



Expropriation with hukou change and labour market outcomes in China



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ABSTRACT

We study the labour market outcomes of Chinese household members changing their registration status (hukou) from rural to urban as a result of land expropriation using panel data from the 2008–2010 Rural Urban Migration in China (RUMiC). While it is largely unclear the extent to which expropriation can be viewed as an event exogenous to individual and household choices, we deal with the potential selection bias of being expropriated by using the methodology proposed by Oster (2019). Gaining an urban hukou is found to improve the labour market outcomes of expropriated household heads and spouses relative to comparable rural stayers and rural-urban migrants. In particular, hukou-changers gain better access to permanent jobs in the public sector through formal search channels. We also find that expropriated parents invest substantially more in children's human capital as compared to rural parents, suggesting that leveling the hukou status among children can contribute to reducing intergenerational inequality.

1. Introduction

Although economic reforms post-1978 have enabled rural people throughout China to become more mobile and seek fortune in urban centres, their registration as rural hukou holders has de facto not changed (Chan & Wang, 2008). There is considerable evidence on the discrimination imposed by the hukou system on rural-urban migrants and their families (Meng, 2012). Yet, micro-economic evidence on the impact of a change in hukou status on labour market consequences is rather sparse. Thanks to a new database, the Longitudinal Survey on Rural Urban Migration in China (RUMiC – (Akgüç et al., 2014)), we are able to estimate the causal effects of the hukou status on labour market performance by exploiting a unique shock captured by the data: land expropriation accompanied by a change from rural to urban hukou status.

Despite the large literature documenting land reforms since the 1980s and the fast urbanisation of China (Ding, 2003; Guo, 2001; Lin, 2007), as well as the mechanics and consequences of land expropriation in China (see e.g. (Deininger & Jin, 2009; Lin & Yi, 2011)), few studies address the direct economic effects of land expropriation in a household context. Our novel contribution is that we provide the first economic investigation into the labour market impact of hukou status under circumstances where expropriation and hukou change simultaneously occur.

The compensation of agricultural land with a change in legal rights, which allows former rural hukou holders to access public goods and benefits (along with some cash considerations) restricted to urban-hukou holders in the expanding city, is a unique Chinese

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phenomenon. Therefore, for applied researchers, it offers the possibility of studying how individuals and households respond when subjected to a positive shock in their economic and legal circumstances without adapting their behaviour in anticipation of possible future hukou change – rural and hukou holding was effectively fixed in 1958. After that date individuals appear to have had neither influence nor choice in the hukou they held, though this is based on the historical setting in which rural and urban hukou were determined, and, importantly, the general lack of available documentation on how expropriation was effectively carried out through China. The rigidity of the hukou system post-1958 is conducive to view ‘expropriation with hukou change’ as a variable exogenous to individual choices. In this case, its effect on outcomes about career or education could be interpreted as causal¹ when estimated by Ordinary Least Squares (OLS). To verify this conclusion, we apply the approach developed by Oster (Oster, 2019) to formally test whether the results are robust to omitted variable bias, finding overwhelming evidence in the affirmative.

In the empirical analysis we apply the panel random estimator to exploit the longitudinal nature of RUMiC data and use non-migrant rural hukou holders as the main comparison group: these are the people whom the expropriated originally belong to, but we include migrants from the same and other provinces as self-selected groups of rural hukou holders. The results reveal that receiving an urban hukou through expropriation considerably raises the hourly wages of the affected relative to rural stayers and rural-urban migrants. The principal channels through which this effect arises are access to better jobs for tenure (permanent positions), the use of formal job search methods (government arrangements or direct contact with the employer) and types of employer (state-owned companies and government authorities).

We also find that children of the expropriated hukou-changers complete more education than children of urban natives and children of migrants, and almost one year of extra schooling relative to children of rural stayers. This result is novel altogether, and supports the hypothesis that removing barriers to education in urban centres for rural hukou-holding children may be a tool to reduce intergenerational inequality between non-urban and urban-hukou holder groups.

The rest of the paper is organised as follows. Section 2 discusses previous literature. Section 3 illustrates the institutional background, describes the data used, and provides descriptive statistics. Section 4 introduces the methodology in great detail, while Section 5 presents the results. Section 6 extends the analysis along two important dimensions and performs robustness checks. Section 7 concludes.

2. Literature

Our paper exploits land expropriation as a quasi-natural experiment to estimate the causal impact of changing hukou status from rural to urban on labour market performance, connecting and complementing two strands of literature.

The first strand is the literature studying the process of land expropriation throughout China and its consequences, with a focus on the economic impact of holding a rural hukou in an urban area (Deininger & Jin, 2009; Guo, 2001; Lin & Yi, 2011; Xu et al., 2009). Several scholars focus on the unfairness of the compensation received by the expropriated households and underpin calls for a fairer compensation system for land requisition (Zhang, 2013; Zou & Oskam, 2007).² Another important line of research in this literature examines the role of expropriation in determining the level of risk and uncertainty of the environment. For example, expropriation is found to raise the uncertainty about land tenure (Khantachavana et al., 2013) and reduce investments in fertilisers, leading to permanent under-investment and negative repercussions on land productivity (Jocoby et al., 2002). Expropriation also matters in migration decision-making. It lowers the probability of rural-urban migration because the additional uncertainty it creates adds to the costs of migration, as pointed out by Jin and Deininger (Jin & Deininger, 2009).

The second branch of literature focuses instead on inequality between rural and urban hukou holders living in Chinese cities. Its main preoccupation is to document conditions and labour market outcomes of rural-urban migrants in the context of their inability to receive local welfare support. Although rural-urban migrants are more likely to move after the development of the land rental market (Kung, 2002), they typically live in a city only *de facto* but not *de jure*. Essentially, migrants have limited access to public services and social benefits, including unemployment benefits, health insurance, pensions as well as subsidies for housing and education (Cai et al., 2011; Chan, 2008; Frijters et al., 2010), which consequently leads to worse labour market outcomes (Meng, 2012), poor health status (Zhang & Kanbur, 2005), and lower educational attainments of their children (Biavaschi et al., 2015; Li, 2010; Liu, 2005; Wu, 2011), relative to children of their urban hukou holder counterparts. Only until recently has the socioeconomic status of rural-urban migrants improved. In some places and for certain types of (demanding) jobs, migrants receive a higher call-back rate from prospective employers than comparable urban residents precisely because they are perceived as working harder and costing less (Kuhn & Shen, 2014).

Notwithstanding the extensive research on expropriation and the hukou system, very little is known about the circumstances under which the combination expropriation-hukou change occurs, especially in the early years of land reform (Zhan, 2017). Li, Shu, Shi, and Zhu (Li et al., 2017) is the only source we have come across where expropriation and hukou changes are explicitly discussed. The authors aim to understand how farmers' willingness varies between those who want to and actively move to the city (e.g. rural-

¹ However, in one exception expropriation presented individuals with a choice between urban hukou and financial compensation: in the case of Nanjing, four waves of expropriation were implemented during the 1990s and 2000s (Li et al., 2017). In the first round, started in 1996, expropriated farmers were given a choice between urban employment (effectively an urban hukou) and financial compensation. Subsequent rounds of expropriation offered only financial compensation and some training. While the experience of Nanjing could simply be an exception that does not invalidate viewing expropriation as an exogenous variable for the other cities surveyed by RUMiC, we evaluate the robustness of the results by implementing the procedure developed by Oster (Oster, 2019) and by checking regression estimates after excluding people from Nanjing.

² Standard practice bases the compensation amount on the value of the average annual output of the land in the three years prior to expropriation without any consideration for the increase in value that accrues after conversion to non-agricultural use.

urban migrants) and those who are abruptly absorbed by the city because of land expropriation. Using a household survey conducted in Nanjing, they show that expropriated farmers are more concerned about the changes to their employment and inhabitation than expropriation itself.

To our knowledge, no study has explicitly assessed the economic effects of the transfer of hukou status, and in particular expropriation with hukou change. We are hence among the first studies to investigate this issue. This study extends the existing literature by providing new evidence that converting hukou status from rural to urban through land expropriation enhances labour market outcomes. By focusing on hukou-changing expropriation, our paper not only connects the literatures on expropriation and on rural-urban migration, but it identifies a source of exogenous shock that can be used to estimate the causal effects of a change in legal rights on other important individual decisions and outcomes.

3. Background and data

3.1. Hukou system and land expropriation in China

The economic reforms introduced since 1978 have eased restrictions on individual mobility and the private ownership of enterprises. At the same time, they have maintained an inflexible residence system (*Hukou*) that grants rights on public goods and services only in the geographic area where one is officially registered as opposed to where one lives. These rights include employment in local state-owned enterprises and access to public welfare, such as subsidised housing and public schooling for children.

