The Social Impact of Rural-Urban Migration on Urban 'Natives'

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Abstract

Chinese cities have continued to accommodate more and more rural migrants as millions has moved out of rural areas since the mid 1990s. In a companion paper we examined the impact of rural-urban migration on urban native workers' labour market outcomes (employment and wages). This paper examines its impact on urban natives' social outcomes. In particular, we are interested in the effect of migration on urban crime rate and urban natives' access to social services. We find that rural migrants do not impose significant pressures on urban residents' access to education and health services, but have a modest negative effect on urban public transportation. With regard to crime we find that migrant ratio is positively associated with urban crime rates. However, the first-difference and first-difference with IV estimations result in small negative or zero effect of migrant ratio on the city crime rate. Thus, the illusion that migrants contribute to the increase in the city crime rate is due largely to reverse causality and/or omitted variable biases.

Key word: Migration, Crime, Native social outcomes, China.

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1 Introduction

As a consequence of continuous economic growth in China, the past two decades has witnessed a rapid city expansion with millions of rural migrants moving from rural to urban areas. By now, around 150 million rural migrants are working in Chinese cities with ten to twenty million newcomers each year (NBS, 2009). This rapid and substantial increase in rural migrant inflows has aroused great concerns within city governments and the urban public that rural migrants might cause social problems in cities, such as imposing pressure on local residents access to public services and raising crime rates.

A 2008 survey of city community leaders from 19 Chinese cities on attitudes towards rural migrants suggests that urban residents and local governments are more concerned with rural migrants social impact than their labour market impact. Among the 787 urban community heads surveyed, 87 per cent worried that "rural migrant inflow threatens the safety and security of local community". Furthermore, 67 cent of community heads believed that most of the serious crime were committed by rural migrants. 58.7 per cent of heads believed rural migrants "put pressure on social services and city infrastructure" which is much larger than the proportion concerned that "rural migrants may take jobs away from urban workers" - which only accounted for 23.4 per cent of community heads. From urban residents point of view, it seems that rural migrant inflow is a major source of city crime and congestion in public infrastructure.

Although the public believes and worries about adverse impact of rural-urban migrants on city safety and city social services, no one has provided careful studies to establish the link between migration and the increase in crime or deterioration of social services or social infrastructure. The lack of empirical evidence, however, did not deter the government from implementing many restrictive policies in order to keep migrants out of the urban areas. For example, rural migrants' children were restricted from entering urban schools; migrant access to urban health-care system is very limited; and majority of migrants has no unemployment insurance or health insurance which are available to urban local people.

In this paper we examine whether and the extent to which rural-urban migration affects city crime rate and urban natives' access to social services.

The remainder of this paper is arranged as follows. Section 2 briefly discusses the conceptual framework, the channels through which rural migrants may affect urban residents' access to social services, provides some institutional

background, and surveys the literature in related fields. The estimation strategy and model specifications are presented in Section 3. Section 4 describes the major data sources and provides summary statistics. Empirical results are reported and discussed in Section 5. Section 6 concludes the paper.

2 Conceptural Framework, Institutional Background, and Literature

Unlike the urbanisation process in many developed and developing countries, rural-urban migration in China has been proceeded under a guest-worker scheme (Du, Gregory and Meng, 2006), whereby individuals from rural areas (with rural identification card known as rural *hukou*) can only move to cities temporarily for work purpose. Migrants are on average young adults and a larger proportion of them are males. They come to cities for 7 to 8 years to make money and their *hukou* status in general cannot be changed (Golley and Meng, 2011). The definition of "migrants" and "urban residents" in this paper, therefore, is very clear. "Migrants" refer to individuals with rural *hukou* but residing in cities, while "urban residents" refer to people with urban *hukou* and residing in urban areas.[1]

2.1 Channels of Rural Migrants' Effects

As an important component of the urban society, rural migrants not only generate demand for goods and services as consumers but also provide tax revenue as taxpayers. In this context, rural migrant inflow may affect urban residents' access to various social services through two channels.

First, as consumers, rural migrants may compete with urban residents for the consumption of scarce public facilities and services or they may change the consumption composition of the total city population through affecting demographic characteristics, thereby affecting urban residents' access to social services. This effect is a direct effect, which can be further decomposed into the 'scale effect' and the 'composition effect'. The 'scale effect' is associated with the increases in population in each city due to rural migrant inflow.[2] If

[1] We also distinguish "urban-to-urban migrants" from "urban residents". This is identified based on hukou locations. If an individual with an urban hukou but the hukou location is not in the city he/she is residing the person is identified as "urban-to-urban migrants".

[2] Based on the censuses and population survey data, rural migrants have increased total city population by 4.8%, 8.5% and 14.1% in 1990, 2000 and 2005, respectively.

the level of public service is given, rural migrants may compete with urban residents in obtaining some social services through increasing the total number of potential consumers. Thus, the effect through this channel is usually negative. The 'composition effect' is associated with structural changes among the population, which affects urban consumption behaviour due to the differences in consumption preferences and demographic features between urban residents and rural migrants. Because the consumption preferences of rural migrants and urban residents may be different for various social services, the effect on urban residents' access to each social outcome through this channel is ambiguous. It could be zero or negative.

Second, as taxpayers, rural migrants contribute to the rising of local governments' fiscal revenue. If city governments make use of any such additional tax revenue to provide more public facilities and services through government investment, urban residents' access to social services may be kept constant or even increase. This is an indirect channel, or the 'fiscal effect', which is usually positive. Thus, the government agency, as a decision maker, plays a very important role in determining rural migrants' fiscal effect on public services. Since city governments may invest disproportionately across different public services , the possible fiscal effect may actually depend on governments' investment preferences.

Combining the above two channels (i.e., direct and indirect channels), it is clear that the final effect of rural-urban migration on access to various social services of urban residents is ambiguous, which highlights the necessity for empirical analysis.

2.2 Institutional settings

Below we provide a briefly discussion about the possible impacts of rural migrants, as consumers of public services, on urban residents' access to education, health, public transportation, and their possible impact on urban crime rates based on the current institutional settings in Chinese urban cities.

Education Services: According to an official research report (Research Team of the State Council, 2006), there were 15 million rural migrants' children (who hold the rural *hukou*) residing in cities; among them 44 per cent were aged between 6 and 15 - the age range for compulsory education; an additional 1.5 million migrants' children may move into cities with their parents each year. This may imply that a large influx of rural migrants' children generates a greater

demand for urban basic education.

Although rural migrants and their children have continued to move into cities, it was not until the late 1990s that they were allowed limited access to local public schools. For a very long time, rural migrants' children were strictly restricted from entering urban public schools as they did not have local urban *hukou*. As a response, migrants set up their own schools with no input from local governments. Needless to say, the quality of education in migrant schools are very low.

In March 1998, a document issued by the central government allowed migrant children to enter limited classes or schools in destination cities for the first time, conditional on them only enrolled in special classes for migrant children in public schools or enrolled in private migrant schools. If they enrolled in public schools, they needed to pay extra fees for enrolment and the local governments of migrant sending regions were required to restrict school aged children from moving to cities.

A new regulation in 2001 stipulated that destination city governments should take the responsibility for providing compulsory education to migrant children rather than the government in the sending areas. This new regulation legally guarantees children of migrants' entitlement in accessing basic education in host cities.

Despite the significant progress made in government policies, in reality migrant children's access to public schools is still very limited. For example, it is estimated that in Beijing 70% of the migrant children enrolled in migrant schools (Liu, 2010), while in one of the best migrant-accommodating cities, Shanghai, there are still 30% migrant children attending migrant schools today and even when they are enrolled in the local public schools it has been restricted to the least resourceful ones (Feng and Chen, 2011). In addition, migrant children are still not allowed access to schools beyond nine-year compulsory education in cities. As a result, few can continue their formal education in the host cities and instead a large number of them drop out of school and start working, which may affect the education attainment of rural migrants' children. The rest have to return to their rural hometown to continue their senior high school study.

Health-Care Services: The current urban health insurance system was introduced in urban China in 1998. The system, however, restricts to urban *hukou* employees only, rural migrants who do not have urban *hukou* are not covered by

the urban health insurance system.[3] Although in recent years some attempts[4] were made by the central government to include migrants into the urban health insurance system, up until 2010, the proportion of migrants with urban health insurance is around 20% (Frijters, Gregory, and Meng, 2011). Migrants are covered by the New Rural Cooperative Health Insurance (NRCHI) [5] in their home villages, but NRCHI does not cover their medical expenditure in cities. In addition, the majority of rural migrants cannot afford any urban commercial health insurance. Thus, rural migrants generally do not have much access to the urban health services. When they are seriously ill, they go back to their rural villages.

Evidence from the first-wave of the Rural-Urban Migration in China and Indonesia project (RUMiCI)[6] China survey conducted in 2008 suggests that, among those rural migrants who had been sick in the past three months (accounting for 14.3 per cent of total rural migrants), only 15.3 per cent went to a hospital. Of those individuals with serious illness only 30 per cent went to a hospital, and only 8.2 per cent of those were covered by health city health insurance. This suggests the impact of rural migrants on health care provided by cities is unlikely to be significant.

Public Transportation Services: It is widely believed that the rural migrant inflow may impose pressure on inner-city transportation through the 'scale effect'. However, previous studies find that many rural migrants who are employed in the construction sector and manufacturing factories usually live in construction sets or dormitories provided by employers which are either close to or at their work sites (Research team of the State Council of China, 2006). The RUMICI survey indicates that 47% of the migrants in 2008 are living in work places or employer provided nearby accommodations. Thus, the impact of rural migrant inflow on inner-city transportation should not be very large.

City Crime Rates: Crime rates are relatively independent of that public facilities and services. Nevertheless, the government spending on law enforcement

[3] See the 'Decision on Setting Up Urban Workers' Basic Health Insurance System' issued by the State Council of China in 1998.

[4] The new Labour and Contract Law was issued in 2008 which aimed at protecting the basic social welfare of rural migrants.

[5] The new rural cooperative health insurance system was initiated in October 2002. It has been widely carried out in rural China since 2008 and is planned to cover all rural areas by 2010.

[6] RUMiCI Survey in China has three main samples: the Rural Household Survey of 8000 households, the Urban Household Survey of 5000 households, and the Migrant Household Survey of 5000 households. The survey was conducted annually from 2008 to 2011. Detailed information on the survey and the data are available at http://rse.anu.edu.au/rumici/.

is an important determinant of crime rates. This is why we study the migration impact on crime rates together with that on urban resident access to other public services.

