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Original Article

Location or *Hukou*: What Most Limits Fertility of Urban Women in China?

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Abstract

China's fertility rate is below replacement level. The government is attempting to increase this rate by relaxing the one-child policy. China faces a possible tradeoff because further urbanization is needed to raise incomes but may reduce future fertility. We decompose China's rural–urban fertility gaps using both de facto and de jure criteria for defining the urban population. The fertility-depressing effects of holding urban hukou are more than three times larger than effects of urban residence. Less of the rural–urban fertility gap by hukou status is due to differences in characteristics than is the case for the fertility gap by place of residence.

Key words: fertility, *hukou*, urbanization, China
JEL Classification: J13

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1. Introduction

China is only a decade from its expected peak population of 1.42 billion in 2028. In that year, a little over one-third of people—37.8 per cent—will be aged under 35 while the same age group now are 46.5 per cent of the population. This falling share means about 110 million fewer Chinese will be of an age where it is likely that they could still have children in the future and so the inexorable momentum of population decline sets in. Thus, forecasts of China's population by the end of the century are of just over one billion, which will be under two-thirds of India's population then and just one-third larger than Nigeria (United Nations et al. 2015).

This demographic reversal will have profound effects on economic and social policy. In the economic sphere, it is likely that any position China achieves as the largest economy in the world will be short-lived; the United States will have 450 million people by century-end, so China will need to get to about half of the per-capita income of the United States if it is to be ahead in total economic size (French 2016). This is unlikely because the American workforce is expected to grow 30 per cent between now and 2050, owing chiefly to immigration, while in China, the workforce will be 23 per cent smaller in 2050 than now and this smaller workforce will face a much larger burden of supporting an elderly population. In fact, almost one-quarter of China's growth over the past three decades was from the 'demographic dividend' of having the working age population grow faster than the total population, but this becomes a 'demographic debt' after 2020 that drags the growth rate down (Cai & Lu 2016).

In light of these demographic trends, China's policy-makers have changed course and after 35 years of trying to restrict population growth using the one-child policy (hereafter, OCP), couples can now, irrespective of circumstances, have two children (Xinhua Net 2015). Yet even with this relaxation, which many experts view as too little and too late (French 2016), China faces hard policy tradeoffs in raising fertility from the current sub-replacement rate of around 1.5 (Cai 2010; Peng 2011). The tradeoff focused on in this study is that China is much less urbanized than typical for a country of its income level; the 2010 census showed a de facto urban population that was just under one-half of the total population (Chan & Wan 2017). Urban women have lower fertility rates than rural women (Guo et al. 2012), and China must continue urbanizing to increase productivity and avoid the 'middle income trap' and, thus, further downward pressure on fertility is likely.

In this article, we study fertility gaps between urban and rural women, using data from the China Health and Nutrition Survey (CHNS). We test whether the gap of about 0.5 children per ever-married woman, which is equivalent to just under half the urban fertility rate, is due to different characteristics of urban and rural people or due to something inherent about urban life. In particular, we examine fertility rates if urban women had the same characteristics as rural women, and vice versa. A feature of our analysis is that we allow for China's simultaneous use of de facto and de jure counts when defining the urban population (Chan & Wan 2017). Under China's statistics, a woman can be defined as urban either because she lives in an urban area (a de facto criterion) or from having urban *hukou* (a de jure criterion).

We find that after controlling for various personal and household characteristics, the fertility-depressing effects of holding urban hukou are more than three times larger than are effects of urban residence. In other words, part of the urban–rural fertility gap in China reflects institutional factors, and the different constraints faced by the different types of hukou holders. Thus, comparisons of urban and rural fertility that do not account for the rigidities imposed by the hukou system may overstate the decline in fertility that the continued urbanization of rural women is likely to bring and may make policy tradeoffs appear harder than they truly are.

