

The Causal Effect of Hukou on Health among Rural-to-Urban Migrants in China

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Abstract

A number of economic studies have shown a strong positive correlation between urban household registration status (*hukou*) and better health outcomes in China. The question at the center is whether the correlation implies causation. Change in the hukou system, in 1964, is used to test the causality between hukou and health. The regression-discontinuity (RD) design estimates suggest that urban hukou citizens have a much better chance of being in good health. The deleterious effects of rural hukou on health possibly work through mechanisms of income disparity, variations in educational attainment, and availability of health insurance. (*JEL I1 I3 R1 R5*)

Keywords rural-to-urban migrants, household registration system, hukou system, health status.

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Research on domestic rural-to-urban migration in China is growing quickly and already includes a number of studies investigating migrants' mental and physical health status. The results suggested that the hukou system has deleterious effects on the health of rural-to-urban migrants (Chan and Zhang, 1999; Grey, 2008; Li et al. 2006; Liang and Chen 2007). For instance, a qualitative study conducted on migrant worker's mental health in Beijing reported that psychological symptoms such as hostility, social isolation, sleep disorder, and substance abuse were very common among young rural-to-urban migrants who were interviewed (Li et al., 2006). Another study reported that migrant workers had a poorer health status than their non-migrant counterparts and the general Chinese population (Shen and Huang, 2003).

Since most of the studies rely upon data from a particular province or a specific city, the results may not reflect the overall health status of the floating population in China. It has also been questioned whether the observed positive correlation between urban hukou and better health represents a causal relationship, and therefore, is a good guideline for the revision of public policies. The heart of the problem lies in the interpretation of observed hukou-health correlation.

With a large, on-going national dataset from the China Health and Nutrition Survey (CHNS), change in household registration system (hukou) in 1964 is used to identify the causal effect of hukou on health among rural-to-urban migrants. In 1964, the central government started to put tight control on domestic migration. Thereafter, movement from rural to urban areas became virtually impossible. Hukou was (and is) ascribed at birth based upon one's mother's hukou status, and could not be altered easily. The change in the *hukou* system, which occurred in 1964, provided a particularly credible source of exogenous variation in hukou status. Figure 1a demonstrates the remarkable effect that the legislation change had on lowering the proportion of urban hukou residents. Among people born before 1965, there were more than 50% of urban hukou residents. Following the 1964 change in hukou policy, the fraction of urban hukou residents suddenly fell to about 40%. The same sharp drop in proportion of urban hukou residents was confirmed in the National Population Census of 1990 (Figure 1b).

I use this discontinuity in the proportion of urban hukou residents to identify the causal effect of hukou on health. This is done by comparing the health of people born just before and after the legislation change in the hukou system. Identification comes from the assumption that potential out-

comes are smooth around the cutoff (i.e., birth year 1965). The regression-discontinuity (RD) design estimates suggest that urban hukou citizens have much better chances of being in good health. The deleterious effect of rural hukou on health possibly works through mechanisms of labor disparity, limited access to healthcare, and deprivation of quality education.

There were several motivations for exploring the causal relationship between hukou and health.

First, there were 158 million rural-to-urban migrants in China, accounting for about 14% of the total population. A consolidated amount of evidence from prior research has shown that migration, either international or domestic, as well as voluntary or involuntary, is associated with increased risks for poor mental and physical health (Fan et al., 2013; Ivlevs and King, 2012; Leung and Lee, 2005; Mimura and Mauldin, 2005; Vesely et al., 2014). Improvement of their health will significantly enhance the overall health status of the Chinese population.

Also, rural-to-urban migration, both temporary and permanent, have important contributions to the rapid economic development in China. Better health of migrant workers have the potential to reduce job strain and improve their work performance.

Second, much of the current literature exploring the connection between migration and health, however, has been restricted to domestic or international migrants who seek permanent resettlement in western societies. Few attempts have been made to investigate the health status of rural-to-urban migrants in developing countries, such as China, which are undergoing explosive economic growth and large-scale social transformations. As a result of three decades of economic reforms, many rural-to-urban migrants in China have been transitory migrants, whose migrations are economically driven.

Third, research has mostly been done on segregated and discriminated migrants in the western context, where social segregation towards the minority migrant population has already been established. It is difficult to isolate the influence of institutional discrimination and social stigma against the migrant population. Because of the unique hukou system, rural-to-urban migrants in China offer an opportunity to examine the effects of initial social segregation on the mental and physical health of migrants.

