Spatial Misallocation in Education: The Left-Behind and Land Reforms in China

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Inequality of opportunities

Talent & resources are inefficiently distributed due to variety of barriers:

- Chetty et al., 2016; Chetty and Hendren, 2018a, 2018b: moving out from poor neighbourhoods in the US shapes life-time outcomes;
- Connelly and Zheng, 2007; Hannum, 1999: large rural-urban gaps in education in China.

Implied misallocation can have large macro-level consequences:

- Hsieh et al., 2019: quantification of occupational misallocation for US leveraging changes in discrimination patterns.
- Chyn and Daruich, 2025: quantification of moving vouchers & development programs w/ neighbourhood effects in US.

State of the literature

We contribute to misallocation of talent literature with a case study of land reforms in China.

- Known #1: land right reforms directly improve agricultural productivity. (Chari et al., 2021)
- Known #2: land right reforms stimulate efficient inter-sectoral occupational choice, thereby improving productivity. (Adamopoulos et al., 2024)
- Known #3: land right reforms stimulate structural change and extract women out of agriculture. (Chen et al., 2025)
- Unknown: what is the impact of land rights reforms on human capital of migrants' children (and the macro economy)?

Research question

What is the impact of land rights reforms on human capital of migrants' children (and the macro economy)?

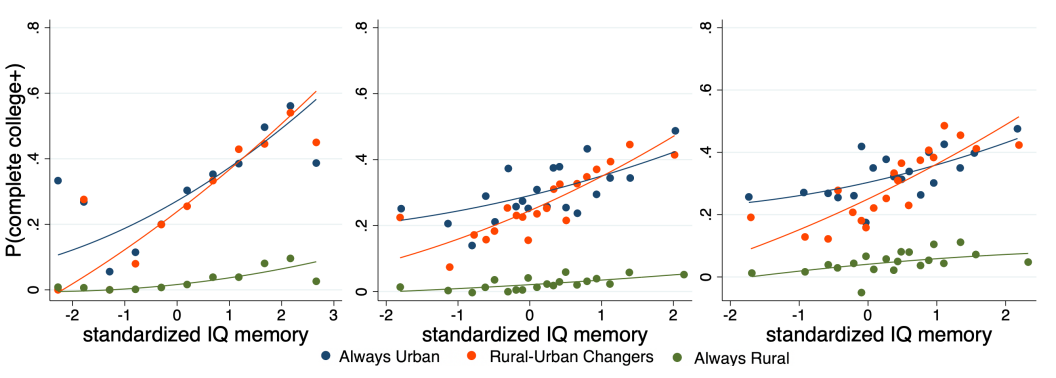
- We answer this using multiple datasources + structural model.

Main idea:

- land insecurity is an important reason that migrant workers leave-behind their kids (& spouse) back home;
- land security reforms $\Rightarrow$ bring along the families;
  - (Need to consider hukou barriers too.)
- with large rural-urban edu-disparities, consequences non-trivial?

Large rural-urban disparities in education

- Large gaps for individuals of similar IQ but of different hukou.
- CFPS sample: Chinese adults 25-50 y.o.
- IQ $\approx$ cognitive test, U.S. Health & Retirement Study (fluid intellig.).
- **1st:** No controls. **2nd:** Controls: age, gender. **3rd:** Urban sample.



Evidence in 2010 1% of Pop Census. Regression evidence.

Timeline of land reforms in China

Gradual reforms of agricultural land rights in China:

- **1998**: the Land Management Law extends the use rights to rural households for 30 years.
- **2003-13**: the Rural Land Contracting Law codifies legal rights of rural households for small-scale leasing (Chari et al., 2021).
- **2013-17**: allow transfer of farmers' land use rights to others (inc. large commercial farms) + collateral rights.
- **2018-21**: land certification. Migration+hk change $\not\Rightarrow$ land loss!

Our causal inference will exploit staggered rollout of the 2003 and 2014 reform waves.

The 2003 Land Reform

The staggered implementation of the 2003-reform wave across provinces (Chari et al., 2021):

- **2003**: Shanghai
- **2004**: Shandong, Hunan
- **2005**: Liaoning, Jilin, Shanxi, Anhui, Xinjiang, Fujian, Jiangsu, Tianjin
- **2006**: Yunnan, Hainan, Guangxi, Gansu
- **2007**: Jiangxi, Zhejiang, Shaanxi, Chongqing
- **2008**: Sichuan
- **2009**: Neimonggu
- **2013**: Qinghai, Hubei, Hebei
- Never: Beijing, Guangdong, Henan, Ningxia, Guizhou, Tibet, Heilongjiang

The 2014 Land Reform

The staggered timing of implementation of the 2014-reform wave across provinces collected from Ministry of Agriculture websites:

- **2014**: Shanghai, Sichuan, Shandong, Anhui
- **2015**: Jilin, Ningxia, Jiangsu, Jiangxi, Henan, Hubei, Hunan, Gansu, Guizhou
- **2016**: Yunnan, Neimeng, Shanxi, Guangdong, Hebei, Zhejiang, Hainan, Liaoning, Shanxi, Heilongjiang
- **2017**: Beijing, Tianjin, Guangxi, Fujian, Chongqing, Qinghai
- Never: Xinjiang and Tibet

Data

2012-2017 China Migrant Population Monitoring Survey (CMDS):

- Repeated cross-sec. of ppl migrated >1 month & w/o local hukou.
- 2012-2014 survey on migrants btw 15-59. 2014+ expanded age cohorts.
- Detailed questions on individuals+family members. No data on land.

2012-2020 China Family Panel Study (CFPS):

- Biannual panel covering both rural and urban areas.
- Questions on economic variables, education, family links, land.

2000-2015 Gansu Survey of Children and Families (GSCF):

- Detailed panel on families & institutions in rural Gansu.

Data

2010 1% Sample of Population Census:

- Rich data on individuals characteristics, incl. edu attainment.

2011 China Education Yearbook:

- Data on education spending.

2012 China Labor Dynamics Survey (CLDS):

- Data on income across locations and sectors.

2007 China Household Income Project Series (CHIPS):

- Records on occurrances of land reallocations.

Main Result 1:
Higher land security $\Rightarrow$ fewer left-behind

Land reform reduces probability of being left-behind

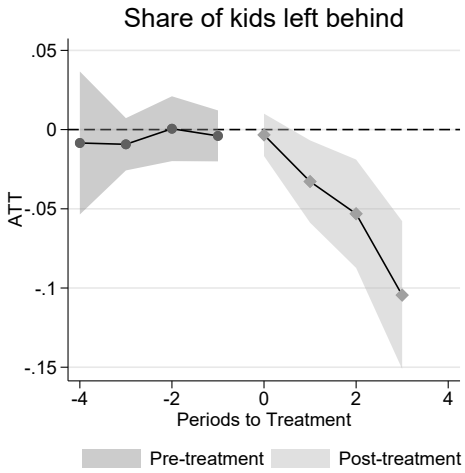
Event study on repeated cross-section from CMDS:

