

# Internal Migration and Education: The Role of Old-age Support\*

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## Abstract

In most developing countries, pension systems are poorly developed and the elderly rely on their children for old-age support. However, with increasing trends in rural-to-urban migration, many elder parents are left alone with limited assistance. This paper investigates whether parents may strategically lower the education investment in children to reduce the probability of their children out-migrating. In particular, I examine whether the Hukou reforms, which greatly relaxed migration restrictions in rural China, had detrimental effects on educational investments. Exploiting the variation in the timing of exposure to Hukou reforms across prefectures and cohorts, I show that the probability of children being enrolled in high school decreases by 0.1 standard deviations if the migration restrictions at high-school entry age are relaxed by one standard deviation. The effect is larger for parents whose ideal living arrangement at old age is to live near their children. Furthermore, the negative effects only exist for parents without pension entitlement. The results suggest that in contexts with weak policies for old-age support, lifting migration restrictions may have detrimental effects on human capital accumulation.

**Keywords:** Hukou Reforms, Education, Old-age Support, Rural China

**JEL Codes:** I25, J14, O15, R23

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# 1 Introduction

In developing countries, pension systems and safety nets provide only limited support for the elderly. As a result, support from descendants remains the main form of old-age support in these settings. Furthermore, descendants have limited ability to outsource care for their parents and the rates of co-residence with elder parents are high. In rural China, for instance, 64.51% of parents aged 60 or above co-resided with their children in 2010 (Chen and Chen 2016). However, with the acceleration of urbanization, many young rural people migrate to urban areas while their elderly parents are left behind in rural areas. Banerjee and Duflo (2011) describe such phenomenon in their book *Poor Economics*. They describe how some parents rue the day when their children decided to out-migrate, leaving their parents alone. In their book, they also describe how this reality could have detrimental effects on investments in education.<sup>1</sup> Since higher educated individuals are more likely to out-migrate (Akresh, Halim, and Kleemans 2022), parents may reduce investments in their children’s education to limit the chances of out-migration.

This paper investigates whether the Hukou reforms in China, which facilitated permanent migration to urban areas, had detrimental effects on education investments in rural areas. I focus on parental decisions of whether to enrol their children in high school, which is a critical window for investment in education. Parents undertake this decision when their children are 15 or 16 years old. I measure high school educational attainment using a large cross-section of rural households from the 2011 wave of the China Health and Retirement Longitudinal Study (CHARLS). This survey contains detailed information on parents and children, as well as those who out-migrated.

I exploit the Hukou reforms that took place during 1997-2010 and that were staggeringly implemented across prefectures. The panel data of the Hukou reforms are from Fan (2019). Specifically, the measurement of the Hukou reforms is an index ranging from 0 to 6, and a larger value means less restriction to migrate to this prefecture permanently.

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<sup>1</sup>Banerjee and Duflo (2011) provide anecdotal evidence of this phenomenon from the Nobel Laureate Theodore Schultz, whose parents were reluctant to educate him because they wanted him to stay back on the farm (page 77).

To construct the relevant Hukou reforms for each origin rural prefecture, I use the information on the most common destination prefectures from migration flows in the year 2000.

I implement a *Difference-in-Differences* strategy across prefectures and cohorts. In particular, I construct the relevant measure of Hukou restrictions when the individual was 16 years old. This measure varies across prefectures because each individual had a different set of destination prefectures, each with different levels of restrictions. Furthermore, it varies across cohorts within a rural prefecture because destination prefectures implemented reforms at different points in time, hence generating cohort variation in exposure to the Hukou reforms. The main identification assumption is that the timing of Hukou reforms is orthogonal to changes in unobserved determinants of educational investments across cohorts.

The estimates indicate that Hukou reforms at the high school entry ages have substantial negative effects on high school enrollment. If the Hukou index, when the child was 16 years old, increases by one standard deviation, the likelihood of the child enrolled in high school would decrease by 0.096 standard deviations. The results are highly statistically significant and robust to using the Hukou index at age 15 or the average of Hukou indexes at ages 15 and 16. I also conduct a placebo exercise and show that Hukou reforms when the individual was 17 or older - hence, when the decision on whether to enrol in high school was already taken - do not affect educational attainment. Furthermore, I present evidence that there are no pre-existing trends in high school enrollment rates that would correlate with Hukou reforms.

I provide two additional results suggesting that these negative effects on education could be motivated by parents' old-age support concerns. First, I examine heterogeneity depending on the parent's reported preferences for the ideal living arrangements for the elderly. In the 2011 CHARLS survey, individuals were asked about what would be the ideal living arrangement for an elderly person without a spouse. Individuals who report that the ideal arrangement would be to live near their children may be particularly concerned about their own old-age support. I find that the Hukou reforms reduce children's

education for parents who prefer to live near their children but not for parents that do not express such preferences. A potential concern with this result is that parents' preferences may be endogenous to their children's out-migration and education decisions. For example, parents may be more likely to express that they prefer not to live with their children if their children out-migrated. To address this, I predict parental preferences using pre-determined household characteristics, and I explore the heterogeneity of results based on this measure. The results are similar. This indicates that when migration restrictions are relaxed, parents concerned with old-age support may reduce their children's high school enrollment.

Second, I also examine the heterogeneity of results by parents' pension entitlement. Parents who do not have pensions may rely more on their children for old-age support (Chen 2017 and Cheng et al. 2018b). Parents' pension entitlements are the status in 2011 from the CHARLS data. I find that the negative effects of the Hukou reforms on children's high school enrollment only exist for parents without pension entitlements. A potential concern with this result is that the parental decision of whether to enrol in a pension program may be endogenous to their children's education and out-migration decisions. To deal with such a potential problem, I predict pension status using pre-determined household characteristics. The results are similar to whether I use the actual pension status or the predicted status based on pre-determined characteristics. This suggests that parents who do not have other forms of old-age assistance, such as pensions, reduce investment in children's education to a greater extent when migration restrictions relax.

An important component in the conceptual framework of this paper is that educational attainment has a positive and causal effect on the likelihood of out-migration. There are a number of studies that have documented this hypothesis in different contexts (Hamory et al. 2021, González Chapela, Jiménez-Martín, and Vall Castelló 2021, Akresh, Halim, and Kleemans 2022 and Hsiao 2022). As a further check, I examine the validity of this hypothesis using my data and setting. To do that, I exploit the staggered implementation of the Compulsory Education Law across provinces since 1986. Specifically, I compare children's migration outcomes across provinces and cohorts. Results show that children

more exposed to the Compulsory Education Law are more likely to live far away from their parents and live in a different county from their parents. This provides supporting evidence that parents indeed can limit children's out-migration by educating them less.

This study is most related to de Brauw and Giles (2017) and Pan (2017) that study the effects of relaxing migration restrictions on education in rural China. de Brauw and Giles (2017) study how allowing temporary migration affects high school enrollment. They exploit the variation in the timing of national identity card distribution across counties which made it easier for rural migrants to register as temporary residents in urban destinations. They find that the an increase of 1% in the share of migrants in the origin village labor force lowers high school enrollment rate by 2.15 percentage points. They argue that the social networks of migrants lower the cost of finding a job in cities and raise the opportunity cost of remaining in school. Pan (2017) evaluates how the change in Hukou inheritance law in 1998 affect high school enrollment of rural youths.<sup>2</sup> With the migration restrictions, many rural young people strategically pursue post-compulsory education to overcome the disadvantage of mobility restrictions. But with the relaxing of mobility restrictions, incentives for obtaining urban Hukou through more education disappear. She uses a regression discontinuity design and finds that the high school attendance rate drops by 8.8 percentage points for barely eligible cohorts compared with those barely ineligible. Relative to these two studies, this paper analyses the effects of relaxing migration restrictions on education from the perspective of old-age support. Specifically, parents reduce educational investment in children to limit their out-migration and increase the probability of in-person old-age care. Additionally, I exploit Hukou reforms at ages 15/16, which is the most critical window of high school decisions by parents and implement a *Difference-in-Differences* strategy.

This paper is also highly related to the literature on children's migration and parental investment in children's schooling. In the context of India, Jensen and Miller (2017) show

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<sup>2</sup>In the old system, Hukou status was inherited at birth from the mother. With the reform of the Hukou inheritance law, the Hukou status can be inherited at birth from the father as well. In addition, children under 18 years old are allowed to transfer the Hukou status inherited from the mother to that held by the father.

that cultural traditions of coresidence and old age support may lead parents to strategically decrease the education of children. They build a model where parents underinvest in children's education to reduce the returns of migrating out of the home village. Empirically they exploit an intervention that increased the urban returns to schooling and show that rural children receive less education since the parents want to keep them at home. Compared with their paper, I study the effect of a reduction in migration cost and show that the relaxation of migration restrictions has a significantly negative effect on education in rural China.

Finally, this paper also adds to the growing body of studies on old-age support. Parents use income transfer (Manacorda and Moretti 2006) and bequests (Ho 2022) or instil filial piety (Guo and Zhang 2020) to make their children provide old-age support. Raut and Tran (2005) proposes two alternative models of intergenerational transfers (pure loan contract or self-enforcing reciprocity) linking parental investment in the human capital of children to old-age support. Becker, Murphy, and Spenkuch (2016) show that parents invest more in the human capital of children when they expect greater old-age support, which ends up benefiting both the parents and the children. In contrast, this paper emphasizes the role of children's in-person old-age care and finds the opposite results. Specifically, parents' motive for old-age support would reduce their educational investment to limit children's out-migration.

The rest of this article is organized as follows. In Section 2, I provide background knowledge about Hukou, education and old-age support in China. Section 3 introduces the data and empirical strategy. Section 4 presents the results of Hukou reforms on education and the mechanism. Section 5 concludes.