With these motivations, it is important to trace out the causal effect of hukou on health, especially among rural-to-urban migrants. The identification of causality between rural hukou status and worse

health outcomes may lead to the formulation of more migrant-friendly policies. There may even be an implementation of effective instruments to respond to this internal migration phenomenon.

The structure for this paper is as follows. The next section gives relevant background information on the origin and changes of the hukou system in China, explaining the regression-discontinuity design. There will then be a description of the data used in this analysis. The section of method and results will provide the empirical method and results, which are carefully interpreted in the section of discussions. The last section is the conclusion.

Background Information on *Hukou* System

The *hukou* system requires individuals to register with local authorities to gain residency, thereby determining where people can live and work. It was first started in cities in 1951 and extended to the rural areas in 1955 (Yang and Zhou, 1999). In the early years of the system, it served largely as a monitoring, not a control, mechanism of population movements.

In the 1950s, there were several stimuli for rural-to-urban migration. The most influential stimulus lay in the "pull" of the cities, with the appeal of urban employment that offered workers security, a series of benefits, and prestige. Yet, there were also "push" features. These included escape from poorer regions, unhappiness with co-operatives, and the loss of income-earning opportunities, which were associated with the market as the state truncated private commerce and nationalized enterprises (Cheng and Selden, 1994). According to historical data, China's urban population increased from 10.6% of total population in 1949 to 14.6% in 1956, with a net gain of 34.6 million. Rural migrants accounted for 19.8 million of the total increase.

Due to the unexpected dramatic inflow of rural migrants to urban regions, the authorities issued a number of documents to control the huge domestic movement. When measures prompted by these state guidelines failed to stanch the population flow to major cities, the hukou system was promulgated as a permanent system in 1958 (Chan and Zhang, 1999). Urban dwellers were given a non-agricultural (urban) hukou status, with which they are allocated food, housing, and other social benefits accordingly. In contrast, rural residents were given an agricultural (rural) hukou status and were responsible for the nation's agricultural output.

Ironically, as the regulations were put into effect, the whole country was swept by the radical campaign of the Great Leap Forward. As the top priority of the state shifted to accelerating industrial growth, this new legislation was simply brushed aside as urban enterprises increased recruitment of labor, prompting some super-high rates of rural-urban migration in 1958-1959.

Then, in 1964, the State Council approved the Regulation of the Ministry of Public Security on Hukou Change. It put tight control on migration to towns or cities from the countryside or to cities from towns. Consequently, from 1965, movement from rural to urban areas became virtually impossible because hukou was (and is) ascribed at birth based upon one's mother's hukou status, and could not be altered.

Through the strict food rationing system and state-control of all industries, the unreachable gap between rural and urban household registration populations was formed after 1964. The rural agricultural hukou people could no longer freely migrate into cities to seek better living conditions. Only several groups were permitted to receive a change from rural to urban hukou under the stringent system (known as *nongzhuanfei*)—recruitment by a state-owned enterprise (*zhaogong*), enrollment in an institution of higher education (*zhaosheng*), promotion to senior administrative jobs (*zhaogan*) (Yang and Zhou, 1999). However, the groups mentioned above are basically a very small percentage of the whole population. Furthermore, if one chose to migrate without going through state channels, that person was not permitted access to resources in the destination area. Denial of food, housing, education, and any other social services rendered illegal migration impossible to maintain (Grey, 2008).

In short, the hukou system acted as a domestic passport system to draw a chasm in the Chinese society. It served to produce and reproduce social segregation and social disparity, especially during the planned economy from 1965 to 1978. While economic dualism (rural/urban) is characteristic of most developing countries and is also existent in China, the hukou system has reproduced a much stronger social dualism through economic, and more importantly, institutional means.

Data

Data were derived from the China Health and Nutrition Survey (CHNS), an ongoing longitudinal survey initiated in eight provinces in 1989. While the survey was not nationally representative, the provinces did vary substantially in geography, stage of economic development and health status. At present, there are about 4,400 households in the overall survey, covering some 19,000 individuals. Follow-up levels were high, but families that migrated from one community to a new one were not followed. The first round of CHNS data was collected in 1989. Eight additional waves were collected in 1991, 1993, 1997, 2000, 2004, 2006, 2009, and 2011.

