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The Health Impacts of Relaxing Internal Migration Policies: Quasi-experimental Evidence from China

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Abstract

This study examines the health impacts of a large-scale internal migration reform in China. Using nationally representative data from the China Labor-Force Dynamics Survey (2012–2018) and a unique dataset on city-level policy intensity and adoption timing, we employ a triple-difference approach to estimate the effects of migration policies on migrants' perceived physical and emotional health. We find that more lenient policies significantly improve migrants' health relative to natives. Integration policies yield health benefits approximately 3-4 times greater than selection policies. The most effective policy tools enhancing all health outcomes are integration policies granting migrants access to public services and education and selection policies targeting high-skilled migrants. Health improvements are driven by reduced overtime work, greater social capital, and stronger integration with natives. Analysis of treatment effect heterogeneity indicates that selection policies offer more consistent health benefits across various durations of residence, while integration policies primarily benefit long-term migrants.

Keywords: Health; Migration Policies; Internal Migration; Hukou Reform; China

JEL Classification: I18; J61; O15; R23

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1. Introduction

Migration is increasing globally, with approximately 281 million transnational migrants in mid-2020 (3.6 percent of the global population) and 740 million internal migrants in 2009 (UNDP, 2009). The health and well-being of immigrants, who are often from disadvantaged communities, has become a central focus in international political dialogues and public policy formulation. Immigrant health has wide-ranging impacts, influencing healthcare provision (Giuntella et al., 2018), social welfare systems Bettin & Sacchi, 2020; Bratsberg et al., 2014; Dustmann & Frattini, 2014), and native populations' health (Aygün et al., 2021; Giuntella & Mazzonna, 2015).

The research on immigrant health has extensively documented the "healthy migrant effect/paradox," which reveals that immigrants tend to be healthier, both physically and mentally, than their native-born counterparts upon arrival to their destination country despite lower socioeconomic status and limited access to public benefits (Acevedo-Garcia et al., 2010; Hummer et al., 2007).¹ However, this advantage declines over time, a trend known as unhealthy assimilation, which persists even as immigrants improve in settlement indicators like language and education (Antecol & Bedard, 2006; Murphy et al., 2017).² The declining health advantages of immigrants—or even the emergence of

¹ The health advantages of immigrants upon arrival are attributable to two main factors: selective migration, where immigrants are positively selected to move from their hometowns (Bernard & Bell, 2018; Feliciano, 2020; Ichou & Wallace, 2019), and selective admission, where immigrants are admitted on their socioeconomic status (Lu & Ng, 2019).

² This immigrant health profile has been widely documented in developed countries such as the U.S., the UK, Canada, and Australia (Kennedy et al., 2015).

health disadvantages—may persist across generations,³ widening health inequality in the host society (Zajdel, 2023). The phenomena of healthy migrant effects and unhealthy assimilation trajectories are not limited to international migration contexts but are also observed in internal migration settings, such as in Indonesia (Lu, 2008) and China (Chen, 2011). One of the main arguments explaining the diminishing health advantages with longer migration duration is the presence of “structural barriers”, i.e., sociopolitical factors in host societies restricting immigrants’ access to public services and hindering their integration. Immigrants also face higher occupational risks (Moyce & Schenker, 2018), leading to worse occupational health outcomes (Hargreaves et al., 2019), along with psychosocial stressors, such as racism, discrimination, and low socioeconomic position. Immigration enforcement policies exacerbate these issues (Young et al., 2022).

While the health trajectories of migrants and structural barriers in social welfare policies after arrival have been extensively documented, the potential of migration policy reforms to reverse the health-worsening trends remains under-studied. More relaxed migration policies may benefit migrants’ health and well-being through various aspects of life, such as stronger social integration (Chen et al., 2024; Guzi et al., 2021), social capital (Carillo et al., 2023), educational attainments (Kaushal, 2008) and better work conditions (Philbin et al., 2018; Sterud et al., 2018). Furthermore, prior research on the effects of migration policies has predominantly focused on international

³ Please see García-Pérez (2016); Perreira & Allen (2021); and Perreira & Pedroza (2019).

migration in developed countries, with far less attention given to internal migration. This gap is notable, as internal migration is more prevalent than international migration, especially in developing countries (International Organization for Migration, 2020, 2022). For instance, from 1990 to 2020, China's urban population grew by 567 million, mainly due to rural-to-urban migration, which was more than three times greater than the global increase in international migration over the same period.

This study exploits a unique quasi-experiment at scale—the Chinese 2014 Hukou Reform affecting the internal migration of millions of people—to evaluate the health consequences of internal migration policies in the contexts of developing countries. China's Hukou (household registration) system is a population management mechanism that regulates internal migration by linking individuals' access to social services, education, and employment opportunities to their registered place of residence, creating disparities between rural and urban residents. The reform encompasses policies aimed at selecting and integrating migrants into a destination. This reform is unprecedented in scale, and the implementation was left to local governments (Ma, 2024). This study draws on a unique dataset on policy adoption timing and intensity of the reform at the city-level (Wang et al., 2024), along with nationally representative data from the China Labor-Force Dynamics Survey (CLDS, 2012–2018). Using a triple-difference approach, we find that more lenient policies significantly enhance migrants' perceived physical and emotional health relative to the local population. Potential mechanisms include reduced overtime work, both in terms of the likelihood

and the number of days working overtime in a typical month, strengthened social capital reflected in perceived fairness in living conditions and trust in others, and greater integration with natives through more frequent contact with natives in workplaces and communities.

The study aims to make several contributions to the existing literature. First, this study speaks to more generally the health impact of public policies outside of the healthcare system by assessing the causal relationship between non-health-targeted policies and migrant's health. Of various public policies, there is growing interest in understanding the health impacts of migration policies, particularly those governing migrant selection and access to public services. Recent reviews document the negative impacts of restrictive entry and integration policies on immigrants' mental health, self-reported health status, and mortality in high-income countries. Yet, these studies are largely based on observational, descriptive statistical, or correlation studies, calling for robust analytical approaches with appropriate counterfactuals to derive causal inferences (e.g., Juárez et al., 2019; Perreira & Pedroza, 2019). Studies show that access to citizenship influenced migrants' mental health (Song & Smith, 2021; Wang & Kaushal, 2019), whereas immigration policies have mixed physical health effects (Venkataramani et al., 2017; Wang & Kaushal, 2019). Contextually, research on internal migrants in developing countries remains sparse, primarily due to data limitations. This study is among the few to examine how internal migration policy changes affect migrants' health. Prior studies on China's internal migration policies focus on Hukou status

conversion, mostly showing a positive relationship between obtaining urban Hukou and rural-to-urban migrants' health (Liu et al., 2015; Song & Smith, 2021; Song & Sun, 2016; Sun, 2021). However, these studies primarily identify associational rather than causal relationships and provide limited analysis of diverse policy tools used in Hukou reforms. This study examines the 2014 Hukou reform in China—a natural experiment affecting the world's largest internal migrant population—to provide a causal and comprehensive assessment of its impact on migrants' multidimensional health.

Second, in line with the causal evaluation of migration policies, this study pushes forwardly the identification to the “fine-grained” level of policy effects in two ways. On the one hand, this study disaggregates the migrant policy reform into mobility-related policies selecting who are welcomed to enter with citizenship (i.e., selection policies) and residence-related policies shaping access to rights, resources, and opportunities based on citizenship (i.e., integration policies). On the other hand, the study employs continuous measures of each policy indicator and accounts for variation in implementation timing at the city-level. This approach precisely identifies the extent and timing of policy changes across cities, creating rich spatial-temporal variations. The detailed identification strategy improves estimation efficiency and consistency of treatment effects and enriches discussion on policy implications. Policy makers would be able to pin down which element(s) of non-health migration policies may act as protective measures for which health dimension(s) to what extent(s).

Third, this study sheds new light on the causal impact of China's 2014 Hukou reform by constructing robust counterfactuals. Existing research has relied on comparisons between megacities and other cities (e.g., An et al., 2024; Hao, 2022). However, this identification presumes two key conditions. First, the intervention must be uniform within megacities and within other cities while varying exogenously between cities of different sizes. In practice, the 2014 Hukou reform followed a top-down decentralization approach in policy design and enforcement, indicating weak obligation for lower-level governments (Ma, 2024). Municipal governments were tasked with (i) formulating specific policy provisions under the central government's general guidelines and (ii) implementing the policy within a timeframe determined by the central government. This institutional framework resulted in substantial heterogeneity in how the reform was approached across cities (Wang et al., 2024). In this regard, the intervention is endogenous to the city size.⁴ Second, policy changes should not affect the composition of who migrates to or from cities of different sizes before and after the reform. However, mobility criteria *per se* are selection policy tools; migrants also self-select their destination and intention to obtain a local citizenship.⁵ These could invalidate counterfactual comparison between migrants across different city sizes. Relaxing the two strong presumptions, this study leverages a unique dataset on city-

⁴ Cities, particularly those with large populations and anticipated inbound migration, can maintain Hukou restrictions to safeguard education and healthcare resources for existing residents (Hong et al., 2022). City-level policy documents suggest that large cities (classified as first- and second-tier) have varying preferences for migrant workers and implemented stricter criteria for obtaining local urban Hukou after the 2014 reform (Zhang et al., 2019).

⁵ See Vortherms & Liu (2022).

level continuous policy changes over time and employs an empirical strategy using both migrant and native samples to examine health outcomes. Specifically, it applies a triple-difference specification to identify the impact of specific policy instruments by comparing health outcomes between internal migrants and the local population across cities that differ in not only the reform timing but also the extent of every specific policy dimension.

Fourth, this study investigates mechanisms and heterogeneity behind the average changes in migrants' multidimensional health profiles. Due to data and policy constraints, few empirical studies have answered what the mechanisms are at work behind the effects of non-health-related migration policies. Investigating the causal mechanisms can inform more effective policy reforms. For instance, which actors and tools can be leveraged to promote the human right to health, particularly when restrictive policies stem from anti-migrant ideologies and power motives? What are the broader societal costs of restrictive policies, considering the chain of consequences? Along with the second contribution on “fine-grained” policy evaluation, this study aims to identify “what works, for whom, and why.”

Fifth, by constructing robust counterfactuals, this study also links to the health equity research by identifying effective policies that address multi-dimensional health inequalities between population groups of different citizenship status. Although the determinants of health inequalities are complex, social and structural factors produced

by inequitable and racialized systems are recognized as contributing sources (e.g., Hatzenbuehler et al., 2017). However, prior research on interventions to reducing health disparities suffer from generalizability and contamination of causal comparisons (Diaz et al., 2017). Misra et al. (2021)’s review calls for methodological advancement and intersectional framework to illuminate the essential role of multiple policy sectors in changing “structural racism”. Benefiting from multidisciplinary and large-scale data and “fine-grained” identification, the present study is also able to delineate which dimension(s) of a migration-related public policy synergistically shape the distribution of a particular health outcome.