From the point of view of migrants as consumers of the law enforcement services, there are several reasons to suspect rural migrant inflow may lead to an increase in city crime rates. First, according to economic theory whether an individual commits a crime is related to opportunity cost (Ehrlich, 1973 and Becker, 1974). In Chinese cities, rural migrants and urban residents may face different opportunity costs in committing a crime. Rural migrants usually earn less than their urban counterparts and are without any social welfare (Meng and Zhang, 2001; Sheng and Peng, 2005; Du, Gregory and Meng, 2006). Thus, they may have a relatively low opportunity cost and high return to commit crime. Second, the majority of rural migrants are males between 18-40, which is considered the group which is more likely to be engaged in criminal activities than the rest of the population (Freeman, 1991; Levitt, 1998; Grogger, 1998).[7] Third, rural-urban migrant inflow is associated with an increase in total city population as well as population density, which is considered one of the key determinants of a city's crime level (Glaeser and Sacerdote, 1999).

2.3 Social Services Related Fiscal Arrangement

In our conceptual framework we assumed two roles of migrant workers: as social service consumers and as contributors. To understand the net impact of migrant inflow on urban local residents' access to social services one needs to have some information on who pays for these services and where the money comes from.

The first issue we care about is the divide between the central and local governments. As our analysis below based predominantly on across city variations, we would want to make sure that local governments rather than the central government pay for majority of these services. Otherwise, in the case of cross-subsidy, the role of migrants within each city will be very unclear.

China's fiscal arrangement has changed a few times over the past 50 or so years. The most recent changes occurred in 1984 and 1993. The first reform decentralized the government fiscal revenue and spending and increased the local government role significantly. The 1993 reform re-centralised government revenue collection, but does not seem to have changed decentralised spending

[7] According to the 2005 1% Population Survey data, 37.1 percent of rural migrants in Chinese cities are males aged between 15-40; while the ratio for urban hukou population is 22.8 percent.

pattern much (Xu, Gao and Zhao, 2009). Figure 1 shows the local government share of the total fiscal expenditure and it clearly indicates the increasing role of the local governments since the 1984 reform. We also have some limited information on the central and local government shares of total education and health expenditure for 2005 (Table 1). The table shows that in that year, 94% and 98% of the government education and health expenditure, respectively, are paid by the local government. We do not have information for other years and for fiscal expenditure on public transport or public security, but the total expenditure share presented in Figure 1 should be an indication on the large share of local government.

The second issue we need to discuss is the extent to which government expenditure dominates the total expenditure on the provision of social services we examine in this paper. This issue is more relevant for the education and health services as it could be paid by private sources. The public transportation and public security would be mainly paid for by the government. Table 2 presents the share of government and private expenditure on education and health for the year 1991, 2000 and 2005. The table indicates that in all three years the government fiscal expenditure accounted for more than 60% of the total expenditure on education, whereas only 23%, 16% and 18% of the health expenditure in the three years, respectively, were paid for by the government. Thus, the government contribution to health-care service provision is very limited.

2.4 Review of Related Literature

Although there is a great concern and debate over whether rural migrants impose pressure on access to public services, city infrastructure and on increase in city crime rates in China, few studies have provided evidence for these concerns. Yet, there has been a large body of international immigration literature focusing on the non-labour market impact of immigrants.

A number of studies have examined issues such as the effects of immigrants on prices (Cortes, 2008), on the housing market (Saiz, 2003), and the fiscal effect (Auerbach and Oreopoulos, 1999; Storesletten, 2000). Cortes (2008) examines the effect of unskilled immigrants on the prices of non-traded goods and services in the U.S. by using analysis based on variation across states within the U.S.. She finds an increase in the density of unskilled immigrants in U.S. cities can reduce prices and the channel through which the price effect takes place is *that unskilled immigrant workers with low wages decrease the price of non-tradable*

goods. A study on immigrants impact on rents and housing prices by Saiz (2003) suggests immigrant inflows can push up rents and housing values in destination cities in the U.S.. Storesletten (2000) computes the net government gain of hosting additional immigrants in the U.S. given their skill and age at the time of immigration by using a dynamic equilibrium model of population transition. He finds the fiscal deficit due to an aging problem could be resolved by implementing immigration policies that allow an increased inflow of working-age high skilled immigrants. Using the generational accounting technique, Auerbach and Oreopoulos (1999) examine the impact of a change in immigrant inflow in the U.S. on the fiscal burdens of current and future generations and conclude that the impact of immigration on fiscal balance is extremely small.

There is another strand of immigration literature which examines the relationship between immigration and crime (Butcher and Piehl, 1998 and 2007; Bianchi et al., 2008). Butcher and Piehl (1998) show that when controlling for the demographic characteristics of a city, recent immigrants appear to have no effect on crime rates and its growth rate in U.S. cities. In another study focusing on Italy Bianchi, Buonanno and Pinotti (2008) find that the size of the immigrant population is positively correlated with the incidence of property crimes as well as with the total crime rate.

A recent study by Edlund, Li, Yi and Zhang (2007) aims at exploring the crime rates in China and its determinants using the annual province-level data for the period 1988-2004. Since their research interest focuses on the relationship between male-biased sex ratios and crime rates, they only include the urbanisation rate rather than the "rate of rural-urban migrants in total city population" as one of their control variables in the estimation regression. Their estimation results show that urbanisation has a very modest positive effect on violence and property crime rates. However, no direct correlation between rural-urban migration and crime rates is examined.

The above studies have different focuses. Nevertheless, the basic theory and methodology applied in their analysis provide valuable guidance to this study.

3 Model Specifications and Estimation Strategy

In this study we treat cities as independent budgetary units and uses variation across cities to examine the effect of migration on the social outcomes of interest.

3.1 Model Specification

When discussing the conceptual framework we distinguish two channels—direct and indirect; and three effects—scale, composition, and fiscal, through which rural migrant inflow may affect urban residents' access to social services or impact on city crime rates. However, in the estimation these channels and possible effects may not be separately measured and identified. The empirical estimation, thus, will be reduced form focusing on the net impact of rural-urban migration through all three effects. The baseline model is specified as below:

$$LnY_{it} = \alpha + \beta Ln(R/U)_{it} + \gamma X_{it} + \delta_t + \epsilon_{it}, \tag{1}$$

where LnY_{it} denotes the logarithm of outcome variables for city i in year t ($t = 1990, 2000$ or 2005); $Ln(R/U)_{it}$ measures the logarithm of the ratio of rural migrants to the total urban population for city i in year t; X_{it} refers to a set of exogenous control variables which are different for different outcome variables; and δ_t is the year fixed effects which captures the common time effect for all cities.

The outcome variables used in Equation (1) include two education indexes, two alternative health-care indexes, one index for public transportation, and one measure for the city level crime rate. More specifically, the two proxies for education services include teacher-student ratios for primary schools and for junior and senior high schools. Health-care outcome is measured as the number of hospital beds per 1000 inhabitants or the number of doctors per 1000 inhabitants. The passengers per bus is chosen as an indicator for city public transportation. The city crime rate variable is measured as city level prosecuted crime cases divided by the total city population. We will discuss in details the definitions of these variables in the Data section.

The control variables, X_{it}, used for each outcome equation differ somewhat. There are three common control variables for all the outcome equations: (1) The 'logarithm of real GDP per capita' is used to capture the level of economic development in each city, which may affect the level of fiscal power a city has in providing social services. (2) The 'population density of the city' is used to capture the general impact of city size. (3) The 'ratio of urban-urban migrants to total city population' is used to capture a possible competition for social services from city-to-city migrants. It also measures the degree of population mobility in addition to rural-to-urban migrants. Studies have found that a city with a higher degree of regional mobility tends to have more criminal activities

(Rephann, 1999).[8]

In addition to these common control variables, the education regression also include the 'proportion of city total population aged between 6-12' for primary school equation and the 'proportion of population aged between 13-18' for junior/senior high school equation. They capture the demand side factors for urban education. The health care regressions include the 'proportion of the total city population over the age of 65', since more aged people may generate higher demand and put more pressure on health care facilities. For the bus transportation regression, the 'total areas within the city administrative territory' and the 'number of taxis' are chosen as control variables.

We include more control variables in the crime equation. The demographic variable we use is 'the percentage of men aged 15-40 among the total city population' to capture the effect that young men are the demographic group most likely to commit crime (Freeman, 1991; Levitt, 1998; Grogger, 1998). We also follow Bianchi et al. (2008), Butcher and Piehl (1998) and Rephann (1999) to include socioeconomic variables such as the 'employment rate' and the 'Gini coefficient' to proxy for economic and social conditions which may be associated with the local crime rate.

The OLS estimation of Equation (1) on our main interest, β, may be inconsistent due to two potential endogeneity problems.

First, there might be a reverse causality between our outcome variables and the migrant ratio. It can be argued that rural migrants are more likely to move to cities where there is better public infrastructures, better social services, and lower crime rate. or that cities with an inferior social infrastructure or high crime rate may impose more restrictions on rural migrant inflow. Failure to address the reverse causality problem may lead to under-estimation of the effect of rural migrant influx on the outcome variables.

Second, the omitted variable problem is another potential concern. It can be argued that some unobservable omitted variable in the error term, such as the supply shocks due to the impact macro-economic fluctuation on city fiscal positions which may affect both rural migrant inflow and urban residents' social outcomes.

To eliminate the endogeneity problems, we adopt first-difference and first-difference with IV methods. More specifically, the error term ϵ_{it} of Equation (1) can be decomposed into two components, i.e., $\epsilon_{it} = u_i + e_{it}$, where u_i varies

[8] The ratio of city-to-city migrants is quite low. In the three data points we used, it is 1.1%, 1.8%, and 5.0% for 1990, 2000, and 2005, respectively.

across cities but not over time, while e_{it} varies across cities and over time. After taking first difference, the time-invariant component u_i can be eliminated from Equation (1), which can help to mitigate the endogeneity concern due to the time-invariant city specific effect. For example, the historical tradition of a city's public infrastructure, which does not vary in the short term, is correlated with the current city infrastructure and may also be associated with the migrant ratio. The first-difference estimation model can be written as:

$$\Delta LnY_{it} = \theta + \beta \Delta Ln(R/U)_{it} + \gamma \Delta X_{it} + \Delta e_{it}, \tag{2}$$

where Δ indicates first-difference, and Δe_{it} refers to the difference in the time variant part of the original error term, ϵ_{it}.

After taking first-difference, there still be some unobserved factors remaining in error term, Δe_{it}, of Equation (2), which are correlated with both the change of log migrant ratio, $\Delta Ln(R/U)_{it}$, and the change in social outcome, ΔLnY_{it}. This endogeneity problem from the time-variant city effect can be further eliminated by using the IV approach. In principle, the instrument used should be uncorrelated with Δe_{it}, and strongly correlated with $\Delta Ln(R/U)_{it}$.