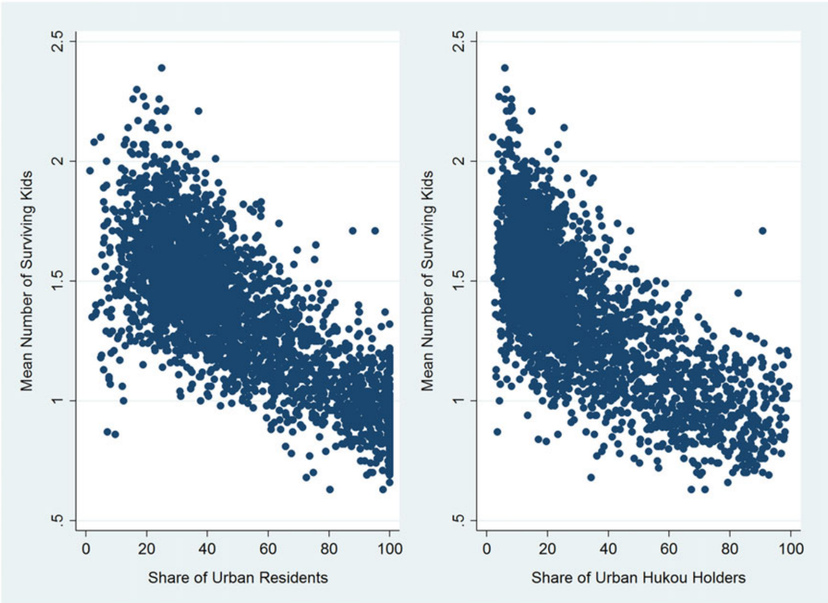
2. Background and Literature

When China introduced the OCP in 1979, the total fertility rate (TFR) had already fallen sharply, from six children per woman in the late 1960s to just 2.8 by the late 1970s (Peng 2011). While a slight rise in the TFR followed, this blip was an echo of the early 1960s rebound in fertility after the disastrous Great Leap Forward, as a larger cohort entered child-bearing age. Given this already declining TFR, there is debate in the literature about the role of government policy versus other more fundamental factors in contributing to China's fertility decline. If policy is not the major determinant of fertility, then a reversal of policy, such as the 2015 changes that allow two children, may not have much effect.

One fundamental factor highlighted in the literature is the inverse relationship between urbanization and fertility (Guo et al. 2012; Kulu 2013). This relationship is seen in Figure 1 in county level data from China's 2010 Population Census, where the urban population is in terms of those living in urban areas in the left panel and those with urban hukou in the right panel. The fertility rate falls from around 1.7 surviving children per woman aged 15 to 64 at the lowest urbanization levels to around 1.0 for counties with the highest urban population share. The time-series data show the same inverse relationship; from 1970 to 2014, the share of the urban population increased from about one-sixth to one-half and the TFR fell from 5.7 to 1.5 (World Bank 2016). Moreover, urbanization is forecast to be the main factor behind China's future fertility decline (Guo et al. 2012).

The prior studies with a focus on rural–urban differences consider locations but not

Figure 1 Fertility and Urban Population Share at County Level, 2010 China Census



another rural–urban classification in China—the hukou system. Hukou is the registration system created in 1955, which divided Chinese into two categories: agricultural hukou (rural hukou) and non-agricultural hukou (urban hukou). The hukou status is assigned to each child at birth according to parental hukou status, irrespective of birthplace.[1] A rural hukou holder may apply to change to urban hukou when enrolling in university, having a job in a state-owned enterprise or as a senior administrator, or when demobilized from military service (Liu et al. 2015). Urban hukou holders have better publicly provided education and health care, but until recently, the family planning policy had more exceptions for rural hukou holders, such as the girl-exception where some provinces let rural hukou holders have a second birth when the first child was a girl.[2]

1. It was determined by the mother's hukou status before 1998 (Liu et al. 2015).
2. The new two-child policy allows all couples to have two children, with no variation by area or hukou status (Xinhua Net 2015). The results below show that differences in policy-driven classifications, such as hukou, have significant effects on rural–urban fertility gaps. Because policy appears as an important fertility determinant, changing policy, as from the OCP to the two-child policy, should be expected to have an effect on fertility, although it is too early to see this in the data.

3. Data Description

We use data from the 2011 wave of the CHNS. These data let us look at impacts on fertility from both residential location and hukou status of each sampled woman. We also decompose the rural–urban fertility gaps (under both the location and hukou classification of urban) into explained and unexplained components.

3.1. Data

The CHNS survey covers a wide range of information at the individual, household and community level. In particular, it provides detailed relationship files for each individual, even if they live in different households, and this enables an accurate measure of fertility. The survey also obtains the hukou status of each individual, which lets us control both for the location and for hukou differences amongst sampled women.

The survey employs a multistage, random cluster sampling procedure to draw the sample

Figure 2 Map of Survey Regions, China Health and Nutrition Survey, 2011

from selected provinces and municipalities in China. In each selected region, counties are stratified by income (low, middle and high) and a weighted sampling scheme is used to randomly select four counties to form the rural sample. The urban sample is formed from the provincial capital and a low-income city. Villages and townships within the sampled counties, and urban and suburban neighbourhoods within the sampled cities, are selected randomly. The survey started with Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Liaoning and Shandong provinces in 1989, added Heilongjiang in 1997 and added the three municipalities of Beijing, Shanghai and Chongqing in 2011. The 12 provinces and municipalities in the 2011 wave are shown in Figure 2 and are distributed over the four levels of urbanization recognized in China (Guo et al. 2012).

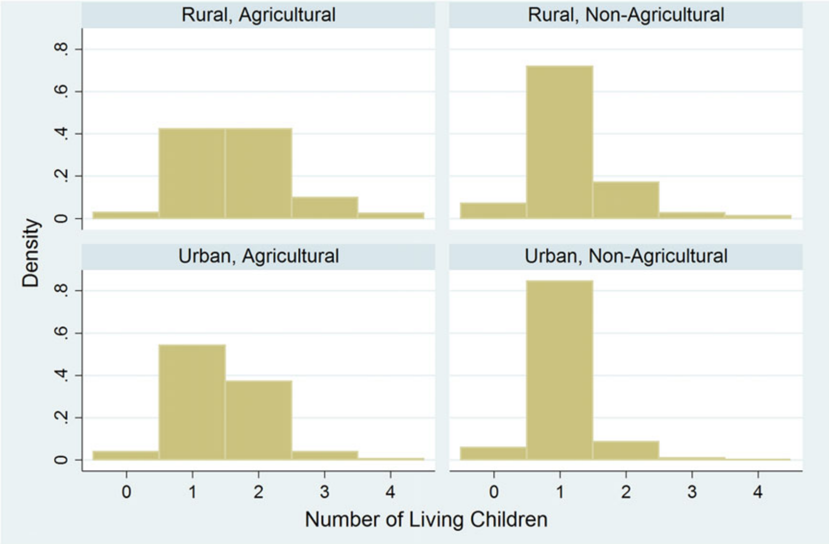
The individuals included in this research are ever-married women of Han ethnicity aged between 20 and 52.[3] This age range covers women of child-bearing age and satisfying the legal requirement for having children.[4] Respondents aged 52 in the 2011 survey were 21 years old when the OCP was introduced, so all sampled women were restricted by this policy throughout their child-bearing period.