The remainder of the paper is organized as follows. Section 2 provides the background information on the Hukou system and its 2014 reform. Section 3 presents the data and empirical methodology. Section 4 discusses the main results, robustness checks, potential mechanisms, and relationship heterogeneity, followed by conclusions and discussions in Section 5.

2. The Hukou System and the 2014 Reform

China’s Hukou system was formally established in mainland China in 1958 as a tool for social planning and industrialization (Chan, 2019). It classifies individuals based on their registered location and type—rural/agricultural or urban/non-agricultural.⁶ Functioning as an “internal passport,” Hukou regulates migration within and across

⁶ A newborn’s Hukou is determined by the Hukou of their p4/8/2025 11:36:00 PMparents.

provincial boundaries, drawing parallels to international border controls (Bao et al., 2011). It ties individuals to their registered place of residence, affecting their access to essential services such as education, healthcare, and social benefits. Consequently, migrants without local Hukou often face restricted opportunities and limited public services, similar to international migrants without legal residency. Changes of Hukou location or type are only allowed under certain conditions with specific requirements (e.g., an employment certificate from a city's department of labor and a college admission letter).⁷

The Hukou restrictions were gradually relaxed after 1978 when China entered the reform era. However, obtaining an urban Hukou remained difficult and those without it continued to have limited access to local public services (Song, 2014).⁸ They suffered from labor market and wage discrimination (Lee, 2012; Song, 2016; Chen & Hoy, 2011), and pre-market discrimination (Démurger et al., 2009; Fu & Ren, 2010; Song, 2012). In March 2014, the “New Urbanization Plan (2014-2020)” was introduced to sustain economic growth. This drove a comprehensive Hukou reform to further satisfy the needs of urban migrants for equal rights to public services and employment opportunities: on July 24, 2014, the State Council issued “Advice on Further Promoting

⁷ The requirements vary across locations. Generally, it is more difficult to register Hukou in more developed cities, which offer access to better public services.

⁸ For instance, in Beijing, more than 50 percent of migrant children attend unregulated informal private schools, which are often of poor quality and located in non-purpose-built buildings (Wang, 2008). Migrant children in public schools are labeled as *jiedu* students (students from outside communities, borrowing a place to study) and have to pay extra fees.

the Reform of the Hukou System,” which is widely considered unprecedented in magnitude and a milestone in the Hukou reform in China (Chan, 2014; Chen & Fan, 2016; Wang, 2020; Zhang et al., 2019). Generally speaking, this nationwide Hukou reform incorporates policies aiming to end the distinction between agricultural and non-agricultural Hukou registration and to recognize migrants’ residential status through replacing the temporary residential permit (*zanzhuzheng*) with a residential permit (*juzhuzheng*) (Chan, 2014). The 2014 reform focused on easing the selection criteria for migrants to obtain local citizenship and relaxing the integration requirements that determine their access to local education and welfare.

The reform adopted a tiered approach to accommodate the situations of different localities, whereby restrictions on obtaining urban Hukou would be removed completely, substantially, and moderately in small, medium, and large cities, respectively, while the issuance of urban Hukou in mega cities remained under strict control. Following the national reform agenda, provincial and municipal governments have announced plans to implement the reform, which encompasses a wide range of policies aimed at selecting and integrating migrants into a destination (Wang et al., 2024). Selection policies vary, with some cities offering favorable conditions for obtaining local Hukou exclusively to highly educated migrants, while others have allowed all migrants to acquire it. On integration, some cities have granted migrant children access to local public schools, while others have extended eligibility to preschool or granted local status for high school and college entrance exams.

Additionally, some cities have relaxed restrictions on access to social assistance, social insurance, and healthcare services, while others have maintained stricter policies. These policy variations offer a unique opportunity to delineate the distinct effects of different internal migration policy tools.

Studies on the 2014 Hukou Reform have primarily focused on its impacts on migrants' mobility (An et al., 2024; Zhang et al., 2020), settlement intentions (Lu et al., 2022), Hukou acquisition (Hao, 2022), and labor market outcomes (An et al., 2024). These studies show that the reform increased migration to smaller cities (An et al., 2024), strengthened migrants' settle intentions (Lu et al., 2022; Zhang et al., 2020), and encouraged local Hukou acquisition (Hao, 2022). While previous research has explored these socioeconomic effects, our study is among the first to investigate the health implications of the reform while delineating impacts of various policy tools.

To sum up, Hukou serves as a critical institutional barrier to population mobility and access to social welfare programs. Hukou-based restrictions have been shown to create cumulative disadvantages over the life course, leading to a range of adverse physical, mental, and cognitive health outcomes (see Song & Smith, 2019, for a comprehensive review). Hukou can be best understood as a form of “multi-level citizenship” shaped by multifaceted social policies (Vortherms, 2021). Obtaining a local Hukou grants migrants access to citizenship rights, social benefits, and improved employment and education opportunities in destination areas—all of which are closely linked to their

health (Sun, 2021). Consequently, Hukou reform policies are likely to carry significant implications for migrant health. Empirical research on how institutional changes shape health outcomes can offer valuable insights for addressing social inequalities in developing countries.

3. Data and Empirical Approach

3.1 Data

We use the 2012, 2014, 2016, and 2018 waves of the China Labor-Force Dynamics Survey (CLDS), a biennial nationally representative survey conducted by Sun Yat-Sen University. The CLDS employs multistage stratified sampling. The sampling follows three stages - county (or equivalent), village (or equivalent), and household - and covers 2,282 counties out of 29 mainland provinces and municipalities (excluding Tibet and Hainan). Individuals aged 15 and older were interviewed. The CLDS is a repeated panel with around 40 percent of respondents reinterviewed in the following wave. It includes 16,253 individuals in 187 counties in 2012, 23,594 individuals in 209 counties in 2014, 21,086 individuals in 264 counties in 2016, and 19,982 individuals in 254 countries in 2018.

We selected both migrants and natives residing in destination cities at the time of interview in four waves.⁹ To reduce bias from reform-induced migration selection, we

⁹ We did not utilize the panel feature due to high attrition rates, which would result in a small sample of urban respondents, especially migrants. In addition, limited access to panel IDs in the 2016 and 2018 waves further constrained its use.

restricted the migrants to those having Hukou outside the county of residence and who had moved to the current place before 2014. Similarly, we defined natives as those who obtained Hukou in the current place of residence before 2014. We also restricted our analytical sample to the cities with at least 5 sample migrants and 10 native urban respondents to ensure enough sample size in each city. Excluding samples without information on health outcomes, demographic characteristics, city-level policy intervention, and other city-level characteristics yielded an analytical sample of 15,479 individuals in 56 cities. To verify whether our sample is representative of all cities in China, we compared characteristics of 56 sample cities with those of all cities. According to Appendix Table 1, the sample cities are not statistically different from others in terms of economic development, proportion of low skilled workforce, percentage of ethnic minority, and percentage of older adults, but have larger population sizes and higher percentages of migrants on average. In the following empirical analyses, we accounted for these significant differences by controlling for city fixed effects and conducting sub-sample estimations to assess heterogeneity.¹⁰

3.2 Main Variables

The main variables in the empirical analysis include health measures as the outcome variables, policy indicators of the Hukou reform as the key components in the regressors of interest, and a set of mechanism variables.

3.2.1 Health Outcomes

¹⁰ We did not control for migration rate in the regression analysis, as it could be a potential bad control.

This study evaluates physical and mental health using three indicators. Physical health is assessed through two measures: (1) physical health problems, based on the question: “In the past month, have any physical health problems affected your work or daily activities?” (1 = “never”, 5 = “always”); and (2) self-reported health problems, derived from the question: “How would you describe your health now?” (1 = “very healthy”, 5 = “very unhealthy”). Mental health is measured through the question: “In the past month, have emotional problems (e.g., feeling depressed or anxious) affected your work or daily activities?” (1 = “never”, 5 = “always”). Higher scores on all measures indicate poorer health outcomes.

Data on self-reported health are available for all four waves, while those on physical and emotional health problems are available for three waves (2012, 2014, and 2016). All three measures are standardized by 5-year age cohorts to facilitate comparison, enhance interpretability, and control for age-related health differences. Descriptive statistics for the unstandardized variables are presented in Panel A of Table 1. On average, respondents report an average frequency of between “1: never” or “2: seldom” for physical and emotional health problems affecting daily activities. For self-reported health, the average response is around “2: healthy.”

[Insert Table 1 here]

3.2.2 Policy Interventions

Our key independent variables of interest are policy measures derived from the nationwide 2014 Hukou reform. The reform implemented a tiered approach, whereby policy objectives differed by city population size and significant variations in Hukou reform approaches exist within provinces. We rely on policy variables from Wang et al. (2024), which offer the timing of city-level reform announcements and quantify reform intensity across 231 prefecture-level cities in two dimensions: selection and integration. In terms of policy timing, our sample of 56 cities includes the earliest policy announcement made in December 2014 and the latest in December 2016. The distribution of policy timing across cities can be found in Appendix Figure 1.¹¹ The dummy variable *Post* is derived based on the city-level policy timing, with a value of 1 if an individual has been affected by the policy and 0 otherwise. In terms of city-level reform intensity, our analysis focuses on the selection and integration policies. Selection policies pertain to the criteria through which a migrant can receive local Hukou. We consider three indicators: one for policies targeting high-skilled migrants (e.g., high-skilled workers, college graduates, overseas returnees, and investors of all kinds), another for policies not specifically aimed at high-skilled migrants (i.e., available to all migrants), and a third for those allowing family reunification. Integration policies determine the extent to which migrants and their family members can obtain access to local education and welfare. Specifically, we consider two indicators: one for policies granting access to education (e.g., preschools, compulsory

¹¹ As shown in the Panel B of Appendix Figure 1, the 231 cities from Wang et al. (2024) also mostly had policy announcements from December 2014 to December 2016, with only 7 cities having the policy announcements after 2016.

education, high schools, vocational education, high school entrance examination, college entrance examination, scholarship, and tuition and fee waiver) and another for those granting access to public services, including employment services, social insurance, social assistance, housing, healthcare, and old-age care services/benefits. A brief description of the policy coding process and the construction of policy indicators can be found in Appendix A, and more details are discussed in Wang et al. (2024). In essence, each policy provision (e.g., access to social assistance, or criteria for a low-skilled worker to obtain local hukou) is coded as a score ranging from -4 (most lenient change) to 4 (most stringent change). A 4-point change in a policy provision is considered as a “major change”, defined as targeting the entire category of a migrant group (e.g., all migrant workers) while introducing entirely new systems (e.g., a points system) or abolishing existing ones (e.g., removing spouse requirements). The coding methods are adapted from De Haas and colleagues (2015). The score for each policy domain indicator mentioned above (e.g., access to education) was derived from aggregating the scores from all policy provisions under that domain. For ease of interpretation, we reverse the policy scores such that a higher value represents a change in the more lenient direction for migrants. The summary statistics of the five policy indicators at the city level are shown in Panel B of Table 1, and the distribution of each indicator can be found in Appendix Figure 2.¹² For the baseline analysis, we create an aggregate indicator for selection policies by summing city-level standardized scores for

¹² Comparing Panels A and B of Appendix Figure 2, we find the distribution of each of the policy indicator in our study sample of cities is similar to that for all the cities with information on policy scores according to Wang et al. (2024).

policies targeting high-skilled migrants, those not targeting high-skilled migrants, and those allowing family reunification. Similarly, we create an aggregate indicator for integration policies by summing city-level standardized scores for policies granting access to education and public services.

