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

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Working Paper in Economics 06/17

March 2017

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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 trade-off since 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 are effects of urban residence. Since *hukou* registration is not a fundamental socio-economic constraint, it could be reformed by China's policy makers in order to weaken the possible trade-off between goals of encouraging urbanization and encouraging higher fertility.

Keywords

fertility
Hukou
urbanization
China

JEL Classification

J13

Acknowledgements

This research uses data from the China Health and Nutrition Survey (CHNS). We thank the National Institute of Nutrition and Food Safety, China Center for Disease Control and Prevention; the Carolina Population Center, University of North Carolina at Chapel Hill; the National Institutes of Health (NIH; R01-HD30880, DK056350, and R01-HD38700); and the Fogarty International Center, NIH, for financial support for the CHNS data collection and analysis files since 1989. We thank those parties, the China-Japan Friendship Hospital, and the Ministry of Health for support for CHNS 2009 survey.

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 percent - will be aged under 35 while the same age group now are 46.5 percent 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 (UN 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 U.S. if it is to be ahead in total economic size (French 2016). This is unlikely since the American workforce is expected to grow 30 percent between now and 2050, due chiefly to immigration, while in China the workforce will be 23 percent 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 and 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 trade-offs in raising fertility from the current sub-replacement rate of around 1.5 (Cai 2010 and Peng 2011). The trade-off 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 and 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 paper, 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 and Wan 2017). Under China's statistics, a woman can be defined as urban either because she lives in an urban area (a *de facto* criteria) or from having urban *hukou* (a *de jure* criteria).

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 trade-offs appear harder than they truly are.

