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**THE POWER OF IDEAS: HOW NORMS, PERCEPTIONS AND
ASPIRATIONS RELATE TO DEMOGRAPHIC PATTERNS AND INDIVIDUAL
WELL-BEING IN CHINA**

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by

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ABSTRACT

This dissertation aims to describe the processes and mechanisms of how structural and cultural changes intertwine and affect demographic patterns and individual well-being in the context of China. It takes a multi-level perspective and is comprised of three empirical chapters. The first (Chapter 2) seeks to understand how macro-level structural and cultural changes shape elders' perceptions of aging over time. This study uses a seven-wave panel survey spanning over 16 years and presents multi-level growth curve models. It focuses on describing inter- and intra-cohort variation in elders' perceptions of aging. The results show compelling evidence of cohort and age effects. Specifically, elders in more recent cohorts exhibit both higher levels of unhappiness with age and feelings of uselessness with age. Net of cohort effects, elders feel increasingly less happy and less useful as they move through the life course. Subsequent models that adjust for time-varying and time-invariant covariates reveal that cohort effects are largely explained by the cohort compositional differences in education and occupation. Age effects, however, remain significant after accounting for elders' socioeconomic status, demographic characteristics and a list of time-varying life events, such as marital status, living arrangements, and residential relocation status.

The second empirical chapter (Chapter 3) moves the focus from the national to sub-national level. It examines transition into adulthood experiences among a group of rural youth in one of the most impoverished provinces in China — Gansu Province. This chapter seeks to understand the roles that youths' structural resources and agentic orientations play in shaping their transition pathways in three life domains: school, work and home-leaving. Data came from wave 1 (2000) and wave 4 (2009) of Gansu Survey of Children and Family (GSCF). Latent class analysis (LCA) is used to identify youth's transition pathways from age 12 to 19. The analysis revealed six

distinctive transition pathways into adulthood. The subsequent multinomial analysis distinguishes three sets of variables that correlate with youth's transition pathways: family socioeconomic status, community-level educational opportunities, and youth's agentic orientations.

The third empirical chapter (Chapter 4) examines how the dynamic interplay of economic conditions, fertility policies, and fertility norms at the local level manifested as spatial heterogeneities of fertility patterns at the macro level. Using geocoded 2010 county-level census data, this chapter estimates Geographically Weighted Regression (GWR) models to identify place-specific relationships between county-level Total Fertility Rates (TFR) and economic, policy and fertility norm-related factors. The results show that the relationships between TFR and widely used economic, policy and norm-related factors vary spatially in terms of direction, strength, and magnitude. The differences and the complexities of localities cannot be told by a single story of either government intervention or socioeconomic development.

In short, results from this dissertation demonstrate utilities in adopting life course and spatial thinking in the study of interactions between structure and culture. It also highlights the necessities of accounting for population heterogeneity in the study of social change.

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CHAPTER 1

Introduction

Social scientists know well that both micro-level individual well-being and macro-level social/demographic changes are conditioned not only by structural factors but also by culturally shaped ideational factors, such as norms, aspirations and perceptions. For example, demographers have long sought to understand the role that cultural norms play in shaping fertility behaviors and trends. Sociologists interested in social mobility processes have noted that education aspirations play an important role in mediating the relationship between family resources and educational attainment (Sewell et al. 1969). What emerges strongly from these studies is that to better understand human behaviors one needs to go beyond identifying the various structural barriers and opportunities that people face. In fact, there has been growing interest in bringing culture back into the center of sociological and demographic research, as evidenced by recent reviews assessing research along these lines (Bachrach 2015; Lamont 2018; Lamont et al. 2017; Patterson 2014; Small, Harding, and Lamont 2010; Vaisey and Lizardo 2016).

Numerous studies could be cited when it comes to the discussions of structural and cultural factors shaping human perceptions and behaviors. The primary purpose of this dissertation, however, is not to engage in philosophical debates on the nature of culture and structure, but to demonstrate empirically how the relevant constructs interact with each other and manifest themselves over time and across space.

This dissertation focuses on contemporary China, a society that has gone through profound economic, social and cultural changes over the past century. If there is ever a universal principle that can be drawn from this period of history, it is that changes in one aspect of a society, such as economic development, will have profound and sometimes unexpected consequences in others. No single study can claim to close the larger gap in the existing knowledge on the social changes in China, however, this dissertation contributes to understanding these social changes. In this dissertation, I use three topics to showcase how macro-level changes have profoundly impacted demographic patterns and individual well-being: elders' perceptions of aging, youth's transition pathways into adulthood, and fertility.

The rest of this introductory chapter is organized as follows. The next section discusses the theoretical considerations shared among the three empirical chapters of this work. The second section discusses the context of China. The third and final section provides an overview of the three analytical chapters.

1. Theoretical Considerations

This dissertation aims to describe the processes and mechanisms of how structural and cultural constructs intertwine and affect demographic patterns and individual well-being under the context of social change in China. In this section, I approach this broad inquiry via two steps. First, I bring two theoretical areas of inquiry together: development theory and the sociological study of culture. The goal is to address the following two theoretical considerations: (1) how structural change is related with cultural change and (2) how culture and structure in turn shape action and perception. Next, to better address the dynamic interactions of structural and cultural changes in

the empirical analysis, I discuss two realms of thinking that help capture the intricate dynamics of development: spatial thinking and life course thinking.

1.1 Development, Structure and Culture

As a point of departure, it is necessary to have a discussion on the definition of structure and culture. The definition of structure and culture vary greatly in social science sub-disciplines. For example, the concept of structure can be as narrow as only referring to economic structure, or it can be all-encompassing as to refer to “the way social positions, social roles and networks of social relationships are arranged in institutions” (Wilson, 2010:2). In the same vein, the concept of culture is used in a wide range of ways, such that scholars were able to identify 164 different meanings of “culture” (Kroeber and Kluckhohn 1952). At a risk of over simplification, in this dissertation, I draw from Bacharach’s 2013 Population Association of America Presidential address, defining structure as “patterned material and social arrangements, such as economic systems and status hierarchies” (Bachrach 2015:2), and defining culture as “shared meanings given to objects and actions in the world” (Bachrach 2015:5).

In an effort to study how structure and culture are interrelated and change over time at the macro level, development theories have much to offer. The primary goal of development studies, as summarized by Viterna and Robertson (2015), is to answer the question “why some countries are poorer than others and what can be done to improve the living standard for everyone?” (p. 244). From this perspective, it is not a surprise that the structural aspect of development is heavily emphasized. For example, both dependency and world system scholars focus heavily on describing the process of economic growth (Cardoso 1972; Wallerstein 1979).

Meanwhile, the changes in culture have always been an integral part of development processes. Indeed, some development theorists have directly addressed the relationships between

economic development and cultural change. For example, the modernization thesis argues that a society's shift from agricultural mode to industrial mode could lead to predictive changes in cultural values (Inkeles 1975; Inglehart 1990, Inglehart and Baker 2000). In studying people from six countries, Inkeles (1975) argued that individuals who were exposed to complex, rationalized modern working environments, such as factories, exhibited a set of psychological traits and unique way of thinking, including openness to new experiences and confidence in their own abilities. Later research by Inglehart, who studied cultural, economic and political changes in 43 countries, demonstrated that as society attains economic and political security, people will increasingly shift their value system from the "survival values", i.e., values that emphasize individual conformity to all kinds of authorities, to "well-being values", i.e., values that de-emphasize all kinds of authorities, as well as encourage individual autonomy, self-expression and democracy (Inglehart, 1997).

Although contemporary development studies have acknowledged that cultural change is an integral part of development processes, it falls short in describing the precise processes and mechanisms of how people's behaviors and perceptions are affected by culture at micro-level. To this end, it is necessary to include insights from cultural sociology. Early studies in sociology stated that these meanings or values play motivational roles in guiding people's behaviors. For example, Weber saw the so-called protestant ethic as the driving force for the emergence of the modern capitalist system (Weber 2013 [1930]).

However, recent scholarship of cultural sociology questions the motivational role that culture plays in affecting people's behavior. This line of scholarships states that "culture influences action not by providing the ultimate values toward which action is oriented, but by shaping a repertoire or 'tool kit' of skills, habits and styles from which people construct 'strategies of action'" (Swidler

1986:277). Thus, the central argument relies on the premise that people do not explicitly think about cultural values when taking action. Instead, they are inclined to justify or interpret their behaviors through the lens of culture after the action is taken (Lamont and Small 2008).

The “tool kit” approach to culture helps explain some heterogeneous behaviors when different people are facing the same structural constraints. For example, Van Hook and Bean (2009) found that, all else being equal, Mexican immigrants are far less likely to become welfare recipients than others when facing unemployment. One explanation is that seeking welfare support is not one of the learned cultural inclinations for Mexican immigrants. Another example given by Lamont and Small in the case of college enrollment, which illustrated that even though poor and non-poor children both value college education, poor children may lack knowledge regarding the actions to take to achieve this goal, including registering for the SAT, taking preparation courses and sending test scores to colleges—a set of knowledge and skills that may not be in their toolkit of actions (Lamont and Small 2008).

1.2 Population Heterogeneity Over Time and Across Space

Population heterogeneity has always been a core concern in social science research. Decades of social science studies unveil that human perceptions and behaviors are highly contextualized and therefore cannot be summarized in a uniform manner (Blau 1977; Coleman 1990; Heckman 2006). The theoretical advancement of development studies and the sociology of culture further solidify this point. For one thing, people are subject to varying structural constraint due to uneven paces of development. For another, people also have different “cultural tool kits” from which to choose in taking actions, even in the face of the same structural contexts. Therefore, identifying people’s varying responses to structural and cultural changes is as important as, if not more than, describing their average responses.

Two realms of thinking provide powerful conceptual frameworks to describe and understand population heterogeneity: spatial thinking (across space) and life course thinking (over time). This subsection provides a brief overview of these two approaches. The focus is on how spatial and life course thinking help better understand the interactions of structure and culture.

To begin, space is important because resources are distributed across space. As a result, people's life chances and material resources can be either determined or mediated by geographic locations (Lobao, Hooks and Tickamyer 2007). Spatial thinking is not new to social scientists (Voss 2007), but spatial analysis has gained momentum in recent decades due to the advancement of data availability and computational capacities and techniques (Chi and Zhu 2008; Entwisle 2007). For scholars who are interested in national or regional development agendas, spatial thinking is also important because the pace of development also varies across space. Therefore, it is critical to acknowledge spatial dimensions of inequality so as to avoid a one-size-fits-all policy-making mentality (Ali, Partridge, and Olfert 2007).

Space is important also because people interact through space. As people interact with each other through space, new technologies, knowledge and ideas also diffuse through space. Spatial autocorrelation is ubiquitous, as famously put by Tobler, "everything is related with everything else, but the nearer things are more related than distant things" (Tobler 1970:234). A classic example is the study of fertility change in Europe. Scholars have found that the changes in fertility rates across European countries did not entirely follow a trajectory of socioeconomic change; instead, the timing of the fertility decline overlapped with ethnic and linguistic boundaries, suggesting that the fertility behaviors, norms and practices are more easily transmitted and within cultural boundaries (Coale and Watkins 1986).

Not only do the interactions between structure and culture vary across space, they also vary over time. With regard to this line of research, life course thinking has much to offer. Life course theorists operationalize changes in behavior and culture from the combinations of three mechanisms: cohort effects, age effects and period effects. Cohort effects refer to the social changes that occur due to the successions of birth cohorts (Ryder 1965). Individuals' birth cohort memberships are often used as a proxy for their exposure to historical contexts. Thus, individuals from different cohorts may exhibit different perceptions toward the same social issue, due to their exposures to different historic contexts. Age effects are the changes that result from social and biological maturation. Period effects are the changes caused by contemporaneous social, institutional and political change that affect all living cohorts (Alwin and Mccammon 2014; Yang 2011). Combining these three effects, scholars have increasingly applied Age-Period-Cohort models, because many social indicators, such as the prevalence of certain diseases, the cause of death, or the rates of violence can be understood from combined age, period and cohort effects (e.g., Yang 2008, 2010; Dwayne 1986).

For scholars who are interested in the imprint of social change in individuals' lives, it is especially critical to differentiate cohort and aging effects. Individuals who are born in earlier cohorts live through different historic context, therefore may form basic world views, values, perceptions and attitudes at younger ages in different historical contexts. The values and perceptions formed in younger ages may or may not carry forward throughout the rest of their lives, since individuals' subsequent life experience may as well shape their perceptions (Krosnick, Alwin, and Krosniek 1989). However, earlier-born cohorts not only live in different historical contexts but are also older and more experienced. Therefore, when a social phenomenon is

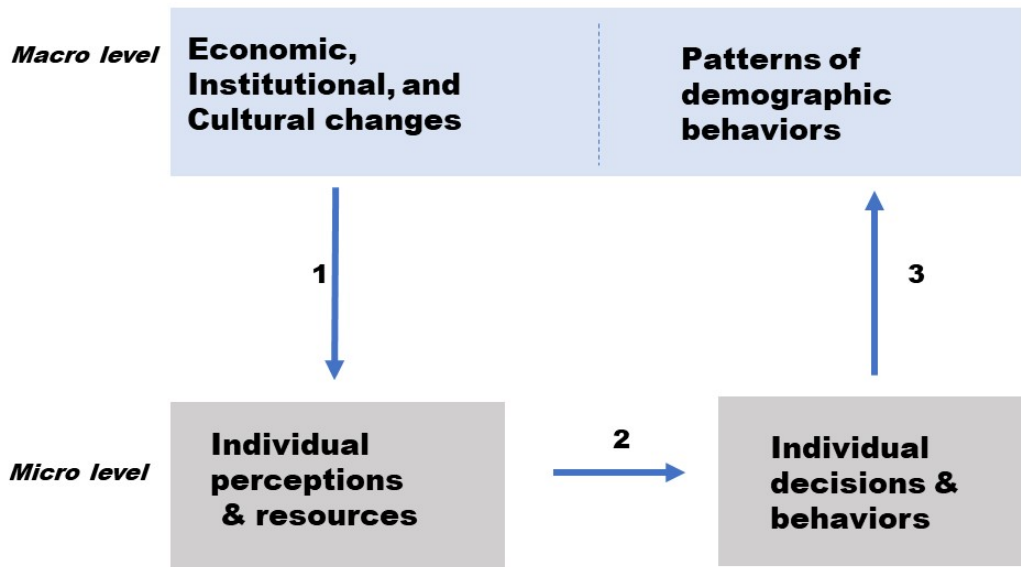
influenced by both individuals' accumulative experiences and by a particular historical context, detangling these two effects could be difficult.

1.3 Conceptual Framework

To sum up, the structural and cultural changes cannot be divorced from each other and they both occur as a nation moves along with its development agendas at the macro level. At the micro level, people's behaviors and perceptions are shaped and influenced by the macro-level structural and social changes. Both spatial and life course thinking provide powerful conceptual tools in order to gain an in-depth understanding on people's varying behaviors and perceptions in eras of rapid social change.

The dynamics of structural and cultural change can be analyzed at both macro and micro levels, as well as macro-micro interactions. Drawing the insights from Bachrach (2015), Figure 1-1 provides a summary. First, macro-level economic, institutional and cultural changes shape individuals' perceptions and beliefs at the micro-level (Arrow 1). Second, individuals' perceptions and beliefs, together with the amount and type of material resources they have, further shape individual behaviors at the micro-level (Arrow 2). Third, micro-level individual decisions and behaviors in turn form demographic behavioral patterns at the macro-level (Arrow 3).

Figure 1-1. Conceptual Framework



Note: Figure is adapted from Bachrach (2015)

2. The Context of China

This section provides an overview of the economic, demographic and cultural changes in China during the past century. The focus is on the spatial and cohort differences in people's experiences during social change.

2.1 Economic Development and Institutional Change

China's century-long course in the pursuit of development started with the fall of the last imperial dynasty in 1911 (Rozman 1982). The time between 1911 to 1949 was featured by constant external and internal conflicts. Externally, China was dragged into the world capitalist system,

after thousands of years of isolation. Internally, with the fall of the Qing dynasty there were several attempts to establish a unified, modern democratic system. However, the strong military powers held by local war lords prevented a unified central government from consolidating (Vohra, 2000).

The establishment of the People's Republic of China in 1949 and the following socialist revolution saw the abandonment of many long-standing pillars of traditional social structures. The time between 1949 and 1979 witnessed several major social disruptions in China, which created salient cohort effects among the people who lived through this period of history. For example, one of the social disruptions is the 1959–1961 famine, which is often considered as one of the largest demographic losses in the twentieth century (Devereux 2000). Studies of this famine have found that individuals' timing of exposure to famine had profound impacts on their later health and other social outcomes. For example, a study by Qian and Meng (2009) revealed that *in-utero* and early childhood exposure to famine had a negative impact on individuals' adult height and weight as well as their educational and labor market outcomes. Similar disadvantages did not occur for the cohort of children who were exposed to famine at a much older age. Another disruptive social event is the Cultural Revolution from 1967 to 1978, a state initiative to reverse traditional social hierarchies (Zhou and Hou 1999). During this period, higher-education systems were entirely disabled and the youth who happened to reach college age were sent to rural areas to be re-educated. Needless to say, this altered the entire life trajectories of the youth who happened to reach early adulthood during the Cultural Revolution (Deng and Treiman 1997; Wen, Fangsheng, and Moen 2015; Zhou and Hou 1999).

The year 1979 witnessed the nation's shift away from a planned economy to a market-oriented economy, which marked another wave of change. At the national level, the so-called “four modernizations” (modernization in agriculture, industry, science and defense) were set as urgent

priorities by the central government. It was in 1979 that the economy stepped onto the “fast track” of growth (Yao 2000). The economic reform started from the agricultural sector, which aimed to change the farming system from a collective system to a household-based one (Lin 1992). As a result, peasants were greatly incentivized to grow more crops for sale. For example, the period between 1979 and 1984 saw an average annual growth rate of agricultural production of 7%, a rate that was more than double the growth rate between 1952 and 1978 (Lin 1992). The reform was so successful in the agricultural sector that a nationwide reform started to take place in other economic sectors

With the economic growth, people’s average living standards have greatly improved. For example, the past several decades have seen a substantial reduction of poverty rates. The National Bureau of Statistics of China (2012) shows that the gross domestic product (GDP) per capita rose from \$218 (purchasing power parity for dollars) in 1978 to \$11,055 by 2009. Measured by the World Bank (2009) standard, the poverty rate in rural China dropped drastically from 65% in 1981 to only 10 % in 2004, with over half a billion people moving out of poverty. However, the economic reform also brought new problems, one of which is growing social inequality. Take income inequality for example: one study using multiple data sources revealed that the Gini coefficient was 0.30 in 1980 but had reached 0.55 by 2012 (Xie and Zhou 2014).

One of the most salient characteristics of the inequality patterns in China are their regional variations and rural-urban differences (Xie and Hannum 1996). To date, the People’s Republic of China has 31 provinces or provincial-equivalent administrative divisions (Figure 1-2). The nation is conventionally divided into four greater geographic regions that are based on economic development levels—the east coast, the middle, the northeast, and the west—with the east coast being the most developed region and the west being the least developed region. The places that

experienced the fastest regional growth are cities in east-coastal provinces, while the least developed regions are the rural areas in western-interior provinces. Take gross domestic product (GDP) per capita for example: the GDP per capita in Shanghai (65,473 yuan) in 2007 was nine times as that of Guizhou (6,742 yuan), one of the poorest provinces (Fan, Kanbur, and Zhang 2011). Even within provinces, the rural-urban disparities are salient. In Guizhou, for example, the GDP per capita in urban Guizhou was three times larger than that of rural Guizhou in 2007 (Fan et al. 2011).

It is necessary to address the underlying institutional arrangement that results in spatial inequality in China. The economic reform was built on the basis of “core-periphery” rationale, in the sense that urban places were granted the priority to develop and rural areas were regarded as reservoirs to provide labor, agricultural products and other resources (Riskin, 2001). The rural-urban disparity was further intensified by the government assigning rural and urban citizens with different household registration entitlements (the *hukou* system), and huge institutional effort was also put into restricting rural-to-urban migration. From the life course perspective, the *hukou* system is found to be one of the most consequential stratification mechanisms in the post-reform era. Individuals are differentiated on the basis of *hukou* origin and are subjected to different chances for getting ahead in life (Wu and Treiman 2004, 2007).

2.2 Demographic Transformation

On the demographic side, China is often characterized as having experienced a compressed demographic transition. Compared with the century-long demographic transitions that took place in Western societies, it only took China a few short decades to transition from a high-fertility, high-mortality regime to a low-fertility, low-mortality and low natural growth regime (Wang 2011;

Whyte, Wang, and Cai 2015). The Total Fertility Rate (TFR) dropped from 5.76 in the 1960s to 2.71 in the late 1980s. By the early 1990s, the TFR further dropped to its below replacement level, and the low fertility regime has persisted thus far (Cai 2010; Feeney and Jianhua 1994; Gu et al. 2007; Morgan, Guo, and Hayford 2010; Wang, Cai, and Gu 2013). Parallel with the rapid decline of the fertility rate is the increased longevity and increase in the size of the older population. The average life expectancy at birth for both sexes increased from 30 years in 1950 to 75 years in 2010 (World Bank 2016) and will likely continue to increase in the near future. There were 118 million Chinese aged 65 and above in 2010, and according to a projection by the United Nations, the total number of Chinese elderly aged 65 and above will amount to 333.6 million by 2050, which will comprise 22.6% of the total population (United Nations, 2015).

Viewing from the sub-national level, the demographic transition pace varies substantially from place to place. Overall, the demographic transition follows an east coast — west inland gradient, and this is in line with the economic development levels. For example, although fertility rates experienced rapid decline, the east coast regions that experienced the fastest decline in rates, relative to the west inland regions (Wang 2008). In a similar vein, an existing study found that by 2010, the life expectancy at birth could have been as high as 85 years in some east coast places, and as 59 years in west inland regions (Wang, Luo, and Liu 2015). The regional disparities in economic development are the driving forces that underlie the regional variations of demographic transition.

2.3 Cultural Change and Continuities

The economic development and demographic transformation interweave with cultural change over the course of development. For centuries, Chinese society was a peasant society.

Sociologist Xiaotong Fei (1992) described such a *gemeinschaft*-like Chinese society as being organized by a web of close family and community ties. He further stated that in the traditional Chinese society, one's goal in life is to fill obligations to others—as son or daughter, husband or wife, father or mother, or friends. Thus, the pursuit of individual goals was heavily restrained.

After the Communist party took power in 1949, the new regime set a socialist transformation process into motion, which deliberately equalized status across different social groups (Treas 1979; Wilhelm 1963). This included the confiscation of the private property and the restriction of parents' control over family wealth (Yin and Lai 1983). The new marriage law, promulgated in 1950, called for radical gender equality in marriage and family life (Ruskola 1994).

However, during the period of socialist revolution in China, individual autonomy was still restrained and discouraged. The Communist ideology mandated that everyone put the collective interest ahead of personal interest. This period also saw an increased advocate of patriotism over filial piety, which encouraged children to argue with and even confront senior family members whose ideologies remained family not state-oriented (Treas 1979).

The market reform since 1978 is marked as a stage of individualization and other Westernized cultural norms. With rapid urbanization and industrialization, mass education and the liberation of the labor market, scholars have found that the younger cohort of Chinese, particularly those born after the initiation of economic reform, are becoming more individualistic (Sun and Wang 2010; Zeng and Greenfield 2015). For example, in evaluating individuals' values orientations among individuals aged 15–69 in the early 1990s, Sun and Wang (2010) showed that the younger the cohort, the more individualistic the responses are measured by the survey items. Another study that conducted a large-scale content analysis of 302,652 Chinese books that were published between 1600 and 2008 using Google Ngram Viewer also draws the same conclusion

(Zeng and Greenfield 2015). Specifically, they find that the frequency of words that connote individual values (such as “choose”, “compete” and “autonomy”) have been increasing, while the frequency of words reflecting collectivist values (such as “communal”, “obedience” and “sacrifice”) have been declining since the 1970s.

While individuals may be becoming increasingly accepting of individualistic values, their value orientations in other life domains may remain stable. With respect to family values, with the turn of the twentieth century, marriage remained nearly universal, childless marriages were rare, divorce rates and pre-marital fertility rates were low—all of which are consistent with the patterns in pre-reform eras (Ji 2015; Raymo et al. 2015; Xu, Li, and Yu 2014). It is therefore evident that contemporary China is experiencing changes of value orientation in some domains in society while also experiencing sustained practices of traditional values in others.

Figure 1-2. The People’s Republic of China



3. Chapter Overview

In the three chapters that follow, I examine how structural and cultural change, analyzed from multi-level perspectives, influence individual perceptions and demographic patterns in the context of China. Although each chapter draws from different theories, asks a unique set of research questions and uses different sets of data, it deals with one arrow illustrated in Figure 1.

The first empirical chapter (Chapter 2) targets Arrow 1 in Figure 1 by examining how macro-level social change affects elders' perceptions of aging. As presented in the previous section, the structural and cultural changes over the course of the past hundred years in China suggests that the people born at different historic times would exhibit different values, perceptions and norms. To empirically test this hypothesis, this chapter focuses on how elders in China today think about their own aging experiences. Specifically, this chapter attempts to demonstrate that: individuals' perceptions of aging are reflections of both their own life experiences, as well as the socially and culturally shared beliefs of their birth cohorts.

Using all seven waves of the China Longitudinal Healthy Longevity Survey (CLHLS) that spans 16 years (1998–2004), this chapter explores inter- and intra-cohort variations on elders' attitudes toward their own aging. The results reveal compelling evidence of cohort differences of elders' perceptions toward aging. Elders in more recent cohorts exhibited higher levels of both unhappiness with age and feelings of useless with age. With regard to the age effects, the results indicate that elders feel increasingly less happy and less useful with the progress of their own biological age. The age effects remain significant after controlling for elders' socioeconomic status, demographic characteristics and a list of time-varying events.

The second empirical chapter (Chapter 3) targets Arrow 2 in Figure 1 by examining youths' transition into adulthood in China. This chapter moves the focus from macro to micro, from the national to subnational level, and examines transition into adulthood experiences among a group of rural youth in one of the most impoverished provinces in China—Gansu Province. This chapter has two overarching goals. The first is to describe transition pathways in education, work and home-leaving among a group of rural youth who live in one of the most impoverished provinces in China. The second objective is to provide critical documentation of the roles that structural and agentic orientations play in shaping rural youth's pathways into adulthood.

In this chapter, I use latent class analysis (LCA) to describe youth's transition pathways from age 12 to 19. Data came from wave 1 (2000) and wave 4 (2009) of Gansu Survey of Children and Family (GSCF). The analysis revealed six latent pathways: (1) vocational school attenders, (2) local high school attenders, (3) moves for high school, (4) moves to work, (5) late middle school finishers + move for work, and (6) late middle school finishers + local high school. The subsequent multinomial analysis distinguishes three sets of variables that correlate with youth's transition pathways: family socioeconomic status, community-level educational opportunities, and youth's agentic resources.

The third empirical chapter (Chapter 4) targets Arrow 3 in Figure 1 by investigating how the dynamic interplay of economic conditions, fertility policies, and fertility norms at the local level manifested as spatial heterogeneities of fertility patterns at the macro level. Individuals' fertility behaviors are subjected to both material resources and cultural norms. With the uneven distribution of resources and uneven pace in the diffusion of fertility norms, the fertility patterns, when viewed at the aggregated level, are heterogeneous across space.

Using geocoded 2010 county-level census data, this chapter adopts the Geographically Weighted Regression (GWR) method to identify place-specific relationships between county-level Total Fertility Rate (TFR) and socioeconomics and policy-related factors. I find that relationships between TFR and widely used social, economic, and policy-related factors (*rural Hukou*, *ethnic minority*, *female education*, *net migration rate*, *poor living standard*, *sex ratio at birth*, and *fertility policy compliance ratio*) vary spatially in terms of direction, strength, and magnitude. The spatial variation is largely due to the differences in local characteristics. The differences and the complexities of localities cannot be told by a single story of either government intervention or socioeconomic development. This chapter therefore seeks to add more concrete discussions on how socioeconomic, political and cultural factors are interwoven and jointly manifested as spatial heterogeneities of fertility rates in China. It also speaks to the ongoing scholarly discussion on the values of adopting a blended theoretical perspective, that is, incorporating both classical demographic transition theory and diffusion theory in explaining fertility change.

In the last chapter, Chapter 5, I conclude the dissertation and relate the major findings of the three empirical chapters to broader theories and the conceptual framework. I then discuss overall theoretical and methodological contributions of this dissertation. The last chapter ends with a discussion of the limitations of this dissertation and future research directions.

