Restrictions on Migration Create Gender Inequality: The Story of China's Left-Behind Children

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Abstract

About 11% of the Chinese population are rural-urban migrants, and the vast majority of them (124 million people) possess a rural *hukou* which severely restrict their children's access to urban public schools. As a result, 61 million children are left behind in rural areas. We use a regression-discontinuity design based on school enrollment age cutoffs to evaluate the causal effects of *hukou* restrictions on children left behind. Migrants are significantly more likely to leave middle-school-aged daughters behind in poor rural areas *without either parent present*, compared to middle-school-aged sons. The effect is larger when daughters have a male sibling. They also send significantly less remittances back to daughters than sons. We use a shift-share instrumental variables strategy to document that children living in rural areas adjacent to cities with more restrictive *hukou* policies are more likely to be left behind as new job opportunities arise in nearby cities due to trade policy changes. We pair this with a longitudinal dataset of children to show that those children are more likely to not complete middle school, remain in the rural area, and remain poor later in life. Although China's *hukou* mobility restrictions are not gender-specific in intent, they have larger adverse effects on girls.

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1 Introduction

People leaving rural areas to go work in factories located in cities has been an important engine of growth in rapidly developing countries like China. 11% of the Chinese population in the 2005 census – 145 million people – were rural-urban migrants. The rapid urbanization generates a complex set of social and economic effects on both the cities migrants move into, and the places they leave behind. Family separation is one of the most important aspects of the societal disruption that accompanies structural transformation and urbanization. As parents move to cities in search of employment, they often leave their children behind under the care of others. This can have gendered effects if migration, remittance, and leave-behind choices differ between the parents of sons versus daughters.

These choices can hold large consequences for the country's development pathways, because of the massive scale of this issue. 69 million Chinese children were growing up in rural areas without parents in 2015, left behind when their parents migrated (UNICEF, 2018). This represents 30 percent of all children born in rural areas (Chen, 2013). The issue is also very policy-relevant, because China imposes internal mobility restrictions that undermine parents' ability to migrate with their children. In particular, stringent *hukou* restrictions in many Chinese cities can make it prohibitively expensive or even impossible for in-migrants to bring their children with them and enroll them in urban schools. Of the 145 million rural-urban migrants in the 2005 census, the vast majority (124 million) were unskilled migrants with a rural *hukou*, which implies that they would have to pay a large fee called $zanzhufei$ to enroll their children in a public school in the city. $Zanzhufei$ for junior middle school enrollment is about 10% of the average migrant's earnings, which acts as a big financial deterrent. Such constraints on migrant parents are becoming even more acute over time as cheaper schools specifically designated for migrant children are shut down in Beijing and other popular migration destinations (Report, 2016).

We use variation in the stringency of *hukou* restrictions in cities where migrant parents work to analyze how parents decide whether and when to leave their children behind in rural areas. Schooling is compulsory, and children must transition from primary school to junior middle school around the age of 12 or 13, depending on their

month of birth. *Zanzhufei* for junior middle school is 53% larger than for primary school, which changes parents' incentives and ability to keep their children with them in the city exactly at that age. We employ a regression discontinuity research design based on the age cutoff for middle school entry using data on the exact date of birth of 173,468 children of migrants, to study whether sons or daughters are treated any differently when parents make migration choices. We show that parents who had migrated to cities with stringent *hukou* restrictions are 3 percentage points (9%) more likely to leave their daughters behind in the rural area exactly when daughters transition into middle school age. These daughters are most frequently left behind without either parent present. That same discontinuity at that age cutoff does not exist for sons. The discontinuity also does not exist for girls whose parents had migrated to less-*hukou*-restrictive cities.[1]

To further address any selection issues arising from parents' destination choices, we study the effects of a 2014 policy in which the central government urged "mega cities" - defined as those with a population of over five million in the city central district area - to rigidly control the population. This new "migrant population control policy" led to a tightening of *hukou* restrictions and shutting down on migrant schools in mega cities(see Fig. 1). We find that parents who had previously migrated to cities above the 5-million-population cutoff become 7 percentage points more likely to leave their middle-school-aged daughter behind after 2014, relative to parents who had previously migrated to cities below the "mega-city" population cutoff. The effect is robust when we restrict attention to migrants who had made their destination choices before the 2014 policy was announced. That same discontinuity does not exist for boys.

Thus, using a different research design and very different variation in the data, we again find that although China's policy of mobility restrictions is not gender-specific in its intent or design, it produces a gendered effect in which daughters of a certain age become more likely to be separated from their parents.

If migrating for work improves parents' earnings capacity, that could benefit children left behind even if parents are unable to spend time with them. The net effect

[1]Migrant parents' destination choices may depend on the importance parents place on their child's education. Our triple difference set-up (by *hukou* policy stringency, by middle school age cutoff, and by gender of child) helps mitigate this endogeneity concern.

on children depends whether the parents' time or money is more important for the child's human capital accumulation (Gibson et al., 2011; Zhang et al., 2014). We therefore add two pieces of analysis to better understand the lives of children left behind. First, we analyze migrant parents' remittance behavior, and find that migrants who leave daughters behind remit 10% less than migrants who leave sons behind. Girls therefore receive less parental time as well as less money compared to boys.

Second, we use a longitudinal survey that tracks rural children from Gansu province over 15 years to analyze the long run consequences of being left behind on later-life outcomes. This survey allows us to identify up to 2000 children growing up in rural area either with or without their parents. Since the parents' decision to migrate (leaving their child behind) is not random, we instrument that choice using global import demand shocks that raises labor demand in cities near each rural area (Khanna et al., 2021), interacted with the *hukou* policy stringency of those cities. This interaction term identifies the migration-pull to the types of cities where parents find it very difficult to take their children with them. This analysis shows that growing up without parents has adverse effects on the child's human capital accumulation, and on their socioeconomic achievements as adults. Children whose parents migrated and left them behind complete three fewer years of schooling and are 40 percentage points more likely to end up with below-average income as adults, compared to children who parents remain with them in the rural hometown [2].

Taken together, our results suggest that girls suffer disproportionately when strict mobility restrictions are imposed on migrant workers in a rapidly developing and urbanizing society. When it is expensive for migrants to keep their children with them, they are more likely to separate from daughters than sons, and daughters receive less time, attention, and money from their parents. This undermines their human capital accumulation and hurts girls throughout their lives. These gendered effects can be traced back to a conscious policy choice of imposing restrictions on people's mobility. Moreover, this issue is not only restricted to China; '*hokhau*' policy in Vietnam also makes it similarly difficult for migrant children to be enrolled in public schools at

[2] An alternative estimation strategy in which we instrument parents' decision to migrate with rainfall shocks in the rural area interacted with historical migration ties due to presence of urban visitors in that rural area in 1982 (e.g. due to the Mao-era send-down movement) produces very similar results.

their parents' work locations (Cameron, 2012). Rich countries that host cross-border migrant workers but discourage those migrants from bringing family members with them (Mobarak et al., 2021) may also produce such distributional effects.

Other research has examined the effects of migration on children's educational outcomes (Zhang et al., 2014), but we are among the first to document the long-run consequences in adulthood, and the first – to the best of our knowledge – to document these gendered effects, and connect it to the stringency of mobility restrictions. We add to the literature on the sources of gender disparities [3] by identifying a new mechanism by which gender disparities might emerge even if the underlying policy (of mobility restrictions) has no direct, explicit gender dimension. We also contribute to the literature on the adverse welfare effects of spatial immobility (Gollin et al., 2014; Bryan et al., 2014; Khanna et al., 2021), and add a gender dimension to the distributional consequences of migration restrictions.

The remainder of this paper proceeds as follows. Section 2 describes the data and Section 3 discusses stylized facts about the *hukou* system and left-behind children in China. Section 4 provides RD estimates of how *hukou* restrictions result in school-aged girls being left behind, Section 5 presents the long-term economic consequences associated with leaving children behind and Section 6 discusses the potential mechanisms driving our empirical pattern. Section 7 concludes.

2 Institutional Background

2.1 Hukou Restrictions, Migration, and Children Left behind

In 1958, China formally instituted comprehensive mobility restrictions known as the *hukou* system to control internal migration.[4] The institution required that each person be classified as rural or urban and be assigned a locality of *hukou* registration, which is typically the person's location of birth. One's *hukou* registration determines

[3] Blau and Kahn (2017); Goldin (2014); Goldin et al. (2017); Goldin et al. (2021); Barth et al. (2017); Qian (2008); Bhalotra et al. (2019); Dahl and Moretti (2008); Chetty et al. (2016).

[4] See http://www.npc.gov.cn/wxzl/gongbao/2000-12/10/content_5004332.htm for more background information.

one's entitlement to pursue many activities and eligibility for state-provided goods and services in a specific place. All internal migration was subject to approval from local authorities at the destination. Thus, the red *hukou* book served as an internal passport that determines a person's rights to reside and work in specific locations within China.

These mobility restrictions have been gradually relaxed since 1984. Chinese citizens can now migrate to cities, but without an urban *hukou*, they have limited access to many government-provided benefits at the destination. Most importantly, it is extremely difficult for the children of migrant parents to enter local schools in cities.

Economic growth in China triggered a dramatic increase in rural-urban migration. With an influx of rural migrants, the population of Chinese cities surged from 200 million in 1985 to 900 million in 2020 (Figure 2). Only a subset of those migrants were classified as urban, so Figure 2 also indicates that the number of urban residents without urban *hukou* privileges also increased dramatically during this period. Obtaining an urban *hukou* requires levels of professional skills or educational attainment that are very difficult for the vast majority of rural migrants to attain (Khanna et al., 2021). The schooling restrictions have therefore led to large increases in the number of children left behind in rural areas. In 2018, approximately thirty percent of all children in rural China (69 million children) were growing up without their parents (UNICEF, 2018).

The stringency of *hukou* regulations varies, with more developed cities with better amenities placing more restrictions on migrants. Figure 3 illustrates that the stringency level of *hukou* restrictions is positively correlated with the share of rural migrants who leave their kids behind. Teachers in rural schools have lower educational attainment than their counterparts in urban schools (Table A.3), urban teachers are more professionally accomplished (Table A.4), and urban schools provide better education facilities (Table A.5), so there are many clear indications that left-behind rural children also experience worse educational quality.

To keep their school-aged children in urban schools, migrant parents either have to pay an extra fee called *zanzhufei*, or send their children to "migrant schools" set up in cities specifically for poor migrant children without a local *hukou*. These schools

are also of poorer quality.[5] Many cities closed migrant schools in recent years, making it even harder for migrant children to receive education in cities (Table A.6). With limited availability of migrant schools, migrant parents have to pay *zanzhufei*, which can be prohibitive for poor migrant households. The amount of *zanzhufei* is higher in cities that have more stringent *hukou* restrictions (Figure 4), which is why *hukou* policy stringency is a useful measure of the difficulty migrant parents face in keeping their children with them.

2.2 Junior Middle Schools More Restricted than Primary Schools

Education is compulsory in China. By law, parents must enroll their children in primary school if they turned six by September 1 in a given year and must enroll them in junior middle school if they turn 12 by that day. Hukou-policy based restrictions are a much bigger constraint on migrant families with junior middle school aged children relative to primary-school-age. Junior middle schools charge a substantially higher amount of zanzhufei than primary schools (Table A.2). The number of available school seats is more limited in urban junior middle schools compared to primary schools.