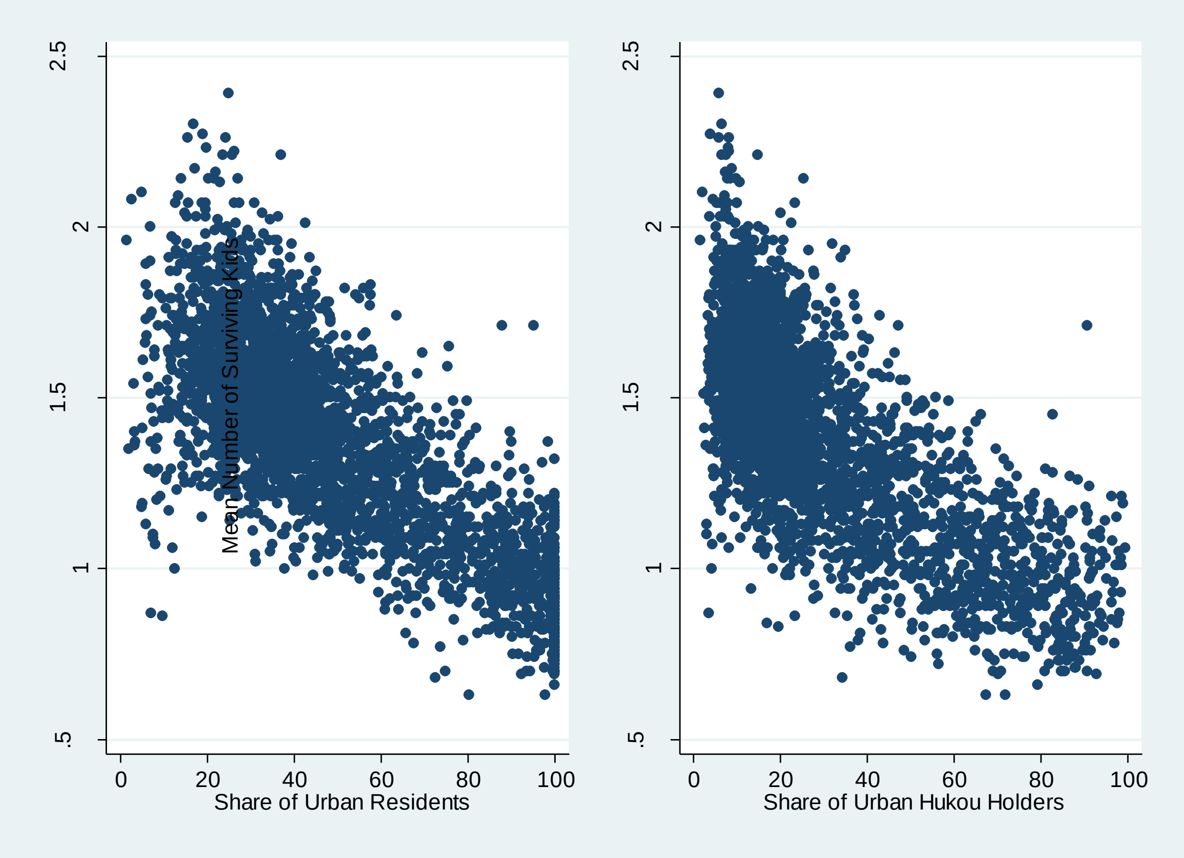
2. Background and Literature

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 urbanisation and fertility (Guo *et al.*2012 and Kulu 2013). This relationship is seen in **Error! Reference source not found.** 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 total fertility rate 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 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-agriculture *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).[2] Urban *hukou* holders have better publicly-provided education and health care, but the family planning policy has more exceptions for rural *hukou* holders. For example, the girl-exception, that lets a couple have a second birth when the first child is a girl, was only available for rural *hukou* holders in many provinces. Thus, it is unclear whether rural-urban fertility gaps reflect something intrinsic about urban location rather than the rigidities imposed by *hukou*.

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



3. Data Description

We use data from the 2011 wave of the China Health and Nutrition Survey (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.

[1] It was determined by the mother's *hukou* status before 1998 (Liu *et al.* 2015).

[2] Agricultural *hukou* holders have access to farming land, which they give up if they convert to urban *hukou*.

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 among sampled women.

The survey employs a multistage, random cluster sampling procedure to draw the sample 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 **Error! Reference source not found.**, and are distributed over the four levels of urbanization recognized in China (Guo *et al.* 2012).

Figure 2: Map of Survey Regions, CHNS, 2011

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. Among them, about one fifth of the rural residents are urban (non-agriculture) *hukou* holders, while about 15% of urban residents hold rural *hukou*. From another perspective, 11% of the agricultural *hukou* holders live in urban areas, and the share for non-agricultural *hukou* holders who live 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 paper 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). **Error! Reference source not found.** plots the distribution of fertility for these four groups; rural and urban represents residence status, and agriculture and non-agriculture represents *hukou*

[3] We exclude the ethnicity minorities in this research because they are mostly exempted from the OCP.

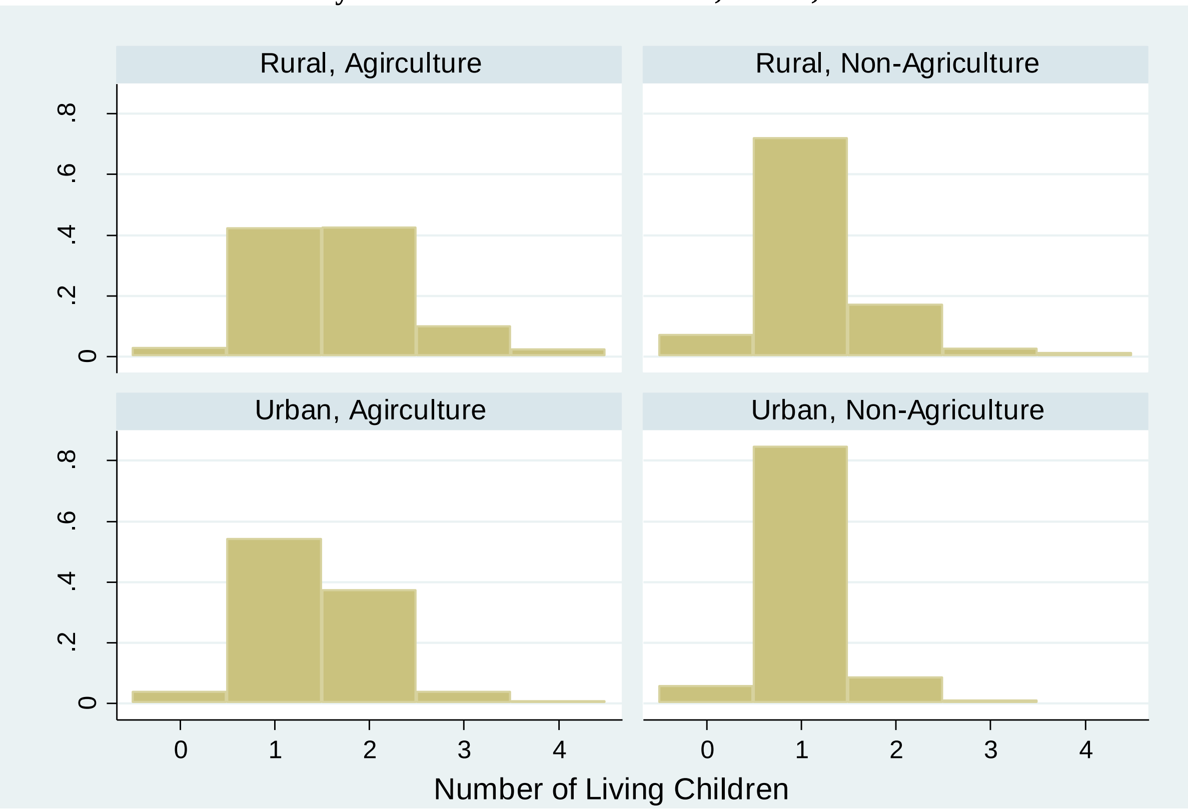
[4] Marriage is the traditional and legal pre-condition of child bearing in China. The legal marriage age is 20 for women and 22 for men from 1980 onwards. Children born with either parent under the age limit will be considered an illegal birth. Such illegal birth in 2011 CHNS only exists for one respondent.