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CHAPTER 2

Perceptions of Aging among Elders in China

Abstract

This chapter seeks to understand how macro-level social changes affect elders' perceptions of aging. Individuals' perceptions of aging are important measurements of old-age subjective well-being. They are influenced by both individuals' own life experiences as well as socially and culturally shared beliefs. Using seven-waves of data set spanning over 16 years, this chapter focuses on exploring inter- and intra-cohort variations in elders' attitudes toward their own-aging. The results indicate compelling evidence of cohort effects on elders' perceptions toward aging, as elders in more recent cohorts had both higher levels of unhappiness with advancing age and feelings of useless with age. Age effects indicate that elders feel increasingly less happy and less useful with the progress of their own biological age, and the age effects remain significant after controlling for elders' socioeconomic status, demographic characteristics and a list of time-varying events.

1. Introduction

Researchers who study old age well-being have increasingly sought to understand how social change may affect well-being status, and furthermore, how individuals' well-being in later life may differ by their socioeconomic status (Elo 2009; Farmer and Ferraro 2005; House, Lantz, and Herd 2005; Kim and Durden 2007; Lynch 2003). Although the precise mechanism through which socioeconomic status is related with later-life well-being in different historical context is still an ongoing area of investigation, there is a growing recognition of the mediating role that elders' perceptions of their own aging play in the relationship between socioeconomic status and well-being. Studies show that all else equal, individuals' positive perceptions of aging are related with better outcomes of various later-life well-being measures, that include lower risk of mortality (Gruenewald et al. 2007; Kotter-Grühn et al. 2009; Levy and Myers 2005; Levy, Slade, and Kasl 2002), higher physical functional ability (Levy et al. 2002), better memory and hearing performances (Jang et al. 2004; Levy 1996), better mental health conditions and less depressive symptoms (Dong et al. 2010; Lai 2009) and higher self-rated health (Low, Molzahn, and Schopflocher 2013; Moor et al. 2006).

Despite growing scholarly interest in the relationship between perceptions of aging and well-being in later life, relatively little empirical research has explored temporal change on perceptions of aging, or whether attitudes toward aging vary by social contexts. The idea that individuals' perceptions of aging may vary across social context and over time, however, is not new. For one thing, people's perceptions of aging are contingent on the relative social status of the elders in a society. Cross-cultural comparisons consistently reveal that culturally-specific socialization may produce different perceptions of aging (Bai, 2014; Bengtson, Dowd, Smith, and Alex. Inkeles 1975; Löckenhoff et al. 2010; Macia et al. 2009). For another, research on age

stereotyping shows that individuals' stereotypes of aging and elders are formulated as early as childhood and are reinforced during adulthood, and become self-stereotyping when individuals get old (Isaacs and Bearison 1986; Levy 2003, 2009; Rabiul 2014). Taken together, an in-depth understanding of self-perceptions of aging requires a joint consideration of life course processes, as well as the social, cultural, economic, and historical contexts in which individuals have lived.

In addition to the need to understand self-perceptions of aging from both social change and human development perspectives, this study is motivated by the need to explore these issues in non-western context. Recognizing cultural values and beliefs affect how people perceive aging, a common perception is that people in western societies, such as U.S. or Europe, generally hold higher negative perceptions of aging, compared with people in non-western settings (Levy & Langer, 1994; Tan, Zhang, & Fan, 2004). While comparative studies bear this out, they also adopt static views that assume social contexts and culture remain unchanged throughout a person's lifetime. Whereas in fact, many non-western societies have experienced rapid social change over the past century. Therefore, it is likely that people born in different historical time periods adopt different perceptions of aging and may even have divergent experiences when it comes to their own aging processes.

Another gap in the existing literature is the lack of research that compares perceptions of aging in later life stages. Most of the existing studies focus on the comparisons among the young, the middle and the old aged people (often above 65), and there is limited research that attempts to differentiate attitude formation and change within the old age groups. This ignores significant diversities among the young-old (age between 65-74), middle-old (age between 75-84) and oldest-old (age 85 and above) (Charles, Reynolds, and Gatz 2001; Gu, Brown, and Qiu 2016; Hummert

et al. 2002). The extent to which the perceptions and attitudes toward aging may vary within the old age groups is not yet well understood.

China provides an ideal context to examine the intersections between social change and elders' perceptions of aging in non-western settings. Over the past hundred years, Chinese society has gone through a period of social, economic, institutional and cultural changes. As a result, elders nowadays are living in a very different society, compared to the time when they were growing up, not only in terms of material conditions, but also in terms of cultural values and norms (Sun and Ryder 2016; Sun and Wang, 2010). Therefore, it is possible for researchers to observe how changes and continuities at the structural level have impacted people's aging experiences within a relatively short window of time in the context of China.

This study aims to advance our understanding of the interplay between societal change and self-perceptions on aging in China. Using a seven-wave panel data set spanning over 16 years (the Chinese Longitudinal Healthy Longevity Survey [CLHLS] 1998, 2000, 2002, 2005, 2008/09 2011/12 and 2014), this study investigates the perceptions toward aging among a sample of elders with a wide age range including the young old, the middle old and the oldest old. In particular, this research focuses on exploring inter and intra-cohort variations on elders' attitudes toward their own-aging.

2. Theoretical Framework and Background

2.1 Social Change and Perceptions of Aging

How societies deal with age and assign age-related roles and status are areas of inquiry that are explored in many fields, including sociology, demography, history, anthropology, and psychology. In an attempt to synthesize diverse intellectual strands, the age stratification

framework highlights the interdependence between age and roles that people occupy (Riley 1978, 1987; Riley et al. 1972). People at different ages perform different social roles. These roles are rewarded differently, through money, approval, power and prestige. However, the relative status of elders is neither static nor universal, it changes over time and is contingent on the social, economic, demographic and cultural context in a society. In what follows I will describe three major macro-level forces that affect the relative status of the elders, as well as people's perceptions toward them: the economic, demographic, and culture.

To begin, anthropological studies argue that the relatively low status of the aged in contemporary developed societies obtains from industrialization and modernization (Cowgill 1974a; Press and McKool 1972; Simmons 1945). In pre-industrialized societies, elders were portrayed as having high social status and full involvement in society. Specifically, the social order in agrarian society is based on seniority, since knowledge and experiences were accumulated with age. Within the family, parents have strong control over their children's life, and family members sought advice from elders on important life choices. At a broader societal level, elders also enjoyed relatively high social status and prestige, and such prestige is further solidified by patrilineal social norms (Cowgill 1974a; Simmons 1945).

However, when a society enters the industrialization stage, the rapid technology development puts less value on traditional knowledge that elders inherited in their youth and accumulated through their previous life experience. The urbanization process leads to massive rural to urban migration, which further weakens elders' control over and importance to their children. Finally, the institutionalization of the modern retirement system generates role ambiguity once individuals step down from formal employment (Cowgill 1974b; Logue 1990).

Besides industrialization, the age composition in a society also influences how elders are perceived by others. With regard to this issue, social psychology has much to offer. The intergroup conflict theory suggests that sub-groups' competitions over valuable yet finite resources could foster between-group hostility (Sherif, 2010). With increases in human longevity, there are concerns that health and economic resources are being disproportionately distributed to elders, who comprise an increasingly larger share of the total population. The competition over limited resources may trigger tension between the young and the old. In the extreme, there are concerns about a coming "age war" or "generational war" in an aging society (Minkler 2002; Silverstein et al. 2000).

Furthermore, culture may also predict peoples' perceptions toward aging. Difference in cultural values and beliefs on aging are popular explanations in comparative studies, especially when it comes to east-west comparisons (Giles et al. 2003). The main argument is that individuals in Eastern Asian societies, such as Japan, South Korea and China, speak more positively in terms of the aging process, relative to western societies (Kurian 1984; Levy 1996; Palmore 1975b; Sung 2004). On the one hand, the relatively high status of elders can be reflected by the shared customs, values and rituals related to aging, such as the honorific language that people use when communicating with elders and the practices of filial piety and ancestor worship (Löckenhoff et al. 2010; Palmore 1975a). On the other hand, the individualistic, youth-oriented culture may marginalize the social roles of elders, and contribute to the pervasive ageism in western society (Palmore 1975b). However, comparative studies paint a much more complex picture than the simple eastern-western dichotomy (Boduroglu et al. 2006; Löckenhoff et al. 2010; North and Fiske 2015). Especially with the rapid modernization and industrialization, there are speculations as to

what extent the prestigious positions of elders reinforced by traditional cultural norms still hold, in particular among younger generations.

2.2 Age self-stereotyping over the life course

Not only are elders' perceptions of aging related to with the larger social context, they also vary with one's biological age. To begin, the transition to old age is associated with processes of physical and cognitive decline (Elder, Shanahan, and Jennings 2015; Mirowsky and Ross 1992). Elders who are aware of their declining health and cognitive conditions may blame aging, and thus exhibit increased negative attitudes toward aging. Second, the biological and cognitive decline with the progression of biological age leads individual's to shift their roles in various life domains. As elders gradually withdraw from social activities, they adjust their expectations on how to spend the rest of their lives. Studies have found that despite the general increase in negative age effects, elders are still relatively happy with their lives, and this suggests that as people grow old, they may adapt to negative age effects. However, other studies suggest that there are limits to such resiliency. Especially as people approach death, they are decreasingly likely to maintain a positive attitude toward aging (Kotter-Grühn et al. 2009).

Besides biological frailty and role-adaptation, individuals' early life exposure to societal-wide aging perceptions may also affect how they view their own aging process (Levy 1999, 2003; Levy and Banaji 2002; Levy and Langer 1994; Sinclair et al. 2005). Internalization theory argues that the stereotype-targeted group is more likely to internalize those stereotypes. In psychological literature, this phenomenon is also referred as "negative stereotype infusion" "self-fulfilling prophecy effects" or "stereotype embodiment" (Dannefer 1987; Levy 2009; Merton 1948; Rothermund and Brandtstadter 2003). By corollary, if individuals were to be exposed to an environment where the negative aging stereotypes are pervasive, they are more likely to internalize

such negative stereotypes by the time they are old (Levy 1999, 2003; Levy and Banaji 2002; Levy and Langer 1994; Sinclair et al. 2005). As a result, perceptions such as the sense of incompetence, self-inadequacy or low self-esteem could become part of their self-identity at old age.

In sum, previous literatures suggest that with the progression of biological age, there exists an overall increased trend on the negative perceptions of aging. The increases in negative perceptions toward aging is partly attributed to individual's functional decline and detachment from various social activities. In addition, the increased negative perceptions toward aging could also be a reflection of aging self-stereotyping, granted that the individuals had formed negative stereotypes on elders at their younger age.

3. The Context of China

To better understand the status of the elders and how they perceive their own aging, it is necessary first to have a brief review of the evolution of the age stratification system in China (Cherry and Magnuson-Martinson 1981). To begin with, age hierarchy was a salient feature in traditional Chinese society. Within the family, age hierarchy is best reflected via the practice of filial piety. Often regarded as the core of Confucius ethics for ordinary people, filial piety comprises a list of rules and behaviors that young people are expected to follow, including respect, obedience, and financial and instrumental support for their parents (Zhan and Montgomery 2003). Outside of the family, elders are also well respected and are an indispensable part in social life. Anthropologist Xiatong Fei described traditional Chinese society as being “ruled by elders” (Fei 1992:114). Because with the limited state power at the local level, the traditional Chinese society is preserved and reproduced by one generation passing along traditional norms to the next. Under

such circumstances, being old is the equivalent to being educated and knowledgeable about traditions (Fei 1992). In other words, the high status attached with old age was ascribed, not achieved in traditional Chinese society.

The past hundred years witnessed tremendous social, economic and political change in China (Sun and Ryder 2016). China took its century-long course in the pursuit of modernization (Rozman 1982) since the fall of the last imperial dynasty in 1911. The establishment of the People's Republic of China in 1949 and the socialist revolution that followed saw the abandonment of many long-standing pillars of traditional social structures. The year 1979 witnessed the nation shift away from planned economy and embrace global economy. This marked another wave of change that not only involves rapid industrialization and urbanization, but also changes in values and norms, especially with a growing acceptance of western values and perceptions.

To date, there are 118 million Chinese who are aged 65 and above, and it is estimated that around 22.6 percent of the total population will be age 65 and above by 2050 (United Nations, 2015). Under the context of rapid social change and population aging, the aging experiences differ tremendously for contemporary elders (Cheung and Kwan 2009; Treas 1979; Whyte 2004; Xue 2011). The changing family structures, coupled with rapid modernization and westernization, has led the status of the elders to be increasingly marginalized. Several qualitative studies found that elders in contemporary Chinese societies reported their declining status in various life domains, indicating the evidences of self-stereotyping (Bai 2011; Bai, Lai, and Guo 2016; Chow and Bai 2011). Another national-level quantitative study by Zhao et al. (2017) explored between-individual differences on feeling useless with age. Their study showed that elders' feeling useless with age is closely related with their socioeconomic status as well as an array of life changing events and behaviors such as marital status, living arrangements and health related behaviors.

4. Research Hypothesis

Despite the existing research advancement, no study examined variations in perceptions toward aging as a primary research topic from both social change and human development perspectives. In summary of the previous discussion, I aim to evaluate the following hypotheses:

Hypothesis 1: Elders' perceptions toward their own aging vary by cohort, with more recent cohorts exhibiting higher levels of negative perceptions toward their own aging.

Drawing from the age self-stereotyping and modernization thesis, the most recent cohorts are exposed to a society where the negative age stereotypes are more pervasive in their childhood, and therefore this cohort may be more likely to internalize the societal-wide age stereotypes and report higher levels of negative perceptions toward their own aging by the time they grow up.

In addition, existing literatures in developmental psychology suggest that the progression of biological age is associated with declining functional status and elder's disengagement from various social roles. Therefore, elders' perceptions toward own aging may be more negative with progress of age, which leads to my second hypothesis:

Hypothesis 2: Net of cohort effects, elders' negative perceptions toward own aging increase with biological age.

However, several theories indicate that aging experiences vary by the type of social strata that in which individuals are found. Social strata affect perceptions of aging in three ways. First, literatures on social strata and health suggest that individuals' socioeconomic status (SES) is directly related with their health outcomes, and that worse health outcomes often are related with individuals' higher negative perceptions toward aging. Second, individuals' socioeconomic status

shape people's life course pathways and further affect their experience with age. For example, individuals with low SES often experience earlier life transitions, including marriage, childbearing and retirement. Their perceptions on aging are further shaped by such hastened life course transitions. Compared with elders who have lower SES, those who have higher SES are reported to feel younger than their actual age and more satisfied with their aging experience. Third, cumulative advantage/disadvantages theory suggests that the advantage held by individuals who have higher SES are amplified at old age, and the divergent trend in socioeconomic advantages could be further transmitted to elders' divergent feelings toward aging among elders who are in different social strata. I expect to observe the same variation in the context of China, in particular:

Hypothesis 3: There exists substantial intra-cohort variations in the level and trajectories of elders' perceptions toward their own aging. In particular, elders with low socioeconomic status exhibit higher levels of negative perceptions toward aging, and also experience faster declining of positive perceptions of aging.

5. Data and Method

5.1 Data and Sample

This study uses seven waves of data from the Chinese Longitudinal Healthy Longevity Survey (CLHLS), a nationally representative survey on well-being and quality of life of elders in China (Zeng et al. 2005). The CLHLS adopts a multi-stage stratified sampling strategy. The CLHLS data were used by researchers within various social science disciplines and is widely acknowledged as having high quality (Gu 2008; Vaupel 2012). A detailed description of the sampling procedure of the CLHLS data can be found at Zeng et al. (2008). The 1998 baseline

survey interviewed 8,803 elders aged 85 and above. The subsequent waves were conducted in 2000, 2002, 2005, 2008/09, 2011/12 and 2014. Starting from the year of 2002, the CLHLS research team expanded the age coverage by including younger age cohorts who aged 65 and above. At each wave, survivors were re-interviewed, and new participants were added to make up for the deceased and lost interviewees. Therefore, even though the mortality attrition is large, the sample size for each wave does not reduce substantially. Specifically, the total sample in each of the following waves was 11,161 in 2000, 16,057 in 2002, 15,476 in 2005, 16,313 in 2008/09, 8,214 in 2011/12, and 7,107 in 2014 survey year (Gu et al. 2016). Aside from basic demographic information, the CLHLS also recorded rich information in terms of elders' health, family structure, and subjective well-being status at each survey year, which enables researchers to study change. All the CLHLS data are available at the Interuniversity Consortium for Political and Social Research (ICPSR) at University of Michigan.

The analytical sample is a synthesis of all seven waves of the longitudinal-waves of CLHLS. Individuals were restricted to those aged between 65 and 110 by the time of their first interview, who did not have missing values on key demographic and socioeconomics characteristics such as age, gender, education and occupation. In total, the sample included 38,164 individuals, who contributed 66,700 person-year records. To assess whether there are systematic differences in the characteristics between the analytical sample and those who are excluded due to loss-to-follow-up or mortality, I conducted a multinomial analysis to compare differences in socioeconomic characteristics among those who stayed in the sample, those who dropped out of the sample and those who died before the last wave. Compared with the individuals who stayed in the sample, dropouts are more likely to be Han Chinese (odds ratio=2. 0), less likely to work in manufacturing occupation (odds ratio=0. 4) before they reached age 60, and have 1-6 years of

schooling (odds ratio=1.11) or 7 years above formal education (odds ratio=1.13) compared with elders who have no formal education. No other characteristics were significantly different from sample members. On the other hand, compared with the individuals who stayed in the survey, those who died are less likely to be female (odds ratio= 0.7), more likely to have engaged in agricultural production before reaching into their 60s (odds ratio=1. 6) and less likely to have been in the industrial sector (odds ratio=0. 7) and have less schooling (odds ratio=0. 8). The rest of the study follows a conventional approach (e.g. Chen, Yang, and Liu 2010) by including two binary variables (died and lost) to indicate two different reasons for sample attrition.

5.2 Measurements

Dependent Variables

I include two dependent variables that measure individuals' temporal comparisons about their change in life. The first variable derives from the question "*Do you feel you are as happy now as when you were younger?*" The second variable derives from the question "*Do you feel the older you get, the more useless you feel?*" Both of these two measurements are important indicators in reflecting individuals' perceptions toward aging, and match verbatim with the Attitude toward Own Aging subscale of the Philadelphia Geriatric Center Morale Scale (1977), one of the most widely adopted measurements on individuals' perceptions of own-aging¹ (Jang et al. 2004; Kleinspehn-Ammerlahn et al. 2008; Kotter-Grühn and Hess 2012; Levy et al. 2002; Macia et al. 2009; Moor et al. 2006). The responses to these two questions are recoded from one to five

¹ There are five statements in the Attitude Toward Own Aging Scale in the Philadelphia Geriatric Center Morale Scale. The rest meaning three are "*Things keep getting worse as I get older*", "*I have as much pep as I did last year*" and "*As I get older, things are better than I thought they would be*". However, these three questions are not asked in the CLHLS survey.

(1=always, 2=often, 3= some times, 4=seldom, 5=never)². The scales are then reverse coded so that the larger value represents individual's stronger feeling toward the statements. Responses of "unable to answer" were coded as missing and dropped out of the analysis. Among those who were unable to answer this question, over 90 percent are due to health-related reasons (Gu, Dupre, and Qiu 2017).

Both of these two variables are important measures on attitude towards aging, yet they bear conceptual differences. Feeling uselessness with age is often used as a measure of age competence and could be more closely related with societal-wide stereotypes toward aging (Gu et al. 2016; Mutran and Burke 1979), whereas feeling happiness with age is more of an internal reflection on elders' own aging experiences, with an explicit comparison with the past. It is also necessary to note that although feeling happy with age sometimes is considered as part of an old-age well-being measurement, it also exhibits unique variances. For example, previous studies found that although elders may report they being satisfied with life in general, they may still be less likely to agree that getting older was better than they expected (Liang and Bollen 1983). Given these considerations, I choose to treat these two variables as separate constructs and examine the cohort and aging effects of these two indicators separately.

Figure 2-1a and 2-1b present the mean value of two dependent variables by age and period, displayed as heat maps. A heat map is a graphical representation of data by first tabulating variables, then coloring values put in cells. It is a useful tool to visualize patterns and variations of the variables of interest. In Figure 2-1, I computed average ratings of elders' responses to the two questions, tabulated by survey year and age. I then color-code this age-by-survey year table using

² The questionnaires on 1998 and 2000 were phrased slightly differently. The 1998 and 2000 survey asked the elders to what extent they felt similar with the condition that the interviewer described. The condition was phrased as "the older I get, the more useless I feel". The answers were coded as 1=very similar, 2=similar, 3=so-so, 4= not similar 5= not similar at all.

a blue-to-red color scale. The blue color denotes the low values of average response, and the red color denotes the high values of the average responses.

From Figure 2-1a one may discern that there is little variation across survey years, except the survey year 2008/2009, when all age groups reported they feel less happy as they age. One possible explanation is the impact the 2008 economic crisis had on elders' well-being. In terms of age-related variation, the heat map shows that elders in most age groupings were relatively happy with their age— average around three. When elders reached to very old age, their rating on feeling happy with age declined to two. Elders' rating on feeling useless with age is presented in Figure 2-1b. The pattern is more or less the same in the sense that there does not appear to be a strong period pattern. The greatest variations also appear among the very old. Before 2005, elders in extreme old age (i.e. age 100 and above) report to have higher level on feeling useless with age. Meanwhile, elders at the same age group who were interviewed in more recent times reported lower values on feeling useless with age. It is also important to note that the exploratory heat maps only present the first rough look at the data structure, since age and cohort effects are inter-related, and other confounding factors are not controlled for.

Figure 2-1a. Heat Map on Age, Period and Feel Happy with Age

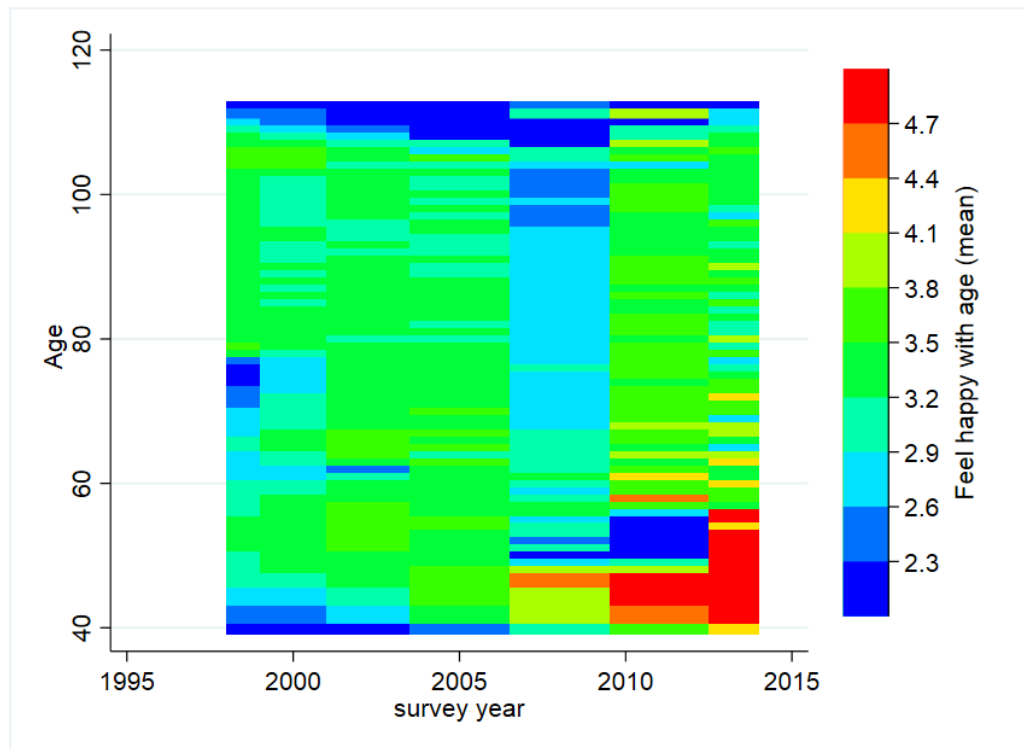
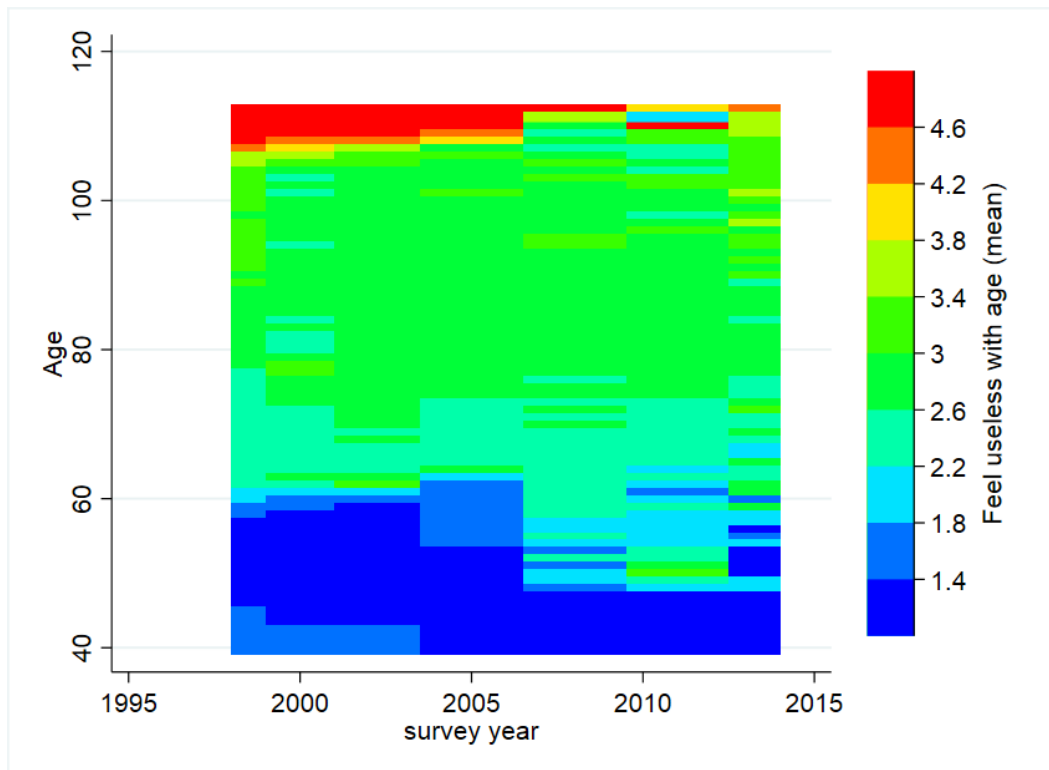


Figure 2-1b. Heat Map on Age, Period and Feel Useless with Age



Cohort

To locate individuals' life course experiences into different historical contexts, I divided the total sample into four birth cohorts, with a joint consideration on the types of political regimes the elders were born in, as well as the subsequent historical context they lived by the time they reached to their sixties. Specifically, the first cohort was born between 1887 and 1911, during which time China was still at its last imperial dynasty, the Qing dynasty. As the oldest cohort in the sample, these individuals witnessed the collapse of the imperial China, lived through wartime, and entered their 60s when the Communist Party took power in 1949. The second (born between 1912 and 1928) and third cohorts (born between 1929 and 1937) were born when China suffered from constant internal and external conflicts. These two cohorts reached their 60s in the 1950s and 1960s, a time when socialist revolution took place in China. The last cohort was born between 1938 and 1954, a time when the nation was reunified as the Republic of China. These people reached their 60s after 1970, a time when rapid development and modernization processes took place in China. An illustration of the cohort division is presented at Figure 1 at Appendix.

Socioeconomic status

Elders' socioeconomic status is captured from two aspects, the elders' educational level, and their major occupation before age 60. Education is measured as a binary variable indicating whether the elders had any sorts of formal education or not. The major occupation before age 60 is measured in five categories, (1) Managerial or professional; (2) Agriculture; (3) Industrial; (4) Commercial /service and (5) Others. In the analysis, the managerial or professional occupations are treated as the reference group.

Other controls

Aside from age, cohort and socioeconomic status, the model also takes into consideration an array of socioeconomic control variables. To begin, gender (female=1, male=0) and ethnicity (Han=1, Ethnic minority=0) are included to control for respondents' demographic characteristics. In addition, the model also included a list of time-varying covariates, based on previous research on factors that affect between-individual variations in elders' perceptions toward aging (e.g. Zhao et al. 2017). These covariates including elder's major source of support, marriage status, living arrangement, place of residence, as well as self-rated health at each wave. In particular, the elder's major source of financial support is captured by two variables, whether the primary source of support is retirement pension or their work wage. The reference category is supported by family members. Marital status is captured by a binary variable indicating being married with spouse present. Living arrangement is captured by a binary variable indicating whether the elders are living in an institution or alone, the reference group is living with family members. The self-rated health is measured in a one to five scale, ranging from "1=very bad" to "5=very good". The descriptive statistics are presented in Table 2-1.