Figure 5 shows that migrant workers are always more likely to leave middle-school-aged children behind than primary-school-aged children. They are also more likely to leave children of all ages behind when they migrate to cities with more stringent *hukou* restrictions. Guangzhou – a popular destination for migrant workers – offers an interesting case study on what happens to migrant children as they transition from primary to middle school age (Table A.7). In 2008, about 43% of the children in migrant households studied in primary schools in Guangzhou, but only around 21% of them studied in local junior middle schools. Further, a fraction of the migrant children enrolled in junior middle schools are allowed to take the high school entrance

[5]The majority of teachers in migrant schools do not have adequate credentials or experience to obtain jobs in local public schools. In addition, migrant schools are often overcrowded and use second-hand desks, chairs and buildings. Many also have poor lighting, heating, ventilation and sanitation, and do not even provide drinking water, restrooms, and student grounds. Although migrant school fees are much lower than *zanzhufei* charged by public schools for migrant students, they are still high for the average migrant family.

exam.

2.3 The 2014 Migrant Population Control Policy in Mega-Cities

In July 2014, the State Council of China promulgated "Opinions on Promoting the Hukou System Reform", which urged mega-cities - categorized as those with a population of over five million in the city central district area - to "exercise strict control over the population". Those mega-cities were required to set a population target by 2020, and local government performance is evaluated against that target. Starting in 2014, local governments in mega cities start strongly restricting the inflow of unskilled migrants by imposing even more stringent restrictions on school enrollment for migrant children. The same "Opinion" led to a gradual relaxation of *hukou* restrictions in small and medium-sized cities. We will examine how the leave-behind decisions of migrant parents attached to mega-cities changed after 2014, relative to migrants attached to other cities.

3 Data

3.1 Left-behind Children Data

We use individual-level data on children from the China Migrants Dynamic Survey (CMDS) conducted by the National Health and Welfare Commission. This is the largest nationally representative survey of China's migrant population. The sampling frame consists of migrants who have lived in cities for more than one month but have no local *hukou*. The survey records socioeconomic information of migrant parents and their children's age, gender, education, and residential location. This allows us to identify whether parents leave their children behind in rural areas at different stages of their education.

We combine six waves of the survey from 2011 to 2016 and construct individual-level pooled cross-sectional data for our empirical analysis. We focus on the sample of children whose parents are in cities where we can measure the stringency of *hukou*

restrictions. Our baseline sample contains over 171,859 children (47,121 children at junior middle school age and 124,738 children at primary school age) whose parents are rural-urban migrants across 30 provinces.

3.2 Longitudinal Data on Children

We use the Gansu Survey of Children and Families (GSCF) to track long-term socioeconomic outcomes for children. The GSCF is a longitudinal, multi-level study of rural children conducted by the University of Pennsylvania and the Gansu Bureau of Statistics in five waves in 2000, 2004, 2007, 2009 and 2015. The first wave surveyed a representative sample of 2,000 children aged 9–12 across 100 villages in Gansu Province. Subsequent waves track these rural children for 15 more years, which allows us to link their long-term socioeconomic outcomes during adulthood, including educational achievement, earnings, and migration status, with their childhood experience of being left behind by parents or not. We construct individual-level longitudinal panel data by combining GSCF 2000, 2004 and 2015. As we restrict our data to those who appear in the 2015 wave, our longitudinal panel data has 1414 individuals.

3.3 Hukou Restrictions Data

We use the *hukou* index constructed by Khanna et al. (2021) to measure the stringency of *hukou* regulations across Chinese cities. The main channels for migrants to obtain local urban *hukou* include tax payment and investment, home purchase, and employment.[6] The requirements of these channels differ by cities, and the composite *hukou* index measures the overall difficulty for adult migrants to obtain local *hukou* through these main channels.

The *hukou* system has been used by local government as a policy tool to control city population and fiscal resource allocation. Internal migrants without a local *hukou* have limited access to many government-provided benefits, including local public education for children. Because China experienced significant changes in the *hukou*

[6]We do not take the channel of family reunion into account, because only a very small fraction of immigrants can obtain local *hukou* through this channel.

policy in 2014,[7] Zhang et al. (2019) construct city-level *hukou* index specific for the periods of 2000–2013 and 2014–2016.

3.4 Data to Construct Instrumental Variables

Estimating the consequences associated with leaving children behind requires us to develop a few instruments for parents' decisions to migrate leaving children behind. One of the instruments uses a labor demand shock in nearby cities due to international trade, which is a pull factor for rural migrant workers. The raw data used to calculate world import demand are drawn from the International Trade Statistics Database of UN Comtrade. Second, we leverage rainfall variation during the planting season in rural areas as a push factor, with data from the China Meteorological Data Service Center. Rainfall is interacted with each rural area's historical ties to migration destinations, which is a function of visitors from those destinations in each rural area. We construct this using the China Population 1982. Appendix Table A.1 reports summary statistics of the key variables used in the analysis.

4 Results on the Propensity to Leave Children Behind

4.1 A Regression Discontinuity (RD) Design Based on School Enrollment Age

Given the increased difficulty migrant parents face to enroll their children in urban junior middle schools, we test whether the propensity to leave children behind changes at the age cutoff for middle school entry. We show the RD result both graphically

[7] China experienced two rounds of *hukou* reforms in the past two decades. First, in the early 2000s, many provinces abolished the *hukou* quota system for rural to urban *hukou* transition; also, the state abolished the grain and oil permit system, thus separating the food supply from *hukou* registration. Although the abolition of the *hukou* quota system lowered the barrier for *hukou* transition, it was still very hard for internal migrants to obtain a local *hukou* in most Chinese cities during that period. Second, in 2014, following the issuance of "Policies on the Reform of the Household Registration System", small and medium-sized cities loosened *hukou* restrictions, whereas large cities strengthened *hukou* restrictions.

and using the following regression specification:

$$Left\ behind_{ijt} = \psi_0 + \psi_1 School\ Age_{it} \times High\ Hukou_{jt} + \psi_2 School\ Age_{it} + \psi_3 T_j \times School\ Age_{it} + \psi_4 T_j + \xi_{jt} + \eta_n + v_{ijt} \tag{1}$$

where $Left\ behind_{ijt}$ is an indicator for whether child i (whose parents work in city j and do not have a local *hukou* in their place of residence) are left behind in a rural area in year t.[8] $School\ Age_{it}$ is an indicator for whether child i is above the enrollment age for junior middle school, based on their exact date of birth relative to the September 1 school entry date.[9] $High\ Hukou_{jt}$ is a binary variable that equals one if the stringency level of *hukou* restrictions in city j and year t is above the average city level. The running variable T_j is the number of years between school enrollment age and children's age. Our primary variable of interest is the interaction between $School\ Age_{it}$ and $High\ Hukou_{jt}$, which examines whether there is any differential discontinuous shift in the probability of leaving children behind at the school enrollment age ($T_j = 0$) in cities with more restrictive *hukou* policies. We combine CMDS 2011-2016 to create an individual-level pooled cross-sectional dataset to estimate equation (1).

We estimate equation 1 separately for male and female children to examine whether migrant parents' decisions vary by the gender of their child. Imbens and Lemieux (2008) and Gelman and Imbens (2019) suggest that a local linear regression using samples near the RD cutoff is likely to yield the most robust estimates. We use a local linear control function for the running variable T_j, and select two years as the bandwidth in our baseline specification. We conduct robustness checks with alternative bandwidths and control functions for T_j.

We add city-by-year fixed effects ξ_{jt} to control for city-by-year characteristics such as industrial structure and economic development plans of local government that may be correlated with the city's *hukou* policies . We control birth cohort fixed effects η_n

[8]We exclude rural-urban migrants who migrated from rural to urban areas within the same prefecture-level region. There are 333 prefecture-level regions in China. A rural and an urban area located within the same prefecture are close to each other, and thus it is easy for migrant parents to go back home and be with their children.

[9]Our empirical identification strategy is a fuzzy RD design, as some migrant workers may send their children to a junior middle school later than the compulsory enrollment age.

to account for any changes in other policies (e.g. the One Child Policy) pertaining to child outcomes. Table A.8 examines whether other variables change systematically at the RD cutoff. We do not see any discontinuities in the fraction of migrants who get a local urban *hukou*, parents' migration decisions, or incomes.

4.2 Graphical Analysis of the Regression Discontinuity

Figure 6 graphically represents shifts in the fraction of left-behind children at the age cutoff for middle school enrollment . Reflecting our triple difference research design, we show separate graphs for sons and daughters, and for cities where migrant parents face more or less stringent *hukou* restrictions. There is a sharp increase in the share of left-behind girls just at the school enrollment age if their parents are in highly *hukou*-restricted cities (the left panel of Figure 6a), whereas we do not observe any discontinuous changes at the enrollment age for boys in those highly *hukou*-restricted cities (the right panel of Figure 6a). We also do not observe any discontinuity for either girls or boys in less *hukou*-restricted cities (Figures 6b). In addition, irrespective of child gender, the fraction of children that are left behind is much lower in less restricted cities than it is in highly restricted cities. Migrant parents appear to leave their daughters rather than their sons in their rural hometown in response to strict *hukou* restrictions, whereas there is no obvious gender bias for parents in cities with relaxed *hukou* policies .

4.3 Regression Analysis

We estimate equation (1) to statistically examine the discontinuity described above. The dependent variable in Table 1 is a binary indicator for the decision to leave the child behind, and our independent variable of interest is the interaction between the indicator for the child reaching junior-middle-school enrollment age and an indicator for parents in cities with above-average stringency of *hukou*-restrictions. Our baseline specifications use two years as the bandwidth around the age cutoff and employ a local linear control function for the running variable. We perform the analysis separately for daughters (columns 1-4) and sons (columns 5-8).

We control for city-by-year fixed effects in columns 1,2,5,6. To absorb any dif-

ferences in attitudes towards boys' versus girls' education between migrants from different areas, columns 3,4,7,8 add a triple interaction between city-, city- and *hukou* province- fixed effects. Columns 2,4,6,8 add birth cohort fixed effects. All columns control for household socioeconomic characteristics.

Across all the specifications for daughters (columns 1-4), the interaction of the above-enrollment-age indicator and the high-*hukou*-restriction indicator is statistically significant, and the coefficient implies that girls become 3.2-3.5 percentage points more likely to be left behind exactly when she reaches the legal enrollment age for junior middle school and her parents work in a city with restrictive *hukou* policy.[10] 34% of girls in migrant households in China are left behind in rural areas, so the discontinuous jump at that age-cutoff represents a 9% increase at the mean. The coefficient on the above-enrollment-age dummy is close to zero, which suggests that the discontinuity does not exist for parents who migrated to cities with relatively relaxed *hukou* policies.