The hukou system was introduced in 1958 as one of the measures devised by the regime to foster its Big Push industrialisation strategy. To quickly accumulate capital in the newly nationalised city-based manufacturing sector, the government collectivised the rural population and means of production to make food and raw material as dictated. It then elected to become the sole and mandatory buyer and seller of rural product to set the prices at which agricultural inputs were sold. It registered each person as rural or urban (1955) and since 1958 it prevented rural hukou holders to gain an urban hukou without the prior approval of the city of destination. These measures capped the annual quota of conversions to about 0.15%–0.20% of the non-agricultural population (Chan, 2009). Since 1984, the Chinese state has undertaken a series of hukou reforms to allow rural citizens to seek jobs in the city. The rural-urban distinction in the hukou system has gradually been abolished across China.

While hukou reforms mainly open up urban labour market to rural migrants, land reforms have also started to open up rural land markets. Expropriation is at the core of China's recent rapid urbanisation, and it occurs when the state expropriates rural land owned by a collective and keeps it under its management, assigning it as urban land by either allocation or conveyance (Lin & Ho, 2003a; Lin & Ho, 2003b). Private land ownership in China effectively stopped in 1956 (Lin & Ho, 2003a). From then onwards, land ownership and its management have been in the hands of either the state, which owns all urban land and some countryside land (e.g. forests), or communes, which own most agricultural land. In 1978, land reforms allowed Chinese farmers to lease agricultural land from their communes for a fee and keep the surplus. The ensuing increases in productivity fuelled demand for consumption and contributed to reform-permissible forms of capital ownership. The increasing number of new enterprises and internal migrants prompted cities to expand their boundaries, via expropriation, to accommodate an expanded demand for commercial as well as residential land. In 1988 China allowed the commercialisation of land use rights, enabling cities to assign land either by allocation, whereby land is dispensed at relatively low prices to specific state-owned or non-profit users with no time limits (e.g. a university), or by conveyance, whereby for a higher fee the buyer can resell such rights to others (e.g. a foreign-owned firm) or pledge these rights as collateral to a financial institution against a loan. Expropriation can be used as a mechanism to 'reallocate' land originally assigned by allocation to the same or new owners via conveyance. Within the rural areas, the commune decides the land used for agricultural and non-agricultural purposes, but participation in the lucrative secondary rural-commercial land market can occur only via the expropriation by the state, which can then reassign the land by conveyance. Notably, local governments could force farmers to give up land and accept a compensation package in the 1980s and 1990s, triggering widespread resistance that threatened the stability of Chinese society. This was due mostly to the power of the local state. To mitigate land conflicts, local governments more recently have resorted to offering urban hukou and welfare benefits to expropriators. As a result, vast numbers of rural people have become newly registered urban residents due to their loss of land rights.

Taken together, these unique features of the Chinese context provide an opportunity to study the behaviour of individuals experiencing changes in the environment in which fundamental decisions are carried out. Specifically, we focus on the relationship between expropriation-induced hukou change and labour market outcomes.

3.2. Data set

The data employed in this analysis are extracted using identical questions from the first three waves of the RUMiC, which is an annual survey with the first wave started in 2008. In particular, we use RUMiC's Urban Household Survey (UHS), Rural Household Survey (RHS), and Migrant Household Survey (MHS). The RUMiC covers principal migrant sending and receiving regions in China. The RHS was conducted in villages across nine provinces, while the UHS and MHS were carried out in 19 and 15 cities, respectively, of fewer provinces.

The RHS comprises around 8000 households, while the UHS and MHS survey around 5000 households each. Urban (rural) residents are individuals holding urban (rural) hukous. A migrant is defined as an individual who has a rural hukou but is living and surveyed in an urban area at the time of the survey. Migrants coming from the same province of the city where the survey takes place are separately identified from those coming from other provinces, as they may have preferential access to services and information due to networks from previous migrants, similarity in language (dialect), and administrative practice implemented at provincial level (e.g. governance).

We identify the expropriated hukou-changing group thanks to RUMiC's question asking whether or not a respondent's hukou has changed and if so why. This is asked only in the UHS and RHS, as migrants by definition maintain their rural hukou, though they most likely live in urban centres. More than half of the expropriated (61%) are drawn from the RHS, which covers rural areas as well as small-sized urban centres, while the remaining observations are sourced from the UHS, which covers medium- and large-size cities. Most expropriations in RUMiC occur in the mid- and late 1990s.

The key counterfactual group consists of rural stayers living in an agricultural area, who are surveyed in the RHS, as this is the group to which the expropriated hukou-changers belong prior to expropriation.³ These individuals are the most similar to those experiencing expropriation in every aspect aside from expropriation and hukou change. We also construct four additional comparison groups to contextualise the results found in a separate robustness section (Section 6), depending on whether or not people change residence or hukou status, or both. Two comparison groups are sourced from the UHS: i) native urban residents who do not change their urban hukou; and ii) current urban hukou holders who changed their hukou (from rural) as a result of their high skills. This group (which in RUMiC has fewer observations) includes both rural hukou holders moving to a city for tertiary education and staying on as employees of organisations that sponsor their hukou change, as well as urban hukou holders from other cities. The remaining two comparison groups are sourced from the MHS: iii) rural hukou migrants from the same province of the urban area where they were surveyed and iv) rural hukou migrants from another province than that of the city where they are surveyed.

We complement RUMiC's geographic information with external data at the city level to control for local economic and social developments using China's City Statistical Yearbook, which is compiled by the Department of Urban Socio-economic Surveys of China's National Bureau of Statistics. This source provides a comprehensive list of major socio-economic indicators for cities at and above prefecture-level, and county-level cities. The list of cities included in the Yearbook varies from year to year as the Chinese urbanisation continues to expand over time. We collect three key indicators on population, labour market and economic performance for the 68 cities that match the cities covered by the RUMiC, and include them as additional explanatory variables in the regressions performed.⁴ These three measures effectively capture urban economic development and labour market opportunities before most individuals were expropriated. As over 90% of the expropriated residents in our sample changed their hukou status in mid- and late 1990s, we use the Yearbooks of 1995, 1996 and 1997 to derive the city's GDP growth rate between 1994 and 1995, population density in 1996, and the unemployment rate for 1996.^{5,6}

We separately analyse the effect of hukou-changing expropriation on household heads of working age (18–55 for women and 18–60 for men) and their working-age spouses.⁷ The summary statistics of the variables used in the empirical analysis for household heads and their spouses are presented in [Tables 1 and 2](#), respectively. In general, the characteristics of expropriated household members emerge as laying in between those of urban hukou holders and those of rural stayers and migrants. As discussed below the characteristics of the control groups bound those of the expropriated hukou-changers with reference to both demographics and labour market outcomes.

3.3. Household heads

The characteristics of working-age household heads for expropriated hukou-changers and control groups are reported in [Table 1](#). Expropriated household heads (group 0) are middle aged (mean age: about 46 years), similar to rural and urban stayers (group 1 and 2) but are markedly older than highly skilled hukou-changers (by about 7 years – group 3) and migrant groups (over 12 years – group 4 and 5). They are mostly males (87%), married (98%), and with a child (1.32), in line with other urbanites while rural stayers have more children on average (1.72), partly due to the fact that the one-child policy was not strictly implemented in agricultural areas. They also clearly differ from migrant household heads, who instead have a more balanced marital status composition (24%–28% are single) and fewer children on average (about 1).

The expropriated hukou-changers are similar to migrants with respect to the years of education (9, or mid-way between rural and urban stayers) and income, but share no other labour market characteristics. Their hours of work (~49 versus 62+ among migrants) and type of job say, the probability of self-employment, are closer to those of urban stayers. In contrast, little similarity exists between the labour market outcome of the expropriated hukou-changers and the highly skilled, who have a much higher level of human capital (14.2 years versus 9.2), income (3317 yuan/month versus 1888 yuan/month), and a higher probability of working under permanent contracts (94% versus 64%).⁸

³ We exclude few cases of rural-rural migrants to ensure that our key comparison group is a well-defined group of people living in rural areas and holding a rural hukou, who do not migrate to urban areas or to other rural areas.

⁴ The 68 cities included in the analysis are distributed across 8 provinces (Hebei, Jiangsu, Zhejiang, Anhui, Henan, Hubei, Guangdong, and Sichuan), while 2 cities are direct-controlled municipalities (Shanghai and Chongqing).

⁵ The China City Statistical Yearbooks are downloaded from <http://www.tjcn.org/>. Data in the Yearbook refer to the previous calendar year. For example, the 1996 Yearbook has information for 640 cities as of 1995, while the 2016 version covers 656 cities.

⁶ The population density measures the number of people in 1000s per kilometre squared.

⁷ The terms spouse and partner are used interchangeably despite possible differences in their legal implications.

⁸ The questionnaire asked individuals who have their hukou changed from “rural” to “urban” about the reasons for the change; one of the responses to this question is through “education”. Typically, in China, individuals from rural areas could get urban hukou by enrolling in higher education (attending university for example). We assume that respondents who answered this question by saying “education” are positively selected by cities as high-skilled individuals. The distribution of educational attainment of this group shows that 67% of individuals have tertiary educational experience.

Table 1
Summary statistics across different groups (household heads).