The key explanatory variable in the study was the type of hukou (urban or rural) a respondent held. Respondents were asked: "What type of household registration do you belong to?" The survey recorded an individual's ranking with one if he or she had urban *hukou*, and zero otherwise.

The sample used was of men and women obtained from longitudinal sections between 1989 and 2011, for whom there were complete sets of data. Only individuals born after 1940 were included to minimize selection bias from the aged group. The survey was used as cross-sectional instead of panel, since there were little within-group variations of individual *hukou* status. Table 1 provides descriptive statistics of the principal variables used in regressions for the overall survey population, as well as different subgroups.

Multiple measures of overall health were used as dependent variables. There were three questions in the CHNS, which provide general information about the respondent's assessment of his or her state of health. Taking these questions in order, respondents are asked: "Right now, how would you describe your health compared to that of other people your age? Excellent, good, fair, poor, or unknown?" I recoded an individual's ranking as one if they are in good or excellent health, and zero otherwise. This variable is labeled Self-Reported Good Health. The mean values presented in Table 1 indicated that approximately 71% of respondents describe themselves as being in good overall health. Only about 70% of respondents in the subgroup, with rural *hukou*, identified themselves as in good overall health compared to 72.5% in the subgroup with urban hukou.

Next, in relation to illness or infirmity, each respondent was asked: "During the past 4 weeks, have you been sick or injured? Have you suffered from a chronic or acute disease?" This was

coded as a single dichotomous variable labeled: No illness. The mean values, presented in Table 1, suggested that the proportion of respondents who suffered from some illness was approximately 9.4%. About 11.5% of respondents in the rural hukou subgroup suffered from some illness while only about 8% of urban hukou respondents reported some illness in the past four weeks.

A subsequent question asked: “Over the past three months, have you had any difficulty in carrying out your daily activities and work due to illness?” (Daily activities are thought to include activities such as walking upstairs without assistance or feeding oneself.) This question offered more precise detail on the implications of the illness, as it measured the individual’s level of independence. This variable was labeled: No activity-limiting illness. From Table 1, it was apparent that approximately 6.22% of individuals in the data suffered from an activity-limiting illness. About 6% of individuals in the subgroup with rural hukou suffered from an activity-limiting illness, while around 6.9% of urban hukou respondents reported some activity-limiting illness in the past three months. All three health variables can be interpreted as measurements of the individual’s perceptions of his or her overall stock of health capital.

In Table 1, only 30% of the respondents had health insurance, with approximately 49.3% in the urban hukou subgroup, and only about 19.5% in the rural hukou subgroup. Also, over 60% of the whole sample held rural hukou and only 32.3% of households were located in urban areas. There was a huge income gap related to *hukou* status, no matter how the income was calculated. The average income of rural hukou individuals were only about half that of urban hukou individuals.

Model

Regression-Discontinuity Approach

From the background information on the hukou system, it was apparent that individuals born before 1964 had the opportunity to obtain a non-agricultural hukou type. They would have had to migrate to urban areas before the imposition of tight control on the hukou system, in 1964. This change in hukou policy allowed us to apply a fuzzy regression discontinuity (RD) design. Under some mild regularity conditions, the average causal effect of hukou status on health for cohorts born just before and just after the cutoff could be identified. There was no discontinuity in income or other covariants

among residents born around 1964.

Assuming one hukou-status cutoff and a homogeneous effect of hukou status on health outcomes (Van der Klaauw 2002):

$$Y_i = \gamma E(K_i|X_i) + a(X_i) + u_i, \quad (1)$$

$$E(K_i|X_i) = \beta 1(X_i \geq X_0) + b(X_i), \quad (2)$$

where i indexed individuals, Y_i denoted the outcome of interest (for example, self-reported health state) for individual i , K_i was the hukou status, X_i was the birth year, and X_0 was the value of hukou-status cutoff (i.e., 1965), $a(\cdot)$ and $b(\cdot)$ were flexible functions of birth year, and $E(u_i|X_i) = 0$. In the present setting this model corresponded to a "fuzzy" (as opposed to "sharp") RD design. As Figure 1 indicated, birth year affected, but did not perfectly explain, hukou status. In the baseline specifications, I used local quadratic regression (a local polynomial of order two) for $a(\cdot)$ and $b(\cdot)$.

