2022) stated that there is a structural mismatch between the urbanization policy and rural migrant workers' willingness to settle down in cities which is a dilemma of “willing to settle down but unable to do so, able to settle down but unwilling to do so”. They use city size to proxy the threshold of settling down in the city. However, the settlement probability index we constructed in this paper enables us to provide more accurate analysis. More specifically, we use settlement probability in each city in 2016 and combine the data from the 2017 wave of the China Migrant Dynamic Survey (CMDS). Fig. 4 shows the kernel density distributions of people who are unwilling to settle down and willing to settle down separately. It suggests that there is a large proportion of migrants who are willing to settle down in cities with high settlement thresholds and a substantial share of migrants who are unwilling to settle down in cities with low settlement thresholds. This verifies the mismatch between the urbanization policy and rural migrant workers' willingness to settle down and sheds light on further *hukou* reforms to improve the reform efficiency.

To empirically test the relationship between settlement intentions and settlement threshold, we use a logit regression model for the analysis as follows:

$$UHRintention_{ic} = \beta_0 + \beta_1 hktthreshold_{c,2016} + X_i\beta + ind_i + occ_i + \varepsilon_{ic} \quad (25)$$

$UHRintention_{ic}$ is the dependent variable, which is a dummy indicating whether migrant i in destination city c is willing to settle down in this city or not. The possible responses include willingness, unwillingness, and undecided, with “undecided” excluded from the analysis. $hktthreshold_{c,2016}$ stands for the settlement threshold of the city c in 2016, which is calculated as 100% minus the corresponding city's settlement probability. X_i comprises a set of important control variables at the city, household, and individual levels. Additionally, we control for industry fixed effects ind_i and occupation fixed effects occ_i . ε_i represents the error term.

Regarding the sample, we applied the following selection criteria. We confined the sample to individuals with jobs. We restricted the age range to 15–64 years, as individuals below 14 and above 65 typically have fewer restrictions on settling. We excluded individuals with pending *hukou* status and those under the “agricultural-to-non-agricultural transition” category, retaining only agricultural or non-agricultural *hukou*. Individuals with the status “in-school learning” were also excluded. Given that settling generally requires legal and stable employment or residence, we retained only individuals who reported moving for work, employment, business, or home demolition and relocation, while excluding cases related to family reunification, education, and training, staying with relatives, or having a registered address. We further eliminated cases where weekly working hours were zero and those with negative or missing monthly income or expenses. Table 2 provides descriptive statistics for the relevant variables.

Table 3 presents the results. Columns (1) to (4) include the whole sample. In column (1), no control variables are included. Column (2) introduces city-level control variables, while column (3) adds household-level control variables. In column (4), individual-level control variables are included. Based on the results in column (4), there is a significant positive correlation between settlement thresholds in cities and willingness among migrants to settle down. This suggests that migrants are more willing to settle down in cities with higher settlement thresholds. Other factors that significantly and positively influence the intentions to settle down include intraprovincial migration, having fewer family members, owning housing property, having a non-agricultural *hukou*, being an agricultural *hukou* holder without contracted land, higher levels of education, shorter weekly working hours, having medical insurance, longer duration of residence, and having children who have moved with the individual. The willingness to settle exhibits a inverted U-shaped relationship with age, meaning that on average as age increases, the intentions to settle first rise and then fall.

If we only consider samples from cities with settlement probabilities greater than or equal to 95%, defining them as zero settlement threshold cities, about 10% of the samples remain. Among these, only 34% are willing to settle, while 66% are unwilling. The factors influencing the willingness of migrants in these zero-threshold cities to settle are analyzed in columns (5), (6), and (7) of Table 3. According to the results in column (7), the main factors affecting whether migrants in zero-threshold cities are “able to settle but unwilling to do so” include long-distance migration (interprovincial migration), agricultural *hukou*, lower levels of education, and not having medical insurance. In relative terms, those with a higher willingness to settle tend to have a non-agricultural *hukou*, no contracted land with agricultural *hukou*, higher levels of education, medical insurance coverage, and children who have moved with them. If low-threshold cities aim to further increase the willingness of migrants to settle and increase their *hukou* urbanization rates, they can focus on these factors. For example, they can promote the settlement of agricultural *hukou* holders without contracted land, improve education levels, enhance medical insurance coverage, and better address the phenomenon of left-behind children, promoting family-oriented mobility. Particularly, for the agricultural *hukou* holders without contracted land, local governments in zero-threshold cities should intensify the promotion of settlement policies to meet the demands of this segment of migrants.

Furthermore, in cities with high or even 100% settlement probabilities, there are still cases where individuals are eligible and

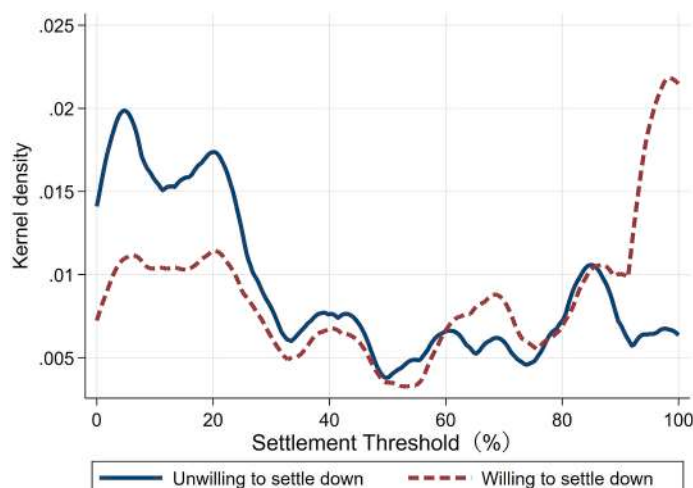


Fig. 4. Migrants' Settlement Intentions in 2017 and Settlement Threshold in 2016.

Table 2
Descriptive Statistics.

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Dependent variable					
Settlement intentions in 2017 (Willing = 1, Not willing = 0)	81,977	0.52	0.50	0	1
Key independent variable					
Settlement threshold in the current city in 2016 (%)	81,977	49.48	35.40	0.00	99.92
Control variables: City-level					
Migration region (Within the city = 0; Cross-province = 1; Cross-city = 2)	81,977	1.15	0.67	0	2
The ratio of housing price to disposable income	81,977	24.75	13.94	5.81	93.43
Control variables: Household-level					
Number of family members living together	81,977	3.11	1.19	1	10
Housing type (Renting or other = 0, Own house = 1)	81,977	0.23	0.42	0	1
The ratio of monthly household expenditures to income	81,914	0.56	1.88	0.006	400
Control variables: Individual-level					
Age	81,977	36.26	9.48	15	64
Gender (Male = 1, Female = 0)	81,977	0.59	0.49	0	1
Hukou type (Agricultural = 1, Non-agricultural = 0)	81,977	0.82	0.38	0	1
Land Ownership (Non-agricultural hukou; Yes = 1; No = 2)	81,977	1.08	0.73	0	2
Years of education received	81,977	10.32	3.34	0	19
Weekly working hours	81,977	57.19	17.68	1	99
Health insurance purchase (Yes = 1, No = 0)	81,977	0.26	0.44	0	1
Number of years lived in the current place	81,977	6.12	5.86	0	47
Marital status (Single or divorced = 0, Married = 1)	81,977	0.83	0.38	0	1
Accompanying children (No children = 0, With = 1, Without = 2)	81,977	0.94	0.93	0	2

