

Family Ties, Economic Resources, and the Well-Being of Older Adults

Across Communities in China

by

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Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor
of Philosophy in the Department of
Sociology in the Graduate School
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ABSTRACT

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Abstract

Many older adults in the developing world rely on their adult children for financial, instrumental, and emotional support. The People's Republic of China (PRC), which will experience rapid population aging in the current century, is no exception. Many scholars and policy-makers are concerned that rapid economic, social, and demographic change in China is leading to a decline in traditional support for aging parents. This study examines the impact of family ties and economic resources on the receipt of support and the health of older adults across communities in China at different levels of economic development.

I analyze data from the 2002 and 2008 waves of the Chinese Longitudinal Healthy Longevity Survey (CLHLS) as well as the 2000 and 2005 1% Chinese Census. Initiated in 1998, the CLHLS interviewed older adults residing in a random sample of counties and cities in 22 provinces and municipalities of China. Additionally, in 2002 a subset of adult children of CLHLS respondents were also interviewed in a separate survey. Furthermore, the 2008-2009 wave collected additional data from middle-aged and older adults residing in specially designated "longevity areas" in China. In addition to the standard questionnaire and health exam, samples of blood and urine were also collected by medical personnel.

The first empirical chapter of this dissertation examines the association between filial piety/altruism and financial transfers to aging parents from adult children using factor analysis, binary logistic regression, and linear regression. The second paper looks at the socioeconomic-status health gradient using biomarker data among older adults residing in longevity areas using binary logistic regression analysis. The third paper examines both individual-level and community-level determinants of non-normative intergenerational coresidence – living with an adult daughter instead of an adult son-- through multilevel binary logistic models analyzing both survey and census data.

I find that (1) adult children's attitudes towards filial piety and family values are associated with both presence and amount of financial transfers to older parents, net of controls for adult child's socioeconomic status, parental need, parents' earlier life transfers to children, and whether elderly parents' provide instrumental support to adult children. (2) Similar to previous research in middle-income countries, many biomarkers were not associated with socioeconomic status but those that were demonstrated a reversed gradient – higher socioeconomic status was associated with worse health. (3) Greater numbers of daughters, higher levels of individual socioeconomic status, and residing in a more developed community was associated with greater likelihood of coresidence with adult daughters versus adult sons.

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1. Introduction

China is a fascinating context within which to study the family because of the dramatic demographic, economic, and social changes that have shaped the nation.

Scholars and policymakers alike are interested in whether or not traditional support to aging parents will decline in the future as the country experiences population aging.

A heightened awareness of and interest in all things regarding China have included its aging population. The aging of the population, combined with the tumultuous social and economic changes of the last one hundred years, generates concern about family support and the well-being of older Chinese. This introduction aims to give an overview of the demographic, economic, and social changes that have taken place in China over the past century. I am interested in knowing how these changes have (or have not) impacted family support and the well-being of older adults.

1.1 Overview of Demographic, Economic, and Social Changes in China

1.1.1 Demographic

China is well-known for its population, the largest of any country on earth, accounting for one-fifth of the world's population. Current interest in the number of people in the Middle Kingdom springs not merely from its absolute size (over 1.35 billion by official estimates) but also from its trajectory of growth. Now, as China seeks

to join the ranks of middle-income countries, these challenges are compounded by the changing age structure of this population, particularly by its rapid aging.

China's population has increased from just over a half billion in 1950 to 1.35 billion in 2010. The total size is expected to peak in 2030 at nearly 1.5 billion according to the United Nations Population Division medium scenario. Population growth was spurred by high fertility rates and decreasing mortality rates in the first few decades after the founding of the People's Republic of China (PRC) in 1949. Although fertility has declined dramatically to below replacement levels in the 2000s, population momentum causes continued population growth. China's life expectancy at birth has also risen rapidly from about 40 years in 1950 to approximately 73 years today (average of males and females).

The PRC will experience rapid population aging in the 21st century; in fact this process has already begun. This includes tremendous growth in both the proportion and absolute number of older adults. According to United Nations medium-variant projections, older adults (those aged 60 and older) will constitute nearly one-third of the population by the year 2050. This is a three-fold increase from its 10 percent proportion in the year 2000. This is due to such trends as fertility decline, increasing life expectancy, and age structure dynamics. Large cohorts of young people move through the life course and gradually become a relatively large older generation, taking up a greater fraction of the whole as new cohorts of youth are relatively smaller and smaller in size.

The analysis by Coale, Feng, Riley, and De of birth rates using surveys from the State Family Planning Commission of China gives us an overview of the total fertility rate (TFR) from 1950 to 1987, as shown in Figure 1 (Coale et al. 1991). Fertility rates were stable from the 1950s until 1970, except for (1) an abrupt decline during the “Great Leap Forward” crisis and (2) a subsequent baby boom in 1963 associated with the return to normalcy, and (3) another dip in 1967, the first year of the Cultural Revolution. In the 1970s and 1980s, births declined sharply from about 5 births per woman to slightly above 2. This was due in large part to China’s family planning policies. The first policy was the “later, longer, fewer” (*wan xi shao* in Chinese) program – later marriage, longer birth intervals, and fewer children – and later, the well-known “One Child Policy”¹. In recent years, data on the total fertility rate in China have been questioned because of child underreporting. A recent paper comparing different sources and calculation methods of fertility rates presents the TFR ranging from about 1.8-2.1 in 1991 and declining to 1.4-1.6 in 2007 (Goodkind 2011). This means China’s TFR has gone from a height of more than 7 (in 1963) to a possible low of 1.4 (in 2007) in a 44-year period.

¹ For more in-depth discussions of China’s fertility policies, see Gu *et al.*, 2007.

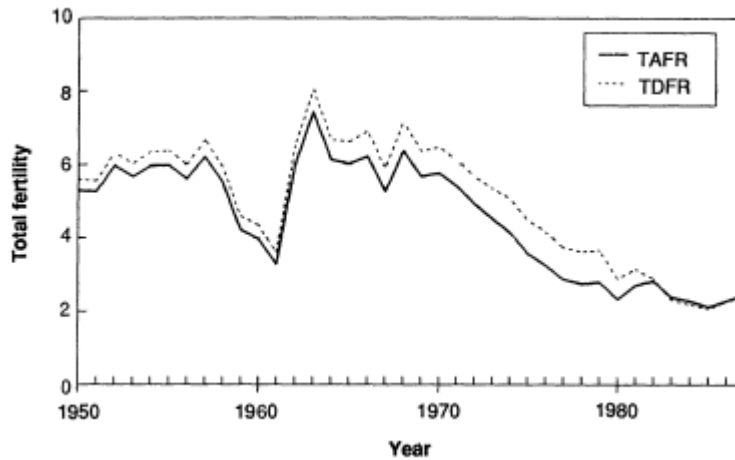


Figure 1: Total age-specific and duration-specific fertility rates in China, 1950-1987 (from Coale et al 1991:390)

China's fertility policies and traditional preference for sons over daughters have combined to produce a dramatic rise in the sex ratio at birth (SRB) and excess mortality of baby girls (Das Gupta and Li 1999; Li 2007; Zeng et al. 1993). Scholars are concerned that this dangerous situation will lead to increased levels of violence and antisocial behavior, as millions of men will be unable to find wives (Banister 2004; Das Gupta, Ebenstein and Sharygin 2010). The sex ratio at birth was in a normal range in China in the 1950s and 1960s because families could have multiple births in order to produce a son. The SRB has risen over time: according to the 1 percent population survey in 2005, the country's overall SRB is 118 (Li 2007). Sons are preferred for a variety of reasons, including continuing the family line (in traditional Chinese society, a married daughter is considered part of her husband's family), old-age security, provision of labor, and performance of ancestral rites.

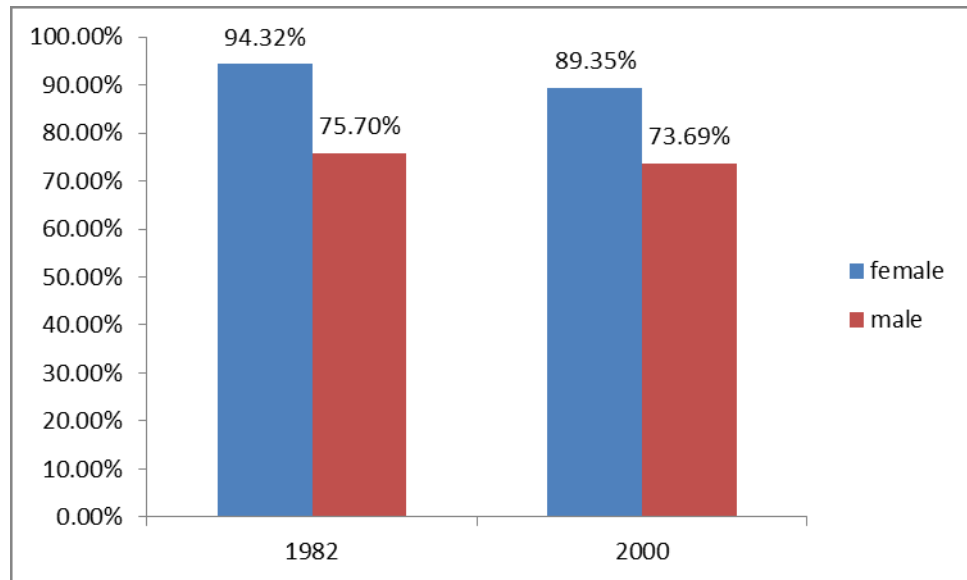


Figure 2: Percentage of 25-29 year olds married by year and sex (data from United Nations Population Division 2008)

Coale and his colleagues (1991) also document marriage trends in the 1950s, '60s, and '70s. The mean age at first marriage for women rose from under 19 in 1950 to over 23 in 1979. This trend is attributed to changes in the legal age at marriage and to family planning policies that encouraged later marriage. Figure 2 shows the percentage of young adults (ages 25-29) who are married in 1982 and 2000. The majority of young women are married by the time they reach age 30, and this has only slightly diminished between 1982 and 2000. Traditionally, men marry later than women and to younger women.

Migration from rural to urban areas is another major demographic phenomenon taking place in China since the mid-1980s. This flow of labor is the largest in human history, with 50 million rural migrants residing in urban areas in the mid-1990s (Zhao

1999) and increasing to over 100 million in the early 2000s (Chan 2010). Migration in China is highly regulated and has been an important part of the national industrialization strategy. Permanent migration from rural to urban areas (or vice versa) is restricted by the Chinese household registration system – *hukou*. This household registration record identifies a household as being agricultural (rural) or non-agricultural (urban). Individuals within a household are also classified by the household's urban/rural *hukou* dichotomy. The *hukou* system, as well as the circulatory and temporary nature of migration, makes measuring the movement of people in China especially difficult.

China also experienced major improvements in health during the first 30 years of the PRC as a result of public health campaigns and access to healthcare for both rural and urban citizens. From 1952 to 1982, the infant mortality rate (IMR) fell from 200 to 34 per 1000 live births. When China opened up to the world in the 1970s, it had better health (IMR) relative to per capita income than other developing countries. After economic reforms, health has again improved but at a slower rate. By the 2000s, the leading causes of death in China were from chronic conditions and not infectious diseases (He et al. 2005).

1.1.2 Economic

After the Chinese civil war and the Communists' rise to power, one of the first major economic changes came in the land reform program. Titles to land were

redistributed from landlords and more prosperous farmers to farming families that previously owned little or no land. After land reform, farmers were encouraged to cooperate through the formation of small “mutual aid teams.”

In 1953, under the leadership of Mao Zedong, the state proposed the first Five-Year Plan (1953-1957). The Soviet economic model, which focused on state ownership in modern industrial sectors, large collective agriculture, and central economic planning, was adopted. The main objective was high economic growth with a focus on the development of heavy industry. This included expansion of steel, electricity, mining, and machine-building, along with education and research infrastructures to support these industries (Rawski 2011).

In 1958, Chairman Mao launched the “Great Leap Forward”, a five-year economic plan aimed to increase industrialization and collectivization. In rural areas, land, tools, livestock and labor were absorbed into large “People’s Communes.” In urban areas the state invested funds in industry and added millions of workers to the state payroll. These goals and programs encouraged steel production through the establishment of “backyard steel furnaces” in every village and urban district.

This plan resulted in a breakdown of the economy and the deaths of millions (estimated between 18 and 45 million) due to starvation brought on by poor management and poor harvests. The “Great Leap Forward” was abandoned by late

1960. The period from 1958 to 1962 is the only period in modern China that witnessed negative economic growth.

The Cultural Revolution (1966-1976) was a mass movement launched by Chairman Mao during his final years in power. This decade-long movement caused massive political, social, and cultural disruption to the nation. Mao's aim was to renew the spirit of the Chinese revolution through class struggle to produce a "continuous revolution." The Cultural Revolution was officially launched at the Eleventh Plenum of the Eighth Central Committee in August 1966. Schools were shut down and Red Guards (groups of militant students) were encouraged to attack all traditional values and "bourgeois" elements. The movement quickly escalated, resulting in physical harm and even death to elderly people and intellectuals. An estimated 1.5 million people were killed during this period, and millions of others suffered imprisonment, loss of property, torture, and general humiliation (Lieberthal 2013).²

Beginning in 1978, China launched several economic reforms under the leadership of Deng Xiaoping. China moved from a planned economy to a market economy. Economic control was given to provincial and local governments, and they were generally allowed to operate and compete on free market principles. Special economic zones were set up to attract foreign investment and boost exports. Additional

² For a more detailed description of the Cultural Revolution, see Yan and Gao's book "Turbulent Decade: A History of the Cultural Revolution" (1996).

coastal cities were also designated as open cities, allowing them to experiment with free market reforms, including tax and trade incentives to attract foreign investment.

Removing trade barriers was a major key to China's economic success

In rural areas, the household responsibility system was fully adopted in 1981. This returned plots of land to individual families. Agriculture was privatized again and the farm household had control over its own land, what to produce, and how to market it. In addition, the economic reforms freed surplus rural labor. Peasants could now also be involved in individual businesses and town and village enterprises³ (TVEs). In the 1990s there were 20 million TVEs which produced one-third of China's GDP. In addition, rural people left farms and moved to towns, and eventually cities. Overall, rural per capita income increased rapidly from 1978 to 1988 (Nee and Su 1988).

The restructuring of China's economy has resulted in a ten-fold increase in GDP since 1978. Annual GDP growth in recent years has been as high as 14.2% in 2007 (Economist Intelligence Unit). In 2010 China became the world's largest exporter. China now stands as the world's second-largest economy (after the United States). Per capita income, however, is still below the world's average (\$4,940 in 2011 according to the World Bank) and over 170 million people live below the poverty line (as measured by less than \$1.25 per day).

³ Town and Village Enterprises (TVEs) are market-oriented semiprivate firms under the jurisdiction of local governments in townships and villages in the PRC.

China's continuing rapid economic growth brings challenges, including high income and wealth inequalities and environmental degradation. The 12th Five-Year Plan (2011-2015) addresses these issues, highlighting measures to reduce environmental pollution, to improve access to education, and to expand social protections, including healthcare.

1.1.2.1 Social Welfare

For many decades, China's welfare policies in cities were limited to disabled veterans and "the three no's" – those with no families, no ability to work, and no source of income. This included mainly childless elderly, disabled homeless people, and orphans. The size of this population was small during pre-reform China, and the problem of urban poverty, therefore, was limited.

China's economic reforms have led to a decline in the social welfare system as it was previously provided to urban workers, namely by their work units. A number of both rural and urban peoples are now part of 'vulnerable populations' – including the unemployed, rural migrants in cities, and low-income families.

Since the late 1990s, the central government has been seriously developing means-tested social assistance programs. The Minimum Living Standard Guarantee System (MLSGS, or *dibao* in Chinese) began in 1994 and was adopted in all cities by 1999. This program provides assistance to urban *hukou* holders. The assistance amount is calculated according to a minimum standard of living. In 2003, the average national

assistance level was 160 Yuan per person per month, which accounted for only 14% of the average wage. Levels are higher in large coastal cities and lower in county-level cities (Leung 2006). Wealthier cities have also developed supplementary benefits such as food assistance.

Since 2007, the MLSGS has been extended to rural areas. Prior to this, most vulnerable groups in the countryside could rely only on the '5 guarantees' (*wubao*). These guarantees fell into 5 categories: food and fuel; clothing, bedding, and pocket money; housing; medical care; and a funeral expenses (Xu and Zhang 2012). Poverty in rural areas has also been reduced through abolishing agriculture taxes and school fees.

Reform of the pension system in urban areas has only recently begun, and these new programs also provide assistance at only a small fraction of the average wage level. A defined-contribution pension is funded by individual contributions and subsidies from the central and local governments. A participant who reaches age 60 after contributing for 15 years can get a monthly minimum of 55 Yuan plus a percentage of the total funds accumulated in the individual account. For those who are already age 60 or older, they can receive the basic pension without any individual contribution (Xu and Zhang 2012).

Pilot programs for rural old-age pensions were begun in the early 1990s. Originally the central government provided only guidance and support to the "old-age pilot program", and funding came from the contributions of individual farmers and

funds from village and town governments. In recent years, the system is the same as that for urban pensions – both individuals and local and central governments are responsible for financing.

While the social welfare and pension systems are still being developed, the increased direct financial support of the central government greatly contributes to the potential success of these programs.

1.1.2.2 Health Care System

In the reform era, the development of China's health care system has lagged behind its economic growth. During the Mao era (1949 through 1970s) both rural and urban populations had access to health care. For rural people, access to basic health services was managed under the cooperative medical systems (CMS), part of agricultural communes. The "barefoot doctors" that were part of these systems provided basic health services and immunizations to China's large rural population. Although these "doctors" had minimal training, widespread availability of basic medicine (including both Western and traditional Chinese medicine) and emphasis on the control of infectious diseases led to major health improvements. Urban residents had health insurance through their work units, either through the Labor Insurance System or the Government Insurance System (Eggleston 2012).

By contrast, in the early 1980s the government dismantled the health care system. Specifically, the central government reduced its spending on health care services, from

32% to 15% (of total health spending) between 1978 and 1999 (Liu 2004). Instead, the responsibility for funding health care fell to provincial and local governments through taxation. This heavily favored wealthy coastal regions over the poorer regions in the interior. In addition, individuals in both rural and urban areas had to pay fees for services. Furthermore, when rural agricultural collectives transitioned to the household responsibility system, the financial base of CMS weakened and eventually collapsed (2005).

In an attempt to maintain lower costs, the government imposed price regulations on basic services and routine surgeries and tests. Hospitals could, however, earn a profit from new drugs, tests, and procedures (Blumenthal and Hsiao 2005). In addition, practitioners could receive bonuses if their hospital generated a certain amount of revenue.

In recent years, health care reform has been a policy focus of the central government. The New Cooperative Medical Scheme (NCMS) for rural residents began in pilot areas in 2003. Under this system, farmers pay premiums, and the (central) government provides matching funds. By 2009, the program had expanded to the point that 94% of villages offer NCMS. In urban areas the Urban Employees Basic Insurance System (UEBMI) was established to replace work-unit coverage. Risk is pooled at the municipality level (Liu 2011). More time and evidence are needed to determine whether these two new insurance programs will lead to greater overall insurance coverage of the

population and will also reduce poverty brought on by catastrophic health care expenditures.

1.1.3 Social

In Mao-era China, society was strictly stratified along at least 3 different lines: 1) a rural-urban division in residential status controlled through the household registration (*hukou*) system; 2) a cadre-worker dichotomy; and 3) a “revolution-antirevolution” dualism in the political realm (Bian 2002). Under the *hukou* system, individuals were restricted from migrating, and rural people were cut off from many urban privileges – higher-quality schools, health care, housing, and food. Urban residents worked for the state, where they were assigned jobs and were provided from the “iron rice bowl”, which guaranteed employment, insurance and welfare benefits that were not offered to rural residents who worked in agricultural collectives. Cadres were members of the Communist party who received extra compensation and were more likely to occupy managerial positions. They also had the potential of being promoted to leadership positions within the party and government. It was very rare for a worker to be promoted to a cadre.

Moreover, all individuals and households were evaluated politically and labeled part of either the revolutionary (“red”) or antirevolutionary (“black”) classes. Those in the black classes were class enemies of the regime. Primarily, this distinction was accorded based on a family’s social class prior to the land reform of the late 1940s. Those

without property would be red and those whose families were landowners would be in one of the black categories. Political performance in party-led campaigns and activities could change a given class label. This culture of political labeling was most intense during the Cultural Revolution.

During the economic reforms of the post-Mao era, some state-sector urban workers kept their jobs, while many others were laid off. Some private entrepreneurs gained status in the market economy, and so did many cadres. The status of the intelligentsia remained unclear. While in the first few decades of the PRC, peasants were recognized as a “leading class”, post-1978 reforms differentiated the working class into wage labor: in the private sector (12 million as of 1998), unprotected labor in the state sector (70 million), laid-off labor (30 million), and deprived migrant peasant-labor (60 million) (Zhang 2000:30).

It is challenging to study social class in China today because of the still-evolving nature of social and economic structures and also ambiguous property rights structures (Bian 2002). While the Communist era reduced socioeconomic inequalities --within urban and rural areas if not between them – inequalities have increased since the implementation of economic reforms.

The status of women also changed under the Communist Regime. A marriage law promulgated in May 1950 espoused gender equality. Mass education campaigns were carried out between 1950 and 1953 to implement and popularize the new marriage

law, and to teach women how to exercise their rights. Communist party leaders argued for realizing gender equality and for self-determination for women so that they could make essential contributions to the social and economic life of the new China.

Developing “a prosperous, powerful, socialist China required that new identities, broader responsibilities, and new social values take precedence over many of the traditional family-centered values of the past” (Johnson 1983:97). Results of research on gender inequality in reform-era China are mixed (Entwisle and Henderson 2000). One insightful observation is that because market development eroded the power of the state as employer and advocate of women’s rights labor market discrimination against women has increased (Honig and Hershatter 1988). In rural areas, however, the market transition has created non-agricultural employment opportunities for women, thus potentially enhancing their status in the household.

After 1978, education as an instrument of economic development, in addition to political development, gained tremendously in importance. The financing of education became the responsibility of local governments, and poor areas that did not have the resources to finance education transferred the costs to families (Hannum 2005).

Although overall growth in income gave families more money to spend on children’s education, but children were also highly valued as laborers on the family farm. In other words, educating a child took him/her away from contributing economically to the household in the short-term.

1.2 Social, demographic, and economic influences on the family

How have the social, demographic, and economic changes over the past one hundred years in China impacted the family, particularly its oldest members?

In “traditional” China the family relied on a large kinship network. The family was guided by organizational principles dictated by Confucianism. Roles and responsibilities, both within the family and outside, were based on gender, age, and generation. This included the dominance of parents over children, old over young, and men over women. These principles were written into law and enforced by dynastic regimes (Lau 2007). They were also the foundations of the family and society, allowing these familial, social, and governmental structures to be mutually supporting and reinforcing.

During the Republican period, the primacy of Confucianism and the family began to decline. Young elites wanted to acquire Western education and technology in order to improve China. In that sense, youth had an advantage over older people in acquiring new skills and ideas. The May Fourth movement of 1919 specifically attacked Confucianism as the root of China’s political and social crises. Urban intellectuals also questioned the traditional family and its treatment of women. Such ideas, however, were limited to urban elites and did not extend to rural areas (Johnson 1983).

⁴ By “traditional China,” I mean Imperial China – the dynastic rule that existed for thousands of years before the founding of the Republic of China on January 1, 1912.