Across all specifications for sons (columns 5-9), both the above-enrollment-age indicator and its interaction with the high-*hukou*-restriction indicator are statistically indistinguishable from zero. The daughter effect is statistically distinguishable from the son coefficient (Table A.11). In contrast to daughters, the elevated entry fees for middle school does not appear to deter migrant parents from keeping their sons with them in the city, regardless of how stringent the *hukou* restrictions are. China's *hukou* policies are not formally gender-specific by design, but when that schooling expense is imposed on parents, they seem more willing to sacrifice time with their daughters. This is reminiscent of Dahl and Moretti (2008)'s findings that parents seem to prefer spending time with sons. Some pre-existing underlying son preference in China appears to be interacting with mobility restrictions to produce gender-unequal outcomes.

Given son preference in China and the availability of sex selection technology, there is a plausible concern that child gender may reflect parental choices. Existing evidence suggests that sex selection is more common at higher birth orders, but observed gender ratio of the first-born child match biological expectations (Almond

[10]Table A.9 shows that the results remain similar under RD design variations in which we extend the bandwidth or use a quadratic control function for the running variable.

et al., 2019). We therefore re-run our regressions in Table A.10 limiting the sample to first-born children only. The empirical patterns remain very similar, where daughters of parents in *hukou*-restrictive cities become 3.7-4.2 percentage points more likely to be left behind when they cross the age threshold for middle-school entry.

Table 2 shows that of the children left behind in rural areas by migrant parents, the majority are left behind without either parent present. These cases account for 24% of the 34% of rural children that are left behind. Furthermore, the discontinuous jump in parents' propensity to leave daughters behind at middle-school-age most often leads to those additional daughters being left behind in rural areas without either parent present. This is relevant because the emotional toll and developmental burden on children are likely larger when both parents are absent (citation). Other descriptive data from China shows that in such cases, grandparents are asked to take care of children left behind in rural areas.

4.4 Another RD Design Based on 2014 Mega-city Migrant Population Control Policy

We use the 2014 "migrant population control policy" imposed on mega cities to construct a different RD research design to again test for gender biases in migrant parents' "leave-child-behind" decisions. This new policy forced local governments in mega-cities to impose new restrictions on migrants' access to local public services. Since "mega-cities" have a precise definition (population exceeding five million in the city central district), we construct the following RD specification based on that population threshold:

$$\begin{aligned} Left\ behind_{ijt} = \alpha_0 + \alpha_1 School\ Age_{it} \times I(Pop > 5\ million)_j \times I(t > 2014) + \\ \alpha_2 School\ Age_{it} \times I(Pop > 5\ million)_j + \alpha_3 School\ Age_{it} \times I(t > 2014) + \\ \alpha_4 School\ Age_{it} + \xi_{jt} + \eta_n + v_{ijt} \end{aligned} \tag{2}$$

where $School\ Age_{it}$ is an indicator for children who have reached middle-school enrollment age by year t, $I\left(Pop > 5\ million\right)_j$ is an indicator for the mega-cities subjected to the new policy, and $I\left(t > 2014\right)$ is an indicator for the post-treatment period.

The running variable in this RD design is the city-specific difference between baseline city population and 5 million, which is absorbed by city-by-year fixed effects–ξ_{jt}. We restrict the sample to parents who made their migration destination choices before 2014, to mitigate any endogeneity concerns about parents choosing destinations based on concerns about children's access to urban schools.

Columns 1 and 2 of Table 4 show that for female children, the RD variable of interest—the triple interaction between having reached the junior middle school enrollment age; the indicator for cities with above-5-million population; and the indicator for post-2014—is positive and significantly different from zero. In response to the new policy, parents who had migrated to mega-cities prior to 2014 become 7 percentage points more likely to leave daughters behind. The second row shows that parents were not exhibiting that behavior before the policy went into effect. Columns 3-4 show that there is no such effect for boys in migrant households. All these coefficients jointly imply that new migration restrictions that increase the cost of raising children in the city pushes parents into discriminating against their daughters.

5 Remittance Behavior

Leaving children behind in rural areas reduces the cost of raising children because parents can avoid paying extra school fees in urban areas. Therefore, migrant parents can compensate daughters for separating from them by sending remittances back to the rural area. Both parental time and money are useful for child development, so it's possible that this is on net beneficial for daughters. Table 3 examines the patterns of remittances sent back by migrant parents as a function of child gender. Remittance sent back is actually 9% *lower* when a daughter is left behind compared to a son being left behind. In panel C, we see that this gender difference gets even larger when the child reaches junior-middle-school age. In this sample, remittances are 13-16% lower for left-behind girls.

In summary, there is no evidence that daughters who (our previous analysis shows) are more likely to be left behind at that age are financially compensated by parents. Daughters receive less time and less money from their parents.

6 Long-term Consequences of Leaving Children Behind

We now use longitudinal data to study the longer term consequences of being left-behind as a child on socio-economic outcomes in adulthood, observed 15 years later. We estimate the following specification using data from the 2000, 2004, and 2015 rounds of the Gansu Survey of Children and Families (GSCF), which tracks children born in rural Gansu over a long period:

$$Y_{ict} = \beta_0 + \beta_1 Left\ behind_{ict} + \xi_m + \eta_t + \varepsilon_{it} \tag{3}$$

We use information on the parents' location to identify children who were either living with their parents, or were left behind when they were middle-school-age in 2000 or 2004.[11] Socio-economic outcomes Y_{ict} are measured in 2015 for individual i born in a rural area in prefecture c in year t.[12] In our main specifications, $Left\ behind_{ict}$ is an indicator for whether individual i was separated from parents for more than six months in a survey year (2000 or 2004) during junior middle school age. We control for residential township fixed effects ξ_m, and birth cohorts fixed effects, η_n.

Note an important difference in the structure of this data relative to datasets we used in our earlier analysis in section 4: in this panel dataset, left-behind children are those whose parents migrated, while parents of the "control group" are non-migrants. Each parent's decision about whether to migrate is an endogenous choice, so we need an instrument for the parents' migration decision to isolate the causal effect of leaving children behind.

[11] Because GSCF 2000 (the initial wave of GSCF) surveyed children aged 9–12, and the school age for junior middle school is 12-15 for those whose birthday is before September 1 and 13-16 for those whose birthday is after September, we can observe their experience of being left behind during middle school age in the 2000 or 2004 wave (the first two waves of GSCF).

[12] All children in our sample hold a local rural *hukou* in the prefecture of birth (a local *hukou* in rural areas in the birth prefecture) in 2000 and 2004. In China, a prefecture region includes both rural and urban areas. The GSCF covers rural children in rural areas in 11 prefectures.

6.1 Instrument #1: Import Demand Shocks in Nearby Cities

Since the growth in China that induced this large-scale rural-urban migration was export-led, we can use global import demand shocks for the products/industries that each city specializes in as sources of exogenous variation that drive migration choices from nearby rural regions of Gansu. Using UN Comtrade data on imports, we create an index called WID_{ct}, which measures each rural region's exposure to a world import demand shock in each year. The import demand shock experienced by each city is defined as the 2-year increase in import demand for industry k weighted by the importance of that industry to destination city d, as measured by that city's pre-period (1997) export share of that industry ($\frac{EX_{k,d}}{\sum_j EX_{k,j}}$). Every city experiences these demand shocks, so each rural region's exposure is determined by their proximity to every "potential" migration destination. We therefore weight the city-specific demand shocks by the inverse of the distance from the migrant's birth location c to every urban destination d, to create the index for rural region c:

$$WID_{ct} = \sum_d \left(\frac{1}{dist_{dc}}\right)\left(\sum_k World\ IM_{k,t-2,\ \ t} \times \frac{EX_{k,d}}{\sum_j EX_{k,j}}\right) \tag{4}$$

This is akin to "shift-share" instruments common in the economics literature. We assign non-zero weights only to potential destination cities that are located within a 400 km radius of birthplace c. The exact instrument we use in our regressions is the interaction between WID_{ct} and restrictiveness of *hukou* regulations in nearby cities, because we are trying to extract the migrant's pull to destinations where they cannot easily take their children. The specification of the first-stage estimation is:

$$\begin{aligned} Left\ behind_{icn,t} &= \gamma_0 + \gamma_1 WID_{ct} \times Des\_High\{Hukou\}_c + \gamma_2 WID_{ct} + \xi_c \\ &+ \eta_{n,\ t} \times Female + \varepsilon_{icn,t} \end{aligned} \tag{5}$$

$Des\_High\ Hukou_{\ c}$ is an indicator for whether migrants from birthplace c would face stringent *hukou* restrictions in cities near location c. We first compute the inverse distance-weighted sum of the *hukou* index across potential destination cities, $\sum_d \left(\frac{1}{dist_{dc}} Hukou\ Index_d\right)$, and consistent with our approach in section 4, the indicator $Des\_High\ Hukou_{\ c}$ turns on if $\sum_d \left(\frac{1}{dist_{dc}} Hukou\ Index_d\right)$ is above the average

level of all cities.

We directly control for WID_{ct} (and $Des\_High\{Hukou\}_c$ is absorbed by the location fixed effects ξ_c) in the first and second stages of this 2SLS strategy, so only the interaction between WID shocks and *hukou* restrictions acts as the excluded instrument. The exclusion restriction of this instrument is violated if positive import demand shocks in nearby cities affect children growing up in rural Gansu through mechanisms other than being left behind by migrant parents. That's actually a very plausible concern: increased world import demand like raises wages for migrant parents (which could benefit children in other ways), and if the shock persists, it could create future economic opportunities for the children as they enter adulthood, and it could also thereby raise their perceived returns to education. All of that should *improve* child education and economic outcomes, while we estimate the opposite, as previewed in the introduction: Gansu children are worse off in multiple dimensions when their parents migrate and leave them behind. Violations of the exclusion restriction therefore lead to an *underestimation* of the detrimental effects of leaving children behind. Our estimates, if anything, will be *conservative* in magnitude.

6.2 Instrument #2: Rainfall and Historical Migration Ties

Our first instrument is created based on shift-share "pull" shocks in cities that attract rural people to migrate. We next leverage "push" factors in places of origin. In particular, our second instrument is the interaction of rainfall in original location interacted with historical migration ties. The specification of the first-stage estimation is:

$$\begin{aligned} Left\ behind_{icn,t} &= \gamma_0 + \gamma_1 Rain_{ct} \times\ Mig\ Tier_c + \gamma_2 Rain_{ct} + \xi_c \\ &+ \eta_{n,\ t} \times Female + \varepsilon_{icn,t} \end{aligned} \tag{6}$$

where $Rain_{ct}$ is the rainfall in the planting season in birth location c and year t. Decreased rainfall in the planting season can negatively affect agricultural productivity. A positive income shock from rainfall can either hold migrants back in the rural area, or it could relax liquidity constraints and permit more migration (Bazzi, 2017).

Like Imbert et al. (2022), we combine this rainfall shock with those rural areas' pre-existing connection to cities in order to predict migration propensity. Internal

migration was prohibited before 1984, so migration flows prior to 1984 were mainly driven by government programs like the Sent Down Youth campaign, which resulted in idiosyncratic variation in each rural region's connection to cities from which the youth had visited pre-1984. We use the Population Census 1982 to calculate the share of in-migrants to rural birth location c to measure such migration network ties. Rural areas that had hosted in-migrants from a large city may have retained better personal connections and knowledge about that city, which in turn increases the desirability or salience of that city as a possible migration destination (Kinnan et al., 2018).