After excluding women with incomplete information, the final sample includes 2543 observations. Amongst them, about one-fifth of the rural residents are urban (non-agricultural) hukou holders, while about 15 per cent of urban residents hold rural hukou. In other words, 11 per cent of agricultural hukou

3. We exclude ethnic minorities because they were mostly exempted from the OCP.

4. Marriage is the traditional and legal pre-condition of child bearing in China. The legal marriage age is 20 for women and 22 for men from 1980 onwards. Children born with either parent under the age limit will be considered an illegal birth (just one child in the 2011 CHNS was of this type).

Figure 3 Fertility Distribution of the Estimation Sample by Residence and Hukou Status, China Health and Nutrition Survey, 2011



holders live in urban areas, and the share for non-agricultural hukou holders living in rural areas is more than a quarter. This is not surprising given that university students, senior administrators and government officials are all granted urban hukou irrespective of their original hukou status and then keep that status notwithstanding current location.[5]

3.2. *Preliminary Results*

The outcome variable representing fertility in this article is the number of surviving children of an ever-married female at the survey time, following Fang et al. (2013). This number equals the total number of births from a woman minus the number of her children who died. Currently, pregnant women count as one birth.[6]

The mean fertility rate is 1.39 children per woman in our sample. The gap of about 0.5 children between urban and rural women is almost half of the mean fertility of urban women. The gap is wider between urban and rural hukou holders (1.65 for rural and 1.09 for urban) than between urban and rural residents (1.58 for rural and 1.11 for urban). Figure 3 plots the distribution of fertility for these four groups; rural and urban represents residence status, and agricultural and non-agricultural represents hukou status.[7] One child is the modal choice for non-agricultural hukou holders, at 72 per cent for those living in rural areas and 85 per cent in urban areas. On the other hand, agricultural hukou holders in rural areas are just as likely to have two children as one child, and 37 per cent of agricultural hukou holders living in urban areas have two children compared with just 9 per cent for non-agricultural hukou holders in urban areas.

Regressions are another way to consider the relationship between the urban indicators and fertility. The measure of individual fertility is

5. China Health and Nutrition Survey is a longitudinal survey following people in the same households. Whether the person was born at the current place or has always lived at the current place is not covered and so cannot be used to detect migrants in our sample. We have reason to believe that the sampled women are mostly permanent residents in the community where surveyed.

6. The infant mortality rate in China is low so it is reasonable to include expected births by pregnant woman as part of the cumulative fertility measure (Fang et al. 2013).

7. Number of living children is truncated at four. Only seven cases in the sample exceed this value, and they are all in the rural-agricultural group.

a count variable, so ordinary least squares is not appropriate, but a Poisson model is suitable.[8] This model takes the following form:

$$\log(\text{Fertility}) = \alpha + \beta U + \varepsilon \quad (1)$$

where Fertility is the count of surviving children of each woman, U is the vector of urban status, which could include urban residence, or hukou status, or both indicators simultaneously. The coefficients from a Poisson regression are interpreted as the expected change in the log of the outcome from a one-unit increase in the right-hand side variables, ceteris paribus. In the case of dummy variables, the coefficients show the expected difference in the log count from the reference group, with a negative coefficient representing a smaller mean outcome than for the reference group. For example, the first model in Table 1 shows that the mean log count of child numbers for women living in urban areas is expected to be 0.355 lower than for women living in rural areas, whose log count of mean fertility is 0.455. This means that the estimated urban fertility is $e^{(0.455-0.355)}$=1.11, which is 0.47 fewer children than the rural rate of $e^{(0.455)}$=1.58, and the difference is statistically significant at the 1 per cent level.

The coefficient for urban hukou is more negative and statistically significant than is the coefficient for urban location (comparing columns 1 and 2 of Table 1). If the two indicators are both included in the model, the urban hukou shows a much stronger impact on fertility than does the urban residence, consistent with the patterns in Figure 3. Specifically, the coefficient on urban hukou is more than twice as large as the coefficient on urban residence, suggesting that de jure urban status matters more to fertility than de facto urban location.

8. Other options are the negative-binomial, and zero-inflated models, and tests for choosing amongst these are discussed in Bauer et al. (2007). There is not a large proportion of zeros in the distribution of child numbers, so zero-inflated models should not be needed. Goodness-of-fit tests after the Poisson regressions give no reason to reject that model and choose negative-binomial regressions.