As shown from Table 2-1 below, the average age of the sampled elders is 86. The sample split evenly between males and females. In terms of ethnicity, the majority of the sampled elders are Han Chinese. Over half of them worked in industrial-related occupations prior to retirement. In terms of time-varying variables, only thirty percent of the elders reported have been married with spouse present any time during the survey period. The major sources of support are from children and grandchildren. Over half of the sampled elders had ever lived in rural areas. Overall the sampled elders had relatively high rating on their health conditions.

Table 2-1 Descriptive Statistics

	Mean	S.D.
Feel useless with age	2.80	1.15
I am as happy now as when I was younger	3.21	1.27
Age (validated)	86.48	10.61
Female	0.55	0.50
Han	0.94	0.24
Education	0.41	0.49
<i>Occupation</i>		
Professional or Managerial	0.08	0.28
Agriculture	0.29	0.45
Industry	0.45	0.50
Life events		
Married and spouse present	0.31	0.46
<i>Major source of support</i>		
Retirement wage	0.20	0.40
Spouse or other relatives	0.03	0.17
Children or grandchildren	0.62	0.48
Government support	0.06	0.24
Work wage	0.07	0.26
Other type of support	0.02	0.14
Alone or in institution	0.18	0.39
Live in rural area	0.53	0.50
Self-rated health	3.47	0.91
Lost	0.19	0.39
Died	0.55	0.50
Person-wave observations	66,700	

5.3 Method

The multilevel growth curve model is particularly suitable for the purpose of this study, since it incorporates individual change and societal change in two levels of analysis. Moreover, the growth curve model also takes into consideration the nature of an un-balanced panel (Singer and Willett 2003). The model is specified as follows:

Level 1:

$$y_{ti} = \beta_{0i} + \beta_{1i}Age_{ti} + \beta_{2i}Age_{ti}^2 + \eta Z_{ij} + e_{ti} \quad [1]$$

Level 2:

$$\text{Intercept: } \beta_{0i} = \gamma_{00} + \gamma_{01}cohort_i + \gamma_{02}SES_i + \gamma_{03}SES_i \times cohort_i + \pi_0 X_i + u_{0i} \quad [2]$$

$$\text{Linear rate of change: } \beta_{1i} = \gamma_{10} + \gamma_{11}cohort_i + \gamma_{12}SES_i + \gamma_{13}SES_i \times cohort_i + u_{1i} \quad [3]$$

$$\text{Quadratic rate of change: } \beta_{2i} = \gamma_{30} \quad [4]$$

The level 1 model (equation 1) depicts individuals' growth trajectories. Specifically, y_{ti} is the “feel useless with age scale” or “feel happy with age scale” for respondent i at wave t. Age_{ti} is the age of the respondent i at wave t. Following the common practice, to make the interpretation of the intercept meaningful, age is centered on its median value (87 years). The intercept β_{0i} is the estimated value of y at median age when all other covariates are held at its mean; β_{2i} is the estimated growth rate per year of age for respondent i. The level 1 model also includes a set of time-varying controls, denoted as Z_{ij} (such as self-rated health status, marriage status, living arrangements and major source of support).

The level 2 model (equation 2 and 3) captures between-individual heterogeneities. Each parameter in level 1 model is further modeled as a function of individual level attributes. In particular, coefficient γ_{00} to γ_{03} captures change in the intercept, while the coefficient γ_{10} to γ_{13} captures the estimated change in the slope. The matrix of time-invariant controls is included in the level 2 model, denoted as X_i . Models were estimated using maximum likelihood. All analyses are conducted using STATA 14.0.

6. Results

6.1 Age and cohort effect

Table 2-2 presents estimates of growth curve models of elders' reported scale on feeling happy with age. The analysis adopts a sequential procedure. The baseline model includes age and cohort only. The following models successively add socioeconomic status (Model 2), time-invariant controls for demographic characteristics (Model 3), the interactions of cohort by socioeconomic status (Model 4), and a full model that further controls for time-varying life course experiences (Model 5). As can be seen from the table, Model 1 strongly supports hypothesis 1 and 2, in the sense that there exist both significant cohort and age effects on elders' feeling happy with age. In particular, the estimated cohort effect is negative, suggesting that the more recent cohorts report lower levels of feeling happy with age. The negative cohort effect is consistent with the modernization hypothesis. A society's increased level of modernization is thought to cause a decline status in the elders, and negative stereotypes of aging. Next, the age effect (denoted as the intercept of the growth rate) is also negative, suggesting net of the cohort effect, elders felt less happy with age with the progression of their biological age. The observed age effect is also predicted by the literatures in developmental psychology. The estimated growth trajectory is further presented in Figure 2-2a, which shows a strong cohort gradient in the growth trajectories.

After adding controls for educational level and occupation in model 2, the cohort effect becomes insignificant while the age effect still remains significant, suggesting that the socioeconomic status largely account for cohort differentials. Model 3 further adds time-invariant controls of gender and ethnicity; The result indicates that females report having lower levels on feel happy with age, compared with their male counterparts. People of Han ethnicity report higher

levels of happiness with age, compared to the ethnic minorities. In addition, the cohort effect remains insignificant while the age effect remains significant in Model 3.

Model 4 includes a set of cohort interactions for both the intercept of the growth curve and linear growth rate to account for intra-cohort differences. After controlling on the intra-cohort variations, the main cohort effect became significant. At the same time, the age effect remains negatively significant in model 4. Model 5 is the full model that further adds time-varying variables that control for various life events, social support and health. After adding all the controls, salient cohort and age effects remain, and the direction of the effects is consistent with model 1. To further illustrate the cohort-specific growth trajectories, the estimated net growth trajectories are presented in Figure 2-2b. After taking into account of elders' socioeconomic status, the demographic characteristics and life course events, the cohort gradients remain significant. Moreover, there is evidence of convergence, in the sense that the gaps across cohorts become narrow with age.

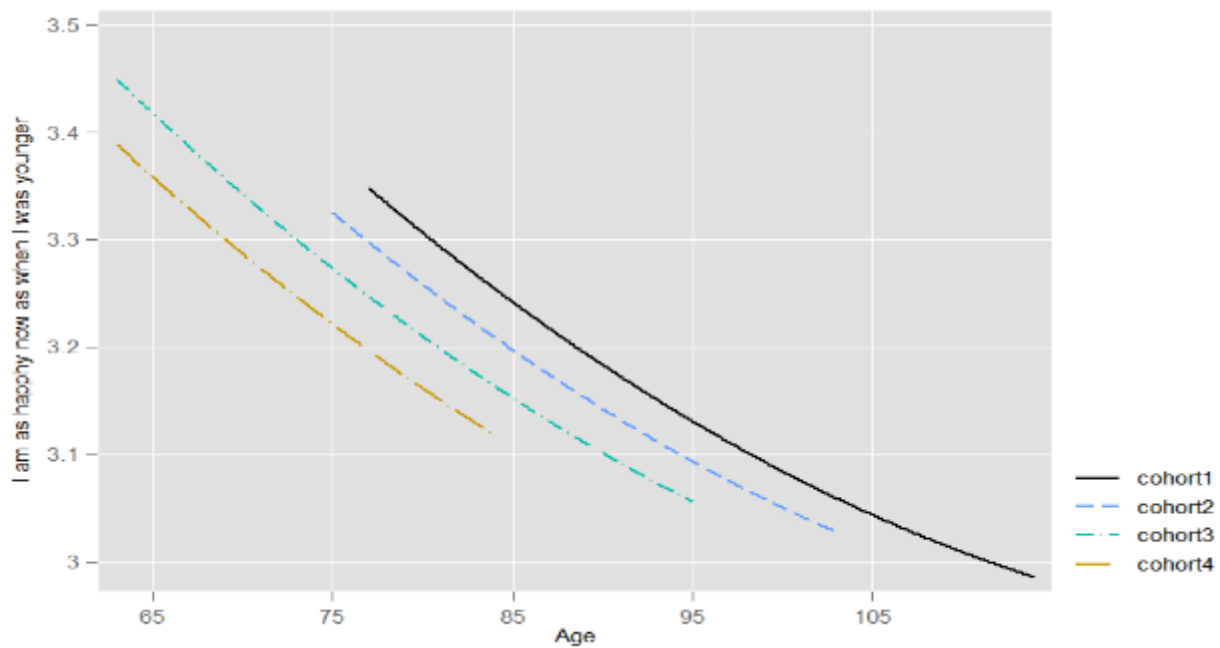
Table 2-2. Growth Curve Models on Feel Happy with Age

	(1) Main effect	(2) SES	(3) Intra-cohort variation	(4) Time-Invariant Controls	(5) Full model
Fixed effects					
For intercept					
Intercept	3.248*** (0.013)	3.356*** (0.024)	3.161*** (0.048)	3.341*** (0.052)	2.195*** (0.054)
Cohort	-0.047*** (0.011)	-0.015 (0.012)	-0.013 (0.012)	-0.172*** (0.043)	-0.210*** (0.041)
Education (<i>ref: no schooling</i>)		0.147*** (0.011)	0.133*** (0.013)	0.106*** (0.027)	0.052+ (0.027)
<i>Main occupation before age 60 (ref: managerial or governmental jobs)</i>					
Agricultural		-0.205*** (0.022)	-0.196*** (0.022)	-0.389*** (0.048)	-0.269*** (0.047)
Industrial		-0.264*** (0.022)	-0.255*** (0.022)	-0.493*** (0.049)	-0.344*** (0.047)
Commercial /service		-0.152*** (0.027)	-0.146*** (0.027)	-0.199** (0.061)	-0.150** (0.058)
Others		-0.116*** (0.027)	-0.109*** (0.027)	-0.215*** (0.058)	-0.150** (0.055)
Cohort interactions					
Cohort × Education				0.030 (0.024)	0.042+ (0.023)
Cohort × Agricultural				0.142** (0.043)	0.127** (0.043)
Cohort × Industrial				0.210*** (0.041)	0.221*** (0.041)
Cohort × Commercial /service				0.060 (0.054)	0.104+ (0.054)
Cohort × Others				0.007 (0.055)	0.062 (0.055)
For linear growth rate					
Intercept	-0.012*** (0.002)	-0.011*** (0.002)	-0.011*** (0.002)	-0.030*** (0.005)	-0.029*** (0.005)
Cohort	0.001 (0.001)	0.002 (0.001)	0.002 (0.001)	0.006* (0.003)	0.006* (0.002)
Education		-0.002* (0.001)	-0.003* (0.001)	-0.001 (0.003)	-0.000 (0.002)
<i>Occupation (ref: managerial or governmental jobs)</i>					
Agricultural		0.003 (0.002)	0.003 (0.002)	0.024*** (0.005)	0.023*** (0.005)
Industrial		0.003 (0.002)	0.003 (0.002)	0.024*** (0.005)	0.023*** (0.004)
Commercial /service		0.003 (0.003)	0.003 (0.003)	0.010+ (0.006)	0.011* (0.005)
Others		0.004 (0.003)	0.004 (0.003)	0.019*** (0.006)	0.020*** (0.005)
Cohort intersection					

Cohort × Education				0.001 (0.001)	0.001 (0.001)
Cohort × Agricultural				-0.007** (0.002)	-0.005* (0.002)
Cohort × Industrial				-0.003 (0.002)	-0.003 (0.002)
Cohort × Commercial /service				0.001 (0.003)	0.001 (0.003)
Cohort × Others				-0.012*** (0.003)	-0.010*** (0.003)
For quadratic growth rate					
Intercept	0.000 (0.000)	0.000+ (0.000)	0.000+ (0.000)	0.000* (0.000)	0.000* (0.000)
<i>Controls</i>					
Female			-0.027* (0.012)	-0.027* (0.012)	0.018 (0.012)
Han			0.218*** (0.021)	0.219*** (0.021)	0.207*** (0.020)
Retirement wage					0.134*** (0.016)
Work wage					-0.052* (0.020)
Married					0.078*** (0.013)
Live alone or in institution					-0.068*** (0.013)
Lost follow up					-0.187*** (0.016)
Died					-0.170*** (0.014)
Self-rated health					0.351*** (0.005)
Live in rural					-0.084*** (0.010)
<i>Random effects</i>					
Level 1:	1.456***	1.456***	1.458***	1.455***	1.409***
within-person	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)
Level 2:	0.138***	0.124***	0.120***	0.121***	0.051***
in intercept	(0.025)	(0.022)	(0.026)	(0.022)	(0.029)
Level 2:	0.000***	0.000***	0.000***	0.000***	0.000***
in growth curve	(0.008)	(0.000)	(0.009)	(0.000)	(0.000)
AIC	230892.080	230341.209	230230.503	230176.347	227739.768

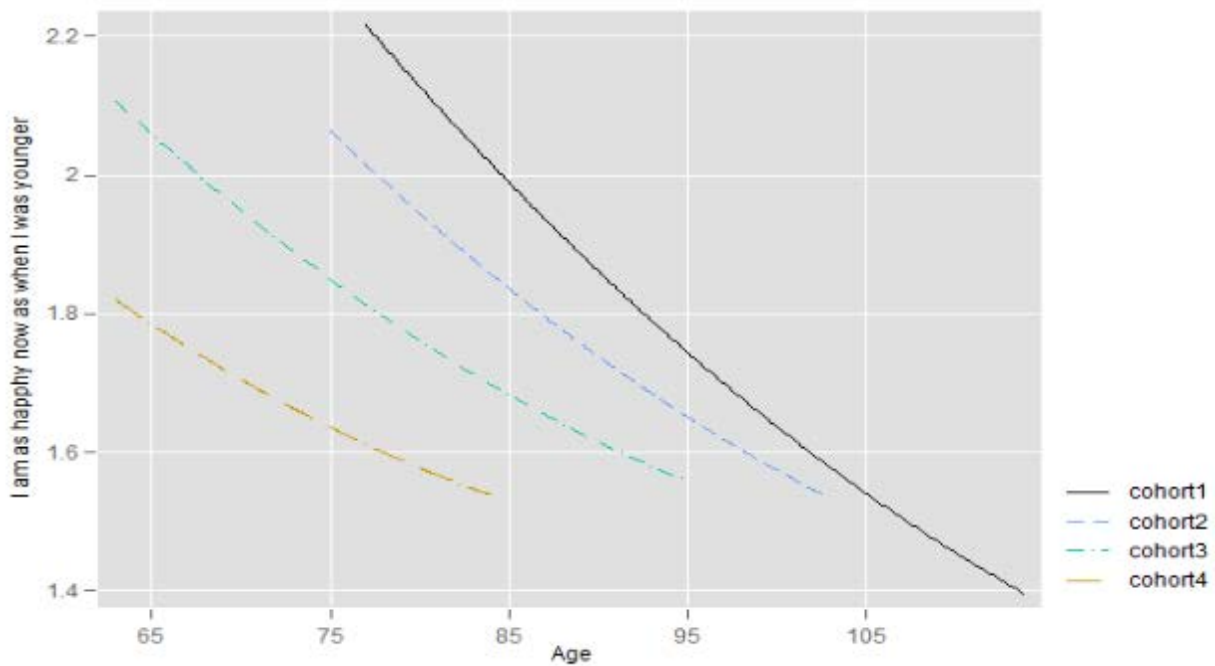
Standard errors in parentheses; + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 2-2a. Gross Cohort-Specific Growth Trajectories on Feeling Happy with Age



Note: calculated based on model 1 in Table 2-1, without any controls.

Figure 2-2b. Net Cohort-Specific Growth Trajectories on Feeling Happy with Age



Note: calculated based on Model 5 in Table 2-2, net of all the controls. The cohort effect is insignificant.

In a similar vein, I also find evidence of cohort and age effects on elders' reported feeling of uselessness. The baseline growth curve model is presented in model 1 of Table 2-3 and the corresponding growth trajectories are presented in Figure 2-3a. However, unlike the pattern presented in Figure 2-2a, the growth trajectories on the elders' reported feeling of uselessness with age exhibit a strong cohort-by-age interaction. That is to say, the effects of cohort and aging are not only additive, but the rates of increase in growth trajectories vary among different cohorts. In particular, the oldest cohorts not only had the lowest level, but also had the flattest growth trajectories on their ratings on feeling useless with age. While the youngest cohorts had the highest and also the largest increase rates on their reported feeling useless with age.

Moving to the rest of the models, the cohort effect became insignificant once the model included socioeconomic variables (Model 2), and it remained insignificant throughout the rest of the models. This suggests that the cohort effect is completely explained by the socioeconomic differences. In the meantime, the age effect (denoted as the intercept of the growth rate) remains positively significant from model 1 through model 4, indicating that elders' feeling useless increases with biological age, which is consistent with the previous findings in developmental psychology. However, the age effect became only marginally significant in the final model, indicating most variations on age effect can be explained by time-varying changes that occur throughout elder's life course. Based on model 5, I graphed the net cohort specific growth trajectories in Figure 2-3b. The graph indicates a narrow cohort gradient and a convergent trend on the growth curve. However, Figure 2-3b should be interpreted with caution as the cohort effect is insignificant and reversed its sign, and the age effect is only marginally significant in the final model.

Table 2-3. Growth Curve Model on Feel Useless with Age

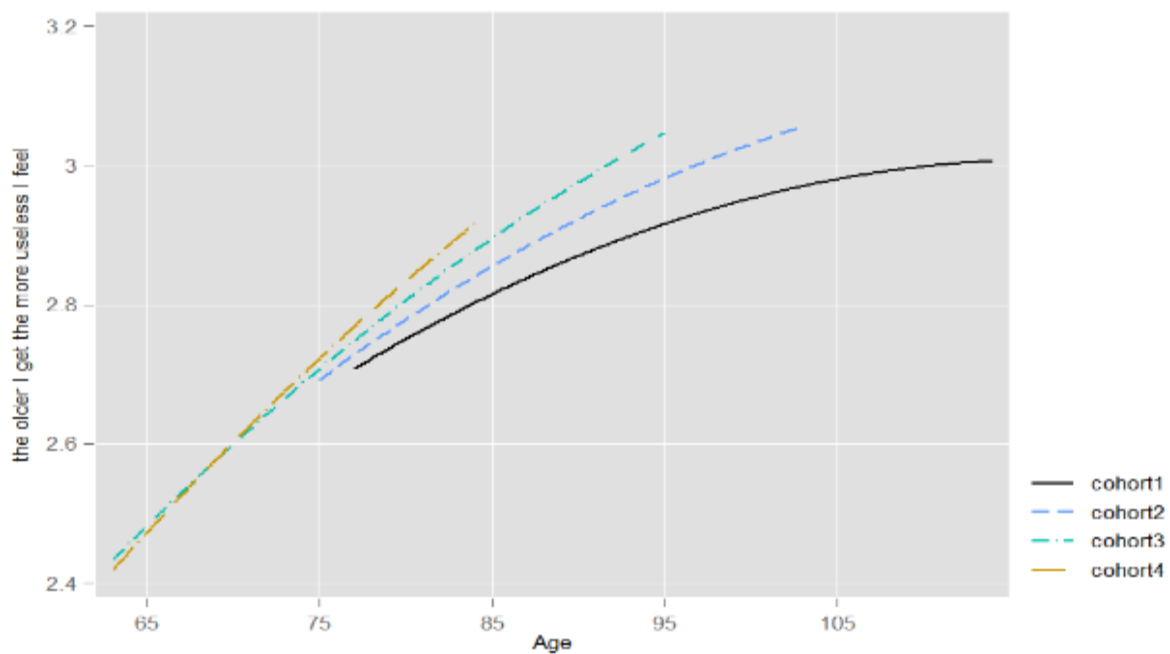
	(1) Main effect	(2) SES	(3) Time-invariant Controls	(4) Intra-cohort variation	(5) Full model
Fixed effects					
<i>For intercept</i>					
Intercept	2.815*** (0.012)	2.675*** (0.022)	2.676*** (0.043)	2.496*** (0.048)	3.735*** (0.051)
Cohort	0.040*** (0.010)	0.019+ (0.011)	0.001 (0.039)	0.002 (0.039)	-0.001 (0.037)
Education		-0.201*** (0.010)	-0.225*** (0.025)	-0.181*** (0.025)	-0.115*** (0.024)
Occupation before age 60 (<i>ref: managerial or governmental jobs</i>)					
Agricultural		0.222*** (0.020)	0.300*** (0.044)	0.303*** (0.044)	0.131** (0.042)
Industrial		0.301*** (0.020)	0.273*** (0.044)	0.273*** (0.044)	0.119** (0.042)
Commercial /service		0.246*** (0.024)	0.189*** (0.055)	0.183*** (0.055)	0.110* (0.052)
Others		0.253*** (0.025)	0.229*** (0.052)	0.187*** (0.052)	0.096+ (0.050)
Cohort interactions					
Cohort × Education			0.021 (0.022)	0.019 (0.022)	-0.001 (0.021)
Cohort × Agricultural			-0.056 (0.041)	-0.061 (0.041)	-0.014 (0.039)
Cohort × Industrial			0.038 (0.039)	0.037 (0.039)	0.008 (0.037)
Cohort × Commercial /commercial /service			0.038 (0.051)	0.021 (0.051)	-0.030 (0.048)
Cohort × Others			0.066 (0.052)	0.082 (0.052)	0.048 (0.049)
<i>For linear growth rate</i>					
Intercept	0.012*** (0.001)	0.010*** (0.002)	0.012** (0.004)	0.012** (0.004)	0.009* (0.004)
Cohort	0.002* (0.001)	0.003* (0.001)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Education		0.001 (0.001)	0.003 (0.002)	0.003 (0.002)	0.002 (0.002)
Occupation (<i>ref: managerial or governmental jobs</i>)					
Agricultural		0.001 (0.002)	-0.008* (0.004)	-0.009* (0.004)	-0.006 (0.004)
Industrial		-0.006*** (0.002)	-0.007+ (0.004)	-0.008+ (0.004)	-0.008+ (0.004)
Commercial /service		-0.007** (0.002)	-0.004 (0.005)	-0.005 (0.005)	-0.006 (0.005)
Others		0.001 (0.002)	-0.001 (0.005)	0.000 (0.005)	-0.000 (0.005)
Cohort intersection					
Cohort × Education			-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Cohort × Agricultural			0.004+ (0.002)	0.004+ (0.002)	0.002 (0.002)

Cohort× Industrial			0.002 (0.002)	0.002 (0.002)	0.002 (0.002)
Cohort× Commercial /commercial /service			-0.003 (0.003)	-0.002 (0.003)	-0.002 (0.003)
Cohort× Others			0.005 ⁺ (0.003)	0.005 ⁺ (0.003)	0.003 (0.003)
<i>For quadratic growth rate</i>					
Intercept	-0.000* (0.000)	-0.000** (0.000)	-0.000 ⁺ (0.000)	-0.000* (0.000)	-0.000 ⁺ (0.000)
<i>Controls</i>					
Female				0.093*** (0.011)	0.045*** (0.011)
Han				0.129*** (0.019)	0.146*** (0.018)
Retirement wage					-0.171*** (0.014)
Work wage					-0.055** (0.018)
Married					-0.067*** (0.012)
Alone or in institution					0.066*** (0.011)
Lost					0.052*** (0.014)
Died					0.053*** (0.012)
Self-rated health					-0.337*** (0.005)
Live in rural					0.110*** (0.009)
<i>Random effects</i>					
Level 1:	1.137***	1.140***	1.140***	1.141***	1.088***
within-person	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
Level 2:	0.168***	0.141***	0.141	0.137***	0.077***
in intercept	(0.017)	(0.017)	(0.017)	(0.017)	(0.024)
Level 2:	0.000***	0.000***	0.000***	0.000***	0.000***
in growth curve	(0.001)	(0.001)	(0.001)	(0.000)	(0.006)
AIC	218683.652	217635.549	217611.826	217504.880	211634.542

Standard errors in parentheses

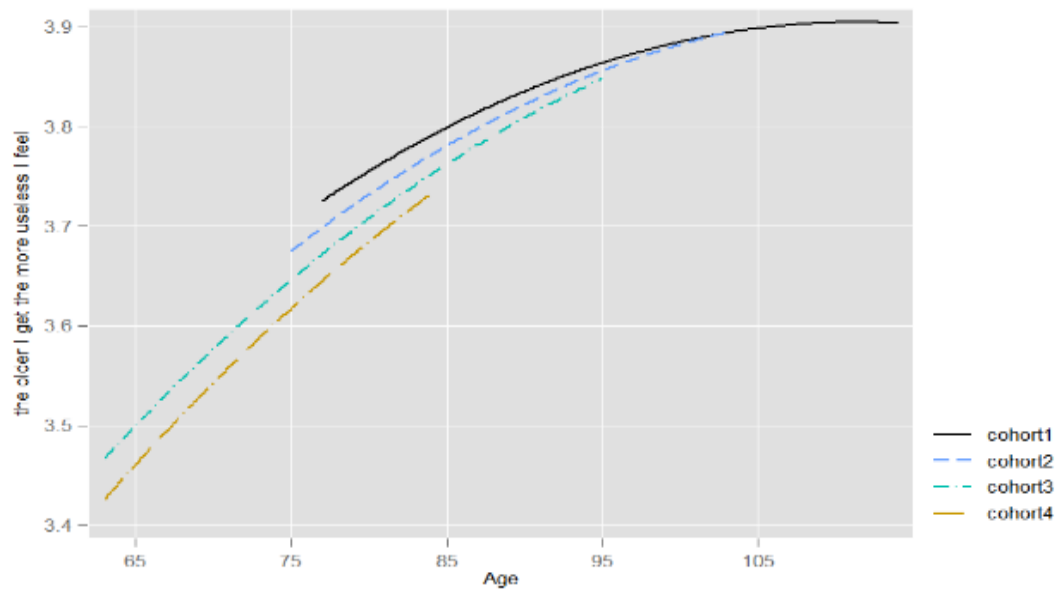
⁺ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 2-3a. Gross Effect on Cohort-Specific Growth Trajectories on Feeling Useless with Age



Note: calculated based on model 1 in Table 2-3, without any controls.