The Chinese Communist Party (CCP) was also hostile to Confucianism. The Communist focus on secularization weakened the historical family chain. Many traditional family customs, including ancestor worship, which in previous eras had helped cement family bonds, were targeted for reform. Ancestor worship contradicted Communist ideology (Wang 2004). Potentially, a reduction in the importance of ancestor worship might reduce filial piety, and put greater focus on the present-day immediate nuclear family (Thornton et al. 1995). In addition, funeral and mourning rites that had been practiced for centuries were replaced with a modern ceremony involving armbands, a memorial meeting, cremation, and no ancestor worship (Whyte 2003). The Communists also attacked China's diffused religion, previously found in social groups and institutions.

While kinship networks, the authority of clan elders, and wealthy families mattered a great deal in local communities in earlier eras, the Communist party endeavored to end the power of family groups. One method was through the organization of associations, under the control of the central government, to compete with clan authority. These included peasant associations, village committees, the communist youth league, and women's associations. Parents eventually lost much authority in the realms of marriage, divorce, and childbearing. State-run education and assignment of jobs and housing replaced training and inheritance from parents and grandparents. In addition, individuals have civil rights under state law and not families

(as was the case in Imperial China). The law stipulated an individual's right to choose a marriage partner, a woman's right to property, and gender civil equality.

In the early 1950s attention was given specifically to reforming the traditional patriarchal family structure (Johnson 1983). Reformists argued that these patriarchal structures were deeply embedded in the previous "feudal" economic and social system and had to be uprooted to create a new Communist society. Such reforms also included a concerted effort to improve the status of women.

As early as 1950, a new marriage law promoted gender equality. This ruling helped to undermine the traditional male dominance over women that is promoted in traditional Confucianism (Johnson 1983). The law gave women equal rights in marriage, property, and family responsibility. Mass education campaigns were carried out between 1950 and 1953 to implement and popularize the new marriage law, and to teach women how to exercise their rights. Communist party leaders argued for gender equality and women's self-determination so that Chinese women could make essential contributions to the social and economic life of the new China. Developing "a prosperous, powerful, socialist China required that new identities, broader responsibilities, and new social values take precedence over many of the traditional family-centered values of the past" (Johnson 1983:97).

In contrast to the Communists' early attempts to raise the status of women, research is ambiguous as to whether market reforms have worsened or improved the

status of women in China. One recent phenomenon that is frequently mentioned in the media is the concept of *shengnu* - "leftover women." These are women in their late 20s and 30s who are yet to marry. Marriage in China tends to be early and universal (Yeung and Hu 2013), hence why the idea of "leftover women" is so alarming to many people. While imbalanced sex ratios should lead to women having their choice of potential mates, many women have a hard time finding suitable partners – men who are as successful as they are. It is considered appropriate for there to be both an age and a status gap between husbands and wives; women want to marry a man who is at least as successful as themselves. It may also be the case that women do not want to get married and be under the thumb of parents-in-law who may have more traditional views on the role of a daughter-in-law.

While some Communist policies were clearly aimed at diminishing the primacy of family ties, other policies seemingly reinforced the importance of family, including encoding filial piety into law from the very beginning of the PRC. In addition to raising the status of women, the 1950 marriage law also emphasized the obligations of adult children to care for elderly parents. Furthermore, the constitution of 1954 stated that that "parents have the duty to rear and educate their minor children, and the adult children have the duty to support and assist their parents." In 1996, the CCP passed a law protecting the rights of elders' which dictated adult children's obligations to respect and take care of their aged parents physically, financially, and emotionally. The law

provided regulations for adult children's provision for aging parents in terms of housing and medical care (Luo and Zhan 2012). In very recent news, the central government continues to dictate the importance of adult children caring for elderly parents, instituting a law that requires adults to visit their parents⁵. Are such laws even necessary? Some news reports highlight the fact that many migrants wish they could visit their parents more, but are unable to because they cannot take time off to travel hundreds or thousands of miles home. Furthermore, most older people have no choice but to rely on family members as social welfare and the state "safety net" is quite limited.

Such regulations demonstrate governmental involvement in and support for the propagation of family structures, normative or not, that translate into care for the elderly. In addition, policies such as mandatory early retirement make middle-aged parents available to provide childcare and help with household chores to adult children.

Other social policies also reinforced the importance of family, such as the *hukou* (household registration) system. Although individuals have rights under Chinese law, designation as an agricultural or non-agricultural *hukou* holder originates from the household of one's birth – an entire family will have the same household registration designation.

⁵ MacLeod, C. (July 1, 2013). China orders children to visit their aging parents, *USA Today*. Retrieved from <http://www.usatoday.com/story/news/world/2013/07/01/china-children/2480593/>

The Chinese family has also been impacted by dramatic demographic shifts over the past 100 years. Population aging results in an age structure with a large number of older adults and a smaller number of working-age people and children. Within families, this results in the 4-2-1 family structure – four grandparents, an adult couple, and one grandchild. Current cohorts of older people (such as those studied in this project), on average, have multiple adult children upon whom to rely for financial, emotional, and instrumental support. Some policymakers and scholars are concerned that population aging and greater numbers of older people with fewer available children will result in an overall decline in support and detriment to the well-being of older people. Others argue, however, that one adult child is sufficient for old-age care, including coresidence, and that family ties are strong in China and a decline in support for aging parents is not inevitable.

Population aging is due to increasing longevity and declines in fertility. China's fertility was high in the 1950s but has declined to below replacement level in present day due to family planning policies, including the "one child policy," introduced in 1978. While declining family size could be an indicator of the diminishing importance of family, childbearing in China is still largely universal and families invest a great deal into their single child. Such investment is expected to be 'repaid' through lifelong ties and old-age support.

Resistance to the “one child policy” indicates the importance of childbearing in China, and in particular having a son. The saying “*yang er fang lao*” – have many children to ensure old-age support still holds. In many rural areas, the policy is not a strict one-child policy but rather has been modified to a “1.5 child policy” – couples are allowed to have a second child if the first child is a girl, thus reinforcing traditional son preference. A main reason for this is that while sons are always members of their natal families, daughters “marry out” and become part of their husband’s families and are obligated to care for their aging parents-in-law. By contrast, some new studies provide evidence that some parents in urban areas prefer for their only child to be a daughter because of the perception that daughters provide better support (Zeng et al. 2012). In addition, son preference has led to an imbalanced sex ratio and demographers predict an excess of 30 million men by the year 2020. Will these “bare branches⁶” be able to support their aging parents?

After the Communists took power, farmland was first redistributed from landlords and wealthy families to families that had previously owned little or no land. Subsequently, the state focused on collectivization of agriculture. These farm collectives reached their maximum size as “People’s Communes.” Under the collective system in rural areas, the importance of family was weakened, as people’s labor was under the jurisdiction of the collective and not the household head. In addition, such People’s

⁶ Common Chinese expression for these excess men because they are unlikely to “bear fruit.”

Communes also provided other basic necessities such as communal dining, removing the need for family household cooking and dining.

Thirty years later, under market reforms, farms were returned to family households through implementation of the “Household Responsibility System.” Agriculture was privatized again and the farm household had control over its own land, what to produce, and how to market it. This made the family important again; parents had responsibility for their own land and livelihoods, and for directing their children’s labor. The return of land rights to farmers means that parents could potentially command filiality from children in exchange for a future promise of land inheritance. Also at this time, there were opportunities off the farm for rural people – such as employment in individual businesses and TVEs.

If peasants are no longer tied to their family farms will that reduce the importance of family? That does not seem to be the case as under China’s *hukou* system, peasants can only migrate temporarily, and are still tied to their hometowns – the jurisdiction of their household registration permit. Migration restrictions also make it difficult for parents to enroll their children in urban schools, so many grandchildren remain in rural villages to be raised by grandparents – further strengthening intergenerational bonds. Moreover, in both rural and urban China, enforced early retirement (55 for women and 60 for men) enables middle-aged parents to be available

to provide childcare, thus enabling their adult children to be in the labor force and even migrate for work.

Prior to market reforms, workers in state-owned enterprises (SOEs) in urban areas were provided with daily necessities, including food, housing, clothing, healthcare, retirement pensions, and also lifetime job security. This system of guaranteed employment and benefits in SOEs is often referred to as the “iron rice bowl.” Individuals were also required to get permission from their employer (work unit) to marry and travel. In these settings the primacy of the family was diminished. One point of interest, however, is that a shortage of housing in urban areas resulted in intergenerational coresidence. Generations were also connected by the fact that a child could inherit a parent’s work unit position upon the parent’s retirement.

While the central government is trying to develop more comprehensive social welfare and health insurance systems for both rural and urban residents, at present day most Chinese citizens rely on themselves and families’ resources. Most people must pay for medical care out-of-pocket and in the case of costly procedures or hospitalizations, families have no choice but to pool their resources. Even so, paying for major medical costs can cause a family to sink into poverty. Minimal social welfare and pension systems means that family members rely on each other and the family continues to be extremely important.

The Chinese populace has experienced many changes over the past century, but in spite of such tumult, the family remains a major social institution. Family ties also remain a primary source of support for older adults, whose numbers will greatly increase in the 21st century as the PRC experiences rapid population aging. More research is needed as to how older adults will be impacted by ongoing social, economic, and demographic changes.

2. Financial Transfers from Adult Children to Elderly Parents in China: Comparing Altruism with Exchange Models of Intergenerational Relations

Policy makers in China often express concern over a decline in filial piety, and a consequent decline in support for elderly parents. While this claim is frequently voiced, few studies are able to directly test the association between attitudes towards filial piety and expression of filial piety in the form of support to aging parents. This paper is interested in testing whether adult children who agree more strongly with traditional family values are more likely to support elderly parents with financial transfers, or whether other factors play a more important role. In addition, this paper will compare altruism (which includes filial piety) models and exchange models (corporate group and mutual aid) to assess their relative strengths in predicting presence of and amount of financial transfers from adult children to parents in China.

2.1 Theory

This study is informed by several theories and models of intergenerational relations. Many studies provide evidence that intergenerational exchange in China is most motivated by altruism (Chen, Liu and Mair 2011; Cong and Silverstein 2011; Song, Li and Feldman 2012; Zimmer and Kwong 2003). Altruism is defined as selfless concern for the well-being of others. Family members care about each other and therefore have special motivations to provide support. In altruistic support, help is given to those family members in greatest need, but not necessarily able to return the favor. In the

altruistic model, a younger generation would provide more to older adults in social systems that maintain strong family ties and altruistic feelings for each other (Zimmer and Kwong 2003). Filial piety can also be conceived as a form of altruism — selfless respect and care given to older family members.

However, intergenerational transfers have also been characterized as being exchange-motivated and also governed by a norm of reciprocity (Silverstein 2006). Late 19th century anthropologist Marcel Mauss described systems of “gift exchange” in his book “The Gift.” In it he recognizes that exchanges which may appear to be voluntary are in fact obligatory and reinforced by recognized sanctions. Although the term is “gift”, he points out that ‘gifters’ have obligations to give, receive, and repay over time. Such exchanges may serve not only an economic purpose but a social purpose as well (Moore 2012b). Similarly, Lévi-Strauss emphasizes that the purpose of kinship systems is to exchange goods.

Furthermore, the exchange model views interactions among family members as a balance between each actor’s objectives and resources. Each family member can potentially improve his situation by trading goods and services. In this perspective, an older parent can “buy” care from children with promises to provide bequests (Bernheim, Shleifer and Summers 1985). Alternately, families can engage in long-term reciprocal transfers. Elder care, for example, can be a repayment for parental investment in adult children at an earlier time point (Bianchi et al. 2008). The concept that family members

reciprocally transfer valued resources between each other is also consistent with rational choice theory (Becker 2009).

The corporate group and mutual aid model are two related and more specific models of exchange theory. A “time-for-money” exchange is common in Asian families where grandparents provide help with housework and childcare in exchange for food or money from their adult children (Frankenberg, Lillard and Willis 2002). In the corporate group model, a household head strategically allocates resources where they will do the most good. For example, the family may choose to invest in developing human capital in younger generations. Studies have found that in patrilineal families, it is more advantageous to invest in sons’ education than daughters’ (Lin et al. 2003). Later on, older parents expect a return on their investment, perhaps through the form of old-age support. Parents and society can ensure compliance to these norms through socialization. A study of intergenerational relations in Taiwan provides evidence for the corporate group model (Lee, Parish and Willis 1994b).

While the corporate group model considers more long-term arrangements between generations, aimed at maximizing family well-being, as those summarized above (Lee and Xiao 1998), the mutual-aid model looks at a shorter time horizon. For example, in the mutual aid model, older parents can provide childcare to enable mothers to enter the labor force. Mutual aid is similar to the corporate group model in that the overall aim is still to enhance the entire family’s well-being.

Power dynamics may also play a role. In a power model of intergenerational relations (Goode 1963), older generations receive support because they control important resources, such as land. Parents have used land ownership and access to the land as a bargaining chip, such as in a Groger's study of older adults in rural North Carolina (1992). However, as the economic and social standing of the young rises, the independence of younger generations decreases and the power of older family members decreases (Goode 1963).

Intergenerational solidarity is another theory describing relationships between generations. It contains six dimensions: 1) structure (geographic distance); 2) association (frequency of social contact and shared activities among family members); 3) affect (feelings of emotional closeness and intimacy); 4) consensus (actual or perceived agreement in opinions, values, and lifestyles); 5) function (exchange of assistance) and 6) norms (strength of obligation felt toward other family members). Solidarity is a broad concept that includes multiple complex and sometimes contradictory connections between people (Bengtson and Roberts 1991; Silverstein and Bengtson 1997). Filial responsibility expectations (part of normative solidarity) are defined as the extent to which adult children are obligated to support aging parents (Lee, Netzer and Coward 1994a). Within the East Asian, Confucian context, this takes on particular meaning and is termed "filial piety" or *xiao* (孝) in Chinese (Ikels 2004). All dimensions but affect are analyzed in this paper.

Theories of the life course also inform this work, specifically in relation to linked lives, historical context, and role theory. Family members are embedded within a network of shared relationships. This is especially salient in China, where the needs of the family can trump the needs of the individual. In addition, a dramatic rise in longevity has expanded kin networks to many generations. Longevity increases time spent in different kinship relations, between parent and child, spouses, and in different roles such as being both a mother and a daughter for many years. With increasing longevity, mothers, fathers, sons and daughters share many decades together as adults (Riley and Riley 1993).

2.1.1 The Impact of Social Change on Intergenerational Relations

Classic modernization theory would suggest that rapid industrialization, urbanization, and westernization in China would undermine traditional filial piety and intergenerational relations in China. Similarly, industrialization can lead to a transition from a family to a non-family mode of social organization. This shift can potentially have strong influences on intergenerational relations including the rise of the nuclear family, declines in intergenerational coresidence, decreases in the influence of older generations, increases in time spent with non-family members, greater reliance on non-family institutions to provide child and elder care, declines in fertility, decreases in family control over information, declines in family training of children, decreases in the authority of family leaders, and increases in conflicts between generations.

It is important to note, however, that the family will not be instantly abandoned, but rather individuals and families will modify existing family structures to fit changed environments. Some scholars have argued that we can think of culture as a “tool kit” – which guides family change in a way that is strategic but within the “culturally constrained array of opportunities” (Chen et al. 2011; Logan and Bian 1999; Swidler 1986). This model stems from Parsonian theory that predicts that from among a host of alternatives, individuals will choose the one that most matches their own values and cultural traditions (Swidler 1986). In this tradition, I argue that values still remain a major link between culture and action.

A change in norms relating to filial obligations brought on by modernization also has a gendered component. In traditional Chinese family ideology, sons are viewed as life-long members of their natal families while daughters are sometimes viewed as “water sloshed out” – because they become members of their husbands’ families. Investment in sons can be repaid with old-age support, the same may not be true for daughters who are conceived to belong to their marital families. At the same time, the 1950 marriage law and subsequent education campaigns aimed to change “feudal” attitudes towards women, reduce gender inequalities and raise the status of women and girls. By contrast, economic reforms and the return of family farms (in rural areas) may have raised the value of sons, who were then expected to contribute to the family (and not the collective’s) welfare (Hannum 2005). Wealthier daughters might have the means

to support both parents and parents-in-law. Similarly, wealthier families may have the means to support human capital development in both their sons and daughters, which might encourage both of them to return the favor later (in exchange-based models of intergenerational support). Will daughters and sons provide equal support to their own parents in 21st century China? Further investigation is needed.

2.2 The Chinese Context

In serving his parents, a filial son reveres them in daily life; he makes them happy while he nourishes them; he takes anxious care of them in sickness; he shows great sorrow over their death; and he sacrifices to them with solemnity. (*Classic of Filial Piety*: Confucius)

The Confucian norm of filial piety has served as a central pillar of cultural and moral ideals for Chinese and other Asian societies for thousands of years. Filial piety in its strictest sense means that parents command absolute subordination from adult children and children should prioritize parents above all other responsibilities.

However, filial piety may no longer be an explicit mandate, but rather an implicit part of the norm of reciprocity. In a study of caregiving behavior in urban China among 110 familial caregivers, Zhan and Montgomery found that those who agreed with patrilocal norms of filial piety were more likely to give financial assistance (2003). My study expands on their work by including more filial piety items, comparisons between altruism and exchange models, and a larger sample size.

Prior to the founding of the People's Republic of China (PRC), having multiple generations under the same roof was a symbol of social-familial success and self-

fulfillment. Complex households embodied the filial piety of sons. Indeed, filial piety played a role in everyday life. The late imperial states and the republican period (early 20th century) officially supported filial piety and ancestor worship (Wang 2004). The historical Chinese family exhibited large extended families, high parental authority, little individualism, as well as arranged, young, and universal marriage. Available research from the 19th and early 20th centuries indicates that filial piety was widely practiced, particularly through a married son's coresidence with parents (Whyte 2004). In addition, the structure of historical Chinese families shares many of its features with other family systems around the world (Thornton and Lin 1995).

Filial piety has remained important, despite Chinese Communism's attempt to eliminate "feudal" practices. While the Chinese Communist Party (CCP) introduced a great deal of social change in China, the traditional practice of filial piety was encoded in law from the beginning of the republic. In 1950, the CCP a marriage law was enacted which emphasized the obligations of adult children to care for elderly parents. In addition, the constitution of 1954 stated that that "parents have the duty to rear and educate their minor children, and the adult children have the duty to support and assist their parents." In 1996, the CCP passed a law protecting the rights of elders' which dictated adult children's obligations to respect and take care of their aged parents physically, financially, and emotionally. The law provided regulations for adult children's provision for aging parents in terms of housing and medical care (Luo and

Zhan 2012). Filial piety is regulated by the government because the CCP does not provide other forms of old-age welfare. Even with extensive support from children, many low-income rural elderly continue working into old age.

By contrast, the Communist focus on secularization frowned upon ancestor worship – weakening the historical family chain. Ancestor worship contradicted Communist ideology (Wang 2004). Potentially, a reduction in the importance of ancestor worship might reduce filial piety, and put greater focus on the present-day immediate nuclear family (Thornton et al. 1995).

Similarly, the Communist attempt at gender equality undermined the hierarchy of men above women that is also part of traditional Confucianism (Johnson 1983). The 1950 marriage law mentioned previously gave women equal rights in marriage, property, and family responsibility. In addition, under the current regime, individuals have civil rights under state law and not families (as was the case in Imperial China). The law stipulated an individual's right to choose a marriage partner, a woman's right to property, and gender civil equality. While land was previously owned by the patriarch of a family, in collective production the land was the property of the collectives and was distributed to production teams. These social forms threatened family control and previous patriarchy. By another turn, China's economic reforms beginning in 1978 returned control of farmed land to families, which led to a return to traditional practices of family solidarity and sons being eligible to inherit property from parents.

Furthermore, prior to economic reform, restrictions on migration maintained close family ties, especially in rural areas. A chronic urban housing shortage also led to a continuation of multigenerational family living arrangements. The state perpetuated male preference in housing and career opportunities, which perpetuated the patrilocal pattern. State work units emphasized seniority, which meant fewer opportunities for young people and greater dependence on parents (Zhang 2004a).

Separate households for different generations can be viewed as the replacement of filial piety or a change in the direction of conjugality. Economic prosperity makes separate dwelling more possible. Urban seniors with pensions have the economic ability to live separately. The diversification of the rural economy in recent decades allows some older adults to earn money and support themselves even in old age (Zhang 2004a). It is plausible that a lack of housing in previous eras may have caused unwanted coresidence (Chu and Yu 2010). A recent study found that older Chinese adults with higher SES and greater numbers of children were more likely to prefer living independently (Sereny 2011). The economic transition created material wealth which enabled people to act on their preferences to live separately. Some older adults find living in a three-generation household to be stressful – they have to help with household chores and may not be able to eat the food they prefer. In addition, a senior parent living in a separate household may help with family harmony – each child/son can contribute equal amounts rather than one child having the burden of coresidence (Zhang 2004a).

Changing economic circumstances have also resulted in the development of alternative forms of coresidence. One ethnographic study from a village in northeastern China found that newly-married couples would engage in “ritual coresidence” – live with grooms’ parents at first but then move out within the first year of marriage (Wang 2004). Instead of the tradition of the oldest son living with his parents, some adult children engage in “meal rotation” (*lunliu gongyang laoren* in Chinese) – taking turns in supporting and feeding senior relatives. It is possible if a parent has at least two sons with separate households (but will not be possible for future elderly with only 1 child). Meal rotation is more common in some villages than others (Jing 2004).

Despite the communist government’s attempt to achieve gender equality, some qualitative research has found that the gender differences in filial piety persist. For some rural older adults filial piety is considered the virtue of reverence of the father by the son. Sons are required to support parents but daughters are only expected to give gifts. Older parents cannot say that their daughters are unfilial because there are no expectations for them (Miller 2004). By contrast, some evidence from urban China shows that married daughters actually provide more financial support than sons, especially when they coreside (Xie and Zhu 2009).

Moreover, daughters face challenges in caring for parents. On the one hand, they may live elsewhere because they moved to their husband’s village upon marriage. In addition, rural daughters do not typically inherit family wealth and therefore are at a

disadvantage economically in comparison with sons. However, with increasing migration of adult children, if a son migrates far away but a daughter is closer-by, the parent might be open to the idea of care from daughters. Daughters can be in closer contact with parents through better transportation and technology, like cell phones. There is evidence that parents also invest in daughters' education as an investment in later-life support (Zhang 2007).

2.3 Previous Studies

2.3.1 Filial Piety

Studies from Taiwan and Hong Kong provide evidence that socioeconomic status (SES) is negatively correlated with attitudes towards filial piety. Individuals with lower education are more likely to agree with filial piety values. This is the opposite of historical China – where scholars and gentry were expected to be more filial. Today, however, the association of low SES with filial attitudes relates to lower SES status people being more likely to endorse conformity-obedience values (Ho 1996).

There may also be gender differences in agreement with filial piety values. Men in China may have a vested interest in maintaining patrilineal system because it benefits them. In a review of the literature, researchers found that men's beliefs about gender equality tend to lag behind women's (Davis and Greenstein 2009). At the same time, however, people's beliefs in more traditional societies tend to be unanimous. Older people's norms tend to lag behind social changes (Alwin and McCammon 2003). In a

rapidly changing society, such as China, many cohorts have experienced different social values in different time periods. A society's social norms can change either through cohort replacement or individuals actually changing their values.

Research from Hong Kong found that college students report low levels of adherence to filial values and commitments to take care of their elderly parents (in the future); whereas older people continued to hold traditional expectations of their adult children's commitments (Harwood et al. 1994; Luo and Zhan 2012). This may cause conflict between generations.

The traditional concept of *xiao* has broadened. It no longer requires direct physical care or proximity of children (including coresidence) but can include hiring a nurse or providing financial support to aging parents.

In Japan, another Confucian society, the rise of the importance of the nuclear family has led to a decrease in the proportion of older people who coreside with adult children. Family nucleation is related to industrialization and large-scale migration from rural to urban areas. Concurrently, norms of economic support for old parents have dramatically weakened and norms of coresidence have moderately weakened (Atoh 2008).