Treated group	Comparison groups					
	(0)	(1)	(2)	(3)	(4)	(5)
	Expropriated (urban + rural)	Rural stayers	Urban hukou non-changers	High education hukou changers	Migrants from close-by	Migrants from far away
Hours worked (week)	49.78 (13.01)	52.18 (16.24)	43.75 (10.59)	42.71 (8.25)	63.46 (16.74)	62.91 (17.83)
Monthly income (yuan)	1887.79 (1114.15)	1669.15 (1069.23)	2442.17 (1628.37)	3316.59 (1842.21)	1583.42 (1023.02)	1850.99 (1235.34)
Age	45.59 (7.23)	46.00 (6.97)	44.90 (7.68)	38.66 (7.16)	34.47 (9.53)	32.97 (9.30)
Male	0.87 (0.34)	0.98 (0.15)	0.70 (0.46)	0.79 (0.41)	0.67 (0.47)	0.72 (0.45)
Married	0.98 (0.15)	0.99 (0.12)	0.96 (0.21)	0.98 (0.15)	0.76 (0.43)	0.72 (0.45)
Number of children	1.32 (0.55)	1.72 (0.73)	1.00 (0.30)	1.00 (0.49)	1.01 (0.76)	1.00 (0.85)
Disabled	0.04 (0.19)	0.04 (0.19)	0.02 (0.15)	0.02 (0.15)	0.03 (0.16)	0.03 (0.17)
Education (years)	9.20 (2.52)	8.02 (2.17)	12.09 (3.15)	14.20 (2.86)	9.08 (2.59)	9.18 (2.47)
Secondary education or higher	0.83 (0.37)	0.81 (0.40)	0.99 (0.12)	1.00 (0.00)	0.87 (0.34)	0.87 (0.33)
Experience	30.39 (8.39)	31.97 (7.62)	26.81 (9.27)	18.45 (8.22)	19.39 (10.52)	17.79 (10.33)
Job characteristics						
Job type: Permanent	0.64 (0.48)		0.80 (0.40)	0.94 (0.24)	0.33 (0.47)	0.42 (0.49)
Job type: Temporary	0.24 (0.43)		0.12 (0.33)	0.03 (0.16)	0.40 (0.49)	0.32 (0.46)
Job type: Self-employed	0.12 (0.33)		0.07 (0.26)	0.03 (0.18)	0.27 (0.44)	0.26 (0.44)
Job search method: Government	0.24 (0.43)	0.11 (0.31)	0.42 (0.49)	0.51 (0.50)	0.02 (0.15)	0.02 (0.13)
Job search method: Employer offer	0.17 (0.38)	0.09 (0.29)	0.24 (0.43)	0.33 (0.47)	0.25 (0.43)	0.29 (0.46)
Job search method: Network	0.52 (0.50)	0.73 (0.44)	0.26 (0.44)	0.08 (0.27)	0.63 (0.48)	0.59 (0.49)
Job search method: Other	0.07 (0.25)	0.07 (0.25)	0.08 (0.27)	0.09 (0.29)	0.09 (0.29)	0.10 (0.30)
Ownership: State-owned enterprises	0.57 (0.50)		0.68 (0.47)	0.78 (0.41)	0.16 (0.36)	0.15 (0.36)
Ownership: Private enterprises	0.41 (0.49)		0.29 (0.45)	0.17 (0.38)	0.81 (0.39)	0.79 (0.41)
Ownership: Foreign-owned enterprises	0.03 (0.17)		0.03 (0.17)	0.05 (0.21)	0.03 (0.17)	0.05 (0.23)
City level characteristics						
GDP Growth	0.15 (0.10)	0.17 (0.13)	0.16 (0.10)	0.14 (0.10)	0.21 (0.10)	0.18 (0.09)
Population density	1.90 (1.16)	1.44 (0.99)	2.15 (1.26)	1.83 (1.06)	1.63 (0.88)	2.16 (1.31)
Unemployment rate	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.00)	0.01 (0.01)
Obs.	536	6161	4144	335	1474	5952

Source: RUMiC (2008–2010).

Notes: The expropriated hukou-changer group consists of respondents who changed their hukou status to urban following expropriation. Columns (0)–(3) based on three waves of data from year 2008 to 2010 while columns (4)–(5) based on year 2008 and 2009 (wave 1 and 2). Variables indicating job characteristics refer to the first two waves and some are not reported for the rural sample due to data availability.

Expropriated hukou-changers rely more on government to find jobs and to a lesser extent on personal networks than rural stayers, though government, rather than social connections, is the urbanites' most important channel for seeking jobs. Most expropriated individuals have permanent jobs (64%), similar to urbanites (80%), but this differs from the case of migrants (33%–42%).

Unfortunately, the type of job and other occupational characteristics are not collected in the RHS since most people are self-employed on land allocated by the commune. This limits our ability to use the group of rural stayers as a reference in the study of the channels through which the employment impact of expropriation materialises. In such case, we carry out the comparison using

Table 2
Summary statistics across different groups (Household Partners).

Treated group	Comparison groups					
	(0)	(1)	(2)	(3)	(4)	(5)
	Expropriated (urban + rural)	Rural stayers	Urban hukou non-changers	High education hukou changers	Migrants from close-by	Migrants from far away
Hours worked (week)	49.65 (12.86)	51.34 (16.17)	43.42 (11.48)	42.45 (8.79)	61.82 (18.15)	64.79 (19.42)
Monthly income (yuan)	1586.98 (1275.28)	1231.65 (844.15)	2223.86 (1486.54)	2756.57 (1597.20)	1538.74 (998.46)	1721.99 (1183.01)
Age	43.34 (6.44)	42.48 (6.47)	43.53 (7.84)	36.53 (6.45)	37.01 (8.00)	35.01 (7.55)
Male	0.19 (0.39)	0.13 (0.33)	0.41 (0.49)	0.32 (0.47)	0.36 (0.48)	0.30 (0.46)
Married	1.00 (0.05)	0.98 (0.14)	1.00 (0.04)	1.00 (0.00)	1.00 (0.00)	1.00 (0.03)
Number of children	1.29 (0.55)	1.56 (0.74)	0.98 (0.29)	0.99 (0.40)	1.23 (0.58)	1.33 (0.67)
Disabled	0.02 (0.12)	0.02 (0.15)	0.01 (0.11)	0.03 (0.16)	0.02 (0.15)	0.03 (0.16)
Education (years)	8.70 (2.81)	7.62 (2.32)	12.02 (3.06)	14.12 (3.48)	8.74 (2.53)	8.49 (2.55)
Secondary education or higher	0.76 (0.43)	0.72 (0.45)	0.98 (0.13)	0.98 (0.13)	0.85 (0.36)	0.79 (0.41)
Experience	28.64 (7.80)	28.86 (7.22)	25.52 (9.30)	16.41 (7.62)	22.27 (8.81)	20.52 (8.44)
Job characteristics						
Job type: Permanent	0.55 (0.50)		0.79 (0.41)	0.90 (0.30)	0.32 (0.46)	0.33 (0.47)
Job type: Temporary	0.31 (0.46)		0.15 (0.36)	0.07 (0.25)	0.31 (0.46)	0.27 (0.44)
Job type: Self-employed	0.14 (0.35)		0.06 (0.24)	0.03 (0.17)	0.37 (0.48)	0.41 (0.49)
Job search method: Government	0.17 (0.38)	0.06 (0.23)	0.35 (0.48)	0.38 (0.49)	0.03 (0.17)	0.02 (0.15)
Job search method: Employer offer	0.19 (0.40)	0.11 (0.31)	0.27 (0.44)	0.34 (0.48)	0.27 (0.44)	0.28 (0.45)
Job search method: Network	0.60 (0.49)	0.77 (0.42)	0.30 (0.46)	0.16 (0.37)	0.62 (0.49)	0.60 (0.49)
Job search method: Other	0.04 (0.20)	0.06 (0.24)	0.08 (0.28)	0.12 (0.33)	0.09 (0.29)	0.10 (0.30)
Ownership: State-owned enterprises	0.48 (0.50)		0.64 (0.48)	0.78 (0.42)	0.13 (0.34)	0.12 (0.33)
Ownership: Private enterprises	0.50 (0.50)		0.32 (0.47)	0.20 (0.40)	0.85 (0.36)	0.83 (0.38)
Ownership: Foreign-owned enterprises	0.02 (0.15)		0.04 (0.19)	0.02 (0.15)	0.03 (0.16)	0.05 (0.21)
City level characteristics						
GDP Growth	0.15 (0.11)	0.17 (0.13)	0.16 (0.10)	0.14 (0.10)	0.20 (0.10)	0.17 (0.09)
Population density	1.87 (1.15)	1.49 (1.00)	2.19 (1.31)	1.94 (1.02)	1.74 (0.99)	2.21 (1.32)
Unemployment rate	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Obs.	454	3177	3391	228	604	2253

Source: RUMiC (2008–2010).

Notes: The expropriated hukou-changer group consists of respondents who changed their hukou status to urban following expropriation. Columns (0)–(3) based on three waves of data from year 2008 to 2010 while columns (4)–(5) based on year 2008 and 2009 (wave 1 and 2). Variables indicating job characteristics refer to the first two waves and some are not reported for the rural sample due to data availability.

migrants from the same province as reference group (group 4).