We employ the two instruments discussed above independently as they represent very different sources of variation (driven by "pull" demand shocks in potential destination cities versus "push" weather shocks in places of origin). In Table A.12, we show the strength of the first-stage relationships between our different instruments and our (endogenous) independent variable of interest.

6.3 Results on Long-term Socioeconomic Outcomes

Table 5 reports the effects of being left-behind on the educational attainment of children, where we use the world import demand shift-share IV strategy. The estimated equation 3 includes birth location fixed effects and cohort fixed effects, and (sometimes) controls for household characteristics like whether a grandparent is alive and whether a grandparent resides in the same village. Parental absence during childhood have significant negative effects on future educational achievements. Leaving children in poor rural areas during junior middle school age reduces schooling attainment by three years. This is a very large effect that represents 0.85 standard deviations of the dependent variable. Columns 3-4 further show that the years of schooling are 28-29 percentage points lower for those who experienced parental absence during school age than for those who did not.

We next restrict our sample to the subset of children who took high school entrance exams. Separation from parents during junior middle school age reduces their probability of passing high school entrance exams by as much as 41-45 percentage points (columns 5 and 6). This result is especially striking because anecdotally, a reason migrants often provide for sending their middle-school-aged-child back is so

that the child can prepare for the high-school entrance exam, for which the curriculum varies by prefecture.

Table 6 shows that being left behind also significantly negatively affects later-life socioeconomic outcomes. In columns 1 and 2, we divide the children in our sample into two groups based on their income in 2015; the low-income group includes those whose income is below the average level and those who do not have any income. Parental absence during school age increases the probability of ending up in the low-income group by up to 40 percentage points. We next look at the persistence of rural status across generations, in columns 3 and 4. The dependent variable here is an indicator for whether an individual either remains in the village or migrates without an urban *hukou*, both of which capture disadvantaged rural status in adulthood. The experience of being left behind increases the probability of retaining rural status by as much as 35 percentage points, which in turn is expected to produce negative effects for the next generation (the children of those left-behind), if the results of this paper are correct. Those "grandchildren" without an urban *hukou* will also be restricted from accessing higher-quality urban educational systems. This undermines inter-generational mobility. Indeed in the GSCF data, people who had been left behind in villages in childhood are approximately 20% more likely to leave their children behind in adulthood, compared to those who had not. Left-behind children are also significantly more likely to have an obesity problem later in life (columns 5 and 6).

While these effects are large, they may yet be *under-estimates* of the true effects (as argued above), because the world import demand shock instrument should improve migrant family's socioeconomic and educational outcomes through other channels (remittances, future economic opportunities, returns to education, etc.). Table A.13 shows estimates of the long-term consequences using the (rainfall $\times$ historical migration ties) instrument. The coefficient estimates are slightly larger in magnitude and document a similar empirical pattern. Once again, leaving children behind has a significant negative effect on their educational achievement, health and socioeconomic status. In Table A.14, we change the RHS measure in equation 3 to "the amount of time that parents are away from children when they are school-aged". We empirical patterns remain the same.

6.4 Hukou Restrictions and the Gender Wage Gap

Two caveats about these long-term results are that (a) the longitudinal data allow us to compare children growing up without parents in rural areas to those growing up *with* parents in rural areas, not to those growing up in cities, and (b) our instruments capture the general economic drivers of parental migration, so it cannot separately identify any differential effect of parental absence on sons versus daughters. In order to shed light on the gender-differentiated long-term consequences of parents' greater propensity to leave daughters behind (as established in section 4), we can return to the CMDS dataset to examine whether there are larger gender differences in adult labor market outcomes for individuals who originate in rural areas adjacent to cities with stricter hukou restrictions (where parents exhibited the bias against daughters).

Figure 7 correlates *hukou* policy restrictiveness in nearby cities on the horizontal axis with a "gender wage gap" measure on the vertical axis, which is the difference in wage rankings between male and female workers who have the same rural area of origin. We divide individual wages into three terciles to measure wage rankings. When individuals come from a rural origin located near potential migration destinations with a restrictive *hukou* environment, there is a greater gender wage gap in earnings later in life for women and men from that origin. This is a natural and sensible implication of the two sets of results we showed in sections 4 and 6: migrant parents are more likely to leave daughters behind when they face a restrictive *hukou* environment, and the children left behind fare worse later in life. The joint implication of these two facts is that we should observe larger gaps in adult economic outcomes in rural areas adjacent to cities with restrictive *hukou* policies, which is exactly what Figure 7 shows.

7 Mechanisms

In this section, we evaluate the underlying mechanisms through which *hukou* restrictions lead to female children being left behind. At least three potential mechanisms may result in our empirical pattern. First, *hukou* restrictions exacerbate the effects of the son preference and cause parents to sacrifice their female children. Second, the rate of returns to education may be lower for females than males. Third, sons

are potentially more productive than daughters. We empirically examine the three mechanisms and find the most consistency with the first mechanism: the interaction between *hukou* restrictions and the son preference.

7.1 The Interaction between Parental Gender Bias and Hukou Restrictions

We firstly assess whether our empirical pattern is driven by the interplay between parental son preference and *hukou* restrictions. Table 7 assigns girls (of migrant households) into two groups, based on whether they have male siblings who will compete with them for limited educational resources in cities. We find that the effects of *hukou* restrictions on the probability of girls being left behind are larger for those with male siblings. Thus, the gender bias of parents leads to unequal intra-household allocation of resources between boys and girls and drives our empirical pattern.

In rural China, the male-female ratio of second births captures the level of son preference. As documented by the literature, rural parents who have a strong son preference are likely to make a sex selection for second births (Almond et al., 2019). Therefore, we create an indicator for whether the male-female ratio of second births in migrant parents' *hukou* provinces (provinces of origin) is above the national median level, to inform us whether those parents come from provinces featuring a strong parental gender bias. To account for the confounding effects of current economic factors on gender ratio, we use the China Population Census 1990 (21 years prior to our sample period) to construct the indicator. Almond et al. (2019) also document that the sex ratio of second births measured using China Census 1990 reflects the son preference of parents (rather than differential potential earnings between male and female children). We thus re-perform our RD estimation and additionally interact our independent variable of interest – the interaction between *hukou* restrictions and the above-enrollment-age indicator – with the indicator for male-biased second-birth sex ratio in migrant parents' original provinces. Table 8 shows that the triple interaction term is significantly positive for female children, indicating that the association between *hukou* restrictions and girls being left behind is significantly more pronounced for migrants who come from regions featuring higher gender bias towards

sons. The results are in accordance with the literature showing that, when people migrate, their beliefs and values on gender roles move with them, even though their external environment has changed (Alesina et al., 2013).

7.2 Other Mechanisms

Men and women are likely to have heterogeneous returns to education, and one may expect that parents leave their female children in villages if females have a lower rate of return to education and therefore should be allocated less educational resources. In Table A.15, we use individual data to perform Mincer wage regressions and introduce an interaction between a female indicator and a high school education indicator [13]. The interaction term is positive and significantly different from zero, which implies that females have a higher (rather than a lower) rate of return to education. Higher returns to skill for females are evident for both rural and urban people and also for migrant workers. Thus, our empirical pattern is unlikely to be driven by differential returns to education by gender.

Another competing mechanism is the "productive son" mechanism. To consider the possibility that potential higher productivity and wages are expected from male children, we examine whether the effects of *hukou* restrictions on female children being left behind are more pronounced in regions with higher baseline male-female gaps in wages. The results in Table A.16 imply that the association between *hukou* restrictions and the probability that female children are left in villages is not affected by baseline gender gaps in wages in either the origin or destination of migrant parents [14].

One may also expect that migrant workers leave their female children behind because separation from parents may have a more detrimental effect on male children. However, we do not find gender differences in socioeconomic outcomes associated with

[13] We use individual-level pooled cross-sectional data by combining CLDS 2012, 2014, 2016 and 2018 to perform mincer wage regression, because CLDS has a sample period similar to our baseline analysis and allows us to look at the pattern of gender-specific returns to education for people with different migration status and *hukou* types (rural or urban *hukou*).

[14] We follow Dahl (2002) and Gao et al. (2022) to run Mincer wage regressions city by city using the Population Census 2005. We use the coefficient on the female dummy in Mincer wage regressions to measure city-specific gender gaps in wages.

leaving children behind.

In sum, the son preference channel does a better job of explaining the observed relationship between mobility restrictions and rural girls being left behind than do other mechanisms we have discussed [15]. Nevertheless, we acknowledge that there may be other mechanisms behind the effects of *hukou* restrictions on left-behind girls that require additional data collection and analysis.

8 Conclusion

Our analysis highlights the unintended consequences of an important new pattern of mobility on gender inequalities. As economic growth and industrial activities increase demand for unskilled workers in Chinese cities, adult migrant workers without a local *hukou* are authorized to work in urban areas, while their children have only limited access to education in cities. Our RD estimates based on the school age cutoff reveal that, under *hukou* restrictions, rural-urban migrants are more likely to leave behind their daughters than their sons in poor rural areas. We further document that people who were left behind during their school age tend to drop out of education early and end up with lower socioeconomic status.

Other studies have documented that mobility constraints trigger economic losses for adult workers and widen economic gaps between rural and urban people. Our contribution is to quantify how migration restrictions placed on children can translate into long-term socioeconomic disadvantages and how female children are more vulnerable to these restrictions. Thus, both the aggregate and the distributional effects of mobility constraints may be larger than development economists previously thought. Our work proposes a new mechanism whereby placing restrictions on migration can aggravate gender inequities among children, even if the migration policy does not have an explicit gender dimension.

Although we focus on gender disparities, our analysis sheds light on economic inefficiencies in the developing world. While improved access to economic opportunities

[15] We acknowledge the son preference of parents may be affected by historical gaps in earnings and productivity by gender. Nevertheless, our results demonstrate that our baseline empirical pattern has nothing to do with current gender disparities in wages and productivity.

for females and disadvantaged groups has significantly boosted economic growth in the U.S. (Duflo, 2012; Hsieh et al., 2019), limited access to education and economic resources that disproportionally affect girls in migrant households may undermine long-term economic development in China.