[5] CHNS 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).

status.[7] One child is the modal choice for non-agriculture *hukou* holders, at 72% for those living in rural areas and 85% in urban areas. On the other hand, agriculture *hukou* holders in rural areas are just as likely to have two children as one child, and 37% of agriculture *hukou* holders living in urban areas have two children, compared to just 9% for non-agriculture *hukou* holders in urban areas.

Figure 3: Fertility Distribution of the Estimation Sample by Residence and *Hukou* Status, CHNS, 2011



Notes

Rural and urban represent the residence status, and agriculture and non-agriculture represent the *hukou* status. Number of living children is truncated at four. Seven observations in the rural-agriculture group exceed this value.

Another way to consider the relationship between the urban indicators and fertility is with a Poisson regression, which is used because the measure of individual fertility is a count variable. This model takes the following form:

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

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

[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-agriculture group.

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% level.

Table 1: Unconditional Fertility Regressions 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		2,543	

*** p<0.01, ** p<0.05, * p<0.1

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 **Error! Reference source not found.**. 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.

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 below:

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

where *Urban* indicates urban residence, and *NonAg* indicates urban (non-agriculture) *hukou* holders, ***X*** is a vector of OCP measures, and the vector ***Z*** has other socioeconomic 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 which 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 one 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 and Gibson 2017). About 72% of rural women in the sample were eligible to have two children before the 2011 survey, while the share was only around 45% 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 all work in their own land while it's not available for urban women (Fang *et al.* 2013). The share of women working in farm jobs is about two percent for urban residents and less than one percent for urban *hukou* holders, but about 37 percent for rural residents and 43 percent 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 seeking job. 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) due 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 to 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.

Table 2: Full Fertility Regression

	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		2,543		
Pseudo-R^2		0.058		

Notes
The fixed effects for province and municipalities are not reported.
*** p<0.01, ** p<0.05, * p<0.1

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%. 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.[8]

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 socioeconomic factors and family planning policy. However, there are possible nuances to this conclusion. For example, more urbanised areas may provide more opportunities to gain higher education 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 a regression decomposition approach 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

Since fertility is a count variable, we apply the Blinder-Oaxaca-decomposition method for count data models developed by Bauer *et al.* (2008) to decompose the fertility gap between urban and rural women into explained and unexplained parts. Oaxaca and Ransom (1994) give an overview of the application of the following generalized linear decomposition:

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

while Bauer *et al.* (2008) rewrite it for the nonlinear case as:

$$\bar{Y}_{\mathrm{A}} - \bar{Y}_{\mathrm{B}} = \{E_{\beta^*}(Y_{iA}|X_{iA}) - E_{\beta^*}(Y_{iB}|X_{iB})\} + \{E_{\beta_A}(Y_{iA}|X_{iA}) - E_{\beta^*}(Y_{iA}|X_{iA})\} + \{E_{\beta^*}(Y_{iB}|X_{iB}) - E_{\beta^*}(Y_{iB}|X_{iB})\} \tag{4}$$

Here group A represents the majority group with higher outcomes, and B the minority group with lower outcomes. 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 due 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 $\{E_{\beta^*}(Y_{iB}|X_{iB}) - E_{\beta^*}(Y_{iB}|X_{iB})\}$ indicates 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.

8 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 once removing the socio-economic and policy effects.

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 to estimate a pooled model to derive the counterfactual coefficient vector β^*.

In this research, there is no reason to favour one assumption about the form of $\boldsymbol{\Omega}$ over the other. We apply all five decompositions to provide robust inferences about the importance of characteristics versus coefficients in explaining the fertility gap.[9] The results of the five decompositions 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.[10] In our context, the majority group and advantage will refer to the rural women in both panels.

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

	Explained Gap		Unexplained Gap		
	Size	% of Total		Size	% of Total
		Urban Residence, Gross Difference = 0.47			
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			
Rural Model (Ω =1)	0.320	56.94%		0.242	43.06%
Urban Model (Ω =0)	0.463	82.34%		0.099	17.66%

9 The Stata command *nldecompose* provides the opportunity to do this, with the group variable taking value one for rural residents (or rural *hukou* holders) since they are the majority group with higher fertilities than urban residents (or urban *hukou* holders) (Bauer et al., 2008).

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

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%

The raw gap in average fertility of urban and rural residents is 1.58-1.11 = 0.47 (see Appendix 1). 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% of the total gap. The differences in average characteristics appear even more important when the coefficients for rural residents are used, with 90.1% of the fertility gap explained. The upper bound for the explained gap is from the pooled model, which shows that 93.3% 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 to 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% of the raw difference. 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 only about seventy percent of the raw difference can be attributed to differences in the characteristics. Thus, compared to 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, 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, we find that when we classify urban and rural women by their residence status, rural life gives a fertility advantage of around ten percent of the gap between urban and rural fertility rates, while urban life gives a fertility disadvantage of about four to five percent 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% of the total urban-rural fertility gap (and to 19.6% 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 agriculture *hukou* holders.

The decomposition results show that a large proportion 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). However, up to 43 percent of the fertility gap cannot be explained by the modeled factors if urban *hukou* holders had the characteristics of rural *hukou* holders but kept their own coefficients. In other words, there is something inherent for urban *hukou* holders that causes lower fertility than that of 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 trade-off 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 trade-off is more apparent than real. Some of the lower fertility of urban women is due to the rigidities imposed by their predominantly non-agriculture *hukou* status. This registration status matters far more to fertility than does the issue of whether they reside in an urban or rural area. In other words, if rural women with agriculture *hukou* move to the city, the expected reduction in their fertility is much less than what is expected when an agriculture *hukou* holder converts to non-agriculture *hukou* (irrespective of whether they live in urban or rural areas). Since *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 trade-off between goals of encouraging urbanization and encouraging higher fertility. Indeed, amongst the many reasons to reform *hukou* (Chan and Wan 2017) the possible positive impact on fertility is not one that has been highlighted previously.

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, much 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 agriculture *hukou* – and these covariates include the different family planning rules that women were exposed to over time – for women with non-agriculture *hukou* their fertility would still remain considerably lower than for the agriculture *hukou* women. Since 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 there is an unobserved effect that leads to a preference for low fertility amongst non-agriculture *hukou* holders. Since most of the women in urban areas hold non-agriculture *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.

Since our data come from the CHNS, which is a longitudinal survey following the same households (even though we focus only on the latest and largest wave), 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 behavior 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 there short-term migrants were fully covered. This suggests, once again, that the apparent policy trade-off between encouraging continued urbanization and raising the fertility rate may be smaller than it appears.

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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	1,520	1,023	1,363	1,180

Appendix 2: Regression 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 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. *** p<0.01, ** p<0.05, * p<0.1