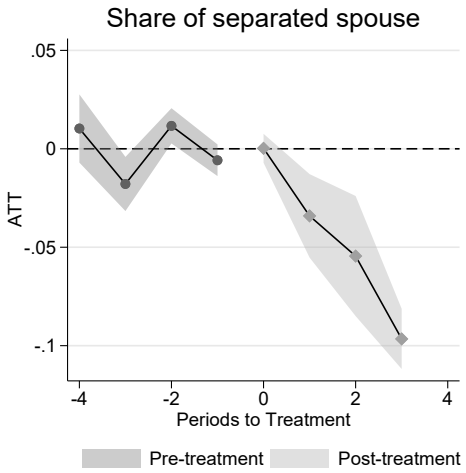
- Outcome: kid or spouse left behind (1) or not (0).
- Identification achieved using the Callaway and Sant'Anna (2020):
  - exploiting staggered timing of 2014-wave land reforms,
  - treated: children of respondents from provinces already treated,
  - control: children of respondents from provinces not-yet treated.
- Sample: migrant-respondents w/ agric hk + children<18.
- Regression: $Y_{i,t} = \alpha + \sum_{k \neq -1} \theta_k \, 1\{t - g(p) = k\} + X_{i,t}\gamma + \lambda_c + \lambda_t + \varepsilon_{i,t}$

Land reform reduces probability of being left-behind

Restricting CMDS sample to respondents who migrated <2014 + controls:

- Child: age, gender, ethnicity, whether locally born.
- Responder: age, gender, edu, marriage status, number of children, number of household members, ethnicity,hukou type.





Robustness of the result

- Government data confirms trends.
- Land reforms are not synchronized with hukou reforms.
- Province-level controls do not predict timing of reforms.
- Without controls and responder restriction on migration<2014.
- Add controls...
- Add the place of the spouse as a control
- ... or add responder age restriction.
- Responders migrated before reform implemented in hukou place.
- Responders are male.
- Responders are female.
- Across-province migration.
- Within-province migration.
- We reform the pre-2014 dummy.
- Add hukou registration index (Zhang et al., 2019) as a control.
- Drop obs. where parents have mixed (agric + non agric) hukou.

Main Result 2:
Longer time in urban $\Rightarrow$ higher Prob(univ.)

Urban environment improves education of rural kids

Identification approach based on 2003-wave of land reforms:

- Use sample from 2012-17 CMDS:
  - 20-30 years old at time of survey;
  - of rural-origin (not local born; have agric HK or their parents do);
  - migrated to urban (i) < 16 y.o., (ii) before, in year, or 1 year after reform,
  - did not migrate out of rural at all.

$$University_i = \alpha + \beta \cdot \text{Years in urban}_i + \gamma \cdot \mathbf{X}_i + \epsilon_i \quad (1)$$

- We instrument *Years in urban* with **Effective Reform Years**:

$$\max\{0, \min\{16 + \text{birth year}_i - \text{year of land reform's introduction}_p\}\}$$

Urban environment improves education of rural kids

First stage regressions:

	(1) Years in Urban	(2) Years in Urban
Effective Reform Years	0.86*** (0.05)	0.70*** (0.05)
Observations	34,957	34,957
Year FE	Yes	Yes
Province of origin FE	Yes	Yes
Migr. destination FE	No	Yes
Birth year FE	No	Yes
Gender FE	No	Yes

Data source: CMDS 2012-2017. Standard errors clustered at the level of respondents' province of origin.
$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

1 year earlier instituted reform by province increases the number of years spent in urban edu by 0.56 years.

Urban environment improves education of rural kids

Second stage regressions:

	P(High School)		P(University)		P(High School)		P(University)	
	(1)	(1')	(2)	(2')	(3)	(3')	(4)	(4')
Years in Urban	0.0170*** (0.0017)	0.0123*** (0.0012)	0.0048*** (0.0006)	0.0044*** (0.0005)	0.0557*** (0.0020)	0.0173*** (0.0047)	0.0098*** (0.0011)	0.0075*** (0.0024)
Model	OLS	OLS	OLS	OLS	IV	IV	IV	IV
Observations	34,957	34,957	34,957	34,957	34,957	34,957	34,957	34,957
KP-Wald F-stat	–	–	–	–	300.3	170.0	300.3	170.0
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province of origin FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Migr. destination FE	No	Yes	No	Yes	No	Yes	No	Yes
Birth year FE	No	Yes	No	Yes	No	Yes	No	Yes
Gender FE	No	Yes	No	Yes	No	Yes	No	Yes

Data source: CMDS 2012-2017. Standard errors clustered at the level of respondents' province of origin; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

IV: 1 extra year of childhood in urban edu increases P(Univ) by 0.8 - 1.0 p.p.

Placebo test of urban effects

Change sample to ”urban kids”:

- currently urban;
- kids or their parents with non-agric hk;
- local born without having moved.

	(1) Years in New Urban Location	(2) Years in New Urban Location
Effective Reform Years	0.05 (0.04)	0.07 (0.05)
Observations	7,022	7,022
Year FE	Yes	Yes
Province of origin FE	Yes	Yes
Migr. destination FE	No	Yes
Birth year FE	No	Yes
Gender FE	No	Yes

Data source: CMDS 2012-2017. Standard errors clustered at the level of respondents' province of origin.
$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Mechanism Analysis

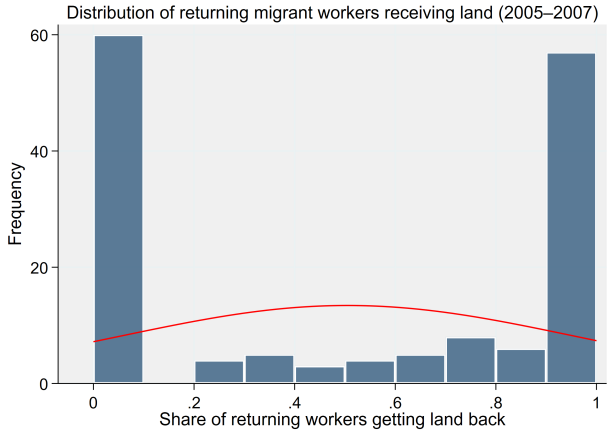
Mechanism summary

We provide suggestive evidence of:

1. migration in 2000s China triggering land loss;
2. agricultural land reforms increasing land security;

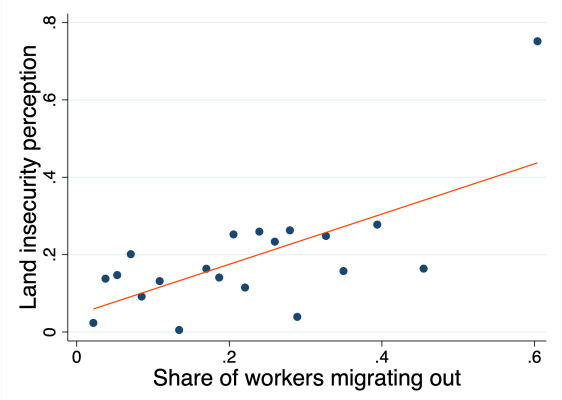
Mechanism #1: land insecurity in 2000s China

- Source: 2007 Chinese Household Income Project Survey.
- Answers provided by authorities of 180 villages surveyed.



Mechanism #1: land insecurity in 2000s China

From GSCF (2004&07), we plot village-level data on share of migrant workers vs the share answering "yes" to the following question:
"According to your experience of previous land re-adjustment in the village, will the fact that some family members left the village to work affect the area of land the household could get?"