Several studies have assessed older adults' expectations for filial responsibility, as opposed to measuring adult children's attitudes towards filial piety. An analysis of US older persons found that older parents' filial responsibility expectations were

positively related to aid given to children, after controlling for parental resources – but not associated with aid received from children (Lee, Netzer and Coward 1994a).

A study measuring rural Chinese elderly's filial piety beliefs using a vignette design found that older mothers with a migrated son were more likely to think a daughter providing care was acceptable – a non-traditional filial expectation. In addition, greater support from daughters was associated with more gender egalitarian beliefs regarding norms of filiality. However, older respondents indicated that sons (in the vignettes) were required to provide support no matter the circumstances, whereas they understood that a daughter's own childcare obligations might supersede her ability to care for an ill parent (Cong and Silverstein 2012).

Few studies have looked at the association between filial piety values and actual behaviors of adult children. Of those the results are mixed. One study found that filial norms were associated with financial support only (but not household chores or emotional support) in multivariate analyses of a survey from China (Lin and Yi 2011).

2.3.2 Financial Transfers to Elderly Parents in Chinese Societies

Financial transfers are an important measure of intergenerational relations in China. For rural elderly, financial support is a major portion of their income (Silverstein, Cong and Li 2006). In addition, rural elderly rely on family for support because poor elderly will not qualify for means-tested social welfare (*dibao*) if they have children available to support them (Xu and Zhang 2012). For urban elderly, financial transfers are

also common (Xie and Zhu's study in three cities in 1999 found 40% of parents receive transfers), but the amounts are small, thus giving evidence that it may be a symbolic gesture rather than a necessity to avoid economic hardship.

A number of studies have examined financial transfers from adult children to elderly parents in Chinese societies. Several studies point to evidence of altruism, that adult children with greater resources are more likely to give and elderly parents with greater need are also more likely to receive. Evidence from Hong Kong (Chou 2008), Taiwan (Lee et al. 1994b) urban China (Xie and Zhu 2009) and rural China (Cong and Silverstein 2011; Li, Feldman and Jin 2004) found that higher SES children gave more to parents. Other studies found that parental need was associated with greater transfers from children in the form of marital status (Logan and Bian 2003), lower parental SES, and poor health (Lee and Xiao 1998). Lee and Xiao's 1992 study also found that family support from children is compensating for a lack of access to public resources.

Other measures of parental need, however, were found to have the opposite effect. A different study found that widowed Mothers in rural China (Li et al. 2004) and widowed fathers in urban China (Logan and Bian 2003) receive less than married couples. Evidence from both rural and urban China also found more educated parents receiving more financial support than less educated parents (Logan and Bian 2003; Cong and Silverstein 2011).

Some studies provided evidence of exchange-based models, including the corporate group model – children’s payment to parents is a return on the parents’ investment in them when they were younger, such as payment for education (Chou 2008). Lee and Xiao (1998) found evidence for both the corporate group and mutual aid models. Parents who helped offspring get a job in pre-reform China and those who help with housework received more financial support.

Gender, number, and residential distance also play a role. Lin et al study from Taiwan found that sons give more support than daughters, but daughters pitch in when sons are missing (2003). Another study found that married adult daughters in urban China give more financial support than married sons, especially after controlling for SES differences (Xie and Zhu 2009). Two studies found that having more children increased the likelihood of financial transfers (Lee et al 1994; Li et al 2004; Xie and Zhu 2009), while evidence from Hong Kong found only a weak relationship between number of children and transfers – providing evidence that perhaps lowered fertility will not reduce support to parents. Findings are consistent regarding geographic distance between adult children and elderly parents – those who coreside receive less financial support and those who live farther away (within the constraints of the sampling frame) receive more (Logan and Bian 2003; Li 2004).

Last, several studies highlighted the importance of social context. Comparisons between the PRC and Taiwan found that Taiwanese families were more traditional, with

financial support mainly the responsibility of sons (Xie and Zhu 2009). Another study found that rural residents are more likely to give than urban residents, but the amount is lower (Lee and Xiao 1998).

Results may differ across these studies because many of them are from specific locales – a single city or county-- and the social context may have a major impact on intergenerational relations. In addition, several studies (and they note this too) are lacking measures of key factors which would enable them to be better suited to test the various theories of intergenerational exchange. This study will address these issues with a larger national dataset of both rural and urban areas, that can ask more refined questions through analyzing available covariates pertaining to both altruism and exchange models.

2.4 Hypotheses

Three hypotheses emerge from this review. Hypothesis 1 relates to altruism while hypotheses 2 and 3 relate to exchange models.

- 1. Higher filial piety values and parental needs are associated with presence of and higher amounts of cash transfers.**
- 2. Parents who help children when they were younger will receive more in their old age.**
- 3. Parents who help adult children with housework and childcare in the present day will receive more cash transfers.**

2.5 Data and Methods

The data for this project come from the Social Dynamics Survey of the Adult-Child Family in China (“SDSCF”), 2002 wave. The SCSCDF is a sub-sample survey of the

adult children of respondents from another survey – the Chinese Longitudinal Healthy Longevity Survey (CLHLS).

The baseline survey of the CLHLS was carried out in 1998 with follow-up surveys (with replacement for deceased elders) in 2000, 2002, 2005, and 2008-2009. Half of the total counties and cities in 22 provinces were randomly selected. This survey area covered 1.1 billion people or 85% of the total population of China. An interviewer conducted the interview and basic health examination at each interviewee's home. The focus of the CLHLS is the oldest old. Therefore, the study attempted to interview all centenarians who agreed to the study in the survey areas. For each centenarian, one nearby octogenarian and one nearby nonagenarian of pre-designated age and sex were interviewed. "Nearby" is broadly defined as the same village or street if available, or in the same town, county or city. The predetermined age and sex was used to have roughly equal numbers of octogenarians and nonagenarians. The 2002 wave of the survey expanded the study to include younger elderly (between ages 65 and 79). The total sample size was 16,057 in 2002. As the survey's aim was to have a large sample of oldest-old, proportional sampling was not used. Therefore, the survey team calculated weights to make the survey more closely approximate the overall age, sex, and rural-urban residence distribution as seen in Chinese census data.

The SDSCF is a two-wave 9-province survey of adult children in China who are the children of a subset of respondents from the 2002 wave of the Chinese Longitudinal

Healthy Longevity Survey (CLHLS). The 2002 wave consists of 4,364 interviews with adults ages 35-65 who reside in the same county/city as the parent that is interviewed in the CLHLS. The first wave of the survey was carried out by the Center of Healthy Aging and Family Studies at Peking University, the China National Research Center on Aging, and the Mainland Marketing Company in the summer of 2002. The provinces and municipalities where the respondents reside are Beijing, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Guangxi, all of which are located in eastern China. The SDSCF collects extensive data on demographic characteristics, health behaviors, educational attainment, work experience, marriage, filial piety values, family values, information about parents and parents-in-law, living arrangements, financial expenditures, children's education, and support for the elderly.

According to the study design, a respondent in the CLHLS who lives in the 9 provinces/municipalities with at least one living child ages 35-65 who lives in the same county/city as the older parent is picked up as a valid object. For those elderly with more than one adult child, a single child is chosen at random. The sampling procedure dictates that the child is chosen based on the birth month of the elderly. For elderly with two children, the survey team divided the year into two, and if the birth month of the elderly falls in the first half of the year, the elder children will be selected as a respondent. For three children, the year is divided into three parts, and so on.

Upon careful inspection of the data, however, it would appear that the characteristics of adult child respondents in the SCSDf are significantly different (based on t-tests) from all eligible children of CLHLS respondents. For example, respondents in the SCSDf are more likely to be male and coresident with elderly parent than other eligible siblings. It may be the case that response rates were lower for non-coresident or female children, and therefore those people were not included in the survey. In light of this, I decided to construct post-stratification weights to account for non-response bias.

I began by looking at the CLHLS elderly respondents that were linked to the SCSDf dataset. Among 3,869 older adults who could be successfully linked to SCSDf, on average each had 2.7 eligible children. I reshaped the data to make each eligible child of a CLHLS linked elder have their own data entry for a total of 10,407 children. I compared the cross-tabulations by age group (35-44; 45-44; 55-65), sex, and coresidence status for those children in the SCSDf and those not. Post-stratification involves classifying the sample by groups (here age group, sex, and coresidence status) and then weights individuals in each group (poststratum). The weight $w_h = rP_h/r_h$ is computed for each sample in post-stratum h , where r_h is the number of respondents in post-stratum h , P_h is the "population" proportion from all eligible children in the CLHLS dataset, and r is the respondent sample size (Little 1993; Smith 1991). Table 17 in the appendix provides the sample sizes and proportion of total sample comparing the two groups (all eligible children of CLHLS respondents vs. those in SCSDf). For example, while coresident sons

ages 55-65 make up only 2.77% of all qualifying children in the “population”, they comprise 14.24% of respondents in the sample. Therefore the weight for coresident sons ages 55-65 is 0.19499 (2.77/14.24).

While SCSDF data contain information on 4,364 respondents I was only able to link the SCSDF data to the CLHLS data for 3,869 respondents, which was necessary for the creation of weights. The weights are based only on those older respondents who could be successfully linked to the SCSDF data. Due to missing data on covariates, the final analytic sample is 3,768 (less than 5% missing data).

2.6 Measures

2.6.1 Dependent Variables

The dependent variables are measures of financial transfers from adult children to elderly parents. I will refer to the three generations in the family as generation 1 (G1) – elderly parents, generation 2 (G2) – adult respondents, and generation 3 (G3) – children of adult respondents (G2) and grandchildren of elderly parents (G1). G2 Respondents were asked “What kind of help did you provide to the elderly in the last year?” Questions were asked separately for “give money – amount of Yuan”, “pay medicine fee – amount of Yuan”, “give food or other – amount of Yuan” and “other – amount of Yuan.” This was asked for mother, father, father-in-law, and mother-in-law. Here I will only analyze giving money to respondent’s own mother and father. Financial

transfers to each parent is looked at as a continuous variable of money (herein referred to as “money”) given.

Additionally, since more than twenty percent of respondents reported providing no financial transfers to parents in the past year, I also examined the dependent variable as a binary variable – with a one being “gives any amount of money” and zero being “no financial transfers”. In order to account for the positive skew of money given to parents, I have taken the log value. Figure 1 is a histogram of financial transfers to adult parents, among those adult child respondents who gave a non-zero amount. The figure demonstrates the data’s positive skew.

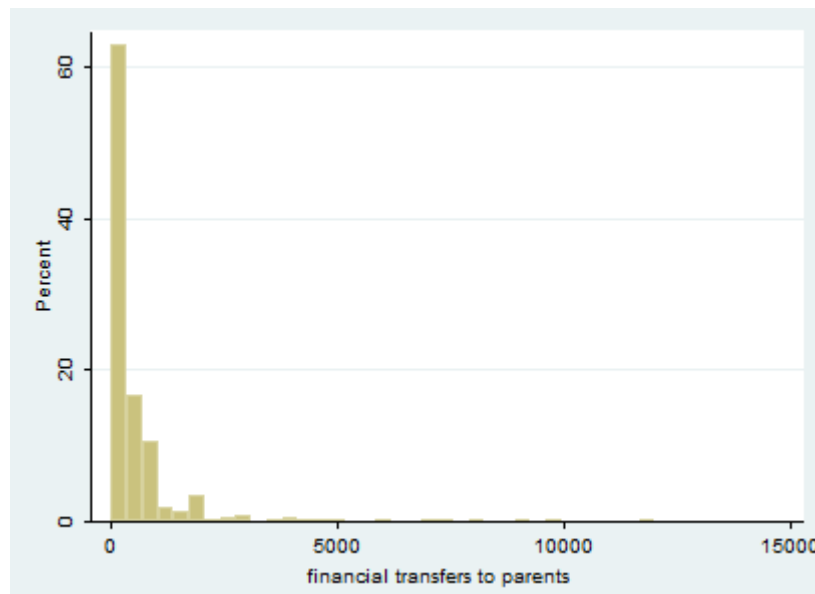


Figure 3: Histogram of cash transfers from adult children to parents in 2002 SCSDF, among those who give non-zero amount (N=2843)

2.6.2 Key Independent Variables

The key independent variables are grouped by whether they pertain to models of altruism versus economic exchange. Key altruism measures in this study are adult children's attitudes towards filial piety and family values. The SCSTDF asked respondents the extent to which they agree with a series of statements pertaining to filial piety and family values. Interviewees responded on a 5-point likert scale with 5 being "very important" and 1 being "not very important". There are 24 items in total, 13 relating to filial piety and 11 relating to family values.

Exploratory factor analysis was carried out on all 24 factors both for weighted and unweighted values. The "factor" command with principal components was carried out in STATA for both weighted and unweighted values. Both weighted and unweighted analyses resulted in the items loading onto 5 factors (Kaiser criterion – eigenvalues ≥ 1). Rotation produced orthogonal factors which are helpful for creating indexes that are not correlated to each other (Hamilton 2009; Kim and Mueller 1978).

Factor analysis was similar for both weighted and unweighted data so unweighted data were used to create the factors for consistency. Table 18 in the appendix provides the rotated factor loadings for unweighted data. The highlighted cells are those loadings above 0.55, which is considered a good level (Tabachnick and Fidell 2006). Only the first 3 factors had Chronbach's alpha values greater than .70 and were retained for analysis (Santos 1999).

Table 1 lists the items and means for the three retained factors, and the percentage of respondents who rate the item important/very important. The first unweighted factor is titled "family values" ($\alpha=0.7963$) and consists of 5 items. The second factor is titled "respect" ($\alpha=0.7679$), and consists of 3 items. The final factor is titled "coresidence" ($\alpha=0.7185$) and consists of 3 items. For ease of interpretation of descriptive statistics, each factor ranges from 1 to 5 and is constructed from the average scores of the items in the factor. In the multivariate analysis the predicted values (from factor analysis) of the factors are used so that each factor has a mean of zero and a standard deviation of 1.

Table 1: Mean scores for filial piety factors and percentage agreement with individual items (unweighted)

Factor	Items	% Important
Factor 1: Family Values (alpha=0.7693)		4.165 (mean)
	F2-1. An adult should marry	81.74
	F2-2. Avoid marriage dissolution as far as possible	80.41
	F2-3. Bringing up offspring in order to make them useful for the society	91.96
	F2-4. Keep the good relationship within family	93.02
	F2-6. Family is good for individual's development	79.25
Factor 2: Respect (alpha=0.7679)		4.107 (mean)
	F1-1 Gratitude for parents' fosterage	90.38
	F1-2. Respect to parents, no matter how parents did with you	77.84
	F1-5. Support parents for their better life	83.52
Factor 3: Coresidence (alpha=0.7185)		3.07(mean)
	F1-4. Son should live with parents after he married	32.17
	F2-10. Three-generations in a family is better	38.51
	F2-11. Married adult should live with older members in family	26.11

Important/very important equals a score of 4 or 5 on item.

Additional measures of altruism are measures of parental need. These include health, marital status, age, and socioeconomic status (SES) of G1. Parental (G1) health is measured by whether one or both parents have any of 4 activities of daily living (ADL) limitations. This measure is assessed by asking the adult child. While there is additional information on the health status of the focal parent (the parent who was interviewed in the CLHLS), this same information is not available for the spouse. Therefore, I chose to

limit the health variable to the adult child respondent's report. Marital status measures whether both parents are alive, or whether there is only one parent (father only or mother only). Age is a categorical variable of ten-year age groups ranging from 60's to 100+ years of age. SES is measured by each parent's educational attainment – no education, elementary school, or junior high or greater.

In order to assess the importance of the corporate group model, I include covariates that measure exchanges between generations at earlier stages of the life course. Did the G1 parent(s) invest in the G2 adult respondent's education and marriage? This is measured by whether the older parents paid for education (senior high school or college) or provided a wedding gift to a son or daughter. I also have a variable measuring the amount of the wedding gift in Yuan. Another test of the corporate group model is whether G2 chooses to invest in their own children (G3) over their parents (G1). This is tested by variables that measure the number of G3 children and whether at least one child is an adult (over 18). It is not clear whether parents would spend more money on children when they are younger – fees for primary and secondary schools, tutors, etc. or when children are young adults – potentially college tuition, help with migration costs, wedding gifts, or buying an apartment.

In order to test the mutual aid model, I have covariates that measure whether G1 provides help to G2 in the present day. These are measures of whether the older parent(s) provided any childcare or housework to the focal child within the past year.

This is a categorical variable with codes for neither, housework only, childcare only, or both. In the case of both parents being alive, this is a measure of support from either one or both parents.

2.6.3 Controls

Control variables include variables pertaining to G2 characteristics and also the relationship between G1 and G2. G2 controls include age, sex, marital status, SES, and family composition. Residential distance and relationship quality between the G2 focal respondent child and the G1 elderly parent(s) is also controlled for. SES is measured by several variables – educational attainment of the respondent, occupation of respondent and household income. Birth order is a binary variable of whether respondent or spouse is an eldest son. In China is it considered the role of the eldest son to provide the lion's share of old-age support to parents. Relationship quality is assessed by the question "How is your relationship with your Father? Mother?" This is measured on a 5 point scale from very bad to very good. Relationship quality is a binary variable where 1 is good or very good relationship with mother or father. I also averaged the two to assess relationship quality with both G1 parents.

2.7 Statistical Analyses

The first analysis is a binary logistic regression to analyze the relationship between any amount of financial transfers (equaling 1) and the different models of

intergenerational relations using a series of nested models. Model 1 includes controls only; Model 2 adds covariates measuring altruism – both filial piety attitudes and parental need; Model 3 tests the corporate group model by adding measures of G1 investment in G2 children to model 1 (baseline), Model 4 further examines the corporate group model by adding covariates for G3 characteristics (number and age); Model 5 tests the mutual aid model by adding measures of whether G1 provides housework or childcare to G2; Model 6 includes all covariates from models 3-5 to assess all economic exchange models simultaneously; and the full model (7) includes all covariates and controls – both altruism and economic exchange models. The second analysis has log amount of financial transfer as the dependent variable and runs analyses for these same seven nested models.

I carried out the multivariate analysis separately by weighted and unweighted data and found the results to be largely the same. The conventional wisdom is that if stratifying variables are controlled for in the regression then there should be no difference in the analysis (Winship and Radbill 1994:248). All analyses are performed with STATA 12.1

Table 2: Mean filial piety factor values by key covariates

	N	Family values factor	Respect factor	Coresidence factor
Males	2606	4.15	4.09	3.11
Females	1162	4.19	4.14	2.98
t-test (p-value)		**	*	***
Agricultural	2228	4.15	4.05	3.12
Non-Agricultural	1540	4.18	4.18	3.00
t-test (p-value)		N.S.	***	***
Educated	2884	4.19	4.15	3.06
Illiterate	884	4.09	3.97	3.12
t-test (p-value)		***	***	*
Eldest son	1395	4.17	4.10	3.11
Not eldest son	2373	4.16	4.11	3.05
t-test (p-value)		N.S.	N.S.	*

***p<0.001; ** p<0.01; *p<0.05; N.S. not significant

2.8 Results

2.8.1 Descriptive Statistics

Table 2 presents t-tests of filial piety factors to assess differences by gender, *hukou*, education, and birth order. There are significant differences by gender for all three factors. Female respondents agree more strongly than male respondents on family values and respect, but less strongly for coresidence norms. One of these items is “son should live with parents after marriage.” For this particular item, 43% of female respondents don’t think it is important, while this proportion is 36% for males.

There are also significant differences across SES measures. Non-agricultural *hukou* holders have higher agreement with respect items and lower agreement with

coresidence items. Similarly, higher education is also significantly associated with respect factors, and also family values factors. Higher SES in terms of education, however, is associated with low agreement with coresidence items. Birth order is only significantly associated with attitudes relating towards coresidence, with eldest sons being more likely to agree. Their attitudes are closer to their actual behavior, where 20% of eldest sons coreside with parents compared to only 10% of other children in the family (including both sons and daughters).

Table 3: Descriptive statistics (weighted data)

Variable	Mean/%	SD	Min	Max
Characteristics of Adult Child - G2				
Demographics				
	Female	46.76%		
	Married	94.19%		
	Age	48.55	8.22	35 65
SES				
	Years of education	7.16	3.95	0 21
	Family Income	1735.39	2092.65	0 50000
	works in agriculture	36.34%		
	Agricultural <i>Hukou</i>	61.07%		
Filial Piety Factors				
	Family Values Factor	4.19	0.52	1 5
	Respect factor	4.10	0.57	1 5
	Coresidence Factor	2.98	0.76	1 5
Family of G2				
	Number of siblings	2.33	1.65	0 8
	Has it least one sister	78.81%		
	Has at least one brother	81.98%		
	Coresident with parent	12.74%		
	Sibling coresides with parent	30.46%		
Characteristics of Children of Respondent - G3				
	1 or more G3 children under 18	71.50%		
	# of children	0.56	0.80	0 5
Characteristics of Elderly Parent(s) - G1				
Parent Needs				
	Age	80.13	10.40	59.5 114
	ADL disabled	18.98%		
	Both Parents	48.68%		
	Father Only	17.59%		
	Mother Only	33.73%		
G1 Education				
	No Education	49.02%		
	Elementary School	32.21%		
	Junior High +	18.77%		
Relationship between G1 and G2				
	Parents paid for education	21.04%		
	Paid for wedding gift	82.60%		
	Gift amount	581.22	1621.23	0 30000
	Parents do not provide	79.87%		
	Gives money to parents	78.69%		
	Amount of financial transfer (Yuan)	495.90	790.79	0 12000

Table 3 provides descriptive statistics for covariates, organized by whether they pertain to G2 (respondent's generation), G1 (elderly parents of respondents) G3 (children of respondents), or characteristics of the relationship between G1 and G2. Descriptive statistics are for weighted data.

Nearly half of respondents are female, and nearly all are married. Among those not currently married, 79% are widow/ers. G2 respondents have on average 7.16 years of education and a household income of 1,735 Yuan. While more than half are agricultural *hukou* holders, only 36% work in agriculture. Since economic reforms, while the household registration system persists, non-farm employment opportunities are available. Among rural *hukou* holders, 55% work in agriculture (figure not shown). G2 respondents tend to have multiple siblings, with the majority having at least one sister and at least one brother. While only 12.74% of respondents coreside with parents, 30% have siblings who coreside with parents. This is unsurprising, given that intergenerational coresidence is still quite high based on the original CLHLS datasets.

Older parents (G1) have a mean age of 80 years. Disability rates are fairly low despite advanced age (18.98%). About half of respondents still have both parents living; only 17.6% have a father only living. Parents' education levels are lower than adult children's. A fraction of parents paid for the adult child's education (21%) while the majority provided some sort of wedding gift (82.6%), with the amount reported ranging from a minimum of 20 Yuan to a maximum of 30,000 Yuan. The majority of respondents

do not report receiving any days of help with housework or childcare within the past year. More than $\frac{3}{4}$ of respondents give some financial assistance to parents in the form of money, with a mean value of 495.90 overall and 630.17 out of those who give something.