willing to settle but have not settled. This might be attributed to information asymmetry related to the settlement process and the possible existence of unobserved hidden settlement barriers. One such hidden barrier is that local governments may not fully align their actual implementation of settlement policies with their publicly available policy documents. Taking Dongguan City as an example, according to the “Notice of the General Office of the Dongguan Municipal People's Government on the Issuance of the Implementation Plan for Promoting Non-Resident Population Settlement in the City” in 2018, recent graduates of colleges and vocational schools are categorized as a group with fully relaxed settlement restrictions, and relevant restrictions should be unequivocally removed. Based on this, the settlement probability in Dongguan in 2018 was 62.1%, which was derived from the 1% Population Sample Survey data in 2015. However, when applying for *hukou* on the Dongguan Municipal Human Resources and Social Security Bureau's official website, various restrictions are imposed on the qualifications for talent settlement, including requirements such as holding legal employment, engaging in business, and participating in social insurance. For example, master's degree holders must be under 50 years old; full-time bachelor's degree holders must be under 45 years old; full-time junior college graduates must be under 40 years old; non-full-time undergraduate degree holders must be under 35 years old and must have paid social basic pension insurance for three years; and graduates of vocational schools and technical schools in the province within two years. Considering these restrictions, the settlement probability in Dongguan City in 2018 cannot be as high as 62.1%. Similar situations may exist in other low-threshold cities. Therefore, due to the existence of these hidden barriers, the quantitative method used in this study may not capture these hidden factors, leading to cases where individuals are “able to settle, willing to settle, but have not settled”.

Table 3
Factors Influencing the Settlement Intentions.

DV: Settlement intentions in 2017	All cities				Zero-threshold cities (with the probability over 95%)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Settlement threshold in 2016	0.015*** (0.000)	0.010*** (0.000)	0.011*** (0.000)	0.011*** (0.000)			
Cross-province		−0.081*** (0.024)	−0.018 (0.024)	0.023 (0.025)	−0.351*** (0.063)	−0.339*** (0.064)	−0.360*** (0.067)
Cross-city within the province		0.231*** (0.023)	0.253*** (0.023)	0.218*** (0.024)	−0.038 (0.056)	−0.035 (0.056)	−0.073 (0.057)
Housing price / disposable income		0.026*** (0.001)	0.026*** (0.001)	0.019*** (0.001)	0.026*** (0.006)	0.026*** (0.006)	0.026*** (0.006)
Number of family members			−0.066*** (0.006)	−0.021** (0.008)		−0.101*** (0.020)	−0.019 (0.025)
Own house			0.375*** (0.018)	0.089*** (0.019)		0.007 (0.055)	−0.102* (0.059)
Monthly expenditures / income			0.068 (0.053)	0.046 (0.046)		−0.077 (0.074)	−0.028 (0.070)
Age				0.041*** (0.006)			−0.001 (0.021)
Age square				−0.001*** (0.000)			−0.000 (0.000)
Male				−0.000 (0.016)			−0.053 (0.051)
Agricultural <i>hukou</i>				−0.820*** (0.040)			−0.669*** (0.136)
Agricultural <i>hukou</i> with land				−0.030 (0.036)			−0.142 (0.124)
Agricultural <i>hukou</i> without land				0.309*** (0.037)			0.354*** (0.126)
Years of education received				0.053*** (0.003)			0.066*** (0.010)
Weekly working hours				−0.007*** (0.000)			−0.003* (0.001)
Purchasing health insurance				0.291*** (0.021)			0.215*** (0.079)
Number of years lived in the city				0.021*** (0.001)			0.003 (0.005)
Married				−0.030 (0.028)			−0.124 (0.089)
With accompanying children				0.260*** (0.025)			0.287*** (0.072)
Without accompanying children				−0.059*** (0.017)			0.038 (0.056)
Industry dummy	✓	✓	✓	✓	✓	✓	✓
Occupation dummy	✓	✓	✓	✓	✓	✓	✓
pseudo R ²	0.048	0.064	0.070	0.109	0.015	0.018	0.049
N	81,977	81,977	81,914	81,914	8274	8261	8261

Notes: *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively, with standard errors in parentheses.

In summary, the existence of the mismatch between *hukou* policies and migrants' willingness to settle down suggests that there are other factors that the government should take into account to improve the efficiency of *hukou* reforms. Therefore, to develop a unified national labor market, it is necessary to address *hukou* reforms in more cities while considering the overall situation at the national level.

5.2. The impact of *hukou* reform on migrants' inflow, migrants' wages and housing price

Next, we conduct the following three regressions to test proposition 2.

5.2.1. The impact of *hukou* reform on migrant inflow at the macro level

We construct the following panel regression model:

$$y_{cp} = \beta_0 + \beta_1 hkprob_{cp} + X_{cp}\beta + city_c + period_p + \varepsilon_{cp} \quad (26)$$

y_{cp} reflects the population inflow of city c during time period p , including the proportion of population inflow to total population and the logarithmic value of population inflow. The calculation of population inflow is similar to [Chen et al. \(2022\)](#), [Imbert et al. \(2022\)](#) and [Jin and Zhang \(2023\)](#). Specifically, using microdata from the 2000, 2005, 2010 and 2015 population censuses and the time of departure from the registered residence, the population inflow of each city from 1996 to 2015 is calculated, and then the population

inflow is summed up for each five-year time period. We limit the sample age to 15–64 years old, and remove students in school, only considering the population of agricultural transfer within the city, and both agricultural and non-agricultural cross-city or cross-province inflow into various cities. $hprob_{c,p}$ stands for the average settlement probability of the city c during each time period p . $X_{c,p}$ comprises various city-level control variables at the initial year for each period p , including log of average urban income, log of average housing price and primary sector ratio. $\varepsilon_{c,t}$ represents the error term. Descriptive statistics are shown in Table G.1 in Appendix G.

The results in Table 4 show that *hukou* reform can promote population inflow, especially for third-tier cities and above, while there is no significant impact on the population inflow in fourth- and fifth-tier cities.¹⁸

5.2.2. The impact of hukou reform on migrants' wages at the micro level

In this part, we will use micro-level data from CMDS from 2012 to 2018 to investigate the impact of *hukou* reform on migrants' wages. The regression specification is as Equation (27).

$$\log wage_{ict} = \beta_0 + \beta_1 hprob_{c,t-1} + X_i \beta + ind_i + occ_i + city_c + year_t + \varepsilon_{ict} \quad (27)$$

$\log wage_{ict}$ is the dependent variable, which is the logarithm of migrant i 's wage in city c in year t . Here we use the last month income as a proxy of wage. We only consider those whose income last month was over 1000 Yuan. $hprob_{c,t-1}$ is one-year lag of settlement probability in city c . For interpretation convenience, here we use the actual value but not percentage points. X_i comprises a set of important control variables including gender, age, age square, ethnicity, education years, *hukou* type and marriage status. Additionally, we control for industry fixed effects, occupation fixed effects, city fixed effects and year fixed effects. Descriptive statistics are shown in Table G.4 in Appendix G.

The results in Table 5 show that *hukou* reform can significantly reduce the migrants' wages, which is similar to the results in An et al. (2024). We also find that the negative impact is much more salient in third-tier cities and above, while it's not significant in fourth- and fifth-tier cities.