Mechanism #2: reforms reduce land insecurity

Evidence from GSCF on impact of 2003 Rural Law Contracting reform (implemented in Gansu in 2006):

	Land security perception	Land security perception
Share of mig.out worker	.46***	.60***
Share of mig.out worker× 2007 dummy		-.27***
Observations	3,548	3,548
Household FE	Yes	Yes
Year FE	Yes	Yes

Errors clustered at household level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

$\Rightarrow$ We plan to instrument the share of migrated workers with rainfall IV. We work on getting the location data of the villages.

Mechanism #2: reforms reduce land insecurity

Evidence from CFPS on the impact of 2014 reform:

	Land expropriation	Land expropriation
Post		-.009
Urban	.041**	.044***
PostReform × Urban	-.038*	-.028*
Observations	40,800	41,751
County×Year FE	Yes	No
Household FE	Yes	Yes
Year FE	No	Yes

Cluster: Province level. Outcome variable: *In the past 12 months, was your family land expropriated?*

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. We interpret urban respondents reporting land ownership as rural migrants. Data summary

Quantitative Model

Model Setup

At each t (length 30 yrs), family consists of 2 members: parent (earner) & child.

There are two locations for parent and child: urban and rural.
Key state variables:

- i: family location a: assets h: parent human capital z: child's ability

Every agent lives 2 periods (life-time: 60 years). In every t, given (i, a, h, z):

- child receives education for $t+1$: $h' = z_z^{\alpha} e_i^{\alpha_e}$;
- parent works in i receiving: $w_i h$;
- t-period child becomes a parent-earner in $t+1$ with $h' = z_z^{\alpha} e_i^{\alpha_e}$;
- at the end of t, location i' for next period's work & education is chosen;
- all subject to a borrowing constraint $a' \geq 0$.

Location Choices

Four possible location-states:

- $i' = rr$: rural child + rural earner
- $i' = ru$: rural child + urban earner
- $i' = ua$: urban earner + urban child w/ agricultural Hukou
- $i' = un$: urban earner + urban child w/ non-agricultural Hukou
  - Each location is associated w/ fixed common additive utility $\zeta_{i'}$.
  - Agents draw i.i.d. Gumbel-taste shocks for each location $\xi_{i'}$.

Each status comes with different:

- Wages: $w_{un} > w_{ua} > w_r$
- Education spending $e_r < e_{ua} < e_{un}$ (financed by lump sum tax) ...
- ... and implied human capital: $h' = z^{\alpha_z} e_{i'}^{\alpha_e}$.
- Land income (more below).

Location Choices & Land Income Risk

In every t, families have claim to income from $\bar{\ell}$ units of land s.t. land loss risk:

- if $i' \in \{rr, ru\}$: income $r_{land}\bar{\ell}$
- if $i' = ua$: income $(1 - \phi_a)r_{land}\bar{\ell}$
- if $i' = un$: income $(1 - \phi_n)r_{land}\bar{\ell}$
- $0 < \phi_a < \phi_n \leq 1$ Land Law

In every t, 1 unit of aggregate land reallocated s.t.:

$$\int (1 - \varphi_i)\bar{\ell} dG = 1$$

Recursive formulation

Given state (i, a, h, z), agent solves the following problem:

$$V(i,a,h,z) = \max_{c,\,a'} \;\; u(c) + \beta\, \mathbb{E}_{\xi_{i'}} \max_{i'} \{\mathbb{E}_{z'} V(i',a',h',z') + \zeta_{i'} + \xi_{i'}\}$$

subject to the following constraints:

$$c + a' + T_i \leq w_i\, h + (1+r)\, a + (1-\phi_i)\, r_{\text{land}} \bar{\ell},$$
$$c,\; a' \geq 0, \qquad h' = z^{\alpha_z}\, e_i^{\alpha_e}, \qquad \log z' = \rho_z \log z + \varepsilon.$$

Calibration Strategy to 2010 China

Calibrating preferences

We assume CRRA utility function $\frac{c^{1-\mu}}{1-\mu}$ with coeff of RRA $\mu = 2$.

Using data from Penn World Tables 10.01, we use time preference β to target ratio of $\frac{Assets}{GDP} = 3.54$ for 2010 China.

We assume i.i.d. taste shocks follow $Gumbel(0, \sigma_e)$; calibrated to target 27% share of rural people in top 25% of income distribution.

Calibrating common location-tastes ξ_i's

Population shares from the perspective of children

	Rural children		Urban children
	Left-behind	**Not Left-behind**	
Non-agric. hukou	\	\	108,650(17.8%)
Agric. hukou	76,794(12.6%)	287,474(47.2%)	136,595(22.4%)

[1] Source: 2010 China 1% population census.

[2] We restrict the sample to children that (i) have the same hukou county as parents; (ii) are below 18 years old; (iii) are not in families with parents divorced and passed away. The "left-behind" children are defined as those with (i) parents' information recorded, and one or two of the parents not living within the same county as the children and the parent being out of the hukou county for more than 6 months; or (ii) missing information regarding one or two of the parents, implying parental absence.

Calibrating land loss risk ϕ_i

Based on table below, we choose:

- $\phi_a = 1 - \frac{51.7\%}{85.8\%} = 39.7\%$ (annual: 1.7%).
- $\phi_n = 1 - \frac{7.4\%}{85.8\%} = 91.3\%$ (annual: 7.8%).
- $\Rightarrow$ Numbers sandwiching risk of 5% used in Adamopoulos et al., 2024.

	Urban	**Rural**
Agricultural hukou	51.7%(N=2230)	85.8% (N=5470)
Agr.$\rightarrow$non-agr. hukou changer	7.4%(N=1319)	\
Non-agric. hukou	0.4%(N=1673)	\

[1] Source: 2010 CFPS.

[2] We use the household head data to estimate the land ownership by different hukou satus.

Land ownership by location and hukou status

Calibrating intergenerational persistence of ability

We externally set ρ_z from estimated empirical AR(1) process $\log(child\ ability) = \rho_z \log(father\ ability) + \epsilon$ on 2010 CFPS data:

	Child's IQ memory	Child's IQ memory
Father's IQ memory	.16***	.16***
Observations	8,740	3,770
Parents$\leq$50	No	Yes
Parents Age; Edu FEs	Yes	Yes
Gender; Age; Edu FEs	Yes	Yes
Year; Urban; Current County FEs	Yes	Yes

[1] Source: 2010 CFPS data. Errors clustered at current county level; * $p < 0.10$, ** $p < 0.05$, * $p < 0.01$.

Estimating education expenditures: e_r, e_{ua}, e_{un}

We set edu exp. as below, using:

- 2011 China Education Finance Yearbook providing data on public and private expenditures (per student) at all levels Table;
- distribution of education attainment Table.