## 2 Background

### 2.1 Hukou in China

Hukou, the household registration system in China, requires people to live and work only where they have official permission to do so. It became law in 1958 (Cheng and Selden 1994). Citizens were divided by rural (agricultural) or urban (non-agricultural) Hukou and further categorized by location of origin. The Hukou system was established to curb rural-to-urban migration and increase the state’s economic control (Chan and Zhang 1999). In the early stage, the government provided jobs, housing, and social security only for people with urban Hukou. People with rural Hukou can not legally live and work in urban areas. The Hukou system therefore made it difficult for rural people to migrate to urban areas before the mid-1980s.

Two forces contributed to the initiation of the Hukou reforms, which conditionally allow people to obtain urban Hukou and permanently migrate to urban areas more easily. First, the strict control over migration caused huge rural-urban disparity in China (Chan and Zhang 1999). Second, the economic reform in 1978 caused a surge in demand in the urban labor market, and rural residents rushed to urban areas without the support of local urban Hukou. This brought challenges to internal migrant workers themselves and their children. In 1984, a document titled “A Document on the Issue of Peasants Settling Down in Cities” was issued by the state government, which requires local governments to integrate rural migrants as part of their urban population. The Hukou reforms are implemented gradually. In 1985, the Ministry of Public Security issued regulations for rural migrants to obtain temporary residence permits in cities (*zanzhuzheng*). In 1997, the State Council approved a pilot scheme to grant urban Hukou to rural migrants who held stable jobs in their newly resided towns and small cities. After the trial period, Hukou reforms were scaled-up nationwide. The local governments of prefectures were given significant autonomy in deciding Hukou policies.

The intensity and scope of Hukou reforms increased and expanded after 2013. In March

2014, the National Urbanization Plan (2014–2020) announced urban Hukou reforms to ensure that 100 million non-Hukou migrants can obtain urban Hukou. In July 2014, the State Council issued “Policies on the Reform of Household Registration System” that further clarified more details of Hukou reforms in small and medium cities, and big cities, respectively. More recently, a point system has been used in many big cities like Beijing, Shanghai, and Guangzhou, see for instance Zhang (2010) and Shen and Li (2020). The credit points are calculated based on various dimensions such as age, education level, working skills, and awards. Once the point is accumulated above a certain threshold within the prefecture, the applicant can obtain local urban Hukou.

## 2.2 Education in China

Schooling in China generally consists of six years of primary school, three years of middle school and three years of high school. After completing these years of schooling, students then have the opportunity to continue higher education.

China Ministry of Education issued the nationwide Compulsory Education Law (CEL) on April 12, 1986. The law officially went into effect on July 1, 1986. There are several important features of the law. First, compulsory education is nine years, including six years of primary school and three years of middle school. Second, compulsory schooling starts at the age of six or seven, depending on the region.<sup>3</sup> Therefore, ages 15-16 are the critical window when parents decide whether enrol their children in high school or not.<sup>4</sup> Third, local governments can have different effective dates to implement the law.<sup>5</sup> Most regions implemented the law in 1986 and 1987, while some provinces later. Panel (a) of Figure 1 shows the implementation year for each province. The detailed timing of issuing

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<sup>3</sup>Children born in the same year may start primary school at different ages due to the entry cutoff date, which is September 1. Specifically, within the same year, children born on August 31 or earlier could enter school at a relatively young age, whereas those born on September 1 or later must delay starting by one year.

<sup>4</sup>Ha, Yi, and Zhang (2016) use ages 15-16 as the window of starting high school as well.

<sup>5</sup>In Article 2, the law explicitly states that the authorities of provinces, autonomous regions, and municipalities directly under the Central Government shall decide on measures to promote compulsory education following the degree of economic and cultural development in their localities.

and implementing CEL can be found in Table A1.

Though the CEL in 1986 specified that the nine years of compulsory education should be tuition-free (Article 10), this was never strictly enforced. In 2006, the government adopted the free compulsory education reform nationally broad. All western provinces were required to implement the reform no later than the spring of 2006, and the other provinces no later than the spring of 2007.<sup>6</sup>

## 2.3 Old-age Support

The traditional view that raising children for old-age support (*yangerfanglao* in Chinese) is still prevalent in rural China, and sons are expected to provide more care. In rural China, 64.51% of parents aged 60 or above co-resided with their children in 2010 (Chen and Chen 2016). According to the China Longitudinal Aging Social Survey 2014 wave, 66.2% of elderly people who are aged above 60 years old agree that people should rely on children for old-age support.<sup>7</sup> In provinces like Henan, Shaanxi, Ningxia, and Jiangxi, the proportion is even above 80%. With the acceleration of urbanization, many young people are settled down in cities while parents are left-behind in rural villages.

Given the social norm of relying on children for old-age support, children’s out-migration may impair parents’ welfare.<sup>8</sup> Therefore, parents may reduce children’s education to limit children’s out-migration. There is some anecdotal evidence. On May 17, 2018, Sohu News published an article where an elderly couple brought up two sons enrolled in Tsinghua University and Renmin University but they ended up living in a nursing home in their old age. This news was widely forwarded and caused heated discussions. In response to this news, a writer wrote an article to discuss children’s education and old-age support, titled *Children are enrolled in Tsinghua University, but old people*

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<sup>6</sup>The effective data for each region. March 2006: Tianjin, Shanghai, Fujian, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu; September 2006: Jiangsu, Zhejiang, Guangdong; March 2007: Hebei, Shanxi, Liaoning, Jilin, Heilongjiang, Anhui, Jiangxi, Shandong, Henan, Hubei, Hunan.

<sup>7</sup>[http://www.stats.gov.cn/tjzs/tjsj/tjcb/dysj/201702/t20170208\\_1460350.html](http://www.stats.gov.cn/tjzs/tjsj/tjcb/dysj/201702/t20170208_1460350.html)

<sup>8</sup>See for instance Xiang, Jiang, and Zhong (2016) and Cai, Park, and Yip (2022) for negative effects of children’s migration on left-behind parents.

are left behind. Should we let children “fly away”? He said that some people believe it would be better if parents reduce children’s schooling and keep them at home for old-age support.<sup>9</sup>

*“Some people hold the opinion that if children enter a famous university but parents are left behind lonely, they should make them learn some simple skills and stay at home with their parents to support them in their old age.”*

Monetary support is also an important way of old-age support from children. It’s true that parents can expect more monetary old-age support from their children if the children are more educated and have better job opportunities (remittance effect). However, the remittance effect may be limited and insufficient to finance a tender for elder parents. For example, in China, only about 32% of children older than 25 transferred money to rural parents in 2011, and the average amount was around 60 dollars.<sup>10</sup> Moreover, the healthcare market in rural China is incomplete, and the cost of hiring a full-time tender is high, varying from 500 to 1500 dollars per month. Therefore, rural parents value children’s physical presence and they may leave them at high risk if their children out-migrate.

Social security is another potential source of old-age care for the elderly. Fang and Feng (2018) present a thorough introduction to the pension system in China. The pension system in rural areas are very limited before the introduction of the New Rural Pension Scheme (NRPS) in 2009.<sup>11</sup> NRPS was rolled out on a county-by-county basis and covered all the counties in mainland China by the end of 2012. Individuals aged 16 years and older could voluntarily participate in the scheme, and people aged 60 years and older could receive a pension.<sup>12</sup> NRPS is beneficial to the elderly physically and mentally (Cheng et al. 2018a). Moreover, a pension scheme could alleviate the reliance on children for old-age support to some extent (Shan and Park 2020, Shen, Zheng, and Yang 2020 and Bau 2021).

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<sup>9</sup>[https://www.sohu.com/a/327037549\\_202914](https://www.sohu.com/a/327037549_202914)

<sup>10</sup>The figures are calculated by the author using the 2011 wave of the China Health and Retirement Longitudinal Study. The monetary transfers include both regular transfers and non-regular transfers.

<sup>11</sup>See Huang and Zhang (2021) for more knowledge about NRPS.

<sup>12</sup>The basic pension is approximately \$9 per month.

## 3 Data and Empirical Strategy

### 3.1 Data

#### 3.1.1 Hukou Reforms in China

The data of Hukou reforms in China are from Fan (2019), which are a prefecture-year panel of the Hukou index during 1997-2010 covering 340 prefectures, the universe of prefecture-level cities in China.<sup>13</sup> Based on the Peking University Law Information Database and the webpage of the official news agency for the communist party, all official news, and laws and regulations potentially related to Hukou reforms are collected by Fan.<sup>14</sup> The *de jure* specific qualification criteria differ across cities. Still, generally, the reforms are based on three aspects: 1) a migrant's job prospects and job stability, 2) his/her residential condition, and 3) his/her history of contribution to the local social security system. Based on Hukou reforms during 1997-2010, Fan (2019) quantitatively constructed a panel data of Hukou index measuring the difficulty of obtaining urban Hukou at the prefecture level.<sup>15</sup> The Hukou index is a scale of 0-6, where a value of 0 means stringent control on Hukou and 6 is for an open-door policy.

The Hukou index is the sum of two sub-scores which are based on the policy's geographical coverage. Specifically, some policies apply only to peripheral urban areas of a city, while others apply to the central districts as well. Each sub-score takes a value of 0-3, and a larger number means less restriction on obtaining urban Hukou. In particular, 0 means that the city grants virtually no local urban Hukou to migrants other than those initiated by public-sector employers; 1 indicates that a migrant can obtain local urban Hukou by purchasing an apartment above a specific size or value; 2 means that a migrant can get local urban Hukou by purchasing an apartment (or renting a subsidized apart-

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<sup>13</sup>The counties directly under the control of the province are not included. The author uses the prefecture code in 2005.

<sup>14</sup>Peking University Law Information Database <http://www.lawinfochina.com/> and the official news agency for the community party <http://www.xinhuanet.com/>.