3.4. Spouses

Table 2 reports characteristics of working-age spouses. Differences across the various comparison groups are not as marked as among the household heads, though the characteristics of the expropriated hukou changers are in the middle of those of rural and

urban stayers, respectively. Expropriated spouses are on average 43 years old, mostly females (81%) and with one or two children. They have slightly less amount of education compared to expropriated household heads (76% versus 83% have secondary education or higher), as well as lower income (1587 yuan/month versus 1888 yuan/month) despite similar weekly working hours.

Expropriated hukou-changing spouses share similar labour market experience with their rural and urban counterparts (29 years vs. 29 and 26, respectively), while they have a level of human capital similar to rural spouses (between 72% and 76% have secondary education or above). They work more hours than their urban counterparts, including the highly skilled (50 h vs. 43 and 42), but earn less income and are more likely to work in temporary jobs or are self-employed. Still, the labour market outcomes of the spouses from expropriated households are better than those of migrant spouses as they work substantially fewer hours per week (50 versus 61+), earn similar income (1587 yuan/month versus 1500–1700 yuan/month), and have a much lower incidence of self-employment (14% versus ~37–41%).

4. Methodology

4.1. Dealing with omitted variable bias

We treat land expropriation as an exogenous variation in the status of hukou, since changing residence status to take advantage of expected future expropriation is not possible. Exogeneity is, however, questioned by the case of Nanjing, where, in the first round of expropriation in 1996, farmers were allowed to choose between higher financial compensation and an urban hukou (Li et al., 2017). This possibility introduces endogeneity into the expropriation variable, threatening viewing its effects as causal. Unfortunately, we could not find any other source about whether the choice given to some Nanjing rural residents in 1996 occurred in other cities. We hence take an extreme viewpoint, assuming that expropriation with hukou change *never* gave a choice to the expropriated farmer, as instead took place in the first round of Nanjing's expropriations in 1996. We then apply a new methodology developed by Oster (Oster, 2019) to formally test whether unobserved self-selection (as occurring if instead farmers *had* a choice) undermines the validity of OLS estimates.

This new methodology, which relies on the assumption that unobserved selection correlates with the selection observed in the explanatory variables, quantifies the magnitude of the unobserved selection that makes β , the coefficient of a treatment variable (e.g. expropriation with hukou change), equal to zero. Oster (Oster, 2019) suggests that if the estimated amount of unobserved selection is at least as much or more than the amount of observed selection, then unobserved selection does not compromise the validity of the treatment coefficient estimated by OLS.⁹ We apply her approach, which involves two steps. The first is to calculate δ , the ratio between unobservable and observable selection that causes the expropriation indicator to become zero at an inflated R^2 (named $R^2_{\max}$). This is 1.3 times the actual R^2 of the OLS regression originally performed.¹⁰ In the case of wages for the household head, $R^2_{\max} = 0.127$ and the corresponding δ is 2.43 (Table 3). Expropriation has no effect on wages if unobserved selection is more than twice as large as the observed selection already controlled for in the original regression. This magnitude is unlikely, suggesting that the β of expropriation is *not* zero.

The second step in Oster (Oster, 2019) is to verify the stability of the β by studying its values when the δ is artificially varied in the interval [0,1]. If the values of β exclude zero, then the regression results are 'robust to omitted variable bias'. As shown in Table 4, zero is never within the range of the expropriation coefficients when δ changes from one to zero. Hence the results presented are robust to omitted variable bias and can be given a causal interpretation. We hence proceed to present the rest of the analysis, modeling hukou-changing expropriation as an exogenous variable, and applying the panel random effect estimator to control for time-invariant individual heterogeneity.

4.2. Wage regression

To study the effect of expropriation and hukou change on the labour market outcomes of affected individuals, we run separate panel regressions with random effect on household heads and their spouses based on the following functional form:

$$\ln w_{it} = \alpha + X'_{it}\beta + \delta E_{it} + C'_i\gamma + P_i\phi + Year_i\gamma_i + \varepsilon_{it} \quad (1)$$

where $\ln w_{it}$ is the logarithm of the hourly wage of individual i surveyed at time t ; X_{it} is a vector of individual characteristics (gender, marital status, children, disability, education and labour market experience). We also include city-level indicators (C_i) and province fixed effects (P_i). $Year_i$ indicates year dummies for the panel. E_{it} is the dummy variable for expropriation with hukou change: namely, 1 for expropriated and 0 for non-expropriated; ε_{it} is an *i.i.d.* random error term. As land expropriation policy was implemented by local governments, at the municipal or county level, adding county- or city-level fixed effects results in having two competing variables capturing the effects of hukou change induced by expropriation. We hence choose to exclude city fixed-effects but include

⁹ Oster (Oster, 2019) shows that the Altonji, Elder, and Taber (Altonji et al., 2005) method is an extreme case that implicitly assumes a maximum R-squared ($R^2_{\max}$) equal to 1, thus neglecting any role of measurement error. Oster considers more realistic values of R^2 ($R^2_{\max} < 1$) allowing discussions of coefficient stability that help to establish robustness. We apply this partial identification method to evaluate the robustness of the effect of changing hukou as a result of expropriation on wages.

¹⁰ Oster (Oster, 2019) suggests calculating $R^2_{\max}$ as the minimum between 1 and $1.3 R^2$ (which is $0.127 = 1.3 \times 0.098$ where $R^2 = 0.098$ as shown in the panel regression in Table 5).

Table 3

Effects Based on selection on unobservables (household heads): comparison group is rural stayers.

Amount of selection on Expropriation	Amount of selection on Unobservables relative to selection on Observables	R_{max}^2
	21.08	0.10
	2.43	0.1268*
	1.38	0.15
	0.71	0.20
	0.48	0.25
	0.36	0.30

Notes: Methodology based on Oster (Oster, 2019) and implemented using Stata's command *psacalc*.* This value of R-squared is calculated following Oster (Oster, 2019), in particular: $R_{max} = \min\{1.3\tilde{R}, 1\}$, $\tilde{R}$ is from the OLS regression of log wage on expropriation and other individual and geographic controls, see the first column in Table 5.**Table 4**

Effects based on selection on unobservables (household heads): comparison group is rural stayers.

Amount of selection on expropriation	Estimated coefficient on expropriation	Delta
$R_{max}^2 = 0.1268$		
	0.045	1.0
	0.048	0.9
	0.051	0.8
	0.053	0.7
	0.056	0.6
	0.059	0.5
	0.062	0.4
	0.064	0.3
	0.067	0.2
	0.070	0.1
	0.073	0.0

Notes: Methodology based on Oster (Oster, 2019) and implemented using Stata's command *psacalc*.

three key city-level indicators (i.e. GDP growth rate, population density and unemployment rate) to control for differences in certain local conditions, such as economic development and labour market opportunities.

We use robust standard errors to control for heteroskedasticity, and cluster the standard error at individual level to capture the longitudinal characteristic of the RUMiC database. We then complement the panel random effect regression with estimates obtained by pooled OLS, which we include for comparison purposes. Results based on panel random effect estimator are used as main reference in the discussion of the results.

4.3. Channels of transmission

To understand the possible channels through which hukou-changing expropriation generates its effects on labour market outcomes, we complement the study of earnings with an analysis of job quality. A variety of studies have found that tenure plays a significant role in wage determination, with considerable evidence pointing to permanent employees earning substantially more relative to temporary or contract workers regardless of countries studied (see, for example, (Booth et al., 2002; Brown & Sessions, 2005; Comi & Grasseni, 2012; Jahn & Pozzoli, 2013)). One possible explanation for the wage gap pertains to additional costs (e.g. training costs) associated with hiring a non-permanent worker. In particular, we analyse the probability of being employed under different types of tenure using a multinomial logit model:

$$p(y_{it} = j) = \frac{\exp(Z'_{it} \pi_j)}{1 + \sum_{i=2}^k \exp(Z'_{it} \pi_i)} \quad (2)$$

where y refers to the observed outcome characterising individual i , j is one of the k possible types of employment, and Z is a set of case-specific regressors that include demographic characteristics, the dummy variable identifying expropriation, a time dummy variable, city indicators and province fixed effects. Estimation of model (2) is carried out through maximum likelihood methods. The exponentiated coefficients are interpreted as relative risk ratios of being in a permanent job or self-employed as opposed to being in a temporary job (the base category) for expropriated household heads.

In addition to job tenure, two factors are found to affect wages as well: job search method and enterprise ownership (whether employed in the public or private sector). While there is conclusive evidence that job search through informal channels positively influences employment opportunities and job search time, there is no consensus as to how it affects wages (see (Ioannides & Loury, 2004) for an extensive review of the related literature). In the Chinese context, Chen, Wang, and Zhang (Chen et al., 2018) empirically examine this issue and find that informal job search through social networks induces a significant wage penalty for migrant

workers. The authors attribute this finding to the negative signal that network search method sends to potential employers and the trade-off between wages and job search efficiency. As for ownership sectors, evidence from developed countries reveals that public employees generally earn more than private sector workers, due to their better qualifications and higher returns to productivity. With regard to China, research has shown that employees working in the government and state-owned enterprises are highly protected and enjoy an earnings premium, despite a recent convergence trend in favour of the private and semi-public sectors as opposed to the public sector (Chen et al., 2005; Démurger et al., 2012; Zhao, 2002). We hence also look at how workers find their jobs and the ownership nature of their employers in the above regression.¹¹ We restrict our focus to household heads only, as they constitute the principal decision-making unit affected by the hukou-changing expropriation.