3.2 The Instrumental Variable[9]

The instrumental variable used in this study is the first-difference in 'predicted migrant ratio'. Following the idea developed in Cortes (2008) and Boustan et al. (2010) we use $\Delta \log(\widehat{R}/U)_{it}$ $(=[log(\frac{\widehat{R}}{U})_{it} - \log(\frac{\widehat{R}}{U})_{it-1}])$ as the instrument, where $(\widehat{R}_{it})$ is predicted number of migrants in city i:

$$\widehat{R}_{it} = \sum_{k=1}^{K} \widehat{OM_{kt}} * \widehat{P_{kit}}. \tag{3}$$

The subscript k indicates the sending rural province. $\widehat{OM_{kt}}$ is the predicted total number of migrants from the sending rural province k at time t, and $\widehat{P_{kit}}$ is the predicted probability of the outflow migrants from the sending province k to the destination city i at time t. $\widehat{OM_{kt}}$ is obtained from the estimation of the following equation:

$$OM_{kt} = \eta + \phi Z_{kt-1} + \nu_{kt}, \tag{4}$$

[9] The instrument used in this paper is similar to that used in Meng and Zhang (2010).

where Z_{kt-1} is a vector of *lagged* push factors[10] at the rural sending region, including "land per capita", "household income per capita", "total land area subject to natural disasters", and "total machinary power for agriculture production".[11]

The probability of migrants moving from rural area k to the destination city i (P_{ki}) is specified as a function of the quadratic in the geographic distance between sending region k and destination city i:

$$P_{kit} = \theta + \lambda_k D_{ki} + \kappa_k D_{ki}^2 + \mu_{kt}. \tag{5}$$

We estimate Equation (5) for each pair of sending region (province) k and receiving region (city) i and the predicted probabilities ($\widehat{P_{kit}}$) are then obtained for each pair of k and i.

The difference in predicted migrant ratios between time t and $t-1$, $(log(\frac{\widehat{R}}{U})_{it} - \log(\frac{\widehat{R}}{U})_{it-1})$, is then used as the instrument. The results of Equations (4) and (5) are reported in Table A1 of Appendix A and they show that most push factors and the distance variables are highly correlated to the migrant inflow to city i. We believe that none of the lagged push factors in sending regions, Z_{kt-1}, should have a direct effect on urban local workers' social outcome variables at receiving cities 5 to 10 years later. The variable measuring geographic distance between k and i should also be not directly related to social service provisions or the crime rate in city i. Thus, our instrument should satisfy the exclusion restriction.

3.3 Estimation Efficiency: Seemingly Unrelated Regression

It is widely believed that various urban residents social outcomes may be correlated with each other since all urban public services are provided by the same local government with one budget constraint. As Zellner (1962) has pointed out, when a common independent variable is used to explain a set of correlated dependent variables, the correlation among these dependent variables may generate correlations among error terms across regressions through the unobserved

[10] We use 1985, 1990, and 2000 push variables (Z_{kt-1}) for the 1990, 2000, and 2005 number of out migration from sending region k, OM_{kt}.

[11] In the estimation, to avoid adjustment on the size of labor force in the regression, we use out migration rate (OMR_k, defined as OM_k divided by total rural labor force in region k) as the dependent variable. The final predicted out migration ($\widehat{OM}_k$) is obtained as a product of the predicted out migration rate ($\widehat{OMR}_k$) and the total rural labour force in region k.

cross-function constraints. Failure to consider the correlation of error terms across regressions may overestimate standard errors for estimation coefficients and therefore could result in falsely making a conclusion of insignificant estimation results.

In this study, the single-function estimation based on Equations (1) and (2) as well as Equation (2) with IV estimation may suffer from overestimation of standard errors problem. Given the potential correlation among our outcome variables for representing urban residents social outcome from different aspects, there might be a significant correlation among the error terms across the single-function regressions of each social outcome index on the rural migrant ratio. To deal with this potential problem, we use the seemingly unrelated regression (SUR) technique (Zellner, 1962; Bartels and Fiebig, 1991) as a robustness check to adjust standard errors for estimated coefficients across all regressions based on the OLS, first-difference, and first-difference with IV estimations.[12]

4 Data and Summary Statistics

4.1 Data

The data used for this paper are mainly taken from two sources. The first data source is the China Population Censuses and Population Survey including the 1 percent micro-data sample of the 1990 and 2000 Censuses and the 20 percent micro-data sample of the 2005 1 percent Population Survey. These Censuses and/or Population Survey are conducted by the National Bureau of Statistics of China (NBS). They provide individual demographic information consistent across years. The advantage of these data for this study is that they cover everyone who lived in the city at the time of the survey for more than six months including rural migrants. Thus they can be used to measure, more accurately than normal survey data, the relative size of rural migrants with respect to the urban population in each Chinese city. Therefore, the main explanatory variable used here—the share of rural migrants to urban population for each city (i.e., migrant ratio)—is calculated from this data source.

The second data source is the 1992,[13] 2001, and 2006 City Statistical Year-

[12] SUR is better applied based on the large-sample properties of 'large T, small N' data sets in which $T \to \infty$ (Baum, 2006). Since our data have a relatively large N (number of cities) and small T (three data points), SUR is only used as a robustness check.

[13] As the censuses were conducted in 1990 and 2000 and the population survey was in 2005, ideally we would like to use the dependent variables also in those years. However, the data

books of China. The data from this source are collected by the NBS on an annual basis. The data set provides a wide range of detailed city-level information including macro-economic and social service outcomes in the previous calendar year (i.e., the years of 1991, 2000 and 2005). Most part of these data is available to the general public, but the use of the crime rate data requires special permission. The dependent variables - urban residents social service outcome variables and crime rates - are mainly constructed from these data.

The combination of the two data sources generates an unbalanced city panel data over the three data points in 1990, 2000 and 2005. The number of cities at the county or above level in China has been increasing over time. Excluding missing values, our final data consist a balanced panel of 152-city over three data points.

4.2 Definition of Dependent Variables

The dependent variables used in this paper are proxies for four types of social service access, namely education, health, public transport, and public security.

We use two variables, the teacher-student ratios for primary school and for junior/senior high schools in the city, to capture education access at these two levels. The numerators are the number of teachers at each level, while the denominators are the number of enrolled students at each level *including enrolled migrant children*. Ideally we would like to include only junior high school teacher-student ratio for the second measure, as only primary and junior high school are the level of education at which migrant children are more likely to have access to, and hence, have possible crowding out effect on the access of local residents. However, the data on number of teachers for the secondary school is combined of junior and senior high school.

Two alternative health service measures, the number of hospital beds and the number of doctors per 1000 inhabitants, are used to address the issue of health care access from different perspectives. The variables are defined as the total number of beds in hospitals and clinics and the total number of doctors divided by the total population, *including migrant population*. Ideally we would wish to have number of hospital beds or doctors per 1,000 patiants as that will be an accurate measure of health services provided, but such data are not available to us.

collection system for the City Statistical Yearbook data changed between 1991 and 1992 for the year 1990 and 1991. Thus, to keep the definition of our major dependent variables consistent, we use 1992 City Statistical Yearbook data for the year 1991 rather than 1990.

The public transportation access is proxied by the total number of passengers per bus. It is defined as the total volume of bus/tram passengers for the whole year divided by the number of buses/trams at the end of year. Note that since there is no information on the frequency of bus/tram usage, we assume the frequency does not change over time and across cities.

In terms of crime rate, the only variable available in the data is the number of prosecuted crime cases. We use this variable divided by total city population (*including migrant population*) to obtain the city crime rate. Of course, the number of prosecuted crime cases is not a perfect proxy for the actual crime rate since it might be influenced by the legislative enforcement of a city. If, for example, a city's legislative authority has a strong concern about rural-urban migration and hence prosecute more migrant crime cases, then number of prosecuted crime cases might be positively correlated with rural migrant density of the city. Thus, using such an index as the dependent variable may lead to an overestimation of the 'net' effect of migrant inflow on the city crime rate.

4.3 Summary Statistics

Table 3 presents the summary statistics for all the outcome variables and the major independent variables[14] based on the 152 city sample. The table shows that in 1991 the teacher-student ratio for primary schools in Chinese cities was 5.2 teachers per 100 students. This number increased slightly over the next 15 years to 5.4 in 2000 and 5.7 in 2005. The resource in secondary school are better with 100 students sharing 6.5 teachers in 2005. These ratios are quite high on developing country standards. The teacher-student ratio for primary school children in India in 2001, for example, was only 2.5 per 100 students.

Over the 15 years, the accessability of the medical services seem to have deteriorated in Chinese cities. In 1991 the number of hospital beds and number of doctors per 1000 population was 6 and 4, respectively, but by 2005 the numbers reduced to 5.7 and 2.9. This phenomenon may be partially related to the decentralization of the health-care expenditure. Table 2 shows that the government fiscal expenditure contributed to 23% of the total health expenditure in 1991, but 18% in 2005, whereas private expenditure contributed to 39% in 1991 and 52% in 2005. It could also be related to the fast urbanization process.

The situation of transportation over time has improved. The number of

[14] Appendix Table 2 presents the sources and definitions of the major independent variables

passengers per bus/tram reduced from 279 in 1991 to 140 in 2000, and then increased slightly to 150.

The most significant change among the outcome variables is probably the number of criminal cases prosecuted per thousand population. It increased from 3.4 in 1991 to 7 in 2005. Once again, this may be related to the rapid urbanization over this period.

Regarding the urbanization process, the average of the total city population has increased from 1.1 million in 1991 to 1.7 million in 2005.[15] The average proportion of rural migrants in total population increased from 7% to 12%, and the proportion of urban-urban migrants increased from 1 to 5%. At the same time while the urban population is increasing, urban areas are enlarging. Thus, over time the average city population density is reducing slightly from 1500 per square-kilometers to 1300 per square-kilometers.

To understand the relationship between the main outcome variables and the city migration ratio, we plot the unconditional correlations in Figures 2 and 3. Figure 2 presents the correlation for each year, while Figure 3 illustrates the relationship between the first-differences of each of the outcome variables and that of the migrant ratio.

When examining the level differences, we find that the variation of migrant ratios across different cities seems to be correlated to both the teacher/student ratio at primary level and the crime rate. No other strong correlation is found. However, when we take the first-differences the results changed. The change in migrant ratio does not seem to have any relationship with the change in teacher-student ratio at the primary school level, but a positive effect on the change at the junior high school level. For health services there seems to be a slight reduction in number of hospital beds and number of doctors for cities where migrant ratio increases. The effect of change in migrant ratio seem to be associated with a increase in passengers per bus between 1991 and 2000, but a reduction between 2000 and 2005. The relationship between migrant ratio and the crime rate exhibit the most significant difference between Figures 2 and 3. When looking at the first-differences, we find no correlation between the change in migrant ratio and crime rate in the first period (1991-2000) and a negative correlation in the second period (2000-2005).

These graphs provide some indications as to how the variations in the out-

[15] There are two measures of total urban population, one from the City Statistical Yearbooks and the other from the Population Censuses and Population Survey Data. Both two measures are reported in Table 3 and they are quite close.

come variables across cities are associated with migrant distributions across cities and over time. Their conditional relationship will be examined in details next.