3.2.3 Mechanisms

We consider three types of potential mechanisms: work conditions, social capital, and integration with natives. Work conditions are assessed through overtime work, based on the Labor Law of the People's Republic of China, which limits the average monthly working days to 22. Two indicators are constructed: (1) whether an individual works more than 22 days in a typical month, and (2) the number of days worked beyond 22.¹³ Social capital is measured using two variables: perception of fairness and trust in others. Perception of fairness is derived from responses to the question, "Do you think your current standard of living is fair compared to the effort you put into your work?" Responses range from 1 ("completely unfair") to 5 ("completely fair"). Trust in others is based on the question, "Generally speaking, do you agree that most people can be trusted?" with responses ranging from 1 ("strongly disagree") to 4 ("strongly agree"). Integration is assessed using two indicators of migrants' interactions with natives in their workplaces and communities. The first captures the frequency of contact with natives within the workplace, ranging from 1 ("never") to 4 ("often"). The second

¹³ The sample for work overtime includes only those who are currently working, comprising around 60 percent of the baseline sample. The baseline model results for this subsample are consistent with those for the full sample.

measures the frequency of contact with natives in the community, also ranging from 1 (“never”) to 4 (“often”).¹⁴ The summary statistics of these variables are presented in Panel C of Table 1.

3.2.4 Other Variables

As shown in Panel D of Table 1, around 20 percent of our analytic sample are migrants. Individual-level control variables include 5-year age categories (age below 20 as the reference group), gender, ethnicity (non-Han, and Han as the reference group), education categories (secondary and postsecondary, and primary as the reference group) and household size. City-level characteristics include real GDP per capita of one’s Hukou place¹⁵ and unemployment rate in the current city of residence, from the China City Statistical Yearbooks, and tenure of a city’s Communist Party Secretary (CPS), collected manually from various official government websites. These city-level indicators can account for the economic conditions in the origins and destinations. Furthermore, city CPSs are key leaders of municipal affairs under the Chinese Communist Party, and their tenure influences promotion opportunities and performance incentives. Since CPSs tenure is a main predictor of policy introduction and policy announcement timing in our data (Wang et al., 2024), we account for this important factor in our analysis.

¹⁴ The first is only available for the migrants who answered “yes” to the question “does your company mainly consist of natives?”, and the second is only available for the migrants who answered “yes” to the question “does your community of residence mainly consist of natives?”

¹⁵ The measure for the current city of residence is used for the natives.

3.3 Empirical Methodology

We employ a triple-difference framework, which exploits variation in outcomes between migrants and local population across cities over time.¹⁶ The discrete version, which we consider only the city-specific treatment timing is as follows:

$$Y_{ijt} = \alpha + \beta_1 Post_{jt} \times Migrant_{ijt} + \beta_2 Post_{jt} + \beta_3 Migrant_{ijt} + \theta' X_{ijt} + \delta' Z_{jt} + \rho_t + \omega_j \times Time_t + \varepsilon_{ijt} \quad (1)$$

where Y_{ijt} represents the health outcome of individual i in city j in year t . $Post$ is equal to 1 for cities in the post policy announcement period and 0 otherwise. $Migrant$ is set to 1 if an individual's Hukou is outside the county of residence and 0 otherwise. X represents a set of individual-level characteristics (female, age groups, ethnicity, education and household size), and Z represents city-level characteristics (the unemployment rate in the current city of residence, the real GDP per capita from one's Hukou place, and the tenure of a city's Communist Party Secretary (CPS)). ρ denotes year fixed effects. The terms $Time$ and ω denote the time trend and city fixed effects, respectively.¹⁷ We control for the city-specific time trend $\omega_j \times Time_t$ in order to

¹⁶ Based on Olden and Møen (2022), the full triple-difference specification in our case should be:

$$Y_{ijt} = \alpha + \beta_1 T_j + \beta_2 Migrant_{ijt} + \beta_3 Post_t + \beta_4 T_j \times Migrant_{ijt} + \beta_5 T_j \times Post_t + \beta_6 Migrant_{ijt} \times Post_t + \beta_7 T_j \times Migrant_{ijt} \times Post_t + \theta X_{ijt} + \delta Z_{jt} + \rho_t + \omega_j \times Time_t + \varepsilon_{ijt}$$

However, since all the cities are eventually treated, $T_j = 1$ when the treatment is considered discrete. Besides, $Post_t$ becomes $Post_{jt}$ because the treatment timing varies by city.

¹⁷ We also tried replacing the time trend with year fixed effects and the results are consistent.

account for trends in outcomes that predate the treatments. The error term is denoted by ε . We cluster standard errors at the city level. The key coefficient of interest is β_1 , which measures the differences in health outcomes between migrants and natives in cities that have already implemented the reform.

To further investigate the extent to which policy effects vary by reform intensity, we apply a continuous triple-difference framework, which considers both the policy timing and intensity. Specifically, we estimate the following model:

$$\begin{aligned}
Y_{ijt} = & \alpha + \sum_{K=S,I} (\beta_1^K PolicyScores_j^K \times Migrant_{ijt} \times Post_{jt} + \beta_2^K PolicyScores_j^K \times \\
& Post_{jt} + \beta_3^K PolicyScores_j^K \times Migrant_{ijt} + \beta_5^K PolicyScores_j^K) + \\
& + \beta_4 Migrant_{ijt} \times Post_{jt} + \beta_6 Migrant_{ijt} + \beta_7 Post_{jt} + \theta' X_{ijt} + \delta' Z_{jt} + \rho_t + \\
& \omega_j \times Time_t + \varepsilon_{ijt} \quad (2)
\end{aligned}$$

$PolicyScore^K$ is a time-invariant city-level aggregate policy indicator of dimension K ($K = S$ for selection policies, and $K = I$ for integration policies). A higher value of $PolicyScore^K$ indicates that the policies of dimension K are overall more lenient. The key coefficient of interest is β_1^K , which denotes how the relative policy impact on migrants (relative to natives) varies according to policy intensity of dimension K .

The key identification of the treatment effect of the Hukou reform on migrants (relative to natives) depends on the assumption that no other factors are generating a difference

in differential trends between the health outcomes of migrants and natives. One way to test this assumption is by examining whether the pre-trends for the dependent variables prior to the intervention are similar across migrants and natives. To test this, we first run the regression model (1), restricting the sample to the period before the city-level announcement month and creating a variable *Pseudo-Post_{jt}* as if the announcement occurred two years prior to the actual date. Table 2 shows that the interaction term is not statistically significant, supporting the assumption. We also perform an event study analysis, replacing *Post_{jt} × Migrant_{ijt}* with a series of interaction terms with dummies for the distance in years to the city-level announcement month.¹⁸ Figure 1 shows that the trends for the three health outcomes between migrants and natives do not differ statistically significantly in the three years or earlier preceding the city-level announcements.

[Insert Table 2 here]

[Insert Figure 1 here]

4. Results

¹⁸ The model of estimation is

$$Y_{ijt} = \alpha + \sum_{d=-3}^{-1} \beta_1^d T_{d,jt} \times Migrant_{ijt} + \sum_{d=-3}^{-1} \beta_2^d T_{d,jt} + \beta_3 Migrant_{ijt} + \theta' X_{ijt} + \delta' Z_{jt} + \rho_t + \omega_j \times Time_t + \varepsilon_{ijt}$$

$T_{-3,jt}$ is a dummy that equals 1 if the city will have the policy announcement in more than 3 years; $T_{-2,jt}$ is a dummy that equals 1 if the city will have the policy announcement in 2-3 years; $T_{-1,jt}$ is a dummy that equals 1 if the city will have the policy announcement in 1-2 years. Having policy announcement within 1 year is the omitted category.

4.1 The Effects of the 2014 Hukou Reform on Health of Migrants

Table 3 presents our main results on the effects of the Hukou reform. The results for the discrete triple-difference model, describing the health effects of the city-level announcement of the reform, are presented in Panel A. The effects on the three health variables are largely statistically insignificant, a finding suggesting that a more comprehensive understanding of the policy's impacts may benefit from considering the reform's intensity across cities. Next, we account for policy reform intensity by examining two key dimensions of the reform: selection and integration policies, using the aggregate indicator for each dimension.

[Insert Table 3 here]

Panel B reports the impacts of policy intensity from the continuous triple-difference model. Overall, we find that the relaxation of both selection and integration policies has beneficial health impacts on migrants relative to natives. A one standard deviation relaxation in one of the three policy tools in the dimension of selection policies results, on average, in approximately 0.02–0.03 standard deviations reduction in the problems of physical health, self-reported health and emotional health. As each city rolled out reforms in multiple policy areas, assuming a city reformed its policies at the average level for high-skilled, non-high-skilled-specific, and family reunification schemes, the changes in health outcomes are by 0.04–0.07 standard deviations. As these policies do not specifically intervene in the health of migrants, these effects are considerable. More

lenient integration policies also improve these three health outcomes of migrants. Indeed, the health benefits of more relaxed integration policies for migrants are approximately 3–4 times greater than those of more relaxed selection policies. When we again assume that a city adopts policies that improve both access to education and access to public services at the average levels, the improvements in health outcomes translate into 0.24 to 0.40 standard deviation changes, which are quite substantial.