5. Results

5.1. Wage regression

5.1.1. Household heads

The estimates obtained on household heads of working age are displayed in Table 5, with the robust standard errors clustered at individual level in parentheses. The table reports estimates obtained by OLS (column 1), and panel random effects (column 2). The model (1) explains about 10% of the variance in wages, perhaps reflecting RUMiC's limited information on the type of job held by those surveyed in the RHS. Individual characteristics affect the wages of household heads, as shown by the positive and non-zero coefficients of education and previous labour market experience, and the penalty associated with being female or disabled (-0.216 and -0.072 , respectively in the case of panel random effects).

Local area characteristics affect wages, too. In particular, the GDP growth of the city is the most influential determinant, as evidenced by its large and negative coefficient, and strong statistical significance. Population density coefficients are effectively zero and unemployment rates are negatively correlated with local wage levels, while provincial fixed effects (not reported but available) control for wider area differences, and are mostly zero.

Expropriation with hukou change generally emerges as improving the wages of household heads. The panel random effect point estimate measures an average effect of 10.3%, which is significantly different at 1% level of significance (7.3% in pooled OLS, significant at 5% level).

5.1.2. Spouses

The case of working-age spouses is similar in many respects to that of the household heads, as shown in Table 6. The transfer of hukou status has a positive and larger wage effect on expropriated spouses relative to rural stayers, $+0.170$ based on OLS and $+0.202$ when using the panel regression, both estimates being highly significant. This effect probably reflects access to a better quality labour market, as indicated by the positive effect of prior labour market experience (albeit not statistically significant), and local welfare when the economy turns for the worse, as shown by the negative sign of local GDP.

Being a male is highly rewarded in the labour market (about 27% or more) even within the context of being a spouse. The number of children is negatively related to wages, which is consistent with the results obtained from household heads sample. Higher education still rewards wages; for example, the OLS estimate suggests that attending junior high school or above yields 5.3% increases in hourly wages for household partners, which is higher than the corresponding returns reported in the household heads sample (4.3%), while the coefficients of the other demographic variables are no different from zero.

5.2. Transmission channels

To investigate the channels through which hukou-changing expropriation materialises, we analyse indicators of job characteristics using model (2). As occupational information on rural stayers is not collected by the RHS, we use migrants from within the same province as comparison group notwithstanding that this generates a discrepancy with the control group reported in Table 5. This choice is based on the implicit assumption that migrants from the same province and the expropriated share some characteristics as they belong to a geographically well-defined rural population subject to common provincial rules and institutions.

The regression coefficients, interpreted as relative risk ratios (RRR) of being in a particular type of job or employer, and using a certain search method for expropriated household heads are summarised in Table 7.¹² A coefficient greater than one indicates that expropriated hukou-changers are more likely to have the comparison outcome category than the corresponding baseline outcome category.

Relative to nearby migrants, the expropriated hukou-changing household heads are more likely to hold a permanent job than a

¹¹ Our job search method variable includes the following four categories: 1) government arranged; 2) employer recruitment; 3) networking; 4) others. We also look at three different types of employers: 1) state-owned enterprises (SOEs) and government agencies/institutions (GAIs); 2) private and individual enterprises (including the self-employed); 3) foreign-owned enterprises.

¹² The relative risk ratio (RRR) is defined as the ratio of the probability of choosing one outcome category after exposure to a risk variable (in our case is the hukou change due to expropriation) over the probability of choosing the baseline or reference category. The values of RRRs can be interpreted as follows. An RRR greater than one indicates increased risk for the comparison category versus the baseline category. An RRR less than one indicates decreased risk for the comparison category versus the baseline category. An RRR of one means that the risk of the event is identical for the comparison and baseline categories.

Table 5
Log wage regressions (Household Heads): comparison group is rural stayers.

	OLS (1)	Panel RE (2)
Expropriated	0.073** (0.033)	0.103*** (0.032)
Male	0.208*** (0.050)	0.216*** (0.049)
Married	0.121 (0.074)	0.098 (0.074)
Number of children	−0.035** (0.015)	−0.032** (0.014)
Disabled	−0.074* (0.044)	−0.072* (0.043)
Secondary education or higher	0.043** (0.022)	0.036* (0.021)
Experience	0.011 (0.007)	0.012 (0.007)
Experience squared	−0.000*** (0.000)	−0.000*** (0.000)
GDP growth (city level)	−0.184** (0.091)	−0.201** (0.088)
Pop density (city level)	0.006 (0.011)	−0.000 (0.011)
Unemployment (city level)	−1.816* (0.970)	−1.616* (0.963)
R ²	0.098	0.097
Obs.	6697	6697
Province effects	Yes	Yes
Year dummies	Yes	Yes

Source: RUMiC (2008–2010).

Notes: The table reports estimates from OLS and panel random effects regressions.

GDP growth: measures GDP growth rate in the city area between 1994 and 1995 based on 1990 price.

Pop density: measures number of persons (in 1000s) per square km in the city area 1996.

Unemployment: measures the unemployment rate in the city area in 1996.

Robust standard errors in parentheses are clustered at the individual level.

Significance levels: * $p < .1$, ** $p < .05$, *** $p < .01$.

temporary one (RRR = 2.157; $p = .000$), and are much less likely to be self-employed (RRR = 0.455; $p = .006$). They are also less likely to have found such a job in a way other than government arrangement (all $p = .000$). The coefficient of network is 0.095 while that of direct recruitment by employer is only marginally higher (0.113) but considerably less than unity, which indicates equal likelihood with the reference category (arranged by government). The expropriated hukou changers also have a higher probability of working in state-owned enterprises or government (RRR = 8.150; $p = .000$) as compared to working in private enterprises. They are less likely to work for a foreign-owned firm as the relative risk ratio becomes less than one.

Moreover, we examine the log hourly wage differentials across tenure types, job search methods and ownership sectors in the estimation sample.¹³ The wage gaps are rather large, especially between individuals working on permanent versus temporary contracts (difference is 0.36) as well as between individuals finding their jobs through formal (government arrangements or direct contact with the employer) versus informal (social networks) channels (difference is 0.31). Apart from the differences in terms of job tenure and job seeking techniques, the gap in log hourly wages is observed across enterprises of different ownership types, with employees working in the public sector receiving higher wages (1.94) compared to those in the private sector (1.74).

Taken together, the results corroborate the findings of the existing literature that permanent staff and public sector employees have greater protections and earn more in the labour market, while informal job search can lead to wage disadvantages (Section 4.3). In turn, this supports the hypothesis that the change in legal rights associated with the hukou change rewards labour market experience relative to those having incomplete rights to enter the city labour market.

6. Extensions and robustness checks

This section consists of two parts. The first part provides two important extensions of the analysis, and the second part performs robustness checks.

¹³ The table with full statistics is available upon request from the authors.

Table 6
Log wage regressions (household partners): comparison group is rural stayers.

	OLS (1)	Panel RE (2)
Expropriated	0.170*** (0.036)	0.202*** (0.035)
Male	0.274*** (0.036)	0.281*** (0.036)
Married	0.106 (0.100)	0.141 (0.095)
Number of children	−0.046** (0.019)	−0.046** (0.019)
Disabled	0.005 (0.070)	−0.049 (0.066)
Secondary education or higher	0.053* (0.027)	0.043 (0.027)
Experience	0.010 (0.008)	0.008 (0.008)
Experience squared	−0.000* (0.000)	−0.000 (0.000)
GDP growth (city level)	−0.262** (0.120)	−0.314*** (0.117)
Pop density (city level)	0.003 (0.013)	−0.002 (0.013)
Unemployment (city level)	−1.451 (1.358)	−1.120 (1.377)
R ²	0.077	0.076
Obs.	3631	3631
Province effects	Yes	Yes
Year dummies	Yes	Yes

Source: RUMiC (2008–2010).

Notes: The table reports estimates from OLS and panel random effects regressions.

GDP growth: measures GDP growth rate in the city area between 1994 and 1995 based on 1990 price.

Pop density: measures number of persons (in 1000s) per square km in the city area 1996.

Unemployment: measures the unemployment rate in the city area in 1996.

Robust standard errors in parentheses are clustered at the individual level.

Significance levels: * $p < .1$, ** $p < .05$, *** $p < .01$.

Table 7
Treatment Effects Job Characteristics (Household Heads) Comparison Group is Migrants from within the Province.