<sup>15</sup>See Sun, Chongen, and Peichu (2011) and Kinnan, Wang, and Wang (2018) for provincial-level data of Hukou reforms. See Zhang, Wang, and Lu (2019) for a panel Hukou index from 2000 to 2016 for 120 cities in China.

ment from his/her employer) with no specific requirement on its values, or by working and contributing to the social security by more than five years; 3 is graded if a migrant can obtain Hukou by working and residing in a city and contributing to the local social security for a relatively short period.

Figure 2 presents the evolution of Hukou policies over time. Panel (a) shows the average Hukou index. The average Hukou index in 2000 was 0.915 and increased to 3.315 in 2010.<sup>16</sup> Panel (b) shows the number of prefectures experiencing reforms each year. In 2001, Hukou reforms were scaled up nationwide, and 236 prefectures implemented Hukou reforms. To have a visual concept of the relaxation of migration restrictions, Panel (b) and (c) of Figure 1 show the Hukou index for each prefecture in 2000 and 2010, separately. In general, almost all the prefectures have gradually relaxed Hukou restrictions. The Hukou index for each prefecture in each year is visually shown in Figure A1.

### 3.1.2 2000 Chinese Census

The 2000 Chinese Census is the fifth national population census in China. The data I have access to is 0.095% sampling and include about 1.18 million people. We observe where people currently reside and when did they move here. The information on the origin place was collected for people who moved here within five years. Focusing on people who migrate within five years, I construct a migration matrix measuring migration flows from the origin prefectures to the destination prefectures. The migration matrix is later used to weigh Hukou reforms in all potential migration destinations. Migration can happen within a prefecture or across prefectures, and Hukou policies in different designation prefectures matter to a different extent. The 2000 census is used because Hukou policies were still strict in 2000 since large-scale Hukou reforms did not happen until 2001.<sup>17</sup>

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<sup>16</sup>In 1997, the first year of the Hukou panel, only 2 out of 340 prefectures had a Hukou index of 2, and all other prefectures were 0. The average Hukou index in 1997 was 0.0118.

<sup>17</sup>The baseline year of 1997, where the Hukou data starts, is not used because the Chinese census occurs almost every ten years. Specifically, the historical waves of the census in China happened in 1953, 1964, 1982, 1990, 2000, 2010 and 2020.

### 3.1.3 China Health and Retirement Longitudinal Study

The China Health and Retirement Longitudinal Study (CHARLS) collects a high-quality, nationally representative sample of Chinese residents who are 45 or older. The baseline national wave was conducted in 2011, and about 10,000 households and 17,500 individuals are surveyed. Those people are followed up every two years. Geographically, the survey covers 126 prefectures, 150 counties/districts and 450 villages/communities (see Panel (d) of Figure 1). The CHARLS includes detailed information linking parents and children including children who out-migrated. For parents, we know their educational background, their preferences for living arrangement for the elderly and their pension entitlements. We observe each child's education level, where they live, and the living distance from their parents.

This paper focuses on a rural sample of the CHARLS 2011 wave, mainly due to three reasons. First, the main outcome of interest is high school enrollment of children aged 16 years or older. If the outcome is already observed in 2011 wave, it will not change in the following waves. Second, the data on Hukou reforms are up to 2010. The education and migration outcomes observed in later waves may be affected by Hukou policies after 2010 which is not covered by data used. Third, this paper focuses on the rural sample because the cultural norm of relying on children for old-age support is deeply rooted in rural areas, and the pension system is incomplete in rural areas.

The CHARLS 2011 consists of questions about parents' living preferences. In particular, each parent is asked about the best living arrangement for an elderly person (see Appendix B for more details). I define that parents prefer to live near children if either parent holds the opinion that the best living arrangement for an elderly without a spouse is to live with children or in the same community/village. Based on this definition, about 90% of parents prefer to live near their children.

I define that parents are with pension entitlement if either parent answered that he/she participated in pension schemes. The survey on parents' pension entitlements asks two

relevant questions: 1. Are you enrolled in at least one kind of pension programs?<sup>18</sup> 2. Do you participate in the New Rural Social Pension Insurance program?<sup>19</sup>

I link the CHARLS data with the Hukou index by prefecture, year and birth cohort. This paper focuses on the sample of cohorts born between 1981 and 1994 because the data on Hukou reforms from Fan (2019) are from 1997 to 2010. This leads to a sample of 5,304. Figure A2 shows the cohort distribution by the year when the child was 16 years old.

The descriptive summary of key variables is presented in Table 1. The definitions of key variables are shown in Table A2.

### 3.2 Empirical Strategy

People can migrate within prefectures as well as across prefectures. Therefore, the Hukou reforms in all potential destination prefectures should matter for migrants from each origin prefecture. Moreover, Hukou reform in a destination prefecture may be more relevant if the current migrant flow from the origin prefecture to this destination is large. To construct the relevant Hukou reforms for each origin prefecture, I use the Hukou reforms in most common destination prefectures from migration flows in the year 2000. In particular, a composite Hukou index is constructed as follows in Equation (1).

$$HukouIndex_{jt} = \sum_{d \in \text{all}} \frac{\#Migrant_{jd,2000}}{\#Migrant_{j,2000}} \times HukouIndexBase_{dt} \quad (1)$$

$HukouIndex_{jt}$  is a composite Hukou index for origin prefecture  $j$  at year  $t$  and  $HukouIndexBase_{dt}$  is the basic Hukou index for all potential destination prefecture  $d$  (including prefecture  $j$  as well). Each basic Hukou index is weighted by previous migration flows calculated from the 2000 China census. Specifically,  $\#Migrant_{j,2000}$  is the total number of migrants

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<sup>18</sup>The listed pension programs include includes supplemental pension of the firms, commercial pension insurance, rural pension, residents' pension and so on, excluding pension insurance of government and institutions, and basic pension of the firms.

<sup>19</sup>The New Rural Social Pension Insurance program is a large social pension program launched in 2009. See Huang and Zhang (2021) for more details about this program.

who originated from prefecture  $j$  during 1995-2000 and  $\#Migrant_{jd,2000}$  is the number of migrants from prefecture  $j$  to prefecture  $d$  during 1995-2000.

The objective is to evaluate the effect of Hukou reforms on the high school enrollment rate. I implement a *Difference-in-Differences* strategy across prefectures and cohorts. In particular, I exploit changes in the relevant Hukou index when a child was 15/16 years old which are the ages of enrolling in high school. This measure varies across prefectures because each individual had a different set of destination prefectures, each with different levels of Hukou reforms. Furthermore, it varies across cohorts within a rural prefecture because destination prefectures implemented reforms at different points in time, hence generating cohort variation in exposure to the Hukou reforms. The main empirical specification is as follows.

$$HighSchool_{ijt} = \beta HukouIndex16_{jt} + X'_{ijt}\gamma + \phi_t + \delta_j + \epsilon_{ijt} \quad (2)$$

where  $HighSchool_{ijt}$  is a dummy that takes 1 if the child  $i$  in prefecture  $j$  of cohort  $t$  was enrolled in high school in 2011, 0 otherwise.  $HukouIndex16_{jt}$  is the Hukou index in prefecture  $j$  of cohort  $t$ , which is the year the child was 16 years old.  $X_{ijt}$  are the control variables, including gender, the number of children and boys in the family, parents' education, and average household land (log). The average differences across cohorts are controlled for in cohort fixed effects  $\phi_t$ .  $\delta_j$  are prefecture fixed effects, which absorb all time-invariant prefecture-level characteristics.  $\epsilon_{ijt}$  is the error term clustered at the prefecture level.  $\beta$  is the coefficient of interest, and it captures the causal effects of relaxing the Hukou restrictions by one unit on the likelihood of enrolling in high school. The underlying assumption is that the timing of Hukou reforms is orthogonal to changes in unobservables that affect education across cohorts.

## 4 Results

### 4.1 The Effects of Hukou Reforms on Education

In summary, the results suggest that Hukou reforms negatively affect high school enrollment in rural China. The baseline results are presented in Table 2. The dependent variable is high school enrollment, and the main independent variable is the Hukou index. Since the normal age for starting high school education in China is 15 or 16 years old, the Hukou indexes when the child was 15 and 16 years old are used separately. Column 1 shows that if the Hukou index, when the child was 15 years old, increases by one unit, the probability of the child enrolled in high school would decrease by 4.3 percentage points, relative to a baseline mean of 34.9 percentage points. Similarly, column 2 shows that if the Hukou index, when the child was 16 years old, increases by one unit, the probability of the child enrolled in high school would decrease by 3.7 percentage points, relative to a baseline mean of 33.7 percentage points. In other words, the estimates suggest that the probability of children being enrolled in high school decreases by 0.096 standard deviations if the Hukou restrictions at high-school entry age are relaxed by one standard deviation. For robustness check, the average Hukou index when the child was 15 and 16 is also used (column 3). Overall, the estimated effects are highly statistically significant and large in magnitude. Results using Hukou index sub-scores of central areas and periphery counties separately are shown in Table A3. The negative signs on *HukouIndex*<sub>16</sub> suggest that Hukou policies in both central and periphery areas of cities matter for children’s migration and education investment.

In the baseline specifications, the individual’s gender, parent’s education, the number of siblings, the logarithm of average household land in 2011, cohort fixed effects and prefecture fixed effects are controlled for. The household land is used as a proxy for household income when the parents made the decision to enrol their children in high school.

Since 15/16 are the ages of starting high school, Hukou reforms happened when a

child was 17 years or older should have no effect on high school enrollment. I provide evidence of a “placebo test”. In particular, I employ a similar specification as in Equation (2) but use *HukouIndex17*, *HukouIndex18* and *HukouIndex19* separately instead of *HukouIndex16*. Considering that the Hukou index tends to be serially correlated, I further control for *HukouIndex16* in the regressions for post-17 cohorts. I expect the coefficient to be zero since when the child was 17 years old or older, he/she should have already enrolled in high school or dropped out. The coefficients on the Hukou index are presented in Figure 3.<sup>20</sup> Each coefficient is from a separate regression. The coefficients for post-17 cohorts are around zero and statistically insignificant. This suggests that Hukou reforms after high school entry ages indeed have no effects on high school enrollment. Moreover, this also provides validation evidence for the usage of ages 15/16 in the main results.