In addition, we further dissect the selection and integration dimensions by indicators (namely, high-skilled, non-high-skilled-specific, family reunification, access to education, and access to public services), with the indicators standardized at the city level. As shown in Panel C of Table 3, more lenient policies in any of the five specific indicators can improve migrants' health. The most effective policies—those enhancing all three health outcomes—are selection policies targeting high-skilled migrants, integration policies granting access to public services, and policies granting access to education. To illustrate the magnitude of these effects, we analyze them in terms of a major change in a policy provision. Notably, for integration policies granting access to education, a major change (an increase of four points in policy scores, equivalent to approximately 1.7 standard deviations) leads to reductions of 0.21, 0.18, and 0.31 standard deviations in physical, self-reported, and emotional health problems, respectively. Similarly, for integration policies granting access to public services, a major change results in reductions of 0.10, 0.07, and 0.14 standard deviations in these health problems. Finally, a major change in a policy provision in selection policies

targeting high-skilled migrants reduces all three health problems by 0.04–0.05 standard deviations.

4.2 Placebo Tests

We conduct placebo tests in our preferred specification (2), applying difference-in-differences estimation to various counterfactual comparisons using sub-groups to investigate the sources of variation in the outcomes. Ideally, the estimated policy impacts in Section 4.1 stem solely from treated migrants' improved health outcomes as a result of Hukou intervention rather than (i) concurrent changes in health among natives or (ii) other concurrent policies.

First, we test whether natives can serve as appropriate counterfactuals for migrants within same cities. We restrict the sample to cities implementing reform in 2014 or 2015 (the earlier adopters) and the post-treatment period only, and re-estimate Eq. (2) to this sub-sample. This approach reduces re-estimation to a difference-in-differences specification ($Post_{jt} = 1$). It exploits variation in outcomes between migrants and natives in the same city and across cities of different extents of intervention. Panel A of Table 4 shows that the effects are largely similar to our triple-difference analyses. The impact of integration policies on physical health problems insignificant.

[Insert Table 4 here]

Second, we test for whether any unobserved time-specific effects change migrants' health independently of the Hukou reform. We restrict the sample to migrants only and compare outcomes between treated and un-treated migrants. This approach reduces re-estimation of Eq. (2) to a difference-in-differences specification ($Migrant_{ijt} = 1$). The difference-in-difference estimation exploits variation in migrants' outcomes before and after the reform and across cities of different extents of intervention. In Panel B of Table 4, the coefficients generally follow the expected signs in the triple-difference setup, except for the physical health consequences of the integration policy, where the coefficient's sign is reversed. The findings indicate that treated migrants, compared to not-yet-treated migrants, experience improvements in emotional health problems, driven by more lenient selection and integration policies, as well as improvements in physical health problems, attributable to more lenient selection policies. There might be, however, other unobserved time-specific policies affecting physical health for migrants who are at the time treated by integration policies.

Third, we test for whether significant differences existed between migrants and natives across cities during periods when the treatment has not yet been implemented. We restrict the sample before the national announcement time (i.e., July 2014). Panel C of Table 4 shows statistically insignificant estimates in all the cases except for the not-yet-implemented integration policies on self-reported health. The positive coefficient implies that, before the reform, migrants appear to have worse self-reported health in the cities with more lenient integration policies later during the reform. This undermines

the respective estimate from the triple difference model, suggesting that the estimated beneficial effect of integration policies on migrants' self-reported health might be over-estimated. In Panel D, we restrict the analysis to natives, exploiting variation in their health outcomes across cities over time. The results appear to be statistically insignificant, suggesting the benchmark results are not driven by a deterioration of outcomes among natives as a result of the Hukou reform.

4.3 Robustness Checks

We perform several robustness checks on our baseline analysis using different specifications and sample variations. The results are presented in Table 5. First, we account for the staggered adoption of city-level Hukou reform announcements by including city-level adoption month dummies as controls. As shown in Panel A, the coefficients are mostly consistent with our baseline results both qualitatively and quantitatively except that the coefficient for selection policies on self-reported health become statistically insignificant.

[Insert Table 5 here]

Second, the estimated health effects might stem from the government's higher pro-migrant spending associated with relaxed mobility and assimilation constraints prior to policy change. Consequently, the estimated coefficients could reflect the health impacts of public spending rather than the reform itself. To address this concern, we control for

a measure of the current city's per capita general public budgeted expenditures on health, social security and employment, and education in 2010,¹⁹ and its interaction with $Migrant_{ijt}$. As shown in Panel B, the results remain robust. Consistent with expectations, higher public spending on health, social security, and employment improves migrants' health (results not shown).

Third, there is a possibility that the results are influenced by cities appearing only before or after the reform in the CLDS sample. To account for this, we restrict the sample to cities present in the data both before and after the reform announcements. Although the number of cities decreases to 28 for the physical and emotional health regressions and to 39 for the self-reported health regression, the results in Panel C remain consistent with the baseline findings.²⁰

4.4 Mechanisms Explaining Changes in Health among Migrants.

In this section, we explore the potential channels through which the Hukou reform policies may influence migrants' health outcomes. We use a regression model as in

¹⁹ The measure of per capita general public budget expenditures on health, social security and employment, and education in the current city is taken from the China City Statistical Yearbook. To avoid the issue of "bad controls," we use the 2010 values (pre-reform) instead of concurrent measures.

²⁰ Besides, we assess the robustness of our results by redefining migrants and natives. We adopt a stricter definition of natives, classifying them as individuals who have held Hukou in the current county for more than five years. Similarly, we also apply a stricter definition of migrants, identifying them as those with Hukou outside the city who moved to the current county before 2014. The results remain robust under both redefinitions.

equation (2) to estimate the policy effects on additional outcomes on working hours and social capital.

One potential mechanism through which more lenient selection and integration policies may improve migrants' health is by enhancing their work conditions. These policies can alleviate uncertainties in various aspects of life, such as social identity, children's education, employment, and healthcare, thereby improving work-life balance by reducing excessive labor supply. Columns (1) and (2) of Panel A in Table 6 indicate that more lenient selection and integration policies significantly decrease the likelihood of migrants working overtime in a typical month as well as the number of overtime days worked. Based on well-documented evidence of the adverse health effects associated with long working hours (Sato et al., 2020), we hypothesize that reduced overtime work is one of the important channels through which the relaxation of migration policies improves the health outcomes of migrants.

[Insert Table 6 here]

Another potential channel is that the relaxation of migration policies could improve their inclusion in the destination, their prospect of settling down, and hence social capital among migrants. Two measures of social capital are examined: perception of fairness and trust in others. According to columns (3) and (4) of Panel A in Table 6, more lenient selection policies improve migrants' perception of fairness in their living

conditions and their level of trust in others. Enhanced social capital, by, for instance, fostering psychological support and spreading norms related to health behaviors, can lead to better health outcomes (Kawachi et al., 2008; Rodgers et al., 2019).

Moreover, more relaxed migration policies may facilitate greater integration of migrants with natives. Using a difference-in-differences specification with the migrant sample (Panel B of Table 6), we show that more lenient selection and integration policies boost migrants' interactions with natives in the workplace. More relaxed selection policies also enhance migrants' contact with natives in their communities. Strengthened social ties with natives can, in turn, lead to improved health outcomes for migrants (Cheung, 2013; Meng & Xue, 2020).

4.5 Heterogeneity in Treatment Effects

In this section, we investigate how policies differentially impact different groups of individuals. We first analyze migrants based on the number of years they have stayed in the current place since the age of 14, replacing the Migrant dummy with a set of dummies that capture their duration of stay.²¹ Table 7 present the results.

²¹ We are unable to derive the duration of migration for the year 2012 so have to drop this year in this analysis. Since the CLDS does ask migration history before age 14, we can only construct duration staying in the current county since age 14. We adopt a 5-year interval from 5 to 20 years and above, considering both statistical power and the cut-off for long-term residence duration in the existing literature (e.g., 7 years in Italy (Trappolini & Giudici, 2021), 20 years in Australia (Jatrana et al., 2018), 15 years in Sweden (Honkaniemi et al., 2020), and 11-20 years in India (Bhan & Patel, 2023)).

[Insert Table 7 here]

Columns (1) and (3) show that more lenient selection policies significantly reduce both physical and emotional health problems of migrants, regardless of their duration of stay since the coefficients for all four interaction terms with selection policies are statistically significant. However, these policies only significantly reduce self-reported health problems among migrants who have stayed in the current place for 5 to 10 years. Moreover, the absolute magnitude of the estimates suggests that the impact of lenient selection policies on migrants' physical health problems slightly decline after 5 years of residence, while their effect on emotional health remains relatively stable. More lenient integration policies reduce physical health problems and self-reported health problems only for long-term migrants who have lived in the destination for over 20 years (columns (1) and (2)). In contrast, they begin to reduce emotional health problems after at least 5 years of residence (column (3)). Similar to selection policies, the effect size of integration policies on emotional health remains stable with longer migration duration. Together, selection policies provide more consistent health benefits across different durations of residence, whereas integration policies tend to primarily bring benefits to long-term migrants. Both policies hold potentials to reduce migrants' physical, self-reported and emotional health problems, which possibly persists into their middle to later life span when disadvantages and health risk are accumulated.

Next, we estimate treatment effects by stratification categories contributing to the heterogeneity in migrants' health dynamics in a life course model.²² We focus on demographic and socioeconomic characteristics such as age, gender, skill level, destination in terms of the city size, and co-residence with children or older adults.²³ Figure 2 shows the point estimates with 95 % confidence intervals for *Post* \times *Selection policies* \times *Migrant* (Panels (a), (c), (e)) and *Post* \times *Integration policies* \times *Migrant* (Panels (b), (d), (f)) from regressions with the same specification as in Panel B of Table 3 by subgroup.

[Insert Figure 2 here]

Regarding gender, more lenient selection policies significantly improve female migrants' self-reported health but not that of males, while significantly reducing emotional health problems for males but not for females. More lenient integration policies generally have stronger effects on males, significantly reducing self-reported health problems for them but not for females. Regarding age, integration policies tend to have stronger health effects on younger migrants, with more lenient integration policies significantly reducing physical and self-reported health problems for younger migrants but not for older ones. Regarding the size of destination cities, in big or mega cities, more lenient selection policies significantly reduce self-reported health problems,

²² See Spallek et al., (2016) for a theoretical and empirical review.