Job Type	Relative risk ratio	Job search method	Relative risk ratio	Ownership	Relative risk ratio
Permanent	2.157*** (0.455)	Government arrangement	Base group	SOEs & GAIs	8.150*** (1.822)
Temporary	Base group	Employer recruit	0.113*** (0.041)	Private & SE	Base group
Self-employed	0.455*** (0.130)	Network	0.095*** (0.031)	Foreign-owned	0.796 (0.498)
		Other	0.051*** (0.023)		
Pseudo-R ²	0.113		0.114		0.182
Obs.	1686		1724		1671
Controls	Yes		Yes		Yes
Province effects	Yes		Yes		Yes
City effects	Yes		Yes		Yes
Year dummies	Yes		Yes		Yes

Source: RUMiC (2008–2009).

Notes: Models are estimated by multinomial logit specification. The reported numbers are estimated as relative risk ratios of being in one category of expropriated individuals compared to individuals in the respective reference group at each column. For example, in column (2), the relative risk ratio of being expropriated is 2.157 (0.455) for being in PER (SE) jobs vs. TEMP jobs. In other words, the expected risk of staying in the permanent jobs is higher for individuals who are expropriated. Control variables include gender, education, experience and squared, number of children, disability and marital status. City effects include, GDP growth: measures GDP growth rate in the city area between 1994 and 1995 based on 1990 price. Pop density: measures number of persons (in 1000s) per square km in the city area 1996. Unemployment: measures the unemployment rate in the city area in 1996.

Significance levels: * $p < .1$, ** $p < .05$, *** $p < .01$.

6.1. Alternative control groups

In the main results we treated rural stayers as our main control group. Table A1 and A2 in the Appendix report the results of panel random effect regressions for household heads and spouses, respectively, when model (1) uses the other four comparison groups.

The panel random effect estimator applied to household heads' wages explains between 15% to 40% of the wage variations in the UHS and MHS, instead of explaining only about 9.7% of the wage variation in the rural labour market case. We also find lower heterogeneity in labour market outcomes for these groups relative to those relying on agricultural income. Expropriation with hukou change is always statistically significantly different from zero, implying that expropriated hukou-changer household heads are indeed affected. The effect, however, differs across control groups: the expropriated hukou-changers earn, on average, 34.8% less per hour than comparable native urban hukou non-changers, and 72.0% less than highly skilled hukou-changers. In contrast, they earn more than household heads in the remaining control groups: +10.8% relative to migrants from nearby, and +24.1% relative to migrants from far away. These results also hold when we control for selection into employment, which is not reported here, as the selection term is not statistically different from zero.

As regards labour market outcomes of the household heads' spouses, the coefficient of the expropriated variable is negative relative to their counterparts holding an urban hukou (−25.7% relative to urban stayers and −55.8% relative to highly skilled urban hukou changers).¹⁴ The expropriated hukou-changer spouses, however, enjoy a wage premium relative to their migrant counterparts. The effect sizes are remarkably similar to those obtained in the case of household heads.

These results are interesting and have important implications. As noted earlier, several studies in China have documented the importance of obtaining a local hukou, highlighting the inferior position of rural migrants relative to urban natives in the city. The results presented here are consistent with previous studies that find labour market disadvantages for individuals holding a rural hukou (e.g. stayers and migrants). Yet, most research that analyses the consequences of a change in hukou status does not differentiate between the “reasons” for hukou change. Our results unravel the within-group inequality among hukou changers. In particular, we show that wage gap also exists between highly skilled hukou-changers and expropriated hukou changers with the former group earning substantially more.

6.2. Children's education

A change in legal rights associated with hukou change may exert its influences on children's outcomes by altering parental investments in children's human capital. We therefore extend our analysis to evaluate the spillover effects on children by estimating the causal impact of hukou-changing expropriation on the schooling outcomes of children aged 10–20 at the time of RUMiC survey. This is the critical time when they are about to finish their junior high school, and decide whether or not to undertake additional pre-university schooling. Importantly, children holding an urban hukou have easier access to urban schooling and at subsidised prices.

We hence study the education of children at the critical age where holding an urban hukou using the statistical model:

$$Education_{it} = a + R'_{it}b + dE_{it} + C'_if + P_i g + Year_t h + \eta_{it} \quad (3)$$

where $Education_{it}$ is the years of schooling of child i aged 10–20 surveyed at time t ; R_{it} is a vector of demographic (age, gender, disability status, number of siblings) and family background (parental education and wages) characteristics; E_{it} is the expropriation indicator. As before, it is a dummy variable equal to one if the child has experienced an urban hukou due to expropriation, while zero corresponds to the control group; C_i and P_i are the vectors of city-specific indicators and province fixed effects, respectively; $Year_t$ captures the time trend; and η_{it} is a random error term. Model (3) is estimated using the OLS estimator.¹⁵

Table 8 shows that receiving an urban hukou after being expropriated is associated with similar educational attainments as children of highly educated urban hukou holders after controlling for other important educational determinants. The expropriated children are observed to have benefited from expropriation compared to children of other comparison demographic groups, including rural stayers, rural-urban migrants and even the native urban hukou holders, in terms of their schooling.

These results probably reflect the differential access to and price of education for children holding urban and rural hukou,¹⁶ and suggest that switching from rural to urban hukou may lead to a reduction in intergenerational differences in educational outcomes, at least up to the end of senior high school. This result complements the finding that differences in educational attainment in China mostly reflect rural-urban differences rather than the coastal or inland geographic location of the province examined (Qian & Smyth, 2008). The rural-urban gap in children education is often seen as a bottleneck in the accumulation of human capital, and an area where government intervention is called for (Liu, 2005; Zhang et al., 2015). Our findings support the hypothesis that removing administrative barriers limiting access to education subsidies as those associated with children's hukou status can have a major effect in abating inequality in the formation of human capital.¹⁷ This result is novel altogether and contributes towards policy design as

¹⁴ Note that most household head partners are females, 87% for the rural sample, 81% for the expropriated, and 64% for migrants from close-by.

¹⁵ Data limitation prevents us from using the panel model for children's outcome due to small sample sizes, and therefore we use pooled OLS while controlling for time dummies. Summary statistics for children in the estimation sample are available upon request from the authors.

¹⁶ Our result is consistent with what has been reported in Liu (Liu, 2005), where he also documented the gap in educational attainment between urban hukou holders and rural hukou holders. The gap was attributed to both limited access to quality education and lower return to education for rural hukou holders.

¹⁷ In modern China, hukou has been the “root” of rural-urban inequality. In July of 2014, the National State Department of the Chinese government has again issued nation-wide policy guidelines regarding further reforming the current hukou registration system. One of the major objectives of the hukou reform is to remove differences in the rights to access public services, such as education or employment opportunities, between urban and rural hukou holders. By the end of November 2014, four major agricultural provinces (Xinjiang, Henan, Heilongjiang, and

Table 8
Children education regressions.

	Rural stayers	Urban hukou non-changers	High edu. Hukou changers	Migrants close-by	Migrants far away
	(1)	(2)	(3)	(4)	(5)
Expropriated	0.982*** (0.265)	0.262* (0.144)	0.089 (0.680)	0.709*** (0.221)	0.840*** (0.238)
Age	0.688*** (0.040)	0.874*** (0.011)	0.809*** (0.042)	0.792*** (0.030)	0.742*** (0.032)
Male	−0.091 (0.167)	−0.074 (0.067)	−0.172 (0.230)	−0.227 (0.178)	0.249 (0.200)
Number of siblings	−0.561*** (0.141)	−0.307*** (0.077)	−0.137 (0.193)	−0.099 (0.150)	−0.068 (0.138)
Disabled	−1.803 (1.101)	−1.922*** (0.222)	1.359*** (0.487)	1.249*** (0.479)	0.455 (0.589)
Father's education (years)	0.067 (0.046)	0.036*** (0.012)	−0.015 (0.055)	−0.011 (0.045)	0.089* (0.046)
Mother's education (years)	0.022 (0.046)	0.046*** (0.014)	0.059 (0.055)	0.058 (0.046)	−0.047 (0.040)
Father's log wage	−0.006 (0.157)	−0.136*** (0.050)	0.039 (0.235)	0.246 (0.173)	0.241 (0.148)
Mother's log wage	0.123 (0.196)	−0.134** (0.055)	−0.110 (0.203)	−0.263 (0.176)	−0.052 (0.184)
GDP growth (city level)	−2.318*** (0.827)	−1.211 (0.815)	0.322 (2.847)	3.954 (2.415)	4.653** (2.063)
Pop density (city level)	0.059 (0.078)	0.244*** (0.080)	0.067 (0.273)	0.120 (0.217)	0.327 (0.199)
Unemployment (city level)	15.654 (10.634)	−34.860*** (10.677)	−7.272 (23.488)	−9.956 (27.248)	−9.550 (27.633)
Adjusted R ²	0.374	0.8	0.807	0.812	0.661
Obs.	784	2655	141	220	339
Province effects	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes

Source: RUMiC (2008–2010).

Notes: Models are estimated by OLS. Columns (1)–(3) based on three waves of data from year 2008 to 2010 while columns (4)–(5) refer to year 2008 and 2009 (wave 1 and 2). GDP growth: measures GDP growth rate in the city area between 1994 and 1995 based on 1990 price.

Pop density: measures number of persons (in 1000s) per square km in the city area 1996.

Unemployment: measures the unemployment rate in the city area in 1996.