After examining the effects of Hukou reforms on high school enrollment, I further evaluate the effects on children’s remittance to parents and out-migration from parents. The sample is further restricted to children who were 25 years or older since younger cohorts may not have settled down or earned wages.<sup>21</sup> The results are shown in Table A4. The coefficients on *HukouIndex16* are consistently negative, though statistically insignificant. These provide some suggestive evidence that Hukou reforms have negative effects on remittance to parents and out-migration.

## 4.2 Mechanism

### 4.2.1 The Role of Old-age Support

The proposed mechanism is that parents reduce children’s educational investment to prevent their out-migration and ensure physical old-age support. In this section, I test this mechanism by heterogeneity analysis. Specifically, I study the heterogeneity of results by parents’ living preferences and pension entitlement. Some discussion on the family

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<sup>20</sup>See Figure A3 for results that do not control for *HukouIndex16* in the regressions for post-17 cohorts and also results for earlier cohorts.

<sup>21</sup>In China, the average age of first marriage in 2011 is 25 years old.

structure follows.

First, I explore the heterogeneity of the effect by parents' living preferences. Parents who prefer to live near their children in their old age may be more worried about children's out-migration. The results are shown in Table 3. In column 1, the coefficient on the interaction of *HukouIndex16* and parents' preference of living near their children is negative and marginally significant. Specifically, it means that when the Hukou index increases by one, children whose parents prefer to live near them are 3.6 percentage points (relative to a mean of 33.7 percentage points) less likely to enrol in high school compared to children whose parents prefer not to live near them. The estimate is statistically significant at the 5% level.

One potential concern is that parents' living preferences could be endogenous to children's migration and education decisions. For example, parents could express that they prefer not to live near their children if they have migrated or do not provide much old-age support. To address this, I predict parental preferences using pre-determined household characteristics using data of CHARLS 2011 wave. Specifically, I regress parents' living preference linearly on the number of children, the number of boys, the mother's education, the father's education and the logarithm of average household land controlling for prefecture fixed effects, mother's birth year fixed effects and father's birth year fixed effects. To have a comparable share of parents depending on observed preference, I define the dummy variable of predicted pension is defined as 1 if the predicted value is larger than the 15th percentile of the fitted values, 0 otherwise. The results are presented in column 2 in Table 3 and are similar with the results of the observed parents' preferences. These results suggest that parents' motive of old-age support may reduce educational investment in their children to keep them around.

Second, I also examine the heterogeneity of results by parents' pension entitlement. Parents who do not have pensions may rely more on their children for old-age support. The results are shown in Table 4. In column 1, the coefficient on the Hukou index when the child was 16 is negative but statistically insignificant. In column 2, the sample is those parents who are not entitled to any pension. The coefficient on the Hukou index

when the child was 16 means that when the Hukou index increases by one, children are 4.1 percentage points (relative to a mean of 33.7 percentage points) less likely to enrol in high school. These results suggest that Hukou reforms have a negative effect on children's high school education due to parents' motive for old-age support.

Parents' pension entitlement could be endogenous. For example, parents may participate in pension schemes if their children have migrated or do not provide much old-age support. To deal with such concern, I predict parental pension entitlement using predetermined household characteristics using data of CHARLS 2011 wave. In particular, I regress parents' pension on the number of children, the number of boys, the mother's education, the father's education and the logarithm of average household land controlling for prefecture fixed effects, mother's birth year fixed effects and the father's birth year fixed effects. To have a comparable share of parents depending on observed pension entitlement, I define the dummy variable of predicted pension is defined as 1 if the predicted value is larger than the 65th percentile of the fitted values, 0 otherwise. The results are presented in column 2 in Table 4 and are similar to the results of the observed parents' pension entitlement.

Lastly, I further study the heterogeneity by family structure. The results are shown in Table 5 where column 1 is the baseline results for comparison. Considering the traditional social norm that mainly sons are supposed to take care of elder parents, I explore what happens to the education of younger sons depending on whether the first child (focus on the son) migrated out or not. Specifically, I interact *HukouIndex*16 with a dummy that takes one if the first child being male in the family lives in a different county from the parents (column 2). The coefficient on the interacted term is negative and marginally significant. This suggests that parents have more incentive to keep a younger son around by educating him less if the elder brother has already migrated out. I do not find gender heterogeneity (column 3).

### 4.2.2 The Causal Effects of Education on Migration

An important component in the conceptual framework of this paper is that educational attainment has a positive and causal effect on the likelihood of out-migration. Some studies have documented this hypothesis in different contexts (Hamory et al. 2021; González Chapela, Jiménez-Martín, and Vall Castelló 2021; Akresh, Halim, and Kleemans 2022, and Hsiao 2022). In this part, I show causal evidence of education on migrating away from parents in China by exploiting the staggered implementation of the Compulsory Education Law (CEL) across provinces since 1986. Specifically, I use the exogenous variation of exposure to CEL across provinces and cohorts.<sup>22</sup> The relevant specification is as follows.

$$Y_i = \sum_{k=3, k \neq 17}^{21} \beta_k \times \{ageCEL_{p(i)t(i)} = k\} + X_i + \delta_{j(i)} + \gamma_{t(i)} + \epsilon_i \quad (3)$$

where  $Y_i$  is the outcome variable of migration for child  $i$  of cohort  $t$  in prefecture  $j$  and province  $p$ .  $ageCEL_{p(i)t(i)}$  is the age of the children in cohort  $t$  when CEL was implemented in their province  $p$ .  $\{ageCEL_{p(i)t(i)} = k\}$  is a dummy that takes one if the child was  $k$  years old when CEL was implemented in his/her province. Children finish middle school education at 15 or 16, so children aged 17 when CEL was implemented should not be affected by CEL and omitted as a baseline. Specifically, children aged 17 or older are not treated by CEL, children aged 7-16 (in the stage of primary or middle schooling) are partially treated and those aged 6 or younger (before starting primary schooling) are fully treated.  $X_i$  are control variables, including gender, number of children and boys in the family, parent's education, and average household land (log).  $\delta_{j(i)}$  are prefecture fixed effects that absorb time-invariant prefecture characteristics.  $\gamma_{t(i)}$  are cohort fixed effects that are aggregated in 5-year intervals.  $\beta_k$  are the coefficients of interest which mean the high school enrollment of different cohorts compared to those aged 17 when CEL was

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<sup>22</sup>Similar strategies are used in Fang et al. (2012) and Du, Xiao, and Zhao (2021). Fang et al. (2012) find that the law raised overall educational attainment in China by about 0.8 years of schooling. Du, Xiao, and Zhao (2021) find that the extra schooling induced by the compulsory schooling reform leads to more egalitarian gender role attitudes. Exploiting the variation of CEL, the effects of education on health (Huang 2015), child development (Cui, Liu, and Zhao 2019) and the probability of becoming an entrepreneur (Cheng and Smyth 2021).

implemented.

I use two outcome variables to measure children’s migration away from their parents: the logarithm of the child’s living distance (km) from their parents and whether the child lives in a different county from the parents. The results are shown in Figure 4. Children who were younger when the CEL was implemented are more likely to live far away and in a different county from their parents. Therefore, more education causes more migration, and parents could limit children’s out-migration by educating them less as shown above.

### 4.3 Robustness

#### 4.3.1 Alternative Specification

In this part, another specification is employed to study the effects of Hukou reforms on education and the role of old-age support. Instead of using the levels of Hukou reforms, I use dummies of Hukou reforms which enable me to provide evidence of non-existing pre-trend of Hukou reforms on high school enrollment. The relevant specification is as follows in Equation (4).

$$HighSchool_{ijt} = \beta_1 Post1_{jt} + \beta_2 Post2_{jt} + X_{ijt} + \delta_j + \gamma_t + \epsilon_{ijt} \quad (4)$$

where  $HighSchool_{ijt}$  is a dummy that takes 1 if the child  $i$  in prefecture  $j$  of cohort  $t$  was enrolled in high school in 2011, 0 otherwise.  $Post1_{jt}$  is a dummy that takes one if when the first Hukou reform happened in prefecture  $j$ , the child was 16 or younger, 0 otherwise. It is defined as a Hukou reform if the basic Hukou index in this prefecture changes relative to last year. Similarly,  $Post2_{jt}$  is a dummy that takes one if when the second Hukou reform happened in prefecture  $j$ , the child was 16 or younger, 0 otherwise.<sup>23</sup>  $X_{ijt}$  are the control variables, including gender, the numbers of children and boys in the family, parents’ education, and average household land (log). The average differences across

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<sup>23</sup>Only the first two Hukou reforms are included in the analysis since few prefectures have more than two Hukou reforms. About 2.5% and 1.1% individuals in the sample post the third and fourth reforms, separately.

cohorts are controlled for in cohort fixed effects  $\gamma_t$ .  $\delta_j$  is prefecture fixed effects, which absorb all time-invariant prefecture-level characteristics.  $\epsilon_{ijt}$  is the error term clustered at the prefecture level.

The results are shown in Table 6. In column 1, only  $Post1_{jt}$  is included and the coefficient suggests that the first Hukou reform has no significant effects on high school enrollment. In column 2, both  $Post1_{jt}$  and  $Post2_{jt}$  are included. The coefficient on  $Post1_{jt}$  is still insignificant, but the coefficient on  $Post2_{jt}$  is significantly negative. This means that conditional on the first Hukou reform, the second reform significantly reduced children’s high school enrollment by 5.8 percentage points relative to a baseline mean of 33.4 percentage points. The first Hukou reform has no effect on education perhaps because Hukou policies are still relatively strict with the first reform. In column 3, I interact the reform dummies with parents’ living preferences. The coefficient on the interaction of  $Post2_{jt}$  and parents’ living preference is -0.159 and significant at the 5% level. This suggests that parents who prefer to live near their children may further reduce their children’s education to limit their potential out-migration. To address the concern that parents’ living preferences may be endogenous to children’s education and migration decisions, the results using the predicted value of parents’ living preferences are shown in column 4 and the results are similar. The results indicate that the second Hukou reforms matter have negative effects on high school enrollment and parents’ motive of old-age support may play a role.