Table 4: Estimated odds ratios of binary logistic regression of any amount of financial transfer to parents (SE reported below odds ratios)

	M 1	M 2	M 3	M 4	M 5	M 6	M 7
Marital Status							
Divorced ^c	0.480** (0.132)	0.505* (0.142)	0.485** (0.133)	0.517* (0.143)	0.488** (0.136)	0.493* (0.137)	0.514* (0.147)
Widowed ^c	0.715 (0.131)	0.734 (0.136)	0.718 (0.132)	0.717 (0.132)	0.714 (0.132)	0.717 (0.132)	0.732 (0.136)
never married ^c	0.420*** (0.0893)	0.477*** (0.105)	0.522** (0.119)	0.527** (0.128)	0.492** (0.122)	0.605 (0.158)	0.672 (0.180)
family income (100s)	1.011** (0.0033)	1.012*** (0.0034)	1.010** (0.0033)	1.010** (0.0033)	1.010** (0.0033)	1.009** (0.0033)	1.010** (0.0034)
Job Status							
not working ^e	1.032 (0.123)	1.018 (0.123)	1.044 (0.125)	1.038 (0.124)	1.044 (0.126)	1.055 (0.127)	1.037 (0.127)
manager ^e	1.322 (0.271)	1.293 (0.267)	1.341 (0.276)	1.332 (0.273)	1.324 (0.272)	1.345 (0.278)	1.326 (0.277)
general worker ^e	1.359* (0.186)	1.332* (0.184)	1.355* (0.185)	1.399* (0.193)	1.384* (0.192)	1.380* (0.192)	1.355* (0.191)
other ^e	1.471** (0.194)	1.437** (0.191)	1.470** (0.194)	1.493** (0.198)	1.458** (0.194)	1.458** (0.194)	1.432** (0.192)
non-agricultural <i>hukou</i> ^f	0.612*** (0.0633)	0.632*** (0.0666)	0.621*** (0.0644)	0.621*** (0.0646)	0.626*** (0.0655)	0.634*** (0.0665)	0.654*** (0.0697)
Residential Distance							
same village/streets ^g	1.586*** (0.165)	1.550*** (0.169)	1.573*** (0.164)	1.575*** (0.164)	1.727*** (0.184)	1.712*** (0.183)	1.709*** (0.194)
same county/districts ^g	1.712*** (0.229)	1.728*** (0.237)	1.683*** (0.225)	1.717*** (0.229)	1.934*** (0.264)	1.899*** (0.260)	1.934*** (0.273)
same province/city ^g	0.915 (0.167)	1.005 (0.190)	0.909 (0.167)	0.928 (0.170)	1.066 (0.199)	1.058 (0.198)	1.172 (0.228)
sibling coresides (w. G1)	0.925 (0.111)	0.930 (0.113)	0.941 (0.113)	0.922 (0.110)	0.911 (0.109)	0.927 (0.112)	0.923 (0.113)
good relations (w. G1)	1.053 (0.133)	0.978 (0.128)	1.050 (0.133)	1.055 (0.133)	1.061 (0.134)	1.059 (0.134)	0.987 (0.130)
Filial Piety							

family values factor	1.102*			1.089*
	(0.0440)			(0.0438)
respect factor	1.074			1.068
	(0.0449)			(0.0449)
coresidence factor	1.022			1.029
	(0.0416)			(0.0423)
Parent ADL disabled	0.836			0.873
Parent(s) alive?	(0.0818)			(0.0866)
father only ^h	0.853			0.898
	(0.102)			(0.108)
mother only ^h	1.004			1.024
parent's age	(0.105)			(0.108)
70 ^{si}	1.127			1.137
	(0.147)			(0.150)
80 ^{si}	1.423*			1.461*
	(0.224)			(0.233)
90 ^{si}	1.307			1.415
	(0.243)			(0.267)
100 ⁺ⁱ	0.985			1.113
parent education	(0.211)			(0.242)
Elementary ⁱ	1.038			1.036
	(0.0997)			(0.100)
junior high ^{+j}	0.625***			0.631***
	(0.0764)			(0.0777)
parents paid for school	1.032	0.995	1.056	
	(0.255)	(0.246)	(0.264)	
parents provided wedding gift	1.316**	1.293*	1.295*	
	(0.135)	(0.133)	(0.134)	
amount of wedding gift	1.000	1.000	1.000	
	(0.0000	(0.0000	(0.0000	
Respondent's children	253)	264)	269)	
number of G3 children		1.060	1.047	1.035
		(0.0804)	(0.0798)	(0.0795)
G3 children are over 18		1.353*	1.412*	1.335*
		(0.193)	(0.202)	(0.195)
Parent(s) provide housework or childcare?				
housework only ^k		1.614***	1.602***	1.529***
		(0.194)	(0.193)	(0.190)
childcare only ^k		1.581	1.558	1.595
		(0.396)	(0.391)	(0.404)
both ^k		1.498**	1.488*	1.471*
		(0.234)	(0.234)	(0.236)

N	3768	3768	3768	3768	3768	3768	3768
chi2	159.2	202.4	166.3	163.8	185.6	191.8	229.2
aic	4092.8	4073.6	4091.7	4092.2	4076.4	4076.2	4062.8

Each model includes controls for gender, age, G2 education, and G2 family composition (not shown, available upon request).

a - compared to males; b - compared to ages 35-44; c - compared to currently married; d - compared to illiterate; e - compared to working in agriculture; f - compared to agricultural *hukou* holder; g - compared to coresident with parent(s); h - compared to both parents alive; i - compared to 60's; j - compared to illiterate; k - compared to none.

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

2.8.2 Multivariate Analyses

Table 4 provides odds ratios for a binary logistic regression predicting whether adult children give any amount of cash transfer to their elderly parents versus none.

Model 1 is the baseline model which consists of controls for the respondent's sex, age, marital status, SES (including education, job status, family income, and *hukou*), family composition (number of siblings), residential distance from parent, and relationship quality.

Adult children who have higher family income, and live close to parents (but not coresident) are more likely to give some amount of money. Those who are divorced or never married (versus currently married), and non-agricultural *hukou* holders are less likely to give to parents, net of controls. I do not find significant coefficients for G2 age, education level, family composition, or relationship quality with G1 parents.

Model 2 examines the importance of altruism measures – both attitudes towards filial piety/family values and also parental need. Are adult children who agree more strongly with filial piety more likely to give financial support to parents? The evidence given here supports an affirmative answer. For each standard deviation above the mean

score, those respondents who had higher scores on the “family values” factor were 10.2% more likely to give to parents, after controlling for parental need. Several measures of parental need are also significant. Parents of advanced age are more likely to receive financial support. Specifically, parents in their 80s are 1.42 times more likely to receive support than parents in their 60s. I did not find significant coefficients for parents in their 90s or 100+. At that age, their adult children are likely retired themselves and may not have means to help the oldest generation. Another measure of G1 need – SES – also indicates that parents in greater need receive more help. Older adults with no education (compared to junior high or more) are more likely to receive financial transfers. There is not, however, a significant difference between the no education and elementary education only.

Model 3 tests the importance of the corporate group model for intergenerational relations. Are parents who gave financial assistance to children earlier in the life course more likely to receive financial support in old age? Net of controls, we see that parents who provided a child a wedding gift were 31.6% more likely to receive some cash transfers from the focal child respondent. The coefficients for parents paying for education and the amount of a wedding gift are not significant.

The corporate group model also relates to maximizing the overall welfare of the extended family, not just the oldest generations. Here we test (Model 4) whether number of children of the respondent child is associated with cash transfers to the oldest

generation (elderly parents). Here we see that while number of children is not significantly associated with transfers, the odds ratio for whether children are adults (over age 18) is significant compared to respondents who do not have adult children. G2 respondents with at least one G3 child who is over age 18 are more likely (by a factor of 1.35) to give support to elderly parents. Having one child who is an adult could potentially increase the household income. In addition, the parents may have more cash since they no longer have to pay education (primary or secondary) fees and related costs.

Model five examines the mutual aid model. Do adult children only give financial support to parents in exchange for parents providing childcare and housework? Those respondents whose parent(s) provided housework (odds ratio of 1.61) or both housework and childcare (odds ratio of 1.498) within the past year are more likely to give financial assistance to G1 parents.

Model 6 examines all covariates relating to exchange models of intergenerational relations (both corporate group and mutual aid). All previously significant odds ratios from models 3 through 5 remain significant. I find evidence for the corporate group and exchange models.

The final, full model includes all covariates to examine the relative importance of both altruism and exchange as models for intergenerational relations in the PRC. Which model is more meaningful in this context? Firstly, filial piety values still matter. Even

after controls for parental need, parents' earlier life transfers to children, respondents' children, and whether elderly parents' provide present-day instrumental support to adult children, filial piety persists in its effects. Those adult child respondents who agree more strongly with filial piety values related to "family values" are more likely to give cash transfers to parents. In addition, parental need is still important in the final model. Older and lower SES elderly are more likely to receive cash transfers from children, after controlling for children's own SES. The effect of parents' providing a wedding gift (at the time of adult child's marriage) is still significant. Transfers from parents to children at an earlier stage in the life course is associated with later-life transfers from adult children to elderly parents (odds ratio of 1.295) compared to those adult children who did not receive a wedding gift. This is evidence of bond between generations; regardless of parental SES. Amount of gift doesn't matter, just that a gift was given. It may be a symbolic gesture. Finally, having young children and parents providing housework is also associated with greater odds of giving financial transfers to elderly parents. This is evidence of both the corporate group and mutual aid models.

Table 5: Ordinary least squares regression estimates of financial transfers to parents among those adult child respondents who gave any money in 2002

	M1	M2	M3	M4	M5	M6	M7
Female ^a	-0.097	-0.164**	-0.083	-0.105*	-0.107*	-0.097	-0.157**
Age	(0.0522)	(0.0519)	(0.0519)	(0.0524)	(0.0521)	(0.0519)	(0.0519)
45-54 ^b	-0.065	0.037	-0.001	-0.130*	-0.108	-0.070	0.010
	(0.0452)	(0.0498)	(0.0466)	(0.0601)	(0.0599)	(0.0600)	(0.0619)
55-65 ^b	-0.110*	0.105	-0.033	-0.202**	-0.182**	-0.134	0.044
Marital Status	(0.0527)	(0.0671)	(0.0542)	(0.0700)	(0.0700)	(0.0702)	(0.0790)
Divorced ^c	0.208	0.193	0.232	0.191	0.204	0.243	0.233
	(0.174)	(0.171)	(0.173)	(0.175)	(0.174)	(0.173)	(0.171)
Widowed ^c	-0.258**	-0.225*	-0.246*	-0.258**	-0.257**	-0.243*	-0.214*
	(0.0964)	(0.0946)	(0.0958)	(0.0963)	(0.0958)	(0.0953)	(0.0937)
Never married ^c	0.352*	0.241	0.606***	0.246	0.345*	0.617***	0.497**
Education Level	(0.138)	(0.136)	(0.143)	(0.147)	(0.148)	(0.154)	(0.152)
Elementary ^d	-0.023	-0.059	-0.021	-0.016	-0.016	-0.015	-0.050
	(0.0528)	(0.0522)	(0.0524)	(0.0528)	(0.0525)	(0.0522)	(0.0517)
Junior high ^d	0.064	0.007	0.065	0.072	0.070	0.073	0.021
	(0.0535)	(0.0534)	(0.0531)	(0.0535)	(0.0533)	(0.0530)	(0.0530)
Senior high ^d	0.108	0.034	-0.013	0.116	0.122	0.015	-0.046
	(0.0691)	(0.0692)	(0.131)	(0.0691)	(0.0688)	(0.130)	(0.129)
College ^{+d}	0.216**	0.091	0.124	0.217**	0.211**	0.131	0.025
Family income (100s)	(0.0788)	(0.0798)	(0.122)	(0.0787)	(0.0784)	(0.121)	(0.120)

	0.012***	0.012***	0.012***	0.012***	0.012***	0.012***	0.011***
	(0.0009)	(0.0007)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
Job Status							
not working ^e	0.343***	0.344***	0.350***	0.330***	0.325***	0.333***	0.334***
	(0.0557)	(0.0548)	(0.0554)	(0.0558)	(0.0555)	(0.0552)	(0.0545)
manager ^e	0.696***	0.677***	0.697***	0.679***	0.683***	0.686***	0.670***
	(0.0889)	(0.0874)	(0.0884)	(0.0889)	(0.0885)	(0.0881)	(0.0868)
general worker ^e	0.316***	0.276***	0.302***	0.298***	0.275***	0.267***	0.235***
	(0.0604)	(0.0595)	(0.0600)	(0.0607)	(0.0606)	(0.0602)	(0.0594)
other ^e	0.436***	0.425***	0.422***	0.425***	0.417***	0.408***	0.402***
	(0.0563)	(0.0553)	(0.0559)	(0.0563)	(0.0561)	(0.0558)	(0.0550)
non-agricultural <i>hukou</i> ^f	0.157***	0.124**	0.169***	0.145**	0.150**	0.162***	0.131**
	(0.0472)	(0.0466)	(0.0470)	(0.0474)	(0.0473)	(0.0471)	(0.0466)
number of siblings	-0.024	-0.0284*	-0.022	-0.021	-0.019	-0.018	-0.024
	(0.0139)	(0.0137)	(0.0138)	(0.0139)	(0.0139)	(0.0138)	(0.0136)
at least one sister	-0.072	-0.087	-0.061	-0.077	-0.083	-0.071	-0.083
	(0.0496)	(0.0486)	(0.0493)	(0.0496)	(0.0493)	(0.0491)	(0.0483)
at least one brother	-0.053	-0.064	-0.059	-0.053	-0.048	-0.055	-0.062
	(0.0536)	(0.0527)	(0.0533)	(0.0536)	(0.0533)	(0.0531)	(0.0523)
eldest son	-0.021	-0.105*	-0.024	-0.020	-0.019	-0.023	-0.093
	(0.0501)	(0.0510)	(0.0498)	(0.0501)	(0.0499)	(0.0496)	(0.0506)
Residential Distance							
same village/streets ^g	0.181***	0.0949*	0.177***	0.182***	0.197***	0.187***	0.103*
	(0.0460)	(0.0470)	(0.0457)	(0.0459)	(0.0470)	(0.0469)	(0.0486)
same county/districts ^g	0.221***	0.152**	0.203***	0.216***	0.231***	0.207***	0.139*
	(0.0587)	(0.0587)	(0.0584)	(0.0586)	(0.0597)	(0.0595)	(0.0601)
same province/city ^g	0.407***	0.281**	0.392***	0.398***	0.411***	0.393***	0.275**
	(0.0936)	(0.0933)	(0.0932)	(0.0936)	(0.0943)	(0.0940)	(0.0941)
sibling coresides with parent	-0.205***	-0.154**	-0.180***	-0.198***	-0.200***	-0.176***	-0.133**
	(0.0513)	(0.0508)	(0.0510)	(0.0512)	(0.0510)	(0.0509)	(0.0505)

good relationship with parents	0.098	0.062	0.098	0.093	0.097	0.097	0.064
Filial Piety	(0.0589)	(0.0593)	(0.0585)	(0.0588)	(0.0585)	(0.0581)	(0.0587)
family values factor		-0.012					-0.008
		(0.0185)					(0.0184)
respect factor		0.0775***					0.0707***
		(0.0188)					(0.0187)
coresidence factor		-0.005					0.002
		(0.0181)					(0.0179)
Parent ADL disabled		0.162***					0.155***
Parent(s) alive?		(0.0451)					(0.0451)
father only ^h		-0.386***					-0.367***
		(0.0542)					(0.0538)
mother only ^h		-0.345***					-0.333***
parent's age		(0.0458)					(0.0454)
70s ⁱ		-0.059					-0.033
		(0.0594)					(0.0591)
80s ⁱ		-0.121					-0.077
		(0.0695)					(0.0694)
90s ⁱ		-0.115					-0.071
		(0.0834)					(0.0834)
100+ ⁱ		-0.288**					-0.240*
parent education		(0.100)					(0.100)
Elementary ^j		0.058					0.057
		(0.0416)					(0.0413)
junior high + ^j		0.071					0.056
		(0.0583)					(0.0578)
parents paid for school			0.113			0.102	0.099
			(0.119)			(0.119)	(0.117)

	parents provided wedding gift			0.246***		0.242***	0.206***
				(0.0502)		(0.0500)	(0.0494)
	amount of wedding gift			0.00004***		0.00004**	0.00003**
	Respondent's children			(0.00001)		(0.00001)	(0.00001)
	number of G3 children				-0.101**	-0.117***	-0.106**
					(0.0327)	(0.0327)	(0.0325)
	G3 children are over 18				-0.043	-0.006	0.031
	Parent(s) provide housework/childcare				(0.0654)	(0.0655)	(0.0660)
	housework only ^k					-0.053	-0.071
						(0.0531)	(0.0529)
	childcare only ^k					0.334**	0.301**
						(0.101)	(0.101)
	both ^k					0.320***	0.285***
						(0.0681)	(0.0680)
88	Constant	5.347***	5.717***	5.065***	5.501***	5.430***	5.149***
		(0.101)	(0.114)	(0.110)	(0.115)	(0.117)	(0.125)
	R-squared	0.220	0.256	0.232	0.223	0.232	0.243
	AIC	7829	7718	7791	7823	7795	7761
	N	2843	2843	2843	2843	2843	2843

a - compared to males; b - compared to ages 35-44; c - compared to currently married; d - compared to illiterate; e - compared to working in agriculture; f - compared to agricultural *hukou* holder; g - compared to coresident with parent(s); h - compared to both parents alive; i - compared to 60's; j - compared to illiterate; k - compared to none.

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

In addition to examining whether an adult child gives any amount of financial support to aging parents, I am also interested in what determines the amount of support, among those adult children who give some amount of cash support to elderly parents. The dependent variable is the log value of cash to mothers and fathers. Table 5 provides the OLS regression of financial transfers to parents, among those adult children who gave some money to parents in the year preceding the survey interview. The setup is the same as for table 4 – each model tests a different theory of intergenerational relations.

Model 1 is the baseline model and controls for respondent sex, age, marital status, SES (education, income, job status, *hukou*), family composition (number and gender of siblings), residential distance of parents, whether parent coresides with a sibling, and relationship quality with parents. We see that older children (55-65 versus 35-44), widows (versus currently married), and those who have a sibling who coresides with parents are likely to give lower amounts of cash transfers. Never-married, those with college education (versus illiterate), higher family income, not employed in agriculture, non-agricultural *hukou*, and those who live near parents (compared to coresident) are likely to give more. Interestingly the coefficient for residential distance increases by distance, with those on the same village/street giving 0.181 more than co-considerers whereas those living the farthest (same province/city) give 0.407 more than co-

residers. According to the r-square, these controls account for 22% of the variation in log amount of transfers given to parents.

Model two adds our measures of altruism to the baseline model – this includes both filial piety/family value measure agreement and also measures of parental need. Similar to the logistic regression analysis, attitudes towards filial piety do matter. In this case, for each score that is one standard deviation above the mean, the amount of financial transfers increases and is highly significant. Greater agreement with “respect” items of filial piety is associated with larger amounts of cash transfers, net of controls.

Several measures of parental need are also significant. G1 parents who are ADL disabled receive greater cash transfers. Interestingly, a widowed father or mother receives less than when both parents are alive. In addition, the very oldest G1 parents (100+) receive less than older parents in their 60s. This may be a function of the fact that G1 parents who are of such advanced age have children who are also older (84% are 55-65). G1 SES is not associated with amount of cash transfers.

Model 3 examines the corporate group model. Are present-day cash transfers from children reciprocating help from G1 to G2 at earlier stages of the life course? Those G2 respondents whose parents provided a wedding gift are likely to give more cash at the present day. The amount of the wedding gift is also a significant predictor, a larger gift than is associated with more money today.

Model 4 adds variables pertaining to G3 children. One aspect of the corporate group model is that families allocate resources to where they will do the most good. Here we see that each additional G3 child lowers the amount of cash transfers to elderly parents. Families are choosing to allocate resources to G3, instead of G1. Age of G3 child is not significant (at least one child over age 18). This contrasts the findings in Table 4.

Model 5 tests the mutual aid model. Do G1 parents receive more cash from G2 children in exchange for present-day instrumental support? Evidence indicates yes. Those older parents who provide childcare or both childcare and housework are likely to receive larger amounts of cash transfers than parents who give neither.

Model 6 combines the covariates from models 3 through 5 to look at exchange models overall. All coefficients remain significant but attenuated. I find support for both the corporate group and mutual exchange models. Both past and present support from G1 to G2 is associated with larger amounts of present-day cash transfers from G2 to G1. In addition, respondents choose to allocate less money to parents when they have G3 children to provide for as well.

The final model (model 7) includes all controls and independent variables pertaining to both altruism and exchange models. Respondents' agreement with filial piety values still matters. Those who agree more strongly with "respect" items are likely to give higher amounts of cash transfers to aging parents. Parental need based health status (here, ADL disability) is also associated with greater amounts of cash transfers.

Similarly, the exchange model coefficients remain significant though effect size is smaller than in model 6. Both past and present support from G1 to G2 is associated with greater amounts of present-day cash transfers from G2 to G1. In addition, respondents choose to allocate less money to parents when they have G3 children to provide for as well.

In comparing model 2 (all altruism covariates) and model 6 (all exchange covariates), we see that the altruism measures explain more of the variance in the log of cash transfers (R-squared of .256 versus .243). This gives evidence that altruism is a better explanation for financial transfers from adult children to elderly parents in contemporary China. However, the final model has the best model fit, which provides evidence that both altruistic and exchange models are relevant. The final model explains 27.4% (r-squared) of the variation in financial transfers from adult child respondents to elderly parent(s).

2.9 Discussion

During the reform era Confucianism has been “rehabilitated”. Confucian shrines have been reopened, texts republished, and both scholars and citizens are able to discuss the virtues of filial piety and other traditional family values (Whyte 2003). In light of this, it may not come as a surprise that this paper’s analysis of survey data from adult children in both rural and urban areas of coastal China has found that agreement with filial piety is high, particularly as it relates to respect for older parents and family values.

The mean values for respect and family values are 4.10 and 4.18 respectively, with a standard deviation of .52 for the former and .57 for the latter. A mean of 4 indicates that the majority of respondents agree with the items in the factors.

There is more variation, however, on traditional attitudes pertaining to intergenerational coresidence (mean of 2.98 and SD of .76). Unsurprisingly, those who actually coreside with parents have higher-than-average agreement than those who don't, but there is also a positive relationship between distance from parent and agreement with the coresidence factor. We cannot know from cross-sectional data, however, whether respondents' residential distance is impacted by their beliefs, or whether their level of agreement matches their current living situation in order to reduce cognitive dissonance.

T-tests indicate that there are significant differences across mean values of filial piety factors. Women in the sample have higher agreement with "family values" and "respect" and lower agreement with "coresidence." Agricultural *hukou* holders have lower agreement with "respect" and higher agreement with "coresidence". Educated respondents agree more with family values and respect than the uneducated, but have less agreement with attitudes towards coresidence.

I have tested the association between attitudes towards filial piety and family values and both presence and amount of financial transfers to parents. Attitudes matter. Adult respondents who agree more strongly with notions of filial piety are more likely

to give and give more than people with weaker agreement, even after applying statistical controls for characteristics of respondents, their parents, their children, and the relationship between adult children and elderly parents. Different filial piety factors varied in their associations with giving any money versus amount given. Agreement with family values was associated with greater likelihood of giving any money, whereas agreement with respect was associated with giving more money. One of the items is “keep a good relationship within the family.” Giving any amount of money may help achieve this goal. One of the respect items is “support parents for their better life” – more money from adult children would enable older parents to have a more comfortable lifestyle. Adult child respondents give more to parents who have poor health, evidence of altruism. These findings give support to hypothesis 1.

I also find support for my hypotheses relating to exchange models. Parents who provided children with a wedding gift were more likely to receive any cash transfers and also a higher amount. While ability to provide a wedding gift may be an indicator of SES, this coefficient remained significant even after controlling for G1 SES. Having young children (G3) was associated with a lower likelihood of any transfer to parents, and each additional child resulted in a lower amount to parents. This can be interpreted as evidence of the corporate group model – allocation of resources within the family to those in greatest need. Another possibility, however, is that G2 parents may help G1 parents in order to encourage G3 to do the same when G2 has needs in old-age. G2

cohorts will have fewer adult children to support them than their own parents did; similarly old-age support from the state was underdeveloped in 2002. In addition, parents (G1) who give instrumental support to their children in the present are likely to receive support, even after controlling for residential distance between G1 and G2 (coresidential parents are more likely to provide housework/childcare than those who live farther away).