Figure 2-3b. Net Effect on Cohort-Specific Growth Trajectories on Feeling Useless with Age



Note: calculated based on model 5 in table 2-3, without any controls. Cohort effect is insignificant in the final model (model5)

6.2 Intra-cohort variations

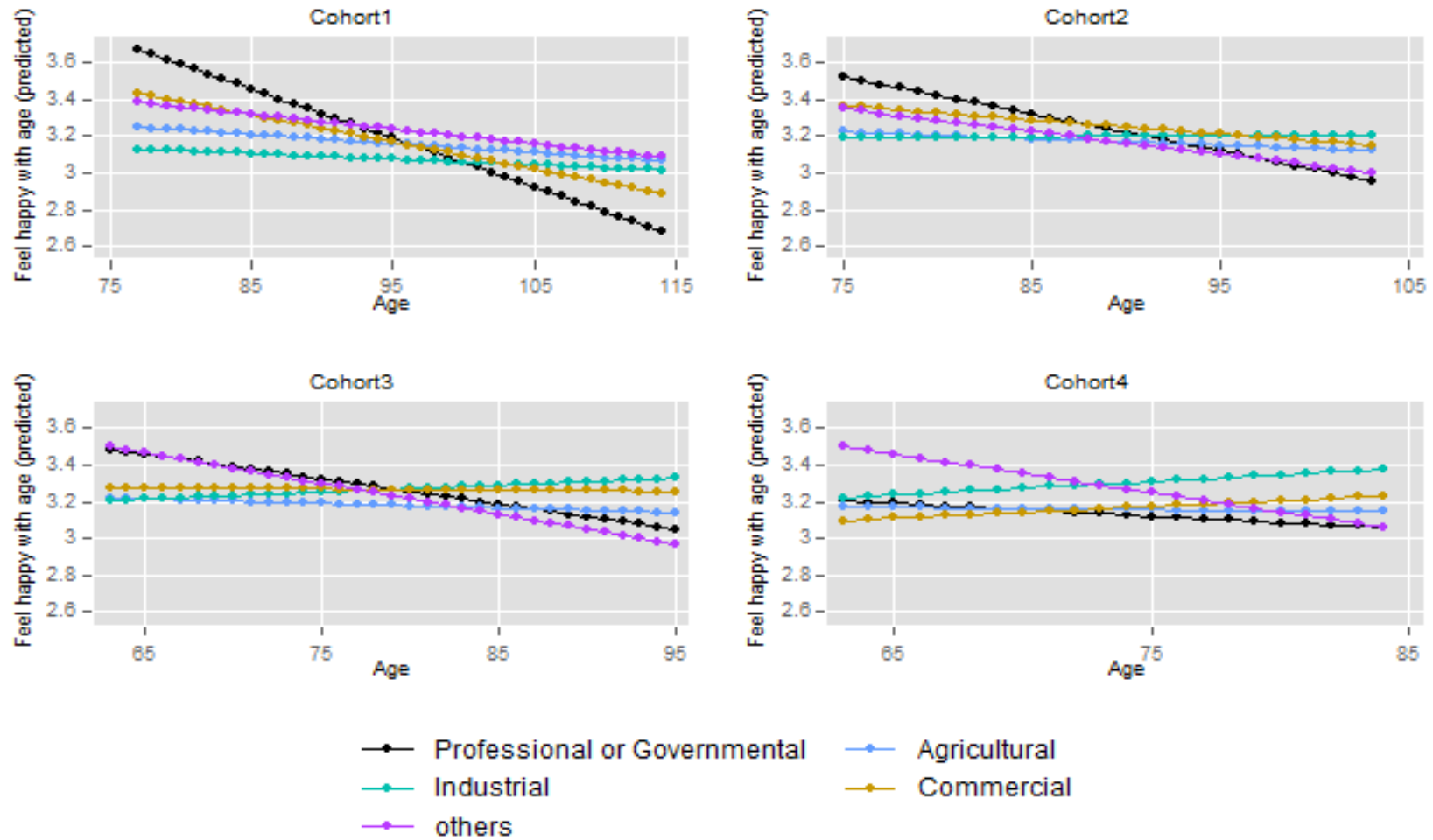
Aside from the age and cohort effects, I also find support for hypothesis 3, in the sense that there exist intra-cohort variations in the levels as well as trajectories of growth curves. For example, the model 4 in Table 2-2 shows that there are strong significant intra-cohort variations in happiness with age, with respect to education and occupation. In particular, relative to the elders who did not receive any formal schooling, those with any formal education have a higher reported feeling happy with age by 0.11 units. The education effect declined to 0.05 in the full model, after controlling for time-varying covariates. In terms of the occupational differences, compared with the reference group (elders whose major occupation were governmental or managerial), elders who held agricultural, industrial, commercial /service and other occupations reported having lower feelings of happiness with age of 0.39, 0.5, 0.20 and 0.22 units in model 4. However, compared with other occupations, elders whose major occupation is governmental or managerial had a more rapid decline when it comes to the growth trajectories on feeling happy with age. This can be seen from the positive occupation coefficients for linear growth curve displayed in model 4 and model 5.

To further illustrate the intra-cohort variations, Figure 2-4a presents the estimated linear growth trajectories on elders' feeling happy with age, broken down by cohort. The results clearly show that the elders whose major occupations are managerial or professional experienced a major decline with the progression of age. Drawing from the role disengagement theory (Hochschild 1975), one possible explanation is that the relatively high prestige held by managerial or governmental jobs may no longer be maintained after retirement, thus elders may experience a decline, especially if the survey question asks for a direct comparison between their current feeling and the feeling when they were young. In addition, elders who held agricultural and industrial jobs

reported having the lowest levels of feeling happy with age at the beginning of the survey. However, the growth rates of these two occupations are quite flat, in the sense that by the end of the survey they appear to be the least unhappy with their own age. One possible explanation of the growth curve patterns in the agricultural and industrial sector could be mortality selection. In particular, compared with other occupations, peasants and industrial workers are often considered as occupying the lower rungs in the social strata. Therefore, they may face greater positive selection into survival in terms of their health and their attitudes on life. As a result, those who were able to live at a very old age are not only a homogenous group, but also healthier ones who may also have relatively positive attitudes toward life and their own aging.

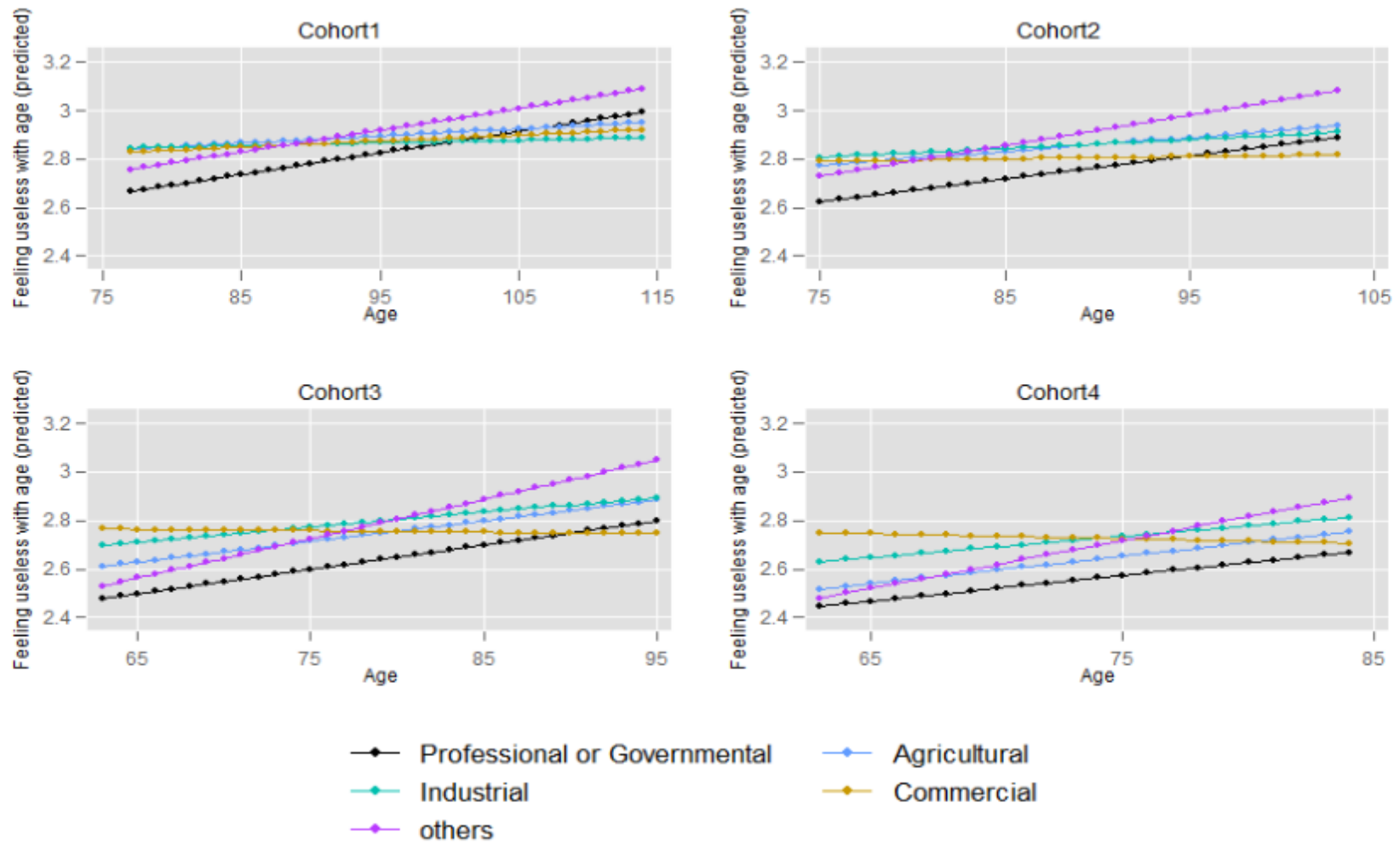
The intra-cohort variation on elders' reported feeling of uselessness with age suggest the same pattern. For example, Model 4 and Model 5 in Table 2-3 reveal that elders with higher education exhibit lower feelings of uselessness with age. Compared with elders whose major occupations were managerial or governmental, elders with other occupations reported greater feelings of uselessness with age. The cohort-specific variations on growth trajectories do not appear to be significant for each single occupational category in both model 4 and model 5. However, the likelihood ratio test for the overall significance of the occupation differentials further suggests that there is statistically significant variation on overall occupational differences for both intercept and growth rate ($\chi^2=76.75$ $df=16$). For this reason, I further plotted occupational specific linear growth curves on feelings of uselessness with age, broken down by cohort (Figure 4b). As with Figure 4a, Figure 4b shows that elders whose major occupation is managerial or professional reported having relatively lower levels on feeling useless with age at the beginning of the survey, while having relatively higher growth rate. Therefore, by the end of the survey, they no longer are the ones that had the lowest rating on feelings of uselessness with their age.

Figure 2-4a. Intra-Cohort Differences on Feel Happy with Age



Note: Calculated based on Model 5 in Table 2-2

Figure 2-4b. Intra-Cohort Differences on Feel Useless with Age



Note: Calculated based on Model 5 in Table 2-3

7. Conclusion

Aging is a cultural as well as biological process. Individuals' perceptions toward their own aging is a reflection of both their own life experiences as well as the socially and culturally shared beliefs about aging processes. Compared with objective measurements such as income or health, perceptions are less discernable. Therefore, although elders' perceptions were increasingly acknowledged as an important factor that closely related with many life-outcomes at old age, relatively little attention has been paid to temporal variations in individuals' perception of aging. The purpose of this study is to fill this research gap by investigating cohort and aging effects on individuals' perception of aging, as well as exploring whether or not elders' perceptions differ by their socioeconomic status.

The context of this study is Chinese society, which as I have argued, is well suited for this exploration. China went through rapid economic, social, institutional and cultural change over the past decade. In this study, the effects of social change on elders' perceptions are captured by utilizing the concept of cohort. In particular, I found compelling evidence of cohort differences in elders' perceptions of aging, as the elders in more recent cohorts had both higher levels of unhappiness with age and feelings of uselessness with age. Furthermore, the cohort effects in both Table 2-2 and Table 2-3 are completely explained by adding controls for individual's socioeconomic status, suggesting the compositions of the old-age groups themselves have changed among cohorts. From the structural perspective, modernization entails processes of industrialization and mass education. One implication of modernization theory is that the cohort compositions will

differ. A further investigation of the data reveals that the more recent cohorts have higher educational levels, as well as non-agricultural related occupations. Therefore, the cohort differences in elders' perception toward aging can be largely attributed to the changing education and occupation compositions among cohorts that are born during different historical times.

It is however also necessary to note the different patterns of growth trajectories that emerged from the two dependent variables. For growth curve models on feeling happy with age, accounting for cohort-by-SES interactions leads to the main cohort effect becoming significant again (model 4 in Table 2-2), and the cohort effect remains statistically significant after adjusting for marriage status, major source of support, living arrangement, health status, rural-urban residency as well as sample attrition (model 5 in Table 2-2). This indicates that there are other mechanisms contributing to cohort variation in elder's reported feelings of happiness with age. One possible explanation is that the remaining significant cohort effect is attributable to the changes in societal norms and attitudes toward aging. Drawing from the aging and modernization hypothesis, there exists a negative association between modernization and the status of the aged, one that corresponds with increased negative stereotypes toward the aged (Nelson 2005). The society-wide negative perceptions toward aging would inevitably affect how elders perceive themselves and their own aging. However, previous studies show that the whole process of age stereotyping is formed in childhood and reinforced in adulthood (Levy and Banaji 2002). Therefore, elders' current perceptions toward themselves are a cumulative reflection of socializing processes of the past. The cohort of the elders who were born in earlier historical time,

presumably were raised in societies where negative perceptions toward elders are not pervasive.

In addition to the cohort effects, the utilization of growth curve models also enabled me to delineate individuals' changes in perceptions over time from the structural changes in the population. With regard to the age effect, I found that elders feel increasingly less happy and less useful with age with the progress of their own biological age, and the age effect remains significant after controlling for elders' socioeconomic status, demographic characteristics and a list of time-varying events. This finding coincides with the cross-national evidences on the positive correlation between elders' chronological age and their levels of dis-satisfactions toward their own aging. For example, the work of Kleinspehn-Ammerlahn et al. (2008) found that elders' satisfaction with age decreases with their biological age, based on a four-wave longitudinal data from the Berlin Aging Study. The positive correlation between biological age and aging dissatisfaction is also found in Korean society, where the work of Jang et al. (2004) found that biological age is negatively correlated with individuals' positive perceptions toward own aging. However, these two studies do not explicitly control for potential confounding effects of cohort differences. The current study thus further substantiates the existing literature on developmental psychology in the sense that individual's increased negative perceptions toward aging can be attributed to elders' biological frailty, their disengagement from social roles as well as their gradual internalization of societal-wide aging stereotypes — all of which work independently from changing cohort composition.

Along with modernization, another ongoing trend in contemporary Chinese society is the elevated social inequality. This study also examined intra-cohort variations in elders' perceptions toward aging, which are captured by education and occupation differences on elder's growth trajectories on perceptions toward aging. The intra-cohort variations reveal a complex picture, because both levels and growth rates on elders' perceptions toward aging vary depending on elders' social strata. In particular, I find that within each cohort, elders who held managerial or governmental occupations before age 60 reported having the lowest negative perceptions toward aging, indicated by feeling the happiest with their age and feeling the least useless with their age at the beginning of the survey. However, the direction of change does not necessarily favor the high social status they hold in their earlier lives. As shown in Figure 2-3, with the progression of time, the elders who held managerial or governmental as a main occupation had the sharpest decline in their age satisfaction, compared with elders who held other occupations. There are two possible explanations. First, elders who held more prestigious jobs may face greater role ambiguity after retirement, which further translates into decreased satisfaction with age. Second, those who had a relatively less prestigious occupation, such as peasants and industrial workers may face greater positive selection in survival. Therefore, those who were able to live longer may view their aging process more positively.

As a closing remark, several limitations need to be acknowledged. To begin with, perceptions toward aging are multifaceted. Previous study suggests that perceptions toward aging can at least be further categorized as three sub-constructs, felt age, attitude toward own aging, and awareness of age-related changes (Brothers et al. 2015). The current study

does not explore individuals' felt age, which is often measured as whether or not individuals feel younger (or older) than their actual age, as well as individuals' awareness of age-related changes, which is measured as a list of statements that reflect perceived age-related changes on five behavioral domains (Brothers et al. 2015). Some existing studies have found temporal variations in people's subjective aging (Uotinen et al. 2006; Westerhof and Barrett 2005). Therefore, it remains to be seen if the same pattern on the measurement of felt age and awareness of age could be observed in the context of China. Second, the current analysis does not explicitly take into consideration the period effect, which raises two considerations. For one thing, age and period are essentially the same in the growth curve models. For another, the current study is conducted in a comparatively short period of time. The present study can be further advanced by taking into account the full age, period and cohort effect. Third, the current study does not explore other relevant markers of status in contemporary Chinese society, such as gender and places of residence. Indeed, the complexities of gender and rural-urban difference on the elders' perceptions toward aging deserves a separate discussion. For example, a further examination of the data revealed that among the elders who were interviewed at least twice in the survey, over thirty percent of them have switched their place of residence from a rural area to urban area. However, this study does not intend to become an exhaustive search for potential explanatory factors for between-individual differences, thus the place of residence is only included as a time-varying control variable. Future studies could seek to explore how changing residence (and the duration of change) would impact elders' perceptions of aging.

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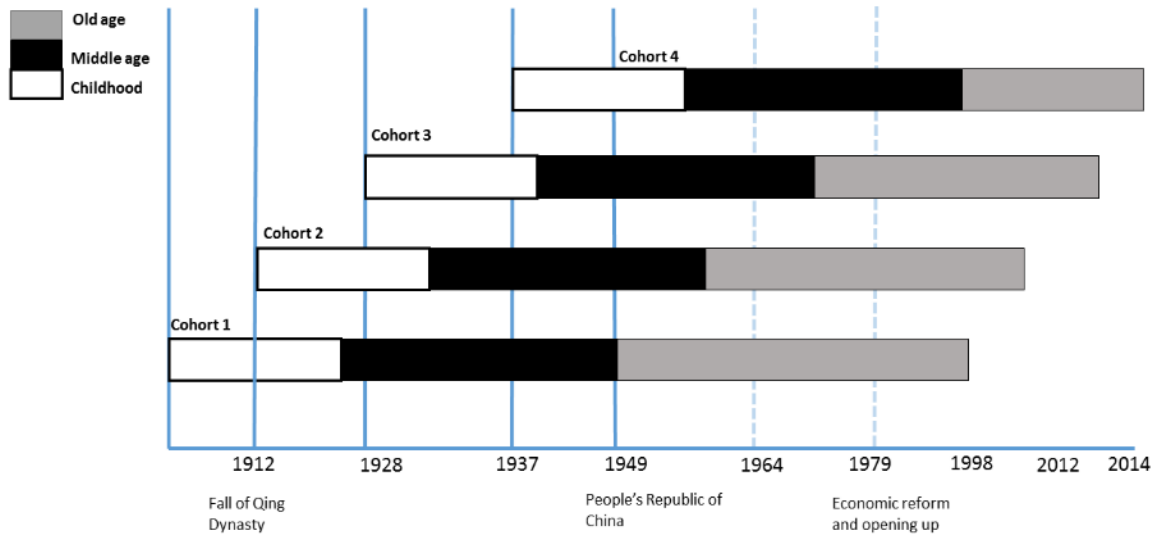
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Appendix A: An Illustration of Cohort Division



CHAPTER 3

Transition Pathways in Education, Work, and Home-Leaving among Rural Gansu Youth of China

Abstract

This chapter has two objectives. The first is to describe transition pathways in education, work and home-leaving among a group of rural youth who live in one of the most impoverished provinces in China. The second objective is to provide a critical documentation on the roles that structural and agentic resources play in shaping rural youth's pathways into adulthood. Data came from wave 1 (2000) and wave 4 (2009) Gansu Survey of Children and Family (GSCF). This study uses latent class analysis (LCA) to describe youth' transition pathways from age 12-19. The analysis revealed six latent pathways: (1) Vocational school attenders (2) Local high school attenders (3) Move for high school (4) Move to work (5) Late middle school finishers + move for work (6) Late middle school finishers +local high school. Three sets of variables distinguished between these groups: family, community, as well as youth's agentic resources.

1. Introduction

Children living in poverty face limited opportunities in many spheres of life. It is well established that childhood poverty is closely linked with many negative consequences in life, such as the risk of dropping out school early, deviant behaviors, poor health outcomes, low intellectual development, and adverse labor market outcomes (Chetty, Hendren, and Katz 2016; Guo and Harris 2012; Lichter 1997; Schafter, Ferraro, and Mustillo 2015). In sum, childhood poverty seems to be one of the critical barriers to upward mobility.

Despite the well-documented disadvantages of children who grow up in poverty, the precise pathways in which childhood poverty leads to disadvantages in multiple life-domains during adulthood are less clear. To better understand how people ended up in different socioeconomic statuses later in life, one needs to have a better understanding of how the lives of poor children unfold over time, and to what extent structural and agentic resources play a role in shaping poor youth's transition pathways. From a policy-making perspective, understanding poor children's experiences transitioning into adulthood can enable design and implementation of timely policy interventions that break the intergenerational poverty cycles.

With regard to the status attainment processes within an individual's lifetime, the life course framework has much to offer. Both educational and occupational attainment can be thought of as movements through an ordered sequence of transitions from lower to higher positions in educational categories or occupational categories (Mare 1981; Mortimer, Vuolo, and Wakefield 2008; Robert, Sheridan, and Hauser 2002). Theoretical

and methodological development on the subject matter reveal that one needs to go beyond looking at life changes in a single life domain (Amato et al. 2008; Macmillan and Eliason 2003; Osgood et al. 2005). After all, decisions made in one life domain may well influence trajectories in other life domains. Therefore, a holistic approach that considers youth's transition experiences in multiple domains of life is necessary.

Using 2000 and 2009 data from the Gansu Survey of Children and Family (GSCF), this chapter has two objectives. The first is to describe diverse pathways into adulthood among a group of rural youth who live in one of the most impoverished provinces in China. I draw from the multi-dimensional life course framework (Elder, 1998) and examine how transitions in education, work, and home-leaving intersected and formed life pathways from adolescence to early adulthood (ages 12–19). Based on the retrospective life history data, I describe youth's move into and out of different educational institutions, their entry into and exit from the labor force, as well as their home-leaving behaviors along the way. I apply Latent Class Analysis (LCA) to identify six sub-groups of youth who exhibit distinctive transition pathways into adulthood.

The second objective is to provide critical documentation on the roles that structural and agentic resources play in shaping rural youth's pathways into adulthood. While existing life course studies predominantly focus on the structural constraints/opportunities in shaping youth's transition pathways, youth do not passively adapt to their life circumstances (Elder 1994). Within the confinement of structural resources, youth's agentic orientations can serve as important psychological resources that buffer against economic hardships (Hitlin and Johnson 2015). I use multinomial analysis to examine the

individual, family, and community resources that are predictive of youth's transition pathways. In so doing, I pay particular attention to the joint contributions of both structural and agentic resources that shape rural youth's transition pathways.

This study contributes to the existing literature in three ways. First, the study provides additional evidence on transitions into adulthood in a rural context. Rural youth, along with other socioeconomically disadvantaged youth, are “the forgotten half” in the transition into adulthood literatures (DeLuca, Clampet-Lundquist, and Edin 2016). More often than not, rural youth appear to be studied as a homogenous group when it comes to nationwide comparisons. Doing so, however, masks the heterogeneous transitions experienced by rural youth. In applying the LCA model, this study reveals that there nevertheless exist large variations among rural youth in their transition experiences.

Second, this study takes a detailed look at youth's movements through different educational levels, including middle, high, and vocational schools. Most of the existing research that examines multi-dimensional transition pathways treats educational transition as a binary status, that is, modeling one's school experience as either finishing the highest schooling or not at any given age. However, for economically disadvantaged youth, their pursuit of formal education is more complex. Considering that educational transition is a key component for youth's trajectories into adulthood in many less developed areas (Hannum and Liu 2005; Yeung and Hu 2013), this study provides rich information on the ways that rural youth navigate their life pathways by going through different educational institutions.

Third, this study also provides a portrait of youth's transition pathways in a non-western context. It is widely acknowledged that youth's transition experiences are contingent on specific historical and geographic contexts. However, most of the present studies focus on youth's experiences in a European or U.S. context. Lacking relevant studies on other societal contexts yield limited understandings of how some fundamental life course concepts operate in other cultural contexts. For example, youth's agentic orientations are found to be an important factor in shaping their transition pathways in Europe and the U.S., where the individualistic culture is thought to be paramount (Hitlin and Johnson 2015; Schoon and Lyons-Amos 2017). However, the concept of individual agency has received much less attention among the studies that focus on the East Asian societies. This is partly due to the concern that the collective, interdependent culture in East Asia societies may result in youth's own agentic orientations playing a limited role in shaping their future (Hitlin and Kwon 2016). From this perspective, China provides an informative case study on how structural and agentic resources shape youth's transition pathways. The youth in contemporary China have more freedom in deciding their education and careers compared with previous generations; but they nevertheless are still influenced by the residues of a collectivist culture, above and beyond the structural limitations.

The rest of the chapter is organized as follows. The next section discusses the theoretical considerations. The third section introduces the context of rural China and the present study, the fourth section deals with method, data and measurement. The fifth

section provides empirical results, and the last section discusses and concludes the research.

2. Theoretical Considerations

2.1 Transition into Adulthood: Markers, Timing, and Pathways

The time between adolescence and adulthood is a demographically dense period (Rindfuss 1991). Most of the major life events, such as finishing school, leaving home, starting a full-time job, getting married, and having kids occur during young adulthood. These life events are not only demographically meaningful, but also are considered as important markers toward adulthood (Macmillan and Cooper 2005). Previous studies have found that the timing and the sequencing in which events take place matter, as they are closely related to many later life outcomes, including health, labor market outcomes, and psychological well-being (Amato and Kane 2011; Barban 2013; Mcvicar and Anyadike-danes 2002; Shanahan 2000)

With the turn of the twenty-first century, youth's passages toward adulthood have become increasingly diversified. Youth from middle-class families, for example, experience prolonged transition times. Compared with the previous generations, it takes a much longer time for today's youth to completely finish education, secure a full-time job, become financially independent, get married, or/and have kids (Amato and Kane 2011; Mortimer et al. 2016). A major reason for the prolonged transition time can be attributed to youth's increased investment in education in order to be better prepared for the

competitive labor market. Other factors, such as high housing prices, also prevent youth from becoming residentially independent (Kendig, Mattingly, and Bianchi 2014). As a result, a new developmental period—emerging adulthood—is thought to take place between adolescence and adulthood (Arnett 2000).

2.2 Structural and Agentic Resources that Shape Transition Pathways

Some scholars question the emerging adulthood narrative, however, arguing that the extended timing in transition into adulthood may only apply to middle-class youth. Poor youth instead may experience an expedited transition (DeLuca et al. 2016; Kendig et al. 2014). Families' lack of financial resources may push youth to leave school early and start full-time jobs to alleviate family financial stress (Kendig et al. 2014). Family economic disadvantages may also result in youth starting family formation, such as entering marriage and having kids, at younger ages; this is especially true for rural girls (McLaughlin, Lichter, and Johnston 1993). Besides achieving transition markers at early ages, poor youth's quick progression into adulthood can also be reflected in other aspects, such as undertaking adult-like responsibilities within families, including providing child care to their siblings (Elder, 1974). Psychologically, families' economic stresses may further translate into youth's mental stresses, fostering youth to be mentally prepared for undertaking adulthood roles at early ages in life (Burton 2007; Shanahan 2009).

Besides family resources, community resources are also found to be critical in affecting youth's transition experiences. Local educational resources, such as the availability of higher educational institutions, are directly related with youth's educational

transition trajectories (Gregory and Huang 2013). Other community contexts, such as local job opportunities, are also closely related to successful school-to-work transitions. For example, Chetty et al. (2016) found that the duration that youth are exposed to poor neighborhoods is critical to many later life outcomes, including income, college attendance and quality, and marriage and fertility outcomes (Chetty et al. 2016). For rural youth in particular, their transitions into adulthood are often plagued by the lack of local educational and employment opportunities. As such, their efforts in achieving upward mobility are often accompanied by out-migration intentions (Egondi et al. 2013; Hektner 1994).

Besides family and community, another source of structural inequality is gender. Although gender is often measured as an individual attribute, it reflects how resources are allocated on the basis of individuals' sex category (Moen 2001). In the context of transition into adulthood, research consistently documents that family resources are often distributed on the basis of gender (e.g., Hannum 2016). Along with gendered resource allocation patterns, parents also form different expectations of children's future achievements for girls and boys, which may further influence how children form career and educational aspirations for themselves (Correll 2012). Corresponding with education and career transitions, other transition experiences, such as home-leaving intentions may be also stratified by gender. For example, Chiang et al. (2016) found that girls and boys in rural Gansu, China do not exhibit significant differences in their propensity to migrate, but they do differ in their reasons to move. Taking all these together, males and females may be stratified into different pathways into adulthood (Oesterle et al. 2011).

However, people do not passively adapt to their life circumstances. Within the constraints of economic, social, cultural, and historical structures, people tend to take action in constructing their life pathways (Bandura 1982). The early Wisconsin status attainment model reveals that young people's plans for the future are a conduit to transmit structural advantages/disadvantages to attainment (Sewell et al. 1969). Recent scholarship has paid increased attention to the mediating role that youth's agentic orientations play in affecting the transition into adulthood. Many psychological concepts were reintroduced as concepts relevant to human agency, such as self-efficacy, mastery, sense of control, planfulness and competences (Mirowsky and Ross 2007; Scholz et al. 2002). Studies suggest that forward-looking, optimistic orientations can be interpreted as a type of psychological resource that children can draw upon when facing life challenges (Mirowsky and Ross 2007; Mortimer et al. 2014).

3. The Context of Rural China and the Present Study

Youth's transition pathways need to be understood within a society's socioeconomic, demographic, cultural and policy contexts. To situate the rural Gansu youth's transition into adulthood experiences into a broader context in China, this section discusses social changes that have occurred in China over the past half century, with a particular focus on the implications for rural children's life experiences.

The early 1980s saw a set of social, economic, and institutional changes that impacted the lives of everyone in China. To begin, the market reform that began in 1978

led to a great improvement of people's living standards. The National Bureau of Statistics of China (2012) shows that the gross domestic product (GDP) per capita rose from \$218 purchasing power parity for dollars in 1978 to \$11,055 by 2009. Measured by the World Bank (2009) standard, the poverty rate in rural China dropped drastically from 65% in 1981 to only 10 % in 2004, with over half a billion people moving out of poverty. The improved living standard implies that children who were born after the economic reform receive better nutrition and that their parents have more resources to invest in their education (Hannum and Park 2007a).