I also provide additional evidence that there is a lack of the pre-trend of Hukou reforms on high school enrollment. Specifically, for cohorts who are 17-21 years old when the first Hukou reform happened, I include the dummies for each cohort and omit cohort 17 as the control group. The results are presented in Figure 5. Each point is the coefficient on included dummies which represents the high school enrolment compared to cohort 17. To the left of the red dashed line, the x-axis is the child’s age when the first Hukou reform happened. To the right part, the x-axis are dummies that indicate whether the child was 16 years old or younger when the first or second Hukou reform happened. For younger cohorts, age is not used since children who are affected by Hukou reforms may

be affected by different waves of reforms. The insignificant estimates on older cohorts suggests that the high school enrollment rates of older cohorts have no decreasing pattern before first Hukou reform. Moreover, cohorts affected by the second Hukou reforms are indeed significantly less likely to be enrolled in high school.

### 4.3.2 No Reverse Causality

Hukou reforms may be implemented when the high school enrollment rates in rural areas are low in order to improve education attainment. If so, the baseline analysis would suffer from the problem of reverse causality. To test such likelihood, panel data of high school enrollment rates at the prefecture-year level are constructed based on the rural sample of the CHARLS 2011 wave. To be concise, at the prefecture-year level, I calculate the high school enrollment rate as the share of 16 years old children who were enrolled in high school. The effect of the change in high school enrollment rates across cohorts on Hukou reforms is evaluated. The specification is as follows in Equation (5).

$$\Delta HukouIndexBasic_{jt} = \beta_1 \Delta HighSchoolEnrollRate_{jt} + \phi_t + \delta_j + \epsilon_{jt} \quad (5)$$

where  $j$  is for prefecture and  $t$  means year.  $\Delta HukouIndexBasic_{jt}$  is the change of the basic Hukou index.  $HighSchoolEnrollRate_{jt}$  is the high school enrollment rate for prefecture  $j$  in year  $t$ .  $\phi_t$  are year fixed affects which capture the time trend.  $\delta_j$  are prefecture fixed effects which absorb time-invariant prefecture characteristics.  $\beta_1$  is coefficient of interest which indicates the change of Hukou index caused by 1% increase in the change of high school enrollment rates.

The results are shown in Table A5. The magnitude of  $\beta_1$  is -0.0004 and insignificant, which implies that Hukou reforms are orthogonal to the change in high school enrollment rates across cohorts.

### 4.3.3 Instrumental Variable (IV) Strategy

The timing of Hukou reforms may coincide with other policy changes within the prefecture which affect schooling. The instrumental variable strategy is implemented to address the potential endogeneity of Hukou reforms. In particular, when constructing the composite Hukou index in Equation (1), for prefecture  $j$ , which is both the origin and destination, I use the provincial average of the basic Hukou indexes excluding the prefecture  $j$  itself ( $\overline{HukouIndexBase_{p-jt}}$ ) to proxy the basic Hukou index of prefecture  $j$ . The specific construction is as follows in Equation (6). Conceptually, Hukou reforms in prefecture A should be uncorrelated with policies in prefecture B that affect education but are not Hukou relevant (exogeneity). Moreover, the prefecture in China are under the provincial authority, and policies are top-down. Therefore it's reasonable that prefectures within the same province have similar Hukou policies (relevance).

$$\begin{aligned}
 HukouIndexIV_{jt} = & \sum_{d \neq j} \frac{\#Migrant_{jd,2000}}{\#Migrant_{j,2000}} \times HukouIndexBase_{dt} \\
 & + \frac{\#Migrant_{jj,2000}}{\#Migrant_{j,2000}} \times \overline{HukouIndexBase_{p-jt}} \quad (6)
 \end{aligned}$$

The results using the instrument variable of provincial average excluding the prefecture itself are presented in Table 7. In Panel A, I show the first stages, the coefficients on instrument variables are nearly 1 and the F statistics are much larger than 10. These results suggest that this is not a weak IV. In panel B, I show the effects of Hukou reforms on high school enrollment using the above IV, and the results are consistent with the baseline.

## 5 Conclusion

Children's out-migration may impair parents' well-being. This paper evaluates whether parents reduce educational investment to limit the likelihood of children out-migrating

and therefore increase the probability of in-person old-age care. I exploit Hukou reforms in China during 1997-2010 as an exogenous shock to migration possibilities. Using cohort and prefecture-level variation in the timing of exposure to Hukou reforms, I evaluate the effects of Hukou reforms on the high school enrollment rate. I find that relaxing migration restrictions resulted in a decrease in high school enrollment rates. Furthermore, the heterogeneity analysis by parents' living preferences and pension entitlement is consistent with the mechanism of old-age support.

This paper helps to understand the role of old-age support in children's education. I show that in rural areas, parents' old-age support matters and would reduce children's education when migration restrictions are relaxed. This is an unintended effect of Hukou reforms since the ultimate goal of such reforms is to reduce the inequities between different types of Hukou holders and improve labor mobility in the economy. Hence, to improve rural education and accelerate the process of urbanization, the government should provide a sound pension system in rural areas.

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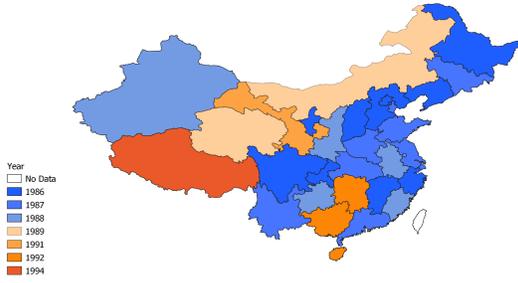
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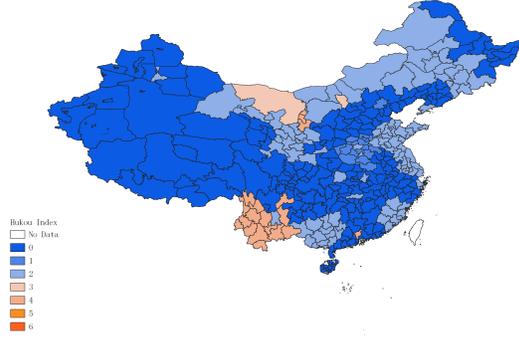
# Figures and Tables

Figure 1: Staggered Implementation of Reforms

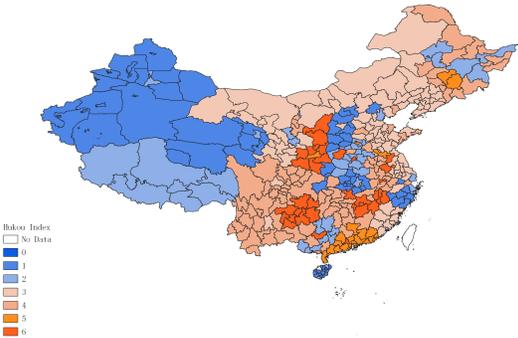
(a) The Timing of the Compulsory Education Law