Table 2 reported the results of the OLS regressions. A positive coefficient implied a positive connection between urban hukou and better health. OLS regressions for ease of interpretation were displayed. Logit models produced similar results. The OLS estimates reflected a highly statistically significant correlation between better health outcomes and urban hukou. A change from rural to urban hukou improved the chances of being in good health by 2.1 percentage points. The urban hukou people had 1.1% more chance to report a risk of suffering from an illness. There was no significant difference between urban and rural hukou in experiencing an activity-limiting illness.

Table 3 reported the results of the RD analysis. Column 1 presented the first-stage regression of urban *hukou* on indicators for whether an individual was born after 1964, along with the quadratic spline for birth year. The coefficients on the cutoff indicator was an estimate of the average decline, in probability, of urban *hukou* at this break. Consistent with the visual evidence in Figure 1a, the probability of having urban *hukou* dropped by about 6.7% at the threshold.

Figure 2 presented "raw" means of self-reported health status, along with the fitted values of a locally weighted regression, calculated within each birth year cohort. Around the cutoff, the change

in *hukou* legislation was accompanied by a decrease in the average self-reported health status. This observation was also borne out by the regression results. Columns 2–4 of Table 3 presented reduced-form regressions of self-reported health status, infirmity, and activity-limiting illness, showing positive and significant increases in health outcomes at the cutoff.

After exploring the possible causal relationship between hukou status and health outcomes, I examined channels through which hukou status influenced later life health outcomes. As mentioned earlier, I hypothesized that the effects of hukou work through mechanisms such as occupational segregation, wage differentials, and social isolation. Just as it seemed implausible to argue that hukou reforms could directly manipulate health outcomes, it seemed reasonable to assume that a change in hukou legislation only affected financial earnings, years of schooling, or access to healthcare through hukou status, shaping these dependent variables indirectly. Specifically, I applied the same RD model to investigate the impact of hukou status on the availability of healthcare.

The regressions were presented in Table 4. The dependent variable represented the availability of healthcare. The OLS estimates reflected a highly statistically significant correlation between healthcare accessibility and urban hukou. A change from rural to urban hukou improved the chances of having health insurance by 51.6%.

After controlling for income, availability of health insurance, and educational fulfillment, the effects of hukou on health outcomes were no longer significant. These results provided support that hukou status acted on health mainly through discrimination against rural migrants in financial income, access to health coverage, and educational accomplishment.

Discussions

From the results, it is clear that urban hukou dwellers have a much better chance for self-evaluated good health, and a significantly less chance to become sick, compared to rural-to-urban migrants with rural hukou. The possible explanations for these results are that urban hukou status grants people with better access to health allowance, public hospitalization, and higher economic income. Those with urban hukou are less likely to have to work in places with bad working conditions or poor sanitary circumstances.

The urbanites with urban hukou, however, reported more occurrence of difficulty in carrying out daily activities and work due to illness. There are two possible explanations. First, as they have much broader access to public health facilities, urban hukou inhabitants may be more concerned about infirmity, taking a break from daily activities and work when they are ill. Whereas, rural hukou people usually still carry out their daily-life activities and work, even when they are sick, in order to keep their income steady.

Second, as urban hukou households are, on average, smaller than that of rural hukou households, and most urban hukou citizens hold full-time employment outside of the household, urban hukou individuals probably encounter more difficulties in getting care by other family members when they are sick. They will, therefore, easily recognize themselves as not carrying out daily activities and work. In contrast, most rural hukou people do not have permanent full-time jobs, but have larger families with extended family members around the household. The individuals will be looked after when they are sick and will not identify themselves as activity-limited by poor health.

The interpretation of the results of this article involves an exploration of the mechanisms that lay behind the observed causal relationship. The hukou effects estimated here may pick up indirect effects of hukou on health as well as direct effects. I emphasize the role of healthcare accessibility in this case. A change from rural to urban hukou significantly improves the chances of having health insurance.

The Ministry of Labor and Social Security provides health insurance plans only to urban hukou residents. Although the New Rural Cooperative Health Scheme (NCMS) provides medical insurance to the rural population, current regulations stipulate that people who are registered in China's rural hukou can only participate in their local NCMS. This, in turn, poses barriers when migrants seek medical services in the health facilities of their destination cities.