In the analysis looking at presence of financial transfers from G2 to G1 I found that both divorced and never-married respondents were less likely to give to parents than those who are currently married. Studies from more developed countries have found that divorce weakens norms governing intergenerational relations (Kalmijn 2007). As divorce rates rise in China (Zeng and Wu 2000) it will be interesting to see how this influences intergenerational support as well.

Another interesting finding was that there was no difference by gender in terms of giving or not giving but daughters were likely to give less than sons in the OLS regression analysis. This finding differs that reported in the study by Xie and Zhu (2009) who found that daughters gave more to parents than sons after controlling for individual SES. Their study only looked at urban China, whereas mine looks at adult children and parents residing in both rural and urban areas. When I ran the analysis separately by rural/urban (not shown), the results were consistent. More investigation is needed.

While the effect sizes of coefficients for filial piety values are quite small, previous literature argues that even a small financial gift to parents may be of symbolic value. In this study, giving cash to parents is one way to demonstrate filiality. Large amounts of economic support from children can reduce elderly poverty but also be a symbol of an adult child's filiality and respect. Parents may take pride in receiving financial support from filial children (Xie and Zhu 2009).

Some limitations of this study need to be addressed. First, the data only provide us with the transfer behavior from the perspective of a single, focal child. I have included some covariates for sibling characteristics from the perspective of the respondent child. Since there are limited data on G2 children from the G1 parents' perspective (CLHLS respondent), it is impossible to assess the accuracy of the respondent's reports. Fortunately, the post-stratification weights allow me to make the data more closely resemble the true population of adult children of CLHLS respondents than the original data with their low response rates for non-coresident children and daughters.

Are theories of altruism and economic exchange complimentary or contradictory? Some studies caution not to create a false dichotomy between altruism and reciprocity. A good deal of research has shown that the volume of intergenerational support is correlated with the strength of emotional bonds (Rossi and Rossi 1990; Silverstein 2006). One can also argue that altruism and exchange models are not thought

of in the same way by individuals. Exchange may be more of a conscious, calculating phenomenon whereas altruism and a culture of filial piety is part of an unconscious schema (Markus 1977; Moore 2012a).

In my future research, I will continue to study the importance of altruism in motivating intergenerational exchange in China. Specifically, I plan to further explore gender differences – both to examine whether sons and daughters are differentially motivated, but also whether these altruism and exchange models are differentially associated with support to own parents versus parents-in-law. In addition, while cash transfers are important and frequently examined in the literature (thus making comparisons across studies easier), some families may have limited cash resources and may engage in other types of exchange --both necessary and symbolic. My future research will also examine other types of support from adult children to older parents (and vice versa) such as providing medicine, food, visits, phone calls, and caregiving days.

In conclusion, this study found support for both altruism and exchange-oriented models of old-age support in China. Moreover, 21st century adult children still ascribe to traditional norms of filial piety and family values, and the strength of these values are associated with both presence and amount of financial support to parents. Questions still remain, however, about how financial support to parents will change in the future due to shrinking family sizes and changes in social welfare policies, among other

concerns. Will future financial support from adult children be symbolic rather than necessary?

3. Incorporating Biomarkers into the Study of the SES-Health Gradient among Older Adults in China

Social and medical scientists have long been interested in examining the relationship between socioeconomic status (SES) and health. Individuals with lower SES experience higher mortality risks and are more likely to experience disease and deleterious health conditions. This “social gradient” in health has been observed across different time periods and age groups, using a wide range of SES indicators, health measures, and methodologies (Adler and Stewart 2010; Elo 2009; Goldman 2001). While we have considerable evidence on the SES-health relationship using self-reports of health in Western, industrialized countries, less is known about the SES-health gradient using biological indicators in less developed countries. Such research in lower and middle-income countries is important, because the rapidly aging populations of such areas will lead to an increase in the health-related needs of older adults with limited economic resources. Fortunately, a growing number of population surveys in developing nations are adding biomarker measures to existing datasets, which offer more objective assessments of health status and disease. They can also aid researchers in gaining an understanding of the nature of physiological dysregulation, and perhaps eventually identify the underlying causal framework linking lower social status and

worse health. Additionally, in populations with limited access to healthcare, self-reports of disease may be conservative estimates of true prevalence of health conditions.

This study contributes to our understanding of the relationship between economic status and health in the developing world, by studying the SES-health gradient using biological health indicators for older adults residing in rural China. These individuals may not be aware of possible risk factors for cardiovascular disease because of lower levels of education and a lack of regular medical care. This study makes several contributions. First, it compares the SES-health gradient across several biomarkers of cardiovascular disease risk, as well as more traditional self-reports of health. In addition, these data points come from a population, as opposed to a clinical sample. Moreover, the dataset includes an over-sample of the oldest-old, about whom scant information has previously been available concerning the SES-health gradient because of insufficient cases in other population surveys. Last, this study focuses on China for a variety of reasons, including its demography, stratification patterns, and traditional medical practices.

China, which makes up approximately twenty percent of the world's population, is experiencing rapid population aging. The quick pace of economic growth in the 1990s and 2000s has resulted in an overall increase in the standard of living "a rising tide lifts all boats" (Treiman 2012) coupled with growing disparities between rural and urban areas, and between interior and coastal provinces. Traditional Chinese Medicine (TCM)

has long-recognized the importance of physical exercise and diet for maintaining good health. TCM is practiced side-by-side with Western medicine in China's hospitals and clinics. Access to healthcare, however, has changed dramatically over the past sixty years in the PRC – from free healthcare in urban areas and “barefoot doctors” in rural areas to the fee-for-service and for-profit hospitals of the present day. How will these changes in economic disparities and health care system influence the SES-health gradient?

3.1 Background

3.1.1 Mechanisms

Several mechanisms have been hypothesized to link socioeconomic status and health, including both material and non-material pathways. For the former, greater economic resources allow access to better nutrition, housing, healthcare, and result in less exposure to environmental hazards. Non-material pathways include social-psychological resources such as better health behaviors (Lantz et al. 1998; Ross and Wu 1995), lower exposure to stress (Lantz et al. 2005), greater personal control (Taylor and Seeman 1999), and increased health knowledge (Goldman and Smith 2002).

Lowry and Xie—whose work is inspired by Link and Phelan's work on social conditions as a “fundamental cause” of health and illness (1995)—also argue that such causal mechanisms may be influenced by larger socio-political contexts. Chen, Yang and Liu (2010) echo this idea but put forward the life course perspective as a complementary

framework for studying the SES-health relationship in a rapidly changing social context such as China, specifically as it pertains to cohort differences in health.

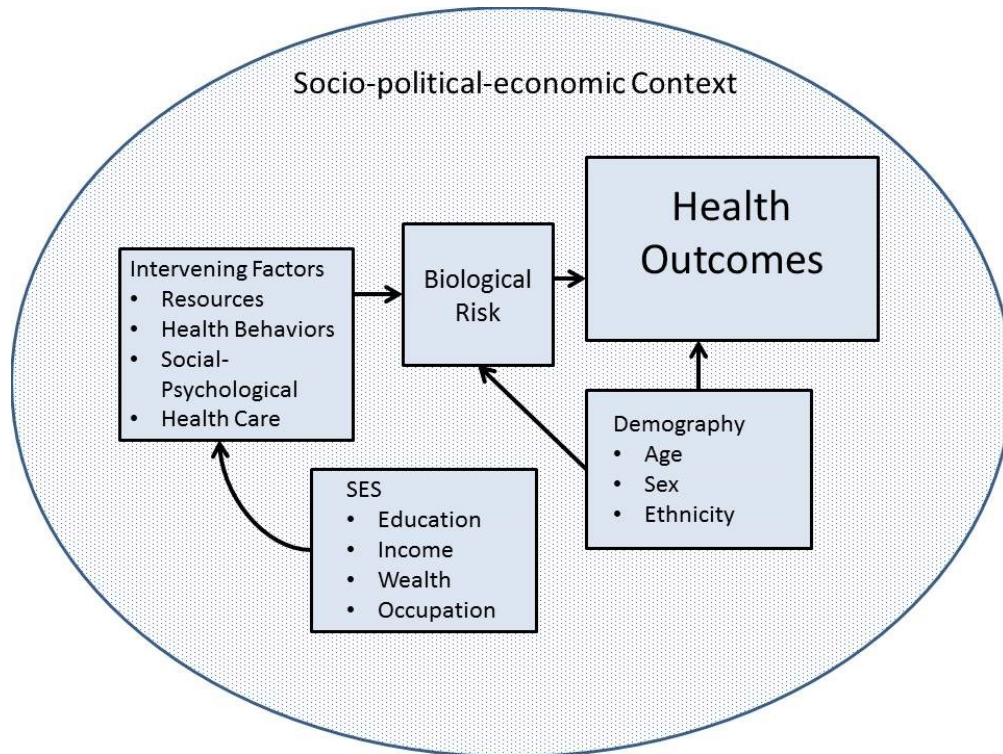


Figure 4: Conceptual framework

Figure 4 presents the conceptual framework for this study (adapted from Crimmins and Seeman 2004; Lowry and Xie 2009). In this bio-psychosocial model of health outcomes, SES influences biological risk and health outcomes through intervening health behaviors, social-psychological resources, and access to economic resources. At the same time, the socio-political-economic conditions can also impact SES, intervening variables, and health outcomes – and the relationships between these groups of factors.

3.1.2 SES-Health Gradients Among Older Adults

Prior studies have shown that health differentials by SES are smallest in young adulthood and increase as people age. Whether the SES-health gradient converges or diverges in old age is still up for debate. Several influential studies of U.S. data find a convergence at older ages (Beckett 2000; Herd 2006; House, Lantz and Herd 2005), while other studies find continued divergence in SES-health gradients at older ages (Huisman et al. 2004; Kim and Durden 2007). Convergence is attributed to several factors. For example, older adults in many countries benefit from age-specific social programs, such as Medicare and social security in the United States. Additionally, it is not clear whether we are observing age differences or cohort differences in the diminishing of the SES-health gradient (Mirowsky and Ross 2003). Analysis of the Health and Retirement Survey (HRS) shows that neither mortality selection nor cohort differences fully explain the shrinking education-health disparities in old age (Herd 2006).

Although several datasets contain sufficient numbers of respondents over age 80, very little research has compared the young-old (60's and 70's) to the oldest-old (80+) in terms of the SES-health gradient. One study using U.S. census data found that the gradient between income and functional limitations persists through age 85, but not beyond (Minkler, Fuller-Thomson and Guralnik 2006).

3.1.3 SES-Health and Gender

It is well documented that women have lower mortality and report worse health than men (Adler and Ostrove 1999), but evidence is mixed regarding SES-health gradients between men and women. Even within a single study, the variations by sex of SES indicator are not consistent. Differences seem to vary based on social context, and how both SES and health are measured and defined (Elo 2009). A review of studies on gender differences in SES-mortality inequalities among US populations concluded that the majority of studies reported male mortality more unequal over absolute measures of socioeconomic inequality (Mustard and Etches 2003)

3.1.4 SES-Health Using Biological Indicators

Studies have established the value of collecting and analyzing biomarkers along with socioeconomic and psychological information in population surveys (Crimmins and Seeman 2001). One advantage of biological measures is that they allow for better modeling of pathways between socioeconomic conditions and physical health. Specifically, biologically measured risk factors may mediate the relationship between SES and a health outcome (Weir 2008). In addition, biomarkers may capture risk factors that are not known to respondents (i.e. not given in self-reports) who may not have access to regular health exams. Furthermore, although biomarkers are often measured in cross-sectional studies, and are certainly indicators of current health conditions, biomarkers and anthropometric measures have additional value because they can also

be interpreted as the cumulative result of exposures over the life span (Rehkopf, Dow and Rosero-Bixby 2010).

3.1.4.1 Advanced Countries

The relationship between SES and health, when health is measured by biological indicators, is not as robust or consistent across studies as self-reports. For example, blood pressure, a commonly analyzed biomarker, has been found to have an inverse association with SES in numerous studies (Atherton and Power 2007; Banks et al. 2006; Bobak et al. 1999). Evidence from studies in Japan and England suggest that the relationship between SES and cardiovascular risk factors vary across cultural and socioeconomic settings (Martikainen et al. 2001).

3.1.4.2 Developing Countries

A gradient between SES and health has been found in nearly every developed country that has been studied, although it may be less steep in more egalitarian countries such as those in northern Europe (Adler and Ostrove 1999). The gradient is not as defined, however, in developing countries. In fact, in certain developing countries, cardiovascular diseases may be more prevalent among the affluent (Bunker et al. 1992; Rosero-Bixby and Dow 2009). A study from Costa Rica, a middle-income developing country, found that the relationship between SES and health was erratic and weaker than that found in wealthier nations (Rosero-Bixby and Dow 2009). One explanation is that as the standard of living rises, different segments of the population will have

variations in exposure to health-enhancing (diet, exercise, etc.) or health-damaging (smoking, drinking, etc.) factors. For example, a study of older Mexicans found that education protected against obesity, but only in urban areas (Smith and Goldman 2007). In addition, health inequalities at older ages depend on social policies, such as access to health insurance and social welfare, and cultural context, such as the types of family and social support that are available.

3.1.5 SES-Health – Evidence from China

Evidence from China has found that higher SES, as measured by education, economic independence, and occupational status, is protective against mortality (Liang, Liu and Gu 2001; Zhu and Xie 2007), cognitive impairment (Zhang, Gu and Hayward 2010)(Zhang, Gu and Hayward 2010), self-rated health (Liu and Zhang 2004), and functional limitations (Beydoun and Popkin 2006) among older adults. In addition, childhood SES exerts long-term effects on functional limitations, cognitive impairment, SRH, and mortality in addition to adult and community SES and psychosocial factors (Wen and Gu 2011). Socioeconomic status is also associated with access to care. According to the Sample Survey on Aged Population in Urban/Rural China (SSAPUR) conducted in December 2000, rural older people are less likely to visit doctors and clinics than urban residents (He 2007).

While education, occupation, income, and wealth are commonly used measures in studies of the SES-health gradient in more developed countries, the most robust

metrics of SES among older adults in China are still being determined. The measures that scholars have applied include: urban/rural residence, household goods, savings, household income, household expenditures, self-rated economic status, and economic independence. Due to differences in lifestyle between agricultural and non-agricultural populations, traditional gauges of socioeconomic position may not be utilized.

3.1.6 Health Status in China

China is an important and unique context for study. As of 2000, China had the highest number of older adults in the world. As such, the PRC, along with some other developing countries, is experiencing population aging much faster than more developed countries due to rapid decreases in fertility rates and increases in longevity. In addition, China has gone through rapid and dramatic social and economic change in the past sixty years. Along with successive demographic transitions, the country is undergoing an epidemiological transition moving from the primacy of acute infectious and deficiency diseases to the increasing dominance of non-communicable and chronic conditions that are generally associated with older populations. According to nationally-representative SSAPUR data, 45% of Chinese elderly reported at least one activity of daily living (ADL) limitation in 2002. In addition, 55% report at least one chronic health condition (He 2007). However, because many Chinese elderly lack access to health care, self-reports of some medical conditions may be conservative.

3.1.7 Health Care in China

In pre-reform China there were three main types of medical insurance: government insurance scheme (*gonfei yiliao*), labor insurance scheme (*laobao yiliao*), and cooperative medical system (*hezuo yiliao*). The government insurance scheme was financed directly by governments at various levels and was provided to people working in governmental organizations. The labor insurance scheme provided insurance to state and collective employees and their immediate family members. The cooperative medical system was primarily for rural areas. This system was funded by individual contributions and collective welfare funds (Zhao 2006).

During the early years of economic reform (beginning in the late 1970s), the coverage provided by these three schemes declined. For example, the system in rural areas declined from 90% of villages covered to less than 5% by the early 1990s (Zhao 2006). As a result of these declines, the majority of people today do not have health insurance and the market cost of health care is prohibitively expensive for poor Chinese citizens (Hu et al 2008; Zhao 2006). Although China shifted towards a market system of health care financing and delivery, hospitals continued to be run by the state. A lack of coordination between financing, pricing, and organization caused inefficiency, waste, and poor-quality of care (Hsiao 1995).

Interestingly, a 1995 study did not find a decline in overall health status associated with the decline in health insurance coverage and rising out-of-pocket costs

for healthcare (Hsiao). The author posits the explanation that the government maintained its per capita funding for public health and prevention. In addition, an overall rise in income improved nutrition, clean water, and education may have offset impacts of poorer medical services to lower-SES people.

New efforts to improve rural health care resulted in the launch of the New Cooperative Medical System (NCMS) in 2003, a co-pay insurance program backed with both central and provincial government funds. The goal of NCMS is to improve rural people's access to health services, and in particular to reduce the risks associated with catastrophic illness (*dabing* in Chinese) (2005 ; Yi et al. 2009). Official statistics report a dramatic expansion of NCMS between 2003 and 2008. The Ministry of Health reported that 95% of counties had been covered by the program by September 2008. Household survey data collected in 2005 and 2008 found that NCMS coverage and participation had substantially improved from its inception in 2003. On average, respondents that required inpatient treatment in 2007 were reimbursed for 15% of expenses. However, for more severe illnesses requiring expenditures above 4,000 Yuan, the reimbursement rate was only 11% on average (Yi et al 2009). Another study of NCMS reported similar results. While health care access has improved among participants, the average household's out-of-pocket spending is still quite high and catastrophic illness can still cause Chinese families to plunge into poverty (You and Kobayashi 2009). More rigorous evaluations of the new system and expansion of the program are necessary.

This study seeks to shed light on the relationship between biological health indicators and SES among older adults residing in China, a developing country. While previous studies have found a mostly positive relationship between SES and self-reports of health in China, this is the first study to look at the SES-health gradient using biomarkers, which provide more objective assessments of health among a population with limited access to healthcare.

3.2 Data and Methods

3.2.1 Data

This paper uses survey and biomarker data from the Chinese Longitudinal Healthy Longevity Survey (CLHLS). The survey was launched in 1998 in China with a focus on the oldest-old because this subpopulation is growing at a rapid rate and previous studies contained few respondents older than 80 years of age. The CLHLS contains extensive data on demographic characteristics, family and household characteristics, socioeconomic status, social support, self-rated health, activities of daily living, and other variables.

Due to an underreporting of self-reported diseases in earlier waves of the CLHLS, additional respondents were surveyed in 2009. The sample surveys middle-aged and older adults (ages 37-100+) residing in specially-designated “longevity areas” in China. “Longevity areas” are counties and cities in China that have been designated as longevity areas by the Chinese Association of Gerontology in accordance with 15

criteria. Three of the most important indicators of the longevity designation are: more than 7 centenarians per 100,000 population, those aged 80 and older make up at least 1.4% of the population, and the average life expectancy in the area is at least 3 years higher than the national average.

The survey was conducted in March-June 2009 in seven longevity areas in China: Xiayi County in Henan Province, Zhongxiang City in Hubei Province, Mayang County in Hunan Province, Yongfu County in Guangxi Province, Laizhou City in Shandong province, Chengmai County in Hainan Province, and Sanshui District (Foshan City) in Guangdong Province. In addition to standard questions and health exam, samples of blood and urine were also collected by medical personnel. The sampling framework was the same as for the CLHLS. All local residents age 100 and older were invited to participate in the study. An equal number of their neighbors in each of 5 age groups (40-59, 60-79, 80-89, 90-99) matched by sex and closest residence were also invited to participate.

2,365 qualified subjects were identified. Of those, 153 left the longevity areas and 132 died before they could be surveyed. All 2,080 of those remaining were notified of the survey and only 51 refused to participate (97.5% response rate). In general, survey response rates are high in China. Of those 2,029 respondents who were surveyed, more than 95% provided venous blood samples, with another 2.3% providing fingertip blood samples. Additionally, 1,935 respondents provided urine samples for analysis and 1,949

provided saliva samples. The face-to-face interviews collected information about each individual's demographic characteristics, dietary habits, health behaviors, and psychological status. During the medical exam, each respondent gave self-reports pertaining to health habits, medical history, and family medical history. In addition, a health practitioner took objective assessments of weight, oral health, hearing, vision, breathing, blood pressure, upper extremities physical ability, mammography, spine examination, and examination of the thyroid, lungs, liver, spleen, and kidneys. The blood and urine samples were analyzed in a lab which carried out a routine blood test, routine urine test, anti-oxidation index, and blood biochemistry for each respondent. This paper's analysis is restricted to respondents who are over age 60 and who also answered the full CLHLS survey and not just the limited survey administered to people in the longevity areas. Therefore, the analytic sample considered in this paper includes 1,234 older adults.

3.2.2 Measures

This research project looks at the relationship between health and socioeconomic status. Health indicators include biomarkers of cardiovascular disease/ metabolic function and self-reports of health. The biomarker variables included for analysis in this paper are total cholesterol, HDL cholesterol, triglycerides, cholesterol ratio (HDL to total cholesterol), fasting blood glucose, systolic blood pressure, diastolic blood pressure,

waist circumference, and body mass index¹ (BMI) in addition to two composite indicators – metabolic syndrome and cumulative risk factor. Metabolic syndrome is defined as having high abdominal girth and at least two of the following risk factors: diabetes, high triglycerides, low HDL cholesterol, and hypertension. The cumulative risk factor is a tally of cardiovascular disease risk factors including high waist circumference, diabetes, hypertension, high triglycerides, and high cholesterol ratio. Cumulative risk may be a better indicator than clinical outcomes, because it focuses on multiple pathways that may lead to CVD (Goodman et al. 2005).

The individual biomarker variables are binary variables where 1 is above the clinical cut-point (see table 6) and 0 is below. Metabolic syndrome is also a binary variable, where 1 is presence of metabolic syndrome and 0 is absence. Cumulative risk is both a binary and an ordinal variable. It comprises three binary variables – 1 or more, 2 or more, and 3 or more risk factors. The ordinal variable has responses coded as 0, 1, 2, and 3 or more. Additional analysis examined the biomarker variables as continuous variables and quartiles (relative to others in the sample), but the binary variables had the greatest association with our SES measures and are also easier to interpret for variables such as BMI which has negative consequences for health at both the low and high end of the spectrum (underweight and obesity).

¹ The BMI cut-off values are those suggested by a WHO expert who compared how BMI values differ between Asian and European populations (Nishida et al 2004).

Table 6: Cut off points and summary measures for individual biomarkers

Cardiovascular Disease Risk Factors	Cut off point	% at clinical level	Mean	(SD)	Min	Max
Hypertension	BP measure or self-report	50.00%				
SBP	≥ 140 mmHg	54.70%	141.01	25.03	69.00	230.00
DBP	≥ 90 mmHg	29.58%	79.73	14.43	28.00	140.00
Ratio of HDL to total cholesterol	> 5	4.05%	3.10	1.34	0.22	19.53
HDL Cholesterol	< 1.04 mmol/L	35.23%	1.18	0.32	0.34	2.64
Total Cholesterol	≥ 6.22 mmol/L	8.52%	3.52	1.31	0.35	8.79
Triglycerides	≥ 2.26 mmol/L	16.64%	1.55	1.24	0.26	10.50
Fasting Glucose	> 7.8 mmol/L	7.31%	5.47	1.84	1.32	25.30
Waist Circumference (cm)	≥ 80 cm for women; ≥ 90 cm for males	32.31%	78.59	11.96	18.00	127.00
Body Mass Index			20.40	4.29	11.05	40.48
obese	≥ 27.5 kg/m ²	5.68%				
underweight	< 18.5 kg/m ²	36.53%				

General health outcomes assessed from survey data includes self-rated health, activities of daily living limitations (ADL), instrumental activities of daily living (IADL), and functional limitations. Self-rated health is assessed by asking respondents, “In general, would you say your health is: (1) very good, (2) good, (3) fair, (4) bad, or (5) very bad?” The variable is reverse coded, where a 5 reflects very good and 1 very bad health. ADL disability is defined as self-reported difficulty with any of the following activities: bathing, dressing, eating, indoor transferring, toileting, and continence. ADL was assessed both as an ordinal variable and a binary variable whereby 1 is “disabled” (having at least one ADL limitation) and 0 is “active” (no limitations). IADL limitations are assessed as self-reported difficulty with performing any of the following activities independently: visiting neighbors, shopping, cooking, washing clothes, and taking public transportation. IADL is assessed as a binary variable where 1 is “disabled” and 0 is “active.” Similarly, functional limitations are assessed by whether the respondent can independently: walk for 1 km, lift a weight of 5kg, and continuously crouch and stand up 3 times. Functional limitation is treated as a dichotomous indicator, with 1 indicating difficulty with any of the three items and 0 indicating no difficulty.