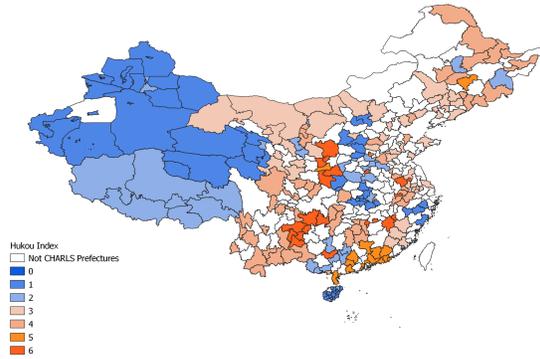
(b) Hukou Index in 2000



(c) Hukou Index in 2010

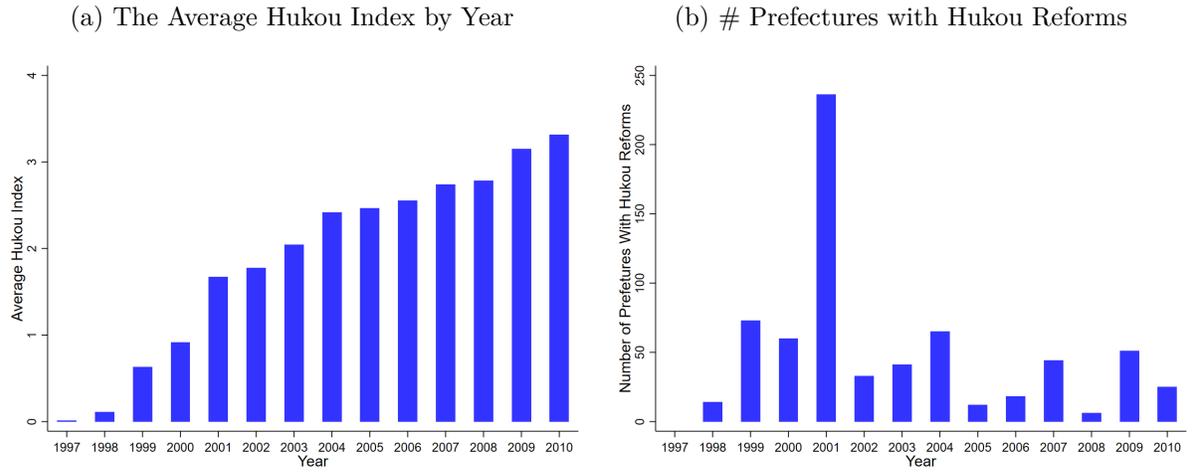


(d) Prefectures in CHARLS Sample



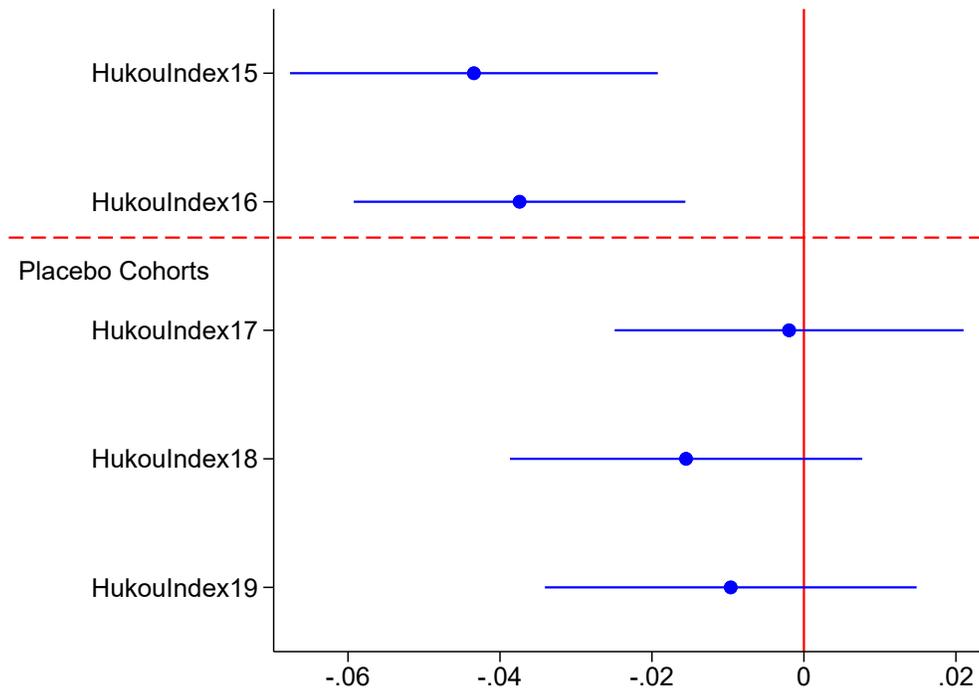
*Notes:* This figure provides a graphical illustration of the staggered implementation of the Compulsory Education Law and Hukou reforms. Panel (a) presents the year of implementing the Compulsory Education Law for each province. Panel (b) and (c) present the Hukou index for each prefecture in 2000 and 2010 separately. The Hukou index is a number from 0 to 6. Panel (d) presents the prefectures covered in the CHARLS 2011 wave.

Figure 2: Hukou Policies by Year



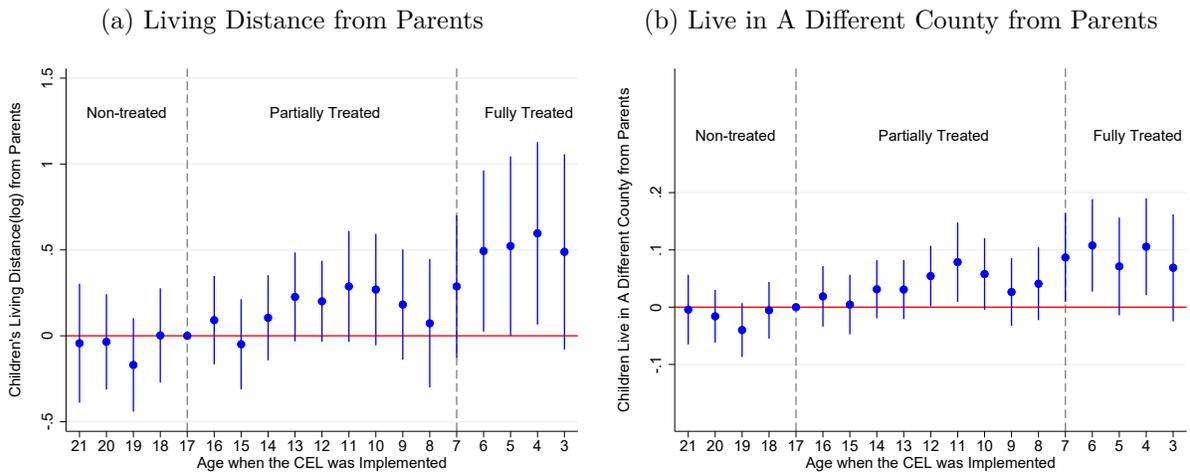
*Notes:* This figure presents Hukou reforms by year. Panel (a) presents the average Hukou index from 1997 and 2010. Panel (b) presents the number of prefectures implementing Hukou reforms each year. It is defined as a Hukou reform if the Hukou index changes compared to last year.

Figure 3: Placebo Test: Coefficient on Hukou Index by Age



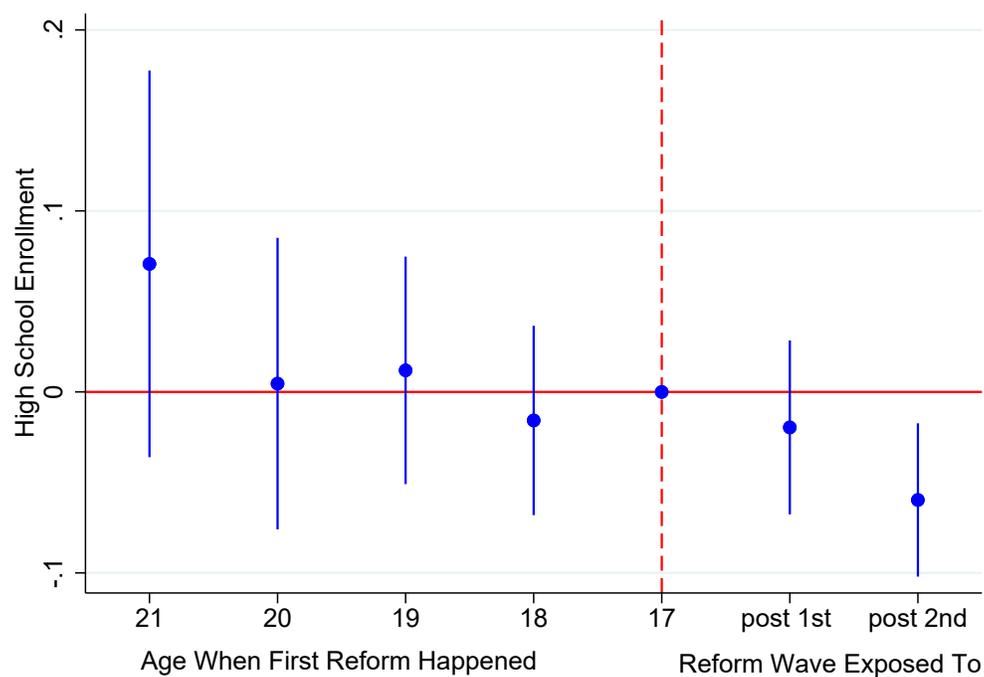
*Notes:* This figure presents the placebo test of Hukou reforms on the education of older cohorts. Each coefficient is from a separate regression. *HukouIndex17* is the Hukou index when the child was 17 years old, and similarly for *HukouIndex18* and *HukouIndex19*. Comparing to Figure A3, the regressions for placebo cohorts control for *HukouIndex16* as well.

Figure 4: The Effects of Education on Children’s Migration



*Notes:* This figure presents the empirical strategy of Equation 3. Panel (a) presents the effects of exposure to the Compulsory Education Law on children’s living distance from parents. Panel (a) presents the effects of exposure to the Compulsory Education Law on whether children live in a different county from their parents.

Figure 5: Hukou Reforms on Education by Cohorts



*Notes:* This figure presents the test of the pre-trend of Hukou reforms on high school enrollment. To the left of the red dashed line, the x-axis is the child's age when the first Hukou reform happened. To the right part, the x-axis is dummies that indicate whether the child was 16 years old or younger when the first or second Hukou reform happened. Here, age is not used since children who are affected by Hukou reforms may be affected by different waves of reforms.

Table 1: Summary Statistics for Key Variables

Variables	N	Mean	S.D.	Min.	Max.
	(1)	(2)	(3)	(4)	(5)
Hukou index when children were 16	5,304	1.674	1.214	0	5.458
Post first Hukou reform	5,394	0.688	0.463	0	1
Post second Hukou reform	5,394	0.300	0.458	0	1
Male	5,394	0.539	0.499	0	1
Mother's education	5,394	0.0480	0.214	0	1
Father's education	5,394	0.154	0.361	0	1
Number of children	5,394	2.842	1.202	1	9
Number of boys	5,394	1.413	0.878	0	7
Average land (log)	5,394	0.295	1.061	-2.197	5.923
Parents prefer living near child	5,394	0.944	0.231	0	1
Parent has pension	5,394	0.364	0.481	0	1

*Notes:* This presents the summary statistics for key variables. The data are from the China Health and Retirement Longitudinal Study (CHARLS) 2011 wave. The sample is restricted to those from rural areas and born in 1984-1996.