	Rural	Urban	
		Agric. hukou	Non-agric. hukou
Public Expenditure	44,769	59,665	79,852
Private Expenditure	7,675	23,973	42,611
Total Expenditure	52,444	83,638	122,463

Location-hukou specific levels of education expenditures

Calibrating human capital production function: α_z, α_e

Using imputed education expenditures, we estimate $h' = z^{\alpha_z} e_{i'}^{\alpha_e}$ directly:

$$\log(Income_j) = \alpha_0 + \alpha_z std\ IQ\ memory_j + \alpha_e \log(edu\ expenditure_j) + \gamma_{age} + \gamma_{gender} + \gamma_{year} + \gamma_{countyXurban} + \gamma_{rural-educated} + \epsilon_j \quad (2)$$

	ln(Income)
std IQ memory	.09***
ln(Edu expenditure)	.59***
Observations	8,988

Source: repeated cross-section of 25-55 year old earners in 2012-16-20 CFPS. Fixed effects included: age, gender, year, countyXurban, rural-educated. Standard errors clustered at the county level.

Calibrating wage rates w_r, w_{ua}, w_{un}

Normalize $w_r = 1$. We set urban wages to target income ratios of $\frac{\int_{i'=ua} w_{ua} h \mathrm{d}G}{\int_{i'=r} w_r h \mathrm{d}G} = 1.64$ and $\frac{\int_{i'=un} w_{un} h \mathrm{d}G}{\int_{i'=r} w_r h \mathrm{d}G} = 2.17$ from:

	Urban	**Rural**
Agric. hukou agri work	\	6.3(38.3%)
Agric. hukou nonagri work	13.8(24.3%)	9.6(10.3%)
Non-agric. hukou nonagri work	18.7(27.2%)	\

[1] Data: 2012 China Labor Dynamic Survey. Sample restricted to ages 25–64 with full-time jobs. Wages winsorized at the (2.5/97.5) level.

[2] Rural figures restricted to agricultural hukou only. Relative shares of each group reported in parantheses.

Labor income per hour of work across locations

Calibrating rural land income r_{land}

Using 2009 wave of China Health and Nutrition Survey (CHNS), we find the ratio of $\frac{value\ of\ self-produced\ food}{avg\ rural\ income} = 43\%$ and target it in our model.

We use the value of self-produced food evaluated at *consumer price* to correctly capture the shadow value of food for rural residents.

Calibration summary

parameter	interpretation	value	target/source
		externally determined	
μ	coefficient of relative risk aversion	2	modelling choice, CRRA=2
r	annual interest rate	2.1%	World Bank
w_r	rural wage rate	1	normalization
ζ_{un}	un location preference shifter	0	normalization
ρ_z	persistence of ability process	0.16	empirical persistence in Table 35
(α_z, α_e)	elasticities of human capital prod. f-n	$(0.09, 0.59)$	elasticities in Table 37
(e_r, e_{ua}, e_{un})	education expenditures (1,000s RMB)	$(52.4, 83.6, 122.5)$	expenditures in Table 3
(ϕ_a, ϕ_n)	land loss risk for ua and un	$(37.4\%, 90.4\%)$	land ownership rates in Table 2
		internally determined (jointly using SMM)	
β	intergen. altruism/time preference	0.48	$K/Y = 3.5$, Penn World Tables
w_{ua}	urban wage rate w/ agric. hukou	1.58	$\frac{\int_{i' \in \{ru,ua\}} w_u \cdot h}{\int_{i'=rr} w_r \cdot h} = 1.64$, CLDS
w_{un}	urban wage rate w/ non-agric. hukou	1.93	$\frac{\int_{i'=un} w_u \cdot h}{\int_{i'=rr} w_r \cdot h} = 2.17$, CLDS
r_{land}	land income per unit of land	0.03	$\frac{r_{land} \cdot \bar{\ell}}{\int_{i'=rr} w_u h + r_{land} \cdot \ell} = 0.43$, CHNS
$(\zeta_{rr}, \zeta_{ru}, \zeta_{ua})$	location preference shifters	$(-4.83, 3.14, -0.06)$	population shares in Table 1
σ_g	Gumbel distribution scale parameter	1.83	27% rural in top 25% of income

Calibration performance

Moment	Model	Data
Assets-to-GDP ratio	3.52	3.53
rr share	44.1%	47.2%
ru share	12.1%	12.6%
ua share	22.7%	22.4%
Share of rural in top 25% of income	19.6%	26.6%
Land income share for rr	47%	43%
Wage income of ua & ru relative to rr	1.61	1.64
Wage income of un relative to rr	2.08	2.17

Moments matched and model fit

Calibration validation

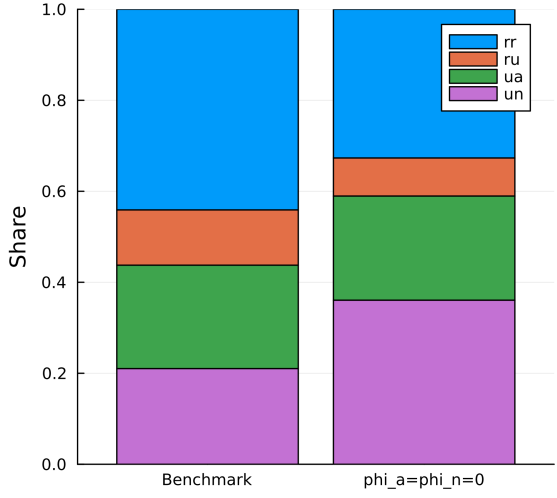
Moment	Model	Data
Impact of land reform on share left-behind	-31%	-33%
P(top 10% income) for rural w/ urban edu	16%	18.6%
Intergenerational elasticity of income in Fan et al., 2021	0.423	0.39-0.442

Non-targeted moments in the model and data

GE Analysis of Land Reforms

$$\phi_a = 37.4\% \ \& \ \phi_n = 90.4\% \rightarrow \ \phi_a = \phi_n = 0\%$$

Impact of reforms on population shares



Impact of reforms on population distribution across locations

Macro effects of the reforms

Statistic	China 2010 Baseline	Post Reform $\phi_a = \phi_n = 0$
Cons.-equivalent welfare	–	+17.8%
GDP	–	+16.6%
Aggregate human capital	–	+8.1%
Land per capita $\bar{\ell}$	–	$-$27.0%
Earnings gini	21.6	$-$4.6%
Intergen. elasticity of income	0.423	$-$8.5%
Average value of being born in urban	tbc	tbc

Key welfare statistics and the impact of land reforms

Future possible model extensions

- transition dynamics for welfare decompositions;
- college decision;
- remittances and intensive educational effort/investment;
- production functions microfounding incomes.

Thank you!

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APPENDIX

Hukou restrictions and land rights: some motivational evidence

- Evidence #1: peasant migrant workers want to settle in cities and keep their rural land.
- Evidence #2: peasant migrant workers face barriers limiting educational opportunities for their children at urban-work locations.
- Evidence #3: superior educational opportunities for kids are a major motivation for peasant migrant workers (20.7% or 46.8% for different sources) to change to urban hukou.