Table 1 Unconditional Poisson Regressions of Fertility Using Two Indicators of Urban Status

	(1)	*(2)*	*(3)*
Urban residence	−0.355***		−0.140***
	(0.019)		(0.026)
Urban hukou		−0.417***	−0.331***
		(0.019)	(0.026)
Constant	0.455***	0.499***	0.514***
	(0.013)	(0.013)	(0.014)
Pseudo-R^2	0.016	0.023	0.024
Number of observations	2543		

***$p<0.01$.
**$p<0.05$.
*$p<0.1$.

4. Multivariate Analysis

In this section, we use two different approaches to test urban effects on fertility. In the first, we repeat the regressions reported in Table 1 but add a series of conditioning variables. In the second, we use regression techniques to decompose the fertility gap between urban and rural women into explained and unexplained parts.

4.1. Poisson Regression

We start by regressing fertility on the two urban indicators, urban residence and urban hukou, along with other control variables, using the Poisson regression. The full model is as seen thereafter:

$$\log(\text{Fertility}) = \alpha_0 + \beta_1 \text{Urban} + \beta_2 \text{NonAg} + \beta_3 \boldsymbol{X} + \beta_4 \boldsymbol{Z} + \varepsilon \quad (2)$$

where Urban indicates urban residence, and NonAg indicates urban (non-agricultural) hukou holders, $\boldsymbol{X}$ is a vector of OCP measures, and the vector $\boldsymbol{Z}$ has other socio-economic factors. The summary statistics of the outcome and control variables for all sampled women, categorized by the two urban indicators, are listed in Appendix 1.

The number of children that sampled women had is a cumulative measure that might not closely relate to current policy. Therefore, we use eligibility for having two children to represent the OCP impact on fertility, where this equals one if the woman satisfied the OCP exceptions for having two children at any stage until 1 year prior to the survey time, and is zero otherwise. The local OCP strength measure is the share of women eligible to have two children in each community at the survey time (Liang & Gibson 2017). About 72 per cent of rural women in the sample were eligible to have two children before the 2011 survey, while the share was only around 45 per cent for urban women.

Amongst the control variables, female employment is considered to have large impacts on fertility. We follow Fang et al. (2013) in splitting employed women by job type (working as farmer, fisherman or hunter versus other jobs). Farm jobs provide more flexibility than the off-farm jobs, and rural women could potentially work their own land while this is not available for urban women (Fang et al. 2013). The share of women working in farm jobs is about 2 per cent for urban residents and less than 1 per cent for urban hukou holders but about 37 per cent for rural residents and 43 per cent for rural hukou holders. The reference group in the regression is the 'not employed' group, which includes people not in the labour force, and people currently unemployed and actively job-seeking. We also control for other individual attributes, including age (in 5-year age groups), whether currently married, number of siblings, highest qualification gained (primary school, lower middle school, upper middle school, technical or vocational qualifications, university or college qualifications and master's degree or higher), annual income for the respondent and the household, whether living in an owner-occupied dwelling and the province fixed effect (with Beijing as the reference category).

Table 2 presents results for the full model, with the first two columns for the raw form of the coefficients and standard errors and the next two columns for their exponential terms. Recall that the coefficients are interpreted as the difference in the log of the expected outcome (number of children) owing to a one-unit change in the covariate. In other words, the difference between the default value of one and the exponential form of the coefficient shows the percentage change in the outcome for a one-unit change in the covariate.

The impacts on fertility of urban residence and of urban hukou remain negative and statistically significant with the covariates included. Compared with the unconditional results in Table 1, the apparent impact of urban hukou is approximately halved (with the raw coefficient going from −0.33 to −0.17), while the impact of urban residence is reduced to one-third of its previous value (from −0.14 to −0.05). Thus, with covariates included in the model, the negative effect on fertility of holding urban hukou is more than three times as large as is the effect of living in an urban area.

Amongst the control variables, being eligible to have two children has a significant and positive impact on fertility, raising the expected number of children by 22 per cent. However, the OCP strength at the community level does not have a significant influence on individual fertility. The fertility rate is also higher for women with more siblings, while working in off-farm jobs and having higher education are estimated to lower fertility, especially for those who gained formal qualifications beyond the level of lower middle school qualification (the compulsory education level in China). Income, marriage status and housing tenure are estimated to have no significant impact on fertility.[9]

The inference to be drawn from Table 2 is that urban fertility is lower than rural fertility in China, under both the de facto and de jure urban–rural criteria, and the differences remain statistically significant after we account for socio-economic factors and family planning policy. However, there are possible nuances to this conclusion. For example, more urbanized areas may provide more opportunities to gain higher education

9. The effects from the province and municipalities are controlled but not reported in the table. It is estimated that women in Heilongjiang, Liaoning and Jiangsu had the lowest fertility, and women in Henan, Guangxi and Guizhou had the highest after accounting for socio-economic characteristics and policy effects.