5.2.3. The impact of hukou reform on average wage and housing price at the macro level

In this part, we will use aggregate level data mainly from China Economic Information Center (CEIC) from 2000 to 2020 to investigate the impact.¹⁹ It should be noted that we cannot distinguish between the wages of locals and migrants using this data. We follow Zhang et al. (2017) and construct the following panel regression model:

$$\Delta y_{c,p} = \beta_0 + \beta_1 \Delta hprob_{c,p} + \Delta X_{c,p} \beta + city_c + period_p + \varepsilon_{c,p} \quad (27)$$

$\Delta y_{c,p}$ represents a five-year change of wage or housing price in city c in period p . $\Delta hprob_{c,p}$ is the five-year change of settlement probability. $\Delta X_{c,p}$ are five-year change of control variables, which include the ratio of foreign direct investment to GDP, GDP per capita, the share of non-agricultural sector outputs in GDP, a set of public goods measures including education expenditure per student in logarithm, the number of hospital beds (per 1000 people), and teacher-student ratio. Descriptive statistics are shown in Table G.5 in Appendix G.

The results in Table 6 show that *hukou* reform can significantly push up urban housing prices, especially for third-tier cities and above, while there is no significant impact in fourth - and fifth-tier cities. What's more, we find some positive impact of *hukou* reform on the average wage for all workers, since the wage data here do not distinguish between the wages of locals and migrants. Compared with the above results of the negative impact on migrants' wages, we can infer that the impact on natives' wages may be much more positive.

6. Comparison with other urbanization policies

In addition to the *hukou* reform policy, there are mainly residence permit policies and urban land policies aiming to promote urbanization. But as a whole, *hukou* reform is much more important to remove the migration barriers to build a national unified labor market.

6.1. The policy of equalization of public services based on residence permits

In March 2014, China's *National New Urbanization Plan (2014–2020)* required the establishment of a residence permit system for the floating population.²⁰ A residence permit serves as a carrier to establish and improve a basic public service provision mechanism. Later in 2016, the *Provisional Regulations on Residence Permits* stipulated that residence permit holders can enjoy “three rights, six services, and seven conveniences” (hereinafter referred to as the “National Positive List”), mainly including compulsory education, basic public

¹⁸ We use the five-year lagged aging level in each city as the instrumental variable (IV) to investigate the causal relationship. The first-stage results are shown in Table G.2 in Appendix G, which indicates that the IV is valid. The second-stage results are shown in Table G.3 in Appendix G, which are similar to Panel A in Table 4.

¹⁹ <https://insights.ceicdata.com>. Founded in 1992 by a team of expert economists and analysts, CEIC Data provides the most expansive and accurate data insights into both developed and developing markets.

²⁰ https://www.gov.cn/zhengce/202203/content_3635155.htm

Table 4The Impact of *Hukou* reform on migrant inflow.

	(1)	(2)	(3)	(4)	(5)	(6)
	The proportion of population inflow in 5 years to the total population			Logarithm of population inflow within 5 years		
Panel A: All cities						
Average settlement probability	0.102*** (0.006)	0.054*** (0.012)	0.042*** (0.012)	0.018*** (0.001)	0.004** (0.002)	0.002 (0.002)
City FE		✓	✓		✓	✓
Year FE		✓	✓		✓	✓
CV			✓			✓
R ²	0.7170	0.8025	0.8200	0.6345	0.8290	0.8401
N	974	974	967	974	974	967
Panel B: Higher-tier cities (third-tier and above)						
Average settlement probability	0.103*** (0.008)	0.111*** (0.021)	0.096*** (0.022)	0.018*** (0.001)	0.008*** (0.002)	0.005** (0.002)
City FE		✓	✓		✓	✓
Year FE		✓	✓		✓	✓
CV			✓			✓
R ²	0.8057	0.8479	0.8649	0.6339	0.8308	0.8428
N	431	431	428	431	431	428
Panel C: Lower-tier cities (fourth-tier and fifth-tier)						
Average settlement probability	0.102*** (0.007)	−0.003 (0.012)	−0.008 (0.011)	0.018*** (0.001)	−0.002 (0.002)	−0.004 (0.003)
City FE		✓	✓		✓	✓
Year FE		✓	✓		✓	✓
CV			✓			✓
R ²	0.4526	0.7192	0.7376	0.4646	0.7796	0.7940
N	543	543	539	543	543	539

Notes: CV includes log of average urban income, log of average housing price and primary sector ratio at the initial year for each period. The classification of city type is based on the First Financial Weekly's classification of Chinese cities in 2016 which is the one widely recognized categorization as [Zhang \(2020\)](#) has summarized.

Table 5The Impact of *Hukou* Reform on Migrants' Wages.

	(1)	(2)	(3)	(4)
Panel A: All cities				
One -year lag of settlement probability	−0.103*** (0.027)	−0.094*** (0.025)	−0.087*** (0.025)	−0.086*** (0.024)
CV			✓	✓
Industry dummy and Occupation dummy		✓		✓
City FE and Year FE	✓	✓	✓	✓
R ²	0.1220	0.2092	0.2323	0.2836
N	889,588	880,775	889,588	880,775
Panel B: Higher-tier cities (third-tier and above)				
One-year lag of settlement probability	−0.089*** (0.029)	−0.083*** (0.026)	−0.075*** (0.027)	−0.077*** (0.026)
CV			✓	✓
Industry dummy and Occupation dummy		✓		✓
City FE and Year FE	✓	✓	✓	✓
R ²	0.1326	0.2287	0.2559	0.3102
N	709,564	703,317	709,564	703,317
Panel C: Lower-tier cities (fourth-tier and fifth-tier)				
One -year lag of settlement probability	−0.036 (0.024)	−0.036 (0.024)	−0.036 (0.024)	−0.035 (0.024)
CV			✓	✓
Industry dummy and Occupation dummy		✓		✓
City FE and Year FE	✓	✓	✓	✓
R ²	0.0700	0.1317	0.1390	0.1813
N	180,024	177,458	180,024	177,458

Notes: CV include gender, age, age square, ethnicity, education years, *hukou* type and marriage status. The classification of city type is based on the First Financial Weekly's classification of Chinese cities in 2016 which is the one widely recognized categorization as [Zhang \(2020\)](#) has summarized.

Table 6The Impact of *Hukou* Reform on the Change of Wages and Housing Price.

	(1)	(2)	(3)	(4)
	Five-year Change of Wages		Five-year Change of Housing Price	
Panel A: All cities				
Five-year change of settlement probability	12.652* (6.939)	10.734* (6.317)	5.461*** (1.533)	5.305*** (1.447)
CV		✓		✓
City FE and Period FE	✓	✓	✓	✓
R ²	0.749	0.769	0.394	0.427
N	1145	1099	1149	1102
Panel B: Higher-tier cities (third-tier and above)				
Five-year change of settlement probability	15.842 (10.453)	18.029* (9.676)	8.299** (3.655)	8.634** (3.472)
CV		✓		✓
City FE and Period FE	✓	✓	✓	✓
R ²	0.811	0.831	0.437	0.493
N	476	463	476	463
Panel C: Lower-tier cities (fourth-tier and fifth-tier)				
Five-year change of settlement probability	5.296 (9.349)	−1.531 (8.496)	0.813 (0.820)	1.100 (0.869)
CV		✓		✓
City FE and Period FE	✓	✓	✓	✓
R ²	0.707	0.738	0.640	0.639
N	669	636	673	639

Notes: CV include the five-year change of the following variables: ratio of foreign direct investment to GDP, the share of non-agricultural sector outputs in GDP, a set of public goods measures including education expenditure per student in logarithm, the number of hospital beds (per 1000 people), and teacher-student ratio. The classification of city type is based on the First Financial Weekly's classification of Chinese cities in 2016 which is the one widely recognized categorization as Zhang (2020) has summarized.