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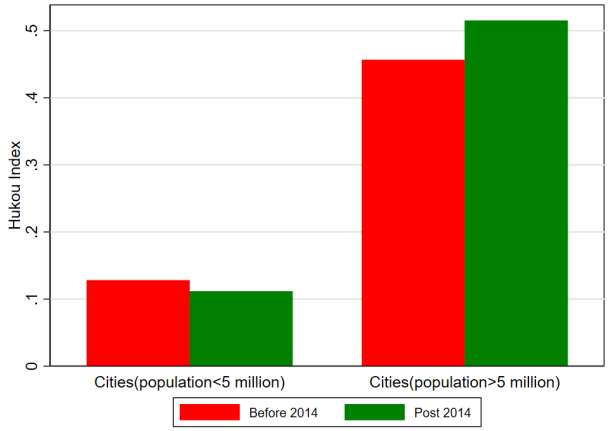
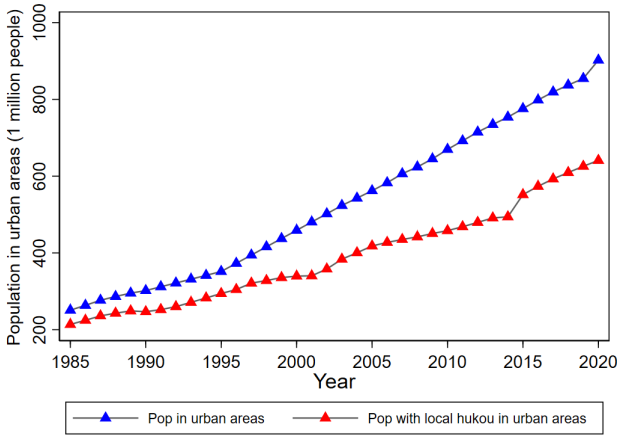
Figure 1: 2014 Population Control Policy and *Hukou* Restrictions



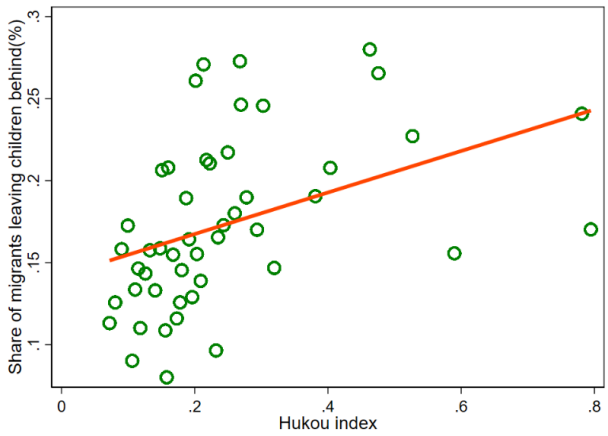
Note: Data come from Zhang et al. (2019).

Figure 2: More and More People Don't Have Local Urban *Hukou* as China Urbanizes



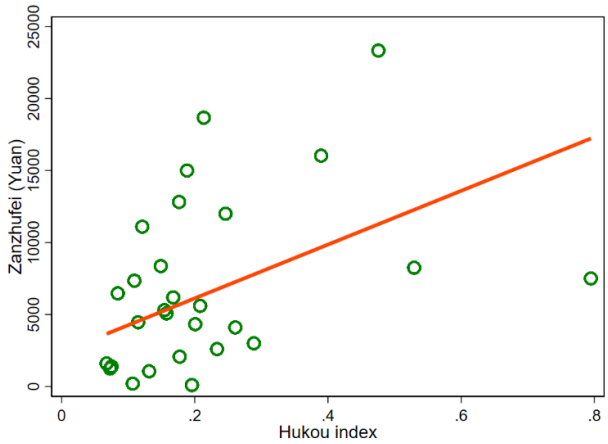
Note: The blue line denotes the population in urban areas, and the red line shows the population holding local urban *hukou* in urban areas. Data come from the *China Statistical Yearbook*.

Figure 3: *Hukou* Index and the Share of Migrants Leaving Children Behind



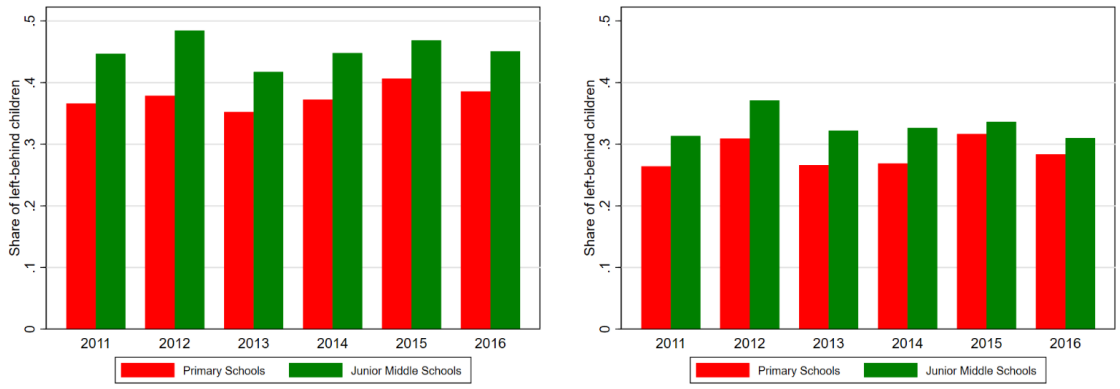
Note: This figure shows the relationship between the share of migrants leaving children behind and the stringency of *hukou* regulations in migrants' destination cities. Cities are grouped into fifty groups according to the quantile of the *hukou* index. The vertical axis denotes the mean value of the share of migrants leaving children behind and the horizontal axis denotes the mean value of the *hukou* index in each quantile. Data on left-behind children come from the *China Migrants Dynamic Survey (CMDS)*, and data on the *hukou* index come from Zhang et al. (2019).

Figure 4: *Hukou* Restrictions and *Zanzhufei* (Extra School Fee) for Migrants' Children



Note: In China, migrant children without a local *hukou* have to pay *zanzhufei* (an extra fee imposed specifically on them) in order to go to a local school. This figure shows the relationship between the amount of *zanzhufei* and the stringency of *hukou* regulations in migrants' destination cities. Cities are grouped into fifty groups according to the quantile of the *hukou* index. The vertical axis denotes the mean value of the amount of *zanzhufei* and the horizontal axis denotes the mean value of the *hukou* index in each quantile. Data on left-behind children come from the *China Migrants Dynamic Survey (CMDS)*, and data on the *hukou* index come from Zhang et al. (2019).

Figure 5: Share of Left-behind Children by School Age

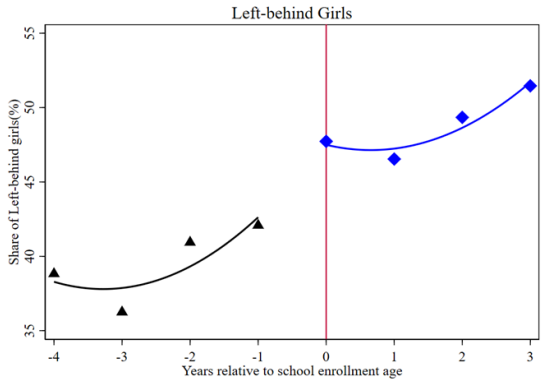


(a) Highly restrictive cities

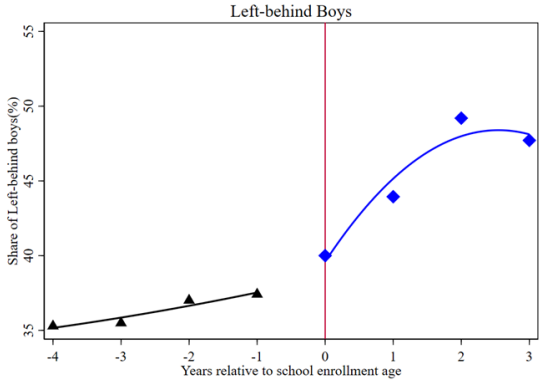
(b) Less restrictive cities

Note: We divide cities into two groups based on the stringency of *hukou* restrictions. Highly restrictive cities are those in which the *hukou* index is above the national mean, and less restrictive cities are those in which the *hukou* index is below the national mean. *Hukou* index measures the stringency of *hukou* regulation and the difficulty for migrants to obtain local *hukou*. Data on left-behind children come from the *China Migrants Dynamic Survey (CMDS)*, and data on the *hukou* index come from Zhang et al. (2019).

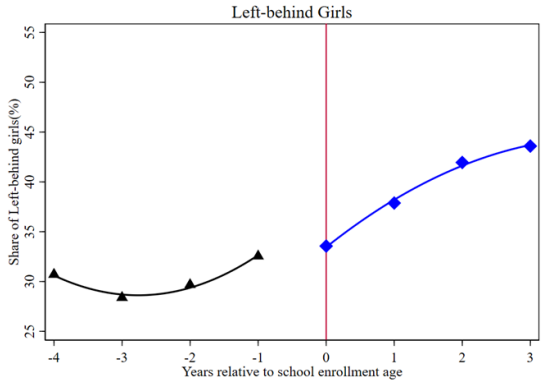
Figure 6: School Enrollment and Left-behind Children



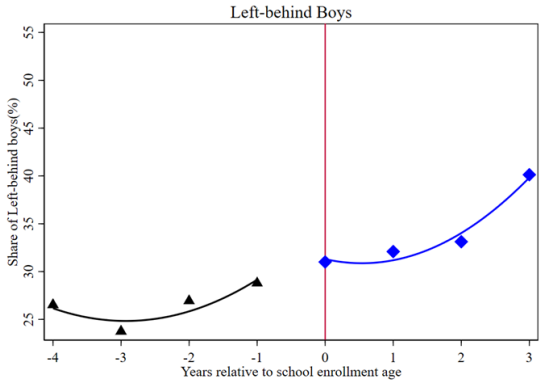
(a) Girls in *highly* restrictive cities



(b) Boys in *highly* restrictive cities



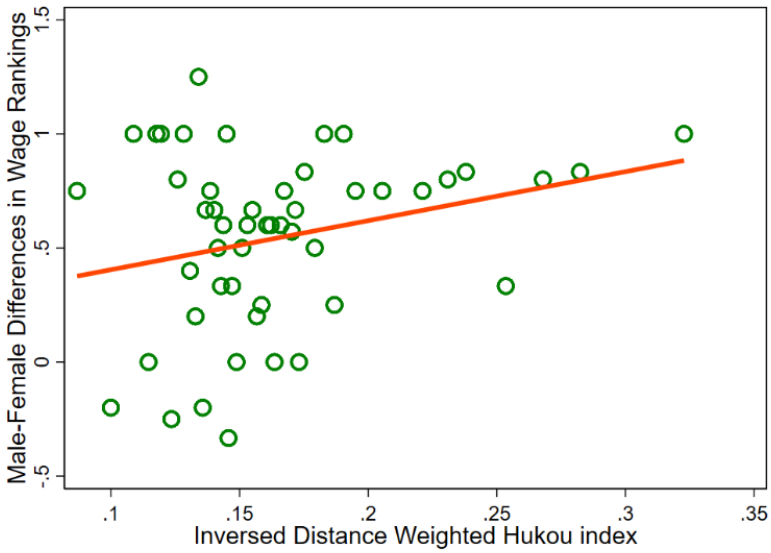
(c) Girls in *less* restrictive cities



(d) Boys in *less* restrictive cities

Note: The vertical axis shows the share of children left behind in villages, for girls and boys, repectively. The horizontal axis shows the number of years relative to the junior middle school enrollment age. We divide cities into two groups based on the stringency of *hukou* restrictions. Highly restrictive cities are those in which the *hukou* index is above the national mean, and less restrictive cities are those in which the *hukou* index is below the national mean. Hukou index measures the stringency of *hukou regulation* and the difficulty for migrants to obtain local *hukou*. Data on left-behind children come from the *China Migrants Dynamic Survey (CMDS)*, and data on the *hukou* index come from Zhang et al. (2019).