Table 2 Poisson Regression of Fertility, Full Model

	Raw form		*Exponential form*	
	Coefficient	*Standard error*	*Coefficient*	*Standard error*
Urban residence	−0.0492**	(0.023)	0.952**	(0.022)
Urban hukou	−0.174***	(0.026)	0.841***	(0.022)
Eligibility for having two children	0.197***	(0.027)	1.218***	(0.033)
Community OCP strength	0.0216	(0.053)	1.022	(0.054)
Age range [20, 25)	−0.600***	(0.084)	0.549***	(0.046)
Age range [25, 30)	−0.383***	(0.056)	0.682***	(0.038)
Age range [30, 35)	−0.170***	(0.047)	0.844***	(0.040)
Age range [35, 40)	−0.0868*	(0.046)	0.917*	(0.042)
Age range [40, 45)	−0.0901**	(0.044)	0.914**	(0.040)
Age range [45, 50)	−0.00306	(0.042)	0.997	(0.042)
Number of siblings	0.0185***	(0.006)	1.019***	(0.006)
Currently married	0.000625	(0.056)	1.001	(0.056)
Working in other occupations	−0.0482*	(0.026)	0.953*	(0.024)
Working as a farmer, fisherman or hunter	0.0481	(0.030)	1.049	(0.032)
Primary school	−0.0702*	(0.037)	0.932*	(0.034)
Lower middle school	−0.100***	(0.034)	0.905***	(0.030)
Upper middle school	−0.210***	(0.039)	0.810***	(0.032)
Technical/vocational degree	−0.189***	(0.045)	0.827***	(0.037)
University degree or higher	−0.215***	(0.044)	0.806***	(0.035)
Annual individual income (000)	−0.000472	(0.000)	1	(0.000)
Annual household income (000)	0.000256	(0.000)	1	(0.000)
Owner-occupied household	−0.00541	(0.030)	0.995	(0.029)
Constant	0.417***	(0.085)	1.518***	(0.129)
Number of observations	2543			
Pseudo-R^2	0.058			

Note: The fixed effects for province and municipalities are not reported. OCP, one-child policy.
***p<0.01.
**p<0.05.
*p<0.1.

and off-farm jobs, so these negative effects of control variables should be partially attributed to urban residence. To further study the fertility gap between urban and rural women, we next turn to regression decompositions to break the observed differences into two parts, the portion that can be explained by differences in characteristics and the portion that is unexplained.

4.2. Decomposition using Regressions

Because fertility is a count variable, we decompose the fertility gap between urban and rural women into explained and unexplained parts by applying Blinder–Oaxaca decompositions using the method for count data models developed by Bauer et al. (2007) and made available as a *Stata* estimator by Sinning et al. (2008). An overview of generalized linear decomposition, based on the treatment in Oaxaca and Ransom (1994), is

$$\overline{Y}_{\mathrm{A}} - \overline{Y}_{\mathrm{B}} = \left(\overline{X}_{\mathrm{A}} - \overline{X}_{\mathrm{B}}\right)\beta^* + \overline{X}_{\mathrm{A}}(\beta_A - \beta^*) + \overline{X}_{\mathrm{B}}(\beta^* - \beta_B) \tag{3}$$

In the nonlinear case, it is

$$\begin{aligned}\overline{Y}_{\mathrm{A}} - \overline{Y}_{\mathrm{B}} = &\left\{E_{\beta^*}(Y_{iA}|X_{iA}) - E_{\beta^*}(Y_{iB}|X_{iB})\right\} \\ &+ \left\{E_{\beta_A}(Y_{iA}|X_{iA}) - E_{\beta^*}(Y_{iA}|X_{iA})\right\} \\ &+ \left\{E_{\beta^*}(Y_{iB}|X_{iB}) - E_{\beta_B}(Y_{iB}|X_{iB})\right\}\end{aligned} \tag{4}$$

where group A represents the majority group with higher outcomes and B the minority group with lower outcomes (Sinning et al. 2008). In our context, group A is rural women, with higher fertility and a larger sample proportion, and group B is urban women. The first term in Equation 3 reflects the portion of the fertility gap that is owing to differences in characteristics. The next two terms reflect the difference due to coefficients, which may indicate an advantage for rural women $\{E_{\beta_A}(Y_{iA}|X_{iA}) - E_{\beta^*}(Y_{iA}|X_{iA})\}$, while for urban women, $\{E_{\beta^*}(Y_{iB}|X_{iB}) - E_{\beta_B}(Y_{iB}|X_{iB})\}$ indicates any disadvantage in terms of fertility. β^* is defined as a weighted average of the coefficient vectors, β_A and β_B: $\beta^* = \Omega\beta_A + (I - \Omega)\beta_B$, where Ω is a weighting matrix and $\boldsymbol{I}$ is an identity matrix.

Different assumptions about the form of Ω can be considered. If it is assumed that Ω is an identity matrix, one obtains the usual Oaxaca decomposition (Oaxaca 1973), where the difference in characteristics is valued using the coefficients from the rural model for fertility. Another widely used assumption is that $\Omega = 0$(Blinder 1973), so the coefficients from the urban model are used to value the difference in characteristics. In addition to these two popular approaches, Reimers (1983) proposes the weighting matrix $\boldsymbol{\Omega} = 0.5\boldsymbol{I}$, which defines β^* to be a simple average of the estimated coefficients for the two groups; Cotton (1988) chooses the weighting matrix $\boldsymbol{\Omega} = s\boldsymbol{I}$, where s denotes the relative sample size of the majority (rural) group; and Neumark (1988) and Oaxaca and Ransom (1994) propose a pooled model to derive the counterfactual coefficient vector β^*. Another intuitive decomposition considers the coefficient on the group indicator variable in the full regression (pooling urban and rural women together) as measuring the unexplained gap (Elder et al. 2010).