5 Estimation Results

Equations (1) and (2) are estimated for each of the outcome variables of access to social services and the crime rate.

5.1 How Rural-Urban Migration Affects Urban Residents' Social Service Accession

How do rural migrants affect urban residents' access to social services in China? We examine the impact on education, health care, and transport accesses separately.

5.1.1 Education

Table 4 reports the results of the impact of migration on teacher to student ratios at the primary school (Panel A) and secondary (junior and senior) schools (Panel B). The dependent variable is the total number of teachers per 100 students in respective levels of schools.

The first column of Panel A reports the OLS results for the primary school teacher-student ratio. The estimated coefficient for the log migrant ratio is negative (-0.073) and statistically significant at the 1 percent level, suggesting an increase in migrant ratio of 1 per cent is associated with a reduction in the teacher to student ratio of 0.07 percent. Controlling for the urban population demand effect (city population density and the proportion of 6 to 12 years old of primary school age), the negative correlation between the teacher to student ratio and migrant ratio seems to suggest that cities (and across time) where there are more migrant population there are less investment in primary school education.

However, the correlation observed in the OLS regress may not imply a causal relationship. To examine the causal impact, we estimate the first-difference and first-difference with IV models. When taking first-difference to control for time-invariant city specific effect (see Column (2)), the effect of the migrant ratio on the teacher-student ratio reduced dramatically and becomes statistically in-

significant. Such a change implies the negative and significant effect obtained from the OLS estimation may be caused by variations across cities which affect both the migrant ratio and teacher to student ratio. For example, if cities which invested more on primary education at a given demand also restricted migrant inflow, a negative relationship might be observed between the migrant ratio and teacher to student ratio in an OLS estimation. If this is the case, the first-difference estimation may reveal the real effect of the migrant ratio on the teacher to student ratio by controlling for this unobserved variation across cities. In this sense the first-difference estimation is better than OLS but it still cannot eliminate the time-varying within-city unobservable effect in error terms. First-difference with IV estimation can further eliminate this type of potential endogeneity. Column (3) of Table 4 shows that when controlling for all sources of potential endogeneity problem and controlling for other observable city level characteristics, rural migrant inflow has a slight positive but statistically insignificant effect on the primary school teacher to student ratio.

The level of economic development, measured by log per capita GDP is positively associated with teacher/student ratio. However, the relationship between the change in teacher-student ratio and economic growth (the first difference measure of log per capita GDP) is not precisely estimated. In addition, urban-urban migration is positively associated with teacher-student ratio, population density is negatively associated with teacher-student ratio, whereas other control variables are not statistically significant.

Panel B of Table 4 (Columns 4-6) reports the same set of results for the middle school (both junior and senior high schools combined) teacher-student ratio. In this estimation, the density of total city population and the proportion of 13-18 years old (middle school age) in the city population are used to control for the demand side of the effect.

Different to the results for the primary school, the OLS estimate of the correlation between the migrant ratio and middle school teacher-student ratio is not statistically significant, but the first-difference and first-difference with IV estimations both reveal positive and statistically significant effects of migration on the teacher-student ratio. In particular, the first-difference with IV result indicates that every one percent increase in migrant ratio induces 0.07 percent increase in teacher-student ratio at secondary school level. This result indicates that perhaps the indirect "fiscal effect" dominates the direct "scale effect". That is to say that migrants as taxpayers contribute significantly to cities' investment in secondary education, whereas as consumers their consumption of secondary

education is limited. This is quite intuitive given that even today migrant children are not eligible to attend public senior high schools in cities.

In summary, the above findings suggest rural migrant inflow does not impose a negative impact on urban primary and middle school education. If anything, migrant inflow contributes slightly positively to the teacher to student ratios at secondary school level. These results are not surprising. As discussed before, migrant parents do not normally bring their children to cities. When they do they often send their children to migrant-funded non-public schools even though the quality of these schools are very low.

5.1.2 Health

The second relationship investigated is the impact of rural migrant inflow on urban residents' access to health-care services. The results are presented in Table 5.

Panel A of Table 5 presents the results on the number of hospital beds per 1000 people. The coefficient for the migrant ratio based on the OLS has a negative and statistically significant effect. An 1 percent increase in migrant ratio reduces hospital beds per 1000 people by 0.056 percent. However, when we take first-difference the effect completely disappears. The first-difference with IV (Column [3]) also produces a near zero effect (0.005). This indicates that rural migrant inflow have no impact on health service provisions measured by number of hospital beds per 1,000 population. The general demand factors, such as the ratio of the ageing population and population density are all positively related to hospital beds per 1000 population. The GDP level and its growth, the supply factor, are also significantly positively related to hospital beds provisions.

The results obtained from using the number of doctors per 1000 inhabitants as a proxy for health service provision are different. In all three cases (OLS, first-difference, and first-difference with IV) the results suggest negative impact of migrant inflow on number of doctors per 1000 people (Panel B of Table 5). The coefficient from the first-difference with IV indicates that an additional 1 percent increase in migrant inflow reduces number of doctors per 1000 people by 0.08 percent, which is a very small impact.

Note that the dependent variables we use here are number of hospital beds or doctors per 1,000 people (potential users) not per 1,000 patients (actual users). Thus, no matter migrants use the services or not, cities with more migrants will have lower measure of health services keeping the numerators (number of

hospital beds or doctors) and number of urban residents constant. Therefore, our estimated results in fact only measure the supply side of the effect. That is whether cities with more migrants invest more on health services or not.

There are many reasons for us to believe that relative to urban local residents, migrants are less likely to use the health services. One reason is that migrants on average are primary aged adults, hence, relatively healthier than the average urban local population. Another reason is that most migrants are not covered by health insurance in cities. When they are sick they try to avoid to go to hospitals or to see doctors. The RUMiCI 2009 survey shows that of the 1374 migrants who reported to be sick in the past three months prior to the survey date, 47 percent saw a doctor or went to the hospital while the remainders simply bought medication from the pharmacies, had a rest, or did not take any action. In comparison, of the 2374 urban *hukou* residents who were sick in the three months leading to the survey date, 77 percent went to see a doctor or to a hospital. When migrants are seriously ill, they normally go back to their rural home towns where they have some sort of health insurance but the quality of health care are much worse than in cities.

Given that migrants as taxpayers contribute to city revenues but less likely to consume health services than their local counterparts, it is reasonable for cities with more migrants to invest less on health care services. This, however, does not imply a reduced services to actual health-care service users. The small adverse effect we observed in this paper may simply reflect the artifact that cities with more migrants have more potential users but less actual users.

Another important issue to bear in mind when interpreting the results on health care services is the fact that the health care in China during the period we study was predominantly funded by a user-pay system and the government contribution to health-care provision is very limited as shown in Table 2. Thus, the migrant inflow causes cities to have less health-care users, hence lower funding for health-care, but their contribution to health care provision made through them being taxpayers maybe somewhat limited. Thus, the small negative causal effect we observed for number of doctors per 1000 people should have very limited implications on the actual access of health-care services the urban residents receive.

5.1.3 Public transportation

The total number of passengers per bus is chosen as the index of the intra-city public transportation access. In order to control for demand side factors, the urban population density, the city geographic area, and the number of alternative transportation vehicles (i.e., taxis) are included as control variables in the estimation. The results are reported in Table 6.

The OLS coefficient for the migrant ratio is positive with a coefficient of 0.10 and significant at the 5 percent level. This suggests a higher migrant ratio is associated with a larger number of passengers per bus. The first-difference reduces the result somewhat but still highly significant. Controlling for both time variant and time invariant unobservable characteristics which may affect both migration and urban transportation (Column [3]) results in a positive effect. The magnitude of the coefficient is much larger (0.17) than that obtained in the OLS regression but the point estimate is not precise. The result seems to indicate that the increase in migrant inflow increases pressure on cities' public transportation service.

The results we obtained so far seem to suggest that migrants inflow put certain pressure on cities transportation service, but have no adverse effect on education or health services.

5.2 How Rural-Urban Migration Affects City Crime Rate

It has been a common belief that migrant inflow increases city crime rates. If we simply examine the unconditional correlation, the data seem to support this view. Figure 1 shows that there is a strong positive relationship between the log number of prosecuted criminal cases per thousand persons and the log migrant ratio. However, this unconditional correlation may be an illusion. It is known that a large proportion of the migrant population is males aged 15 to 40, and this group is more prone to committing crime (Freeman, 1991; Levitt, 1998; Grogger, 1998). Migrants are more likely to move into cities with higher population density and industrialisation level, where higher crime rates are often found in the literature (Rephann, 1999). Thus, the simple unconditional correlation may be misleading. Furthermore, once we take first-difference, the clear positive relationship disappeared. The first-difference unconditional relationship is slight positive between 1990-2000, but negative between 2000 and 2005 (Figure 3).

To understand the true effect of rural-urban migration on city crime rates, we estimate Equations (1) and (2). In addition to the common control vari-

ables as in all the other estimations, we also control for the fraction of male population between 15-40 in the total city population, the ratio of urban-urban migration, the employment rate of the urban labour force, and the city level Gini coefficients.[16] These variables are widely believed to be related to city crime rates (Butcher and Piehl, 1998; Bianchi et al., 2008). The estimated results are reported in Table 7.

We first estimate a simple correlation between the log crime rates and log migrant ratio, controlling only the year effect (Column [1] of Panel A). As expected, the result is positive and significant. The magnitude indicates that every one percent increase in migrant ratio increases the city crime rates by 0.27 percent. In order to test this positive effect is related to the fact that rural-urban migrants are more likely to be young men who are more prone to committing crime we add in a variable indicating "the proportion of males (including both local and migrants) aged 15-40 to that of total urban population". Such an inclusion reduces the estimated elasticity substantially to 0.19 but it is still statistically significant at the 1 percent level (Column [2]). As expected, the variable "proportion of male aged 15-40" is positively associated with crime rate and the estimated elasticity is huge, 1.51, almost eight times of that observed for migrant ratio.

We then include the other control variables and the estimated elasticity on log migrant ratio further reduced to 0.13 and the significant level reduced to the 10 percent (Column [3]). Other control variables we include all have the right signs. It is commonly found that GDP per capita has a positive relationship with the crime rate, and employment rate is negatively associated with the crime rate. Further, if migrants are more likely to be young males, urban-to-urban migration should also have a positive correlation with crime rate. We also find that the crime rate in 2005 is statistically significantly higher than previous years. These findings seem to suggest that the crime incidence in cities is strongly associated with its demographic features of total population as well as economic conditions.