Although the economic reform greatly improved the living standards of Chinese families, the benefits of the reform are not equally distributed across children of different social groups. The rapid economic development also brought elevated income inequality (Xie and Zhou 2014). In particular, the rural-urban divide remains one of the most representative phenomena behind inequalities (Hauser and Xie 2005; Xie and Hannum 1996). As a result, children in rural areas have less access to all types of resources that are essential for upward mobility, including parental care and access to quality schooling (Hannum 2005).

Corresponding with the market reform in the late 1970s, the educational system in China also went through a set of reforms. A fiscal decentralization of the educational system took place in the 1980s, with the goal of mobilizing new resources for education (Hannum and Park 2007b). However, the decentralization also elevated regional inequality in education. The differentials of government revenues translated into quantity and quality differentials in education across places. Studies since the 1990s in China have documented

substantial enrollment disadvantages of rural youth (Hannum 2016). For example, the proportions of youth ages 10–18 who are in school are 88% for urban boys and 89.4% for urban girls, but 76.6% for rural boys and 74.4% for rural girls (Connelly and Zheng 2007).

It is also necessary to note that another outcome of the economic reform is the liberation of labor markets. Together with the relaxation of the household registration system (the hukou system) since the 1980s, there has been a rapid increase in rural to urban migration (Liang 2016). For contemporary rural youth and young adults, the liberation of the labor markets and the relaxation of the hukou system mean that the barriers to migrate to urban areas are much lower.

3.1 The Present Study

As noted previously, social changes have had profound impacts on rural youth's transition experiences. However, there are limited studies focusing on the transition experiences of youth in China. The relevant topics are scattered in the literatures related to social stratification, child development, education, migration, family formation and labor market in China (Chen 2015; Rozelle et al. 1999; Wu and Treiman 2007; Zhang, Hannum, and Wang 2008). Some review articles have attempted to describe the youth's transition into adulthood experiences in multiple domains in life cross-sectionally, focusing on the changes across birth cohorts (Hannum and Liu 2005; Nelson and Chen 2007; Yeung and Hu 2013; Tian 2016).

There has been so far no in-depth investigation on how rural youth navigate their pathways to adulthood in multiple domains in life. In examining rural youth's transition pathways in the domains of education, work, and home-leaving, I propose two hypotheses:

1. There exist large variations in rural youth's transition pathways. In particular, youth differ in their movement across different educational institutions, the timing to start full-time jobs, and leaving their parental homes.
2. Both youth's structural and agentic resources matter in shaping youth's transition pathways, but the agentic orientations should work independently in affecting transition pathways.

4. Method, Data, and Measurement

4.1 Latent Class Analysis

The complexities and the multi-faceted nature of transition into adulthood suggest it is appropriate to treat youth's transition pathways as latent constructs (Shanahan 2000). For the purpose of this study, I use latent class analysis (LCA) to identify youth's various pathways to adulthood. LCA models the relationships among the observed variables by making assumptions about hidden, latent variables (Collins and Lanza 2013). In the context of this study, youth's transition pathways are viewed as error-free latent constructs which cannot be observed directly but can be modelled by specifying youth's role-adoption statuses in different life domains at each age. LCA is widely used in identifying patterns in

the transition into adulthood literature (Amato et al. 2008; Osgood et al. 2005). When using LCA to classify life course pathways, the results are found to be robust and comparable with other methods, such as sequence analysis (Barban and Billari 2012).

Following Collins and Lanza (2013, p 41), with $c=1,...,C$ as the number of the latent class, γ as the probabilities of individuals falling into each latent class (i.e., membership probability), and ρ as the probabilities of observing each response conditional on the probabilities of membership, the LCA model can be expressed as follows:

$$P(Y = y) = \sum_{c=1}^C \gamma_c \prod_{j=1}^J \prod_{r_j=1}^{R_j} \rho_{j,r_j|c}^{I(y_i=r_j)} \quad [1]$$

where $j=1,2,3$, indicating three observed life domains (education, work and home-leaving). The observed life domains have r_j responses (as is elaborated in the next section, the education domain has four responses, so $r_1=4$, and work and home-leaving each have two responses, therefore $r_2=2$ and $r_3=2$). The variable y is a vector of responses to the J variables. The variable $I(y_i = r_j)$ is an indicator function equal to 1 when the response to variable $j=r_j$ and equal to 0 otherwise. Taking all these together, the probability of observing a particular vector of transition responses (such as finishing middle school at age 15, starting high school at age 16, finishing high school at age 18, and starting to work and leaving home at age 19) is a function of the probabilities of membership in each latent pathway, and the probabilities of observing each response are conditional on the latent pathway membership.

To fit a latent class model, one needs to estimate two sets of parameters: latent class prevalence (γ) and item-response probabilities (ρ). The parameters are estimated using

maximum likelihood estimation. The analysis is mainly conducted using *STATA LCA plugin*, developed by the Methodological Center at The Pennsylvania State University (Lanza et al. 2018). Supplemental model-fit tests are conducted using *Mplus 8.0* (Muthén and Muthén 2017).

4.2 Research Site and Data

This study uses data from the Gansu Survey of Children and Families (GSCF), a longitudinal study that aims to document and examine the influence of poverty on children's education, health, and labor market performances in Gansu Province, China (Hannum and Zhang 2012). Located in the western inland, Gansu Province is among the least economically developed provinces in China. According to the 2010 population census, 65% of the long-term residents live in rural areas (Statistics Bureau of China 2012). A report issued by United Nations Development Program showed that the Human Development Index of Gansu is 0.63, ranking it the fourth-to-last of all 31 provinces in China (UNDP 2013).

The GSCF survey adopted the multi-stage sampling procedure. Thus, the survey is representative of children in rural Gansu (Hannum and Adams 2008). The first wave was conducted in 2000, during which the research team interviewed 2,000 children aged 9–12 years old from 100 villages in rural Gansu. Questionnaires tapped children's school experiences, cognitive and non-cognitive performances, achievement-related attitudes and plans for the future (Hannum and Zhang 2012). To better capture these children's living environments in multiple aspects, separate surveys were conducted with the targeted children's parents, teachers, school principals, and village officers. The second and third

waves were conducted in 2004 and 2007, during which time the children and the families from the original sample were revisited. The fourth wave was conducted in 2009, when the targeted children reached early adulthood (ages 17–21).

The analytical sample used for this study includes children who were interviewed in both 2000 (Wave 1) and 2009 (Wave 4). Specifically, children's school, work and migration histories are derived from a series of retrospective screening questionnaires in the 2009 survey. Children's family socioeconomic statuses (SES), school experiences, cognitive and non-cognitive skills, educational aspirations, and future orientations are derived from the questionnaires from the 2000 survey.

Attrition is low in GSCF. Among all the children who were interviewed in 2000, only 280 were lost to follow up in the 2009 survey. The sample used for this study is further restricted to those youth who have complete information on the starting and ending dates of school, work, and migration histories in the first wave. The analysis is further limited to the respondents who were at least 19 years old when interviewed in 2009. This restriction maximizes the sample size and also ensures that a sufficient period of time in transition is covered. As a result, an additional 193 youth are excluded from the analysis, leaving a final analytical sample of 1,470 individuals.

4.3 Measurement

Transition Pathways

Education: The 2009 survey asked youth "Have you ever attended middle/high school/vocational high school/technique school /college?" If youth responded yes, the questions then asked the start date (month and year) as well as the length of stay in that

specific educational level. Based on this information, each youth was characterized into one of the following four mutually exclusive statuses: Not in school=0, Middle school=1, High school=2, Vocational school (*Gaozhi* 高职 or *Zhongzhuan* 中专) =3. A few individuals ($N=65$) reported that they attended 3-year technique school (*Dazhuan* 大专) by age 19. To avoid model sparseness, the 3-year technique school attendants are grouped into the vocational school category.

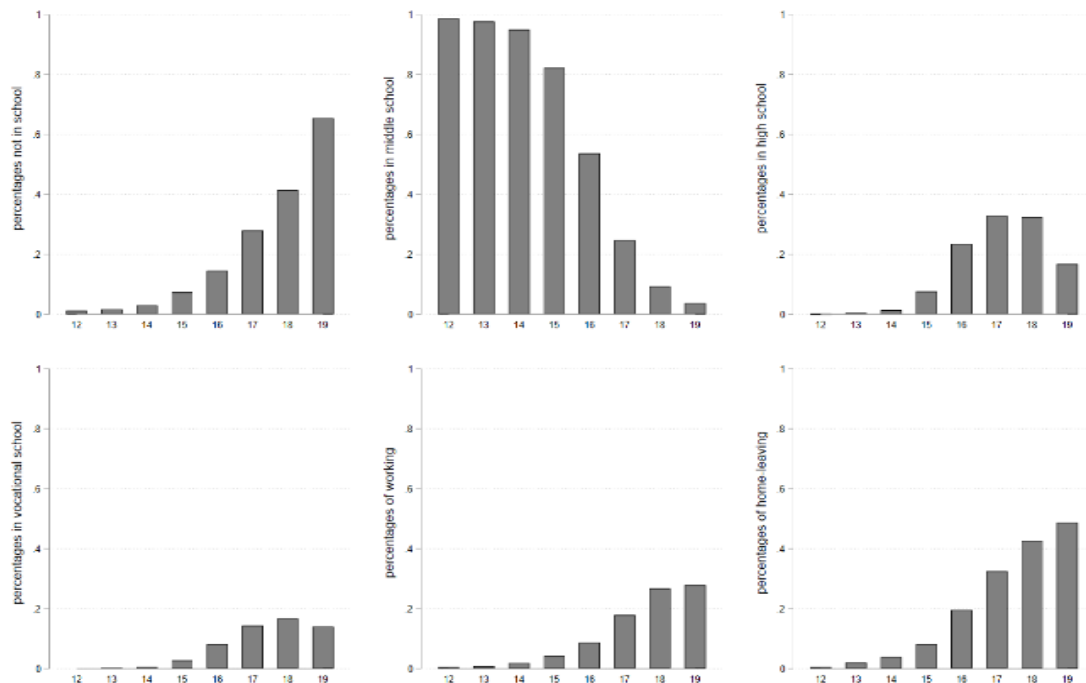
Work: The 2009 survey asked youth “Have you ever undertook a full-time job?” If the answer was yes, the survey then asked the first and the most recent full-time jobs the youth took, as well as the start and end dates of each job. From each age from 12 to 19, youth are characterized into one of the two statuses: *Work full time* =1, otherwise=0.

Home-leaving: The 2009 survey also collected information on youth’s residential changes. Specifically, youth were asked “Have you ever lived somewhere else outside of your family home for more than three months?” If the answer was yes, the survey then asked how many times youth had ever lived outside of the family home, as well as the start and end dates (month and year) of each move. For the purpose of this study, *Home-leaving* = 1 if an individual lived somewhere else other than the family home for more than three months in that year, otherwise=0. An illustration of the coding scheme of a hypothetical individual’s life histories in these three life domains is presented at appendix B.

Figure 3-1 further presents the distributions of education, work and home-leaving statuses at each age. It is evident that as youth progress to adulthood, they start to exit from the formal educational system. By the time when the sampled youth reached age 19, more than 60% of them were not in school. In terms of the attendance at each educational level,

the attendance of middle school was near universal between ages 12 and 14, and the percentages dropped slightly at 15, when around 80% of youth remained in middle school. The percentages of youth who were in high school increased from under 5% at age 15 to over 30% at ages 17 and 18, then further decreased to under 20% at age 19. Compared to high school enrollment, youth's enrollment in vocational school was low. For example, less than 20% of youth were enrolled in vocational school at age 18. The percentages of youth who reported working full time increased from less than 10% at age 15 to around 30% by age 19. Another notable feature of the sampled youth is the high prevalence of home-leaving at early ages. For example, at age 16, around 20% of youth reported that they lived somewhere else other than their family homes, by the time they reached to age 19, roughly half of them reported that they had lived somewhere else.

Figure 3-1. Distributions on School, Work, And Home-Leaving Status by Age



Structural and Agentic Resources

Youth's agentic orientation

I capture youth's agentic orientations from two dimensions: (1) their orientations toward the future, and (2) their assessments of their own competencies at the present. To begin, *Educational aspiration* is captured using three dummy variables indicating the highest educational level the youth aspire to achieve: high school, vocational school, and college and above. The reference group is aspiring to less than a high school education. *Future orientation* is a scale score that captures youth's responses on six survey items that related to their perceptions toward the future ($\alpha=0.47$). These statements include "I have confidence in the future", "I can live better than most people in the future", "I am mentally prepared for the future", "I won't feel very happy in my future", "I won't get what I truly want in the future", "My future will be better than the present" and "Responses range from 1=totally disagree, to 4=fully agree. Negatively worded items are reverse coded. The response scores are summed and standardized to create a scale score.

Besides future orientations, youth's assessments of their own competencies at present are also an important dimension of agentic orientations (Johnson and Hitlin 2017). To this end, I include *Self-esteem* as a measure of youth's assessment of their own capacities. Following Glewwe et al. (2013), *Self-esteem* is a scale of 12 statements that measures youth's self-esteem at the first wave. An exploratory factor analysis reveals that the internal consistency of these 12 statements is high ($\alpha=0.60$) and therefore can be represented with a single factor. The responses scores are summed and standardized to

create a scale score. The complete indicators of the *Future orientation* and *Self-esteem* items are provided in Appendix C.

Other individual characteristics

A general cognitive ability test was conducted in the 2000 wave that aimed to test children's common knowledge, abstract reasoning and math skills (Leight, Glewwe, and Park 2015). *Cognitive skill* is included as a control. A higher value indicates greater cognitive skills. *Good health* is an assessment of self-evaluated health conditions at wave 1. A higher value indicates youth reported better self-evaluated health. Youth's gender and age at 2009 are also included in the model.

Family resources

Family resources are captured from two perspectives: family SES and children-parent relationships. In particular, family SES is captured by two variables. *Family wealth* is measured by a summation of the values of households' large assets, including dwellings, automobiles, tractors, and TVs, washing machines, and furniture, to name a few. Compared with annual income, which is subject to variations, family wealth is a better measure of households' economic well-being in rural China. *Parental education* measures the highest educational level ever attained by either parent. It has four values: 1 = Illiterate or semi-illiterate, 2 = Primary school 3 = Middle school, and 4 = High school and above.

Two additional variables are included to measure youth's perceptions of parental warmth, another important factor related to transition pathways identified by previous literature. Specifically, *Close to mother/father* is a dichotomous measure equal to 1 if youth responded that they feel close to at least one parent, and 0 otherwise.

Local opportunity structures

To capture local structural opportunities, four variables are derived from the village questionnaires of the 2000 survey. *Near to middle school* equals 1 if the village officers reported that there was a middle school at or near to the village, 0 otherwise; *Near high school* is coded 1 if the village officers stated that there was a high school at or near to the village, 0 otherwise; *Near vocational school* is coded 1 if there is a vocational school near to the village, 0 otherwise. *Non-agricultural employment* is the reported percentage of households with family members working outside of the agricultural sector in a village.

Table 3-1 presents the descriptive statistics of covariates measured at wave 1. It is evident that a predominant share of sampled youth (49%) aspired to go to college or higher, despite the fact that very few of them made it to college by 2009. In terms of family resources, the average parental educational level is close to middle school. A large share of youth reported that they feel close to their mother (70%) and/or father (69%). In terms of village-level characteristics, the percentage of households who have family members working outside of the agricultural sector is small (5%).

Table 3-1. Descriptive Statistics at Wave 1 (2000)

	Mean	SD
<i>Agentic orientations</i>		
Educational aspiration: High school	0.18	0.38
Educational aspiration: Vocational school	0.19	0.39
Educational aspiration: College or higher	0.49	0.50
Future orientation	0.00	1.00
Self-esteem	0.00	1.00
<i>Individuals' other characteristics</i>		
Age at 2009 wave	20.33	1.11
Female	0.45	0.50
Good health	0.76	0.43
Cognitive skills	18.16	9.86
<i>Family characteristics</i>		
Household wealth (log transformed)	9.45	0.99
Parental education	2.62	1.03
Close to mom	0.70	0.46
Close to dad	0.69	0.46
<i>Village characteristics</i>		
Non-agricultural employment	0.05	0.12
Near high school	0.44	0.50
Near vocational school	0.33	0.61
Near middle school	0.80	0.40

5. Results

5.1 Identification of Common Patterns of Pathways to Adulthood

To identify the optimal numbers of latent pathways to adulthood among GSCF respondents, I compared model-fit statistics for a series of LCA models, ranging from 2 to 8 latent classes. The model-fit statistics are presented in Table 3-2 and include Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), BIC with adjustment of sample size (Adj-BIC), Entropy, and Lo-Mendell-Rubin (LMR) test (Lo, Mendell, and Rubin 2001). Although AIC, BIC, and Adj-BIC values continue to decline with the

increased number of latent pathways, the LMR test results show that the 7-latent-pathway model is not a significant improvement over 6-latent-pathway model. Based on the considerations of model parsimony and LMR test results, I choose the 6-latent-class model as the final model.

Table 3-2. Model-Fit Statistics

# of latent pathways	AIC	BIC	Adj-BIC	Entropy	LMR <i>p</i> -value
2	29381.89	29801.48	29550.52	0.91	0.00
3	27543.13	28175.17	27797.14	0.93	0.00
4	26425.69	27270.17	26765.07	0.93	0.00
5	25559.40	26616.33	25984.17	0.93	0.00
6	24996.42	26265.80	25506.57	0.94	0.00
7	24487.54	25969.37	25083.06	0.94	0.27
8	24142.29	25836.57	24823.19	0.94	0.00

AIC = Akaike information criterion; BIC = Bayesian information criterion;
Adj-BIC = Sample-size adjusted BIC, LMR = Lo-Mendell- Rubin test.
The LMR test is conducted using Mplus.

5.2 Six pathways to adulthood

The final LCA model with six latent pathways generates in total $6 \times 8 \times 8 = 384$ item-response probabilities (ρ). For the ease of presenting the results, the estimated probabilities of each latent pathway is graphed by age (Figure 3-2). This section also reports the prevalence of each latent pathway (γ).

The first pathway that emerges reflects youth's high chance of attending vocational school after middle school (the estimated probability is 0.41 at age 16 and 0.81 at age 17).

Therefore, youth who fall into the first pathway are characterized as vocational school attenders. Corresponding with their vocational school attendance, they also have high probabilities of moving outside of the family home at the same time. For example, the estimated probability of home-leaving is 0.25 at age 15 and 0.44 at age 16. The first pathway is the best fit for 16.7% of the total sampled youth.

Youth who fall into the second pathway are characterized as local high school attenders. Compared with the first pathway, it is apparent that these youth have higher probabilities of attending regular high school (for example, the probability of attending high school at age 16 is 0.95). Moreover, these youth also have lower probabilities of leaving home, indicating that they received high school education at the local level. Around 18% of the youth in the sample fall into this pathway.

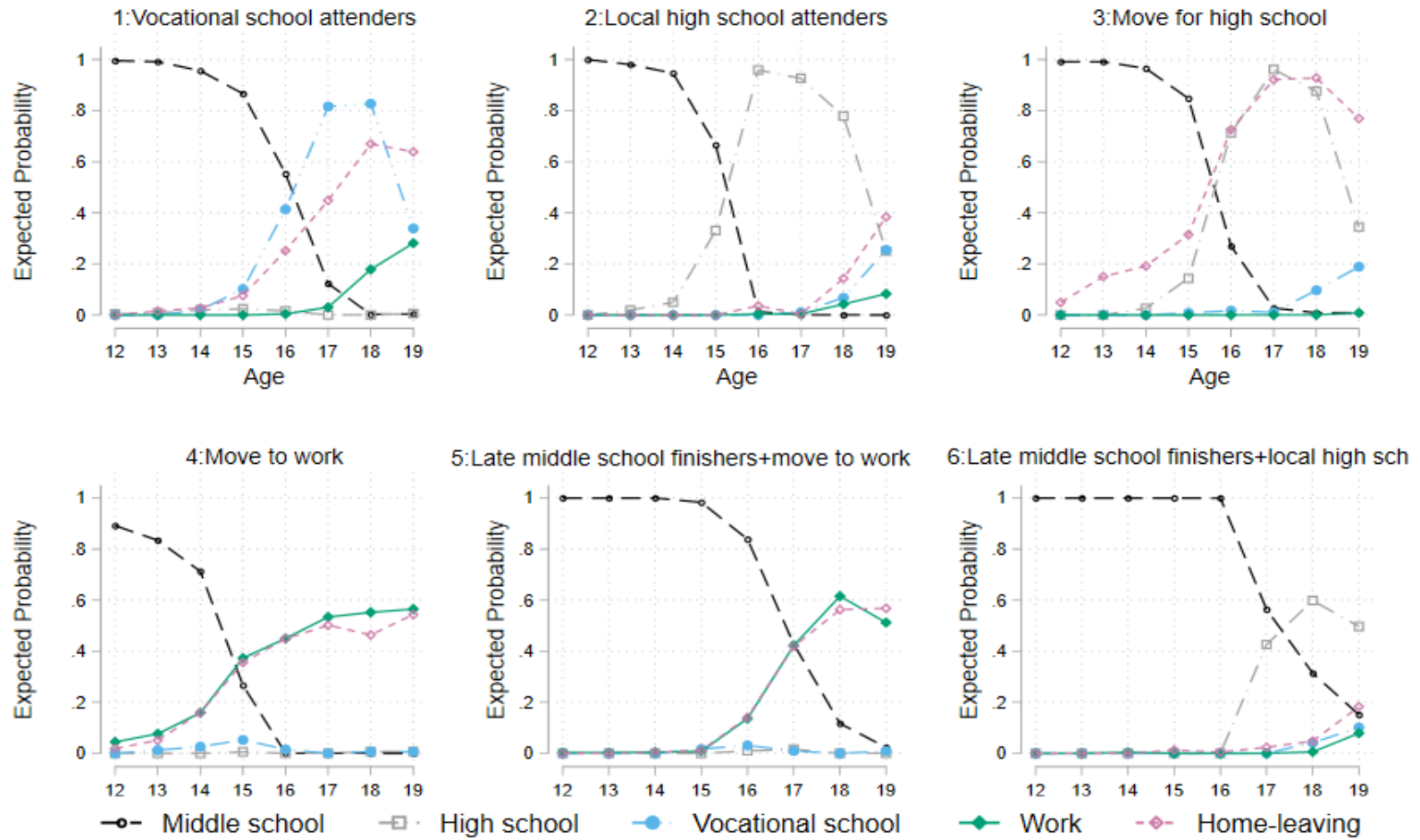
For youth falling into the third pathway, home-leaving starts as early as age 13. By age 15, the probability of leaving home is 0.31, and it keeps increasing until age 18, when the chance of leaving the family home is 0.92. Another salient feature of the third pathway is that the probabilities of attending high school overlap with the probabilities of leaving home, suggesting that these youth attend high school somewhere other than local areas. Around 8.3% of the youth in the sample fall into this pathway.

For the fourth pathway, it is apparent that these youth have a high probability of leaving home for work after middle school. For example, at age 16, the probabilities of home-leaving and work are both 0.45. Meanwhile, these youth have less chance of continuing any form of formal education after middle school (both high school and vocational school included). This group of youth comprises 10.8% of the total sample.

The fifth pathway that emerges shows that youth have a delayed transition out of middle school. For example, by age 17, the probability of remaining in middle school is 0.42. Meanwhile, the probability of work and home-leaving start to increase at age 17, indicating a transition from middle school directly to work. The fifth pathway has the largest prevalence among the sample: 27.2% of youth in the sample fall into this pathway.

Similar to the fifth pathway, youth who fall into the sixth pathway also delay their transition from middle school. However, unlike the fifth pathway, this group of youth have higher probability of attending high school after middle school. For example, the estimated probability of attending high school at age 16 is 0.6. Meanwhile, these youth also have low probability of leaving home, indicating that the high school education is received at the local level. The youth who fall into the sixth pathway comprises 18.9% of the total sample.

Figure 3-2. Six Transition Pathways



5.3 Structural and Agentic Resources Related with Transition Pathways

I conducted multinomial logistic regression to assess the associations between a set of resource factors and youth's transition pathways. Table 3-3 reports the estimated odds ratios of the multinomial regression model. The reference group is local high school attenders. The last column reports the *p*-values of the log likelihood test for the overall effects of each covariate.

From Table 3 it can be seen that educational aspiration plays a significant role in predicting transition pathways. In particular, youth who have higher educational aspirations (indicated as aspiring to vocational school or college), have higher odds of falling into the second pathway, that is, attending high school after middle school. After taking into consideration youth's educational aspirations, the other two indicators of agentic resources, future orientations and self-esteem, do not significantly relate with youth's pathways into adulthood.

Besides agentic resources, other individual attributes, including gender, age, and cognitive skills, are also significantly associated with transition pathways. In particular, girls have lower odds of falling into the reference pathway, i.e. attending local high school after middle school. Older youth have higher odds of falling into the fourth (move to work), the fifth (late middle school attenders+ move to work) and the sixth (late middle school finishers+ local school attenders) pathway. Youth's cognitive skills are also significantly associated with their transition pathways. Specifically, having a higher cognitive test score is associated with higher odds of falling into the reference pathway, compared with the other five pathways.

In terms of family characteristics, it is not surprising that family SES is significantly related with youth's transition pathways. In particular, higher family wealth is related with higher odds of being in the first (vocational school attenders) and the third (move for high school) pathway, relative to the reference pathway. On the other hand, higher family wealth is related to lower odds

of being in the fourth (move for work), the fifth (late middle school finishers+ move for work), and the sixth (late middle school finishers + local high school attenders) pathway. Meanwhile, youth's feelings of closeness to their mothers or fathers do not show significant associations with transition pathways.

For village-level characteristics, close to vocational school is statistically associated with youth's odds of being in the vocational school attender pathway (OR= 1.02). However, other village-level characteristics do not significantly associate with youth's transition pathways.

Table 3-3. Multinomial Model Predicting Latent Pathway Membership (ref: local high school attenders)

	Vocational School Attendees	Move for high school	Move for work	Late middle school finishers+ Move for work	Late middle school finishers + Local high school attendee	<i>P-value</i> ¹
<i>Agentic orientations</i>						
Educational aspiration: High school	0.69	0.77	0.60	0.78	0.72	0.79
Educational aspiration: Vocational school	0.53	0.52	0.36	0.38	0.50	0.02
Educational aspiration: College	0.37	0.69	0.30	0.28	0.41	0.00
Future orientation	1.04	1.21	1.08	0.98	0.91	0.22
Self-esteem	1.01	0.99	0.97	1.00	1.08	0.92
<i>Individuals' other attributes</i>						
Age at 2009 wave	0.94	0.76	1.54	1.26	1.71	0.00
Female	1.67	1.30	1.67	1.75	1.43	0.01
Good health	0.80	0.82	0.77	0.88	0.84	0.84
Cognitive skills	0.96	0.99	0.94	0.95	0.94	0.00
<i>Family Characteristics</i>						
Household wealth (log transformed)	1.17	1.16	0.73	0.84	0.92	0.00
Parental education	0.81	1.02	0.64	0.63	0.80	0.00
Close to mom	0.60	0.91	0.61	0.62	0.73	0.07
Close to dad	1.15	0.94	0.89	0.98	1.12	0.81
<i>Village characteristics</i>						
Non-ag employment	0.99	0.11	0.69	1.08	0.72	0.36
Near high school	0.88	1.02	1.12	1.01	0.93	0.87
Near vocational school	1.02	0.62	1.00	0.84	0.77	0.04
Near middle school	0.86	0.91	0.95	1.17	1.30	0.38

Note: loglikelihood=-11914.65; The model is adjusted for sampling clusters at village level

¹p-value reflects 4 degrees of freedom test of overall relation between covariates and latent pathway membership

6. Discussion and Conclusion

This study examines variations of transition pathways among a group of rural youth in Gansu Province, China. The first objective of this paper is to investigate whether the distinctive patterns of transition pathways can be empirically identified. Using latent class analysis, I identified six distinctive transition pathways.

The LCA results show that the most common pathway is the fifth pathway, i.e., late middle school finishers + move to work (27.2%), followed by the sixth pathway, late middle school finishers + local high school attenders (18.9%). Together over 40% of the rural youth fall into these two pathways. A shared characteristic between these two pathways is that the youth finish middle school at later ages. For example, for youth in the fifth pathway, it is predicted that they still have a 40% chance of remaining in middle school by age 17; the corresponding probability is greater than 50% for pathway six. It is, however, not surprising that a large share of rural youth finish middle school late. Previous studies have shown that poor households may decide to enroll their children in school at later ages in order to accumulate sufficient economic resources to pay for the cost of schooling (Nonoyama-Tarumi, Loazia, and Engle 2016). Moreover, youth who delayed entry into formal schooling are found to be more likely to experience grade retention, thus leading to a prolonged time for completing school (Chen 2015).