In this research, there is no reason to favour one assumption about the form of Ω over the other. We apply all six decompositions to provide robust inferences about the importance of characteristics versus coefficients in explaining the fertility gap.[10] The results are reported in Table 3, with the top panel showing the decomposition of fertility gaps between urban and rural residents, and the bottom panel the gaps between urban and rural hukou holders.[11] In our context, the majority group and advantage will refer to the rural women in both panels.

The raw gap in average fertility of urban and rural residents is 1.58−1.11 = 0.47 (see Table A1). If the mean values of characteristics for rural residents are combined with the coefficients for urban residents, the gap in mean fertility would close by 0.38 children, which is 80.8 per cent of the total gap. The differences in average characteristics appear even more important when the coefficients for rural residents are used, with 90.1 per cent of the fertility gap explained. The upper bound for the explained gap is from the pooled model method derived by Neumark (1988), which shows that 93.3 per cent of the raw difference in urban–rural fertility is due to the different characteristics of urban and rural women. Thus, almost all of the lower fertility of female urban residents is due to their different characteristics compared with those of rural women, with very little of the gap due to an unexplained ‘structural’ effect of urban living.

The raw gap in fertility between urban and rural hukou holders is 0.56, and this gap is less explained by the differences in average characteristics of the two groups. The lower panel of Table 3 shows that if rural hukou holders had the characteristics of urban hukou holders and kept their own coefficients; the fertility gap would be closed by 0.32 children, accounting for 56.9 per cent of the raw difference. This is almost the same size as the explained gap estimated by the Elder et al. (2010) decomposition method. The counterfactual results based on the assumptions of Ω = 0.5 and Ω = 0.54 (the share of rural hukou holders in the sample) show about 70 per cent of the raw difference can be attributed to differences in the characteristics. It is only when the urban coefficients are used, or when the Neumark (1988) approach to using a pooled model is used, that about 80 per cent of the fertility gap is explained by differences in characteristics. Thus, compared with

10. The Stata command *nldecompose* provided by Sinning et al. (2008) gives the opportunity to do this, for five of the methods. We also adapt the Elder et al. (2010) method, which was based on continuous outcomes, by using the marginal effect from the Poisson regression on the group indicator to measure the unexplained gap in fertility, where the indicator variable equals one for women who are the urban residents (or urban *hukou* holders) and zero otherwise.

11. The regressions for the subsamples used by the decompositions are listed in Appendix 2.

Table 3 Decomposition of the Urban/Rural Gaps in Fertility using Six Different Formulations of the Counterfactual Case

	Explained gap			Unexplained gap	
	Size	*Percentage of total*		*Size*	*Percentage of total*
Urban residence, gross difference = 0.47					
Pooled model (elder)	0.402	85.53		0.068	14.47
Rural model (Ω = 1)	0.424	90.11		0.047	9.89
Urban model (Ω = 0)	0.380	80.81		0.090	19.19
Simple average (Ω = 0.5)	0.401	85.24	Advantage	0.051	10.88
			Disadvantage	0.018	3.89
Weighted average (Ω = 0.6)	0.406	86.15	Advantage	0.042	8.96
			Disadvantage	0.023	4.89
Pooled model (Neumark)	0.439	93.32	Advantage	0.013	2.69
			Disadvantage	0.019	3.99
Urban hukou, gross difference = 0.56					
Pooled model (elder)	0.319	56.96		0.241	43.04
Rural model (Ω = 1)	0.318	56.94		0.242	43.06
Urban model (Ω = 0)	0.463	82.34		0.099	17.66
Simple average (Ω = 0.5)	0.394	70.08	Advantage	0.058	10.28
			Disadvantage	0.110	19.64
Weighted Average (Ω = 0.54)	0.389	69.17	Advantage	0.054	9.64
			Disadvantage	0.119	21.19
Pooled model (Neumark)	0.468	83.30	Advantage	0.044	7.75
			Disadvantage	0.050	8.95

decomposing urban–rural gaps by place of residence, when they are decomposed by hukou status, the gap is both larger and less explained by differences in characteristics.

In addition to showing the overall importance of characteristics versus coefficients, some of the decompositions can also be used to allocate the unexplained differences between the two groups. Looking at the counterfactual results based on the assumptions of simple average and weighted average for the weighting matrix, if urban and rural women are classified by their residence status, rural life gives a fertility advantage of around 10 per cent of the gap between urban and rural fertility rates, while urban life gives a fertility disadvantage of about four to 5 per cent of the gap. For the classification based on hukou status, however, something inherently disadvantageous about urban hukou contributes much more to the unexplained gap; using the weighted average, the fertility disadvantage of urban hukou is equivalent to 21.2 per cent of the total urban–rural fertility gap (and to 19.6 per cent of the gap if using the simple average weighting matrix). The urban hukou fertility disadvantages are about twice as large as are the fertility advantages for agricultural hukou holders.