²³ Given that we have already used the triple-difference regression, we estimate separate sub-samples to check heterogeneity instead of using four-term interactions in one regression.

and more lenient integration policies significantly reduce physical health problems, but both effects are not observed in small or medium cities.²⁴ Regarding skill levels,²⁵ more lenient selection policies significantly reduce self-reported health problems for high-skilled migrants but not for low-skilled migrants, while significantly reducing emotional health problems for low-skilled migrants but not for high-skilled migrants. Lenient integration policies more significantly reduce physical, self-reported, and emotional health problems for low-skilled migrants than for high-skilled ones. Regarding living arrangements, more lenient selection policies reduce physical and self-reported health problems for migrants not living with children (aged 14 or below) or older adults (aged 60 or over), but reduce emotional health problems for those living with them. More lenient integration policies significantly reduce self-reported and emotional health problems for migrants living with children or older adults, but not for those without such living arrangements. Overall, integration policies appear to have more profound health effects on male, younger, and low-skilled migrants, those living in larger cities, and those living with children or older adults. The health effects of selection policies are also stronger in larger cities.²⁶

²⁴ It should be noted that the coefficients for the sample in small or medium cities are less precisely estimated, with wider confidence intervals, likely due to the smaller sample size.

²⁵ “High-skilled” is defined as those with a high-skilled occupation or a college degree or higher, and “low-skilled” is defined as those with a low-skilled occupation and those with a high school degree or lower. Leaders of government agencies, party organizations, enterprises and institutions, professionals, and technical workers are considered high-skilled occupations, and other occupations are considered low-skilled occupations.

²⁶ Approximately two-thirds of our migrant sample have agricultural Hukou. In Appendix Table 2, we show that the policy changes appear to have stronger effects on migrants with agricultural Hukou compared to those with non-agricultural Hukou in terms of self-reported health.

5. Conclusions

Although the health trajectories of migrants have been widely studied, there is limited research on how non-health-targeted policies influence their health. Existing studies on this topic primarily focus on international migration in developed countries and are mostly correlational. The local variations in China's 2014 Hukou reform offered a unique opportunity to access how various migration policy tools may exert effects on migrants' well-being. By leveraging the variations in the city-level policy timing and content, this study provides causal evidence on how relaxing internal migration policies affects migrants' health outcomes.

Overall, our results indicate that more lenient internal migration policies, including both selection and integration policies, lead to better physical and mental health outcomes among migrants, with integration policies having more pronounced impacts than selection policies. Specifically, selection policies targeting high-skilled migrants, integration policies granting access to education and those granting access to public services have wider impacts since they reduce not only self-reported and physical health problems but also emotional health problems of migrants. In general, the results suggest that the policy environment can significantly influence the life conditions of migrants, a finding that is consistent with research on international migration policies (e.g., Wang & Kaushal, 2019).

Potential mechanisms through which the relaxation of selection and integration policies may improve migrants' health include reduced overtime work, increased social capital, and enhanced integration with native populations. While selection policies benefit both new and long-term migrants, integration policies primarily improve outcomes for long-term migrants. Besides, the health benefits of integration policies are more pronounced among male, younger, low-skilled migrants, those living in larger cities, and those living with dependents, such as children or older adults. Similarly, the health effects of selection policies are stronger for migrants residing in larger cities.

This study offers several policy implications for policymakers in China and beyond. First, while concerns about increased demand for public services, particularly healthcare, persist amid the ongoing relaxation of internal migration policies in many Chinese cities, the evidence suggests that healthier migrants resulting from these policies could alleviate strain on healthcare systems over time and improve resource allocation. Second, the findings show that selection and integration policies have distinct health impacts and can complement each other to promote both immediate and long-term improvements in migrants' well-being. Third, the findings indicate the health benefits of policy reforms may not be evenly distributed across population groups and geographic regions. Future policy design and implementation should place greater emphasis on enhancing the inclusivity and reach of these reforms.

While the analyses offer valuable insights, some limitations remain. First, this study covers a limited number of cities in China. However, among datasets collecting health indicators of migrants before and after the 2014 Hukou reform, this one provides the best coverage and includes cities broadly representative of urban China. Second, CLDS health measures rely on self-reports; objective indicators would have provided additional insights. Third, the modest sample size of the CLDS limits statistical power for subgroup analyses, though it remains one of the few datasets with satisfactory coverage of both migrants and locals. Fourth, the indicators collected in the CLDS limit our ability to test a broader range of mechanisms behind the observed policy effects. Finally, a longer follow-up period would provide a better understanding of the longer-term effects. However, the onset of COVID-19 in 2020 may have confounded the policy effects. Despite these limitations, this study rigorously investigates the effects of migration policies on migrant health, offering robust evidence to support continued reforms that promote equal rights and enhance migrants' well-being.

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Tables and Figures

Table 1 Summary Statistics

	Mean	Standard deviation	Minimum	Maximum	Observations
Panel A Health Outcomes					
Physical health problems	1.512	0.859	1	5	12,732
Self-reported health problems	2.213	0.891	1	5	15,479
Emotional health problems	1.504	0.785	1	5	12,732
Panel B Policy Scores at the City Level					
High-skilled scheme	3.375	4.845	0	28	56
Non-high-skilled-specific scheme	5.857	5.050	-5	20	56
Family reunification scheme	2.554	3.368	0	15	56
Access to education	3.839	2.357	0	8	56
Access to public services	11.821	6.000	0	29	56
Panel C Mechanisms					
Work overtime	0.537	0.499	0	1	9,745
Days working overtime	2.938	3.244	0	9	9,745
Fairness	3.226	0.916	1	5	15,469
Trust	2.758	0.545	1	4	15,469
Contacts with natives within one's company	3.432	0.838	1	4	694
Contacts with natives within one's community	2.616	0.947	1	4	1,396
Panel D Other Variables					
Migrant	0.205	0.404	0	1	15,479
Post	0.378	0.485	0	1	15,479
Age 20-24	0.068	0.251	0	1	15,479
Age 25-29	0.095	0.294	0	1	15,479
Age 30-34	0.095	0.293	0	1	15,479
Age 35-39	0.095	0.293	0	1	15,479
Age 40-44	0.117	0.321	0	1	15,479
Age 45-49	0.127	0.333	0	1	15,479
Age 50-54	0.123	0.329	0	1	15,479
Age 55-59	0.110	0.313	0	1	15,479
Age 60 and above	0.115	0.319	0	1	15,479
Female	0.535	0.499	0	1	15,479
Non-Han	0.043	0.203	0	1	15,479
Household size	3.723	1.676	1	19	15,479
Secondary	0.567	0.496	0	1	15,479
Postsecondary	0.282	0.450	0	1	15,479
Unemployment rate in the destination city	0.121	0.528	0.003	4	15,479
Real GDP per capita in the sending city (in RMB)	71317.181	38185.216	10341.184	191047.562	15,479
Tenure of a city's CPS in years	2.275	1.610	0	7.258	15,479

The measure of self-reported health problems is available for four waves (2012, 2014, 2016, 2018), and physical health problems and emotional health problems are available for three waves (2012, 2014, 2016). The three variables

are standardized by a 5-year age cohort in the regression analysis. All mechanism variables are available for all four waves, except for “contacts with natives within one's company,” which is only available in 2012, 2014, and 2016.

In the baseline regressions, the aggregate indicator for selection policies is constructed by summing city-level standardized scores for policies targeting high-skilled migrants, those not targeting high-skilled migrants, and those permitting family reunification. This indicator has a mean of 0 and a standard deviation of 3 at the city level. Similarly, the aggregate indicator for integration policies is constructed by summing city-level standardized scores for policies granting access to education and public services. This indicator has a mean of 0 and a standard deviation of 2 at the city level. Higher scores indicate more lenient changes for migrants.

Table 2 Test for Parallel Trends Assumption

	(1)	(2)	(3)
VARIABLES	Physical health problems	Self-reported health	Emotional health problems
Pseudo-Post × Migrant	0.0747 (0.0625)	0.00737 (0.0621)	0.051 (0.0756)
Individual-level Characteristics	YES	YES	YES
City-level Characteristics	YES	YES	YES
Year Fixed Effects	YES	YES	YES
City-specific Time Trends	YES	YES	YES
R-squared	0.018	0.075	0.027
Observations	9,633	9,633	9,633

All of the associated main effects are controlled. Robust standard errors clustered at the city level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 3 The Effects of the Hukou Reform on Health

VARIABLES	(1) Physical health problems	(2) Self- reported health	(3) Emotional health problems
Panel A The Effects of Policy Announcement			
Post × Migrant	-0.117 (0.0698)	-0.085 (0.0512)	0.00276 (0.0977)
R-squared	0.021	0.062	0.03
Panel B The Effects of Policy Intensity: Two Dimensions			
Post × Selection policies × Migrant	-0.0262*** (0.00631)	-0.0163** (0.00799)	-0.0262** (0.0105)
Post × Integration policies × Migrant	-0.0754** (0.0329)	-0.0654*** (0.0241)	-0.110*** (0.0329)
R-squared	0.022	0.065	0.033
Panel C The Effects of Policy Intensity: Specific Policy Indicators			
Panel C.1 High-skilled scheme			
Post × High-skilled scheme × Migrant	-0.0529*** (0.0106)	-0.0509*** (0.0123)	-0.0545*** (0.0188)
R-squared	0.022	0.065	0.033
Panel C.2 Non-high-skilled-specific scheme			
Post × Non-high-skilled-specific scheme × Migrant	-0.102** (0.0388)	-0.00904 (0.0492)	-0.0706 (0.0624)
R-squared	0.022	0.065	0.033
Panel C.3 Family reunification scheme			
Post × Family reunification scheme × Migrant	-0.0638** (0.0293)	-0.0407 (0.0302)	-0.0942*** (0.0346)
R-squared	0.022	0.065	0.033
Panel C.4 Access to education			
Post × Access to education × Migrant	-0.125** (0.0541)	-0.108*** (0.0361)	-0.183*** (0.0571)
R-squared	0.023	0.065	0.033
Panel C.5 Access to public services			
Post × Access to public services × Migrant	-0.143* (0.074)	-0.107* (0.0578)	-0.212*** (0.078)
R-squared	0.022	0.065	0.033
Individual-level Characteristics	YES	YES	YES
City-level Characteristics	YES	YES	YES
Year Fixed Effects	YES	YES	YES
City-specific Time Trends	YES	YES	YES
Observations	12,732	15,479	12,732
Number of Cities	47	56	47

All of the associated main effects are controlled. Robust standard errors clustered at the city level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 4 Difference-in-Differences Analyses for Various Subgroups

VARIABLES	(1) Physical health problems	(2) Self-reported health problems	(3) Emotional health problems
Panel A Cities Implementing the Reform in 2014 or 2015 during the Post-treatment Period			
Selection policies × Migrant	-0.0227*** (0.00648)	-0.0121** (0.00501)	-0.0216** (0.00790)
Integration policies × Migrant	-0.0986 (0.0784)	-0.114** (0.0460)	-0.174** (0.0677)
Observations	1,716	2,620	1,716
R-squared	0.071	0.103	0.103
Panel B Migrants			
Post × Selection policies	-0.0739*** (0.0129)	-0.0225 (0.0172)	-0.0646*** (0.0137)
Post × Integration policies	0.0176 (0.0349)	-0.039 (0.0383)	-0.0751* (0.0435)
Observations	2,717	3,175	2,717
R-squared	0.045	0.056	0.044
Panel C Before the National Announcement (July, 2014)			
Selection policies × Migrant	0.00669 (0.00603)	0.00302 (0.00416)	0.00948 (0.00629)
Integration policies × Migrant	-0.00692 (0.0128)	0.0684*** (0.0186)	-0.0271 (0.0191)
Observations	7,109	7,109	7,109
R-squared	0.022	0.078	0.034
Panel D Natives			
Post × Selection policies	0.00619 (0.00881)	0.0139 (0.0155)	0.00236 (0.0115)
Post × Integration policies	0.0587 (0.0354)	0.00649 (0.0463)	0.0168 (0.0376)
Observations	10015	12304	10015
R-squared	0.024	0.074	0.037
Individual-level Characteristics	YES	YES	YES
City-level Characteristics	YES	YES	YES
Year Fixed Effects	YES	YES	YES
City-specific Time Trends	YES	YES	YES

Each column within each panel is a separate regression. All of the associated main effects are controlled in each panel.