[16] Gini coefficients are calculated using Urban Household Survey (UHS) data for the year 1990, 2000, and 2005. There are two issues related to using Gini coefficients. First, the UHS survey only covers 63 of the 157 cities we use in this paper. To make sure our results are consistent, we estimate the crime equation using two different specifications, one with full 157 city sample but without Gini coefficient as control variables, and one with Gini coefficient but for a subset of the sample. The latter results are reported in Panel B of Table 5. The second issue is related to the fact that UHS only include urban local workers and migrants are not included. This may under-estimate the degree of inequality. We test the sensitivity of this problem by comparing Gini coefficients calculate from the 2005 1% population survey data, which include migrants, and those obtained from using the 2006 UHS data.

Although the OLS estimation reveals a small and statistically significant relationship between the migration ratio and city crime rate, this result suffers from the endogeneity problem as discussed before. The estimates with first-difference and first-difference with IV, which mitigate the endogeneity problem, are presented in columns [4] and [5] of Table 7. The relationship between the change in city crime rates and the change in migration ratios controlling for the other independent variables is slightly negative, but not significant. Whereas the first-difference with IV results a very small positive and statistically insignificant effect.

The above results did not control for the Gini coefficients, which is commonly believed to have some correlation with crime rates, because we only have a sub-sample of cities with the Gini coefficient measure. Panel B presents the results including Gini coefficients as an additional independent variable for this subsample of cities, while Panel C exhibits the results without Gini coefficient control for the same group of cities. Comparing the results from Panels B and C we find that controlling for the Gini coefficients does not affect our main finding that the variation in the migrant ratio across cities has no impact on the variation of the crime rates across cities.

The result that migrant inflow has no impact on city crime rates is quite different from the common belief that migrants are more prone to committing crime. But thinking carefully it is quite understandable. Due to the restrictions on migrant access to social services in cities, they only come to cities to work so that they can bring home as much money as possible. As a result, migrant workers on average work 7 days a week and more than 10 hours daily (Du et al., 2006; Lee and Meng, 2009). Given their working schedule it is almost impossible for them to spend too much time committing crimes.

A potential drawback of our crime rate measure must be born in mind. As the only crime data available for the analysis is the number of prosecuted criminal cases rather than the crime cases committed, it is possible that migrants could have in fact committed much more crime but that not all of them were apprehended. For example, if some migrants commit crime just prior to leaving for their home villages they are unlikely to be caught. If this is the case, the measure of the crime rate used in this paper may not reflect the actual crime rate for a city or the actual effect of migration inflow on the city crime rate. Nevertheless, this would only have an impact on our results if the measurement error in crime rate vary significantly across cities. We have no reason to believe that this is the case.

5.3 Robustness Check

In this subsection we conduct the following robustness checks.

First, the analysis presented above on the effects of migration inflow on urban residents' access to various types of social services and on city crime rates treats each of the outcome variables as independent. However, all these outcome variables may in fact be related through government spending. To test sensitivity we use the Seemingly Unrelated Regression (SUR) to estimate all social service outcomes and the city crime rate regressions jointly, so that the error terms across different equations are correlated. The results using first-difference with IV method are reported in Table 8.

We first treat hospital beds and doctors as alternative health care measures and estimate the five equations (excluding one of the health care measures) jointly (Columns [2] and [3]) and then we treat them both as part of the decisions the governments make when decide where to spend the money (Column [4]). Finally, as spending on public security only indirectly affect crime rate, we also estimate five equations excluding the crime rate equation (Column [5]). The results from the SUR estimation, that allows error terms to be correlated across the equations, are largely consistent with those observed from the single equation estimation (Column [1] of Table 8 reproduces these single equation estimation results), but the estimation precision are slightly improved. The major change is that the estimated elasticity of migrant ratio on "number of hospital beds per 1,000 population" is now negative, but still statistically insignificant when crime rate is included in the equation. When we exclude crime rate from the SUR estimation, though, this elasticity becomes significant at the 10 percent level with a small magnitude (-0.06).

Second, as shown in Figure 3 that the relationship between the first-difference in migrant ratio and in the hospital beds per 1,000 population, the number of doctors per 1,000 population, the passengers per bus, and the crime rate all differ somewhat across years. We would like to know whether the causal impact of migration rates on these outcome variables also vary across years. We interact the migrant ratio variable with the year dummy variable and interact the instrument with the year dummy variable as well to generate an additional instrument. Table 9 presents the first-difference and first-difference with IV results on these outcome variables.

The first-difference results indicate that the main adverse impact of increase in migrant inflow on reduction in "doctors per 1,000 persons" and increase in

"passengers per bus" occurred between 1990 and 2000. The change in migrant ratio between 2000 and 2005 has no impact on doctor supply and it reduced "passengers per bus". For the crime rate equation we observe a statistically significant impact of increase in migrant ratio on reduction in crime rate in the second period, which is consistent with the unconditional relationship observed in Figure 3.

When using first-difference with IV method, the estimated coefficients for both the "doctors per 1,000 persons" and "passengers per bus" equations are more than doubled in size and that for the "crime rate" equation, both coefficients switched sign. We take this as an indication of the weak IV. Indeed, the F-tests for the IV used for the interaction term are all less than 10. We therefore decide not to interpret these results.

Finally, as discussed in footnote 16 the Gini coefficients used in Table 7 are calculated using UHS data, which do not include migrant population. This may under-estimate the actual inequality within each city. To the extent that the level of under-estimation does not systematically differ cross cities our results should not be biased. Fortunately the 2005 1% Population Survey data have information on individual income, which enable us to calculate city level Gini coefficients for all city population including migrants. For this year, therefore, we can test whether the cross-city variation in Gini coefficients differs between those calculated using data without migrants (UHS) and with migrants (Population Survey data). Figure 4 presents the unconditional relationships between crime rates and Gini coefficients measured using UHS and Population Survey Data. The relationship are very similar.

6 Conclusions

Based on the increasing concern of the urban public about rural-urban migration and its social impact, this paper investigated the link between rural migrant inflows and various social outcomes, including the level of urban locals' access to social services and the city crime rate.

In terms of urban social services, we found that rural migrant inflow imposed no adverse effect on education. If anything, we found it to increase secondary school resources as reflected in the number of teachers per 100 enrolled students. This perhaps is due mainly to the fact that migrants contribute to the tax revenue but consume very little of secondary education resources. Some

small negative effect of rural-urban migration on urban health-care service provision is found. However, as the measure of the health-care service provision is inaccurate, i.e. the denominator used is potential users (per 1,000 population) not actual users (per 1,000 patients), and migrants are less likely to use urban health-care services relative to their urban resident counterparts, the small negative effect may not reflect the actual impact of migration on urban local residents' health-care usage. The only real adverse effect we found of rural migrant inflow on social services is on city public transportation measured as passengers per bus. It seems that migrant inflow has increased the crowdedness of buses slightly.

With regard to public security, we found that rural migrants do not increase city crime rates as is commonly believed. The simple cross-sectional positive relationship between the migrant ratio and the crime rate across different cities are considerably reduced after we control for the proportion of male aged 15 to 40, a demographic group which is more prone to committing crimes. When further taking first-difference and using first-difference with IV method, we found that increase in migrant ratio had no effect on increase in crime rate across cities even without controlling for demographic characteristics of the cities. In other words, rural-urban migration does not cause an increase in city crime rate.

Our findings contradict the common believes. It indicates that city governments and the urban public tend to over-emphasise the adverse effects of the rural-urban migration on social outcomes. Large scale rural-urban migration is an inevitable consequence of the economic growth no matter city people like it or not. One of the most important tasks of the government during this process is make the right policy to smoothly manage the migration process, correct public mis-perception, and enable the assimilation of migrant population.

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Table 1: Central and Local Government Fiscal Expenditure among Education, Health Care and City Service (2005) (Unit: billion Yuan, %)

	Total government fiscal expenditure [1]	Central Gov. [2]	Local Gov. [3]	% of local fiscal expenditure [3]/[1]
Total Expenditure	3393.03	878.79	2514.23	74.10%
Education	397.48	24.49	373.00	93.84%
Health	103.68	2.13	101.56	97.95%

Source: China Statistical Yearbook in 2006.

Table 2: Comparison Between Education and Health Care Expenditures by Sources: 2000 and 2005 (Billion Yuan, %)

	Expenditure			% of total expenditure		
	1991	2000	2005	1991	2000	2005
Panel A: Education Expenditure						
Total	73.15	384.91	724.26	100	100	100
Government Fiscal Expenditure	61.78	256.26	446.59	84.40	66.58	61.66
Private/ Institutes Contribution	0.00	8.59	34.79	0.00	2.23	4.80
Social Charity Contribution	6.28	11.40	9.34	8.58	2.96	1.29
Tuition Fees	3.23	59.48	134.66	4.41	15.45	18.59
Others	1.85	49.18	98.89	2.53	12.78	13.65
Panel B: Health Care Expenditure						
Total	88.86	458.66	865.99	100	100	100
Government Fiscal Expenditure	20.23	70.95	155.25	22.76	15.50	17.90
Social Expenditure	34.11	117.19	258.64	38.37	25.50	29.90
Private Expenditure	34.52	270.52	452.10	38.83	59.00	52.20

Source: China Statistical Yearbook in 2001 and 2008, China Health Yearbook 2001.

Table 3: Summary Statistics

	1990/1991	2000	2005
Number of teacher per 100 student in primary school	5.18	5.44	5.71
	(0.97)	(1.24)	(1.16)
Number of teacher per 100 student in junior/senior middle school	7.68	6.27	6.47
	(1.21)	(1.15)	(1.15)
Number of hospital bed per 1000 inhabitants	6.09	5.79	5.74
	(1.95)	(1.84)	(1.77)
Number of doctor per 1000 inhabitants	4.05	3.12	2.92
	(1.45)	(1.13)	(0.97)
Volume of passengers per bus for the whole year (10 thousand times)	278.59	142.60	151.05
	(165.19)	(76.63)	(63.74)
Number of criminal cases	3512.88	8729.87	12675.28
	(5021.50)	(16890.28)	(18424.51)
Number of criminal cases per thousand inhabitants	3.39	5.62	6.99
	(3.27)	(5.69)	(5.31)
Total number of population at the end of survey year (thousand people)	1082.60	1433.47	1715.64
	(1119.98)	(1744.07)	(2073.23)
Total number of city population (thousand people)[a]	1266.33	1486.49	1777.20
	(1345.32)	(1919.76)	(2040.31)
Proportion of rural migrants among total city population (%) [a]	7.03	8.18	11.62
	(5.81)	(8.46)	(11.52)
Real GDP per capita (Yuan/Person)	5156.83	18188.19	32499.83
	(3602.99)	(15468.83)	(18260.84)
City population density (thousand people per Km^2)	1.50	1.40	1.30
	(1.29)	(1.01)	(0.95)
Urban-urban migrant ratio (%) [a]	1.09	2.82	4.99
	(2.06)	(1.96)	(3.53)
Proportion of population aged between 6-12 (%) [a]	4.93	4.88	4.94
	(2.29)	(1.54)	(1.53)
Proportion of population aged between 13-18 (%) [a]	4.71	5.76	5.40
	(2.99)	(1.59)	(1.63)
Proportion of aged population (>=65) (%) [a]	3.11	4.10	5.66
	(1.81)	(1.62)	(4.67)
Total land areas of adminstrative region (Km^2)	1285.30	1750.09	2067.09
	(1962.40)	(2603.59)	(2989.23)
Number of taxis	1120.90	4183.32	4319.38
	(3055.10)	(7333.19)	(7482.88)
Proportion of males aged 15-40 among total city population (%) [a]	26.10	23.91	21.71
	(4.03)	(2.23)	(2.75)
Employment rate (%) [a]	95.92	86.98	89.65
	(2.95)	(5.18)	(4.93)
Gini coefficient[b]	0.21	0.31	0.35
	(0.029)	(0.04)	(0.05)
Number of cities		152	

Data Source: City Statistical Yearbook Database 1992, 2001 and 2006. [a] indicates data are taken from 1990 and 2000 China Population Census and 2005 1% Population Survey. [b] Gini coefficients in 1990 and 2000 are calculated based on Urban Household Survey in 1991 and 2001, repectively. The Gini coefficient in 2005 is calculated using 2005 1% Population Survey. The number of common cities with Gini coefficients for three years is 64.