Institutional environment: overview of land law

- China's constitution endows ownership of land with state $\Rightarrow$ private persons can only have *land use rights*. Moreover, *Land Contract Law* stipulates that land unused for 2+ years has to be returned to the village council (PKUlaw, 2025b).
- Before 2018, the law stipulated that if the *entire* family of the peasant worker moved to a city with districts and converted to non-agricultural hukou, land shall return to the local village council; the 2018 reform lifted this restriction, promoting land rentals. (PKUlaw, 2025a)
- **The 1998-2003-2014-2018 waves of land reforms increase security of agricultural land use rights.** (CCCPC, 2013)

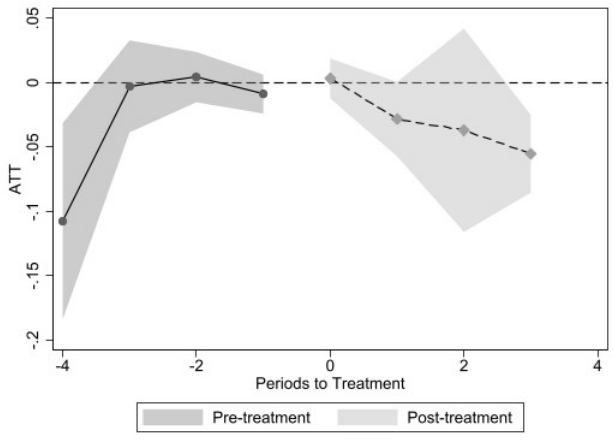
Institutional environment: overview of education system

- Non-local hukou holders face access barriers to local public school system.
- Before 2012, children of across-province peasant migrant workers were largely barred from taking the university entrance exam at their work location; this restriction was eased after 2012. (Ministry of Education,PRC, 2013)
- The difficulty of hukou conversion depends on the range of migration: Across province $>$ within province $>$ within city.
- High school curricula (standards) and university entrance exams (gaokao) vary by province. Similarly, universities have different quotas for students from different provinces.

Results: without any control and restriction

Back This graph is produced without any controls and restriction.

Share % kids left behind



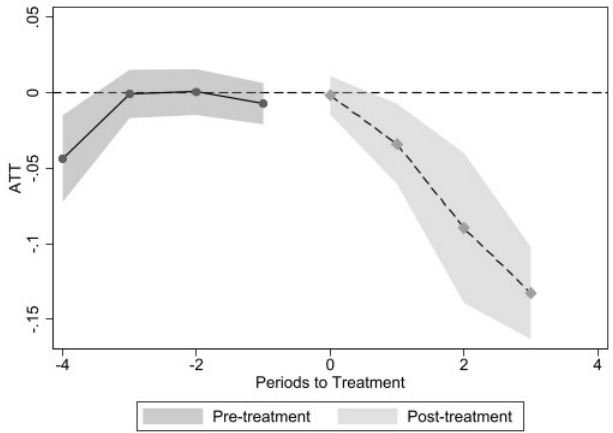
Results: Add control

Back

This graph adds the controls:

- Child: age, gender, ethnicity, whether locally born
- Responder: age, gender, edu, marriage status, number of children, number of households, ethnicity, hukou type.

Share % kids left behind

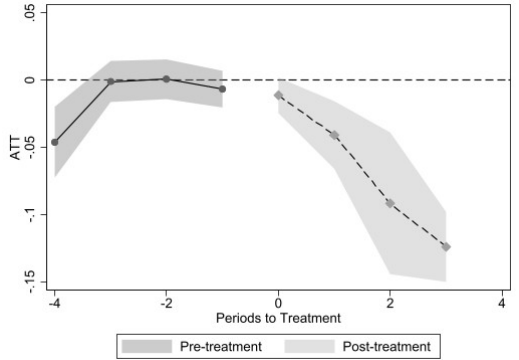


Results: migration year restriction

Back

- This graph is produced with controls:
  - Child: age, gender, ethnicity, whether locally born
  - Responder: age, gender, edu, marriage status, number of children, number of households, ethnicity, hukou type.
- This graph restricts the responder who migrated before the treatment happened in their hukou province

Share % kids left behind

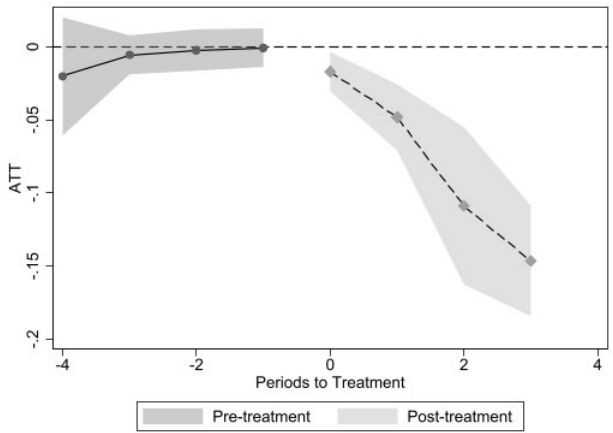


Results: with responder age restriction

Back

This graph restricts the sample to the responders who are below and aged between 25 and 60 when they migrate.

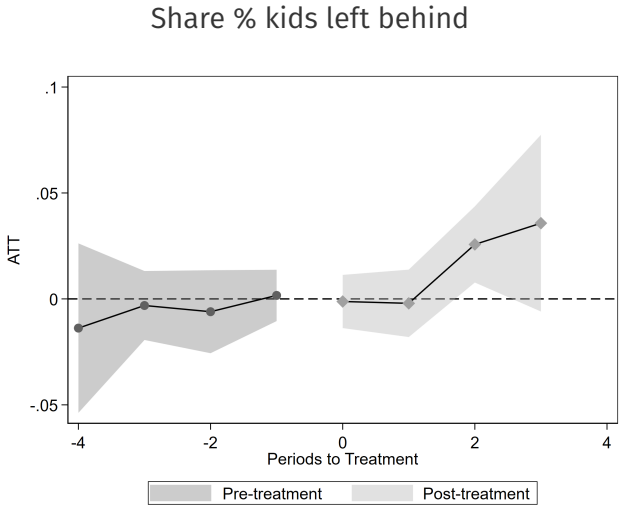
Share % kids left behind



Results: add spouse place

Back

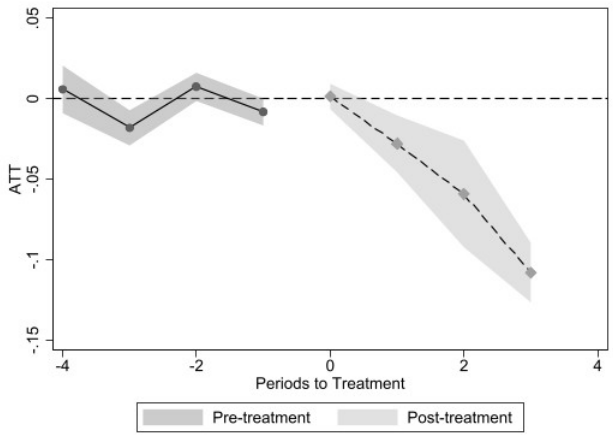
This graph adds control of the place of the spouse to study the impacts on the left-behind kids