employment services and so on.²¹ However, there is still a big gap between the residence permit and the local *hukou*. One who has got a local *hukou* can immediately obtain full civil rights, civil benefits and all public services, and a local *hukou* is permanent. In contrast, obtaining a residence permit follows a “positive list” management model, where the rights and benefits involved are only a small part of all citizen rights and benefits, and those outside the positive list cannot be enjoyed. Even according to the latest *National Basic Public Service Standards (2023 Edition)*, the basic public services that residence permit holders can enjoy still do not specifically involve substantive rights that the floating population urgently hopes for, such as public rental housing, receiving middle and high school education, and taking high school entrance examination and the college entrance examination.²²

In addition to the “National Positive List”, local governments have also formulated “Local Positive List” in accordance with the requirements of Article 14 of the *Provisional Regulations on Residence Permits*, which states “creating conditions, expanding scope, and improving standards”. Due to the significant discretion of local governments in implementing the residence permit system, even the rights listed on the national positive list may still have various explicit or implicit thresholds, resulting in a significant discount in the actual level of public services enjoyed by residence permit holders. For example, compulsory education has been stipulated at the national level as a basic public service that residence permit holders can enjoy, but local governments may attach restrictions during specific implementation. Moreover, local governments lack sufficient motivation to expand the scope of rights and public services for migrants, resulting in a “positive local list” filled with many “useless” rights, but lacking many substantive rights that migrants urgently hope for. In addition, the residence permit has a validity period and needs to be signed once a year.

As the previous analysis shows, the settlement threshold has almost reached zero in small and medium-sized cities and it is very easy for migrants to obtain local *hukou* there. However, the settlement threshold is still quite high, and the migrants there can only obtain basic public services by obtaining a residence permit. Even though, the mandatory use of residence permits and points systems for migrants to cities in Shanghai, Shenzhen, and Beijing is more about population control than social equality and equalizing migrant services with locals as Dong and Goodburn (2020) show.

6.2. The policy of linking the increase in urban construction land scale with the increase of settled agricultural migrants

With regard to urban land policy, the Ministry of Land and Resources issued a policy in September 2016 stipulated that based on the number of agricultural transfer population settled in cities, the scale of new urban construction land should be reasonably determined

²¹ https://www.gov.cn/zhengce/content/2015-12/12/content_10398.htm

²² <https://www.gov.cn/zhengce/zhengceku/202308/P020230810416348836015.pdf>

to ensure its land demand.²³ What's more, according to the 14th Five Year Plan for the Implementation of New Urbanization issued in June 2022, the revision of national spatial planning at all levels should prioritize the construction of compulsory education school buildings and affordable housing in areas with concentrated population flow.²⁴ However, these policies do not cover unsettled migrants. Moreover, the central urban areas of super mega and megacities will not be allocated new construction land due to the absorption of agricultural migrants.

6.3. Other supporting policies related to urbanization of agricultural migrants

Apart from the above two policies, there are still other supporting policies related to the urbanization of agricultural migrants according to the 14th Five Year Plan for the Implementation of New Urbanization issued in June 2022. Some important measures are listed as follows.

- (1) Financial incentives. The central finance and provincial finance will respectively provide support to regions that have attracted a large number of cross-provincial and cross-municipal agricultural transfer populations.
- (2) Transfer payment. This plan requires promoting the allocation of investment within the central budget to cities with a high number of agricultural migrant workers. When arranging funds for urban infrastructure construction and affordable housing, the central government will provide appropriate support to areas with a high number of agricultural migrant workers.
- (3) Education policies. Local governments should ensure the right of migrant children to receive education in their current place of residence, with public schools as the main focus to provide compulsory education protection. Moreover, the local governments with net inflow of migrants should also gradually include the agricultural migrant population in the scope of secondary vocational education, general high school education, and inclusive preschool education guarantee.
- (4) Social insurance policies. Local governments should gradually loosen the *hukou* restrictions on residents to participate in social insurance in their permanent residence or employment, and fully implement the responsibility of enterprises to pay social insurance premiums for migrant workers.

7. Conclusion and discussion

In this paper, we construct a comprehensive and objective index to reflect settlement probability at the city level in China from 1996 to 2022. This index quantifies the dynamic changes in *hukou* policies and describes the current status of *hukou* acquisition thresholds across cities. Therefore, this paper can serve as a foundation to explore how to build a unified labor market effectively.

Furthermore, we build a general spatial equilibrium model to investigate the effects of *hukou* reform. In the model, we have urban labor markets and housing markets and incorporate the factor of settlement probability. In addition, we test the theoretical predictions using microdata. We show that there is a mismatch between the settlement probability and people's willingness to settle down. We also find that factors influencing the situation of "being able to settle down but unwilling to do so" are mainly longer migration distances, agricultural *hukou* status, lower educational attainment, and lack of medical insurance coverage. In addition, we find settlement probability is significantly positively correlated with the migrants' inflow, significantly negatively correlated with the wages of migrants and significantly positively correlated with the urban housing prices, especially in higher-tier cities, which are consistent with theoretical derivations and signify the optimistic change of labor market integration in China.

Therefore, to further promote the establishment of a nationwide unified labor market, efforts should be directed toward reducing the *hukou* registration thresholds in cities with persistently low probabilities while concurrently enhancing the promotion and enforcement of existing *hukou* policies in those cities with low thresholds. Then it is necessary to strengthen the publicity of the existing registered residence system reform policies and promote the timely settlement of the floating population who can settle down and are willing to settle down but did not. In addition, efforts should be made to eliminate hidden barriers to settling down, so that the actual implementation of policies is as consistent as possible with policy provisions.

Declarations of interest

None.

Data availability

Data will be made available on request.

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*This study is grateful for the data support of population census micro data by the National Bureau of Statistics - Peking University

²³ https://www.gov.cn/gongbao/content/2017/content_5204901.htm

²⁴ <https://www.gov.cn/zhengce/zhengceku/2022-07/12/5700632/files/7e5eda0268744bebb5c1d4638e86f744.pdf>

Research Data Center.²⁵

Appendix A. Comparison of the new index with existing indexes in the literature

Extant studies, such as Wu and Zhang (2010), Zhang and Tao (2012), Liu (2016), Sun (2017), Fan (2019), Zhang et al. (2019), Sun et al. (2020), and Tian (2024), have conducted quantitative research on city-level settlement thresholds to varying degrees, as shown in Table A.1.

Table A.1

The *hukou* index in the literature.

	Wu and Zhang (2010)	Zhang et al. (2019)	Liu (2016)	Fan (2019)	Sun et al. (2020)	Tian (2024)
Time	One year	Two periods	One year	Each year	Each year	Each year
Specific Time	2010	2000–2013 2014–2016	2015	1997–2010	2010–2016	2001–2007
Data Type	Cross-sec.	Two-Period Panel	Cross-sec.	14-year Panel	7-year Panel	7-year Panel
# of Cities	45	120	63	325	286	247
Minimum	0.0804	0.1331 0.2753	0.0244	0	0.0275	−2
Maximum	3.1762	2.4960 2.6284	0.9268	6	0.8931	+2
Method	Projection Pursuit	Projection Pursuit	Hand score and FAHP	Hand code	Hand score and AHP	Hand code and Machine Learning

Notes: The table only lists the main methods used in the papers. The indexes in Wu and Zhang (2010) and Zhang and Tao (2012) are the same. In Zhang and Tao (2012), Liu (2016) and Zhang et al. (2019), a larger value of the index means higher *hukou* thresholds, while Fan (2019), Sun et al. (2020) and Tian (2024) use a larger number for more relaxing *hukou* policies (i.e., lower *hukou* thresholds). Kinnan et al. (2018) and Wang et al. (2023) have not disclosed the range and other information of their index. Sun (2017)'s index is ignored here because it's similar to Sun et al. (2020).