Robust standard errors clustered at the city level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 5 Robustness Checks

VARIABLES	(1) Physical health problems	(2) Self-reported health problems	(3) Emotional health problems
Panel A Control for Announcement Time			
Post × Integrate indicator for selection policies × Migrant	-0.0281*** (0.00622)	-0.0106 (0.0103)	-0.0292*** (0.00974)
Post × Integrate indicator for integration policies × Migrant	-0.0694** (0.0336)	-0.0678*** (0.0225)	-0.0983*** (0.0326)
Observations	12,732	15,479	12,732
R-squared	0.025	0.071	0.035
Panel B Control for Public Spending on Health, Social Welfare, and Education in 2010			
Post × Integrate indicator for selection policies × Migrant	-0.0266*** (0.00625)	-0.0172** (0.00747)	-0.0262** (0.0106)
Post × Integrate indicator for integration policies × Migrant	-0.0596* (0.0326)	-0.0568** (0.0231)	-0.110*** (0.0359)
Observations	12,732	15,423	12,732
R-squared	0.023	0.065	0.033
Panel C Balanced City Panel			
Post × Integrate indicator for selection policies × Migrant	-0.0268*** (0.00629)	-0.0167** (0.00736)	-0.0289*** (0.00953)
Post × Integrate indicator for integration policies × Migrant	-0.0787** (0.0344)	-0.0593** (0.0228)	-0.117*** (0.0385)
Observations	8,843	14,547	8,843
R-squared	0.025	0.063	0.033

All of the associated double interaction terms and main effects are controlled in each column. The other controls are the same as those in Table 3. Robust standard errors clustered at the city level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 6 Potential Mechanisms

Panel A The Effects of Policy Intensity on Working Overtime and Social Capital				
	(1)	(2)	(3)	(4)
VARIABLES	Work overtime	Days working overtime	Fairness	Trust
Post × Selection policies × Migrant	-0.0154*** (0.00396)	-0.111*** (0.0298)	0.0136* (0.00789)	0.00938** (0.00401)
Post × Integration policies × Migrant	-0.0329** (0.0154)	-0.282*** (0.103)	0.00988 (0.0268)	-0.00313 (0.0155)
Observations	9,745	9,745	15,469	15,469
R-squared	0.174	0.214	0.035	0.045
Panel B The Effects of Policy Intensity on Migrants' Integration				
	(1)	(2)		
VARIABLES	Contacts with natives within one's company	Contacts with natives within one's community		
Post × Selection policies	0.0361** (0.0143)	0.0397** (0.0185)		
Post × Integrated policies	0.157*** (0.0441)	0.0298 (0.0675)		
Observations	694	1,396		
R-squared	0.127	0.137		

In Panel A, all of the associated double interaction terms and main effects are controlled in each column.

In Panel B, the sample for column (1) are the migrants answering “yes” to the question “does your company mainly consist of natives?” The sample for column (2) are the migrants answering “yes” to the question “does your community of residence mainly consist of natives?” All the associated main effects are controlled.

The other controls are the same as those in Table 3.

Robust standard errors clustered at the city level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

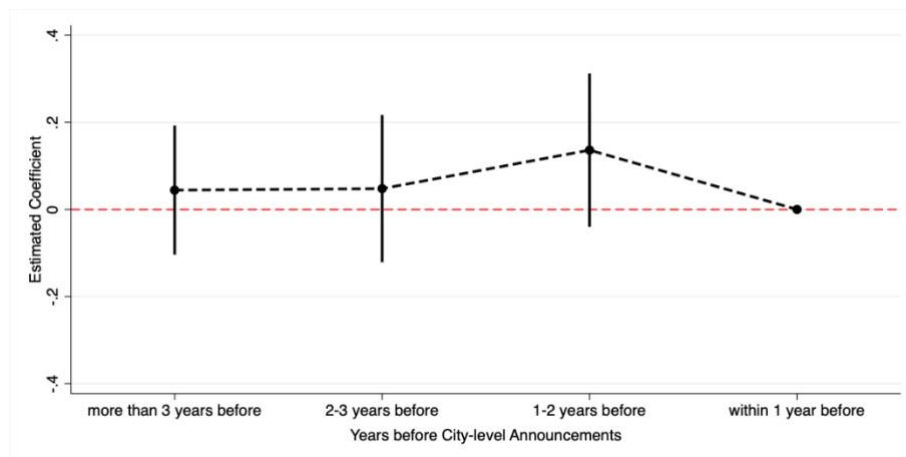
Table 7 Heterogeneous Treatment Effects by Migrants' Years in Destination

VARIABLES	(1) Physical health problems	(2) Self-reported health problems	(3) Emotional health problems
Post × Selection policies × Migrant duration 5 years or less	-0.0442*** (0.0108)	-0.0195 (0.0127)	-0.0278** (0.0117)
Post × Selection policies × Migrant duration 5 to 10 years	-0.0299** (0.0114)	-0.0658*** (0.0174)	-0.0313** (0.0127)
Post × Selection policies × Migrant duration 10 to 20 years	-0.0318*** (0.0108)	-0.00230 (0.0113)	-0.0276* (0.0151)
Post × Selection policies × Migrant duration above 20 years	-0.0291*** (0.00943)	0.00105 (0.0111)	-0.0319* (0.0161)
Post × Integration policies × Migrant duration 5 years or less	-0.0117 (0.0529)	-0.0526 (0.0466)	-0.0286 (0.0608)
Post × Integration policies × Migrant duration 5 to 10 years	-0.0464 (0.0369)	-0.0296 (0.0505)	-0.150*** (0.0435)
Post × Integration policies × Migrant duration 10 to 20 years	-0.0596 (0.0455)	-0.0432 (0.0348)	-0.0679 (0.0515)
Post × Integration policies × Migrant duration above 20 years	-0.0908** (0.0447)	-0.105** (0.0426)	-0.120** (0.0515)
Observations	9,741	12,488	9,741
R-squared	0.028	0.076	0.032

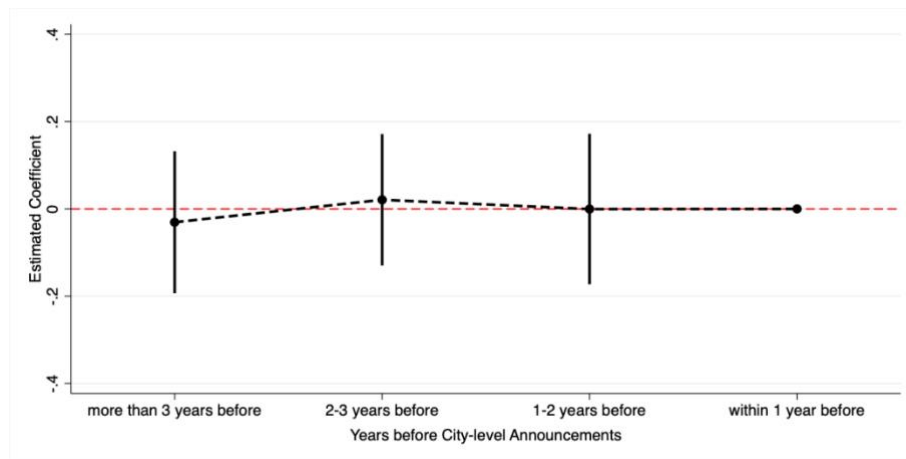
All of the associated double interaction terms and main effects are controlled in each column. The other controls are the same as those in Table 3.

*** p<0.01, ** p<0.05, * p<0.1

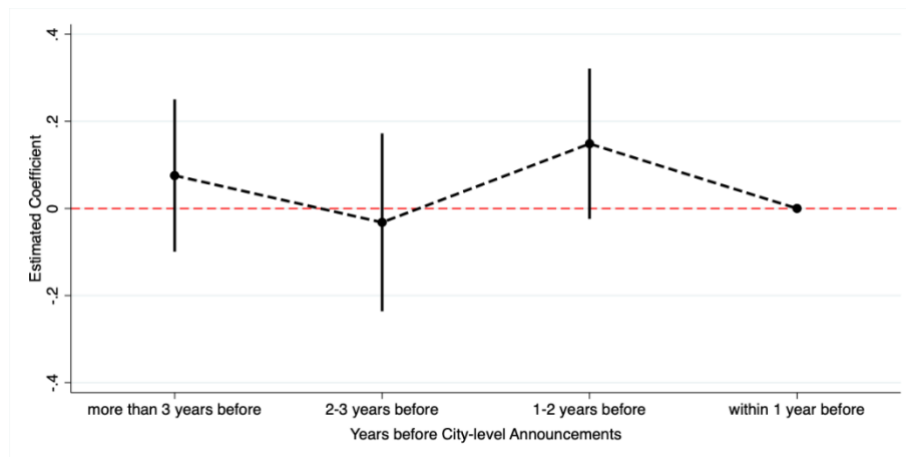
Figure 1 The Health Effects on Migrants by Year Before City-level Announcements