By taking a detailed look at youth's educational transitions, this study also finds vocational education plays an important role in the rural educational system. In particular, the LCA model estimates that 16.7% of youth fall into the first pathway, that is, those attending vocational school after middle school. This percentage is comparable with the percentage of youth who fall into the

second pathway, i.e. local high school attenders (18%)—a more conventional track to go through after middle school.

Furthermore, the study reveals that there exists a great share of youth that experience expedited transition from school to work. In particular, 10.8% of the youth in the sample fall into the fourth pathway (move to work). This group of youth stayed in middle school to age 15. By age 16, the probability of working full time is above 40%, and the probability of working full time keeps increasing with their age. When these youth reach age 19, their probability of engaging in full-time work is close to 60%.

In terms of youth's home-leaving and employment trajectories, this study reveals that the pursuit of education and work are important motives for home-leaving. This finding is consistent with the existing studies on home-leaving behaviors during the transition into adulthood (Aassve, Billari, and Ongaro 2001). Regardless of the motivations for home-leaving, this study finds that a substantial share of youth leave home at much younger ages. For example, unlike the existing home-leaving studies that find college attendance to be one of the main drivers for home-leaving (Anderson and Fleming 1986; Raymore, Barber, and Eccles 2001), the rural youth in this study left their parental homes either for high school (the third pathway) or for vocational school (the first pathway). Previous studies find that even for freshman in college, home-leaving is associated with increased emotional stress (Tognoli 2003). This study does not address the emotional aspect of youth's home-leaving, but it sheds light on another layer of potential disadvantages of sampled rural youth.

For the second research objective, the multinomial model finds several significant associations between agentic and structural resources and youth's transition pathways. To begin, the results show that youth's educational aspiration has explanatory power in predicting youth's transition

pathways. In particular, aspiring to go to higher educational institutions (vocational school or college) increases youth's odds of attending a local high school (the second pathway). This suggests that rural youth who have higher educational aspirations do make efforts toward achieving their aspirations. However, after taking into consideration youth's educational aspirations, youth's orientations toward the future and their assessments of their capacities in the present (i.e. self-esteem) do not exhibit significant associations with their transition pathways. It is possibly because this study focuses only on youth's early transition experiences from ages 12 to 19, a time when the sense of agentic orientation is still developing and thus they have limited power in shaping their life trajectories at these ages.

In terms of structural resources, the study finds that family wealth and parental education are associated with the increased chances of remaining in school rather than working after finishing middle school. This finding is consistent with the existing literature showing that family socioeconomic status serves as an important factor in shaping youth's transition pathways (Amato et al. 2008).

6.1 Limitations and Future Research Direction

This study has several limitations. To begin with, this study relies on youth's retrospective responses on the timing of their previous life experiences; therefore, it is possible that their life history data suffer from recall bias. Future studies may gather prospective and actual data on youth life pathways. Second, this study focuses on rural Gansu youth; therefore, generalizations to other youth populations should be made with caution. Third, the study captures the transition from age 12 to 19, which only covers youth's early transition experiences. Future studies may expand this research by looking at youth's transition experiences at later ages. In a similar vein, this study

does not include marriage or parenthood histories because only 91 youth in the final sample were reported to have been married in the 2009 survey. Future research should also consider incorporating the marital and parenthood histories to make a complete history of the transition into adulthood. Fourth, this study only measures youth's future orientations at one point in time (wave 1). The second and the third waves, although they included youth's educational aspirations, lack a consistent measure of future orientation. However, youth's agentic resources are also inherently changing by nature (Bozick et al. 2010). Future studies may consider the changing nature of youth's agentic orientations over time and examine the dynamics processes between the changes in future orientations and pathways into adulthood.

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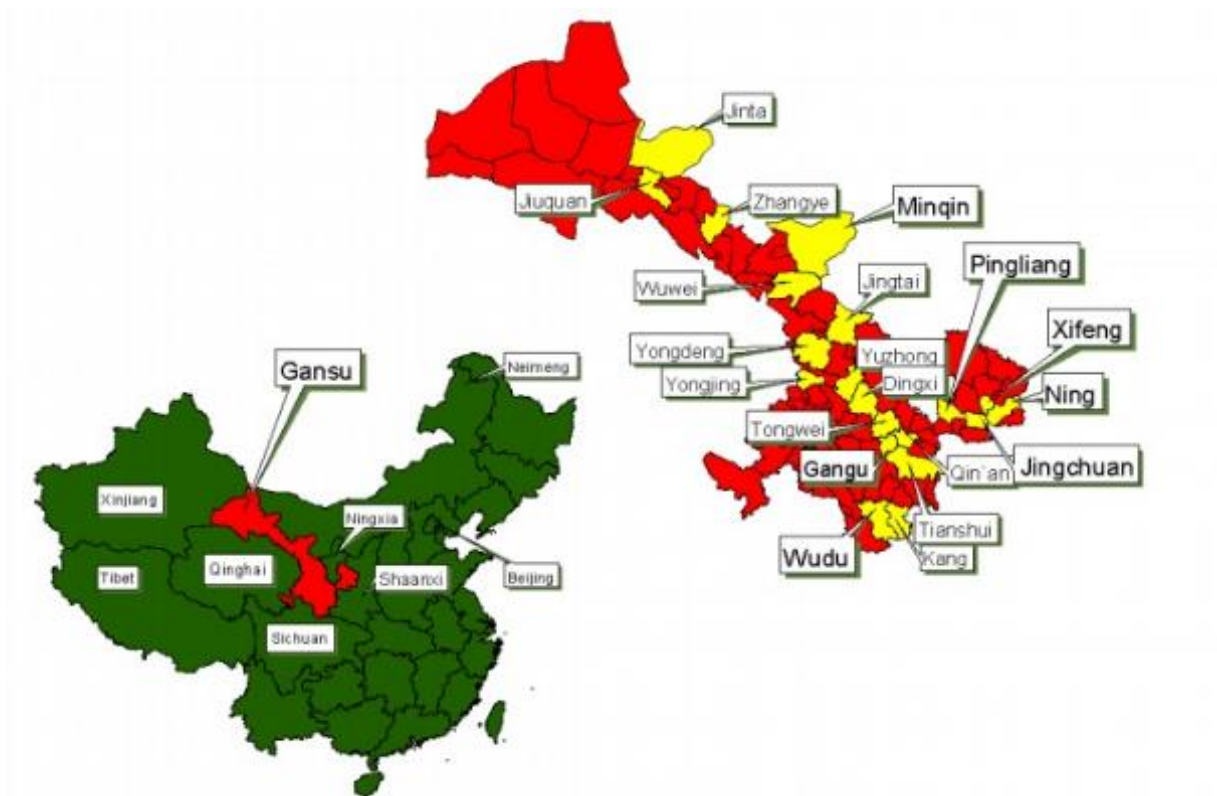
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Appendix A. Map of Gansu and Study Site



Source: Gansu Survey of Children and Family World Bank Proposal (2002)

<https://china.pop.upenn.edu/documentation>

Appendix B. An Illustration of Coding Schemes

Hypothetical individual A

Age	12	13	14	15	16	17	18	19
School	1	1	1	2	2	2	3	0
Work	0	0	0	0	0	0	0	1
Home-leaving	0	0	0	1	1	1	1	1

School: Not in school=0, Middle school=1, High school=2, Vocational school =3

Work: Full-time work=1; otherwise=0

Home-leaving: Live somewhere else other than family home =1; otherwise=0

Appendix C. Descriptive Statistics of Variables that Construct Measures of Future Orientations and Self-Esteem

Orientations toward future (alpha=0.47)	Mean	SD
I have confidence in the future	3.33	0.76
I can live better than most people in the future	2.76	0.85
I am mentally prepared for the future	2.96	0.80
I won't feel very happy in my future life (reverse)	2.77	0.93
I won't get what I truly want in the future (reverse)	2.72	0.91
My future will be better than the present	3.05	0.76
Self-esteem (alpha=0.60)		
I get most of the things I want	2.72	0.88
I give up on the things I could not achieve (reverse)	2.97	1.02
I always achieve what I want most	2.98	0.78
I have many things to be proud of	2.25	0.93
I always do things well	2.95	0.79
I always win praise from others for what I've done	2.82	0.88
I cannot do things well without the presence of my parents (reverse)	2.95	0.90
I think I should be good at everything	2.97	0.85
I feel inferior to others (reverse)	2.64	0.91
My school performance is good	3.12	0.79
I am satisfied with my life	3.23	0.73
I have reasons for what I do	3.04	0.78

Note: All the items are measured in 1-4 scale, where 1=totally disagree and 4=totally agree

CHAPTER 4

A Study of Spatial Heterogeneity of County-Level Fertility in China

Abstract

This chapter examines how the dynamic interplay of economic conditions, fertility policies, and fertility norms at the local level manifest as spatial heterogeneities of fertility patterns at the macro level. Using geocoded 2010 county-level census data, this chapter adopts the geographically weighted regression (GWR) method to identify place-specific relationships between the county-level total fertility rate (TFR) and socioeconomic and policy-related factors. The relationships between TFR and widely used social, economic, and policy-related factors (*rural Hukou*, *ethnic minority*, *female education*, *net migration rate*, *poor living standard*, *sex ratio at birth*, and *fertility policy compliance ratio*) vary spatially in terms of their direction, strength, and magnitude. The spatial variation is largely due to the difference in local characteristics. The differences and the complexities of localities cannot be told by a single story of either government intervention or socioeconomic development. This chapter extends the existing fertility research in China by explicitly recognizing the spatial heterogeneity in the impacts of policy and socioeconomic factors on the local fertility rate, and therefore sets the stage for future research that will contextually analyze varying fertility rates at the sub-national level in China and other countries.

1. Introduction

The past several decades have witnessed rapid fertility decline in the People's Republic of China. The total fertility rate (TFR) dropped from 5.76 in the 1960s to 2.71 in the early 1980s. By the 1990s, the TFR further dropped to its below-replacement level, and the low fertility regime has persisted thus far (Gu et al. 2007; Lavelly and Freedman 1990; Morgan, Guo, and Hayford 2010). There is a large body of literature examining fertility decline in China. However, their findings about what factors contribute to the fertility decline and to what extent are inconsistent. For example, scholars disagree on the major driving forces of fertility decline (Cai 2010; Lavelly and Freedman 1990; Li, Zhang, and Zhu 2005). Also, results from quantitative analyses based on publicly available data do not entirely match with those from in-depth fieldwork studies in terms of the roles that specific variables (such as education and economic development) play in affecting fertility behaviors (Greenhalgh and Winckler 2005; Harrell et al. 2011; Peng 2010; Qian 1997; Short and Zhai 1998; Zhang 1999, 2007).

However, a less studied aspect in this line of research is the degree of spatial heterogeneity in fertility dynamics. One possible reason for the conflicting findings is that the effects of the driving factors on fertility vary spatially because of the differences in local contexts or characteristics. The underlying fertility decline processes are context specific and vary across space. Uneven socioeconomic development levels, coupled with the variations of implementation and enforcement of family planning policies, could lead to fertility variations across space. In fact, existing theories of fertility decline suggest that fertility behaviors vary according to how they are influenced by economic structure, social interaction, culture, and policy implementation strategies

(Axinn and Yabiku 2001; Bongaarts and Watkins 1996; Cleland and Wilson 1987; Hirschman 1994; Montgomery and Casterline 1993). To this end, the relationships between fertility and social, economic, cultural, and policy-related factors may not be readily summarized by a single one-size-fits-all model. Successful policymaking needs to go beyond the search for a universal explanation of fertility decline and requires a contextual understanding of not only local fertility patterns but also the underlying factors that drive these patterns.

The goal of this chapter is therefore not to search for universal relationships but to investigate the spatially varying relationships between county-level fertility rates and a set of social, economic, and policy factors in China. Specifically, this chapter aims to explore (1) whether the relationships between the fertility level and these indicators vary across space and (2) if so, what the strengths and magnitudes are of these local relationships that are otherwise dismissed at the national level.

In this chapter, I apply geographically weighted regression (GWR) models to analyze geocoded 2010 county-level census data. The GWR models allow different relationships to exist in different points of space by calibrating multiple regression models using spatial weights (Brunsdon, Fotheringham, and Charlton 1996, 2008; Fotheringham, Brunsdon, and Charlton 2003). The results reveal a complex picture of the spatial variation of the relationships that fertility has with its driving factors in China and thus highlight the importance of incorporating spatial heterogeneity into fertility research.

2. Background and Literature

2.1 Fertility Policy, Socioeconomic Development, and Fertility Decline

The decline of fertility rates in China is often seen as a special case, as it is usually characterized as a combination of socioeconomic development and implementation of a family planning policy (Winckler 2002). Although it is helpful to differentiate the effects of the fertility policy and socioeconomic development, the fertility policy cannot be isolated from a broader social and economic context. Existing studies agree that it is useful to draw a conceptual distinction between the impacts of the fertility policy and socioeconomic development; in practice, however, the two forces may operate in ways that reinforce each other. The level of socioeconomic development may be set as a precondition that enables the implementation of family planning programs, and the fertility policy may in turn further reinforce the existing social and familial norms (Merli, Qian, and Smith 2004; Tien 1984). This section provides an overview of the evolution of the fertility policy and socioeconomic development in China. I place particular focus on the existing evidence of how these two forces interact with each other in influencing the variations of the fertility rates of China at sub-national levels.

The Chinese family planning policy, commonly referred to as one-child-policy, has long been recognized as one of the largest population control exercises in the modern world. The fertility policy was an integral part of the nation's development strategy. The charismatic rule of Mao Zedong came to an end in the mid-1970s, after which the central government initiated a set of socioeconomic reforms. The reforms aimed to create a transition from a centrally planned economy to a market-oriented economy as well as to hasten the country's industrialization and modernization. The fertility policy, which was initiated in the late 1970s, aimed to manage China's population in a planned, scientific way (Greenhalgh 2008).

Starting in the mid-1980s, fertility policy went through a set of decentralizing processes (Greenhalgh 1986; Gu et al. 2007; Short and Zhai 1998). Marked by the central government's release of "Document 7" in 1984, the creation and implementation of the fertility policy was devolved from the central government to the local level. The aim was to make the fertility policy tailorable to local social, economic, and cultural conditions. An early study that analyzed reports from 40 localities in 17 provinces revealed that tremendous diversity already existed, and that "nothing resembled a unified national situation" (Greenhalgh 1986: 499). A study by Gu et al. (2007) provides more comprehensive documentation of the variations of the fertility policy at the sub-national level. By collecting birth control regulations issued by State Family Planning Commissions (SFPCs) in different provinces, Gu et al. (2007) identified 22 circumstances where couples were eligible to be exempted from the strict one-child policy. These exceptions were further grouped into four categories: gender based, economic based, political/ethical/social based, and entitlement/replacement based.³ Aside from variations in the written policy, the implementation of the fertility policy also varies. A study by Short and Zhai (1998), which investigated the local fertility policies among 167 communities, concluded that the fertility policies vary not only in terms of the strength of the written policies (measured as the percentage of the population who are exempt from the one-child policy) but also in terms of the types of incentives and punishments that were implemented at the local level.

Besides the persistent scholarly interest in documenting and analyzing variations in policymaking and implementation procedures, there is also an increased speculation as to the extent that the fertility variation at the sub-national level is mainly attributable to the heavy-handed fertility policy. This line of research draws arguments from the classic demographic transition

³ The criteria for couples eligible for exemption from the one-child policy vary from place to place. A more detailed account of the variances can be found in Table 1 of the work by Gu et al. (2007).

theory and posits that socioeconomic development played a more important role than the fertility policy in driving fertility decline and variations at the sub-national level (Birdsall and Jamison 1983; Ping 2000; Poston and Jia 1990; Wang 2008). The process of industrialization and urbanization increased the cost of raising children, increased women's participation in the labor market, and also facilitated the spread of small-family ideals and ultimately influenced reproductive motivation (Birdsall and Jamson 1983; Tien 1984). For example, using the 2000 census, a study by Cai (2010) compared the county-level fertility rates between two provinces, Jiangsu and Zhejiang, which had similar economic development levels but differently written fertility policies. Cai discovered that although the written policies varied greatly between these two provinces, the county-level fertility rates were still very similar. Cai concluded that even if the fertility decline was initiated by heavy-handed government intervention, the persistently low fertility trend in recent years is primarily driven by socioeconomic factors rather than government intervention.

2.2 Spatial Heterogeneity of Fertility Decline: Theories and New Evidence

Building upon the classical demographic transition theory (Easterlin and Crimmins 1985; Kirk 1996), existing studies of fertility in China primarily emphasize the role that socioeconomic development has on fertility decline because it is closely related to the policy debate of whether heavy-handed government intervention is still necessary under the current low fertility regime. These early non-spatial studies highlight the rural-urban differences as one major spatial dimension to be considered (Greenhalgh 1988; Kaufman et.al.1989; Lavelly and Freedman 1990; Li 1995). However, there is growing interest within the demographic literature to move away from the classical demographic theory of fertility. This is primarily because fertility decline is seen as far from a universal theory, to the extent that “different historical and geographic settings show

more diversity than a simple theory of fertility change would predict” (Hirschman 1994: 203). The countervailing argument addresses the role that social interactions and diffusion of knowledge play in affecting fertility behaviors (Axinn and Yabiku 2001; Bongaarts and Watkins 1996; Cleland and Wilson 1987; Hirschman 1994; Montgomery and Casterline 1993). The central argument is that couples do not make fertility decisions by only considering their own circumstances; they also learn and imitate the fertility behaviors of the people who are close to them. These learning and imitating processes may operate independently from economic considerations. Therefore, the spatial pattern of fertility levels cannot be interpreted as only being in response to the underlying socioeconomic structures—it also reflects the spread of innovation, knowledge, norms, and institutional practices (Casterline 2010).

Several studies have shed light on spatial variation of fertility decline in the context of China. For example, an explicit spatial approach was adopted by Skinner et al. (2000), who proposed a Hierarchical Regional Space (HRS) model to study the fertility transition of China in the 1990s. The HRS model takes into consideration two-dimensional spatial structures: core-periphery zones and the rural-urban continuum. By studying the fertility decline in the lower Yangzi River region, Skinner et al. (2000) highlighted four aspects that attribute to the spatial variations of the fertility rate: socioeconomic development levels, family planning policy and practices, changes in traditional family norms, and the spread of sex-selective abortion technologies. These four dimensions co-vary systematically with the decline of the fertility rate in the lower Yangzi River area through regional space, following a trajectory of declining from inner core cities to far-periphery villages.

However, increased evidence suggests that the spread of ideas, norms, and behaviors may not entirely be in concert with spatial structures of socioeconomic characteristics. Compared with

rapid economic development and institutional change, the changes in culture and norms may be slow. As a result, one may observe distinctive fertility behaviors in certain places that differ from general patterns. For example, ethnographic research conducted by Zhang (2007) found a reversal in the reversed relationship between fertility rates and economic development levels. In areas where the economic development level is high, wealthy families tend to have more children since they are able to pay the fines, while relatively poor rural families tend to have only one child due to the concern of high costs. The work of Peng (2010) called attention to the dynamics of birth control policy implementation at the local level, arguing that the collision between pronatalist family norms and antinatalist family planning laws may be particularly salient in some places. He found that places with strong patrilineal norms (measured by kinship networks and presence of ancestral halls) are particularly resistant to the family planning policy, thus exhibiting high fertility levels.

2.3 The Present Study and Research Hypotheses

Both theoretical arguments and empirical evidence suggest that understanding fertility decline in China requires explicit recognition of spatial heterogeneity in local characteristics; however, methodologically it is often difficult to describe spatially varying relationships using conventional approaches. The standard regression approaches such as the Ordinary Least Squares (OLS) models and most of the spatial econometric models (referred to as “global models” in the literature) obtain only one set of coefficients for all the locations and thus they ignore local and spatial contexts of fertility behaviors (Ali, Partridge, and Olfert 2007; Brunsdon, Fotheringham, and Charlton 1996; Chi and Zhu 2008). One may argue that the varying relationships can be captured by using carefully selected interactions between socioeconomic factors and place-specific dummy variables in a single model. Doing this, however, would require researchers to have

intricate knowledge of a specific set of interactions. Other models that deal with local contexts, such as the spatial expansion method and multilevel modeling, require an *a priori* functional form that results in the nature of the spatial process being modeled as being deterministic or discrete (Fotheringham et al. 2003).

For the purpose of this study, I take a blended perspective, considering fertility decline as a result of structural transformation of socioeconomic characteristics as well as diffusion of new ideas, technologies, and social norms (e.g., Goldstein and Klüsener 2014; Harrell et al 2010; Retherford 1985). Specifically, I consider spatial distribution of fertility levels in China as a reflection of combined forces of economic development, fertility policy implementation and enforcement, as well as diffusion of new family norms (such as small-family ideals). What distinguishes this study from previous studies is that I do not assume any predetermined spatial structures in our model specification (such as rural-urban dichotomy, east-west gradient, or core-periphery hierarchy), nor do I aim to get more precise global estimates by taking into consideration spatially correlated error terms. Instead I focus on describing the characteristics of the non-stationarity of fertility behaviors across space, which is often regarded as a source of non-random error variances that need to be controlled in global models. Using geographically referenced county-level data and applying GWR techniques, I estimate one set of coefficient estimates for each county while taking into consideration the characteristics of its neighboring counties. In doing so, I capture the apparent lack of uniformity in the observed relationships between fertility levels and their determinants, as well as investigate local fertility patterns that are otherwise masked in the global models. I elaborate my hypotheses as follows.

To begin, I expect to find that economic development plays a more complex role in affecting fertility behaviors. Previous literature reveals that the relationship between economic

development and fertility decline is not universal, in the sense that the effect is contingent on the micro-dynamics between pronatalist social norms and anti-natalist fertility laws (e.g., Greenhalgh and Winckler 2005; Peng 2010; Zhang 2007). Even in vast rural areas where fertility policies are generally considered to be lenient, the magnitudes and types of fertility incentives and regulations that couples are exposed to differ from place to place. To this end, I hypothesize *H1a: Although economic development serves as one of the driving forces of fertility decline at the national level, there exist positive relationships between economic development levels and fertility rates in some places*. This speaks to the observation that in several economically developed areas, affluent families can afford to pay fines for violating family planning laws and additional child rearing costs if they desire multiple births.

On the other hand, some studies have found that small-family ideals have begun to emerge in some rural places such that rural families tend to actively seek only one child, even if they are permitted to have an additional child (Zhang, 2007; Greenhalgh and Winckler 2005; Merli and Smith 2002). To this end, I hypothesize *H1b: Fertility behaviors vary extensively in rural areas, such that that rural residency is not always an indicator of high fertility levels*.

I also consider the relationship between female education and fertility levels to be contingent on local economic structures and social/cultural norms. The classic economic theory of fertility decline argues that females with higher education are more likely to participate in the labor market, thus facing higher opportunity costs of childbearing (Becker 1960). However, negative relationships between female education levels and fertility rates are only observed when females have a certain level of autonomy in making childbearing decisions (Jejeebhoy 1995; Jain 1981). In places where the son-preference norms are strong, females with higher education have better access to health facilities and maternal care and thus more quickly progress to having a second

child (Qian 1997). Therefore, I expect to see *H2a: Female education levels are non-negative or insignificantly related to fertility rates in places where traditional family norms are strong.*

However, I also expect to see some “threshold effects” (Jain 1981), in the sense that certain economic and social thresholds need to be reached before observing the negative effect of women’s education on fertility levels. I hypothesize *H2b: In places where extreme poverty persists, an increase in female education level is associated with an increase in fertility levels.*

In terms of culture/ethnicity differences, I hypothesize *H3: There exist distinctive fertility patterns in places where ethnic minorities concentrate.* For one thing, the fertility policy treatments for ethnic groups and the Han Chinese differ. For another, the diffusion of fertility norms and behaviors are faster within homogenous populations (Attané and Courbage 2000; Childs et al. 2005; Poston, Chang, and Dan 2006). Therefore, I expect to see distinctive fertility patterns in places where ethnic identities are particularly strong.

The last hypothesis considers the spatial clusters of very low fertility rates. There have been many discussions on the emergence of low fertility regimes in the European context. For example, Kohler et al. (2002) posited that the emergence of a lowest-low fertility (i.e., period fertility lower than 1.3) in Europe is attributable to combined factors of measurement issues, newly emerged socioeconomic and institutional conditions, and amplified effects of the social interaction processes. Although the primary focus of this chapter is not to seek explanations of the emergence of spatial clusters of low fertility rates, applying GWR techniques nevertheless enables us to detect distinctive fertility behaviors in low fertility regimes. Therefore, I expect to see *H4: The spatial clusters of low fertility rates are not sufficiently explained by the commonly identified*

socioeconomic, policy, or cultural factors. In other words, I expect to see relatively worse model fit in places where the low fertility rates are clustered.

3. Data, Measurement, and the Analytical Strategy

3.1 Data and Measurement

The unit of analysis is administrative counties in the People's Republic of China. This study includes 2,869 counties or county-equivalent administrative units in mainland China.⁴ The county-level data are primarily drawn from the 2010 population census. The 2010 county-level boundary shapefile is linked to the 2010 population census. The data set and the county boundary shapefile were both obtained from China Geo-Explorer II, which is maintained by the China Data Center (2014) of the University of Michigan.

This study uses unadjusted period Total Fertility Rate (TFR) as the measure of county-level fertility. The unadjusted period TFR describes the observed fertility patterns of a synthetic cohort of females who followed the same fertility schedule as those in the 2010 census. The TFR is calculated based on the age-specific fertility rate (ASFR) for women aged 15 to 49 reported in the 2010 census's long form. Compared with the previous five population censuses, the 2010 census is acknowledged for having better quality and more complete enumeration (Wu 2014; Cai 2013).

⁴ The analysis excluded Hong Kong, Macau, and three islands that have no long-term residents (Zhongsha qundao, Nansha qundao, and James Shore).

Seven independent variables were identified based on previous studies on the determinants of fertility in China. The first two variables are included to take into account the two largest subpopulations who receive nationwide exemptions from the stringent one-child-per-couple restriction. One variable, *rural Hukou*, is measured as the percentage of the population that has rural residency status. Another variable, *ethnic minority*, is measured as the percentage of ethnic minorities in the total population at the county level. Aside from the majority Han Chinese, there are 55 ethnic minority groups that are officially recognized by the central government in China. They are identified by ethnic, cultural, and religious criteria (Attané and Courbage 2000). Since the 1970s, the national legislation has been consistent in stating that minority couples (or any couple in which one member is an ethnic minority) are not subject to the one-child policy (Attané 2000; Gu 2007). I expect to see *rural Hukou* and *ethnic minority* to be positively associated with TFR in the global model.

Female education is measured as the percentage of females aged 18 and above who have completed at least nine years of compulsory schooling, equivalent with completing primary and secondary education or higher. *Female education* has been identified as a strong predictor for fertility level at both individual and aggregated levels (Jejeebhoy 1995; Martin 1995). Higher female education is expected to be negatively associated with county-level fertility at the national level. *Net migration* is included in the model to capture the potential migration effect. The net migration rate is calculated as the percentage of the non-registered population to the census enumerated total population. A positive value of net migration rate indicates inflow of the migration, while a negative value suggests outflow of the migration (Cai 2010). I also included a measure of *poor living standard*. The 2010 census asked a list of questions regarding household living conditions, including whether there is a kitchen, tap water, a toilet, or a shower in the house.

I calculated the percentage of households that do not have kitchens, tap water, toilets, or showers for each county. To avoid the issue of multicollinearity, I applied principle component analysis to create a composite measure of poor living standard (Standard Cronbach's Alpha = 0.838) based on the four above-mentioned variables.

I also included *sex ratio at birth* (SRB) in the model. It is measured as the number of boys at age zero divided by the number of girls at age zero. The imbalanced SRB has been a concern in China for the past two decades and can be attributable to three causes: the excessive birth of boys due to sex-selective abortions of female fetuses, the higher survival chances of boys due to infanticide and malnutrition of infant girls (Zeng et al. 1993), and the underreporting of female births in the 2010 census (Goodkind 2017; Shi and Kennedy 2016; Zeng et al. 1993). The imbalanced SRB is considered a result of the practice of the son-preference tradition, which is further amplified by the family planning policy. Existing studies have shown that the creation and implementation of family planning policies are heavily dependent on the sex of the surviving children. It is found that in places where there exist strong son-preference norms, couples whose first birth is a girl are less likely to receive the one-child certificate, less likely to use contraceptives, and less likely to seek abortion, compared to the couples who already have at least one son (Arnold and Liu 1986). Therefore, at the aggregate level, I expect an overall positive relationship between SRB and TFR.