Table 2: The Effects of Hukou Reforms on High School Enrollment

	Dep.Var.: High School Enrollment		
	(1)	(2)	(3)
<i>Mean Dep. Var.</i>	<i>0.349</i>	<i>0.337</i>	<i>0.344</i>
HukouIndex15	-0.043*** (0.015)		
HukouIndex16		-0.037*** (0.013)	
HukouIndexAve1516			-0.059*** (0.017)
<i>Standardized Coefficient</i>	<i>-0.109</i>	<i>-0.096</i>	<i>-0.140</i>
Baseline controls	Y	Y	Y
Cohort FE	Y	Y	Y
Prefecture FE	Y	Y	Y
Observations	4,882	5,304	4,814
R-squared	0.191	0.183	0.190

*Notes:* Standard errors in parenthesis are clustered at the prefecture level. Baseline controls include gender, parents' education, number of children and boys in the family and average land (log). \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 3: Heterogeneity by Parents' Living Preference

	Dep. Var.: High School Enrollment	
	(1)	(2)
<i>Mean Dep. Var.</i>	<i>0.337</i>	<i>0.337</i>
HukouIndex16	0.001 (0.024)	-0.011 (0.021) [0.019]
Parents Prefer Living Near Child	0.023 (0.040)	
HukouIndex16 * Parents Prefer Living Near Child	-0.040** (0.020)	
Parents Prefer Living Near Child (Predicted)		0.082* (0.045) [0.035]
HukouIndex16 * Parents Prefer Living Near Child (Predicted)		-0.031* (0.016) [0.015]
Baseline controls	Y	Y
Cohort FE	Y	Y
Prefecture FE	Y	Y
Observations	5,304	5,304
R-squared	0.184	0.184

*Notes:* Standard errors in parenthesis are clustered at the prefecture level. Baseline controls include gender, parents' education, number of children and boys in the family and average land (log). In column 2, parents' living preference is predicted by the number of children and boys in the family, parents' education, average land (log), parents' birth year FE and prefecture FE. The predicted dummy takes one if the predicted value is larger than the 15th percentile. Bootstrap standard errors (1,000 times) are in brackets. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 4: Heterogeneity by Parent's Pension Entitlement

	Dep. Var.: High School Enrollment			
	(1)	(2)	(3)	(4)
	Parent Has Pension = 1	Parent Has Pension = 0	Has Pension (Predicted) = 1	Has Pension (Predicted) = 0
<i>Mean Dep. Var.</i>	<i>0.382</i>	<i>0.337</i>	<i>0.358</i>	<i>0.351</i>
HukouIndex16	-0.018 (0.022)	-0.041** (0.017)	-0.022 (0.023) [0.024]	-0.038** (0.016) [0.017]
Baseline controls	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
Prefecture FE	Y	Y	Y	Y
Observations	1,816	3,010	1,805	3,021
R-squared	0.218	0.188	0.175	0.189

*Notes:* Standard errors in parenthesis are clustered at the prefecture level. Baseline controls include gender, parents' education, number of children and boys in the family and average land (log). In columns 3 and 4, parents' pension is predicted by the number of children and boys in the family, parents' education, average land (log), parent's birth year FE and prefecture FE. The predicted dummy takes one if the predicted value is larger than the 65th percentile. Bootstrap standard errors (1,000 times) are in brackets. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 5: Heterogeneity by Family Structure

	Dep. Var.: High School Enrollment		
	(1)	(2)	(3)
<i>Mean Dep. Var.</i>	<i>0.337</i>	<i>0.337</i>	<i>0.319</i>
HukouIndex16	-0.037*** (0.013)	-0.021 (0.024)	-0.041*** (0.015)
First Child (Son) Migrated out		0.044 (0.038)	
HukouIndex16*First Child (Son) Migrated out		-0.032* (0.018)	
Male	0.042** (0.016)		0.030 (0.024)
HukouIndex16*Male			0.007 (0.011)
Baseline Controls	Y	Y	Y
Cohort FE	Y	Y	Y
Prefecture FE	Y	Y	Y
Observations	5,304	1,896	5,304
R-squared	0.183	0.192	0.183

*Notes:* Standard errors in parenthesis are clustered at the prefecture level. Baseline controls include gender, parents' education, number of children and boys in the family and average land (log). The variable of First Child (Son) is a dummy that takes one if in the family the first child, who is a son, lives in a different county from the parents. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 6: Hukou Reforms and Education Using Alternative Specification

	Dep.Var.: High School Enrollment			
	(1)	(2)	(3)	(4)
<i>Mean Dep. Var.</i>	<i>0.334</i>	<i>0.334</i>	<i>0.334</i>	<i>0.351</i>
Post1	0.002 (0.026)	-0.005 (0.028)	-0.016 (0.065)	0.034 (0.046) [0.048]
Post2		-0.058** (0.027)	0.094 (0.079)	0.064 (0.061) [0.057]
Parents Prefer Living Near Child			-0.002 (0.039)	
Post1*Parents Prefer Living Near Child			0.012 (0.064)	
Post2*Parents Prefer Living Near Child			-0.159** (0.070)	
Parents Prefer Living Near Child (Predicted)				0.138*** (0.038) [0.038]
Post1*Parents Prefer Living Near Child (Predicted)				-0.041 (0.036) [0.041]
Post2*Parents Prefer Living Near Child (Predicted)				-0.124** (0.060) [0.058]
Baseline controls	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y
Prefecture FE	Y	Y	Y	Y
Observations	5,394	5,394	5,394	4,907
R-squared	0.182	0.183	0.184	0.180

*Notes:* Standard errors in parenthesis are clustered at the prefecture level. Baseline controls include gender, parents' education, number of children and boys in the family and average land (log). In column 4, parents' living preference is predicted by the number of children and boys in the family, parents' education, average land (log), parents' birth year FE and prefecture FE. The predicted dummy takes one if the predicted value is larger than the 15th percentile. Bootstrap standard errors (1,000 times) are in brackets. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 7: Hukou Reforms and Education Using Instrumental Variable

	(1)	(2)	(3)
Panel A: First Stage Results			
	Dep. Var. HukouIndex		
HukouIndex15(IV)	0.988*** (0.031)		
HukouIndex16(IV)		0.995*** (0.041)	
HukouIndex $\overline{1516}$ (IV)			0.094*** (0.039)
F Statistic	984.8	1011	655.1
Panel B: IV Results			
	Dep. Var. High School Enrollment		
HukouIndex15	-0.045*** (0.015)		
HukouIndex16		-0.036*** (0.014)	
HukouIndex $\overline{1516}$			-0.060*** (0.018)
Cohort FE	Y	Y	Y
Prefecture FE	Y	Y	Y
Observations	4,882	5,304	4,814
R-squared	0.053	0.052	0.055

*Notes:* Standard errors in parenthesis are clustered at the prefecture level. Baseline controls include gender, parents' education, number of children and boys in the family and average land (log). HukouIndex16(IV) is the instrument variable for HukouIndex16. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

## Appendix A

Table A1: The Timing of the Compulsory Education Law by Province

Province	Time of Initiation	Year of Implementation
	(1)	(2)
Beijing	July 1986	1986
Tianjin	November 1987	1987
Hebei	July 1986	1986
Shanxi	July 1986	1986
Inner Mongolia	September 1988	1989
Liaoning	July 1986	1986
Jilin	February 1987	1987
Heilongjiang	July 1986	1986
Shanghai	September 1986	1987
Jiangsu	September 1986	1987
Zhejiang	September 1986	1986
Anhui	September 1987	1988
Fujian	August 1988	1988
Jiangxi	February 1986	1986
Shandong	September 1986	1987
Henan	October 1986	1987
Hubei	March 1987	1987
Hunan	September 1991	1992
Guangdong	October 1986	1987
Guangxi	September 1991	1992
Hainan	December 1991	1992
Chongqing	July 1986	1986
Sichuan	July 1986	1986
Guizhou	January 1988	1988
Yunnan	October 1986	1987
Tibet	July 1994	1994
Shaanxi	September 1987	1988
Gansu	September 1990	1991
Qinghai	October 1988	1989
Ningxia	July 1986	1986
Xinjiang	May 1988	1988

Table A2: The Definitions of Key Variables

Variable	Definition
HukouIndex15	the composite Hukou index when the child was 15 years old
HukouIndex16	the composite Hukou index when the child was 16 years old
HukouIndexAve1516	the average of composite Hukou indexes when the child was 15 and 16 years old
Post1	a dummy that takes 1 if the child was 16 years old or younger when the first Hukou reform happened within the prefecture, 0 otherwise
Post2	a dummy that takes 1 if the child was 16 years old or younger when the second Hukou reform happened within the prefecture, 0 otherwise
Male	a dummy that takes 1 if the child is male and 0 if the child is female
Mother's education	a dummy that takes 1 if the mother has high school education, 0 otherwise
Father's education	a dummy that takes 1 if the father has high school education, 0 otherwise
Number of children	the number of children in the family
Number of boys	the number of children in the family
Average land (log)	the logarithm of average household land (unit: mu)
Parents prefer living near child	a dummy that takes 1 if either parent prefers to live with children or the same village/community, 0 otherwise
Parent has pension	a dummy that takes 1 if either parent has pension entitlement in 2011, 0 otherwise
ageCEL	the child's age when the Compulsory Education Law was implemented in the province
Child's living distance from parents	the logarithm of the child's living distance from parents (unit:km)
Child lives in a different county from parents	a dummy that takes 1 if the child lives in a different county from parents, 0 otherwise
Child lives in urban areas now	a dummy that takes 1 if the child lives in urban areas now, 0 otherwise