(a) Physical Health Problems



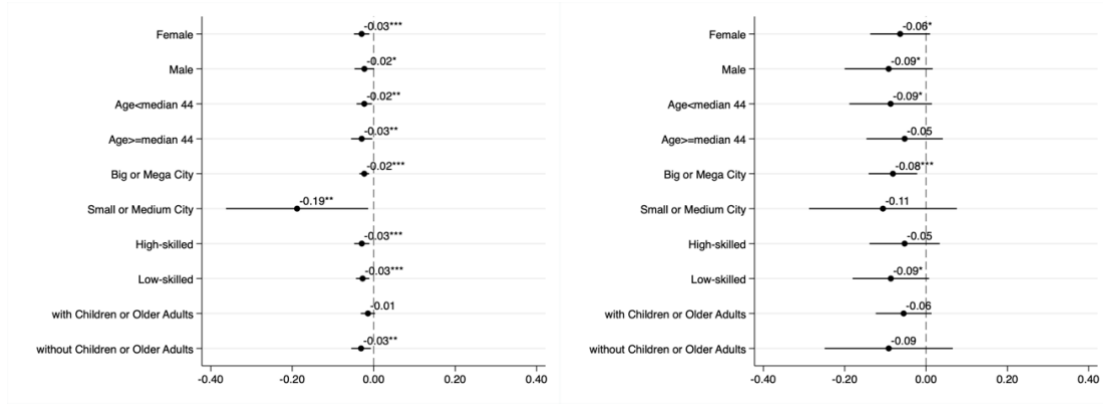
(b) Self-reported Health Problems



(c) Emotional Health Problems

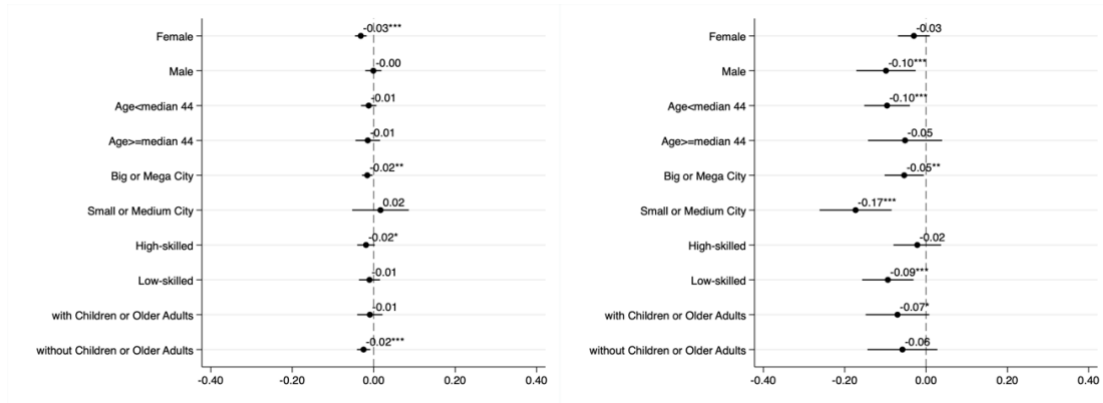
Notes: This figure displays the estimated coefficients and 95% confidence intervals for the effect of city-level policy announcements on three health outcomes of migrants relative to natives, based on the years leading up to the announcements. The omitted category is “policy announcement within 1 year.”

Figure 2 Heterogeneous Analysis by Subsample



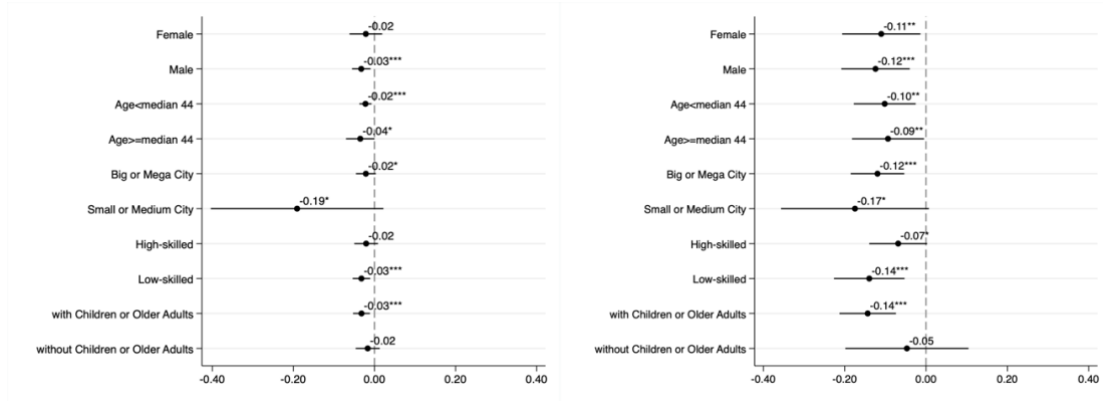
(a) Selection Policies on Physical Health Problems

(b) Integration Policies on Physical Health Problems



(c) Selection Policies on Self-reported Health Problems

(d) Integration Policies on Self-reported Health Problems



(e) Selection Policies on Emotional Health Problems

(f) Integration Policies on Emotional Health Problems

Notes: This figure shows the effects of selection and integration policies on migrant health across different groups. The y-axis lists these groups, categorized by gender (male vs. female), age (below vs. above the sample median), city size (big/mega vs. small/medium), skill level (high- vs. low-skilled), and living arrangement (co-residing with children/older adults vs. not). In Panels (a), (c), and (e), the x-axis represents the estimated coefficients on $Post \times Selection\ policies \times Migrant$ for regressions with physical health problems, self-reported health problems, and emotional health problems as outcome variables, respectively. In Panels (b), (d), and (f), the x-axis represents the estimated coefficients on $Post \times Integration\ policies \times Migrant$ for the same outcome variables, respectively. Panels (a)-(b), (c)-(d), and (e)-(f) correspond to regressions with the same specifications as columns (1), (2), and (3) of Panel B in Table 3, respectively.

The lines surrounding the point estimates represent the 95% confidence intervals.

Statistical significance: *** p < 0.01, ** p < 0.05, * p < 0.1.

Appendices

Appendix A Brief Description of Policy Coding

According to Wang et al. (2024), each city-level Hukou reform policy document contains multiple articles addressing selection and integration policies, ranging from 4 to 29 articles. The policy score for each article is calculated based on two key dimensions: **restrictiveness** and **magnitude of policy change**.

Restrictiveness evaluates policy changes across five aspects (de Haas et al., 2015):

1. Does the policy expand or shrink the pool of migrants granted rights?
2. Does it lower or raise eligibility criteria for a specific group?
3. Does it simplify or complicate administrative procedures for a migrant group?
4. Does it increase or decrease available options for the migrant group?
5. Does it relax or intensify control over a particular migrant group? (Haas, Natter & Vezzoli, 2015).

If any of the answers holds true, the policy is coded as **less restrictive (value = -1)**; otherwise, it is coded as **more restrictive (value = 1)**.

Magnitude of change captures the degree of change, assessed by **coverage** and **radicalness**. Coverage is considered **full** if the entire category of a migrant group (e.g., all migrant workers, all investors) is targeted, and **partial** otherwise (de Haas et al., 2015). Radicalness is deemed **fundamental** if the policy introduces entirely new systems (e.g., a points system) or abolishes existing ones (e.g., removing spouse requirements). Otherwise, it is considered **non-fundamental** (e.g., reducing residency requirements from five to three years) (de Haas et al., 2015).

Combining **coverage** and **radicalness**, four categories define the magnitude of change:

1. **Major change (weight = 4)**: Full coverage with a fundamental change.
2. **Mid-level change (weight = 3)**: Partial coverage with a fundamental change.
3. **Minor change (weight = 2)**: Full coverage with a non-fundamental change.
4. **Fine-tuning change (weight = 1)**: Partial coverage with a non-fundamental change (de Haas et al., 2015).

For each policy article, restrictiveness is weighted by the magnitude of change. The final policy score for each indicator (e.g., high-skilled scheme) is derived by summing the scores of all relevant articles in a city's policy document. For example, if a city has two articles addressing the selection of college graduates and overseas returnees, the high-skilled scheme score would be the sum of these two article scores.

References

- de Haas, H., Natter, K., & Vezzoli, S. (2015). Conceptualizing and measuring migration policy change. *Comparative Migration Studies*, 3(1), 15.
<https://doi.org/10.1186/s40878-015-0016-5>
- Wang, J. S.-H., Zhu, Y., Peng, C., & You, J. (2024). Internal Migration Policies in China: Patterns and Determinants of the Household Registration Reform Policy Design in 2014. *The China Quarterly*, 258, 457–478.
<https://doi.org/10.1017/S0305741023001674>

Appendix Table 1 Sample Selection

VARIABLES	(1) Study city sample	(2) Study city sample
Density of nighttime lighting	0.00492 (0.00445)	0.000292 (0.00522)
Proportion of low-skilled workforce	0.0957 (0.295)	-0.0571 (0.373)
Urban population (in 10 thousand)	0.000459*** (0.000162)	0.000392*** (0.000145)
Percentage of migrants	0.00682** (0.00307)	0.0105*** (0.00382)
Percentage of ethnic minority	-0.000661 (0.000698)	-0.00107 (0.00116)
Percentage of older adults (65 or older)	0.000939 (0.0109)	-0.00608 (0.0147)
Central region	-0.00253 (0.0500)	-0.0938 (0.0684)
Western region	0.00931 (0.0564)	-0.0330 (0.0848)
Constant	-0.0515 (0.274)	0.246 (0.354)
Observations	304	220
R-squared	0.216	0.243

Density of nighttime lighting represents the density of nighttime lighting detected by satellite covering 2010–2013, which was derived from the U.S. Air Force's Defense Meteorological Satellite Program/Operational Linescan System at the National Oceanic and Atmospheric Administration. This is an indicator of economic development. Proportion of low-skilled workforce is the proportion of low-skilled workforce in 2008 which was derived from the 2008 Economic Census. Urban population comes from China Urban Construction Statistical Yearbook. Percentage of migrants refers to the proportion of individuals with Hukou registered outside their county, as recorded in the 2010 Census. Percentage of ethnic minority and percentage of older adults aged 65 or over come from the 2010 Census. Central region and Western region are two dummies, and Eastern region is the omitted category. The sample of the regression in the column (1) contains all of the prefectural cities with the information on these variables available while that in the column (2) contains all of the cities with policy information and other information available.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