Most migrants and their children have limited access to sanitation and other basic health facilities. Residing in densely-packed and unsanitary housing, migrant communities rapidly spread illness and disease to one another (Duan and Zhou, 2001; Wan, 1995; Zeng, 1997). Private hospitalization, the only option available to migrants, is a costly luxury that most will not take on. More importantly, they do not wish to "waste" remittances, which are designated to go to the home and support the family, for their own health problems (Grey, 2008).

Conclusions

Prior studies suggested that the hukou system has deleterious effects on the health of rural-to-urban migrants (Chan and Zhang, 1999; Grey, 2008; Li et al., 2006). As most of these studies rely upon data from a particular province, or a specific city, their results may not reflect the overall health status of this floating population in China. Also, it has been questioned whether the observed positive correlation between urban hukou and better health represents a causal relationship.

With a large, on-going national dataset from the China Health and Nutrition Survey (CHNS), plausible evidence is provided regarding a causal relationship between hukou and health status. RD estimates show that changing from a rural to urban household registration type increases the probability of being in good health by more than 10%. In particular, rural-to-urban migrants, with rural hukou in cities, have a significantly worse self-evaluation of health than rural hukou citizens who remain in rural areas. The main contribution of this study is to identify the causal deleterious effect of institutional discrimination and social stigma on health of rural hukou citizens, especially on the health of rural-to-urban migrants in China.

Since the causal effects of hukou disappeared after controlling for income disparity, healthcare variations, and years of schooling, hukou status potentially works on health through mechanisms such as access to quality education, availability of health facilities, and wage differentials. I focused on the role of healthcare accessibility. Although the New Rural Cooperative Health Scheme (NCMS) provides medical insurance to rural populations, current regulations stipulate that people who are registered in China's rural hukou can only participate in their local NCMS. This, in turn, poses barriers when migrants seek medical services in the health facilities of their destination cities.

The findings suggest that rural-to-urban migrants, as a group, face more access barriers than urbanites. In particular, health insurance is very important in reducing access barriers. Our results could aid policy makers in assessing critical needs among the floating population and set policy priorities accordingly. Obviously, providing healthcare coverage for every citizen is costly, and China may not be at the stage of economic development where such policy is a possibility or a priority. Some nationwide or localized policies could potentially alleviate access barriers faced by migrants and help to improve their health outcomes. For instance, community-based free or subsidized clin-

ics in migrant-concentrated residential areas can be very beneficial. Also, subsidized services for gynecological and maternal-child healthcare can provide good safety measures for female migrants and their children.

My work thus far suggests that rural hukou status has a deleterious effect on the health of rural citizens, especially among rural-to-urban migrants. A natural follow-up works is needed to explore, in greater depth, channels through which hukou status influenced later life health outcomes. Also, it would be interesting to check the variation in health among migrant children born in the urban household, versus migrant children that moved to urban settings with their parents. Therefore, it is imperative that a well-developed and detailed survey, targeting the health status of rural-to-urban domestic migrants in China, be carried out. This will better confirm the causal relationship between health and hukou status. It will also investigate the channels through which hukou status affects later-life health outputs.

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Table 1: Summary Statistics of Important Variables for Different Sub-samples

Variable	Total Survey Population Mean[std]	All individuals with Rural <i>hukou</i> Mean[std]	All individuals with Urban <i>hukou</i> Mean[std]
Self-reported Good Health	0.712[0.453]	0.699[0.459]	0.725[0.464]
No Illness	0.906[0.291]	0.885[0.271]	0.920[0.319]
No Activity-limiting Illness	0.938 [0.242]	0.939[0.239]	0.932[0.251]
Health insurance	0.301[0.657]	0.195[0.627]	0.493[0.791]
Hukou (1=rural, 0=urban)	0.618[0.486]		
Urban household (1=yes, 0=no)	0.323[0.494]	0.170[0.375]	0.549[0.498]
Female	0.500[0.500]	0.504[0.500]	0.500[0.500]
Age	35.107[20.406]	37.240[19.604]	42.429[19.721]
Age Squared	1648.944[1591.684]	1760.671[1556.800]	2163.760[1723.600]
Years of Schooling	4.700[3.390]	4.600[3.306]	4.745[3.530]
Total Net Household Income	6027.719[9203.700]	4709.970[7185.800]	9952.430[12986.000]
Total Net Individual Income	4085.650[7130.500]	3838.910[5665.880]	7939.400[10682.030]
<i>N</i>	47171	29152	18019

Standard errors in brackets.