Figure A1: The Hukou Index for Each Prefecture and Year

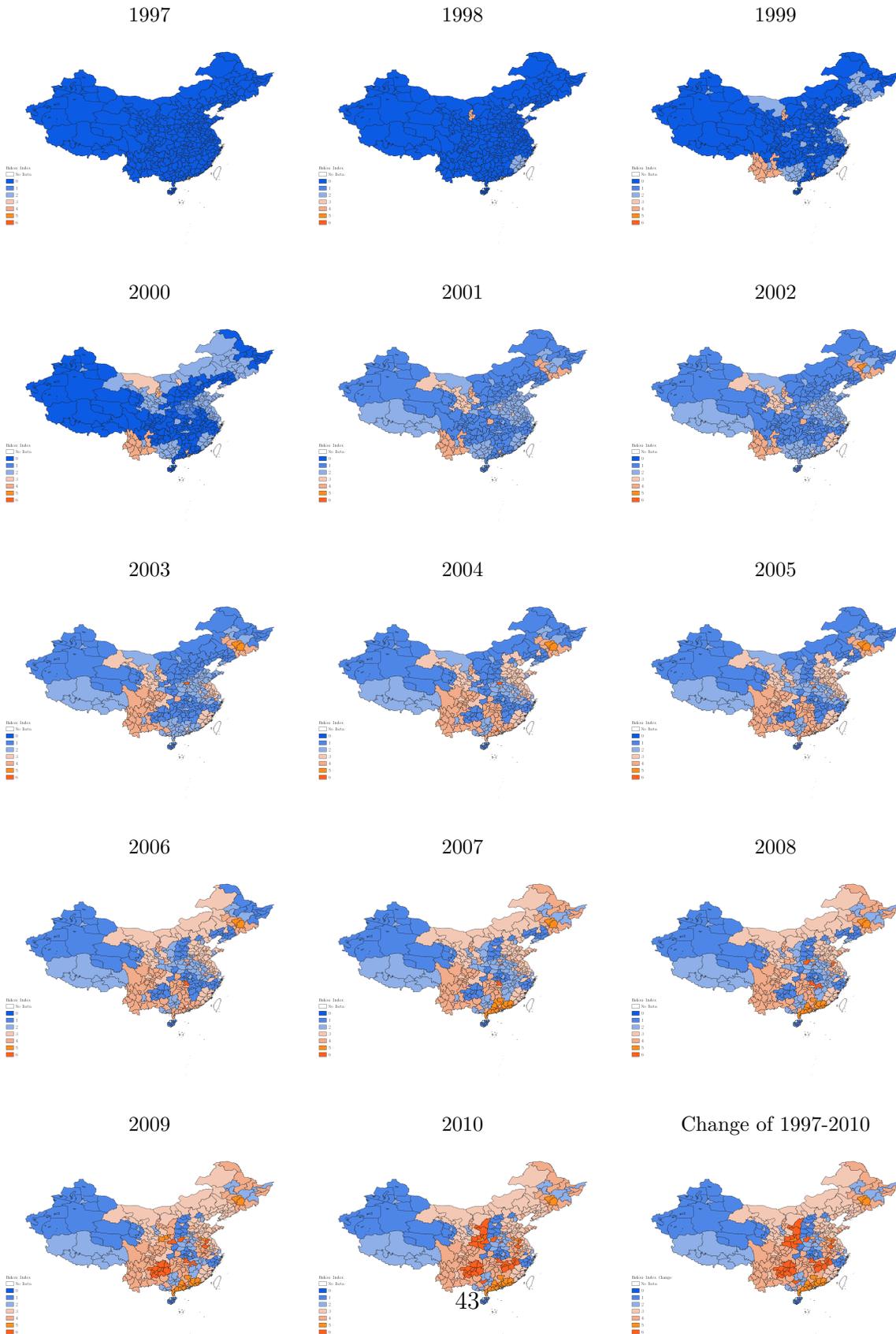
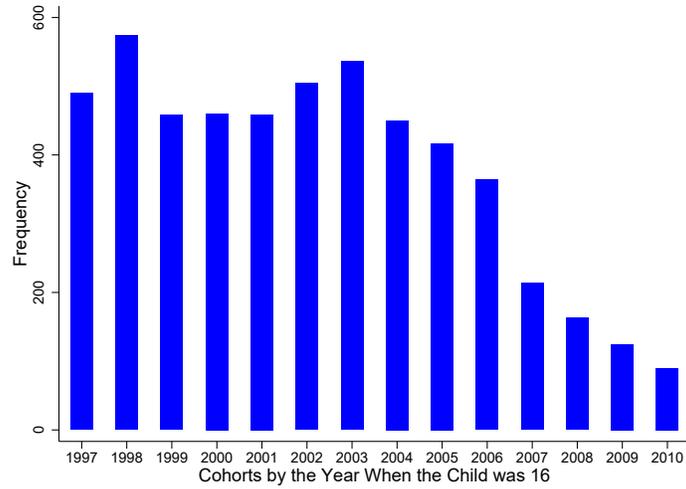
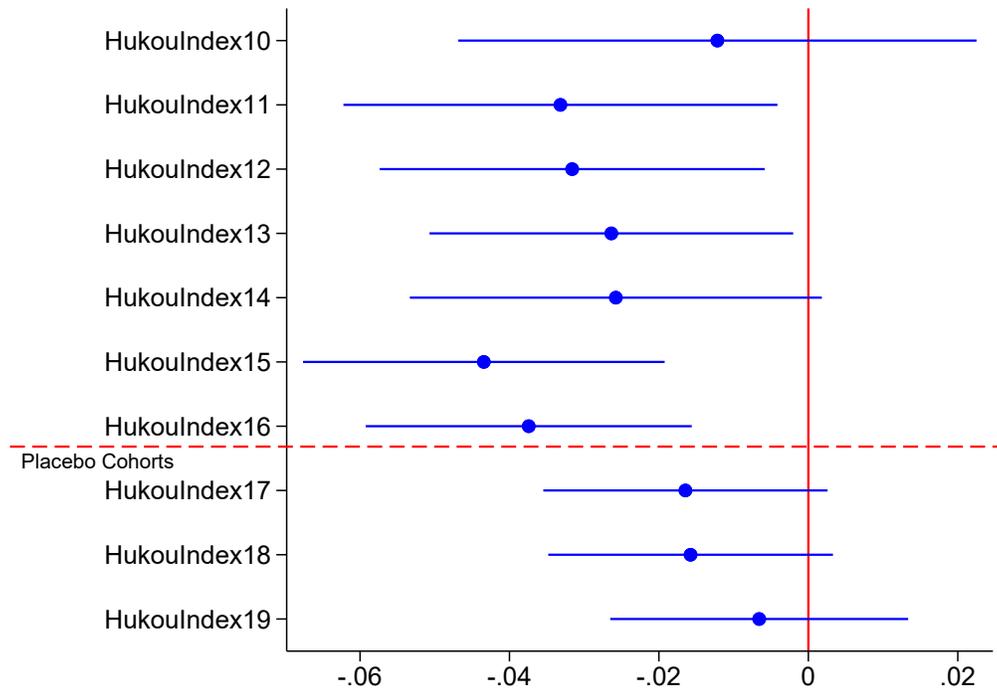


Figure A2: Cohort Distribution by the Year When the Child was 16



Notes: This figure presents the cohort distribution of CHARLS sample. Each cohort is defined as the year the child was 16 years old.

Figure A3: Placebo Test: Coefficient on Hukou Index by Age



Notes: This figure presents the placebo test of Hukou reforms on the education of older cohorts and younger cohorts. Each coefficient is from a separate regression. *HukouIndex17* is the Hukou index when the child was 17 years old, and similarly for other variables.

Table A3: The Effects of Hukou Reforms on Education

	Dep.Var.: High School Enrollment					
	Hukou Index of Central Areas			Hukou Index of Counties		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Mean Dep. Var.</i>	0.349	0.337	0.344	0.349	0.337	0.344
<i>Mean Main Indep. Var.</i>	0.617	0.655	0.657	1.087	1.131	1.153
HukouIndex15	-0.054** (0.022)			-0.068** (0.027)		
HukouIndex16		-0.040** (0.020)			-0.068** (0.027)	
HukouIndex $\overline{1516}$			-0.065** (0.025)			-0.098*** (0.033)
Baseline Controls	Y	Y	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y	Y	Y
Prefecture FE	Y	Y	Y	Y	Y	Y
Observations	4,882	5,304	4,814	4,882	5,304	4,814
R-squared	0.191	0.183	0.188	0.191	0.183	0.189

*Notes:* In columns 1-3, the Hukou indexes for the central area of each city are used. In columns 4-6, Hukou indexes in peripheral counties of each city are used. Standard errors in parenthesis are clustered at the prefecture level. Baseline controls include gender, parents' education, number of children and boys in the family and average land (log).\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table A4: Remittance to Parents in 2011

	Dep. Var.: Remittance to Parents		Dep. Var.: Out-migration from Parents		
	Monetary Transfer	All Transfer	Distance	Different County	Live in Urban areas
	(1)	(2)	(3)	(4)	(5)
<i>Mean Dep. Var.</i>	471.7	487.2	2.033	0.281	0.432
HukouIndexW16	-25.739 (55.350)	-27.600 (47.475)	-0.089 (0.100)	-0.033* (0.017)	-0.007 (0.026)
Baseline Controls	Y	Y	Y	Y	Y
Cohort FE	Y	Y	Y	Y	Y
Prefecture FE	Y	Y	Y	Y	Y
Observations	2,941	2,945	2,859	2,900	1,906
R-squared	0.087	0.093	0.203	0.167	0.206

*Notes:* The Sample is restricted to children aged 25 years or older in 2011. Standard errors in parenthesis are clustered at the prefecture level. Baseline controls include gender, parents' education, number of children and boys in the family and average land (log).\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table A5: No Reverse Causality

	Dep. Var.: Change of Hukou Index
	(1)
<i>Mean Dep. Var.</i>	0.269
Change of High School Enrollment Rate	-0.0004 (0.001)
Year FE	Y
Prefecture FE	Y
Observations	621
R-squared	0.204

*Notes:* High school enrollment rate (%) at the prefecture-year level is constructed based on the rural sample of CHARLS 2011. Specifically, the high school enrollment rate is the proportion of children who were enrolled in high school over those 16 years old. Standard errors in parentheses are clustered at the prefecture level. Standard errors in parenthesis are clustered at the prefecture level.

## Appendix B

### Parents' Living Preference

Each parent is asked the following question:

Suppose an elderly person has no spouse but has adult children and has a good relationship with them. What do you think is the best living arrangement for him/her?

1. Live with adult children.
2. Don't live with them in the same house, but in the same community or village.
3. Don't live with them in the same house and the same community or village.
4. Live in a nursing house.
5. Other

I define that parents prefer living near children if either parent answers 1 or 2.