The decomposition results show that most of the differences between the fertility of female urban residents and female rural residents can be explained by differences in their characteristics (including different OCP rules). The different methods of decomposition do not really matter to this claim, with the explained share of the gap ranging from 81 to 93 per cent. However, if we compare fertility of urban and rural hukou holders, less of the gap is explained by different characteristics (on average, just 70 per cent is explained) and the different decomposition methods give a wider range of results. This suggests that there is something inherent for urban hukou holders that causes lower fertility than for rural hukou holders compared with the situation for urban residents versus rural residents.

5. Discussion and Conclusions

China's current fertility rate is below replacement level, and the government has begun to make changes in an attempt to increase this rate, including by relaxing the family planning policy to let every couple have two children. However, given that China is becoming more urban and that urban fertility is lower than rural fertility, it is important to examine whether urbanization might drag down future fertility. Indeed, to the extent that there may be something inherent in urban life that reduces fertility, China would seem to face a difficult policy tradeoff because it needs to keep urbanizing in order to become richer but this urbanization may further depress fertility, and sub-replacement fertility will be a drag on future economic growth.

In this research, we decomposed China's rural–urban fertility gaps. Our results suggest that the tradeoff is more apparent than real. Some of the lower fertility of urban women may be due to the rigidities imposed by hukou status, which matters far more to fertility than does the issue of where they reside. In other words, if rural women with agricultural hukou move to the city, the expected reduction in their fertility is much less than what is expected when an agricultural hukou holder converts to non-agricultural hukou (irrespective of whether they live in urban or rural areas). Because hukou registration is an idiosyncratic and legal feature of China rather than a fundamental socio-economic constraint, it could be reformed by China's policy-makers to weaken these possible tradeoffs between goals of encouraging urbanization and encouraging higher fertility. Indeed, amongst the many reasons to reform hukou (Chan & Wan 2017) the possible positive impact on fertility is not one that has been highlighted previously.[12]

Our decompositions show that most of the fertility gap between urban and rural areas can be attributed to the difference in the average characteristics of women living in each type of area. In contrast, more of the gap remains unexplained if we compare women with different hukou status. In other words, even if the covariates that we control for were changed so that they take on the average values for women with agricultural hukou—and these covariates include the different family planning rules that women were exposed to over time—for women with non-agricultural hukou their fertility would still remain considerably lower than for the agricultural hukou women. Because our decomposition also controls for location (and in turn, when studying location gaps it controls for hukou status), the size of the remaining unexplained gap suggests that there is an unobserved effect that leads to low fertility amongst non-agricultural hukou holders. Because most of the women in urban areas hold non-agricultural hukou, the previous literature that has not distinguished between China's de facto and de jure classifications of the urban and rural population will tend to attribute this hukou effect to an effect of urban life on fertility.

Our data come from the CHNS, which longitudinally follows the same households (even though we focus only on the latest and largest wave), so it is possible that migrants who frequently change addresses will be under-represented in our sample. These migrants are more likely to be people who do not change their hukou status even as they move from rural to urban areas, and their fertility behaviour may be more like that of rural women than urban women if this potentially under-sampled group are migrants who circulate between urban and rural areas. Thus, if there is any sampling bias in our study, it would be in the direction of finding a larger gap between the fertility of women in urban and rural areas than might exist if these short-term migrants were fully covered. This suggests, once again, that the apparent policy tradeoff between encouraging continued urbanization and raising the fertility rate may be smaller than it appears.

12. An alternative interpretation suggested by a referee is that China's policy-makers could allow more rural women to move to cities without changing their hukou status and this may reduce fertility by less than if hukou status was changed. However, there are welfare costs for people who live in cities without the non-agricultural hukou, so this is not a policy that we would recommend.

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Appendix 1. Summary Statistics for the Estimation Sample, CHNS, 2011