Results: spouse

- This graph adds the place of the kids as a control

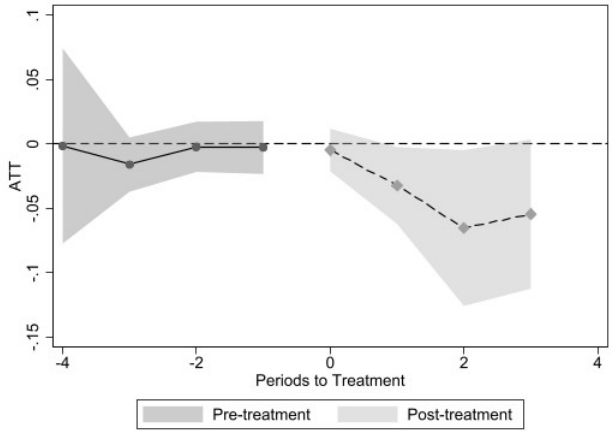
Spouse % separated from the responder



Results: kids & gendered effects

- This graph studies the place for the kids if the responder is male

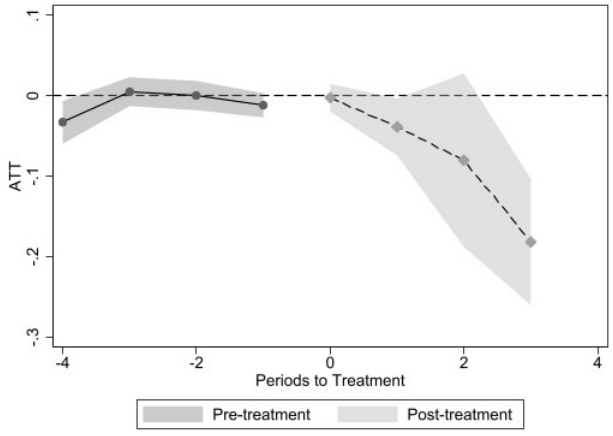
Share % kids left behind



Results: kids & gendered effects

Back This graph studies the place for the kids if the responder is female

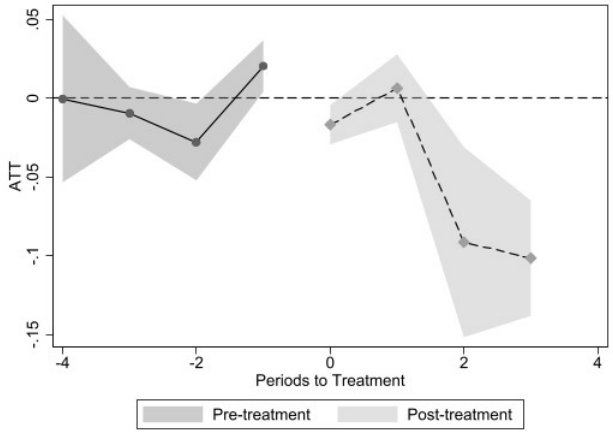
Share % kids left behind



Results: kids & distance

Back This graph studies the responders who migrated across provinces

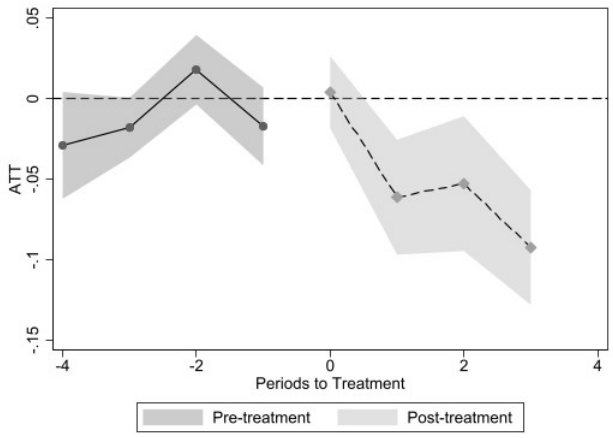
Share % kids left behind



Results: kids & distance

Back This graph studies the responders who migrated within provinces

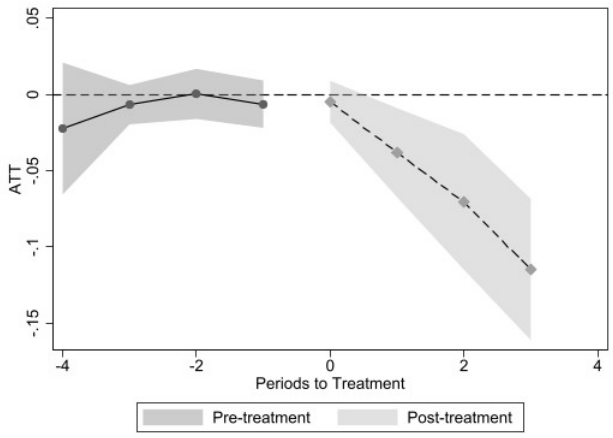
Share % kids left behind



Results: kids & mig-destination FE

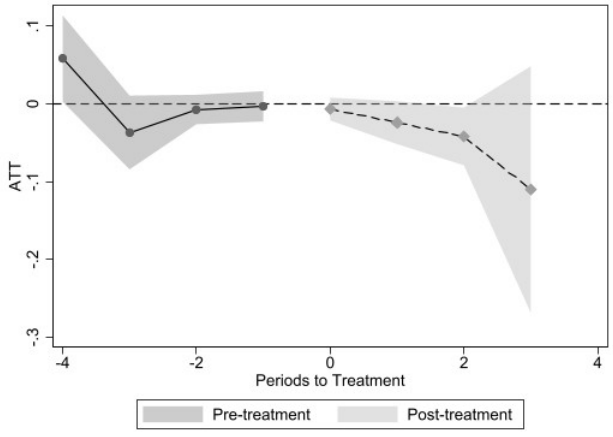
Back This graph only includes the mig-destination FE.

Share % kids left behind



Results: kids & hukou registration index

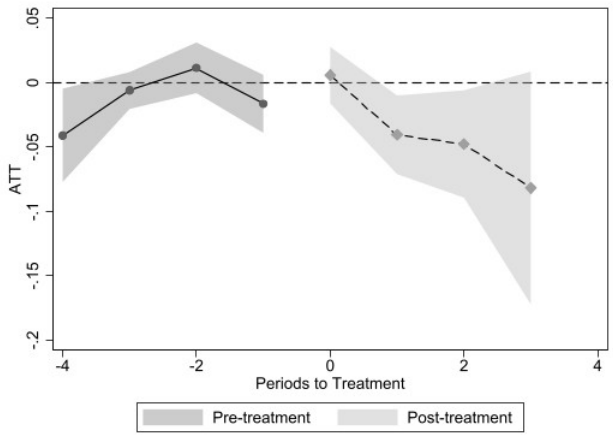
Back This graph adds the hukou registration index as a control



Results: kids & drop mixed hukou of the parents

Back This graph drops parents with mixed hukou type

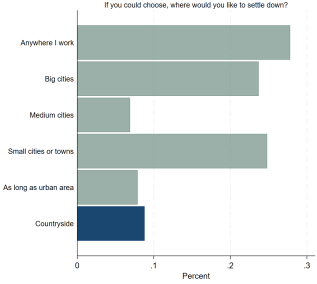
Share % kids left behind

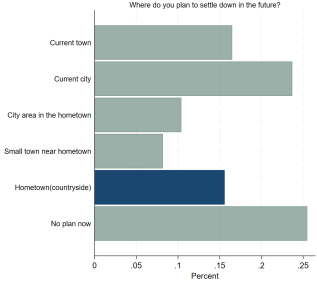


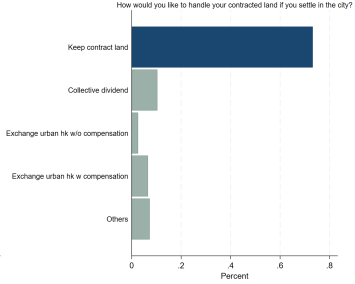
Motivational facts #1

Back

Source: Development Research Center of the State Council, 2011 (*Nongmingong shiminhua*)