Robust standard errors in parentheses are clustered at the individual level.

Significance levels: * $p < .1$, ** $p < .05$, *** $p < .01$.

China continues its transition to a market-oriented economy.

6.3. Robustness checks

We re-estimated both pooled OLS and panel random effects regression models by excluding all observations from Nanjing, where expropriated farmers were given a choice between higher financial compensation and urban hukou in 1996. Table A3 in the Appendix presents the estimated effects of hukou-changing expropriation on wages when the control group is composed of rural stayers, and Table A4 when four alternative control groups are used. The estimated hukou effects on the wages of household heads and spouses after we trimmed the sample are very similar to those found in the original sample.

As a further robustness check, we incorporated additional city-level controls apart from the three key indicators on economy, population and labour market. In particular, we classified all cities in our sample into five tiers according to a tier list released by the *YiMagazine* in 2019.¹⁸ Cities in different tiers differ significantly in consumer behaviour, income level, population size, infrastructure, lifestyle, the level of sophistication in products and services, and so on. First-tier cities (e.g. Shanghai) represent the most developed areas while fifth-tier cities (e.g. Sanmenxia) are generally located on the least developed parts of the country. The idea is to more accurately capture unobservable regional differences that might be correlated with wage outcomes. The results after adding a richer set of city-level controls are reported in Tables A5 and A6. For household heads, the estimated impacts on wages, albeit being smaller and statistically weaker, still have the same signs and remain within reasonable distance of the benchmark estimates. The estimated

(footnote continued)

Hebei) have already abolished the rural/urban distinction in the household registration system. This clearly shows that the central government has long realised the problems associated with the hukou system and that it is determined to overhaul it in the near future.

¹⁸ The list contains 337 Chinese cities ranked on 6 tiers: tier 1, new tier 1, tier 2, tier 3, tier 4, and tier 5 on five dimensions: 1) concentration of commercial resources; 2) city's pivotability; 3) citizen vitality; 4) diversity of lifestyle; 5) future dynamism. We merged tier 1 and new tier 1 cities into a category called "first-tier".

effects on spouses' wages do not change much after the inclusion of city tier dummies in the models.

7. Conclusions

In this paper we investigate the labour market impact of rural-urban hukou change on household heads aged 18–55 for women and 18–60 for men and their working-age spouses in China. To identify the hukou changing effect, we exploit land expropriation as a quasi-natural experiment exogenous to individual and household choices, and implement Oster's (Oster, 2019) procedure to evaluate the robustness of the results to omitted variable bias. Using data from the RUMiC (2008–2010), we find strong evidence that those who changed their hukou status to urban via expropriation receive higher wages than comparable rural stayers and migrants and, hence, “catch up” with native urban residents in the labour market. Such effects occur through better quality jobs, the adoption of formal job search techniques and types of employer. Moreover, the expropriated hukou-changers earn substantially less than highly skilled hukou-changers. Hence, our results help to paint a more complete picture of the role of hukou transfer in labour market performance as earlier studies do not consider the reasons for hukou change.

We also examine the spillover effects of hukou change on children's educational outcomes bearing in mind that the results are obtained from a smaller sample size. The investment in education is similar between children experiencing a hukou change due to expropriation and due to high skills. Moreover, expropriated children with urban hukou have about one year of more schooling relative to comparable children who have only rural hukou. This novel result is important for policy formulation as leveling the hukou status among children in an urban area by removing differences in access to schooling and the price of education appears to remove intergenerational differences in educational investment up to age 20, regardless of differences in parental background. This is particularly relevant as China's government attempts to reduce income inequality. Improving access to education may represent a channel to do so. However, reforms to date seem to have mostly focused on the tertiary sector. Our findings suggest targeting earlier stages of education to prevent the rise of bottlenecks with too many would-be university students prevented to complete secondary education because of their rural hukou status.

Future research could expand on this work by looking at the relationship between hukou change and labour market outcomes of expropriated individuals belonging to various age groups across the wage distribution. Further evidence is needed also for the nexus between hukou change and other outcomes, especially subjective outcomes such as job satisfaction and subjective well-being. There is also scope to explore the school performance of children from expropriated households. Apart from children, elderly parents of expropriated individuals may be affected as well. It would be interesting to understand the spillover effects of expropriation-induced hukou change on other household members.

Appendix A. Appendix

Table A1

Panel random effects log wage regressions (household heads): different comparison groups.

	Rural stayers	Urban hukou non-changers	High edu. Hukou changers	Migrants close-by	Migrants far away
	(1)	(2)	(3)	(4)	(5)
Expropriated	0.103*** (0.032)	−0.348*** (0.038)	−0.720*** (0.067)	0.108** (0.050)	0.241*** (0.035)
Male	0.216*** (0.049)	0.186*** (0.025)	0.157** (0.065)	0.257*** (0.027)	0.160*** (0.015)
Married	0.098 (0.074)	0.127** (0.050)	0.236 (0.145)	0.119*** (0.040)	0.128*** (0.022)
Number of children	−0.032** (0.014)	−0.025 (0.030)	−0.016 (0.048)	−0.025 (0.026)	−0.014 (0.013)
Disabled	−0.072* (0.043)	−0.139** (0.065)	−0.199 (0.122)	−0.177** (0.071)	0.023 (0.040)
Secondary education or higher	0.036* (0.021)	0.019 (0.053)	0.070 (0.060)	0.155*** (0.040)	0.124*** (0.022)
Experience	0.012 (0.007)	−0.012*** (0.004)	0.017 (0.011)	0.005 (0.005)	0.004 (0.003)
Experience squared	−0.000*** (0.000)	−0.000 (0.000)	−0.000** (0.000)	−0.000** (0.000)	−0.000*** (0.000)
GDP growth (city level)	−0.201** (0.088)	0.422* (0.241)	−0.610 (0.433)	0.158 (0.321)	0.902*** (0.174)
Pop density (city level)	−0.000 (0.011)	0.106*** (0.024)	0.040 (0.034)	0.073** (0.030)	0.038** (0.018)
Unemployment (city level)	−1.616* (0.963)	−5.631** (2.702)	−5.158 (4.164)	−6.506 (4.236)	6.969*** (2.574)
R ²	0.097	0.224	0.399	0.294	0.154

(continued on next page)

Table A1 (continued)

	Rural stayers	Urban hukou non-changers	High edu. Hukou changers	Migrants close-by	Migrants far away
	(1)	(2)	(3)	(4)	(5)
Obs.	6697	4680	871	1904	6382
Province effects	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes

Source: RUMiC (2008–2010).

Notes: Models are estimated by panel data regression with random effects. Columns (1)–(3) based on three waves of data from year 2008 to 2010 while columns (4)–(5) refer to year 2008 and 2009 (wave 1 and 2).

GDP growth: measures GDP growth rate in the city area between 1994 and 1995 based on 1990 price.

Pop density: measures number of persons (in 1000s) per square km in the city area 1996.

Unemployment: measures the unemployment rate in the city area in 1996.

Robust standard errors in parentheses are clustered at the individual level.

Significance levels: * $p < .1$, ** $p < .05$, *** $p < .01$.

Table A2

Panel random effects log wage regressions (household partners): different comparison groups.

	Rural stayers	Urban hukou non-changers	High edu. Hukou changers	Migrants close-by	Migrants far away
	(1)	(2)	(3)	(4)	(5)
Expropriated	0.202*** (0.035)	−0.257*** (0.043)	−0.558*** (0.074)	0.100* (0.055)	0.238*** (0.039)
Male	0.281*** (0.036)	0.488*** (0.026)	0.392*** (0.064)	0.352*** (0.045)	0.249*** (0.026)
Married	0.141 (0.095)	−0.009 (0.129)	−0.343*** (0.046)	−0.203*** (0.051)	−0.197 (0.121)
Number of children	−0.046** (0.019)	0.015 (0.034)	−0.052 (0.049)	−0.097*** (0.036)	−0.019 (0.019)
Disabled	−0.049 (0.066)	0.096 (0.063)	0.029 (0.150)	0.044 (0.129)	0.043 (0.068)
Secondary education or higher	0.043 (0.027)	0.174*** (0.060)	0.189*** (0.069)	0.177*** (0.050)	0.118*** (0.028)
Experience	0.008 (0.008)	−0.016*** (0.005)	0.002 (0.012)	0.007 (0.009)	−0.007 (0.005)
Experience squared	−0.000 (0.000)	−0.000 (0.000)	−0.000 (0.000)	−0.000* (0.000)	−0.000 (0.000)
GDP growth (city level)	−0.314*** (0.117)	0.813*** (0.267)	−0.287 (0.527)	−0.403 (0.491)	0.356 (0.292)
Pop density (city level)	−0.002 (0.013)	0.111*** (0.026)	−0.013 (0.038)	−0.001 (0.035)	0.022 (0.023)
Unemployment (city level)	−1.120 (1.377)	−8.202*** (2.900)	−5.421 (3.970)	−2.847 (4.234)	−1.423 (3.358)
R ²	0.076	0.272	0.414	0.282	0.177
Obs.	3631	3845	682	964	2613
Province effects	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes

Source: RUMiC (2008–2010).