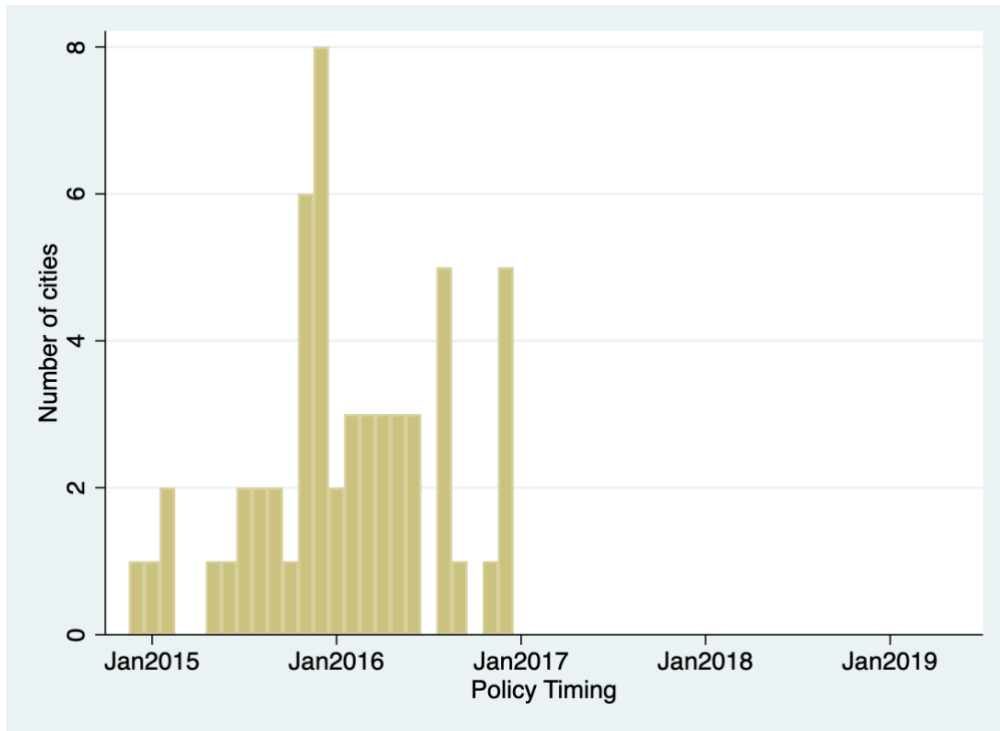
Appendix Table 2 Heterogeneous Treatment Effects by Hukou Type of Migrants

VARIABLES	(1) Physical health problems	(2) Self-reported health problems	(3) Emotional health problems
Panel A The Effects on Migrants with Agricultural Hukou			
Post × Selection policies × Migrant with agricultural Hukou	-0.0211*** (0.00644)	-0.0214** (0.00971)	-0.0244** (0.0104)
Post × Integration policies × Migrant with agricultural Hukou	-0.0865** (0.0386)	-0.0847* (0.0441)	-0.0927** (0.0443)
Observations	11,795	14,389	11,795
R-squared	0.025	0.068	0.034
Panel B The Effects on Migrants with Non-agricultural Hukou			
Post × Selection policies × Migrant with non-agricultural Hukou	-0.0349*** (0.0111)	-0.0108 (0.0114)	-0.0296** (0.0128)
Post × Integration policies × Migrant with non-agricultural Hukou	-0.0239 (0.0385)	-0.0479 (0.0326)	-0.101*** (0.0373)
Observations	10,947	13,389	10,947
R-squared	0.023	0.071	0.036

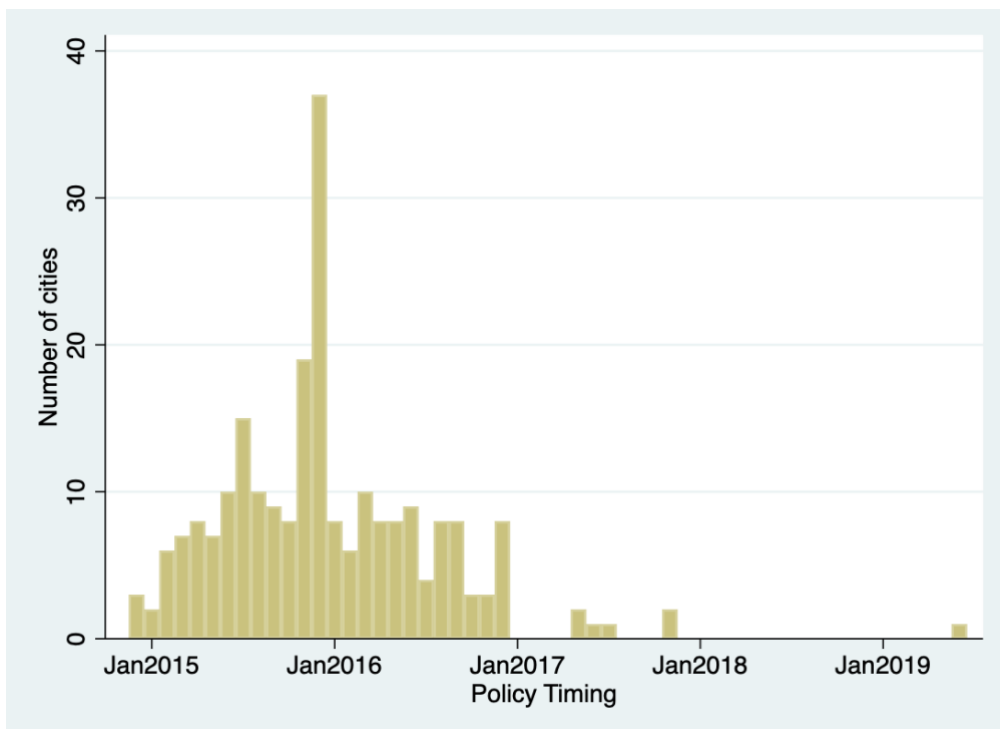
All of the associated double interaction terms and main effects are controlled in each column. The other controls are the same as those in Table 3. Robust standard errors clustered at the city level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Appendix Figure 1 The Distribution of City-Level Policy Timing

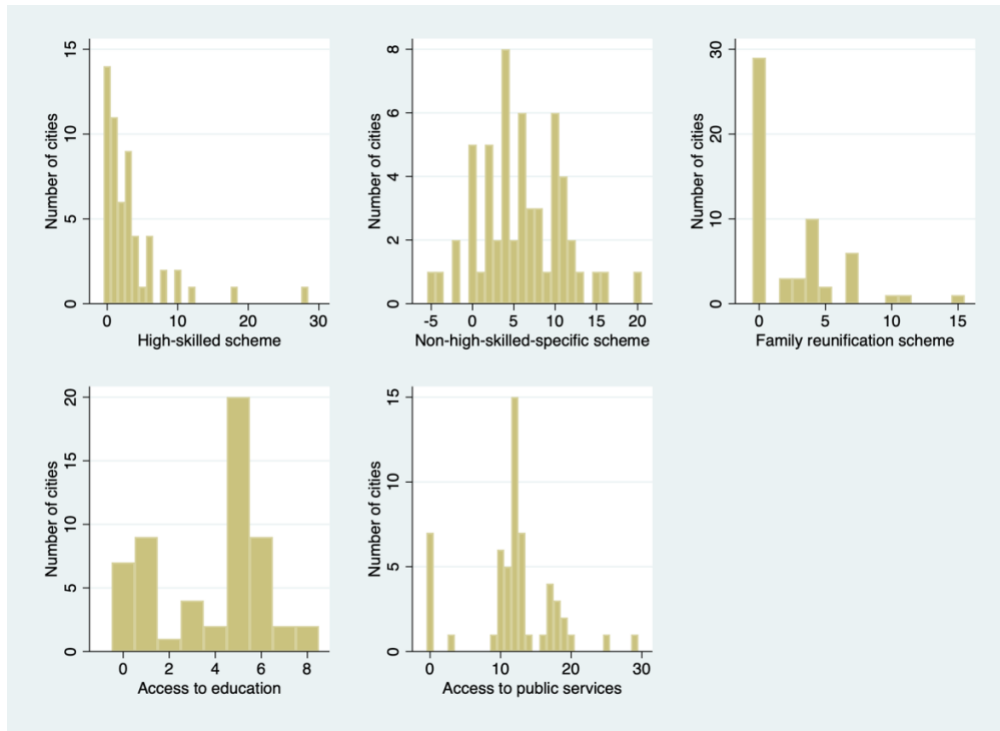


Panel A. For the 56 Cities in our Study

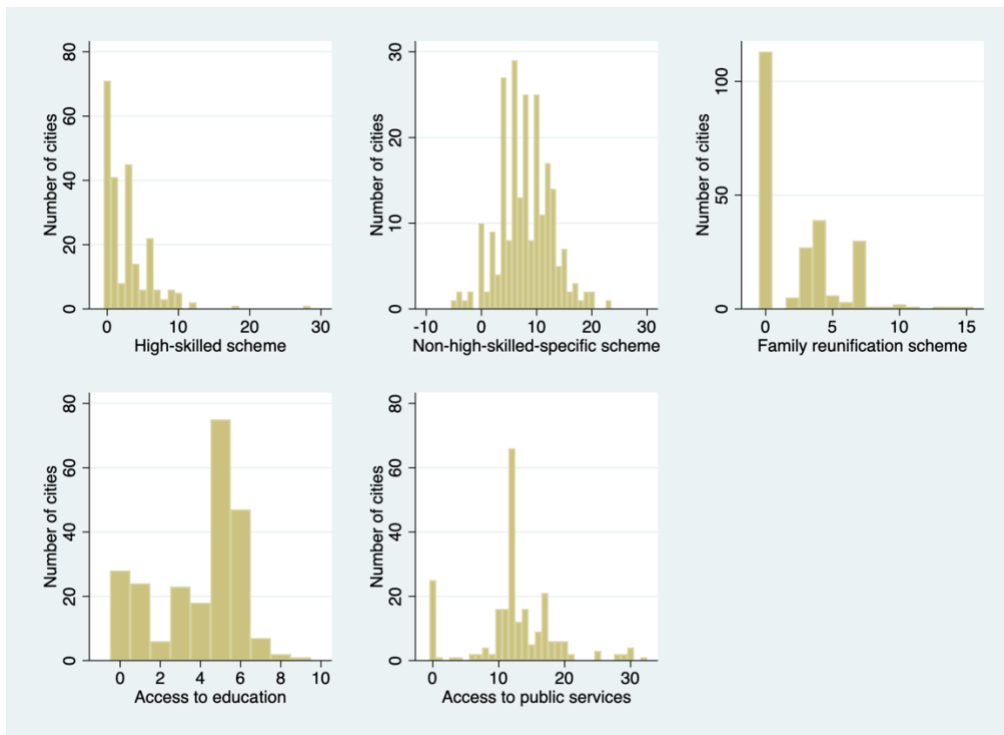


Panel B. For the 231 Cities with Information on Policy Scores

Appendix Figure 2 The Distribution of City-Level Policy Scores



Panel A. For the 56 Prefectural Cities in our Study



Panel B. For the 231 Prefectural Cities with Information on Policy Scores