This study operationalizes socioeconomic status as education level and former occupation (occupation held before age 60). Several SES measures are available in the CLHLS survey, but only education and occupation were chosen. These measures are commonly used in studies of the SES-health relationship and therefore make our study

more comparable to other studies. A large literature indicates that education is a strong predictor of SES in adult life. Studies of Chinese samples report a significant correlation between education and broader measures of SES (Zhu and Xie 2007). Respondents were asked “How many years did you attend school?” Due to the high number of respondents who answered 0 (60% in the full CLHLS 2008 sample and 69% in the biomarkers sub-sample), education is treated as a binary variable with 0 indicating no formal education, and 1 indicating some. Education levels are especially low among female elderly (see table 8).

For occupation, respondents were asked: “What was your primary occupation before age 60?” Respondents could choose from 1) professional or technical, 2) governmental/managerial, 3) service/industrial worker, 4) self-employed, 5) agriculture/forestry/fishery, 6) housework, 7) military personnel, 8) unemployed, and 9) other. As seen in table 8 more than 80% of respondents worked in agriculture or fishing. Therefore occupation is treated as a binary variable with non-agricultural occupations coded as 1 (higher SES) and agriculture/fishing coded as 0.

Control variables include age, marital status, and health behaviors. Health behaviors include whether respondents currently smoke, drink alcohol, or engage in regular exercise.

3.2.3 Statistical Analysis

Analyses are run separately on men and women, primarily because of sex differences in the biology of disease (Mendelsohn and Karas 2005). For the individual biomarkers, binary logistic regression models were used to calculate the odds of being above the clinical cut-point of each biomarker. Binary logistic regressions were also used for the outcomes of metabolic syndrome; having one or more, two or more, or three or more CVD risk factors; good self-rated health; ADL disability; IADL disability; and functional status. For the cumulative risk score ordinal logistic models were used to calculate the odds ratios of moving one point higher. Each model includes controls for age, marital status, and health behaviors (drinking, smoking, and exercise). Education and occupation are included jointly in all models to estimate their independent effects. All analyses were performed using STATA version 12.1 (StataCorp, College Station, TX).

3.4 Results

Table 7 provides descriptive statistics for the dependent variables, separately for men and women. There are significant differences between men and women for several of the health indicators. In this sample, men have higher diastolic blood pressure, waist circumference, BMI, and count of CVD risk factors. A greater proportion of men have the following indicators above the clinical cut-point: cholesterol ratio and HDL cholesterol. In terms of self-reports, men have lower prevalence of ADL disability, IADL disability, and functional limitations. This is partially due to the age distribution of men

in the sample. Women have higher cholesterol ratios, HDL cholesterol, total cholesterol, proportion underweight, and proportion with metabolic syndrome. In terms of general health, the female respondents have lower SRH (lower is worse) and a greater number of ADL limitations than men.

Table 7: Descriptive statistics of health variables by sex

	Females (N=721)		Males (N=513)		Sign. (t-test for continuous measure)
	% at clinical level	Mean (SD)	% at clinical level	Mean (SD)	
Cardiovascular Disease Risk Factors					
Hypertension	50.62%		49.12%		
SBP		140.88 (26.31)		141.20 (23.14)	N.S.
DBP		78.53 (14.72)		81.42 (13.85)	***
Ratio of HDL to total cholesterol	3.88%	3.20 (1.24)	4.31%	2.97 (1.46)	**
HDL Cholesterol	28.85%	1.23 (0.32)	44.23%	1.11(0.30)	***
Total Cholesterol (good cholesterol)	88.21%	3.81 (1.27)	96.10%	3.12 (1.27)	***
Triglycerides	13.59%	1.51 (1.16)	20.94%	1.61(1.34)	N.S.
Fasting Glucose	7.07%	5.46 (1.76)	7.63%	5.49(1.95)	N.S.
Waist Circumference (cm)	38.56%	76.89 (11.39)	22.03%	80.99 (12.34)	
Body Mass Index (overweight)	4.16%	19.56 (4.15)	7.80%	21.56 (4.23)	***
Body Mass Index (underweight)	46.60%		22.31%		
Metabolic Syndrome	11.93%		10.53%		
Count of CVD risk factors (high waist circumference, diabetes, hypertension, high triglycerides, high cholesterol ratio)		1.05 (0.87)		1.14 (0.94)	+
Self-reports of Health					
Self-rated health (% good)	47.41%	3.33 (0.87)	51.72%	3.44 (0.88)	+
Activities of Daily Living	21.64%	0.58 (1.36)	7.80%	0.23(0.95)	***
Instrumental Activities of Daily Living	57.14%		30.60%		
Functional Limitations	49.10%		23.20%		

Table 8 provides the means/percentages for this paper's key independent variables and controls, stratified by gender. A greater number of the male respondents are younger elderly, while females are three times as likely to be centenarians as men. Women have longer life expectancies than men and are more likely to reach the oldest-old ages. A greater percentage of male respondents are married, also likely for reasons of male-female differences in life expectancy – older males are more likely to still have living wives. Otherwise, marriage is virtually universal for these cohorts and divorce is rare. Education levels are higher for males. 56% of older Chinese men in longevity areas have some education, compared to only 13% of women.

In terms of health behavior, men are much more likely to be current or former smokers than women--an unsurprising finding because the smoking culture in China is heavily gendered. Women in this sample, however, are more likely to lead sedentary lifestyles as demonstrated by the exercise variable. It is important to note, however, that many of these factors may relate to the age distribution of the men and women.

Table 8: Descriptive statistics of SES measures and control variables by sex

Variable	Female N=721	Male N=513
Demographic		
Age group		
60-69	9.43%	21.05%
70-79	9.99%	20.27%
80-89	18.86%	29.24%
90-99	29.96%	18.52%
100+	31.76%	10.92%
Marital Status		
Married	15.53%	49.12%
Widowed	82.52%	44.44%
Other (separated/divorced, never married)	1.94%	6.43%
Health Behaviors		
Non-smoker	84.60%	34.89%
Non-drinker	85.02%	52.63%
Currently exercises	72.68%	85.38%
Socioeconomic Status		
No Education	87.08%	44.05%
Former occupation in agriculture	88.75%	80.31%

Table 9 presents the associations between SES measures and physiological measures obtained from blood and urine samples, separately for each biomarker and sex. Overall, 6 of 10 associations are significant for the male sub-sample, and only 3 of 10 for females.

Table 9: Estimated odds ratios of binary logistic models of being at or above clinical cut point for individual biomarkers by sex

	High Waist Circumference		Hypertension		Good Total Cholesterol		High Triglycerides		Low HDL Cholesterol	
	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE
Men										
SES variables										
No education	1.00		1.00		1.00		1.00		1.00	
some formal education	1.366	0.343	1.709**	0.348	0.551	0.31	2.770***	0.789	0.922	0.19
Agricultural Occupation	1.00		1.00		1.00		1.00		1.00	(0.19)
Non-Agricultural Occupation	1.205	0.332	1.399	0.335	0.605	0.327	1.14	0.32	1.839*	0.441
Women										
SES variables										
No education	1.00		1.00		1.00		1.00		1.00	
some formal education	0.558*	0.16	1.058	0.274	1.395	0.632	2.008*	0.669	1.296	0.355
Agricultural Occupation	1.00		1.00		1.00		1.00		1.00	
Non-Agricultural Occupation	1.107	0.288	1.391	0.346	0.466*	0.156	0.532	0.227	0.906	0.262

Models control for age, marital status, and health behaviors.

Table 10: Estimated odds ratios of binary logistic models of being at or above clinical cut point for individual biomarkers by sex (cont.)

	High Cholesterol Ratio		Diabetes		Obese		Underweight		Metabolic Syndrome	
	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE
Men										
SES variables										
No education	1.00		1.00		1.00		1.00		1.00	
some formal education	1.257	0.713	0.582	0.223	0.306**	0.129	0.789	0.192	1.55	0.554
Occupation										
Agricultural	1.00		1.00		1.00		1.00		1.00	(0.19)
Non-Agricultural	1.733	0.886	1.302	0.58	3.756**	1.565	0.493*	0.168	1.999*	0.677
Women										
SES variables										
No education	1.00		1.00		1.00		1.00		1.00	
some formal education	0.355	0.616	0.397	0.85	0.437	2.111	1.195	1.662	0.477	1.113
Occupation										
Agricultural	1.00		1.00		1.00		1.00		1.00	
Non-Agricultural	0.262	1.427	0.849	1.738	0.753	1.471	0.837	0.771	0.2	1.396

Models control for age, marital status, and health behaviors.

For male respondents, SES is associated with hypertension, high triglycerides, low HDL cholesterol (“good cholesterol”), obesity, underweight, and metabolic syndrome. Higher SES is associated with worse health in terms of having hypertension, triglycerides, low HDL cholesterol, and metabolic syndrome. For obesity, the results are mixed. Men with some education are less likely to be obese than men with no education (odds ratio of 0.350). In other words, men with no education are more than 2.8 times as likely to be obese as men with some education, net of controls. It may be that those with higher education have a greater understanding of the detriments of obesity. At the same time, however, those whose former occupation was not agriculture (higher SES) are more likely to be obese, net of controls. This may be more related to physical activity through the course of daily work. Overall, however, obesity is rare for this population. Most of these older men would, in fact, benefit from weight gain (22% are underweight according to the BMI measure).

For females, high SES is associated with worse health measured as the greater likelihood of bad cholesterol and high triglycerides; yet high SES is associated with better health in that women with some education are less likely to have a high waist circumference. This is similar to the findings for obesity in male respondents; higher education is associated with a lower likelihood of being obese (here measured by high waist circumference and not BMI).

Table 11: Estimated odds ratios of logistic models of presenting 1, 2, or 3 or more CVD risk factors by sex

	One CVD Risk Factor		Two CVD Risk Factors		Three CVD Risk Factors		CVD Category ^a	
Men	OR	SE	OR	SE	OR	SE	OR	SE
SES variables								
No education	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
some formal education	2.227***	0.49	1.47	0.35	1.83	0.76	1.794**	0.33
Agricultural Occupation	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Non-Agricultural Occupation	1.56	0.44	1.36	0.35	1.26	0.49	1.39	0.29
Women								
SES variables								
No education	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
some formal education	0.66	0.20	1.06	0.29	1.05	0.46	0.96	0.23
Agricultural Occupation	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Non-Agricultural Occupation	1.26	0.37	1.16	0.31	1.23	0.59	1.29	0.29

Models control for age, marital status, and health behaviors; a- ordered logistic regression.

Table 10 presents the associations between any CVD risk factors (cumulative risk score) and SES, separately for men and women. For men, higher SES is associated with having at least one CVD risk factor, both in binary and ordinal logistic regression. Those older men with some education are 2.2 times as likely to present a risk factor than those with no education.

Table 12: Estimated odds ratios of binary logistic models of self-reported health measures by sex

	ADL Disability		Good SRH		IADL Disability		Functional Limitations	
	OR	SE	OR	SE	OR	SE	OR	SE
Men								
SES variables								
No education	1.00		1.00		1.00		1.00	
some formal education	0.715	0.284	1.284	0.276	0.681	0.166	0.783	0.201
Agricultural Occupation	1.00		1.00		1.00		1.00	
Non-Agricultural Occupation	1.275	0.618	2.346***	0.604	0.761	0.238	0.619	0.212
Women								
SES variables								
No education	1.00		1.00		1.00		1.00	
some formal education	0.862	0.383	1.352	0.371	0.327***	0.111	0.441*	0.152
Agricultural Occupation	1.00		1.00		1.00		1.00	
Non-Agricultural Occupation	1.278	0.412	1.193	0.319	0.801	0.245	0.621	0.184

Models control for age, marital status, and health behaviors

The final table (table 12) looks at the association between self-reports of health and SES among the elderly respondents in the CLHLS longevity areas biomarker subsample. Again, there is only a modest association between health and SES. For men, high SES (non-agricultural occupation) is associated with a greater likelihood of self-rating health as good or very good compared to respondents who formerly worked in agriculture (net of controls). Similarly, high SES among female respondents is associated with lower likelihood of poor health – self-reports of IADL disability and functional limitations. These findings are consistent with the larger literature finding that higher SES is associated with better health, including previous studies examining Chinese populations residing in mainland China and Taiwan.

3.5 Discussion

Overall the study has mixed findings related to the SES-health gradient among older adults residing in longevity areas in China. For men, higher SES is associated with worse health as measured by biological indicators, with the exception of obesity. Results for obesity were particularly mixed – those with higher education are less likely to be obese, whereas those with high SES as measured by non-agricultural occupation are more likely to be obese and less likely to be underweight. This could be due to the fact that individuals can more easily tell if they are obese or underweight, versus other biomarkers that can only be assessed through blood and urine analysis. Supplementary analyses (not shown) indicate that high SES (some education) is significantly associated

with normal BMI for men. By contrast, the association between self-reports of health and SES for male respondents mirror the gradients found in more developed countries – higher SES is associated with better health.

For female respondents, there are fewer significant associations between SES and health. This is surprising given that high SES is much less common among female respondents (for example, less than 15% of females report any formal education); therefore I would expect that the effect of SES would be more pronounced. High SES is associated with worse health for two of the biomarkers–high total cholesterol and high triglycerides. High SES is associated with better health in terms of normal waist circumference and two self-reports–educated women were less likely to be IADL disabled or have functional limitations.

Yet the scarcity of relationships between SES and biological health indicators is similar to previous studies among middle aged and older adults in Taiwan (Dowd and Goldman 2006). Dowd and Goldman found that for men, higher SES (as measured by income) was associated with worse health in the form of diastolic blood pressure. They did not, however, find significant findings for SES and obesity among men. A study examining pilot data from CHARLS (China Health and Retirement Longitudinal Study) from Zhejiang and Gansu provinces found similar results to the present study – a positive association between SES and obesity for men (high SES associated with worse health) and also that higher SES was associated with the absence of IADL disability for

women (Strauss et al 2010). An in-depth study of SES and health from another developing country, Costa Rica, also found similar findings for biomarkers of health and SES¹. Similar to my study, they found low SES to be protective against obesity and high triglycerides. Also similar were their findings for self-reports of health – poor SRH and disability are associated with lower SES.

The fact that I found so many indicators with a reversed SES-health gradient may be a result of the areas sampled for this study. Most of the longevity areas are in rural parts of China (one exception is a city district in Guangdong province). China's economic development has occurred unevenly by region. While this study presents a snapshot of the SES-health gradient of biomarkers in rural areas, more work is needed to look at this phenomenon across regions of China with differing levels of socio-economic development. Generally, SES and CVD have positive association early in economic development but negative in most developed market economies (Ezeamama et al. 2006).² Furthermore, diet is associated with SES, with higher-status people more likely to have high-fat and high-calorie diets in developing countries (Rosero-Bixby and Dow 2009).

¹ The Costa Rica study is not entirely comparable since they pooled analyses for men and women, unlike SEBAS and CHARLS studies.

² I re-ran the analysis excluding Guangdong data and found that the results were largely unchanged for men and for women the only significant coefficients were for self-reports of health. However, many chi-square values were not significant because of small sample size.

Socioeconomic development of communities in China has occurred unevenly since China began economic reforms in the late 1970s. Additional studies should examine how variation in community development in China might impact the SES-health gradient. A few existing studies have begun to explore those issues. For example, Zimmer, Wen, and Kaneda's study (2010) examined variations in functional health transitions over two time points examining the effects of both individual and community SES. They found substantial health advantages for urban residents but also that SES (as measured by education and access to insurance) influences health differently in rural versus urban areas. Pilot data from CHARLS also identify community variation (Strauss et al 2010). By contrast, a study using the 2002 and 2005 waves of the CLHLS examining SES and health did not find that community SES moderated the association between individual SES (both adult and childhood measures) and ADL disability (Wen and Gu 2011).

This study re-emphasizes the importance of collecting biological indicators for populations with limited access to regular healthcare – such as the poor and rural residents in China -- and therefore who may not know that they exhibit risk factors for cardiovascular disease. The association between good health as measured by self-reports of health and higher SES suggests that higher SES persons may have greater awareness of their overall health status, though they lack awareness of biological risk factors that have not yet manifested in disease outcomes.

Several potential limitations of this study deserve attention. First, the respondents for this study reside in longevity areas, and it is not clear to what extent, besides their relative average longevity, seniors residing in longevity areas differ from persons living in other areas of China. This could potentially influence the relationship between SES and biomarkers of CVD risk. In addition, this study only looks at older adults and we cannot infer the relationship between SES and CVD risk factors among younger Chinese populations. Furthermore, some of the inconsistent results pertaining to SES and health may be due to the fact that it is not yet clear how to conceptually or empirically measure and test socioeconomic status among older persons in China. In addition, the study participants range in age from 60 to over 100 and conditions in China have varied dramatically over the course of the 20th century. Each cohort has had different life experiences. Moreover, socioeconomic status, particularly education, has had different meaning and value in different periods of China's recent history. Some cohorts have had greater opportunities for education and choice of occupation than others.

This dataset has the potential to provide researchers with a wealth of information about the objective health of older adults in China. The inclusion of biological and anthropometric measures of health in this and other surveys expands the possibilities for social scientists to elucidate the mechanisms between social experiences and health outcomes. Future longitudinal analysis will be able to explore the pathways between

social position, risk factors and disease onset. As China's economy develops and the standard of living rises, researchers will have the opportunity to see whether the SES-health gradient will change, and whether individuals and communities will become more or less heterogeneous in terms of the association between socioeconomic status and health.

4. Variations in Non-normative Coresidence across Communities in China

This paper explores variations in coresidence between adult children and elderly parents in China, specifically pertaining to coresidence with adult sons versus adult daughters. In the traditional Chinese family, multiple generations live together along male lineages, with elder care being the responsibility of adult sons and their wives (Chu, Xie and Yu 2011; Whyte 2004). In spite of these traditions, there are still older adults who engage in non-normative coresidence – i.e. coresidence with adult daughters, even when sons are available.

This paper will explore determinants of coresidence with an adult daughter instead of an adult son among a sample of both rural and urban elderly from the 2008 wave of the Chinese Longitudinal Healthy Longevity Survey (CLHLS). I will look at the association between daughter coresidence, individual/family characteristics, and also community context. Specifically I assess whether coresidence with daughters is related to demographic factors, availability of children, SES, and health. This paper will contribute to the literature by examining Communist context as well as individual and family level covariates. Here I pose the question - are older adults who reside in more economically developed areas more likely to coreside with adult daughters than those in less developed areas, net of individual characteristics? Do communities with higher levels of son-preference have lower levels of daughter coresidence?

Several papers have examined coresidence patterns in China, comparing coresidence with an adult child versus living independently, but very few studies have looked at normative vs. non-normative coresidence. This topic is important since fertility decline and the “one-child policy” in China means that older adults in the 21st century may not have adult sons available for coresidence (Pimentel and Liu 2004). In addition, coresidence patterns can be an indicator of shifts in social norms and traditional values (Chen 2005), in this case especially relating to gender dynamics within families.

Three different perspectives are commonly discussed in the literature to explain changing patterns in coresidence. These are demographics, modernization theory, and resources/needs of parents and children. In addition to these three, I will also highlight a less commonly discussed perspective – convention theory.

Changing demographics in China impact the availability of children. Population aging reduces the number of adult children with whom to coreside (Kane and Choi 1999). On the one hand, in a family with multiple adult children, one of the adult children (often an eldest son) will coreside with aging parents (along with a wife and children), while the other siblings will reside in nuclear households. From the older parents’ perspective, however, having fewer children may mean less choice in terms of with whom to coreside, though evidence indicates that older adults prefer to live with a son (Logan and Bian 1999). In addition, population aging implies both an increase in the number of older adults and increasing longevity, leading to the possibility of a greater

number of years with physical and mental impairment. In the future, the one child policy may result in some older parents living alone due to the 4-2-1 problem – one adult couple having to care for two sets of aging parents.

The modernization perspective infers that the strength of traditional values associated with parental authority will decrease and lead to a decline in intergenerational coresidence (Goode 1963). At the same time, modernization may also lead to an increase in the status of women, thus enabling women and men to share equal roles in family coresidence with older parents (Pimentel and Liu 2004). Modernization theories assume that changing circumstances imply changing cultural preferences (including regarding coresidence patterns). Increased labor migration of rural sons has also reduced traditional son coresidence.

In contrast, altruism may counteract modernization's drive towards lower intergenerational coresidence. This framework highlights the importance of family interests over the individual in regards to shaping decisions and behaviors. This perspective directly connects to Confucian philosophy – filial piety, indebtedness to parents, and respect for elders (Whyte 2004; Zimmer and Korinek 2010).

Previous studies of intergenerational support in China, including coresidence, have shown that the resources and needs of both generations (adult children and older parents) are related to coresidence patterns. Coresidence can relate to either the needs of adult children or the needs of parents. Coresidence benefits parents in terms of both

economic support, instrumental support for those with health limitations, but also through realizing cultural expectations for support from adult children. Adult children can benefit from living in a parents' home and receiving help with childcare and housework responsibilities, enabling them to work for wages or even migrate [see Chen, Liu, and Mair 2011 for a review of grandparent coresidence in China].

Another possible mechanism for an increase in the acceptance of coresidence with an adult daughter is defined by convention theory. This theory argues that social practices are determined by group norms and individual decisions. Even if people would prefer to coreside with an adult daughter, the norm is to coreside with an adult son. Scholars theorize that social change begins gradually, with a few people willing to coreside with an adult daughter, but eventually reaches a "tipping point" where a critical mass of people have moved away from the original notion (Hayford 2005; Mackie 1996). In China, where mass education campaigns sought to change the public's attitudes quickly, things may progress at a different pace (Lau 2007). Convention theory would indicate that one way to predict individual decisions about coresidence is based off of the community norms and behaviors – how many people in the same community are willing to live with an adult daughter? Multi-level modeling can get at convention theory by seeing how neighbors' behavior impacts an individual's likelihood to coreside with a daughter. Convention theory has previously been used to examine other social

practices (including foot binding and female circumcision) but not yet looked at non-normative coresidence patterns.

4.1 Chinese Context

This topic of coresidence with a daughter versus a son is of special interest in China, both because of traditional beliefs relating to the roles of sons versus daughters but also because of the social, economic, and cultural changes that have taken place in the People's Republic of China (PRC) through the Communist revolution, Cultural Revolution, Market Reforms, and the most recent decade of rapid industrialization and accompanying social changes.

Confucianism has been the dominant moral philosophy in China (and other East Asian countries) for nearly 2,000 years. The Chinese emphasis on filial piety (*xiao*) plays a major role in the dynamic between parents and children, of any age. Filial piety means absolute love and respect for parents and ancestors. In the 20th century, beginning with the May 4th movement and continuing during the Communist Revolution in the 1940's and the Cultural Revolution from 1966-1976 the tenets of Confucianism and other traditional virtues came under attack. While criticized during the Communist period, after market reform there has been resurgence in Confucian values. And in fact, the Communist Party now encourages (and even mandates, in some cases) adult children to care for their aging parents, rather than making the burden of elderly care the responsibility of the state. This paper also seeks to test to what extent the Confucian

traditions of the patrilocal family have been sustained or diminished by a decline in social welfare and overall social change in China.