In contrast, our new *hukou* threshold index panel covers a longer period and include more cities. The method using existing floating population in censuses is also much easier to understand.

To access the validation of our new *hukou* threshold index, we further investigate the correlation between the newly developed index of settlement threshold and existing indexes in the literature. There has been no such comparison in the existing literature to the best of our knowledge. To make them more comparable, we process those indexes in Fan (2019) and Sun et al. (2020) to make a larger number mean a higher threshold of obtaining urban *hukou* in the destination cities. To compare with Zhang et al. (2019), we averaged our index over 2000–2013 and 2014–2016 separately. The results of the correlation analysis, as presented in Table A.2, demonstrate a significant positive correlation between the new and existing indexes. The highest correlation was observed with the *hukou* threshold index constructed by Zhang et al. (2019) for the period 2014–2016, with a correlation coefficient being 0.6998 and the corresponding *p*-value being 0.0000. Similar results were obtained when averaging across various indexes. This suggests that the new index developed in this study aligns with extant indexes.

Table A.2

Correlation between the New Index and Existing Indexes in the Literature.

	Wu and Zhang (2010)	Liu (2016)	Zhang et al. (2019)	Sun et al. (2020)	Fan (2019)
	2010	2015	2000–2013 2014–2016	2010–2016	1997–2010
New index	0.5272***	0.5044***	0.3063*** 0.6998***	0.2187***	0.4958***
<i>P</i> value	0.0002	0.0000	0.0007 0.0000	0.0000	0.0000
# of Cities	45	63	120 120	286	325
Observations	45	63	120 120	2002	4550

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. In Zhang and Tao (2012), Liu (2016), and Zhang et al. (2019), a larger number means a higher *hukou* threshold as our index, so we calculate the correlation directly. Considering the range of the original indexes, we process the index in Sun et al. (2022) as 1 minus the index in their paper, and process the index in Fan (2019) as 6 minus the original index before calculating the correlation. The threshold index in Wang et al. (2023) and Tian (2024) was not disclosed. For cases where there are multiple quantitative results in the same literature, only the main results are used in the table, and the significance of using other results remains unchanged. There are only slight differences in the correlation coefficient values, which are retained for reference.

²⁵ <https://nprdc.pku.edu.cn/index.htm>.

Appendix B. Age distribution of urban population by migration reasons

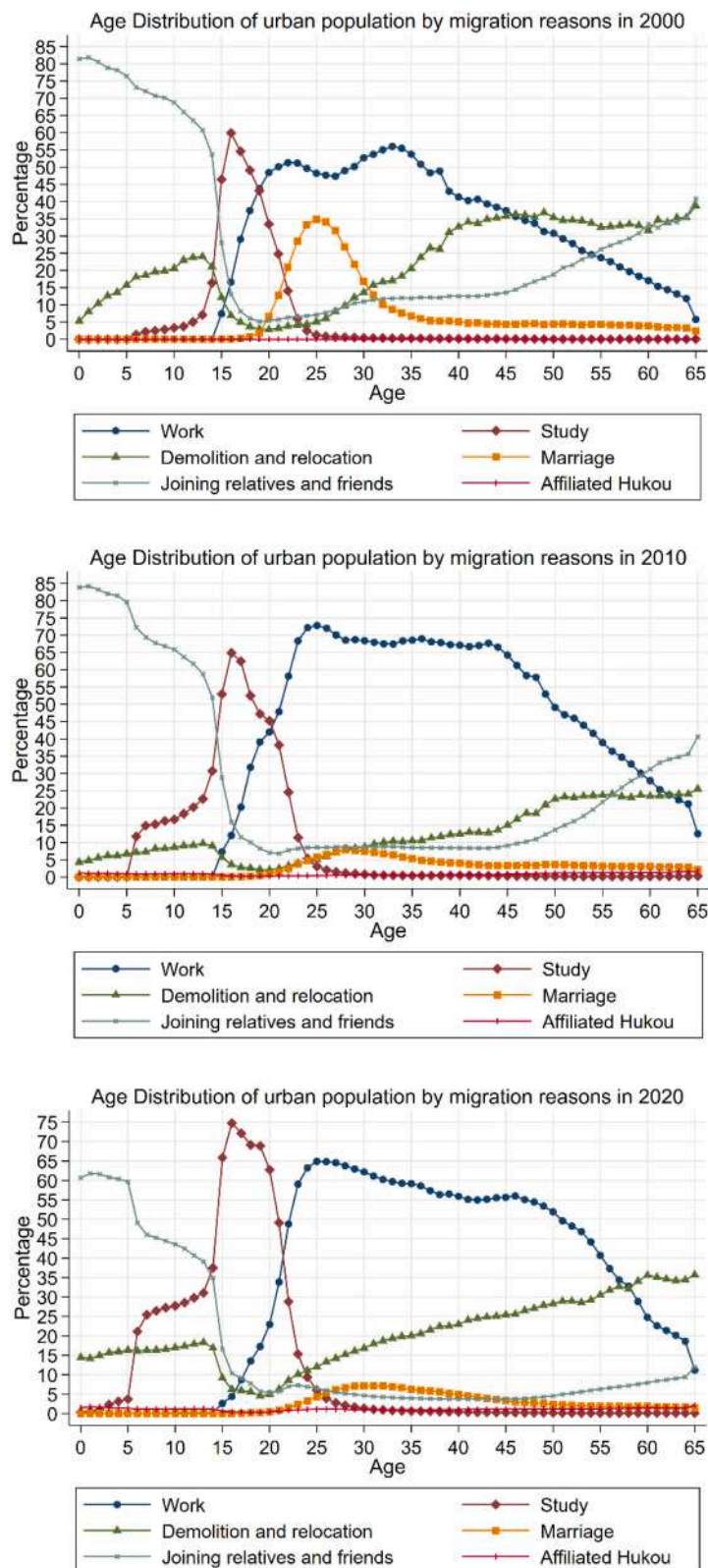


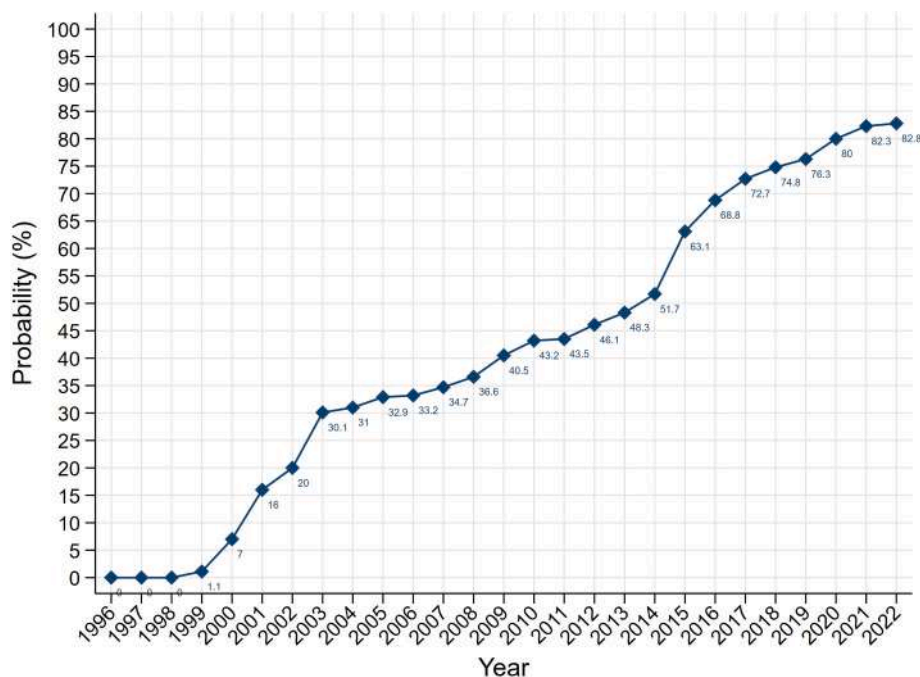
Fig. B.1. Age Distribution of Urban Population by Migration Reasons in 2000, 2010 and 2020.