Table 4: Effect of Rural-Urban Migration on Education

	OLS	FD	FD with IV	OLS	FD	FD with IV
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A *: Log of Teacher to Student Ratio in Primary Schools*			***Panel B*** *: Log of Teacher to Student Ratio in Secondary Schools*		
Log migrant ratio	-0.073***	-0.010	0.032	-0.013	0.026**	0.066**
	(0.014)	(0.014)	(0.042)	(0.010)	(0.013)	(0.028)
Log real GDP per capita	0.034*	0.042	0.024	0.042***	0.011	-0.008
	(0.020)	(0.027)	(0.030)	(0.015)	(0.024)	(0.025)
Log city population density	-0.041***	-0.006	-0.001	-0.018**	0.025	0.036
	(0.013)	(0.023)	(0.022)	(0.009)	(0.021)	(0.022)
Log urban-urban migrant ratio among total city population	0.026*	0.033**	0.024	0.022*	0.031**	0.020
	(0.014)	(0.013)	(0.017)	(0.012)	(0.014)	(0.015)
Proportion of population aged 6-12	0.398	-0.998	-0.445	-	-	-
	(0.608)	(0.685)	(0.873)	-	-	-
Proportion of population aged 13-18	-	-	-	0.914**	0.265	0.523
	-	-	-	(0.394)	(0.335)	(0.368)
Year dummy for 2000	-0.031	-	-	-0.296***	-	-
	(0.037)	-	-	(0.029)	-	-
Year dummy for 2005	0.004	0.060*	0.027	-0.299***	0.265***	0.236***
	(0.046)	(0.031)	(0.043)	(0.036)	(0.028)	(0.033)
Constant	-3.360***	-0.053	-0.018	-2.893***	-0.265***	-0.231***
	(0.206)	(0.040)	(0.050)	(0.158)	(0.040)	(0.042)
Number of observations	456	304	304	456	304	304
R^2	0.134	0.026	0.002	0.284	0.319	0.300
F-test statistic for excluded IV	-	-	45.86	-	-	55.62

Note: Robustness standard errors are displayed in parentheses. * Significant at 10% level;** Significant at 5% level; *** Significant at 1% level. IV indicates the predicted log migrant ratio in the host city.

Table 5: Effect of Rural-Urban Migration on Health Care

	OLS	FD	FD with IV	OLS	FD	FD with IV
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Log of Number of Hospital Beds per 1000 people			*Panel B: Log of Number of Doctors per 1000 people*		
Log migrant ratio	-0.056**	-0.006	0.005	-0.050**	-0.060*	-0.082*
	(0.023)	(0.016)	(0.034)	(0.025)	(0.032)	(0.050)
Log real GDP per capita	0.131***	0.181***	0.176***	0.200***	0.195**	0.203**
	(0.036)	(0.045)	(0.046)	(0.042)	(0.083)	(0.081)
Log urban population density	0.057***	0.154***	0.157***	0.027	0.143***	0.139***
	(0.018)	(0.043)	(0.043)	(0.022)	(0.054)	(0.053)
Log urban-urban migrant ratio among total city population	0.072***	0.019	0.016	0.144***	0.100**	0.105***
	(0.025)	(0.018)	(0.020)	(0.028)	(0.039)	(0.039)
Proportion of aged population (>=65)	3.443***	1.349	1.472*	2.468***	0.980	0.739
	(0.912)	(0.828)	(0.893)	(0.951)	(1.762)	(1.861)
Year dummy for 2000	-0.338***	-	-	-0.677***	-	-
	(0.058)	-	-	(0.074)	-	-
Year dummy for 2005	-0.494***	0.164***	0.155***	-0.957***	0.376***	0.394***
	(0.082)	(0.042)	(0.052)	(0.091)	(0.059)	(0.072)
Constant	0.749*	-0.303***	-0.295***	0.126	-0.593***	-0.608***
	(0.383)	(0.068)	(0.072)	(0.445)	(0.114)	(0.115)
Number of observations	456	304	304	456	304	304
R^2	0.200	0.196	0.195	0.204	0.086	0.085
F-test statistic for excluded IV	-	-	52.78	-	-	52.78

Note: Robustness standard errors are displayed in parentheses. * Significant at 10% level;** Significant at 5% level; *** Significant at 1% level. IV indicates the predicted log migrant ratio in the host city. The dependent variables are defined as number of hospital beds or number of doctors dividing total population in city (including both rural migrants and urban residents).

Table 6: Effect of Rural-Urban Migration on Public Transportation

	OLS	FD	FD with IV
	(1)	(2)	(3)
Dependent Variable - Log of Number of Passengers Per Bus			
Log migrant ratio	0.098**	0.105**	0.169
	(0.044)	(0.050)	(0.136)
Log real GDP per capita	-0.076	0.023	-0.008
	(0.058)	(0.075)	(0.085)
Log urban population density	0.145**	0.293	0.268
	(0.058)	(0.241)	(0.239)
Log urban-urban migrant ratio among total city population	0.001	0.022	0.005
	(0.047)	(0.046)	(0.051)
Log total land areas of the city	0.110**	0.079	0.049
	(0.048)	(0.159)	(0.162)
Log number of taxis	0.106***	0.013	0.024
	(0.026)	(0.034)	(0.042)
Year dummy for 2000	-0.820***	-	-
	(0.104)	-	-
Year dummy for 2005	-0.739***	0.792***	0.760***
	(0.127)	(0.114)	(0.111)
Constant	5.079***	-0.761***	-0.718***
	(0.693)	(0.164)	(0.155)
Number of observations	438	292	292
R^2	0.312	0.399	0.394
F-test statistic for excluded IV	-	-	51.47

Note: Robustness standard errors are displayed in parentheses. * Significant at 10% level;** Significant at 5% level; *** Significant at 1% level. IV indicates the predicted log migrant ratio in the host city. Since 6 cities have missed bus/taxi information in 1990, the city sample reduces to 146 for this analysis.

Table 7: Effect of Rural-Urban Migration on Crime Rates

		OLS		FD	FD with IV
	(1)	(2)	(3)	(4)	(5)
Panel A *: Dependent Variable: Log of Crime Rates*					
Log migrant ratio	0.266***	0.187***	0.128*	-0.079	0.021
	(0.056)	(0.063)	(0.066)	(0.099)	(0.222)
Log Proportion of males aged 15-40 among total city population	-	1.511***	0.965*	0.033	-0.107
	-	(0.539)	(0.552)	(0.687)	(0.700)
Log real GDP per capita	-	-	0.189*	0.256	0.228
	-	-	(0.107)	(0.206)	(0.207)
Log urban population density	-	-	0.064	0.036	0.067
	-	-	(0.045)	(0.185)	(0.195)
Log urban-urban migrant ratio among total city population	-	-	0.122*	0.150	0.130
	-	-	(0.064)	(0.112)	(0.120)
Log employment rate	-	-	-0.779	0.158	0.022
	-	-	(0.599)	(0.588)	(0.644)
Year dummy for 2000	0.382***	0.508***	0.112	-	-
	(0.111)	(0.115)	(0.169)	-	-
Year dummy for 2005	0.682***	0.988***	0.716*	0.253	0.238
	(0.097)	(0.134)	(0.382)	(0.329)	(0.320)
Constant	1.651***	3.465***	1.136	-0.133	-0.077
	(0.181)	(0.660)	(1.377)	(0.322)	(0.341)
Number of observations	453	453	453	302	302
R^2	0.158	0.184	0.221	0.017	0.013
F-test statistic for excluded instrument	-	-	-	-	42.27
Panel B: Controlling for log gini coefficent (sample cities reduce to 64)					
Log migrant ratio	0.377***	0.228**	0.211*	-0.014	0.149
	(0.090)	(0.105)	(0.117)	(0.154)	(0.362)
Log gini coefficient	0.136	0.067	0.024	-0.438	-0.337
	(0.415)	(0.417)	(0.444)	(0.552)	(0.562)
Number of observations	192	192	192	128	128
R^2	0.244	0.278	0.313	0.060	0.053
F-test statistic for excluded instrument	-	-	-	-	16.53
Panel C: Not Controlling for log gini coefficent, bus use 64 city-sample					
Log migrant ratio	0.379***	0.229**	0.212*	0.008	0.185
	(0.090)	(0.105)	(0.116)	(0.149)	(0.341)
Number of observations	192	192	192	128	128
R^2	0.243	0.278	0.313	0.056	0.046
F-test statistic for excluded instrument	-	-	-	-	18.76

Note: Robustness standard errors are displayed in parentheses. * Significant at 10% level;** Significant at 5% level; *** Significant at 1% level. IV indicates the predicted log migrant ratio in the host city. The dependent variable-crime rate- is defined as log number of prosecuted criminal cases per 1000 persons (including both rural migrants and urban residents). Since one city have missed crime information in 2005, the city sample reduces to 151 for crime equation. Panel B gives the results with additional control for Log Gini coefficients. Gini coefficients in 1990 and 2000 are calculated based on the Urban Household Surey data and Gini coefficients in 2005 are taken from 2005 mini-Census. To keep the consistent cities with Gini information over three years, the sample size further reduces to 64 cities for each year. To make the comparison, in Panel C, we include the regression results based on 64 city-sample without control for Gini coefficients.