Figure 7: *Hukou* Restrictions and Male-Female Wage Gaps



Note: These figures illustrate how *hukou* restrictions in migrants' potential destination cities during individuals' childhood affect the gender gap in wages later in life. The horizontal axis denotes the inverse distance-weighted *hukou* index of potential destination cities (for migrants coming from a particular city of origin) when these individuals were at junior middle school age. The vertical axis shows differences in wage rankings between male and female workers who have the same city of origin. We divide individual wages into three tertiles to measure wage rankings. Cities are grouped into fifty groups according to the quantile of the inverse distance-weighted *hukou* index. Wage data come from the China Migrants Dynamic Survey (CLDS) 2016, and data on the *hukou* index come from Zhang et al. (2019).

Table 1: School Enrollment Age and left-behind Children

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable: Indicator for leaving the child in rural hometown							
	Female	Male	Female	Male	Female	Male	Female	Male
Above enrollment age × Highly restricted cities (=1) (ψ_1)	0.0324**	0.00331	0.0330**	0.00444	0.0349**	0.00871	0.0354**	0.00984
	(0.0145)	(0.0150)	(0.0144)	(0.0148)	(0.0145)	(0.0170)	(0.0144)	(0.0167)
Above enrollment age (ψ_2)	-0.00451	0.000905	-0.00545	0.00125	-0.00375	0.000643	-0.00644	0.000597
	(0.0158)	(0.0136)	(0.0159)	(0.0134)	(0.0176)	(0.0153)	(0.0178)	(0.0152)
P-value of $\psi_1 + \psi_2$	0.0341	0.679	0.0397	0.576	0.0149	0.400	0.0271	0.360
Coeff diff pval	0.000		0.000		0.000		0.000	
Observations	31,071	40,854	31,071	40,854	31,071	40,854	31,071	40,854
Adjusted R-squared	0.172	0.146	0.173	0.147	0.206	0.184	0.207	0.184
Mean of Dep. Var.	0.35	0.34	0.35	0.34	0.35	0.34	0.35	0.34
Household Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE×Year FE	Yes	Yes	Yes	Yes	No	No	No	No
City FE×Year FE×*Hukou* Province FE	No	No	No	No	Yes	Yes	Yes	Yes
Cohort FE	No	No	Yes	Yes	No	No	Yes	Yes
Age Bandwidth	2	2	2	2	2	2	2	2
Control function for the running variable	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear

Notes This table shows the results of estimating equation (1). The bandwidth is two years. We use a RD sample of children who are two years older or younger than the enrollment age of junior middle school. "Coeff diff pval" reports the p-value of a test of equality of (ψ_1) between the female and male, using the Fisher's permutation test. Household controls include father's age and age-squared, an indicator for whether household income is above the median value among the migrant population in the city and an indicator for whether household consumption is above the median value among the migrant population in the city. We use a local linear control function for the running variable. Robust standard errors clustered at the city level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 2: One Parent Versus Both Parents Are Separated from Children

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Female				Male			
Panel A: Dependent Variable: Indicator for leaving the child behind without both parents								
Above enrollment age × Highly restricted cities (=1) (ψ_1)	0.0202*	0.0208*	0.0230**	0.0236**	0.00615	0.00726	0.00912	0.0102
	(0.0118)	(0.0117)	(0.0107)	(0.0106)	(0.0124)	(0.0121)	(0.0143)	(0.0138)
Above enrollment age (ψ_2)	-0.00903	-0.0145	-0.00770	-0.0137	-0.00126	-0.00500	-0.00151	-0.00559
	(0.0133)	(0.0132)	(0.0137)	(0.0136)	(0.0129)	(0.0129)	(0.0143)	(0.0142)
Observations	31,071	31,071	31,071	31,071	40,854	40,854	40,854	40,854
Adjusted R-squared	0.130	0.131	0.188	0.189	0.142	0.142	0.174	0.175
Mean of Dep. Var.	0.24	0.24	0.24	0.24	0.23	0.23	0.23	0.23
Panel B: Dependent Variable: Indicator for leaving the child behind with one parent								
Above enrollment age × Highly restricted cities (=1) (ψ_1)	0.0117	0.0117	0.0119	0.0118	-0.00284	-0.00282	-0.000407	-0.000347
	(0.00733)	(0.00747)	(0.00778)	(0.00793)	(0.00595)	(0.00589)	(0.00643)	(0.00634)
Above enrollment age (ψ_2)	0.00683	0.0109	0.00394	0.00725	0.00216	0.00624	0.00216	0.00619
	(0.00831)	(0.00847)	(0.00881)	(0.00915)	(0.00749)	(0.00744)	(0.00705)	(0.00696)
Observations	31,071	31,071	31,071	31,071	40,854	40,854	40,854	40,854
Adjusted R-squared	0.207	0.208	0.252	0.253	0.179	0.180	0.225	0.226
Mean of Dep. Var.	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11
Household Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE×Year FE	Yes	Yes	No	No	Yes	Yes	No	No
City FE×Year FE×*Hukou* Province FE	No	No	Yes	Yes	No	No	Yes	Yes
Cohort FE	No	Yes	No	Yes	No	Yes	No	Yes
Age Bandwidth	2	2	2	2	2	2	2	2
Control function for the running variable	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear

Notes The bandwidth is two years. We use a RD sample of children who are two years older or younger than the enrollment age of junior middle school. Household controls include father's age and age-squared, an indicator for whether household income is above the median value among the migrant population in the city and an indicator for whether household consumption is above the median value among the migrant population in the city. We use a local linear control function for the running variable. Robust standard errors clustered at the city level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Remittance sent to rural children by gender

	(1)	(2)	(3)	(4)
	Dependent variable: Log Amount of Remittance			
Panel A: Full Sample				
Female	-0.0872***	-0.0890***	-0.0928***	-0.0956***
	(0.0332)	(0.0332)	(0.0342)	(0.0341)
Observations	39,556	39,556	39,556	39,556
Adjusted R-squared	0.0778	0.0785	0.124	0.125
Panel B: Primary School Age				
Female	-0.0980*	-0.0971*	-0.0952*	-0.0925*
	(0.0530)	(0.0530)	(0.0558)	(0.0559)
Observations	14,460	14,460	14,460	14,460
Adjusted R-squared	0.0810	0.0814	0.133	0.133
Panel C: Junior Middle School Age				
Female	-0.134**	-0.135**	-0.165**	-0.164**
	(0.0653)	(0.0642)	(0.0702)	(0.0689)
Observations	8,018	8,018	8,018	8,018
Adjusted R-squared	0.0818	0.0816	0.113	0.112
Household Control	Yes	Yes	Yes	Yes
City FE×Year FE	Yes	Yes	No	No
City FE×Year FE×*Hukou* Province FE	No	No	Yes	Yes
Cohort FE	No	Yes	No	Yes

Notes Panel A shows results for all children aged below 16, and panels B and C, respectively, show results for children at primary school age and junior middle school age. We use the CMDS 2011 and 2012 to perform estimation as only the two waves of CMDS contain information about remittance. Robust standard errors clustered at the city level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: An Alternative RD Design based on Population Controls in Mega Cities

	(1)	(2)	(3)	(4)
Dependent Variable: Indicator for leaving the child in rural hometown				
	Female	Male	Female	Male
Above enrollment age ×I(Population>5 million) ×	0.0700***	-0.0429	0.0772**	-0.0314
I(Year>2014)	(0.0220)	(0.0363)	(0.0306)	(0.0267)
Above enrollment age ×I(Population>5 million)	-0.00355	0.0186	-0.00946	0.00909
	(0.0222)	(0.0139)	(0.0197)	(0.0153)
Above enrollment age (ψ_2) × I(Year>2014)	-0.0495**	0.0342	-0.0491	0.0434
	(0.0214)	(0.0262)	(0.0291)	(0.0277)
Above enrollment age (ψ_2)	0.0314*	-0.0240	0.0453**	-0.0200
	(0.0173)	(0.0166)	(0.0172)	(0.0186)
Coeff diff pval	0.000		0.000	
Observations	10,296	13,812	10,296	13,812
Adjusted R-squared	0.163	0.137	0.192	0.169
Household Control	Yes	Yes	Yes	Yes
City FE×Year FE	Yes	Yes	No	No
City FE×Year FE×*Hukou* Province FE	No	No	Yes	Yes
Cohort FE	Yes	Yes	Yes	Yes
Age Bandwidth	2	2	2	2
City Size Bandwidth	3	3	3	3

Notes The age bandwidth is two years. We use a RD sample of children who are two years older or younger than the enrollment age of junior middle school. "Coeff diff pval" reports the p-value of a test of equality of "Above enrollment age ×I(Population>5 million) ×I(Year>2014)" between the female and male, using the Fisher's permutation test. The city size bandwidth is 3 million, and thus we only include cities with population between 2 and 8 million. Household controls include father's age and age-squared, an indicator for whether household income is above the median value among the migrant population in the city and an indicator for whether household consumption is above the median value among the migrant population in the city. Robust standard errors clustered at the city level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: The Effects of Leaving Children Behind on Education Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)
	Years of Schooling		IHS of Years of Schooling		Pass High School Entrance Exams (=1)	
Indicator for leaving the child behind	-2.863***	-3.005***	-0.277***	-0.290**	-0.411*	-0.446*
	(0.561)	(0.697)	(0.0769)	(0.0980)	(0.194)	(0.232)
F stat	50.97	43.33	50.97	43.33	37.28	36.29
Observations	1,335	1,335	1,335	1,335	946	946
Mean of Dep. Var.	11.37	11.37	3.07	3.07	0.67	0.67
SD of Dep. Var.	3.510	3.510	0.381	0.381	0.469	0.469
Household Controls	No	Yes	No	Yes	No	Yes
Township FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes Instrumental variables specification using the interaction of World Import Demand (WID) and *hukou* restrictions. We drop observations with missing values in the dependent variables. Household controls include an indicator for whether a grandparent was alive and an indicator for whether a grandparent was living in the same place. Like Khanna et al. (2020), we control for import tariffs which may affect firm productivity. The Inverse Hyperbolic Sine (IHS) transformation is applied to years of schooling (columns 3 and 4). We restrict our sample to those who had taken high school entrance exams in columns 5 and 6. Robust standard errors clustered at the prefecture of birth level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: The Effects of Leaving Children Behind on Health and Labor Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)
	Low Income Group (=1)		Disadvantaged Rural Status (=1)		Obesity (BMI>30)	
Indicator for leaving the child behind	0.397**	0.397**	0.347***	0.352***	0.109**	0.108**
	(0.153)	(0.152)	(0.0590)	(0.0694)	(0.0345)	(0.0358)
F stat	47.51	37.67	47.51	37.67	47.51	37.67
Observations	1,379	1,379	1,379	1,379	1,379	1,379
Mean of Dep. Var.	0.71	0.71	0.91	0.91	0.026	0.026
SD of Dep. Var.	0.452	0.452	0.291	0.291	0.160	0.160
Household Controls	No	Yes	No	Yes	No	Yes
Township FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes Instrumental variables specification using the interaction of World Import Demand (WID) and *hukou* restrictions. We drop observations with missing values in the dependent variables. Household controls include an indicator for whether a grandparent was alive and an indicator for whether a grandparent was living in the same place. Like Khanna et al. (2020), we control for import tariffs which may affect firm productivity. We divide the children in our sample into two groups based on their income in 2015; the low-income group includes those whose income is below the average level and those who do not have any income (columns 1 and 2). Disadvantaged rural status is an indicator for whether an individual either remains in the village or migrates without an urban *hukou* in 2015 (columns 3 and 4). Robust standard errors clustered at the prefecture of birth level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Heterogeneity by Whether Having Male Siblings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable: Indicator for leaving the child in rural hometown							
	Have male siblings				Don't have male siblings			
Above enrollment age × Highly restricted cities (=1) (ψ_1)	0.0317*	0.0324*	0.0317*	0.0324*	0.0192	0.0194	0.0192	0.0194
	(0.0191)	(0.0192)	(0.0191)	(0.0192)	(0.0198)	(0.0197)	(0.0198)	(0.0197)
Above enrollment age (ψ_2)	0.0134	0.0137	0.00948	0.0109	-0.0227	-0.0238	-0.0421**	-0.0443***
	(0.0251)	(0.0252)	(0.0234)	(0.0234)	(0.0175)	(0.0172)	(0.0166)	(0.0167)
P-value of $\psi_1 + \psi_2$	0.0198	0.0179	0.0180	0.0124	0.840	0.800	0.154	0.125
Observations	13,591	13,591	13,591	13,591	14,395	14,395	14,395	14,395
Adjusted R-squared	0.184	0.185	0.184	0.185	0.161	0.161	0.161	0.161
Mean of Dep. Var.	0.405	0.405	0.405	0.405	0.336	0.336	0.336	0.336
Household Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE×Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort FE	No	Yes	No	Yes	No	Yes	No	Yes
Age Bandwidth	2	2	2	2	2	2	2	2
Control function for the running variable	Linear	Linear	Quadratic	Quadratic	Linear	Linear	Quadratic	Quadratic