Notes: Models are estimated by panel data regression with random effects. Columns (1)–(3) based on three waves of data from year 2008 to 2010 while columns (4)–(5) refer to year 2008 and 2009 (wave 1 and 2).

GDP growth: measures GDP growth rate in the city area between 1994 and 1995 based on 1990 price.

Pop density: measures number of persons (in 1000s) per square km in the city area 1996.

Unemployment: measures the unemployment rate in the city area in 1996.

Robust standard errors in parentheses are clustered at the individual level.

Significance levels: * $p < .1$, ** $p < .05$, *** $p < .01$.

Table A3

Robustness checks, exclusion of nanjing: comparison group is rural stayers.

	Household heads		Household partners	
	OLS	Panel RE	OLS	Panel RE
	(1)	(2)	(3)	(4)
Expropriated	0.066* (0.034)	0.099*** (0.032)	0.157*** (0.036)	0.189*** (0.036)
Male	0.203*** (0.050)	0.210*** (0.049)	0.274*** (0.036)	0.281*** (0.036)
Married	0.114 (0.076)	0.090 (0.076)	0.121 (0.105)	0.150 (0.099)
Number of children	−0.039*** (0.015)	−0.036** (0.014)	−0.045** (0.019)	−0.045** (0.019)
Disabled	−0.062 (0.044)	−0.055 (0.042)	0.007 (0.072)	−0.045 (0.067)
Secondary education or higher	0.049** (0.022)	0.042** (0.021)	0.044 (0.027)	0.035 (0.027)
Experience	0.011 (0.007)	0.012 (0.007)	0.008 (0.008)	0.007 (0.008)
Experience squared	−0.000*** (0.000)	−0.000*** (0.000)	−0.000* (0.000)	−0.000 (0.000)
GDP growth (city level)	−0.265*** (0.097)	−0.249*** (0.094)	−0.422*** − (0.130)	0.460*** (0.127)
Pop density (city level)	0.010 (0.011)	0.002 (0.011)	0.007 (0.013)	0.002 (0.013)
Unemployment (city level)	−1.883* (0.973)	−1.657* (0.966)	−1.250 (1.359)	−1.000 (1.380)
R ²	0.1	0.1	0.08	0.079
Obs.	6529	6529	3527	3527
Province effects	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes

Source: RUMiC (2008–2010).

Notes: The table reports estimates from OLS and panel random effects regressions after excluding observations from the city of Nanjing. GDP growth: measures GDP growth rate in the city area between 1994 and 1995 based on 1990 price.

Pop density: measures number of persons (in 1000s) per square km in the city area 1996.

Unemployment: measures the unemployment rate in the city area in 1996.

Robust standard errors in parentheses are clustered at the individual level.

Significance levels: * $p < .1$, ** $p < .05$, *** $p < .01$.

Table A4

Robustness checks, exclusion of nanjing: different comparison groups.

	Rural stayers	Urban hukou non-changers	High edu. Hukou changers	Migrants close-by	Migrants far away
	(1)	(2)	(3)	(4)	(5)
Household heads					
Expropriated	0.099*** (0.032)	−0.342*** (0.037)	−0.721*** (0.068)	0.091* (0.051)	0.239*** (0.035)
R ²	0.1	0.234	0.394	0.299	0.157
Obs.	6529	4318	846	1839	5905
Household partners					
Expropriated	0.189*** (0.036)	−0.240*** (0.043)	−0.554*** (0.075)	0.100* (0.055)	0.238*** (0.040)
R ²	0.079	0.285	0.419	0.285	0.18
Obs.	3527	3562	659	937	2461

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Table A4 (continued)

	Rural stayers	Urban hukou non-changers	High edu. Hukou changers	Migrants close-by	Migrants far away
	(1)	(2)	(3)	(4)	(5)
Controls	Yes	Yes	Yes	Yes	Yes
Province effects	Yes	Yes	Yes	Yes	Yes
City effects	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes

Source: RUMiC (2008–2010).

Notes: The table reports estimates from panel random effects regressions after excluding observations from the city of Nanjing. Control variables include gender, education, experience and squared, number of children, disability and marital status. City effects include, GDP growth: measures GDP growth rate in the city area between 1994 and 1995 based on 1990 price. Pop density: measures number of persons (in 1000s) per square km in the city area 1996. Unemployment: measures the unemployment rate in the city area in 1996.

Robust standard errors in parentheses are clustered at the individual level.

Significance levels: * $p < .1$, ** $p < .05$, *** $p < .01$.

Table A5

Robustness checks, more regional controls: comparison group is rural stayers.

	Household heads		Household partners	
	OLS	Panel RE	OLS	Panel RE
	(1)	(2)	(3)	(4)
Expropriated	0.034 (0.033)	0.048 (0.032)	0.135*** (0.035)	0.155*** (0.035)
First-tier cities	0.223*** (0.051)	0.251*** (0.050)	0.220*** (0.064)	0.202*** (0.065)
Second-tier cities	0.071 (0.046)	0.076* (0.046)	0.091 (0.064)	0.053 (0.065)
Third-tier cities	−0.048 (0.042)	−0.051 (0.041)	0.004 (0.061)	−0.027 (0.062)
Fourth-tier cities	−0.025 (0.038)	−0.021 (0.038)	−0.069 (0.056)	−0.089 (0.057)
R^2	0.112	0.111	0.093	0.092
Obs.	6697	6697	3631	3631
Controls	Yes	Yes	Yes	Yes
Province effects	Yes	Yes	Yes	Yes
City effects	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes

Source: RUMiC (2008–2010).

Notes: The table reports estimates from OLS and panel random effects regressions. Control variables include gender, education, experience and squared, number of children, disability and marital status. City effects include, GDP growth: measures GDP growth rate in the city area between 1994 and 1995 based on 1990 price. Pop density: measures number of persons (in 1000s) per square km in the city area 1996. Unemployment: measures the unemployment rate in the city area in 1996.

Robust standard errors in parentheses are clustered at the individual level.

Significance levels: * $p < .1$, ** $p < .05$, *** $p < .01$.

Table A6

Robustness checks, more regional controls: different comparison groups.

	Rural stayers	Urban hukou non-changers	High edu. Hukou changers	Migrants close-by	Migrants far away
	(1)	(2)	(3)	(4)	(5)
Household heads					
Expropriated	0.048 (0.032)	−0.334*** (0.039)	−0.692*** (0.067)	0.152*** (0.052)	0.257*** (0.036)
First-tier cities	0.251*** (0.050)	0.424*** (0.089)	0.653*** (0.137)	0.141 (0.132)	−0.047 (0.076)
Second-tier cities	0.076* (0.046)	0.357*** (0.112)	0.429** (0.173)	−0.089 (0.170)	−0.175* (0.102)
Third-tier cities	−0.051	0.335***	0.560***	−0.008	−0.058

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Table A6 (continued)

	Rural stayers	Urban hukou non-changers	High edu. Hukou changers	Migrants close-by	Migrants far away
	(1)	(2)	(3)	(4)	(5)
Fourth-tier cities	(0.041) −0.021 (0.038)	(0.085) 0.400*** (0.096)	(0.145) 0.318** (0.142)	(0.135) −0.043 (0.166)	(0.083) 0.047 (0.229)
R ²	0.111	0.226	0.423	0.302	0.156
Obs.	6697	4680	871	1904	6382
Household partners					
Expropriated	0.155*** (0.035)	−0.240*** (0.043)	−0.526*** (0.074)	0.152*** (0.057)	0.263*** (0.042)
First-tier cities	0.202*** (0.065)	0.409*** (0.103)	0.419*** (0.159)	0.224 (0.166)	−0.041 (0.103)
Second-tier cities	0.053 (0.065)	0.355*** (0.123)	0.065 (0.188)	0.003 (0.202)	−0.156 (0.133)
Third-tier cities	−0.027 (0.062)	0.239** (0.095)	0.137 (0.164)	−0.046 (0.171)	−0.086 (0.113)
Fourth-tier cities	−0.089 (0.057)	0.296*** (0.110)	0.175 (0.171)	0.051 (0.299)	−0.196 (0.279)
R ²	0.092	0.275	0.449	0.297	0.179
Obs.	3631	3845	682	964	2613
Controls	Yes	Yes	Yes	Yes	Yes
Province effects	Yes	Yes	Yes	Yes	Yes
City effects	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes

Source: RUMiC (2008–2010).

Notes: The table reports estimates from panel random effects regressions. Columns (1)–(3) based on three waves of data from year 2008 to 2010 while columns (4)–(5) refer to year 2008 and 2009 (wave 1 and 2). Control variables include gender, education, experience and squared, number of children, disability and marital status. City effects include, GDP growth: measures GDP growth rate in the city area between 1994 and 1995 based on 1990 price. Pop density: measures number of persons (in 1000s) per square km in the city area 1996. Unemployment: measures the unemployment rate in the city area in 1996.

Robust standard errors in parentheses are clustered at the individual level.

Significance levels: * $p < .1$, ** $p < .05$, *** $p < .01$.

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