Figure 1: Percent of Urban Hukou residents in cohorts from 1940-1990

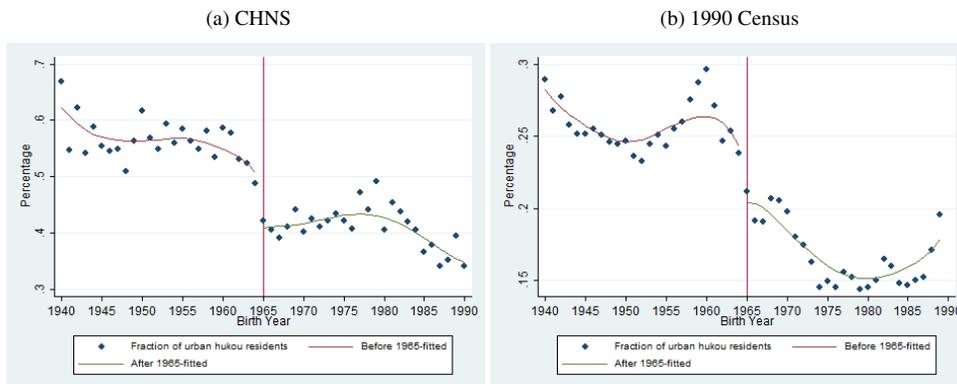


Table 2: OLS Specifications: *hukou* effects

	Self-reported good health (1)	No illness (2)	No activity-limiting illness (3)
<i>hukou</i>	0.021*** (0.005)	0.011*** (0.002)	-0.006 (0.006)
<i>age</i>	0.000 (0.001)	0.006** (0.002)	-0.004 (0.002)
<i>age</i> ²	-0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
<i>birthyear</i>	-0.006*** (0.001)	0.012*** (0.002)	0.008*** (0.001)
Survey year FE	Yes	Yes	Yes
Observations	42654	71115	30131
<i>R</i> ²	0.057	0.034	0.008

Note: Robust standard errors in parentheses.

- 0.1 * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: First-Stage and Reduced-Form Specifications: *hukou* effects

	First Stage	Reduced form		
	Urban <i>hukou</i> (1)	Self-reported good health (2)	No illness (3)	No activity -limiting illness (4)
<i>year65</i>	-0.067*** (0.014)	-0.127*** (0.037)	0.066* (0.032)	-0.063 (0.083)
<i>birthyear</i>	0.05*** (0.004)	0.000 (.)	0.057** (0.019)	0.000 (.)
<i>birthyear*year65</i>	-0.004 (0.005)	0.014 (0.011)	-0.049* (0.022)	-0.061* (0.028)
<i>birthyear</i> ² * <i>year65</i>	-0.001- (0.000)	-0.003*** (0.001)	0.004 (0.002)	-0.004- (0.002)
<i>birthyear</i> ²	0.000*** (0.000)	0.001 (0.001)	0.000 (0.002)	0.004*** (0.001)
<i>age</i>	0.0421 (0.0421)	-0.012 (0.010)	0.099*** (0.011)	-0.034- (0.020)
<i>agesqu</i>	0.00 (0.00)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000 (0.000)
Survey year FE	Yes	Yes	Yes	Yes
Observations	54401	40408	39167	25100
<i>R</i> ²	0.009	0.0452	0.0442	0.0175

Note: Robust standard errors in parentheses.

- 0.1 * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Healthcare accessibility: *hukou* effects

	OLS (1)	Reduced form (2)
<i>hukou</i>	0.516*** (0.013)	
<i>year65</i>		0.117*** (0.030)
<i>age</i>	0.136*** (0.015)	0.162*** (0.015)
<i>age</i> ²	0.000* (0.000)	0.000 (0.000)
<i>birthyear</i>	0.130*** (0.015)	0.147*** (0.016)
<i>birthyear</i> * <i>year65</i>		-0.001* (0.001)
<i>birthyear</i> ² * <i>year65</i>		0.003*** (0.001)
Observations	60324	71337
<i>R</i> ²	0.352	0.304

Note: Robust standard errors in parentheses.
 - 0.1 * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 2: Self-reported health status and birth year from 1940 to 1990