Notes We use the sample of female children to estimate equation (1). Columns 1-4 show RD estimates for girls without male siblings, and columns 5-6 show RD estimates for girls with male siblings. The bandwidth is two years. We use a RD sample of children who are two years older or younger than the enrollment age of junior middle school. Household controls include father's age and age-squared, an indicator for whether household income is above the median value among the migrant population in the city and an indicator for whether household consumption is above the median value among the migrant population in the city. We use a local linear control function for the running variable. Robust standard errors clustered at the city level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Heterogeneity by Baseline Sex Ratio in Original Provinces

	(1)	(2)	(3)	(4)
	Dependent variable: Indicator for leaving the child in rural hometown			
Above enrollment age×Highly restricted cities (=1) ×High Baseline Sex Ratio (=1)	0.0680***	0.0664***	0.0820***	0.0812***
	(0.0222)	(0.0222)	(0.0169)	(0.0168)
Observations	31,066	31,066	31,066	31,066
Adjusted R-squared	0.101	0.102	0.206	0.207
Household Control	Yes	Yes	Yes	Yes
City FE×Year FE	Yes	Yes	No	No
City FE×Year FE×Hukou Province FE	No	No	Yes	Yes
Cohort FE	No	Yes	No	Yes
Age Bandwidth	2	2	2	2
Control function for the running variable	Linear	Linear	Linear	Linear

Notes The bandwidth is two years. We use RD sample that are two years older or younger than the enrollment age of junior middle school. Household controls include father's age and age-squared, an indicator for whether household income is above the median value among the migrant population in the city and an indicator for whether household consumption is above the median value among the migrant population in the city. We use a local linear control function for the running variable. High baseline sex ratio is an indicator for whether the male-female ratio of second births in migrant parents' *hukou* provinces is above the national mean level. Robust standard errors clustered at the city level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Online Appendix

A.1 Summary Statistics of Key Variables

Table A.1: Summary Statistics of Key Variables

Variable name	Mean	Std. dev
Panel A		
Leave children behind (=1)	0.343	0.475
Amount of Remittance	4755.343	7131.414
Household Income	73629	45040
Household Consumption	36775	21380
Age of Father	36.52	5.300
Panel B		
Years of Schooling	11.34	3.496
Pass High School Entrance Exams	0.675	0.469
Low Income Group (=1)	0.715	0.452
Disadvantaged Rural Status (=1)	0.907	0.291
Obesity (BMI>30)	0.0262	0.160
A grandparent was alive (=1)	0.786	0.410
A grandparent was living in the same place (=1)	0.938	0.242

Notes Table shows summary statistics for most outcomes, independent variables and control variables. Data on the variables in panel A come from the China Migrants Dynamic Survey (CMDS), and data on the variables in panel B come from the Gansu Survey of Children and Families (GSCF). We divide the children in our GSCF sample into two groups based on their income in 2015; the low-income group includes those whose income is below the average level and those who do not have any income. Disadvantaged rural status is an indicator for whether an individual either remains in the village or migrates without an urban *hukou* in 2015

A.2 Important Facts about the Educational System in China

Table A.2: Migrant Households' Spending on Education

	Primary school	Junior middle school
Zanzhufei specific for migrant children	1432.005	2198.48
Total education expenditure (excluding *zanzhufei*)	1444.093	2339.375

Notes In China, migrant children without a local *hukou* have to pay $zanzhufei$ (an extra fee specifically imposed on them) in order to go to a local school. Data come from the Chinese Household Income Project Survey (CHIPS) 2007 and 2008.

Table A.3: The Share of Teachers by Education Levels

	Master or above	College	Pre-college	High school	Below high school
Panel A: Junior middle school					
Urban	0.031	0.830	0.135	0.003	0.000
Rural	0.004	0.657	0.328	0.011	0.000
Panel B: Primary school					
Urban	0.010	0.570	0.374	0.045	0.000
Rural	0.001	0.249	0.552	0.195	0.003

Notes Data come from the $EducationalStatisticsYearbookofChina2013$.

Table A.4: The Share of Teachers by Professional Titles

	Special Grade (Excellent)	Level-1	Level-2	Level-3	No title
	Panel A: Junior middle school				
Urban	0.218	0.436	0.270	0.009	0.068
Rural	0.114	0.405	0.372	0.026	0.083
	Panel B: Primary school				
Urban	0.578	0.302	0.022	0.003	0.095
Rural	0.508	0.360	0.041	0.002	0.089

*Notes*Professional titles are designated to teachers based on their professionalism and progressive nature. The special grade teacher is the highest professional title, followed by Level-1 teacher, and then by Level-2 and Level-3 teacher. Data come from the $EducationalStatisticsYearbookofChina$2013.

Table A.5: Education Facilities per Student

	Num of multi-media classrooms	Asset value of education equipment
	Panel A: Junior Middle School	
Urban	0.053	0.511
Rural	0.036	0.358
	Panel B: Primary School	
Urban	0.081	0.653
Rural	0.036	0.293

*Notes*Data come from the $EducationalStatisticsYearbookofChina$2013.

Table A.6: Beijing Closed Migrant Schools in Recent Years

Year	Number of migrant children in Beijing (10,000)	Share of migrant children in migrant schools	Number of Migrant Schools
2006	37.5	34.7	300
2007	40.0	36.5	268
2008	40.0	34.0	228
2010	43.4	—	—
2011	47.8	27.2	176
2012	41.9	—	158
2013	52.9	24.2	130
2014	51.1	18.2	127

*Notes*Data come from the $AnnualReportonEducationfortheChina'sMigrantChildren$(2016).

Table A.7: Migrant Children in Guangzhou Disappear as They Enter Junior Middle School

		2008	2012	2015
Primary school	Num of migrant children	376963	434473	458216
	Share of migrant children	43.69%	52.82%	48.86%
Junior middle school	Num of migrant children	86089	121426	127815
	Share of migrant children	21.09%	32.51%	37.97%
High school Entrance Exam	Num of migrant children	—	23762	31969
	Share of migrant children	—	20.06%	28.87%

*Notes*Only a small fraction of migrant children without a local *hukou* are eligible to take local high-school entrance exams. Every year, the Guangzhou government sets a quota for the number of migrant children who can take local high-school entrance exams. Additionally, the threshold for them to be enrolled in local high schools is higher than their local counterparts. Data come from the $Annual Report on Education for China's Migrant Children$(2016).

Table A.8: Summary Statistics of Observables for Below and Above the School Age Cutoff

	(1) Below age cutoff	(2) Above age cutoff	(3) Diff. in means	(4) RD Estimates
Panel A: Boys				
Household *hukou* transfer (=1)	0.006	0.003	-0.003	-0.010
	(0.078)	(0.054)	[0.003]	[0.007]
Father migrates (=1)	0.014	0.009	-0.005	-0.027
	(0.117)	(0.092)	[0.009]	[0.035]
Mother migrates (=1)	0.018	0.018	-0.000	-0.008
	(0.135)	(0.133)	[0.010]	[0.039]
Father income (=1)	37,288.474	30,975.676	-6,312.798*	-6,720.214
	(23,504.601)	(23,217.771)	[3,253.024]	[13,079.839]
Mother income (=1)	21,312.289	21,306.623	-5.666	8,199.975
	(14,738.911)	(17,566.470)	[2,327.219]	[10,131.891]
Panel B: Girls				
Household *hukou* transfer (=1)	0.003	0.002	-0.001	0.006
	(0.052)	(0.041)	[0.002]	[0.008]
Father migrates (=1)	0.009	0.010	0.001	0.000
	(0.096)	(0.101)	[0.008]	[0.032]
Mother migrates (=1)	0.023	0.031	0.008	-0.037
	(0.149)	(0.173)	[0.013]	[0.052]
Father income (=1)	35,217.738	35,613.582	395.844	-7,051.000
	(22,727.107)	(23,917.980)	[3,333.514]	[11,393.291]
Mother income (=1)	21,669.966	19,778.509	-1,891.457	-9,579.064
	(15,597.513)	(15,566.202)	[2,430.097]	[8,001.999]

Notes Household *hukou* transfer is an indicator for whether a particular household transfers their *hukou* location. Father migrates and Mother migrates are indicators for whether father and mother, respectively, move away from their *hukou* city. Columns 1 and 2 report the sample mean and standard deviation for children whose ages are above and below the age cutoff, respectively. Column 3 reports the raw difference between these sample means. Note that this statistic shows a simple difference between all children aged 6-15, which is not necessarily a discontinuous difference at the RD cutoff. In column 4, we use our RD sample to investigate whether there is such a discontinuous difference. We use local linear regression to obtain RD estimates for the observables and report the standard errors in brackets. In columns 1 and 2, standard deviations are reported in parentheses. In columns 3 and 4, standard errors are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1.