Notes: The data for 2000 are based on the long-form dataset and do not distinguish between urban, town, and rural areas. The data for 2010 and 2020 are based on the complete dataset and only analyze the portion that migrated to urban areas.

Data Source: China Population Census in 2000, 2010, and 2020.

Appendix C. The dynamics of city-level settlement threshold

We further use the proportion of the permanent population of each city to the national population as a weight to calculate the weighted average settlement probabilities, as demonstrated in Fig. 2 for 331 cities.²⁶ The changing trend closely mirrors that of Fig. C.1. The weighted average settlement probability had exceeded 82% by 2021.

**Fig. C.1.** Weighted Average Settling Down Probability in All Chinese Cities, 1996–2022.

Given that *hukou* policies in different types of cities (e.g., first-tier cities vs second-tier cities) may vary, we also show the temporal changes of settlement probability across city type in Fig. C.2, where the classification of city type is based on the First Financial Weekly's classification of Chinese cities in 2016 which is the one widely recognized categorization as Zhang (2020) has summarized.²⁷ In general, higher-tier cities exhibit a lower settlement probabilities and slower increase of the probability, which contradicts Wang et al. (2023)'s statement that the policy approach distinctions between big, medium and small cities were negligible. First-tier cities consistently maintain lower settlement probabilities, while other cities experience substantial growth after 2014.

²⁶ Zhongwei City in Ningxia Autonomous Region is further excluded since it was not established until 2003.

²⁷ Among these classifications, one widely recognized categorization is the "X-line cities," which includes lists such as the "China City Business Attractiveness Rankings" initiated by the First Financial Weekly in 2013 and the tier classification used by the National Bureau of Statistics since 2012 when releasing housing price indexes. The "China City Business Attractiveness Rankings" employ a methodology similar to PageRank, combining survey data with traditional data sources. It comprehensively assesses over 400 cities, including municipalities and top 100 counties, beyond the traditional first-tier cities from both a corporate and individual perspective. This ranking system holds significant authority and represents one of the influential methods for classifying cities in China.

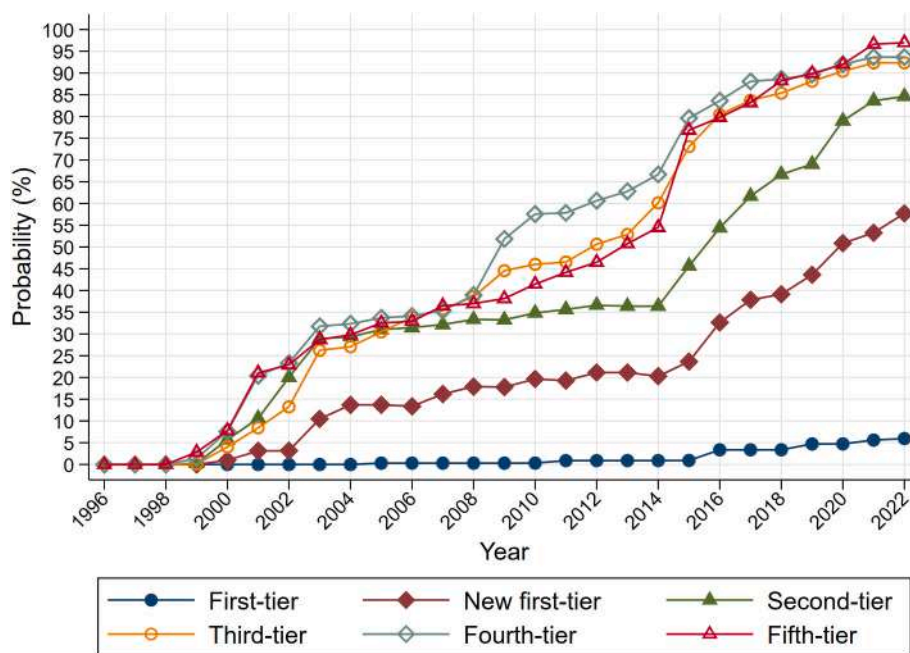


Fig. C.2. Average Settlement Probability for Six Types of Cities from 1996 to 2022.

Appendix D. The city-level household registration requirement in 2022

Table D.1

Hukou Policies for Cities with Settlement Probability below 50% in 2022.

Province	City	Settlement Probability	Current Settlement Policy
Beijing	Beijing	0.19	Point account system, with an annual quota of about 6000.
Shanghai	Shanghai	1.44	1. The number of households transferred and settled was 37,684 in 2021. 2. Individuals with a doctoral degree or fresh master degree.
Tianjin	Tianjin	3.64	1. Point account system, no total quantity limit. In 2020, 26,850 people settled down. 2. Fully liberalize the restrictions on registered residence migration in this city. Agricultural transfer population in urban areas who have legal and stable residences and legal and stable employment in this city can settle down.
Guangdong	Guangzhou	9.08	1. Point account system, 13,000 people settled down in 2022. 2. Individuals with a doctoral degree (≤ 50 years old) or master degree (≤ 45 years old) or bachelor degree (≤ 40 years old).
Jiangsu	Suzhou	9.52	1. Point account system, 10,616 people settled in 2020. 2. Individuals with a doctoral degree (≤ 55 years old) or master degree (≤ 50 years old) or bachelor degree (≤ 45 years old) or a college degree who are no >35 years old and with stable employment.
Zhejiang	Hangzhou	12.94	1. Point account system, 11,144 people settled in 2018. 2. Remove the restrictions on settlement in a county or city. Actual residence and compliance with the requirements for rental management of residential housing.
Guangdong	Shenzhen	13.13	1. Point account system, 10,000 people settled down in 2020. 2. Individuals with a bachelor degree or above (≤ 45 years old) or a college degree or above (≤ 35 years old).
Fujian	Xiamen	27.17	1. Fresh university graduates with a job. 2. Individuals with a bachelor degree or above (≤ 55 years old). 3. Policies in Jimei District, Haicang District, Tong'an District, and Xiang'an District: (1) Individuals with a bachelor degree or above (≤ 50 years old) and being employed. (2) Individuals with a college degree (≤ 50 years old) and being employed. (3) Graduates from technical colleges, employed, graduated after June 2015. (4) Those who have self-built housing, fundraising housing, housing under the name of the employment unit, and are employed.
Guangdong	Zhuhai	34.61	Those who have been legally and stably employed for at least 5 years and have a legally stable residence.
Jiangsu	Nanjing	37.66	1. Point account system. 9393 people settled down in 2022. 2. Remove <i>hukou</i> restrictions in urban areas of Pukou, Liuhe, Lishui, and Gaochun districts. 3. People with a master degree or above, or a bachelor degree (≤ 45 years old) or a college degree (≤ 40 years old).

