Abstract:
While it is well known that sex ratio at birth (SRB) in China is high and varies across space, research that analyzes such spatial variations is overly general, often at the provincial level. Furthermore, previous debates over the causes of spatial variation in SRB were less focused on the regional effect of different family planning policies and their interactions with local socio-economic and demographic conditions in differentiating SRBs at individual units of analysis. Combining data from three different sources, this paper uses multilevel models to analyze the spatial variations in SRB within and across different provinces. A special focus lies on the impacts of institutional factors at the provincial level on SRBs of different sub-county population groups in China. We also explore the spatial correlation patterns of SRBs in neighboring locations. Considering spatial dependency effects in a multilevel model creates valuable insights into the unexplained variations in SRB across sub-county population groups in China.

Background:
Over the last few decades, China’s SRB has shown a steady increase. Though extensive literature on gender imbalance in China focus on particular regions or the entire country in general, a small body of work has emerged on the regional disparities in SRB and factors accounting for variations between different regions in China (Liu, 2002; Coale, 1991; Hull, 1990). However, few studies have systematically studied causal factors for the high spatial variation in SRB. Three categories of factors account for variations in SRB across regions in China. First, individual-level unit characteristics such as educational attainment, ethnic status, and socio-economic status are widely found to be associated with SRB levels (Xie, 1989; Anderson and Romani, 1997; Terrell, 2005).

Second, more and more studies have recognized the significant role of regional disparities in economic development, medical services, and most importantly, family planning policies in differentiating SRBs (Tang et al, 2011,). The family planning policies on SRB reduction are mainly formulated by provincial and prefectural governments in China and executed by governments in smaller geographically-embedded administrative units. In light of their varied economic and social conditions, different provinces vary in their regulations and rewards on SRB reduction. However, only a few studies including
Yang (2006) and Hung (2004) have made attempts to measure the regional effects of policy instruments on SRBs. Therefore, little can be determined on whether there is a causal relationship between the family planning program or, in particular, the one-child policy, and SRB. Moreover, almost no attention has been paid to the interactions between regional factors and individual level factors. For example, family planning policies in each province affect mediate the impacts of individual characteristics, such as being a minority or living in a rural community, on SRBs within a province.

Finally, due to the way that SRB data are collected from neighboring regions, spatial dependencies in SRB values of different basic units of analysis across space may exist. This spatial factor of variations in SRB has only recently gained academic interests in the study of SRBs in China (Tang et al., 2011; Zhang, 2011; Guilmoto and Oliveau, 2007). Yet, the underlying theory that explains the spatial autocorrelation among SRB values in China has widely been acknowledged, i.e., the preference for sons due to social and cultural pressures diffused across neighboring regions in China (Yi, 1993; Yang, 2009). Despite their consensus on a very obvious pattern of spatial autocorrelation in SRBs across county and province, existing studies use very rough models to estimate the SRBs, thereby reducing their power of prediction.

**Research Question:**

Based on previous research, this paper asks three research questions.

1) What are the spatial variation patterns of SRBs among sub-county groups within and across province?

2) After controlling for individual-unit level characteristics, how do regional policy factors affect SRBs and interact with individual-unit level factors?

3) Does neighborhood effect of SRBs exist among more proximate regions? Will consideration of spatial dependency effects in a multilevel model provide better results in model estimation?

**Data and Measures:**

Considering the spatial/neighborhood effects, we perform a multilevel analysis to systematically examine the spatial variations of SRB values across sub-county population groups in China and the effects of individual unit level, regional/hierarchical level, and
neighborhood level factors on the spatial pattern of SRB in China.

For the first stage of analysis, individual-unit level information mainly comes from China Census 2000 Assembly Data. We define the basic unit of analysis as a sub-county level population group. Census 2000 covers aggregated information on population living in any county-level administrative units, they are further divided into sub-county groups by current place of residence in city, town, and county (rural areas outside town).

In the second stage, policy data are included. Analyzing documents on family planning regulations and rewards to reduce SRB, we develop a simple scheme to measure family planning policies at the provincial level and incorporate them into the multilevel model. In China, 31 provincial level administrative units (province, autonomous regions, and major municipalities) are major political entity to draw up the family planning policies. Although, prefectural- and county-level governments literally participate in the formulation of family planning policies, they usually choose to follow the published provincial level policies, only matching regulations and rewards to local socio-economic and demographic conditions. Lastly, exploratory spatial data analysis is conducted and a multilevel model will be adjusted to account for spatial correlation.

**Preliminary Results:**

Results from preliminary analyses suggest that wide variations lie in SRB values across sub-county groups by all places of residence. Although Table 1 agrees with previous findings that SRB in Western provinces are more balanced, the relative standard deviation of SRB within these provinces, such as Tibet and Inner Mongolia, are extremely high. In comparing SRBs across sub-county groups by their types of residence in China, the average SRB is the highest in rural areas outside of town, and lowest in cities. Sub-county population living in towns has the highest variations in SRB levels. In Jiangsu, Tianjin and Chongqing, a big contrast lies between the relatively low SRBs in cities and the relatively high SRBs in rural areas.

Table 1. Mean and Variance of SRB by place of residence in each province
Next, I will demonstrate the spatial variations in SRB on maps. We have finished constructing the main database for first level analysis. Currently, we are conducting content analysis of policy factors for stage-two analysis in the multilevel model. After that, we will move on to exploratory spatial statistic analysis and discuss more about the
issues raised by complex spatial modeling of geographically distributed SRB data. We plan to have a full paper ready for presentation at the PAA 2013 meetings next spring.

Conclusion:

Gender preference in China has always been strong. Surprisingly, SRB has progressed even more rapidly since China’s family planning regulations including the one-child policy became more lenient since the late 1980s. In addition, levels of SRB vary across China and “hot spots” of demographic masculinity tend to concentrate in inland East regions. Yet prior work has not paid adequate attention to the spatial pattern of SRB in China. Little work has explicitly measured the association between family planning policy and SRBs. Findings from this work shed light on the effect of family planning policy on spatial variations of SRBs in China, with a focus on its interaction with individual-unit level factors in shaping local SRB differentials. By incorporating spatial statistical analysis into the multilevel regression model, we also control the effects of spatial dependencies between SRBs.

References:


Guilmoto, Christophe Z. and Sébastien Oliveau. 2007. “Sex Ratio Imbalances Among Children At Micro-Level: China And India Compared.” Published in Population Association of America 2007 Annual Meeting, New York, USA.