The last independent variable Included in the model is *fertility policy compliance ratio*. It is measured as the lifetime fertility level set by the local State Family Planning Commissions (SFPCs) divided by the observed lifetime fertility level in the 2010 census. The lifetime fertility level set by the local SFPCs, also referred to as "policy fertility" in some existing literature, is a hypothetical indicator of what the total number of children ever born to a woman would look like

in a place if all the households in that place obey the local fertility policy. I adopted this indicator at the province level from Table 3 in Gu et al. (2010).⁵ Compared with the TFR, which depicts the fertility level in the year 2010, the lifetime fertility level is akin to a stock measure of the fertility levels in the past few decades.⁶ A value of fertility policy compliance ratio greater than 1 indicates that the policy fertility is larger than the observed lifetime fertility, suggesting greater compliance with the local fertility policy, while a value of the ratio smaller than 1 indicates greater noncompliance with the local policy. Similar practices that attempted to measure the level of fertility policy compliance can be also found in works by Attané (2002). I expect this indicator to be negatively related with TFR—that is, greater compliance with the local policy should be related with lower TFR.

3.2 Analytical Strategy

I first produced the non-spatial descriptive statistics and conducted an exploratory spatial analysis to detect spatial clusters both visually and statistically. Then I applied OLS models to obtain coefficient estimates at the global level. To explore the varying relationships between fertility and socioeconomic predictors, the last step is to apply GWR models. Following Fotheringham et al. (2003), the basic function of the GWR model is expressed as:

$$y_i = \beta_{0i}(u_i, v_i) + \sum_{n=1}^k \beta_{ni}(u_i, v_i)x_{ni} + \varepsilon_i \quad [1]$$

⁵ Although the implementation of the fertility policy varies greatly at the sub-provincial level, the variations of written policy within each province tend to be small (Cai and Lavelly 2007). The constructed *fertility policy compliance ratio* therefore captures the within-province variations of policy compliance, given the policy fertility in each single province is constant.

⁶ It would be ideal to have a measure of lifetime fertility broken down by the birth cohort of mothers; however, I am unable to obtain such data at the county level. The lifetime fertility level used here is a lump-sum measure of the fertility levels for multiple cohorts, therefore reflecting a stock of fertility level.

where y_i is TFR at county i , (u_i, v_i) denotes the coordinates of the centroid of county i , β_{0i} is the local intercept for county i , and β_{ni} is the local coefficient for predictor n for county i .

In GWR models, the regression coefficients are estimated for each location independently by applying location-specific weighting schemes; therefore, there are as many “local” regression models as there are observations (Wheeler and Tiefelsdorf 2005). In matrix form, the vector of local coefficients of $\hat{\beta}$ is estimated as:

$$\hat{\beta} = (X^T W(u_i, v_i) X)^{-1} X^T W(u_i, v_i) y \quad [2]$$

where $W(u_i, v_i)$ is an $n \times n$ weight matrix whose diagonal elements are spatial weights for each location i and whose off-diagonal elements are zero. X is the matrix of independent variables, and y is the vector of dependent variables. The weighting schemes that are applied to calibrate the local regression models are based on the approximation of each i to the sampling locations of each observation (Fotheringham et al. 2003). There are a variety of weighting schemes available for researchers to choose from (Fotheringham et.al. 2003). I chose the Gaussian weights and their bi-square variations, which are also the most commonly used options (Nakaya 2014). The weight value of observation at location j for estimating the coefficient at location i is expressed as:

$$w_{ij} \begin{cases} = \left[1 - \left(\frac{d_{ij}}{b} \right)^2 \right]^2 & \text{if } d_{ij} < b \\ = 0 & \text{otherwise} \end{cases} \quad [3]$$

where d_{ij} is the Euclidean distance between locations i and j and where b is the bandwidth size (i.e., the distance between each observation and its neighboring locations specified by the spatial weights). The bandwidth size was determined by an adaptive method. Model comparison between the OLS and GWR models was conducted to illustrate using the Akaike Information Criterion with a correction for finite sample sizes (AICc). One of the advantages of GWR modeling

is that researchers can map the local coefficients as well as R^2 in order to better identify spatial heterogeneities. Following this rationale, maps of the local coefficients and local R^2 are presented. The preliminary exploratory spatial analysis as well as the procedure of mapping the local coefficients were conducted with *ArcGIS*. The descriptive statistics and the global model were calculated in *SAS*. The GWR model was conducted in *GWR4.0*.

4. Results

4.1 Descriptive Statistics and the OLS Regression Model

Table 4-1 presents the descriptive statistics of the variables. Table 3-1 documents substantial county-level variations in TFR and socioeconomic factors. For example, although the mean of county-level TFR is 1.24, the lowest TFR is 0.02 in the Culuan district in Heilongjiang province and the highest TFR is 4.72 in the Jinkouhe district in Sichuan province. In terms of the independent variables, *ethnic minority* on average comprises 16.22% of the total population at the county level. There are 13 counties that have 0% ethnic minority population, while 9 counties have 99% ethnic minority population. The percentage of population with *rural Hukou* at the county level is 70%. Again, the statistics vary over space from 0% up to 100%. For *female education*, on average only around 50% of females have at least middle school education. A zero value indicates that no females in a county have higher than middle school education. Table 4-1 also reveals the skewed *sex ratio at birth*, as the county-level average SRB is 1.15 males per females, which is higher than the typical range, which usually lies between 1.05 and 1.07 globally (Coale and Banister 1994). The lowest SRB is observed in the Shangganglin district, Heilongjiang province (0.77 males per females), and the largest SRB is observed in Anxi County, Fujian province (1.78

males per females). Lastly, the indicator *fertility policy compliance ratio* has an average value of 1.15. Recall this covariate is measured as the ratio between policy fertility and actual lifetime fertility level, where a value greater than 1 indicates that the observed lifetime fertility level in one place does not exceed the threshold set by the fertility planning committee, thus indicating greater compliance with the policy. The last column in Table 4-1 is the Moran's *I* statistic, which is a measure of the spatial autocorrelation among the neighboring values (Anselin 1995). The Moran's *I* statistics for all the variables are relatively high, suggesting strong spatial patterns that exhibit for both dependent and independent variables.

Table 4-1. Descriptive Statistics (N = 2,869)

Variable	Mean	SD	Min	Max	Moran's <i>I</i>
Total Fertility Rate	1.239	0.463	0.020	4.760	0.545***
Rural Hukou	0.705	0.236	0.006	1.000	0.541***
Ethnic minority	0.162	0.290	0.000	0.998	0.866***
Female education	0.541	0.170	0.000	0.907	0.669***
Net migration	-0.026	0.266	-8.212	1.000	0.282**
Poor living standard	0.000	1.000	-1.726	3.391	0.633***
Sex ratio at birth	1.153	0.110	0.765	1.767	0.444***
Policy compliance ratio	1.152	0.300	0.551	2.759	0.681***

p<0.01; *p<0.001

Note: SD = standard deviation. Moran's *I* is calculated based on the first-order queen's weight matrix. The significance levels are based on 999 times of permutations.

The percentile map of the dependent variable, the county-level TFR, is presented in Figure 4-1a. The fertility rate is higher in the southeast and southwest regions of China and lower in the northeast region and part of the east coast region. To shed further light on the pattern and magnitude of spatial clusters, I explored the significant local spatial clusters/outliers of TFR using local indicators of spatial association (LISA) statistics. LISA is often used as a diagnostic tool for inspecting local spatial heterogeneity in measures of global spatial association (Anselin 1995). Figure 4-1b reveals that counties with high TFRs tend to cluster on the western boundaries of the

Xinjiang and Tibet regions and southern provinces such as Yunnan, Guangxi, Guizhou, and Guangdong provinces. Low TFRs tend to cluster in northeastern counties near the coastal line. Several metro areas, such as Beijing and Shanghai, also exhibit clusters of low TFRs. Aside from the spatial clusters, the LISA map also highlights the spatial outliers, which are counties that surround clusters of counties with different values. For example, although high values of TFR are concentrated in the southeast regions, there still exist counties that have significantly lower values of TFR compared to their neighboring counties in this region (denoted as “low-high” outliers). Another place that exhibits low-high outliers in TFR is the Zhujiang River Delta in Guangzhou Province, one of the most economically developed areas in China. In contrast, there are counties in northern provinces, notably Hebei and Ningxia, that have high values of TFRs, surrounded by low TFRs in their neighboring counties (denoted as “high-low” outliers). To briefly sum up, the LISA map shows that the distributions of TFRs vary across space. For example, even among the most economically developed areas, the fertility patterns differ between Shanghai and Guangzhou, where the former shows spatial clusters of “low-low” TFRs and the latter exhibits clusters of “low-high” outliers. This evidence suggests that a further analysis of spatial heterogeneity of TFRs is necessary.

Figure 4-1. County-level TFR and The Local Clusters/Outliers

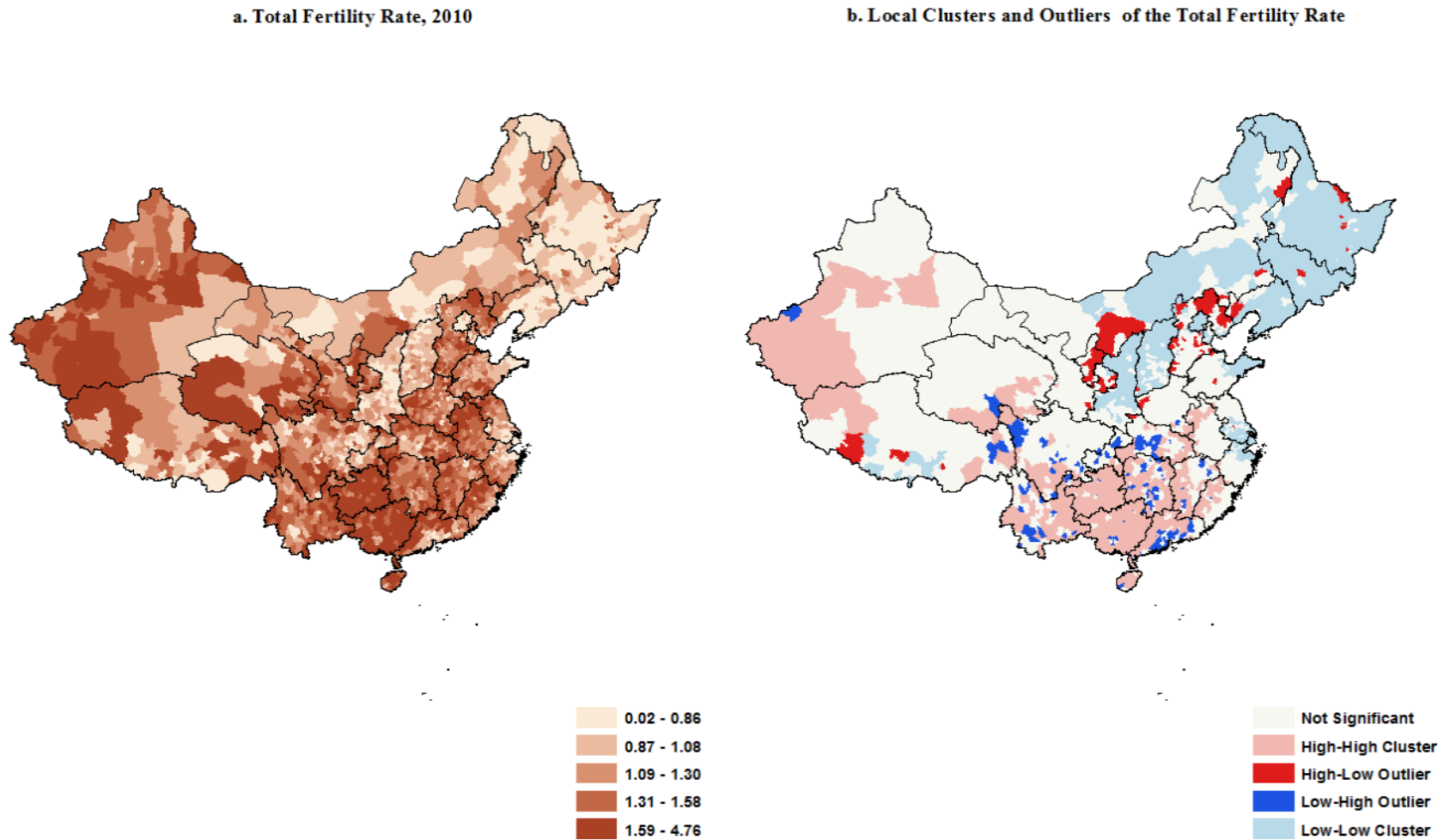


Table 4-2 presents the coefficient estimates of the non-spatial global models. Model 1 includes two variables, ethnic minority and rural Hukou. Both variables are statically significant and have expected signs. These two covariates explain 23.5% of variation in county-level TFR. The full model is model 2, which included all the covariates. The full model explains overall 32.2% of variations of the county-level TFR, and AICc decreased from 2974.7 to 2578.4. In the final model, all covariates have expected signs. For example, aside from the strong positive relationships of ethnic minority and rural Hukou on TFR, model 2 also reveals a negative relationship between female education and TFR. The magnitude of the effect is substantial, as a 10% increase in female education is associated with a 4.3% decrease of TFR.⁷ Among other covariates, the negative coefficient between net migration and TFR suggests that places where large population inflows exist are also the places where fertility levels are low, which is expected because the migration flows in China largely occur from rural to urban places. I found poor living standard does not exhibit a significant relationship with TFR after controlling for other social and policy-related variables.

The global model reveals a positive relationship between observed SRB and TFR, indicating places with more skewed SRB (more reported male births than female births) are related with larger TFR. Lastly, I find a negative relationship between *fertility policy compliance ratio* and TFR, suggesting that all else being equal, greater policy compliance is related with lower TFR. I further conducted a multicollinearity test for the all the explanatory variables. The variance inflation factors (VIFs) for the explanatory variable parameters are all within the reasonable range, suggesting that multicollinearity is not a severe issue for the identified global model.

⁷ As shown in Table 1, *female education* does not incorporate 100% multipliers, and their values range from 0 to 1. Therefore, a unit (0.01) increase in *female education* is associated with a 0.43 unit increase of TFR. The same interpretation also applies to other covariates.

Table 4-2. Ordinary Least Squares Models (N = 2,869)

Variable	Model 1		Model 2		VIF
	Estimate	Std. Error	Estimate	Std. Error	
Ethnic minority	0.316***	0.027	0.236***	0.032	1.601
Rural Hukou	0.796***	0.033	0.536***	0.050	2.487
Female education	/		-0.430***	0.070	2.567
Net migration	/		-0.267***	0.031	1.227
Poor living standard	/		-0.017	0.010	1.735
Sex ratio at birth	/		0.114***	0.110	1.466
Policy compliance ratio	/		-0.311***	0.033	1.994
Intercept	0.626***	0.007	1.028***	0.065	0.000
Adjusted R ²	0.235		0.322		
AICc	2974.772		2578.407		

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Note: VIF = variance inflation factor. AICc == Akaike information criterion with a correction for finite sample size.

4.2 Geographically Weighted Regression Results

The OLS model shows that the relationships between county-level TFR and socioeconomic factors are consistent with the existing story of socioeconomic development. This section demonstrates how the identified relationships change from one place to another and to what extent these local relationships remain hidden in the global model presented in the previous section. Table 4-3 presents the estimated coefficients of the GWR model. The last column is the diff-of-criterion test for spatial heterogeneity (Nakaya 2014). The test results suggest that all of the covariates are spatially nonstationary and therefore should all be treated as local covariates. In terms of the overall goodness-of-fit, compared to the OLS model, the GWR model explains 58.9% of the variations of county-level fertility. The AICc of the GWR model is 1403.7 compared to the 2578.4 of the OLS model, which suggests that the GWR model has a better fit compared to the global OLS model.

Table 4-3. Estimates of the Geographically Weighted Regression Model of TFR**(*N* = 2,869)**

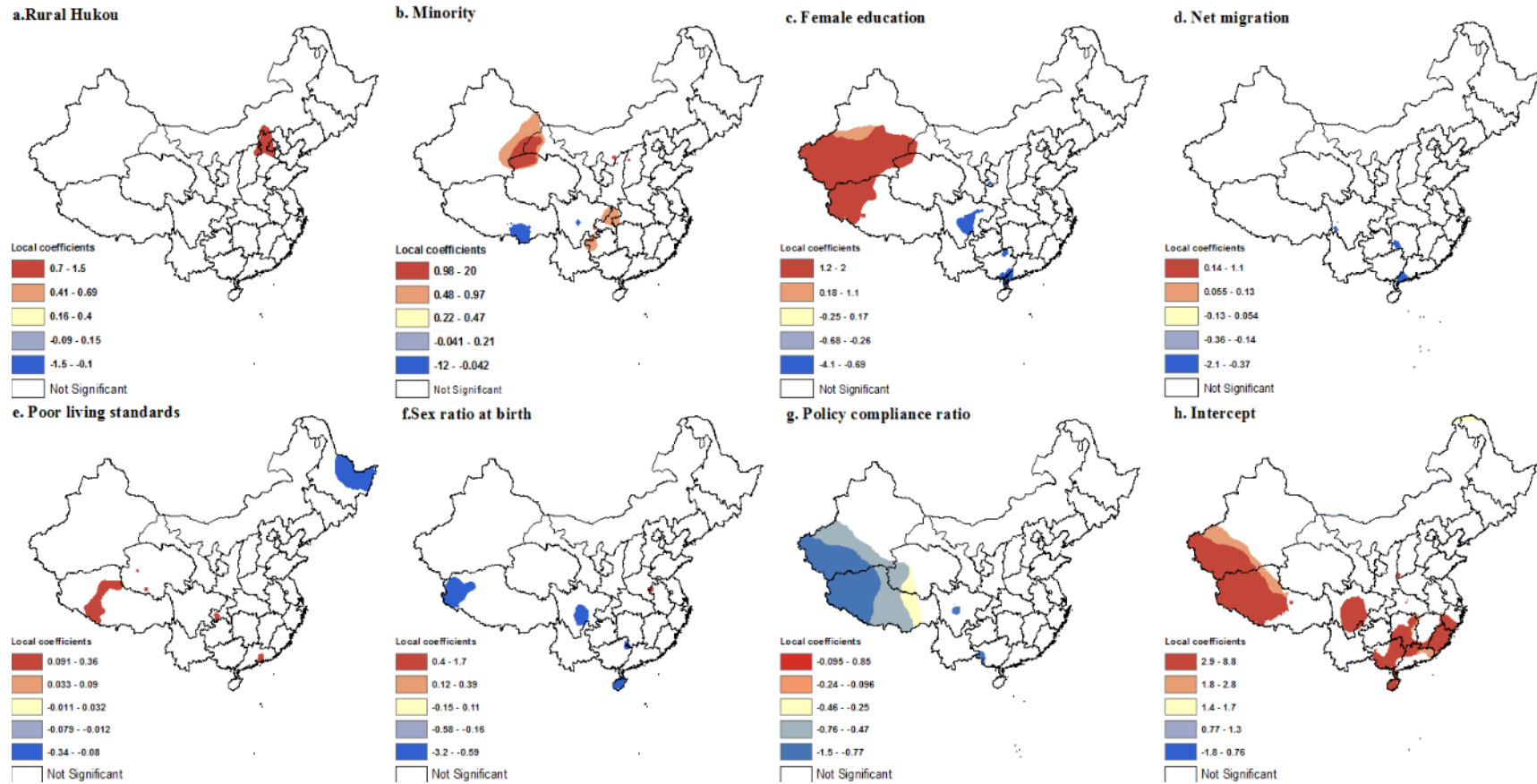
	Min	Lower Quantile	Median	Upper Quantile	Max	Diff-of- criterion
Rural Hukou	-1.570	-0.192	0.086	0.375	1.572	-0.47232
Ethnic minority	-13.477	-0.136	0.270	1.133	20.113	-25.8558
Female education	-4.132	-0.864	-0.475	-0.004	2.020	-10.1604
Net migration	-2.111	-0.429	-0.214	0.044	1.224	-16.9947
Poor living standard	-0.342	-0.050	0.011	0.074	0.373	-18.5079
Sex ratio at birth	-3.250	-0.240	0.081	0.439	1.748	-117.131
Policy compliance ratio	-1.540	-0.692	-0.301	-0.052	0.893	-38.4797
Intercept	-1.979	0.899	1.511	2.618	8.900	-969.779
Adjusted R2	0.593					
AICc	1403.699					
Best bandwidth	160					

Note: Positive value of diff-of-criterion suggests non-spatial variability. AICc = Akaike Information Criterion with a correction for finite sample size.

To better present the GWR results, I conducted the following visualization processes. I first created the estimated coefficient maps. The local coefficients are classified by a five-quantile scale and are mapped using multi-hued color schemes. Next, I masked the maps of *t*-statistics on top of the local coefficient maps so as to only present the local coefficients that are statistically significant at the $\alpha = 5\%$ level, following a visualization method proposed by Matthews and Yang (2012). Note that the conventional statistical inference procedure for detecting significant local coefficients in GWR models suffers from multiple testing problems (Byrne, Charlton, and Fotheringham 2009; da Silva and Fotheringham 2015); therefore, I adopted a correction method proposed by da Silva and Fotheringham (2015) to adjust the inference test results.⁸ The refined maps illustrate the local coefficients that are statistically significant after the adjustment (Figure 2). For the purpose of reference, the local coefficient maps without accounting for significant levels are included in Figure 4-3.

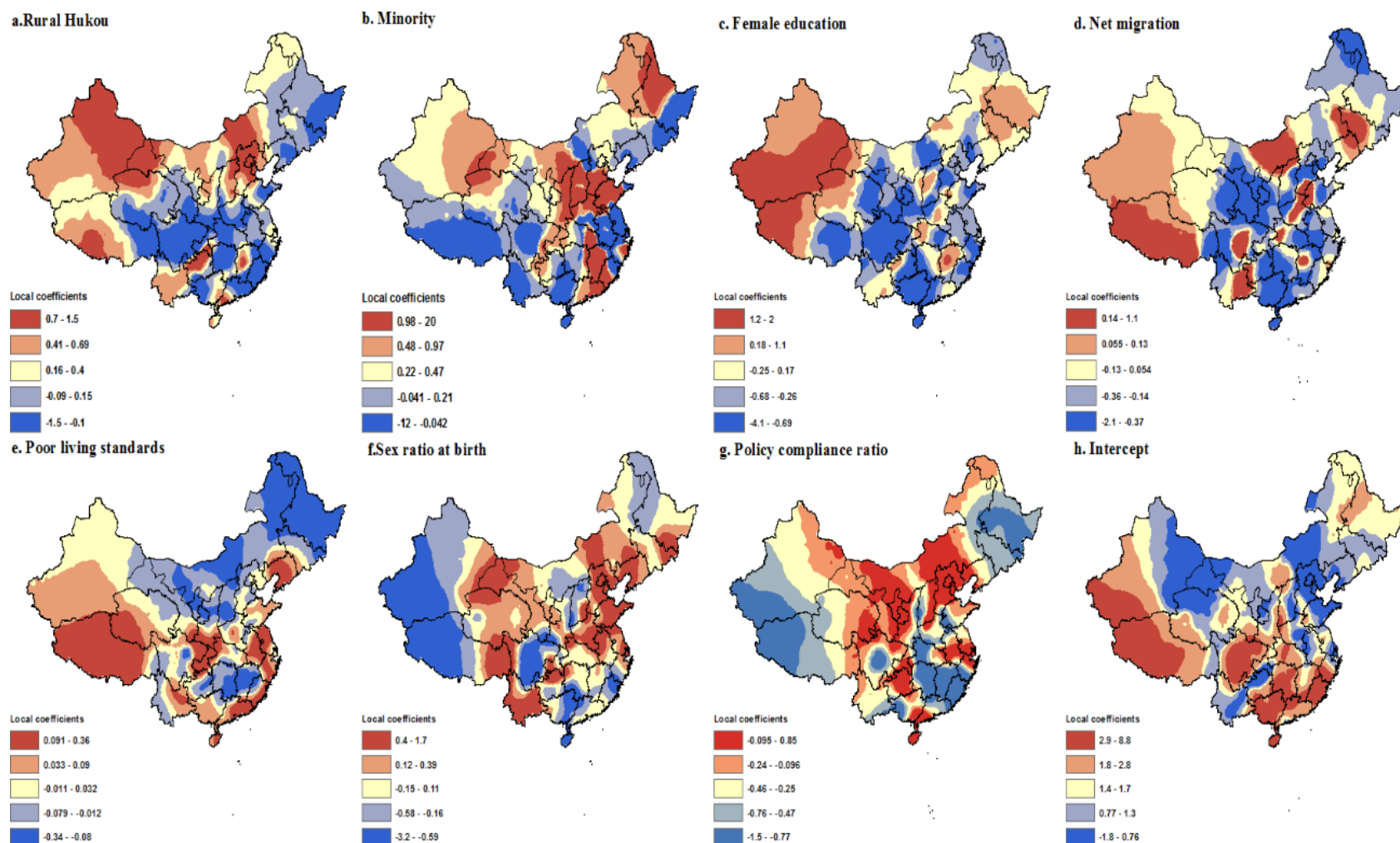
⁸ For a significance level of 5%, the proposed correction method compares the *t*-value with ± 4.273 at the 95% confidence level instead of the conventional value of ± 1.96 . This is equivalent to say that our correction uses $\alpha = 0.00001602$ (calculated based on Equation 8 of da Silva and Fotheringham 2015) for a significance level of 5%.

Figure 4-2. The Estimated GWR Local Coefficients at County Level (significant areas only)



Note: Local coefficients are displayed in quintile scales. Local inference test results are adjusted to correct multiple testing problems. For a significance level of 5%, the proposed correction method compares t -value with ± 4.273 at the 95% confidence level, instead of the conventional value of ± 1.96 . This is equivalent to saying that our correction uses $\alpha = 0.00001602$ (calculated based on Equation 8 of da Silva and Fotheringham 2015) for a significance level of 5%.

Figure 4-3. The Estimated GWR Local Coefficients at County Level (without presenting significant level)



Note: Local coefficients are displayed in quintile scale

Figure 4-2a presents spatially varying relationship between *rural Hukou* and TFR. The result indicates that the positive relationship is only statistically significant in the capital city of Beijing and its surrounding areas. Significant levels aside, the positive relationships between *rural Hukou* and TFR are found in vast west regions, while the east coast, the middle, and the northeast regions present negative relationships between *rural Hukou* and TFR (Figure 4-3a).

The relationships between *ethnic minority* and TFR are presented in Figure 4-2b. Recall that the global model indicates a positive association between the percentage of ethnic minorities and fertility in each county, but the local coefficient map shows that the positive relationships do not hold across space. An investigation of Figure 4b reveals that the significant positive clusters are found only on the borders of Gansu and Xijiang provinces, and significant negative clusters are found in southern regions in Tibet. One possible explanation of the different signs of local coefficients that appear in part of Xijiang and Tibet is that the ethnicities differ in these two places. In Xijiang the majority ethnic groups include Uygurs, Kazaks, and Huis, known as Chinese Muslims. In total, they compose 56.5% of the total population in Xijiang. In Tibet are Tibetans, who compose 90.5% of the total population ((Tibet Autonomous Region Statistic Bureau 2012). It is likely that fertility behaviors vary greatly within ethnic minority populations, especially considering distinct social, cultural, and religious practices among different ethnic groups.

Figure 4-2c presents the local coefficients of *female education*. The map indicates that the expected significant negative relationships are found only in several small places in Sicuan province, suggesting that female education still plays a salient role in reducing the fertility rate in the southwest. However, in northwest regions, most notably in Xinjiang and part of Tibet, the relationships between *female education* and TFR are positive, suggesting that the higher the

percentage of females who have at least middle school education, the greater the county-level TFR. Consistent with several existing empirical studies, the findings suggest that the relationship between female education and fertility is context specific, with respect to both the level of socioeconomic development and societal gender norms (Jejeebhoy 1995). It is also likely that certain economic and social thresholds need to be reached before observing the fertility decline (Jain 1981). Therefore, these findings suggest that future policy that aims to improve the educational level should be targeted at places such as Tibet and Xinjiang, where the socioeconomic development levels are low.

The negative relationship between *net migration* and TFR is partly confirmed in Figure 4-2d. However, the significant local coefficients are only found in counties in Guangdong and Hunan provinces, leaving the majority of regions statistically insignificant. Large rural to urban migration flow is one of the newly emerged features of the population dynamics of China. One possible explanation for the insignificant relationships that are found in most places might be attributed to the census undercount of both fertility levels and migrant populations (Liang and Ma 2004).