Motivational facts #1

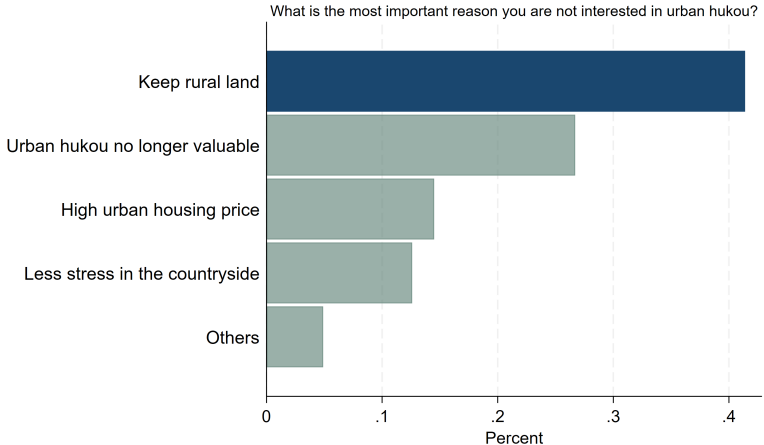
Back Source: Chen and Fan, 2016

	Yes(%)	No(%)	Haven't decided (%)	Survey Year
Do you plan to stay for the next three years?	64.1	8.1	27.8	2010
Do you plan to stay long-term (five years or more)?	60.1	12.4	27.5	2012
Are you willing to transfer your hukou here if there are no other conditions?	50.0	24.3	25.7	2012
Are you willing to obtain urban hukou?	21.8	78.2		2011
Are you still willing to transfer your hukou here if you are required to return your contract land?	11.8	85.1	3.1	2010

Rural Migrants' Intention to Settle Down and Obtain Hukou in the Place of Survey

Motivational facts #1

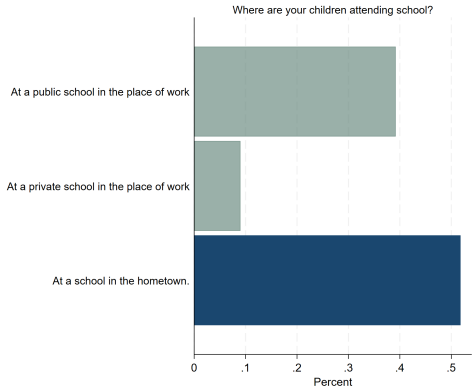
Back Source: Chen and Fan, 2016

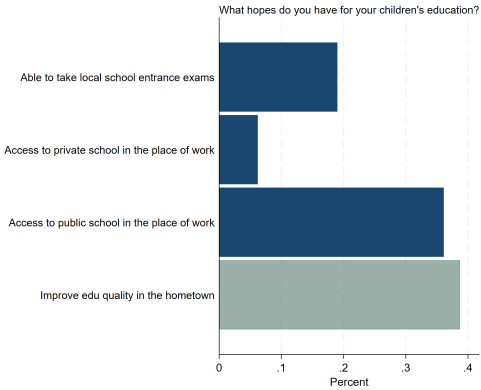


Motivational facts #2

Back

Source: Development Research Center of the State Council, 2011 (*Nongmingong shiminhua*)





Motivational facts #2

Back Source: China Education Panel Survey (2013)

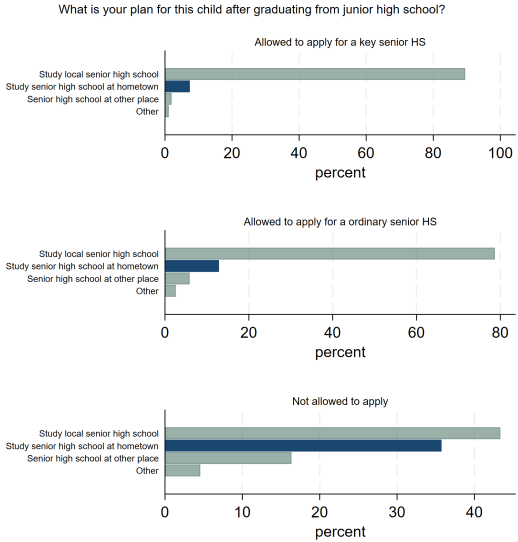
		Yes(%)	Yes w/ special requirements(%)	No(%)	No migrant students(%)
Allowed to apply for key senior HS		50	23	15	12
Allowed to apply for ordinary senior HS		55	18	14	12
Allowed to apply for	Vocational high schools technical secondary schools	77	6	4	13

Q: *Are nonlocal hukou kids allowed to go to local high schools?* - answers by school principals. Special requirements include (1) Studying in the local (prefecture-level city) junior high school for three years; (2) Local Hukou of this city (prefecture-level city) or enough 'score' to obtain it; (3) Local Hukou of this province; (4) The property ownership certificate or lease contract of parents' house/apartment; (5) (Temporary) residential permission; (6) Social security for at least one year; (7) Family planning certificate; (8) Business license or employment certificate

Motivational facts #2

Back

Source: China Education Panel Survey (2013), answered by parents



Motivational facts #2

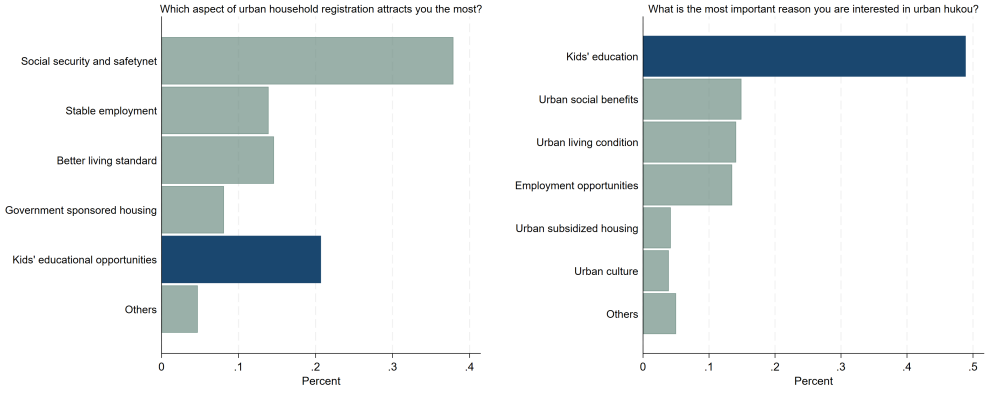
Back

Source: China Education Panel Survey (2013)

	Public School	Private School	Share(%)	Mean Edu expense per semester
not local agri hk	2431	397	86.0	1781.5
local agri hk	10577	1118	90.4	1370.8
not local nonagri hk	1702	162	91.3	1418.2
local nonagri hk	10484	237	97.8	904.2

Share of kids going to urban public vs private schools, and average costs

Motivational facts #3



Reasons of perceived attractiveness of urban hukou (from two sources)

Note: Source for left panel: Development Research Center of the State Council, 2011 (*Nongmingong shiminhua*). Source for right panel: Chen and Fan, 2016.