	Categorized by Location		*Categorized by hukou*	
	Rural	*Urban*	*Rural*	*Urban*
Fertility	1.58	1.11	1.65	1.09
Urban residence			11.23%	73.73%
Urban hukou	20.39%	85.04%		
Eligibility for having two children	72.37%	43.40%	72.71%	46.86%
Community OCP strength	62.16%	35.57%	63.10%	38.02%
Mean age	40.27	40.35	40.08	40.56
Age range [20, 25)	5.20%	1.86%	6.02%	1.36%
Age range [25, 30)	8.82%	9.68%	9.02%	9.32%
Age range [30, 35)	10.26%	14.57%	9.83%	14.49%
Age range [35, 40)	18.09%	18.28%	17.53%	18.90%
Age range [40, 45)	24.21%	21.99%	24.36%	22.12%
Age range [45, 50)	25.99%	24.93%	26.85%	24.07%
Age range [50, 52)	7.43%	8.70%	6.38%	9.75%
Currently married	98.42%	95.70%	98.83%	95.59%
Number of siblings	3.14	2.33	3.28	2.27
Not employed	21.05%	16.52%	20.69%	17.54%
Working in other occupations	41.51%	81.33%	36.68%	81.61%
Working as a farmer, fisherman or hunter	37.43%	2.15%	42.63%	0.85%
No qualification	11.58%	3.03%	13.87%	1.53%
Primary school	23.55%	4.40%	25.09%	5.17%
Lower middle school	45.13%	23.56%	46.52%	24.83%
Upper middle school	10.59%	21.90%	9.24%	21.95%
Technical/vocational degree	4.14%	13.78%	2.86%	13.98%
University degree or higher	5.00%	33.33%	2.42%	32.54%
Annual individual income (000)	16.45	29.08	15.09	28.97
Annual household income (000)	47.95	68.47	41.82	72.83
Owner-occupied household	96.18%	84.26%	96.18%	85.85%
Beijing	4.54%	19.75%	5.50%	16.61%
Liaoning	6.12%	2.54%	4.84%	4.49%
Heilongjiang	10.72%	6.84%	11.89%	6.02%
Shanghai	3.75%	17.50%	1.91%	17.80%
Jiangsu	11.12%	6.35%	9.10%	9.32%
Shandong	8.55%	6.45%	8.07%	7.29%
Henan	11.32%	6.84%	13.28%	5.17%
Hubei	11.05%	6.84%	10.71%	7.80%
Hunan	8.42%	5.87%	7.63%	7.12%
Guangxi	13.95%	6.84%	14.53%	7.12%
Chongqing	7.89%	10.75%	9.54%	8.47%
Guizhou	2.57%	3.42%	3.01%	2.80%
Number of observations	1520	1023	1363	1180

Note: CHNS, China Health and Nutrition Survey.

Appendix 2. Poisson Regressions of Fertility on Urban Life by Subgroups, CHNS, 2011

	Categorized by Location		*Categorized by hukou*	
	Rural	*Urban*	*Rural*	*Urban*
Urban residence			−0.00506	−0.0459
			(0.035)	(0.031)
Urban hukou	−0.127***	−0.193***		
	(0.035)	(0.042)		
Eligibility for having 2 children	0.281***	0.0896**	0.251***	0.157***
	(0.037)	(0.039)	(0.039)	(0.038)
Community OCP strength	−0.0515	−0.0217	−0.121	0.0586
	(0.078)	(0.082)	(0.079)	(0.080)
Age range [20, 25)	−0.591***	−0.639***	−0.672***	−0.538***
	(0.098)	(0.176)	(0.100)	(0.199)
Age range [25, 30)	−0.403***	−0.300***	−0.440***	−0.279***
	(0.071)	(0.084)	(0.074)	(0.082)
Age range [30, 35)	−0.221***	−0.0483	−0.271***	−0.0143
	(0.062)	(0.067)	(0.066)	(0.062)
Age range [35, 40)	−0.154***	0.0269	−0.208***	0.0930*
	(0.059)	(0.061)	(0.065)	(0.055)
Age range [40, 45)	−0.152***	0.0308	−0.191***	0.0685
	(0.056)	(0.060)	(0.061)	(0.056)
Age range [45, 50)	−0.0151	0.0119	−0.0668	0.0667
	(0.054)	(0.057)	(0.059)	(0.053)
Number of siblings	0.0133*	0.0268***	0.0133*	0.0311***
	(0.008)	(0.008)	(0.008)	(0.008)
Currently married	0.122	−0.0572	0.0756	−0.035
	(0.085)	(0.070)	(0.089)	(0.070)
Working in other occupations	−0.0632*	−0.0515	−0.0686**	−0.0715*
	(0.033)	(0.041)	(0.034)	(0.043)
Working as a farmer, fisherman or hunter	0.0382	0.0461	0.0246	0.234*
	(0.034)	(0.086)	(0.034)	(0.120)
Primary school	−0.0445	−0.174*	−0.0807**	0.0346
	(0.040)	(0.093)	(0.039)	(0.118)
Lower middle school	−0.0737**	−0.216***	−0.0958***	−0.0828
	(0.037)	(0.083)	(0.036)	(0.108)
Upper middle school	−0.199***	−0.278***	−0.233***	−0.145
	(0.047)	(0.087)	(0.049)	(0.109)
Technical/vocational degree	−0.137**	−0.309***	−0.196**	−0.175
	(0.068)	(0.088)	(0.083)	(0.109)
University degree or higher	−0.309***	−0.297***	−0.147*	−0.219*
	(0.074)	(0.089)	(0.077)	(0.112)
Annual individual income (000)	8.72E−05	−0.00126***	−8.7E−06	−0.00114**
	(0.001)	(0.000)	(0.001)	(0.000)
Annual household income (000)	0.000157	0.000515**	−6.5E−05	0.000752***
	(0.000)	(0.000)	(0.000)	(0.000)
Owner-occupied household	−0.00909	−0.0136	0.0366	−0.0502
	(0.054)	(0.035)	(0.062)	(0.033)
Constant	0.290**	0.476***	0.372***	0.167
	(0.125)	(0.128)	(0.132)	(0.139)
Number of observations	1,520	1,023	1,363	1,180
Pseudo-R^2	0.057	0.027	0.049	0.025

Notes: The fixed effects for provinces and municipalities are not reported. CHNS, China Health and Nutrition Survey; OCP, one-child policy.
***$p<0.01$.
**$p<0.05$.
*$p<0.1$.