(continued on next page)

Table D.1 (continued)

Province	City	Settlement Probability	Current Settlement Policy
Anhui	Hefei	42.26	<ol style="list-style-type: none"> 1. Agricultural transfer population who have been employed for >2 years and have a residence (including leasing). 2. Fresh graduates from universities and vocational colleges. 3. Individuals with a master degree or above, or a bachelor degree (≤ 40 years old) 4. Individuals from administered administrative towns in Chaohu and with legal and stable residence (including leasing).
Guangdong	Zhongshan	42.37	<ol style="list-style-type: none"> 1. Have been continuously insured for at least 1 year in the city and own a house. 2. Do not own a house, but have a legal and stable residence (including rental), and have been insured in the city for at least 3 consecutive years. 3. Fresh graduates from universities and vocational colleges. 4. Undergraduate students within five years of graduation; 5. Individuals with a master or doctor degree (≤ 55 years old) or bachelor degree (≤ 55 years old and have participated in social insurance for at least 1 month) or a college degree (≤ 45 years old and have participated in social insurance for at least 6 months).
Zhejiang	Zhoushan	43.19	<ol style="list-style-type: none"> 1. Vocational school (including technical school), college or above: males who are younger than 45 and females who are younger than 40. 2. Individuals with a master degree. 3. Individuals who are younger than 35 and with a labor (employment) contract.
Guangdong	Shantou	44.42	<ol style="list-style-type: none"> 1. Full time college degree or above. 2. Individuals with purchased, self-built, received-gifts, or inherited legally owned property rights housing. 3. Individuals who have rented a house, been employed for at least three years, and earned the "Guangdong Province Residence Permit". 4. Mutual relocation within the city: households with legal and stable residences, or employees recruited.

Notes: The information provided in this section excludes social security considerations, which are approximated by the length of residence. This section also does not consider professional title-related *hukou* acquisition policies. Additionally, it does not consider individuals with unclear definitions or those who cannot be identified through census data, such as "high-level talent needed for the economic and social development of our city, technical and skilled personnel, managerial talents, returning overseas students, and university graduates" as stipulated in the 2016 policy of Zhuhai City. In July 2023, Zhejiang Province introduced new *hukou* policies, which require a comprehensive cancellation of *hukou* acquisition restrictions across the entire province (excluding the urban area of Hangzhou), ensuring the uniform standards for *hukou* acquisition for rural-to-urban migrants from outside the province and local residents, implementing the *hukou* registration system based on the place of habitual residence, and implementing policies for *hukou* acquisition based on having a legitimate and stable residence (including rental) and policies for the relocation of immediate family members, including spouses. Hangzhou City further improved its point-based *hukou* acquisition policy and gradually phased out the annual *hukou* acquisition quota restrictions. However, as of the submission of this article, Zhoushan City in Zhejiang Province, where settlement probability remains below 50%, has not yet issued detailed implementation rules corresponding to these new policies.

Cities with settlement probability ranging from 50 to 80% exhibit the following characteristics. Firstly, many of these cities allow individuals with vocational education backgrounds to acquire *hukou*, and some have relatively lenient quantitative requirements concerning age and residency duration. Secondly, a seemingly loose policy in some underdeveloped cities does not reflect an actual low threshold. For instance, it is required that individuals have legal and stable employment or residence to obtain *hukou* in Yushu in Qinghai Province. However, the proportion of individuals meeting these conditions may not be as high as expected. Similarly, in Xining, although legal and stable employment was the only requirement for *hukou* acquisition in 2021, the proportion of the existing floating population meeting this requirement in 2020 was <75%. Thirdly, cities located in close proximity to the capital have relatively stringent *hukou* acquisition requirements. For example, Langfang has stricter conditions for *hukou* acquisition compared to other cities in the region.

Cities with settlement probability ranging from 80% to 95% exhibit the following characteristics. Firstly, these cities have either eliminated or adopted extremely lenient quantitative requirements. Secondly, some cities have implemented a differentiated approach based on administrative regions within the city, such as Shijiazhuang and Huanggang, which have achieved "single stability" (either stable employment or residence) for county-level cities while maintaining the "double stability" (both stable employment and residence) requirement for urban districts. Additionally, some cities have successfully implemented "single stability" *hukou* acquisition policies, such as Chuzhou in Anhui province.

Cities with settlement probability exceeding 95% can essentially be considered as having zero-threshold policies, which feature two key characteristics. Firstly, individuals who express a desire to acquire *hukou* can do so without any significant barriers, resulting in a genuine zero-threshold policy where the settlement probability reaches 100%. Secondly, these cities require either legal and stable employment or residence (including renting a private house), ensuring the settlement probability remains at or exceeds 95%.

Appendix E. The dynamics of provincial-level settlement threshold

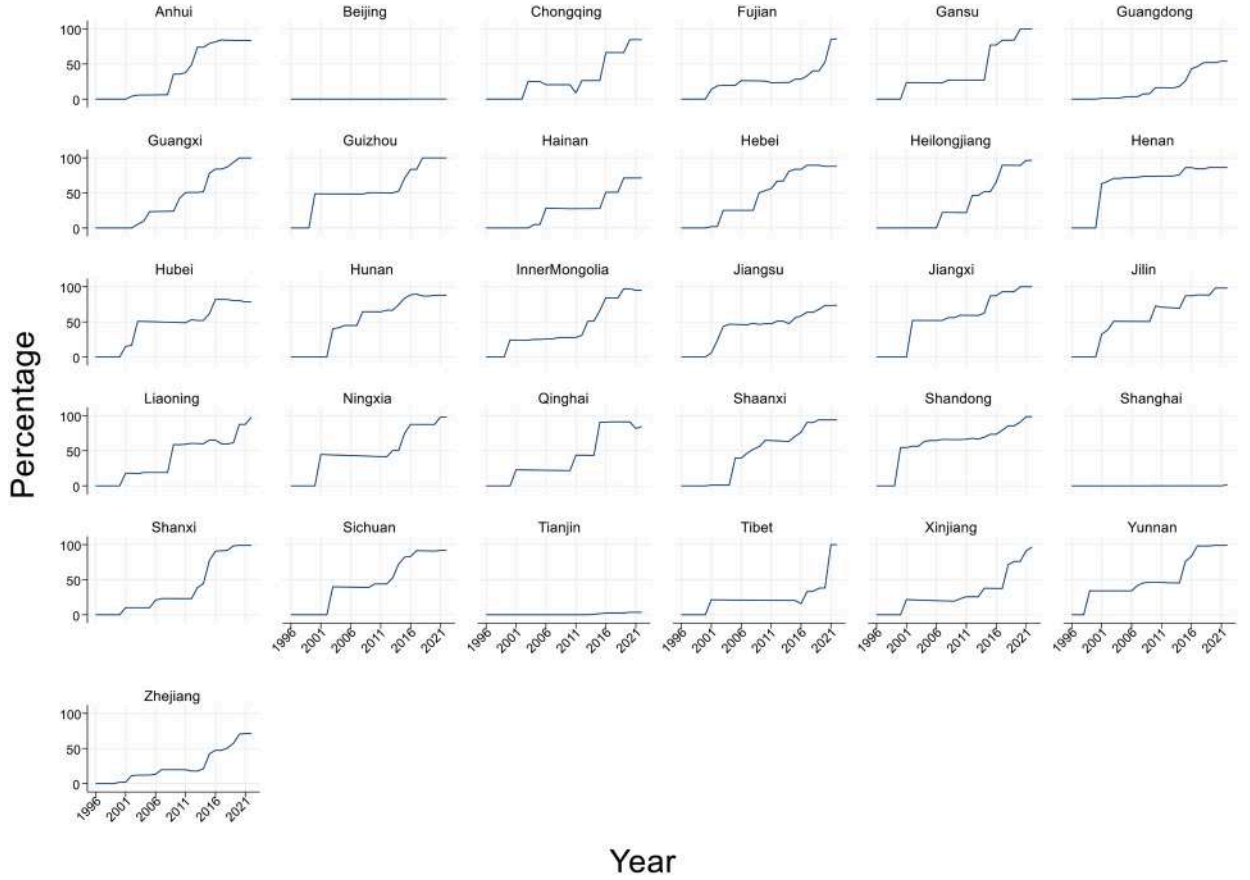


Fig. E.1. Weighted Average of Settlement Probability in Each Province in China during 1996–2022.