A.3 Additional Results of RD Estimates

Table A.9: Alternative RD Control and Different Bandwidth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable: Indicator for leaving the child in rural hometown							
	Female				Male			
Panel A: Quadratic Control+2-year Bandwidth								
Above enrollment age × Highly restricted cities (=1) (ψ_1)	0.0324**	0.0330**	0.0349**	0.0354**	0.00331	0.00444	0.00871	0.00984
	(0.0145)	(0.0144)	(0.0145)	(0.0144)	(0.0150)	(0.0148)	(0.0170)	(0.0167)
Observations	31,071	31,071	31,071	31,071	40,854	40,854	40,854	40,854
Adjusted R-squared	0.172	0.173	0.206	0.207	0.146	0.147	0.184	0.184
Panel B: Quadratic Control+3-year Bandwidth								
Above enrollment age × Highly restricted cities (=1) (ψ_1)	0.0261*	0.0269*	0.0268*	0.0274*	0.0161	0.0167	0.0187	0.0193
	(0.0146)	(0.0144)	(0.0144)	(0.0142)	(0.0148)	(0.0145)	(0.0159)	(0.0154)
Observations	47,040	47,040	47,040	47,040	61,572	61,572	61,572	61,572
Adjusted R-squared	0.176	0.177	0.208	0.209	0.152	0.152	0.187	0.188
Panel C: Local Linear Control+3-year Bandwidth								
Above enrollment age × Highly restricted cities (=1) (ψ_1)	0.0261*	0.0269*	0.0268*	0.0274*	0.0162	0.0168	0.0188	0.0193
	(0.0146)	(0.0144)	(0.0144)	(0.0142)	(0.0149)	(0.0145)	(0.0159)	(0.0154)
Observations	47,040	47,040	47,040	47,040	61,572	61,572	61,572	61,572
Adjusted R-squared	0.176	0.177	0.208	0.209	0.152	0.152	0.187	0.188
Household Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE×Year FE	Yes	Yes	No	No	Yes	Yes	No	No
City FE×Year FE×*Hukou* Province FE	No	No	Yes	Yes	No	No	Yes	Yes
Cohort FE	No	Yes	No	Yes	No	Yes	No	Yes

Notes This table shows the results of estimating equation (1). We use a RD sample of children who are two years older or younger than the enrollment age of junior middle school. Household controls include father's age and age-squared, an indicator for whether household income is above the median value among the migrant population in the city and an indicator for whether household consumption is above the median value among the migrant population in the city. Robust standard errors clustered at the city level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.10: Estimates using the Sample of First-born Children

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable: Indicator for leaving the child in rural hometown							
	Female				Male			
Above enrollment age × Highly restricted cities (=1)	0.0366**	0.0374**	0.0413**	0.0418**	0.00864	0.00974	0.0131	0.0141
	(0.0155)	(0.0154)	(0.0170)	(0.0170)	(0.0159)	(0.0158)	(0.0188)	(0.0185)
Observations	27,370	27,370	27,370	27,370	34,234	34,234	34,234	34,234
Adjusted R-squared	0.172	0.173	0.203	0.203	0.141	0.142	0.175	0.176
Mean of Dep. Var.	0.36	0.36	0.36	0.36	0.35	0.35	0.35	0.35
Household Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE×Year FE	Yes	Yes	No	No	Yes	Yes	No	No
City FE×Year FE×Hukou Province FE	No	No	Yes	Yes	No	No	Yes	Yes
Cohort FE	No	Yes	No	Yes	No	Yes	No	Yes
Age Bandwidth	2	2	2	2	2	2	2	2
Control function for the running variable	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear

Notes This table shows the results of estimating equation (1) using the sample of first-born children. The bandwidth is two years. We use a RD sample of children who are two years older or younger than the enrollment age of junior middle school. Household controls include father's age and age-squared, an indicator for whether household income is above the median value among the migrant population in the city and an indicator for whether household consumption is above the median value among the migrant population in the city. We use a local linear control function for the running variable. Robust standard errors clustered at the city level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.11: Triple Difference Regressions

	(1)	(2)	(3)	(4)
	Dependent variable: Indicator for leaving the child in rural hometown			
Female × Above Enrollment Age × Highly restricted cities (=1)	0.0282*	0.0279*	0.0282*	0.0279*
	(0.0152)	(0.0151)	(0.0152)	(0.0151)
Observations	71,925	71,925	71,925	71,925
Adjusted R-squared	0.157	0.158	0.157	0.158
Household Control	Yes	Yes	Yes	Yes
City FE × Year FE	Yes	Yes	Yes	Yes
Cohort FE	No	Yes	No	Yes
Age Bandwidth	2	2	2	2
Control function for the running variable	Linear	Linear	Quadratic	Quadratic

Notes The bandwidth is two years. We use a RD sample of children who are two years older or younger than the enrollment age of junior middle school. Household controls include father's age and age-squared, an indicator for whether household income is above the median value among the migrant population in the city and an indicator for whether household consumption is above the median value among the migrant population in the city. Robust standard errors clustered at the city level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

A.4 Additional Results of Long-term Consequences

Table A.12: First-Stage Estimation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Indicator for leaving the child in rural hometown				IHS of the amount of time that parents are away			
WID	-0.141	-0.152			-0.482	-0.537		
	(0.319)	(0.321)			(1.218)	(1.236)		
WID × High hukou restrictions	1.053***	1.048***			1.906***	1.891***		
	(0.153)	(0.171)			(0.528)	(0.581)		
Log rainfall			0.384***	0.376***			0.698**	0.669**
			(0.0698)	(0.0692)			(0.225)	(0.224)
Log rainfall × Migration ties			-3.588***	-3.518***			-3.389***	-3.140***
			(0.332)	(0.408)			(0.649)	(0.944)
Observations	1,379	1,379	1,414	1,414	1,379	1,379	1,414	1,414
Adjusted R-squared	0.126	0.125	0.126	0.125	0.146	0.146	0.149	0.149
F stat	47.55	37.70	116.8	74.26	13.02	10.61	27.29	11.06
Household Controls	No	Yes	No	Yes	No	Yes	No	Yes
Township FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes Household controls include the number of children, an indicator for whether a grandparent was alive, and an indicator for whether a grandparent was living in the same place. The Inverse Hyperbolic Sine (IHS) transformation is applied to the amount of time that parents are away (columns 5-8). Robust standard errors clustered at the prefecture of birth level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.13: Alternative Instrumental Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Years of Schooling		IHS of Years of Schooling		Low Income Group (=1)		Disadvantaged Rural Status (=1)	
Indicator for leaving the child behind	-3.603**	-4.034**	-0.332**	-0.370**	0.508*	0.512*	0.375***	0.389***
	(1.273)	(1.494)	(0.127)	(0.159)	(0.238)	(0.243)	(0.112)	(0.112)
F stat	102.6	74.55	102.6	74.55	116.7	74.21	116.7	74.21
Observations	1,366	1,366	1,366	1,366	1,414	1,414	1,414	1,414
Mean of Dep. Var.	11.34	11.34	3.065	3.065	0.715	0.715	0.907	0.907
SD of Dep. Var.	3.496	3.496	0.380	0.380	0.452	0.452	0.291	0.291
Household Controls	No	Yes	No	Yes	No	Yes	No	Yes
Township FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes Instrumental variable specification using the interaction of rainfall with historical migration ties. We drop observations with missing values in the dependent variables. We divide the children in our sample into two groups based on their income in 2015; the low-income group includes those whose income is below the average level and those who do not have any income (columns 5 and 6). Disadvantaged rural status is an indicator for whether an individual either remains in the village or migrates without an urban *hukou* in 2015 (columns 7 and 8). We control for other weather conditions, including sunshine, temperature, and humidity. Household controls include an indicator for whether a grandparent was alive and an indicator for whether a grandparent was living in the same place. The Inverse Hyperbolic Sine (IHS) transformation is applied to years of schooling (columns 3 and 4). Robust standard errors clustered at the prefecture of birth level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.14: Alternative Measure of Leaving Children Behind

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Years of Schooling		IHS of Years of Schooling		Low Income Group (=1)		Disadvantaged Rural Status (=1)	
Indicator for leaving the child behind	-1.640***	-1.727**	-0.159**	-0.167*	0.219**	0.220**	0.191***	0.195**
	(0.463)	(0.594)	(0.0598)	(0.0748)	(0.0828)	(0.0841)	(0.0557)	(0.0645)
F stat	17.37	14.68	17.37	14.68	13.01	10.60	13.01	10.60
Observations	1,335	1,335	1,335	1,335	1,379	1,379	1,379	1,379
Mean of Dep. Var.	11.37	11.37	3.067	3.067	0.714	0.714	0.906	0.906
SD of Dep. Var.	3.510	3.510	0.381	0.381	0.452	0.452	0.291	0.291
Household Controls	No	Yes	No	Yes	No	Yes	No	Yes
Township FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes Instrumental variables specification using the interaction of World Import Demand (WID) and *hukou* restrictions. We drop observations with missing values in the dependent variables. We divide the children in our sample into two groups based on their income in 2015; the low-income group includes those whose income is below the average level and those who do not have any income (columns 5 and 6). Disadvantaged rural status is an indicator for whether an individual either remains in the village or migrates without an urban *hukou* in 2015 (columns 7 and 8). Household controls include an indicator for whether a grandparent was alive and an indicator for whether a grandparent was living in the same place. Like Khanna et al. (2020), we control for import tariffs which may affect firm productivity. The Inverse Hyperbolic Sine (IHS) transformation is applied to the amount of time that parents are away (the independent variable of interest) and years of schooling (the dependent variable in columns 3 and 4). Robust standard errors clustered at the prefecture of birth level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

A.5 Results of Competing Mechanisms

Table A.15: Differential Returns to Education by Gender

	(1)	(2)	(3)	(4)	(5)
		Log income			
	Full Sample	Rural *hukou* holders	Urban *hukou* holders	Migrants	Locals
High school (=1)	0.167***	0.143***	0.323***	0.289***	0.207***
	(0.0148)	(0.0184)	(0.0295)	(0.0243)	(0.0177)
High school (=1) × Female (=1)	0.178***	0.106***	0.110***	-0.548***	-0.579***
	(0.0197)	(0.0268)	(0.0400)	(0.0231)	(0.0168)
Observations	30,018	21,855	8,123	0.150***	0.203***
Adjusted R-squared	0.364	0.331	0.278	(0.0329)	(0.0251)
City FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Notes We control for an indicator for female, an indicator for rural *hukou*, age and age-squared. Robust standard errors clustered at the city level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.16: Heterogeneity by Gender Wage Gaps

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Destination Regions				Original Regions			
	Dependent variable: Indicator for leaving the child in rural hometown							
Above enrollment age × Highly restricted cities (=1) × Gender wage gaps	-0.00663	-0.00492	-0.0489	-0.0443	-0.0336	-0.0327	-0.00619	-0.00262
	(0.0745)	(0.0735)	(0.0675)	(0.0660)	(0.107)	(0.107)	(0.102)	(0.102)
Observations	31,026	31,026	31,026	31,026	31,021	31,021	31,021	31,021
Adjusted R-squared	0.172	0.173	0.206	0.206	0.101	0.102	0.206	0.206
Household Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE×Year FE	Yes	Yes	No	No	Yes	Yes	No	No
City FE×Year FE×*Hukou* Province FE	No	No	Yes	Yes	No	No	Yes	Yes
Cohort FE	No	Yes	No	Yes	No	Yes	No	Yes
Age Bandwidth	2	2	2	2	2	2	2	2
Control function for the running variable	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear

Notes The bandwidth is two years. We use baseline gender wage gaps in destination cities in columns 1-4 and in original provinces in columns 5-8. We use a RD sample of children who are two years older or younger than the enrollment age of junior middle school. Household controls include father's age and age-squared, an indicator for whether household income is above the median value among the migrant population in the city and an indicator for whether household consumption is above the median value among the migrant population in the city. We use a local linear control function for the running variable. Robust standard errors clustered at the city level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.