Census data show that coresidence with adult children has declined from 67% in 1982 to 60% in the year 2000 (Zeng and Wang 2003). At the same time, in the year 2000, older adults in rural areas were nearly 30% more likely to coreside with adult children than were older people living in urban areas. More evidence is needed, however, to identify the possible reasons for why coresidence patterns have changed.

4.2 Previous Research

4.2.1 Coresidence

In China, coresidence with an adult child has long been the basis for old-age support (Logan and Bian 1999; Silverstein et al. 2006; Zimmer and Korinek 2010). Living with a child may confer health advantages (Silverstein et al. 2006). However, as previously mentioned, China is experiencing fundamental social changes that may affect traditional coresidence patterns. Socioeconomic change can affect attitudes and values regarding old-age support (England 2005). Scholars and policy-makers alike are concerned that the tradition of intergenerational coresidence may be declining, and to the detriment of older adults (Sheng and Settles 2006). Coresidence rates between adult children and parents in China are high but falling (Yasuda et al. 2011; Zeng and Wang 2003). Some scholars attribute persistence of high levels of coresidence to practical

constraints – such as the lack of state welfare for elderly persons in post-Mao China (Zhang 2004b).

A large number of studies examine determinants of intergenerational coresidence in East Asia. Number of children, especially sons, is positively associated with coresidence with adult children (Silverstein et al. 2006). The effects of SES on coresidence patterns are unclear, although coresidence is higher in rural than in urban China (Chen 2005). Needs of parents also play a major role. One common finding is that widowed parents, especially mothers, are more likely to live with children (Chen 2005; Logan and Bian 1999). Older adults in poor health are more likely to prefer coresidence with children and display that preference in both rural and urban China (Sereny 2011). Coresidence with adult children is also a product of the life stage. Coresidence with parents when adult children are young may be a function of adult children's need – such as a young couple being unable to afford their own home or they need help with childcare, as compared to later life stages.

4.2.2 Coresidence With Daughters Versus Sons

While many studies are concerned with the traditional deviation from the norm of coresidence (older parents who choose to live alone), this study looks at another aspect – coresidence with an adult daughter versus an adult son. There is limited evidence on such non-normative coresidence patterns in mainland China. One early study by Logan et al in 1993 in the municipalities of Shanghai and Tianjin found that

14% of coresidential couples lived with wife's parents (Logan, Bian and Bian 1998). They also found that better-educated couples were more likely to live with the wife's parents if given a choice.

A recent study (2003-2004) comparing married couples in southeast China and Taiwan found that coresidence with a husband's parents (also called patrilocal residence) was more prevalent in Taiwan than in China. Although Taiwan has higher levels of development, they also have a more traditional Confucian culture because the country did not undergo a Communist revolution. In this particularly study, coresidence was from the perspective of the adult child and compared determinants of coresidence with husband's parents versus wife's parents. Practical factors were important. The families in this study chose to coreside with wife's parents (matrilocal residence) out of practical considerations, such as the availability of living space. In addition, higher income in Taiwan allowed adult children to "buy out" of their obligation to coreside. Higher parental SES in the form of former occupation was associated with lower rates of coresidence with a son in Taiwan and higher parental education was associated with greater likelihood of coresidence with wife's parents. Having young children was associated with coresidence with husband's parents (in order to provide childcare). In addition, having more brothers was associated with a lower likelihood of patrilocal residence. Urban people in both Taiwan and China were also less likely to coreside – possibly due to modernization factors (Chu et al. 2011).

Zhang's study (2004b) examined coresidence patterns in urban China in the 1990s. The author hypothesized that greater material wealth and housing stocks should enable urban families to achieve their living arrangement preferences. Market transition benefits younger people. The old state system rewarded seniority and political loyalty. This study provided evidence that unmarried daughters are less likely to live with parents. One possible reason for this trend is that daughters may be forced out of the parental home when parents have to face the cost of sons' weddings and their families (Zhang 2004).

Taking a life course perspective, Pimentel and Liu examined both static coresidence patterns and also patterns of entry and exit into non-normative coresidence over an adult child's lifetime (2004). In this study, determinants of coresidence were associated more with needs and resources of parents and children, than with demographic or modernization factors. For example, for older cohorts, having brothers decreased the likelihood that female respondents would coreside with their own parents (Pimentel and Liu 2004).

4.2.3 Community Effects

Social scientists have long been interested in the social community's impact on individual behavior. A large amount of research has looked at "neighborhood" effects on a variety of social processes. A review of mostly US literature identified several potential mechanisms to link communities and individuals: social ties and interactions;

collective efficacy; community resources; and land use patterns (Sampson, Morenoff and Gannon-Rowley 2002). A study of childbearing in Nepal identified diffusion of beliefs and preferences and social interactions as key mechanism linking community and individual behavior (Axinn and Yabiku 2001).

Several studies of fertility behaviors have examined individual behavior in social context. Entwisle and Mason found that community's level of socioeconomic development and family planning programs influenced the impact of individual SES on fertility behavior (1985). A study in Nepal found that individuals who live closer to "non-family" institutions (also a community development marker) were more likely to use contraceptives, net of individual characteristics (Axinn and Yabiku 2001). While these studies examine fertility and not coresidence, the mechanisms linking individual behavior and community context may be similar.

Few studies have looked at the impact of community context on living arrangements of older adults. One notable exception looked at the probability of living alone among unmarried older adults in the US. The authors found that older women were more likely to live alone if they lived in communities with greater proportions of older adults. They were less likely to live alone if they lived in communities with greater norms of familism (Krivo and Mutchler 1989). Several studies point out potential limitations in the neighborhood-effects literature. First, an uncertainty about the level at which to measure the neighborhood, and also a lack of relevant data to measure

community context. In addition, the methodology to develop community-level measures is not as well-established as the science of developing individual level measures (Sampson et al 2002).

4.3 Data and Methods

4.3.1 Data

Data used in this article are from the fifth wave of the Chinese Longitudinal Healthy Longevity Survey (CLHLS) conducted in 2008-2009. This study is only interested in looking at older adults who coreside with adult sons or daughters. Out of 16,956 CLHLS respondents, 14,084 live with a household member (the remainder lives alone or in an institution). Of those 14,084, 68.6% coreside with an adult child. Because I am interested in examining coresidence choices between an adult son or an adult daughter, I am also interested in looking at coresiders “at risk” of coresidence with either a son or a daughter. By “at risk” I mean those elderly respondents who have at least one son and one daughter. The sample size is thus limited to 7,089 individuals (73% of all co-residers).

The CLHLS baseline survey was conducted in 1998, and the follow-up surveys with replacement for deceased and lost-to-follow-up elders were conducted in 2000, 2002, 2005 and 2008-2009. The CLHLS has been conducted in randomly selected half of the counties and cities in 22 of the 31 provinces and municipalities of China (Liaoning,

Jilin, Heilongjiang, Hebei, Beijing, Tianjin, Shanxi, Shaanxi, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Sichuan, and Chongqing). The survey areas covered 985 million persons in the 1998 baseline year, which was 85 percent of the total population of China. The CLHLS aimed to interview all centenarians (voluntary participants). For each centenarian, one nearby octogenarian and one nearby nonagenarian of pre-designated age and sex was randomly selected and interviewed. Nearby refers to same village or street, or the same town, county or city when applicable. This sampling design ensures comparable numbers of randomly selected male and female respondents ages 80-99. The 1998 baseline and 2000 follow-up surveys included oldest-old interviewees aged 80-110 and did not include young elders aged 65-79. The CLHLS survey has been expanded since the 2002 wave to cover ages 65 and above through the addition of a new sub-sample of interviewees aged 65-79.

The data collected in the questionnaire includes family structure, living arrangements and proximity to children, activities of daily living (ADL), physical performance capacity, self-rated health, self-evaluation of life satisfaction, cognitive function, chronic disease, care needs and costs, social activities, diet, smoking and drinking, psychological characteristics, economic resources, caregivers and family support, etc. At each wave, survivors were re-interviewed, and the deceased and lost-to-follow-up interviewees were replaced by additional participants.

The systematic assessments on data quality concerning accuracy of age-reporting, reliability, validity, consistency of the main measures, and randomness of attrition show reasonably good quality in the CLHLS data sets (Gu 2008; Gu and Dupre 2008; Zeng 2008)

. The unique CLHLS datasets collected in the 1998, 2000, 2002, 2005 and 2008-2009 have been publicly available and widely applied in healthy aging studies by scholars around the world.

4.3.2 Measures

4.3.2.1 Individual-Level

The dependent variable in this study is living arrangement, from the perspective of an individual older adult, and not from the perspective of an adult child (as is the case in many previous studies). For our analysis the dependent variable has two categories – coresidence with an adult son or coresidence with an adult daughter. Those who coreside with an adult child may also simultaneously coreside with a spouse, adult grandchild, or young grandchild, but that is not the focus of this study. While it would be interesting to look at those who coreside with an adult grandchild (since the CLHLS focuses on the oldest-old, several old respondents have outlived their own children!), the data do not tell us whether it is the offspring of a son or a daughter. Additionally, those who coreside with an adult grandchild only (not in addition to an adult child) make up only 2.1% of our analytic sample and are excluded. Those who coreside with

both an adult son and adult daughter are also excluded (n=187). Last, since some of our community-level variables are constructed by aggregating CLHLS respondents, the analysis is limited to respondents who live in communities where a minimum of 5 respondents were interviewed (N=6,864). Due to missing data on both individual level and community level variables, our final analytic sample is 6,538 (less than 5% missing data).

Based on previous literature and data availability, the individual-level covariates in this study include demographic, socioeconomic status (SES), family, and health characteristics. Demographics include age and gender. Age is a categorical measure of age group: 60-69, 70-79, 80-89, 90-99, and 100+. Age 100+ is the comparison group. SES is measured by former occupation. This is a categorical variable including agriculture/fishing, white collar, service/industry, and other (includes military, government, housewife, etc.). Agriculture/fishing is the comparison group in analyses. Family characteristics include marital status, number of sons and daughters, and whether sons/daughters live nearby. Marital status is a categorical variable with 3 categories – currently married, widowed, and divorced/separated (never married are omitted because they would not have any children). Number of sons/daughters is a continuous measure of number of sons/daughters (greater than 1). Two dummy variables measure geographical closeness of children – does at least one son live nearby? Does at least one daughter live nearby? Nearby is measured by whether adult child lives

in same village, town, or city district. Health status is measured by activities of daily living (ADL) disability. ADL disability is a binary variable measuring whether the respondent has self-reported difficulty with one or more of the following activities: bathing, dressing, eating, indoor transferring, toileting, or continence. Last, I add a covariate measuring whether the home is owned or rented in the respondent's own name. I am interested to see whether the adult child moved in with the elderly parent or vice versa.

Unfortunately, the CLHLS has limited information on the characteristics of adult child offspring of respondents. We only know their age, gender, birth order, residential distance, and frequency of visits. We do not have information about the adult child's socio-economic status or the quality of the relationship.

4.3.2.2 Community-Level

Community-level data come from aggregations of CLHLS data and Chinese census data. Community is here defined as living within the same city district, county, or county-level city. Over time, China has developed an administrative system that recognizes four levels of administration: the province level (including provinces, autonomous regions, and municipalities), the prefecture level (including cities at prefecture level), the county level (including counties, autonomous counties, and cities at the county level, as well as districts under the jurisdiction of cities), and the township level. The communities in this study are those at the county level – counties, city-level

counties, and city-districts. We restrict our analyses to communities in the CLHLS that have at least 5 respondents. While having a minimum number of respondents is not theoretically necessary in multi-level modeling, it is important for any community measures that are made by aggregating responses of respondents within communities.

The development indicators come from China's 2000 and 2005 (1%) census. While more up-to-date data could come from Chinese statistical yearbooks – which are collected yearly by every province/municipality in China – the large amount of missing data (sometimes county-level data was not available for whole provinces) in these sources presents analytical challenges. Therefore, I decided to use the older but more complete census data. All census data were accessed through the “China Data Online” database, housed at the University of Michigan. Two indicators of development are used: the percentage of the population that is agricultural (as measured by *hukou* status) and percentage of households with an in-house toilet facility. Percentage of agricultural population ranges from less than 5% in a city district in a northeast city to more than 95% in a rural county in Anhui province. Similarly, percentage without a toilet facility ranges from zero percent in an urban northeast city district to 90% in a rural county in Jiangxi province.

Since 2006, the Chinese government has divided the provinces and municipalities of China into four regions: Western, Central, Eastern, and Northeastern. The Eastern coastal regions are the most developed. There is considerable variation in

income both between and within provinces, but there is evidence that the rate of growth of disparities between regions is decreasing (Li and Xu 2008). While all regions have experienced income growth since economic reform began in 1978, there are still disparities across regions, particularly between rural and urban regions, and between coastal and inland areas.

To examine community norms regarding son preference I included a measure of sex ratio at birth (SRB). Communities with imbalanced sex ratios (more males born than females) indicate that community norms value sons over daughters, a traditional view. People who live in the same communities may be less likely to accept non-normative coresidence (coresidence with daughters) These same communities are less likely to accept non-normative coresidence.

The SRB data come from the China 2005 1% census. SRB is either provided in a table or can be derived by dividing number of male births by the number of female births in a given year. While most provinces provided county-level data, some provinces only had data at the city level. In those cases, the SRB for a given county would be the same as the prefecture-level city that the county is under. I looked at the data several different ways, including SRB as a continuous variable or as an ordinal variable ranging from normal SRB, moderately high, high, and very high (adopted from Zhu et al 2009). I chose to analyze SRB as a continuous measure; the results in multivariate analysis were no different than from creating categories of SRB.

In order to measure convention theory I have also constructed a community-level variable measuring the percentage of people in that community (among CLHLS respondents) who coreside with a daughter, excluding the respondent's own answer. This variable is calculated from the full sample, not just the sample used here (ever-married coresiders with at least one son and one daughter). For example, a community with 20 respondents and 3 of whom coreside with daughters, for each of those respondents who coreside with daughters their value would be $2/19$ (10.5%). For those respondents who don't coreside with daughters the value would be $3/19$ (15.7%). From the former respondent's perspective, 10.5% of community members coreside with daughters. From the latter's perspective, 15.7% of respondents coreside with daughters. This variable is only calculated for communities with at least 5 respondents. 72% of sampled communities have at least 5 respondents, and there are equal proportions of districts, counties, and cities between those communities with at least 5 respondents and the full sample. Similarly, the full sample and communities with at least 5 respondents are similar distributed in northeast, eastern, central, and western provinces in the CLHLS.

4.4 Analytic Strategy

Multilevel (or hierarchical) models enable us to estimate both individual level and community level effects. Multilevel models estimate unbiased coefficients and

standard errors; standard logistic regression will produce biased results when observations are not independent – likely the case when community effects are strong. This study employs multi-level binary logistic regression analysis. The dependent variable is coresidence with a daughter versus a son.

The statistical model used in multilevel analysis of binary variables is similar to the standard logistic regression model. The observed outcome is y_{ij} – whether person i in community j coresides with a daughter (value of 1) or a son. The null model (no covariates) is modeled as

$$\log\left(\frac{\pi_{ij}}{1 - \pi_{ij}}\right) = \beta_0 + u_{0j}$$

The intercept β_0 is shared by all communities while the random effect u_{0j} is specific to community j . The random effect is assumed to follow a normal distribution with variance $\sigma_{u_0}^2$.

This paper will only look at random intercept logit model. Additional analysis examined random effects of individual-level coefficients (random slopes) and also cross-level interactions and found no significant point-estimates. A model with one level 1 predictor and one level 2 predictor would look like this:

$$\log\left(\frac{\pi_{ij}}{1 - \pi_{ij}}\right) = \beta_0 + \beta_1 x_{1ij} + \beta_2 x_j + u_{0j}$$

β_1 is a level-1 coefficient and β_2 is a level-2 coefficient. β_0 is overall intercept in the linear relation between log-odds and x . The exponential of β_0 gives us the odds that $y=1$ when $x=0$ and $u=0$. β_1 is effect of 1-unit change in x on the log-odds that $y=1$ after adjusting for β_2 and group effect u_j . If we hold u_j constant then β_1 can be referred to as cluster-specific effect. Intercept for a given group j is β_0 plus u_j , which will be higher or lower than overall intercept depending on value of u_j . u_j is the random effect (or level 2 residual). Variance of u_j is the between-group variance adjusted for covariates.

As is conventional in multilevel modeling, each continuous second-level variable is mean centered (this includes percentage agricultural *hukou*, percentage with toilet, SRB, and percentage who coreside with a daughter). Percentages are calculated out of the number 100. The coefficient (log-odds are reported) indicates the increase or decrease in log-odds for a 1% or 1 point increase in that covariate.

Similar to multilevel models with linear outcome, we can examine the proportion of the total residual variance that is due to between-group variation. This is calculated by the variance partition component (VPC). In a logit model the value of σ_u^2 is approximately 3.29 (Guo and Zhao 2000; Steele 2009).

$$VPC = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_\epsilon^2}$$

Every model in table 15 reports the VPC. The models in table 15 are as follows. Model 1 is the null model – no covariates. Model 2 adds all individual-level covariates.

Models 3 through 7 add one second-level covariate (community level) to model 2. Model 3 adds a covariate for the percentage of the population in the community that has an agricultural *hukou* (rural population). Model 4 adds a covariate for the type of community – comparing rural county, county-level city to prefecture-level city district. Model 5 adds a covariate for region – comparing western, central, and northeast to eastern (the most developed region). Model 6 gets at community norms with a measure of community sex ratio at birth (SRB). Model 7 adds a covariate for the percentage in the community who coreside with daughters. Model 8 is the full model which includes all the individual-level covariates from model 2 and also 3 community-level measures – percentage rural, region, and percentage who coreside with daughters. All analyses were done with “xtmelogit” in STATA IC 12.1. Table 15 reports log-odds.

4.5 Results

4.5.1 Descriptive Statistics

Overall, among those who coreside with an adult child, the majority coreside with a son. In the analytical sample, only 12.4% overall coreside with an adult daughter.

Table 13 does show, however, that there are some differences between older adults who coreside with daughters versus those who coreside with sons. Those who coreside with daughters are likely to have greater numbers of daughters (mean of 2.33 versus 2.11) and fewer sons (1.97 vs. 2.16 on average). On the other hand, they are more likely to have sons living nearby (same village, town, or city district) and less likely to

have daughters living nearby. There are also differences in socio-economic status – here measured by former occupation. While more than 70% of those who coreside with sons were previously employed in farming or fishing, among those who coreside with daughters, it is closer to 50%. Those who coreside with daughters are also more likely to be living in their own home (32.56% versus 26.59%). This gives evidence that daughters are more likely to move into parents' homes than are sons. In other words 32% of daughters who coreside with parents live in the parents' home (based on the name under which it is owned or rented) while 26% of sons who coreside with parents live in the parents' home. Examining longitudinal data or retrospective reports would shed more light on this issue. Last, older respondents who reside with daughters are more likely to be ADL disabled. This is true even though age of the two groups is very similar and age tends to be associated with health status. This relates to the western literature on gender and caregiving that daughters are more likely to be caregivers for frail elderly than sons (Spitze and Logan 1990). There appear to be no differences by age, gender, or marital status.

Table 13: Descriptive statistics of all covariates by coresidence status

Variables	Coresidence with Son (N=5724)		Coresidence with Daughter (N=814)		Total (N=6538)	
	Mean/%	SD	Mean/%	SD	No./Mean	%/SD
Individual Covariates						
Age	89.22	10.95	90.03	11.29	89.32	11
Female (%)	62.86%	0.01	64.37%	0.02	63.05%	0.01
Marital Status						
married (%)	18.50%	0.01	18.06%	0.01	18.45%	0
widowed (%)	79.16%	0.01	80.71%	0.01	79.35%	0.01
Separated/Divorced (%)	2.34%	0	1.23%	0	2.20%	0
# of daughters	2.11	1.14	2.33	1.22	2.14	1.15
# of sons	2.16	1.12	1.97	1.12	2.14	1.12
at least one son lives nearby (%)	61.84%	0.01	75.31%	0.02	63.52%	0.01
at least one daughter lives nearby (%)	89.29%	0	65.48%	0.02	86.33%	0
Respondent's former occupation						
Agriculture/Fishing (%)	73.79%	0.01	51.97%	0.02	71.08%	0.01
white collar (%)	4.61%	0	7.49%	0.01	4.97%	0
service/industry (%)	9.91%	0	19.53%	0.01	11.10%	0
other (%)	11.69%	0	21.01%	0.01	12.85%	0
home is purchased/rented in respondent's name (%)	26.59%	0.01	32.56%	0.02	27.33%	0.01
ADL disability (%)	26.64%	0.01	35.38%	0.02	27.73%	0.01
Community Level Variables:						
% in community with agricultural <i>hukou</i>	74.57%	0.23	61.38%	0.31	72.93%	0.25
% in community with in- home toilet	28.32%	0.26	27.52%	0.24	28.22%	0.25
Type of Community						
Prefecture-level city district	32.48%	0.01	49.88%	0.02	34.64%	0.01
County	45.86%	0.01	33.78%	0.02	44.36%	0.01
County-level city	21.66%	0.01	16.34%	0.01	21.00%	0.01
Region of Residence						
Northeast	29.96%	0.01	26.90%	0.02	29.58%	0.01
Eastern	27.25%	0.01	23.71%	0.01	26.81%	0.01
Central	37.84%	0.01	38.70%	0.02	37.95%	0.01
Western	4.94%	0	10.69%	0.01	5.66%	0
Sex Ratio at Birth	117.96	9.17	117.76	9.32	117.94	9.19
% in community who live with daughters (excludes respondent)	9.70%	0.08	12.98%	0.09	10.11%	0.08

There are also differences in the types of communities that these two groups of elderly respondents reside in. Those who coreside with daughters tend to live in communities that have fewer people with agricultural *hukous* (61% versus 75%), and also more likely to live in city districts rather than more rural areas. Region of residence is largely similar, as is community's sex ratio at birth. Those who coreside with daughters are more likely to have neighbors who also coreside with daughters – 13% versus 9.7% for those who coreside with sons.

Table 14 provides more information about the communities sampled in the CLHLS. For this study, 562 communities are included (out of a total of 842 in the full sample). The mean number of respondents in each community is 28. The majority of communities are in eastern provinces. In addition, nearly half of the communities are city districts. This is very similar to the overall sample of communities in the 2008 CLHLS. The mean SRB across communities is 119.37 – considerably above the normal SRB of roughly 107 (Zhu, Lu and Hesketh 2009). Across communities, about 19% of respondents coreside with daughters, with some communities in the sample having no one coresiding with daughters and others having nearly all respondents sampled from that community coresiding with daughters.

Table 14: Distribution of community level variables

	N	%	Mean	SD	min	max
Number of communities	562					
# of respondents per community			28.02	44.98	5	466
<i>communities by region</i>						
Northeast	55	9.79%				
Eastern	201	35.77%				
Central	173	30.78%				
Western	133	23.67%				
<i>Type of Community</i>						
Prefecture-level city district	267	47.51%				
County	210	37.37%				
County-level city	85	15.12%				
SRB			119.37	9.64	98	138
% coresident with daughters		19.35%			0.00%	92.85%
% rural resident		66.48%			1.10%	95.60%
% without in-home toilets		26.75%			0.00%	93.73%

4.5.2 Multivariate Analysis

Coefficient estimates and standard errors for eight models are presented in table 15. Log-likelihood values are also presented to judge differences in model fit between nested models. Model 1 is the null model. Model 2 includes only individual characteristics. Models 3 through 7 add different community-level factors to model 2. The final model (8) includes all individual covariates and three important community-level factors – percentage of population with agricultural *hukou*, region, and percentage in community who coreside with daughters. Based on the log-likelihood statistics,

model 3 fits the data best (likelihood ratio tests showed no significant improvement between model 3 and the full model [model 8]), while model 7 is the best in terms of reduction in level 2 random variance (change from 0.581 in the null model to 0.071 in model 7).