Appendix F. Calculation details of the general equilibrium solutions

(1) Substitute Eq. (4) into (16), we have:

$$(1 - \lambda_m)^{1-\lambda_m} (\beta B_c N_c^\alpha M_c^{\beta-1} K_c^{1-\alpha-\beta})^{(1-\lambda_m)} A_c^m H_c^{\lambda_m} M_c^{-\lambda_m} = u$$

$$M_c^{(\beta-1)(1-\lambda_m)-\lambda_m} ((1 - \lambda_m) \beta B_c N_c^\alpha K_c^{1-\alpha-\beta})^{(1-\lambda_m)} A_c^m H_c^{\lambda_m} = u$$

In which, $(\beta - 1)(1 - \lambda_m) - \lambda_m = \beta - \beta\lambda_m - 1 = -(1 - \beta + \beta\lambda_m)$.

Take logarithm on both side and rearrange it, we have:

$$\ln(M_c) = c_1 + \frac{1}{1 - \beta + \beta\lambda_m} (A_c^{nhk} + \Delta A_c^{hk} hkprob_c + SC_{ic}^m)$$

In which $c_1 = \frac{(1-\lambda_m)}{1-\beta+\beta\lambda_m} (\ln(1 - \lambda_m) \beta B_c N_c^\alpha K_c^{1-\alpha-\beta}) + \frac{\lambda_m}{1-\beta+\beta\lambda_m} \ln(H_c) - \frac{1}{1-\beta+\beta\lambda_m} \ln u$.

(2) Then we can get:

$$\ln(W_c^m) = c_2 + \frac{\beta - 1}{1 - \beta(1 - \lambda_m)} (A_c^{nhk} + \Delta A_c^{hk} hkprob_c + SC_{ic}^m)$$

In which $c_2 = \ln(\beta B_c N_c^\alpha K_c^{1-\alpha-\beta}) + (\beta - 1)c_1$.

(3) Combine Eqs. (3) and (4),

$$\ln(W_c^n) = \ln\left(\frac{\alpha}{\beta N_c}\right) + c_1 + c_2 + \frac{\beta}{1 - \beta(1 - \lambda_m)} (A_c^{nhk} + \Delta A_c^{hk} hkprob_c + SC_{ic}^m)$$

(4) According to Eq. (15), we have:

$$\ln(P_c) = c_3 + \left(\frac{\beta}{1 - \beta + \beta\lambda_m}\right) \ln(A_c^{nhk} + \Delta A_c^{hk} hkprob_c + SC_{ic}^m)$$

In which $c_3 = c_1 + c_2 + \ln\left(\frac{\lambda_m}{H_{cr}}\right)$.

Appendix G. Additional tables related to the empirical part

Table G.1
Descriptive Statistics about Migrants Inflow and Other Variables.

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Dependent variable					
The proportion of population inflow in 5 years to the total population	974	9.01	7.99	0.08	75.37
Logarithm of population inflow within 5 years	974	12.06	1.31	7.83	16.02
Key independent variable					
Average settlement probability	974	28.50	29.52	0.00	100.00
Control variables					
Log of average urban income	970	9.14	0.48	8.20	10.48
Log of average housing price	971	7.53	0.57	4.83	9.85
Primary sector ratio at the initial year	974	0.18	0.11	0.00	0.64
Instrumental variables					
Old-age dependency ratio (%)	974	10.67	2.81	1.36	25.59
Proportion of the aging population (%)	974	7.33	2.03	1.23	16.50
Proportion of the working age population (%)	974	65.03	4.77	51.37	89.03

Table G.2
The Correlation between Aging and Settlement Probability.

	(1)	(2)	(3)	(4)	(5)	(6)
Aging level 1	1.509*** (0.424)	1.562*** (0.396)				
Aging level 2			3.221*** (0.674)	3.275*** (0.610)		
Aging level 3					−0.571** (0.235)	−0.559** (0.227)
l5lninc_u		16.766** (6.763)		16.663** (6.776)		15.427** (6.694)
l5lnhprice		−17.339*** (4.626)		−17.249*** (4.619)		−17.617*** (4.746)
l5gdp1r		−58.981*** (18.488)		−60.500*** (18.364)		−57.978*** (18.690)
City FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
R ²	0.711	0.732	0.714	0.736	0.707	0.728
adj. R ²	0.709	0.730	0.713	0.734	0.706	0.726
N	974	967	974	967	974	967

Notes: Aging level 1 is old-age dependency ratio (%). Aging level 2 is the proportion of the aging population. Aging level 3 is the proportion of the working age population.

Table G.3

The Impact of Hukou Reform on Migrant Inflow (2SLS).

	(1)	(2)	(3)	(4)	(5)	(6)
IV	Aging level 1		Aging level 2		Aging level 3	
Panel A: DV is the proportion of population inflow in 5 years to the total population						
Average settlement probability	0.747*** (0.180)	0.718*** (0.162)	0.564*** (0.109)	0.560*** (0.103)	0.971*** (0.359)	0.956*** (0.354)
City FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Control Variable		✓		✓		✓
Observations	970	960	970	960	970	960
r _{kf}	12.65	15.58	22.81	28.85	5.905	6.078
Panel B: DV is the logarithm of population inflow within 5 years						
Average settlement probability	0.067*** (0.018)	0.064*** (0.016)	0.046*** (0.010)	0.046*** (0.010)	0.095** (0.041)	0.088** (0.038)
City FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Control Variable		✓		✓		✓
Observations	970	960	970	960	970	960
r _{kf}	12.65	15.58	22.81	28.85	5.905	6.078

Notes: Aging level 1 is old-age dependency ratio (%). Aging level 2 is the proportion of the aging population. Aging level 3 is the proportion of the working age population.

Table G.4

Descriptive Statistics about Migrants' Wages and Others.

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
logarithm of wage	889,588	8.14	0.53	6.91	14.22
one-year lag of settlement probability	889,588	0.39	0.32	0	1
gender	889,588	0.60	0.49	0	1
age	889,588	34.68	9.12	16	59
ethnicity	889,588	0.93	0.25	0	1
education years	889,588	9.81	2.61	0	19
<i>hukou</i> type	889,588	0.84	0.36	0	1
marriage status	889,588	0.77	0.42	0	1

Table G.5

Descriptive Statistics about Average Wage, Housing price and Others.

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
five-year change of wage	1145	18,695	10,257	−14,269	73,712
five-year change of housing price	1149	1515	1992	−284	22,058
five-year change of settlement probability	1229	21.08	25.79	−24.15	100.00
five-year change of the ratio of foreign direct investment to GDP	1147	−0.25	2.87	−36.91	22.84
five-year change of GDP per capita	1149	14,035	11,556	−42,776	134,958
five-year change of the share of non-agricultural sector outputs in GDP	1149	2.30	3.90	−15.27	16.96
five-year change of education expenditure per student in logarithm	1149	4037	3852	−13,017	2980
five-year change of the number of hospital beds (per 1000 people)	1104	8197	8373	−34,760	92,104
five-year change of teacher-student ratio	1149	0.52	0.77	−2.78	5.61

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