Table 8: Robustness Check: Seemingly Unrelated Regression Results

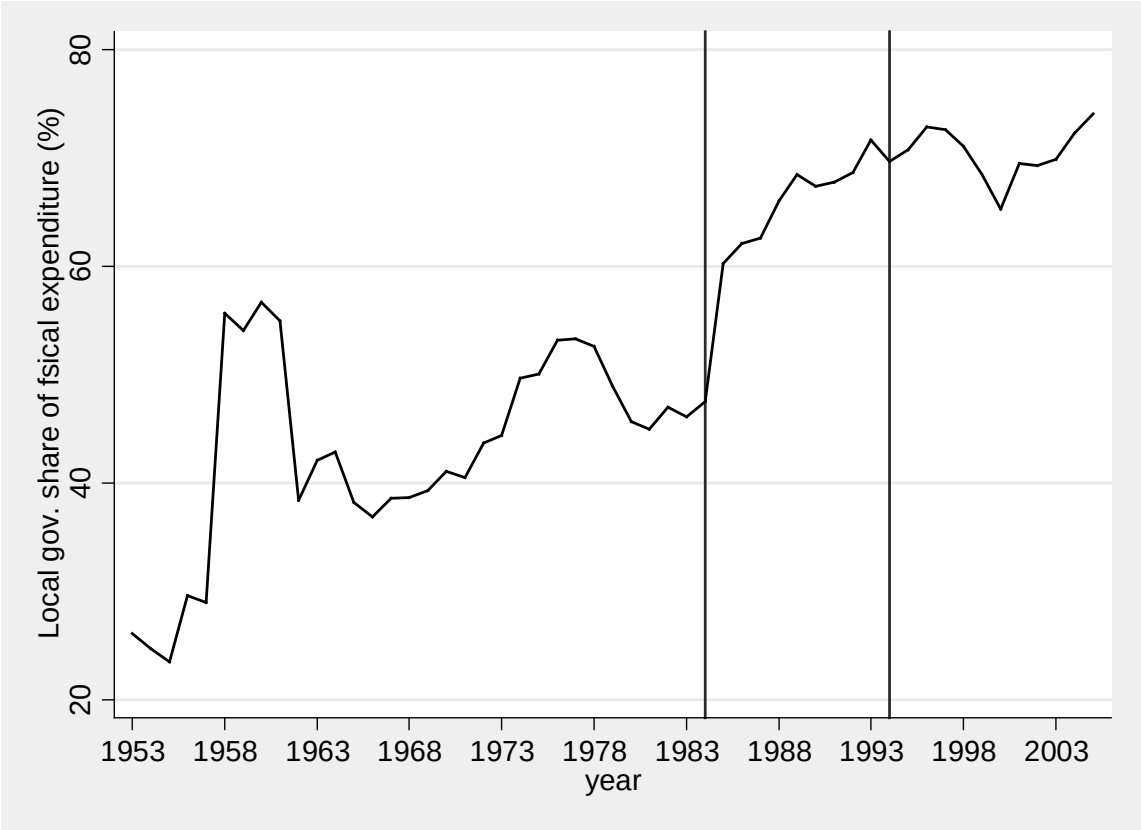
	Single Regression IV	SURE with IV			
Coefficient for Log Migrant Ratio	(1)	(2)	(3)	(4)	(5)
Teacher/Student Ratio in Primary Schools	0.032	-0.001	-0.001	-0.001	-0.021
	(0.042)	(0.029)	(0.029)	(0.029)	(0.030)
Teacher/Student Ratio in Middle Schools	0.066**	0.052**	0.052**	0.052**	0.047*
	(0.028)	(0.026)	(0.026)	(0.026)	(0.027)
Number of Hospital per 1000 person	0.005	-0.055	-	-0.055	-0.061*
	(0.034)	(0.034)	-	(0.034)	(0.036)
Number of Doctor per 1000 person	-0.082*	-	-0.070	-0.070	-0.081
	(0.050)	-	(0.079)	(0.079)	(0.082)
Passenger per Bus	0.169	0.146**	0.146**	0.146**	0.106
	(0.136)	(0.074)	(0.074)	(0.074)	(0.077)
Crime Rates	0.021	-0.045	-0.045	-0.045	-
	(0.222)	(0.188)	(0.188)	(0.188)	-

Note: Standard errors are displayed in parentheses. * Significant at 10% level;** Significant at 5% level; *** Significant at 1% level. In each panel, five FDIV regressions for different outcomes are jointly estimated by using Seemingly Unrelated Regression with controls of same independent variables as those included in Tables 2-5. To simplify, only coefficients of log migrant ratio are presented in this table. Columns (4) and (5) exclude crime regression. The difference between columns (2) and (3), (4) and (5) is to choose number of hospital or number of doctor per 1000 person to be the indicator for health care.

Table 9: Time Varying Effect of Migration Inflow on Social Outcomes

	Hospital beds		Doctors		Panssegers per bus		Crime	
	FD	FD with IV	FD	FD with IV	FD	FD with IV	FD	FD with IV
Log migrant ratio	0.002	-0.020	-0.059*	-0.105**	0.161***	0.344***	0.037	-0.062
	(0.017)	(0.035)	(0.035)	(0.052)	(0.060)	(0.132)	(0.111)	(0.219)
Log migrant ratio * Year dummy for 2005	-0.032	0.118	-0.003	0.107	-0.215**	-0.759***	-0.480**	0.406
	(0.034)	(0.113)	(0.061)	(0.120)	(0.084)	(0.232)	(0.204)	(0.628)
Number of observations	304	304	304	304	292	292	302	302
R^2	0.198	-	0.086	-	0.412	-	0.035	-
F-test statistic for excluded IV (Log migrant ratio)	-	32.74	-	32.74	-	32.13	-	28.34
F-test statistic for excluded IV (interaction term)	-	7.90	-	7.90	-	7.61	-	8.64

Figure 1: Local government share of total fiscal expenditure: 1953-2005



Source: China Statistical Yearbook, 2001 and 2006

Figure 2: Unconditional Relationship between the Dependent Variables and Migrant ratio

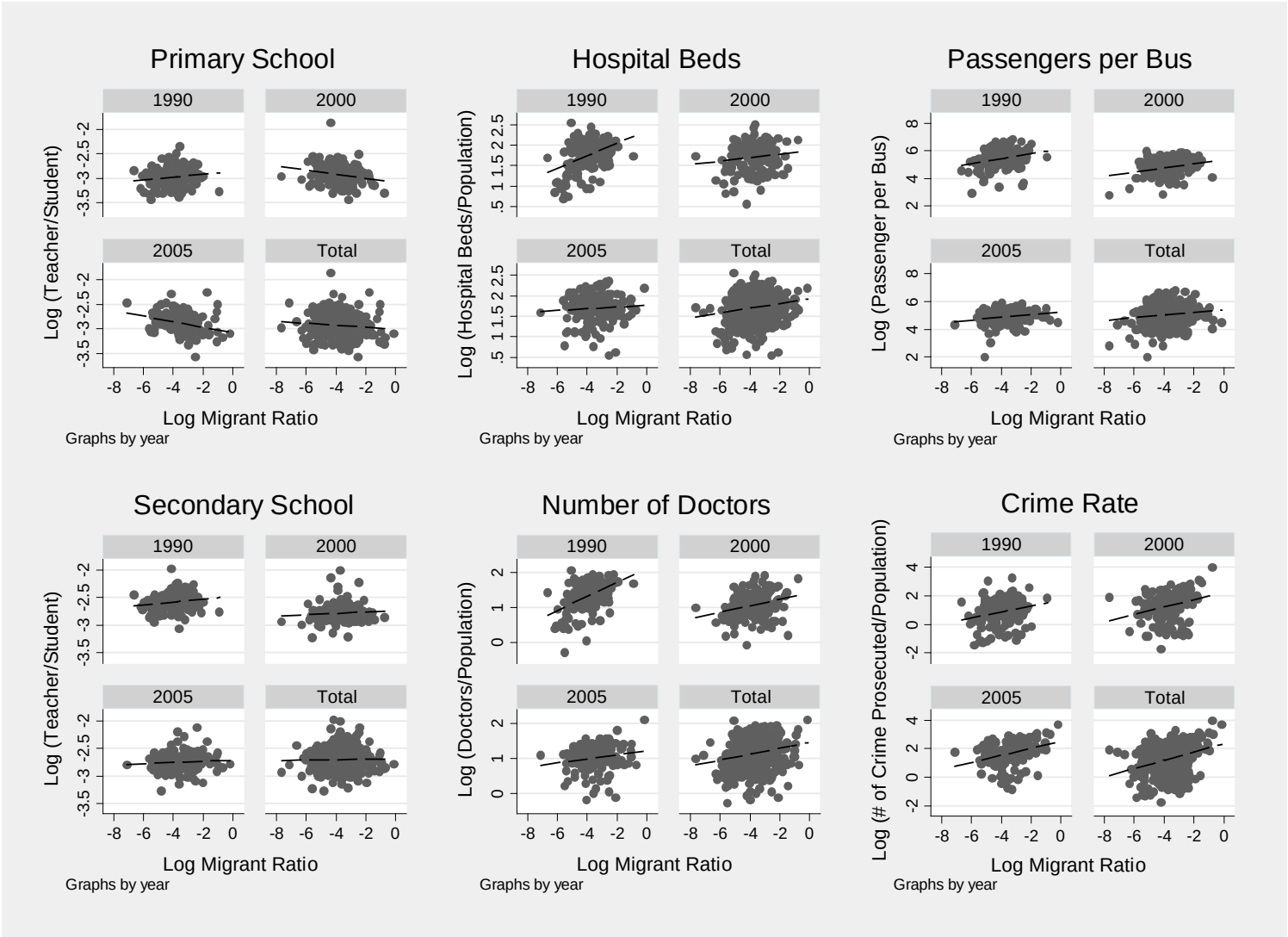


Figure 3: Unconditional Relationship between Change in the Dependent Variables and Migrant ratio