Despite that the global model implies a positive relationship between *poor living standard* and TFR, Figure 4-2e indicates that the local coefficients between *poor living standard* and TFR roughly follow a northeast-southwest gradient, with northeast regions displaying negative coefficients and southeast regions displaying positive coefficients. The significant negative relationships are clustered in northeast regions, in particular in Heilongjiang province. Recall that the northeast is where the “low-low” clusters of TFR are found (Figure 4-2b); it is possible that under the context of ultra-low fertility, the relationships between *poor living standard* and fertility behaviors becomes negative, as the cost of childbearing and rearing become the uppermost concern over other factors.

Figure 4-2f presents the estimated local relationships between *sex ratio at birth* and TFR. The global model indicates a positive relationship between SRB and TFR, while the local map shows that the relationships between SRB and TFR at the local level are highly variable across space. Specifically, the significant negative clusters are scattered in three places: (1) Tibet, (2) the border between Sichuan and Yunnan provinces, and (3) Hainan province. This indicates that all else being equal, a more balanced SRB (lower SRB) is associated with a higher TFR. An ancillary analysis of spatial clusters of SRB (available upon request) indicates that among the above-mentioned three areas, (1) and (2) are the enclaves of low SRB, while (3) includes the clusters of high SRB. Less skewed SRB in the three areas could be attributed to two factors: weaker son-preference tradition, which is more likely to be observed among ethnic minority populations, and relaxed fertility policies. Specifically, (1) and (2) are places where the majority of the populations are non-Han Chinese.⁹ Although Han Chinese are the dominant population in (3), the fertility policy is much more relaxed in this region so that the policy fertility is above 2.0 (Gu et al. 2007). Although here I only offer speculations, the GWR result nevertheless indicates that the relationships between SRB and TFR are conditional on local culture and socioeconomic contexts and cannot be summarized by a global model. Figure 3g displays local relationships between *fertility policy compliance ratio* and TFR, where the significant local relationships are found only in Tibet and Xinjiang; in the remaining places the relationships between the level of compliance and TFR are statistically insignificant.

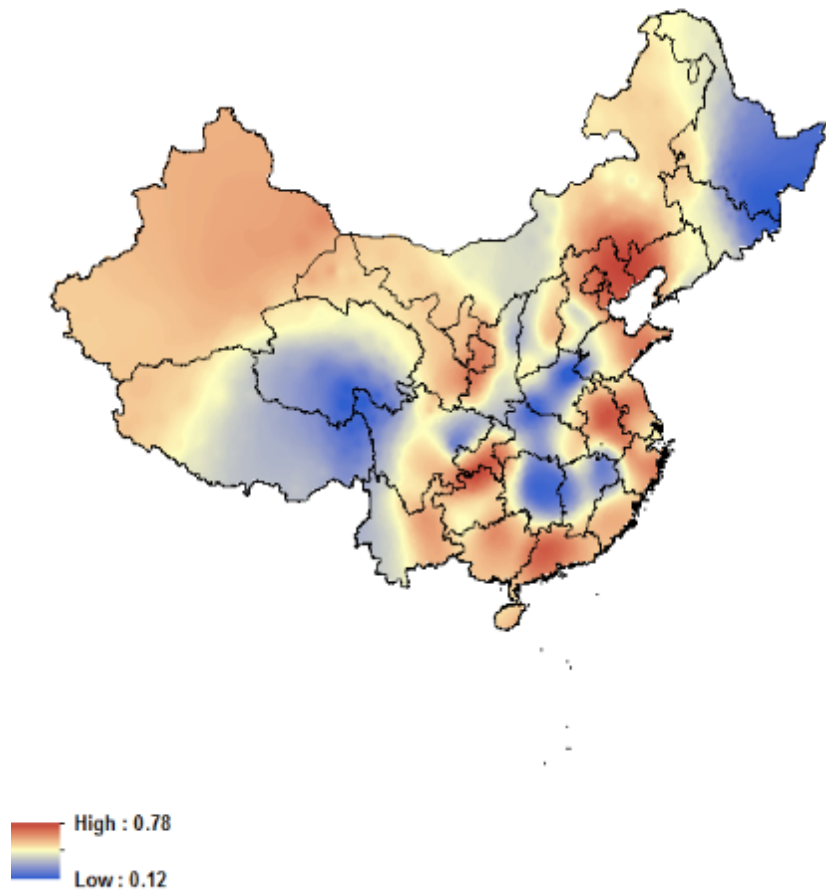
To further examine the performance of the GWR model, the maps of local R^2 and local residuals are presented in Figure 4-4. The local R^2 map (Figure 4-4a) shows that the GWR model fits well in most places of China, but there are three exceptions. First, regions including Tibet, the

⁹ In (1), the dominant ethnic group is Tibetans, and in (2) the dominant ethnic group is Miaos.

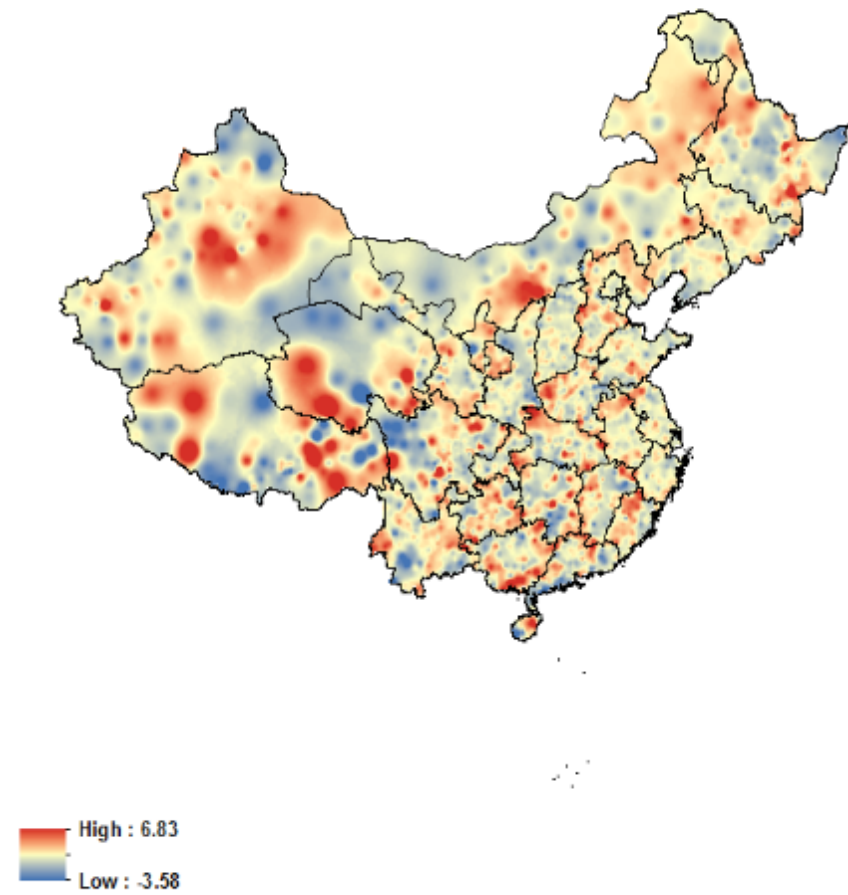
southern part of Xinjiang province, and Qinghai province. These are the places where ethnic minority groups, including Tibetans and Turkic-speaking populations (such as Uyghur, Kazakh, and Kirgiz) concentrate. Second, the northeast regions, in particular Heilongjiang and Jilin provinces are the places where clusters of “low-low” TFRs are found (Figure 4-1b). Third, the GWR model does not fit well in central regions including Hunan, Jiangxi, Hubei, and Henan provinces.

Figure 4-4. GWR Model Fit

a. Local R-squared



b. Local Standardized Residual



5. Discussion and Conclusion

After almost forty years of economic development and implementation of family planning policies, fertility patterns in China now present a mixed picture across space. In some places, the variations of TFRs can still be explained within a conventional development framework; in others, clusters of low TFRs might suggest the emergence of new fertility regimes that are distinctive from the processes of the first demographic transition.

The spatial variation of TFRs might be caused by the variations in socioeconomic development and fertility policy as well as in local contexts such as culture and norms. Using geocoded 2010 county-level census data and GWR models, I found that the effects that the socioeconomic development and fertility policy factors have on TFRs vary spatially in terms of direction, magnitude, and significance levels. Moreover, the varying relationships do not follow predefined provincial administrative boundaries, suggesting spatial variation both between and within provinces. I revisit the four hypotheses as follows.

First, the role that economic development plays varies across space, in particular in rural areas. For example, variables such as *poor living standard*, measured as households' access to a set of modern household facilities, have different signs in northeast and northwest areas after controlling for the composition of rural population. In addition, the significant positive effect of *rural Hukou* is found only in places close to Beijing, suggesting that there is some unique rural residency characteristic in this place that operates independently from economic and fertility policy factors.

Second, the relationships between *female education* and TFRs are place specific. The GWR results suggest significant negative relationships between female education and TFRs in only a few places, such as inland Sichuan province and border counties between Guangxi and Guangdong provinces; but the relationship is positive in northwest regions. Moreover, although I did find positive relationships in places such as middle and southern China, where traditional family norms are strong (see Figure 4-3), the relationship becomes insignificant after I correct for multicollinearity in the inference test.

Third, fertility differences overlap with cultural boundaries. This hypothesis is confirmed in the subsequent GWR models. The local R^2 map (Figure 4-4a) and residual map (Figure 4-4b) show that Tibet, the northern part of the Xinjiang and Qinghai have low model performance and non-random distribution of residuals. These results coincide with observations of historical fertility decline in Europe, in the sense that the diffusion of behaviors, technologies and social norms is faster among the people who share the same culture and languages (Bongaarts and Watkins 1996). The existing studies on fertility in Tibet and Xijiang have documented distinct social, cultural, and political identities as well as family and childbearing patterns (Attané and Courbage 2000; Childs et al. 2005; Liu et al. 2005). It is possible that these distinctions likewise affect fertility behaviors in these regions.

Fourth, the existing socioeconomic and policy variables have low explanatory power in places with significant clusters of low TFRs. The LISA map (Figure 4-2b) indicates two types of areas with spatial clusters of low TFRs: large metro areas (such as the greater Beijing and Shanghai areas) and vast areas in northeast China. The subsequent GWR analysis further shows that the GWR model has good performance in metro areas but not in areas in northeast China. In particular, the model fit is as low as 0.12 in the northeast, indicating that the existing seven predictors

altogether (*rural Hukou*, *ethnic minority*, *female education*, *net migration*, *poor living standard*, *sex ratio at birth*, and *fertility policy compliance ratio*) cannot explain the clusters of low TFRs in the northeast. This suggests that there might be new social, cultural, and economic conditions accounting for the clusters of low fertility in northeast areas of China. To this end, these findings speak directly to place-specific and context-specific research about fertility trends in China. The GWR method is used as a “spatial microscope” (Fotheringham et al. 2003) that detects distinct place-specific relationships that otherwise may be dismissed in global models.

That said, this study has two limitations that should be addressed in future research. First, the 2010 county-level TFR suffers from measurement error due to the underreporting of births, which is a long-known issue in the census of China. The issue of measurement error would be of less concern if the errors were spatially homogenous and did not correlate with any independent variables. However, existing literature suggests that the underreporting of births occurs more often in rural areas than in urban areas and that births of girls are more likely to be underreported than births of boys (Goodkind 2011; Li, Zhang, and Feldman 2010; Shi and Kennedy 2016). If it is the case, it is likely that the estimated coefficients of *rural Hukou* and *sex ratio at birth* are biased downwardly. It should also be noted that most of the existing studies that aim to address underreporting of births are conducted at the national level, using inter-census backward projection to compare cohorts that are enumerated between censuses (Cai 2013). I used unadjusted data in this study, because in order to correct the underreporting of births at the county level using the same methodology, one needs to take children’s inter-county migration trends into account, but the data are not available. Future studies should tackle the issue of birth underreporting at the county level in order to better understand the relationships between TFR and the variables of interest.

Second, the study is limited by using only census data, which does not include direct measures of the economic development level, such as gross domestic product per capita or average household income. Also, the statistics on child mortality are not available at the county level, and this is one predictor that has been found to be highly associated with the fertility level (Işık and Pınarcıoğlu 2006; Zhang 1990). In addition, this study focused on describing the spatial heterogeneity of fertility patterns for only a single year; therefore, it cannot be used to make inferences on the causal relationships of these determinants. To better understand fertility transitions over time and across space, further research is needed to utilize different data sources for multiple years.

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CHAPTER 5

Conclusion

The overarching objective of this dissertation is to examine how structural and cultural forces are interacted and manifested to affect demographic patterns and individual well-being across space and over time. To empirically operationalize this rather abstract idea, this dissertation uses three analytical chapters—each with its own distinctive, substantive focus—to demonstrate the intricate and complex interplay between structure and culture in affecting demographic patterns and individual well-being.

This dissertation draws insights from several subfields of sociology and demography, including development studies, sociology of culture, spatial demography and life course studies. Although these subfields have their own distinctive research agendas and substantive focuses, they nevertheless all pay close attention to the ways that people react differently under different social contexts. Informed by this common theme, this dissertation focuses on describing how individuals' behaviors and perceptions are shaped under different historical, social and spatial contexts.

In this concluding chapter, I first review each analytical chapter. In reviewing these chapters, the goal is to revisit how each topic fits into the broad development context of China, as well as the substantive findings that advance the understanding of the relevant

subfields. Next, I discuss the overall contributions and policy implications of this dissertation. The last section discusses the limitations as well as future research directions.

1. Summary of Main Findings of the Three Analytical Chapters

Chapter 2: Perceptions of Aging Among Elders in China

Overall, this dissertation adopts a multilevel perspective, in the sense that each analytical chapter deals with one arrow presented in Figure 1 in the introductory chapter. In Chapter 2, I examine how macro-level social and cultural change shape micro-level individuals' perceptions of aging. Often considered as a culturally related construct, an elder's perception of aging is identified as an important dimensions of old-age subjective well-being and thus has drawn increasing scholarly attention (Lai 2009; Levy and Myers 2005; Zhao et al. 2017).

However, the variations in the perceptions of aging over time are less clear. In Chapter 2, I argue that elders' perceptions of aging can be interpreted as combinations of both cohort and aging effects. For one thing, as extensively discussed in Chapter 1, because of the rapid social change that occurred in China over the past six decades, there have been salient cohort effects found in many dimensions of social life (Fan 2015; Wu and Xie 2003; Zhou and Hou 1999). I therefore also expect to see strong cohort effects for elders' perceptions of aging. For another, elders' perceptions of aging are also contingent on their

personal life experiences and health; therefore, I expect to see changes in elders' perceptions of aging as they progress in their biological age.

To differentiate cohort and aging effects on elders' perceptions of aging, Chapter 2 uses all seven waves of the Longitudinal Healthy Longevity Survey (CLHLS) that spans 16 years (1998–2004). I use two variables to capture elders' perceptions of aging: elders' feelings of uselessness with age and feelings of happiness with age. Several findings emerge from the growth curve models. First, the baseline model shows significant cohort effects on elders feeling useless with age and feeling happy with age. When controlling the cohort composition (measured by the elder's highest education and last occupation before retirement), the cohort effects becomes insignificant. This suggests that the cohort differences in elders' perceptions of aging are largely attributable to the changing education and occupation compositions among cohorts that are born during different historic times. Second, significant age effects emerge even after accounting for cohort composition and other time-varying covariates. Specifically, the model shows that with the progress of age, elders become increasingly less happy and feel more useless with age. Third, besides cohort and aging effects, there also exist within-cohort variations; this is captured by the significant cohort-by-education interactions in the growth curve model.

Chapter 3: Transition Pathways in Education, Work, and Home-Leaving among Rural Gansu Youth of China

While Chapter 2 showcases how structural and cultural change inform changes in perceptions of aging, Chapter 3 describes how structure and culture resources influence individuals' demographic behaviors (Arrow 2 in Figure 1). In particular, Chapter 3 focuses on examining rural youth's pathways into adulthood at Gansu Province. Rural youth is

often a neglected subpopulation in policy conversations, and this is largely due to the legacy of the nation's urban-centered development agenda that has been implemented for over six decades. Recent studies find that rural youth are faring increasingly worse over the past ten years compared with their urban peers. For example, rural schools lost a substantial share of central government subsidy, due to the decentralized financial reform that took place in the educational sector (Hannum 2003). About one third (58 million) of the contemporary rural children grew up without their parents' company, as their parents migrated to urban areas to seek jobs (Jia and Tian 2010). Furthermore, when these children became young adults, some of them quit school early and joined the rural-to-urban migration flow to look for jobs.

However, no studies have examined rural youth's transition experiences in education, work and home-leaving patterns in a holistic manner. In Chapter 3, I first seek to understand the sequence and timing of these three demographically important activities that occur during the period from adolescence to early adulthood. Drawing on retrospective life history data from the 2009 wave of Gansu Survey of Children and Family (GSCF) and applying Latent Class Analysis (LCA), I identified six distinctive transition patterns: (1) vocational school attenders, (2) local high school attenders, (3) move for high school, (4) move to work, (5) late middle school finishers + move for work, and (6) late middle school finishers + local high school attenders.

Having examined rural youth's diverse transition pathways, I then examine the second research objective, which is to identify how family, community and youth's agentic orientations play roles in affecting their transition pathways. Two major findings emerge

from the second half of this chapter. First, youths' transition pathways are largely predicted by the family and community resources available to them. Second, beyond family and community resources, youth's educational aspirations offer additive explanatory powers in predicting their transition pathways.

Chapter 4: A Spatial Perspective of Fertility Patterns of China

Chapter 4 highlights spatially varying relationships between fertility rates and an array of economic, social, political and cultural factors. Although the unit of analysis is at the aggregate (county) level, this study informs how micro-level individuals' fertility behaviors, shaped by structural and cultural resources, manifested as spatial heterogeneities of fertility rates at the macro-level (Arrow 3 of Figure 1 in the introduction chapter). In so doing, it addresses a seemingly paradoxical phenomenon: why the mechanisms of fertility behaviors, summarized from national-level studies, do not entirely coincide with what in-depth case studies describe. For example, increased female education, viewed from an aggregated national level, is considered to be one of the major driving factors of fertility decline. However, case studies at the local level reveal that the relationships between female education and fertility levels are much more dynamic, such that the negative relationships are often tempered by the local traditional fertility norms (i.e., desire for a larger family) (Peng 2010).

I argue that this seemingly paradoxical phenomenon can be well explained from a spatial perspective. The national-level, aspatial analysis masks the intricate dynamics of fertility changes at the local level. The fertility dynamics that the ethnographic/regional

case studies describe precisely reveal the importance of taking into account place-specific contexts in order to have an in-depth understanding of fertility change in China.

Based on this premise, Chapter 4 proposes four hypotheses on the conditions where the general observations of fertility change mechanisms may be tempered by local contexts: (1) the negative relationships between economic development levels and fertility rate are conditioned by local fertility norms, such that places with strong traditional family norms (measured by sex ratio at birth) will exhibit positive or insignificant associations between economic development and fertility rates; (2) percentage of rural population, which is often regarded as being positively related with fertility level, will not be positively associated in places where modern small family ideals are prevalent; (3) the negative associations between female education level and fertility will only hold when economic development reaches to a certain threshold, and/or when the traditional family norms are not prevalent; and (4) The spatial clusters of low fertility rates are not sufficiently explained by the commonly identified socioeconomic, policy, or cultural factors. In another words, I expect to see worse model fitting in places where low fertility rates are clustered.

Using the geo-coded county-level 2010 census data and applying the Geographically Weighted Regression (GWR) method, the results show that there are distinctive places where the relationships between fertility rates and the structural and cultural factors differ from what national level studies would predict: (1) Large metro areas and their surrounding places, such as Beijing and its surrounding areas. The GWR results show that the significant positive effect is only found in places close to Beijing, which suggests that there are some unique rural residency characteristics in Beijing and its nearby

areas that operate independently of economic and policy factors. (2) Places where ethnic populations are clustered, such as Xijiang and Tibet Autonomous regions. The local coefficient map of GWR shows that the variables that intend to capture the structural differences, such as female education, are positively related with fertility rates in these areas. (3) Places where low fertility rates are clustered, in particular the northeastern region. The overall model fit in the northeast region is particularly low, suggesting that the seven variables included in the model do not explain much of the variations of the northeastern region.

2. Contributions and Policy Implications

Taking all this together, the findings reported in this dissertation advance existing studies on how economic, social institutional and cultural changes affect demographic patterns and individuals' perceptions and well-being. For example, in Chapter 4, I show that the economic, policy and cultural factors have distinctive explanatory power in describing fertility variations in different places of China. I argue that the driving forces for spatially heterogeneous fertility behaviors are the combination of uneven economic development paces as well as different fertility norms across space. In Chapter 3, I show that structural resources/opportunities (such as family socioeconomic resources and community educational resources), and youth's agentic orientations toward the future—a concept that is closely related with individualized cultural orientation—together predict youth's pathways in education, work and home-leaving.

In addition, this dissertation adopts a dynamic view of life-course processes, thus revealing how individuals' lives are embedded within a larger historic context and unfold over time in a diverse manner. For example, existing studies on the transition into adulthood find that youths' transition pathways are becoming increasingly diverse as society becomes more modern (Shanahan 2000), and Chapter 3 identifies six pathways into adulthood, clearly showing the diversity of the pathways to adulthood of the youth in the sampled GSCF survey. In a similar vein, the second half of the analysis in Chapter 2 reveals substantive within-cohort variations in elders' perceptions of aging. In particular, elders with different socioeconomic statuses exhibit different changes in perceptions of aging over time, even if they are born in the same cohort.

Furthermore, in terms of methodological contribution, this dissertation also highlights the value of taking into account spatial heterogeneity to better model the intricate dynamics of social processes. For example, an advantage of applying GWR in Chapter 2 is that spatial processes of fertility change are modelled in a (near) continuous manner. The spread of new knowledge, norms and behaviors does not necessarily align with administrative boundaries; therefore, the impacts of the variables need to be modelled beyond administrative boundaries. In Chapter 2, I use the smallest geographic unit available for fertility-related data of China—the county level—and impose no further pre-determined spatial structures on the model. The results show that the varying relationships between an array of economic, social, policy and cultural factors and fertility rate do not follow predefined administrative boundaries at a higher level (such as provincial boundaries).

As far as policy implications are concerned, one of the most important policy implications that can be drawn from this dissertation is that a context-specific policy-making strategy is the way to go. Because people react differently in the face of different or even the same structural constraints, successful policy making needs to go beyond the search for a universal policy strategy. Instead, policy makers need to seek an in-depth understanding of local contexts before designing relevant intervention programs.

This dissertation also reveals problems generated by urban-centered development policy agendas. China has been implementing an urban-centered development strategy since 1949. Even after 1979, when the economic reform was initiated, the urban-centered policy agenda is still largely preserved (Whyte 2010). To date, mounting research has found that social inequality in China is mainly manifested as regional/rural-urban inequality, instead of as household inequality (Wu and Treiman 2004; Xie and Hannum 1996). Today about half of the population in China still lives in rural areas, and 40 percent of that population is under age 30 (Census Bureau 2015). In Chapter 3, I show that one of the repercussions of the urban-centered development agenda is that rural youth are facing many spheres of structural barriers in their pathways in transition into adulthood. Together with many existing studies (Hannum and Park 2007; Kirk 1996), this dissertation shows that systematic policy actions need to be taken to address the widening rural-urban gap in virtually every aspect of Chinese social life.

3. Limitations and Future Research Directions

This section discusses the issues that are left unaddressed in the three analytical chapters and my future research directions. In discussing the limitations and future research directions, I focus on three areas: theory, data, and measurement.

3.1 A Better Integration of Spatial and Life Course Thinking

This dissertation relies heavily on spatial and life course thinking, because they both are powerful frameworks for contextualizing human behaviors. However, across the three empirical chapters, I still largely treat changes over time and across space as if they are two separate processes. Admittedly, it would be incorrect to assume that spatial thinking exclusively deals with space and that life course thinking deals only with time. For example, one of the five principles of life course theory is “human development in time and place” (Elder, Kirkpatrick Johnson, and Crosnoe 2003). Life course scholars are well aware of the importance of space, because geographic locations are an important context in shaping people’s life trajectories over time. On the other hand, scholars who conduct spatial analysis are also well aware of the importance of change over time. This is reflected by the increased appreciations for spatial-temporal studies across many social science subfields (Bivand and Brunstad 2005; Curtis et.al 2018; Chi 2010; Goodchild 2000; Weeks 2004).

Despite the fact that both spatial and life course thinking acknowledge the importance of incorporating both spatial and temporal dimensions in the empirical studies, there is limited conversation between these two realms of thinking. For example, life course scholars tend to view space as discontinued, taken-for-granted, or sometimes fixed

constructs that are defined by administrative boundaries. This perception ignores the sustained concern and debate among spatial social scientists about the fluid nature of space, about how spatial boundaries are shaped, defined and re-defined by policy and research agendas (Fowler, Rhubart, and Jensen 2016; Irwin 2007). In a similar vein, the way that spatial-temporal analysis deals with time, if using life course scholars' jargon, would be mostly "period effects." Doing this underutilizes the rich information decipherable by looking at time from different angles.

Although these two frameworks deal with distinctive research topics, have different research agendas, are accustomed to different unit of analysis and rely on different data sources, I nevertheless foresee that with the progress of data resources and methodology, better integration between these two can yield deeper theoretical insights and broader practical applications in both fields.

3.2 Reflections on Data

This dissertation uses both population census and survey data. One needs to acknowledge that substantial progress has been made in collecting survey data in China in recent decades. Besides the two surveys used in this dissertation (CLHLS and GFCS), there are many others, such as the China Health and Nutrition Study (CHNS), a longitudinal survey that started in 1989 and has now just completed its tenth waves (North Carolina Population Center, 2015); the China Health and Retirement Longitudinal Study (CHARS), a study designed to be comparable to the Health and Retirement Study in the U.S. (Zhao et al. 2013); and the Chinese Family Panel Study (CFPS), a longitudinal study designed to be

comparable to the Panel Study of Income Dynamics (Xie and Hu 2014), to name a few. Therefore, social scientists who are interested in topics related to China have more choices, since nowadays there have been survey data collected in China that are comparable to data collected in the U.S. and other nations in terms of data quality, coverage and content.

However, for researchers interested in the spatial processes of human behavior, the population census is still one of the primary sources to rely on. The decennial census is often considered as providing the benchmark of portraying a nation's demographic profiles. The role of the population census, defined by the United Nations, is "to collect, process and disseminate small area detailed statistics on population, its composition, characteristics, spatial distribution and organization" (United Nations 2008:29). Compared with the census data in other nations, the population census data in China have their own peculiarities. On one hand, due to China's strict household registration system, the decennial census is often considered as having relatively good coverage and response rates (Wu 2014). However, the Chinese census has been widely criticized because of its inaccurate reports of fertility-related information (Zhang and Zhao 2006).

For scholars who do not directly work with census collecting processes, it is necessary to examine the census data quality. Moreover, given that the current research on this topic has been exclusively focused on the overall assessment of census data quality at the national level, evaluating census data at finer geographic scales is an especially pertinent task. Therefore, in future research, I would like to apply spatial thinking to evaluate Chinese census data quality. I argue that by evaluating census data quality at subnational scales and accounting for spatial patterns of data quality, researchers can obtain

a better understanding of how incentives from central and local governments as well as households all affect data quality. An extension of this line of future work would be using small-area Bayesian estimation techniques (Schertman and Hauer 2017) to empirically estimate misreporting uncertainties in population censuses at subnational levels.

3.3 Operationalize and Measure Culturally Related Constructs

A major theme running through this dissertation is that both structure and culture matter in interpreting people's heterogeneous behaviors/ perceptions. As discussed in the introductory chapter, with the theoretical advancement of the sociology of culture, culture can be operationalized and measured in many ways. In particular, culture can be considered a latent variable that reflects the "shared meanings, values or beliefs among people" (DiMaggio 1997:265). Culture can also be considered as a toolkit or as frames that people rely on when interpreting behaviors (Swidler 1986).

However, across the three analytical chapters of this dissertation, my approach in operationalizing and measuring the concept of culture is still much in line with the former rather than the latter. For example, in Chapter 2, elders' perceptions of aging are captured by their feelings of uselessness with age and feelings of happiness with age. In Chapter 4 the traditional fertility norms are captured using sex ratio at birth. Could culture, when viewed as tool kit that people rely on instead of values and beliefs that provide motivation for action, be captured in empirical, quantitative analyses? Or is in-depth ethnographic research the only way to obtain better understandings of how culture informs action? This is another future research area I would like to explore.

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