Mechanism #2.1: 2014 wave of reforms reduces land insecurity in CFPS

Focus on sample of households in 2010-2020 CFPS that:

- are observed at least once both pre- and post-reform;
- respond at least once that they own land.
- Land expr.: "*In past 12 months, was your family land expropriated?*".

	Mean	Std. Dev.	Min	Max	Obs
Own Land	.70	.46	0	1	56,615
Urban	.47	.50	0	1	24,480
Rural	.90	.30	0	1	31,096
Land expropriation	6.7%	.25	0	1	39,323
2011	4.4%	.205	0	1	7,109
2014	7.6%	.265	0	1	8,148
2016	6.4%	.244	0	1	8,809
2018	7.5%	.264	0	1	8,897
2020	7.0%	.25	0	1	6,808
Urban	9.0%	.285	0	1	11,440
Rural	5.7%	.23	0	1	27,975

Educational expenditures

Back

School level	Area	Fiscal transfer	Private expenditure	Total
Primary school	Rural	3,876	222	4,098
	Urban	4,616	1,184	5,800
Middle school	Rural	5,061	354	5,415
	Urban	5,993	1,599	7,592
High school	Rural	3,821	2,459	6,280
	Urban	4,972	3,502	8,474
College	–	5,890	6,710	12,600
University	–	11,745	11,477	23,222

Data: China Educational Finance Statistical Yearbook 2011. Expenditures cover both public and private schools. Private expenditures include tuition fees and costs of textbook, uniform, meals and school trip, and other related costs.

Average annual education spending per student in 2010

Educational disparity btw agri & non-agri hk holders

Back

		Below high school	High school	College	Uni & above
Rural	Agric. hukou	140,811(34.5%)	37,296(9.1%)	16,929(4.1%)	5,999(1.5%)
Urban	Agric. hukou	64,079(15.7%)	33,872(8.3%)	19,169(4.7%)	10,637(2.6%)
	Non-agric. hukou	9,832(2.4%)	18,809(4.6%)	24,583(6.0%)	26,616(6.5%)
Total		214,722(52.6%)	89,977(22.0%)	60,681(14.8%)	43,252(10.6%)

[1] Data: 2010 1% population census. Data contains no information on hukou status change. Sample restricted to those aged 19–23.

[2] College, or junior college, (*daxuezhuanke*) includes graduates of vocational and professional schools. University (*daxuebenke*) includes enrollees into bachelor (or higher) degrees.

Education distribution in 2010

Land law #1

Back

"Where any entity or individual that conducts contracted operation of basic farmland and abandons such basic farmland for two consecutive years, the original contract awarding entity shall terminate the contract and take back the contracted basic farmland."

— Regulation on the Protection of Basic Farmlands (2011 Revision)

Land law #2

Back

"*if during the term of contract, the whole family of the contractor moves into a city divided into districts and his rural residence registration is changed to non-rural residence registration, he shall turn his contracted arable land or grassland back to the party giving out the contract*"

— Law of the PRC on Land Contract in Rural Areas (2009 Amendment)

"*The state protects the conventional usufructs on rural land for agricultural operations of farmer households that migrate to urban areas. Farmer households' permanent settlement in urban areas shall not be conditioned upon the surrender of their conventional usufructs on rural land for agricultural operations*"

— Law of the PRC on Land Contract in Rural Areas (2018 Amendment)

Land law #3

Back

"On the premise of upholding and improving the system for providing the strictest possible protection for farmland, we will endow farmers with the rights to land tenure, land use, land revenue, land transfer and mortgage and guarantee of contracted land use, and allow farmers to develop industrialized operation of agriculture by becoming shareholders using their contracted land-use right."

— Decision of the CCCPC on Some Major Issues Concerning Comprehensively Deepening the Reform (2013)

Edu law #2

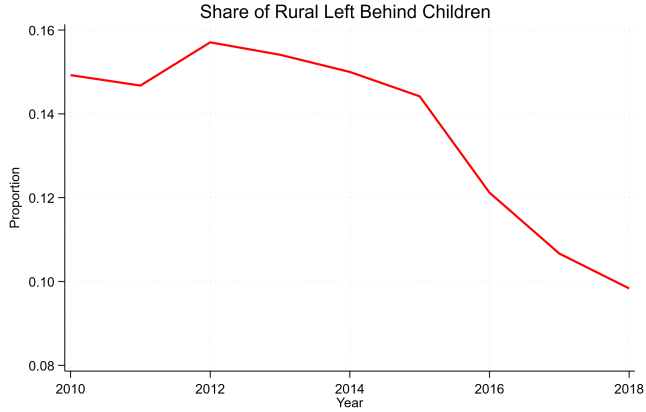
Back

"Provincial education administrations and relevant departments shall work closely together to conscientiously implement the program for children of migrant workers in their provinces (autonomous regions and municipalities) to participate in local examinations for advancement to higher education after receiving compulsory education, and to do a good job of admitting the candidates concerned to the examinations."

— Ministry of Education (2013, first appearance)

Government data on left-behind patterns

Back

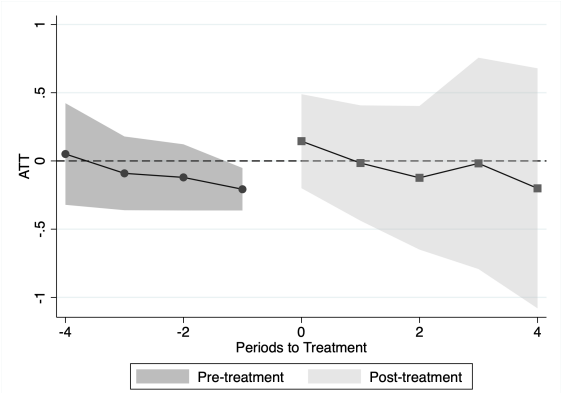


Source: China Education Department
Notes: 'Rural Left-behind children' are defined by the China Education Department
as rural compulsory school kids whose one parent or both have migrated out for work for more than three consecutive.

Share of Rural Left-Behind Children

Land reforms are not synchronized with hukou reforms

Back



Impact of land reforms on hukou-migration restrictions

Figure presents city-level event study of 2003-wave land reforms on the index of hukou-migration restrictions from Fan, 2019. 95% CIs. Std errors clustered at the province level

Province-level observables do not predict land reforms

Back

	2003-wave Year of reform introduction	2014-wave Year of reform introduction
log(population)	5.190 (5.035)	0.0282 (1.945)
log(number of high school students)	-3.237 (4.848)	0.148 (2.043)
log(GDP pc)	-10.08 (7.910)	0.474 (2.588)
log(fiscal expenditures pc)	9.701* (5.589)	2.703 (2.012)
log(rural income pc)	8.012 (10.34)	0.0552 (3.178)
log(urban income pc)	-3.435 (10.32)	-2.959 (3.868)
Observations	31	31
R^2	0.26	0.35

For provinces not treated in either wave of reforms, we assume either the year of implementation in the next wave or 2021 (end of all reforms). Per capita variables are derived by dividing the relevant variables by the total population of a province. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Predictors of the reforms' timing