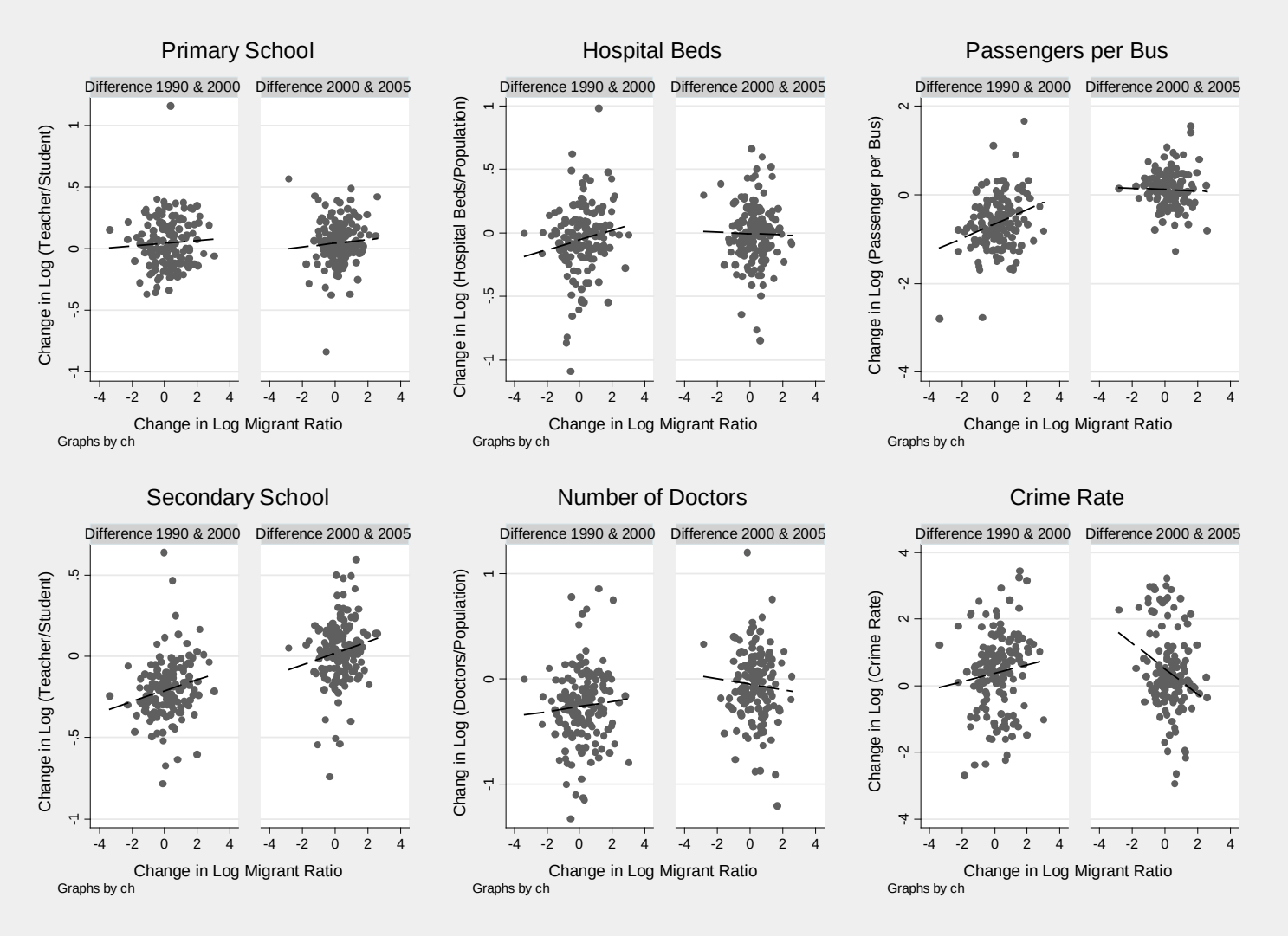
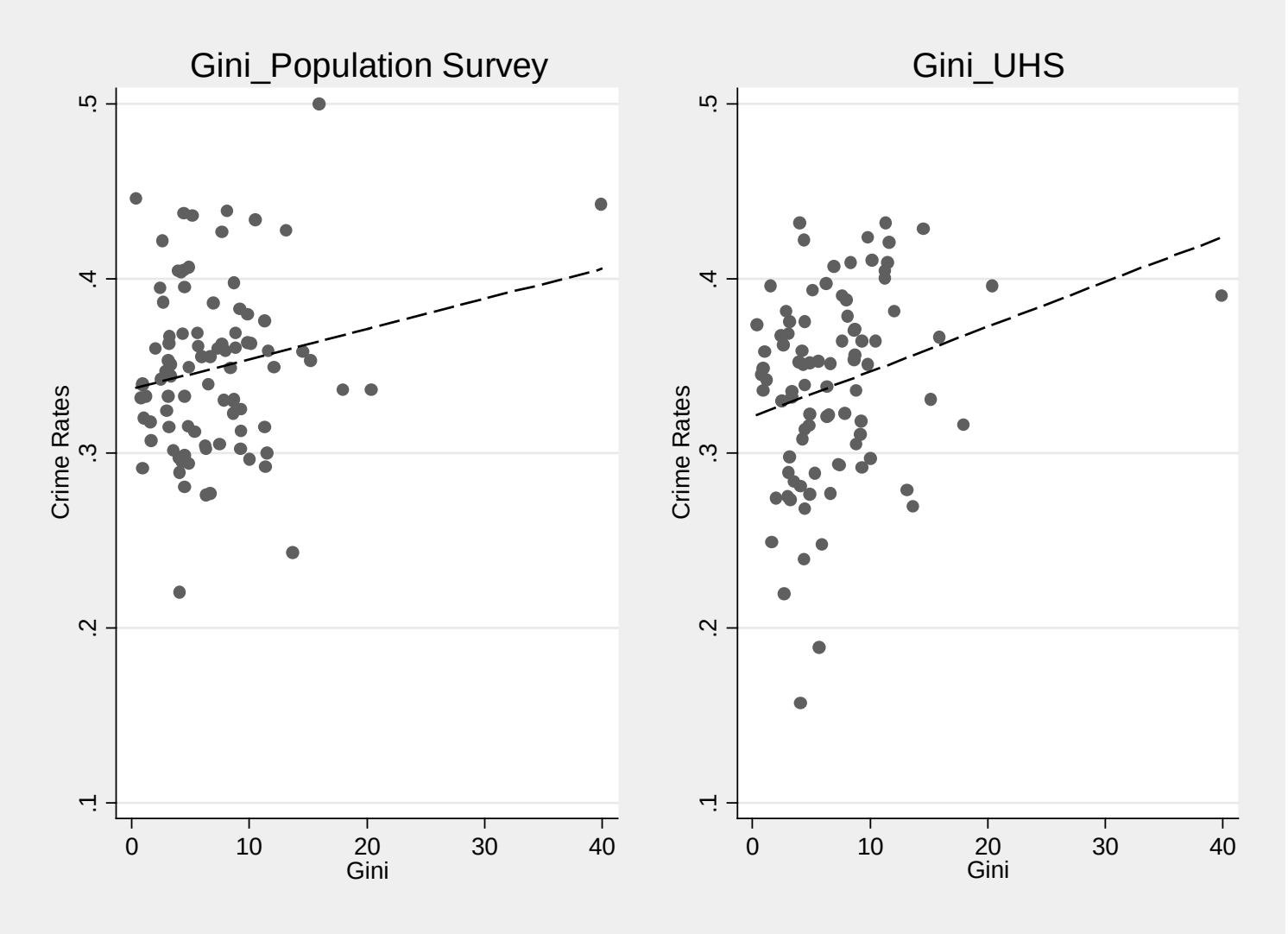


Figure 4: Unconditional Relationship between Crime Rates and Gini Coefficients



Appendix Table A1: Results from Regressions Used to Construct the Instrument

	1990	2000	2005
Panel A: Push factor			
Dependent variable: out-migration rate from source province k			
Land per capita	-2.810*	4.622	-5.421***
	(1.615)	(3.109)	(1.057)
Land per capita^2	1.655**	-3.392*	0.531***
	(0.773)	(1.794)	(0.119)
Net income per capita	0.000	0.003**	-0.000
	(0.001)	(0.001)	(0.001)
Areas of disaster	0.000	0.027***	0.001***
	(0.000)	(0.005)	(0.001)
Total power of agricutural machinery	0.000	-0.002***	-0.001***
	(0.000)	(0.001)	(0.000)
Constant	1.466*	-1.165	12.699***
	(0.765)	(1.576)	(2.834)
Number of observations	28	28	30
R^2	0.244	0.588	0.491
Panel B: Pull factor			
Dependent variable: migration probability from source province k to city j			
$Distance_{kj}$	-0.636*	-0.750***	-0.660**
	(0.375)	(0.188)	(0.267)
$Distance_{kj}^2$	0.216	0.230***	0.211**
	(0.132)	(0.063)	(0.093)
Interactions between Distance and Province dummies	Yes	Yes	Yes
Interactions between Distance^2 and Province dummies	Yes	Yes	Yes
Dummies for province	Yes	Yes	Yes
Constant	0.411*	0.569***	0.485***
	(0.229)	(0.123)	(0.167)
Number of observations	1,049	2,162	1,442
R^2	0.577	0.555	0.500

Note: Robustness standard errors are displayed in parentheses. * Significant at 10% level;** Significant at 5% level; *** Significant at 1% level. IV indicates the predicted log migrant ratio in the host city. The dependent variable- crime rate- is defined as log number of prosecuted criminal cases per 1000 persons (including both rural migrants and urban residents). Hainan and Sichuan missed for 1990 and 2000 regressions due to the incomplete information.

Appendix Table 2: Source and definition for Independent Variables

Variables:	Data Source:	Description:	Note:
Proportion of rural migrants among total city population	1990, 2000 Census and 2005 1% Population Survey	total number of rural migrants/total number of city population	[1] **Rural migrant** indicates labour force whose agriculture Hukou registered in other provinces or other city within the provinces and have left the Hukou registration place over half years. [2] **Total city population** includes rural migrants and local non-agricultural Hukou residents.
Real GDP per capita (Yuan/Person)	City Statistical Yearbook 1992, 2001, and 2006		
City population density (thousand people per Km^2)	City Statistical Yearbook 1992, 2001, and 2006	total number of population at the end of survey year/total land areas of administrative region	**Total number of population at the end of survey year** includes rural migrants and local non-agricultural
Urban-urban migrant ratio	1990, 2000 Census and 2005 1% Population Survey	total urban workers with non-agricultural Hukou and registered in other places /total number of city population	Total city population includes rural migrants and local non-agricultural Hukou residents.
Proportion of population aged between 6-12	1990, 2000 Census and 2005 1% Population Survey	population aged between 6-12 / total number of city population	Total city population includes rural migrants and local non-agricultural Hukou residents.
Proportion of population aged between 13-18	1990, 2000 Census and 2005 1% Population Survey	population aged between 13-18 / total number of city population	Total city population includes rural migrants and local non-agricultural Hukou residents.
Proportion of aged population (>=65)	1990, 2000 Census and 2005 1% Population Survey	population aged over 65 / total number of city population	Total city population includes rural migrants and local non-agricultural Hukou residents.
Total land areas of administrative region (Km^2)	City Statistical Yearbook 1992, 2001, and 2006		
Number of taxis	City Statistical Yearbook 1992, 2001, and 2006		
Proportion of males aged 15-40 among total city population	1990, 2000 Census and 2005 1% Population Survey	male population aged between 15-40 / total number of city population	Total city population includes rural migrants and local non-agricultural Hukou residents.
Employment rate	1990, 2000 Census and 2005 1% Population Survey	the number of labourers (including rural migrants) worked over one hours with salary / total number of labour force	In 1990, the definition for employment is different from other years. Employed workers is definited as those who have reported their occupations and industries.