In the first model we see that 15% of the variation in coresidence with daughters comes from the community level. Additional statistical tests (available upon request) indicate that there is significant variation at the community level and this research question is worth pursuing with multilevel models. From the log-odds for the constant we calculate the probability that an individual will coreside with an adult daughter in an average community (random variance equal to zero) is 11.5%.

In the second model several individual-level characteristics have significant effects on the likelihood of coresidence with an adult daughter. Each additional son reduces the likelihood of coresidence with a daughter, while the number of daughters has no significant effect. Coefficients for proximity of children are also significant. Having a son close by raises the likelihood of coresidence with daughters, while having at least one daughter close by lowers the likelihood.

Those who are separated/divorced (as opposed to married) are also less likely to coreside with a daughter, although this group makes up a small proportion of the overall sample. Higher SES – as evidenced by former occupation other than agriculture/fishing – is associated with greater likelihood of coresidence with an adult

daughter versus a son. Home in respondent's own name is associated with greater likelihood of coresidence with daughters. Poor health (as measured by ADL disability) is associated with greater likelihood of coresidence with daughters. Last, the percentage of variation at the community level is reduced to 8.71% after controlling for individual characteristics. This reduced variance gives evidence that the individual-level characteristics are distributed differently across communities.

Table 15: Multilevel binary logistic models for coresidence with daughter

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Individual Characteristics								
Age								
60-69		-0.108	-0.101	-0.11	-0.104	-0.11	-0.0506	-0.0886
(compared to 100+)		(0.213)	(0.213)	(0.213)	(0.213)	(0.213)	(0.209)	(0.213)
70-79		-0.0591	-0.0714	-0.0715	-0.0599	-0.058	-0.00926	-0.0604
(compared to 100+)		(0.167)	(0.167)	(0.167)	(0.167)	(0.167)	(0.164)	(0.167)
80-89		-0.18	-0.166	-0.186	-0.166	-0.18	-0.118	-0.15
(compared to 100+)		(0.132)	(0.132)	(0.132)	(0.132)	(0.132)	(0.129)	(0.132)
90-99		-0.225	-0.199	-0.225	-0.21	-0.226	-0.165	-0.181
(compared to 100+)		(0.118)	(0.117)	(0.117)	(0.118)	(0.118)	(0.115)	(0.118)
Female		0.0801	0.063	0.0754	0.0951	0.0819	0.0937	0.075
		(0.0984)	(0.0982)	(0.0983)	(0.0986)	(0.0985)	(0.0966)	(0.0982)
widowed		0.0842	0.0594	0.0801	0.0752	0.0833	0.0706	0.0528
(compared to married)		(0.134)	(0.134)	(0.134)	(0.134)	(0.134)	(0.131)	(0.133)
separated/divorced		-0.751*	-0.798*	-0.737*	-0.733*	-0.762*	-0.790*	-0.793*
(compared to married)		(0.373)	(0.378)	(0.374)	(0.372)	(0.374)	(0.371)	(0.376)
Number of daughters		0.338	0.336	0.337	0.333	0.338	0.331	0.331
(above 1)		(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.034)	(0.035)
Number of sons		-0.504***	-0.506***	-0.502***	-0.513***	-0.504***	-0.499***	-0.511***
(above 1)		(0.0507)	(0.0506)	(0.0506)	(0.0508)	(0.0507)	(0.0497)	(0.0506)
Former occupation								
White collar		0.737***	0.517***	0.635***	0.706***	0.737***	0.675***	0.515***

(compared to agriculture/fishing)	(0.184)	(0.188)	(0.185)	(0.184)	(0.184)	(0.179)	(0.187)
Service/Industry	0.918***	0.620***	0.784***	0.883***	0.914***	0.842***	0.620***
(compared to agriculture/fishing)	(0.128)	(0.136)	(0.13)	(0.129)	(0.129)	(0.124)	(0.135)
Other	0.815***	0.643***	0.737***	0.800***	0.814***	0.752***	0.647***
(compared to agriculture/fishing)	(0.117)	(0.121)	(0.118)	(0.118)	(0.117)	(0.114)	(0.121)
Home in respondent's name	0.226*	0.133	0.192	0.219*	0.230*	0.216*	0.138
	(0.102)	(0.103)	(0.102)	(0.103)	(0.103)	(0.0995)	(0.103)
At least one son close by	1.569***	1.575***	1.562***	1.575***	1.568***	1.542***	1.571***
	(0.112)	(0.112)	(0.112)	(0.112)	(0.112)	(0.11)	(0.112)
At least one daughter close by	-1.985***	-1.962***	-1.974***	-1.976***	-1.985***	-1.941***	-1.950***
	(0.107)	(0.107)	(0.107)	(0.107)	(0.107)	(0.104)	(0.107)
ADL disabled	0.244*	0.177	0.223*	0.217*	0.243*	0.226*	0.177
	(0.101)	(0.102)	(0.102)	(0.102)	(0.101)	(0.0983)	(0.102)
Community Characteristics							
% in community with agricultural <i>hukou</i>		-0.0126***					-0.0114***
		(0.00193)					(0.00245)
Type of community (compared to city district)			.				
County			-0.493***				
			(0.119)				
County-level city			-0.540***				
			(0.156)				
(compared to eastern) western					0.0344		0.16

						(0.135)		(0.132)
central						0.0516		0.143
						(0.137)		(0.132)
northeast						0.619***		0.344
						(0.187)		(0.186)
community SRB							-0.00577	
							(0.00575)	
% in community coreside with daughters							.0254***	0.00524
							(0.00582)	(0.0085)
Constant	-2.041***	-1.839***	-1.700***	-1.491***	-1.902***	-1.847***	-1.837***	-1.818***
	(0.0613)	(0.199)	(0.199)	(0.211)	(0.212)	(0.199)	(0.191)	(0.21)
random variance	0.581	0.314	0.244	0.269	0.298	0.32	0.071	0.19
% variation at community level	15.01%	8.71%	6.90%	7.56%	8.31%	8.86%	2.11%	5.46%
N	6538	6538	6538	6538	6538	6538	6538	6538
Log likelihood	-2410.7	-2068.1	-2046.9	-2057.3	-2062.5	-2067.6	-2061.3	-2044.3
Chi-square	.	584.3	603.3	595.6	591.7	584	635.7	617.9

Standard errors in parentheses

* p<.05; ** p<.01; *** p<.001

Notes: Sample includes ever-married adults with at least one living son and one living daughter who coreside with an adult child and live in communities with at least 5 CLHLS respondents.

In the next model, I add in a variable that measures characteristics of the community where the respondent lives – the percentage in the community with an agricultural *hukou* (also referred to as rural population). Respondents in communities with higher levels of agricultural-*hukou* holders are less likely to coreside with daughters. This variable is mean-centered. For each percentage point above the mean, the log-odds of coresidence with a daughter is reduced by $-.0126$. In model 3, after controlling for this community characteristic, the majority of the coefficients from model 2 remain statistically significant. A likelihood ratio test gives evidence that model 3 improves the model fit but variation at the community level still persists. This finding is consistent with the modernization framework. I also examined the effect of percentage of households without a toilet and found it was not significantly associated with probability of coresidence with daughters, and did not improve the model fit (likelihood ratio test) from model 2 and is not shown here.

Model 4 adds another indicator of development level of respondent's community of residence – whether the area is a rural county or county-level city (as compared to city district). Living in counties or county-level cities is correlated with a lower probability of coresidence with a daughter. Model 5 adds a measure of community region. Those whose communities are located in northeast provinces (Heilongjiang, Jilin, or Liaoning) are more likely to coreside with daughters than older adults residing in eastern, coastal provinces. There are not statistically significant differences between western and central

provinces and the comparison category - eastern. Likelihood ratio tests show that both models 4 and models 5 are an improvement in model fit from model 2 (which consisted of individual covariates only).

I expected that the eastern provinces would have higher coresidence with daughters as a result of the modernization theory. However, further examination of Chinese census data found that the northeast provinces have a lower proportion of agricultural *hukou* holders than other regions of China (including eastern). As we see from model 3, rural residents are less likely to coreside with daughters; the findings for model 5 are therefore not surprising. In China there are differences in levels of development both within and between regions and provinces.

Model 6 tests community norms. Are communities with stronger son preference (as evidenced by a high SRB) associated with lower probability of daughter coresidence? In this study, the evidence indicates no. While the coefficient is in the expected direction (higher SRB associated with lower daughter coresidence), it is not statistically significant. In addition, the model does not fit the data any better than model 2. I also examined the data looking at SRB as an ordinal variable and found similarly non-significant coefficients.

Model 7 tests convention theory by adding a measure of percentage in the community who coreside with daughters. This measure is strongly correlated with the probability of coresidence with daughters. Each percentage point above the mean raises

the likelihood of daughter coresidence. The greater percentage of neighbors who coreside with daughters, the greater the respondent's own likelihood to coreside with a daughter.

The final model includes three of the previously significant community-level variables – percentage agricultural *hukou* holder, region, and percentage of neighbors who coreside with daughters. Only percent with agricultural *hukou* is significant. Respondents in communities with a higher percent of rural population are less likely to coreside with daughters and are more likely to coreside with sons. Even after controlling for community characteristics, many of the individual-level covariates are still significant. Greater number of sons and having a daughter close-by lowers the likelihood of coresidence with daughters, while higher SES (non-agricultural occupation) and having a son nearby raise the probability of coresidence with daughters. Compared to model 2, home in respondent's own name and ADL disability is no longer significant. Interestingly, a likelihood ratio test shows that this final model does not fit the data any better than model 3 (community-level measure of percent rural residents only).

In each model shown in table 15, the variance of the level-2 random effect is significantly different from zero. Even after controlling for an extensive set of individual and community characteristics, there is still some variation across communities in the likelihood of coresidence with daughters. Adding individual covariates in model 2

reduces the variance by 7.5% and adding community variables in the final model reduces the variance a further 3.25%. Convention theory lowers variance more than economic development (comparing model 7 with model 3) – a reduction of 6.6%.

4.6 Discussion

This paper has shown that both individual-level characteristics and community-level variables are associated with daughter coresidence. In the best-fitting model (model 3, based on log-likelihood), older persons with additional number of sons and a daughter nearby were less likely to coreside with an adult daughter. Older respondents with greater number of daughters, at least one son nearby and higher SES were more likely to coreside with daughters than sons, among a sample which includes ever-married respondents who coreside with an adult child and have at least one living son and one living daughter.

Community effects were also significant. When looking at community characteristics in separate models, I found that older adults who reside in communities where a greater percentage of the population is rural were less likely to coreside with daughters and more likely to coreside with sons – providing evidence of modernization. More developed, urban areas have higher levels of non-normative coresidence. Percentage agricultural population resulted in better model fit than other measures of development that were aggregated at higher levels (such as region of the country). This provides evidence that while there are broad levels of differential development across

provinces and regions of China, there are also significant differences across smaller communities (here city districts, counties, and county-level cities).

A community norm – community sex ratio at birth (SRB)- was not significantly associated with daughter coresidence. I hypothesized that individuals living in communities with greater son-preference would be less willing to coreside with daughters. Instead I did not find a significant effect of SRB and no significant changes in model fit from the model with individual-level predictors only.

In addition to the community's level of development, I also found evidence for convention theory. Respondents who reside in communities where a greater proportion of neighbors engage in daughter-coresidence are more likely to engage in non-normative coresidence themselves. In addition, controlling for this convention variable resulted in the greatest reduction in second-level random variance.

Similar to a previous study comparing Taiwan and Southeast China, this paper also found that higher individual SES was associated with coresidence with an adult daughter (Chu et al. 2011). In addition, having more sons is associated with greater coresidence with a son versus a daughter. By contrast, I did not find that age was an important predictor of non-normative coresidence (Pimentel and Liu 2004). While previous findings have been mixed in regards to modernization and non-normative coresidence, my study provides evidence that more developed communities have higher rates of non-normative coresidence.

This paper makes several innovative contributions. First, it is one of few papers to look at non-normative coresidence with an adult daughter, and one of few to look at it from the perspective of an older parent rather than an adult couple. Second, while many studies of coresidence only look at urban or rural families in a few locations within China, this paper looks at both rural and urban families residing in 22 of China's provinces and municipalities across four different regions of China – eastern coastal, central, northeast, and western. Last, this paper employs multilevel logistic regression models to look at coresidence patterns within social context. While many studies discuss the role that development and modernization play in influencing intergenerational relations in China, most studies test this in more crude ways – such as comparing rural/urban broadly or Taiwan versus mainland China. This study uses multilevel models to get at the more nuanced meaning of social context.

In spite of these contributions, some limitations of this study must be noted. The data used for this project are cross-sectional. We cannot assess causality, or know precisely whether the adult child moved in with the parent or vice versa. Although I do have a measure of whether the home is owned in parent's own name (versus the child's), this is only a rough estimate of who moved in with whom. Some papers argue that quasi-coresidence (living nearby) is just as important as coresidence patterns (Chen 2005) in China. My paper gave some evidence of this as having a son nearby was associated with greater likelihood of non-normative coresidence, while having a

daughter nearby showed the opposite. Also, previous research has shown that living arrangements of the oldest-old change frequently, an older person residing with a daughter at one time point may reside with a different child later (Zimmer 2005). But I argue that overall willingness to reside with a daughter at any point in time is an indicator of social change and different norms held by people that may vary by both individual characteristics and community context. In addition, this is an exploratory study, so building on a simpler cross-sectional snapshot can be a first step in analyzing a more complex model of non-normative coresidence patterns. Future studies should look at changes in community context and changes in coresidence patterns over time. Last, the CLHLS sampling strategy was not explicitly intended for this sort of contextual analysis, but the data have been used for this purpose in other papers, including papers examining both environmental (Zeng et al. 2010) and socioeconomic context on elderly health and mortality (Wen and Gu 2011).

While many studies raise concerns about economic development and social change leading to a decline in intergenerational support, these data show high levels of intergenerational coresidence and strong persistence of norms of coresidence with sons. However, there were interesting differences by family structure, individual SES, and community norms and level of development. As sociologists we care about social context, and how social change may impact the family in a rapidly aging and developing society like China. Future research should further explore changes in overall

coresidence patterns, non-normative coresidence, but also the importance of social context in determining the actions of individuals and families.

5. Conclusions

The year 2008 marked the thirtieth anniversary of the introduction of market reforms in China. Researchers are still discovering how family support and the well-being of older adults have been impacted by the demographic, economic, and social changes of the Republic (1912-1949), Mao (1949-1976), and Reform (1978-present) eras.

This dissertation has contributed to our knowledge of aging in China through the analysis of the unique datasets of the Chinese Longitudinal Healthy Longevity Survey. In examining financial transfers from adult children in rural and urban China, I found that both altruism and exchange models are associated with the likelihood and amount of transfers. In addition, agreement with the values of filial piety persists and is associated with financial transfers to older generations.

In an analysis of the SES-health gradient among older adults residing in rural longevity areas, I found few associations between biological health and socioeconomic status. Among the significant associations, I found the opposite SES-health gradient from that found in more developed countries: in China, higher SES was associated with worse health. In the final empirical study, I explored variations in normative (with sons) and non-normative (with daughters) coresidence patterns across communities in China. I found that normative coresidence persists in most families that engage in intergenerational coresidence, but individual and community characteristics are

associated with greater likelihood of daughter coresidence. Specifically, individuals with higher SES and who live in more economically developed communities are more likely to coreside with daughters than low SES individuals and those in less developed communities.

Social scientists are still examining the effects of market reforms on a variety of aspects of social life in China including education, religion, economics, stratification, and the family. As previously mentioned, it has been more than thirty years since China launched free market-based economic reforms. Researchers, however, tend to only differentiate two time periods – before and after economic reforms. This is partly due to the fact that a lot of research on older adults in China uses datasets collected in the nineties.

Whyte points out that many cities in the mid-1990s had not been dramatically changed by market reforms (Whyte 2005). For example, the author reports that the majority of respondents in Baoding City (the site of his study) worked in or had retired from state-owned enterprises and lived in public housing. In addition, retired persons were still receiving pensions, medical insurance persisted, and few had been laid off. It was only later in the decade that the “iron rice bowl” was dismantled.

Instead of a dichotomy between before and after reforms, I hope that future research on China will look at more nuanced historical periods of time. A very recent

paper on the transition to adulthood does just this. Leung and Hu’s study looks at cohorts who came of age during 5 periods (see table 16 below).

Table 16: Historical periods, 1949-2013 (adapted from Yeung and Hu 2013)

Years	Name	Background
1949-1966	Early Communist Years	1950 marriage law; 1958 Household Registration System; 1958-1962 Great Leap Forward and Famine
1966-1978	Cultural Revolution	Closing of schools; “sent down” generation
1978-1991	Early Reform	1978 Deng Xiaoping comes to power; one-child policy; 1980 marriage law
1992-2001	Mid-Reform	
2001-2008	Rapid Growth	Rising housing prices; 2001 WTO member
2008-present ¹	Uncertain Economic Growth ²	

Studying the family in China is both fruitful and challenging because so much social change has taken place in such a short period of time. One can compare not only the eras before and after reform, but also the different reform eras. Family life in China is influenced by the legacy of the imperial era, the socialist era, and the reform eras. This

¹ Yeung and Hu do not include this additional time period.

² Bishop, B. (2013 May 28). Tamping Down Expectations on China's Growth, *The New York Times*. Retrieved from <http://dealbook.nytimes.com/2013/05/28/tamping-down-expectations-on-chinas-growth/?ref=china>

research is challenging because the changes being examined are rapid, and because of the country's size, the changes are not uniform. Rapid changes mean it is difficult to know what questions to ask and what to look for. Much research, however, confirms that China is still influenced by the legacies of its historical past.

Future research on the Chinese family should take advantage of ongoing data collection projects (such as the CLHLS) and new ones with data collected in the 1990s, 2000s and 2010s. Additional waves of the CLHLS, China Health and Nutrition Survey (CHNS), Chinese Health and Retirement Longitudinal Survey (CHARLS), and Chinese General Social Survey (GSS) will help researchers look at trends in old-age support and elderly well-being over different time periods and in different communities.

While my dissertation is a snapshot of intergenerational support and elderly health in China in the early 21st century, I hope that examining variations across individuals and across communities with varying levels of socioeconomic development will help shed light on how the Chinese family and support for older adults might look in the future. In my subsequent research, I hope to continue examining whether and how individuals and families will be influenced by past legacies and ever-evolving social values, demographic conditions, and economic resources.

Appendix

Table 17: Post-stratification weights for SCSDF data

Gender	Coresidence Status	Age Group	N	Prop.	n	Prop.	weight 1
Male	Non-coresident	35-44	1,422	13.66%	416	10.75%	1.27081
Male	Non-coresident	45-54	1,877	18.04%	475	12.28%	1.46907
Male	Non-coresident	55-65	1,144	10.99%	331	8.56%	1.28491
Male	Coresident	35-44	426	4.09%	373	9.64%	0.42459
Male	Coresident	45-54	399	3.83%	531	13.72%	0.27935
Male	Coresident	55-65	289	2.78%	551	14.24%	0.19499
Female	Non-coresident	35-44	1,604	15.41%	331	8.56%	1.80156
Female	Non-coresident	45-54	1,950	18.74%	352	9.10%	2.05952
Female	Non-coresident	55-65	1,080	10.38%	210	5.43%	1.91195
Female	Coresident	35-44	80	0.77%	66	1.71%	0.45063
Female	Coresident	45-54	74	0.71%	108	2.79%	0.25473
Female	Coresident	55-65	62	0.60%	125	3.23%	0.1844
			10,407	100%	3,869	100%	

Table 18: Factor loadings – unweighted data (PCF, after rotation)

variable	factor 1	factor 2	factor 3	factor 4	factor 5	uniqueness
f11	0.2995	0.678	0.0071	-0.0558	-0.0443	0.4456
f12	0.177	0.7533	0.0814	0.0086	0.0417	0.3927
f13	-0.0649	0.5393	0.382	0.055	0.2599	0.4884
f14	-0.079	0.2294	0.7086	-0.0733	0.1868	0.3988
f15	0.2755	0.7004	0.0784	-0.008	-0.0495	0.4248
f16	-0.0112	0.5223	0.2496	0.1272	0.4188	0.4732
f17	0.0562	-0.1578	0.2162	0.0231	0.7223	0.4029
f18	0.184	0.358	0.0547	0.1329	0.6338	0.4155
f19	0.3212	0.4529	0.0375	0.1734	0.0253	0.6596
f110	-0.011	0.0731	0.0349	0.6364	0.1743	0.5579
f111	-0.0121	-0.0137	-0.0015	0.782	0.0298	0.3872
f112	0.0233	-0.0511	0.2368	0.6134	0.0752	0.5589
f113	0.1644	0.3709	0.0829	0.4429	-0.2431	0.5733
f21	0.6521	-0.0032	0.0874	-0.0346	0.2957	0.4785
f22	0.6964	0.0852	0.1763	-0.0286	0.1938	0.4383
f23	0.6842	0.3314	-0.0812	0.0527	-0.0797	0.4064
f24	0.6719	0.3405	-0.0451	-0.0326	-0.1402	0.4099
f25	0.4998	0.0629	0.36	-0.0104	0.2387	0.5596
f26	0.591	0.3185	0.1493	0.075	-0.0335	0.5203
f27	0.5195	0.1331	0.0325	0.1283	0.2814	0.6157
f28	0.416	0.1186	0.202	0.2149	0.11	0.7138
f29	0.259	-0.054	0.4204	0.2265	0.3671	0.5672
f210	0.2105	0.0324	0.7257	0.1404	0.0396	0.4068
f211	0.0469	0.0506	0.8284	0.0607	0.0562	0.3022

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Biography

Melanie Dawn Sereny Brasher was born in the Bronx, New York, on December 11, 1982, on a snowy winter's day. She attended her first year of college at Binghamton University, and subsequently transferred to Washington University in St. Louis where she received her Bachelor of Arts in International & Area Studies (concentration in East Asia) and Music in 2005. Following graduation Melanie worked as an English teacher at a public high school in Shenzhen, China. She began her graduate studies at Duke University in the fall of 2007, receiving her master's degree in Sociology in December 2009. She will receive her Ph.D. in Sociology from Duke University in September 2013.

Melanie has published four peer-reviewed publications in English-language journals:

- Sereny, Melanie. "Living Arrangements of Older Adults in China: The Interplay Among Preferences, Realities, and Health" *Research on Aging*, March 2011
- Sereny, Melanie and Danan Gu. "Predicting Living Arrangement Concordance and Its Association with Self-Rated Health among Institutionalized and Community-Residing Elderly People in China" *Journal of Cross-Cultural Gerontology*, April 2011
- Zhaoxue Yin, Xiao-Ming Shi, Virginia Kraus, Simon Fitzgerald, Han-zhu Qian, Jian-wei Xu, Yi Zhai, Melanie Sereny, and Zeng Yi. "High Normal Plasma Triglycerides are Associated with Preserved Cognitive Function in Chinese Oldest-old" *Age and Ageing*, March 2012

- Yin, Zhao-Xue, Xiao-Ming Shi, Virginia B Kraus, Melanie Sereny, and Yi Zeng. "HS-CRP and Traditional Risk Factors: Who is significantly associated with diabetes in Chinese Oldest-Old?" *Heart*, October 2012

Melanie was an NIA Pre-Doctoral Trainee for the Social and Medical Demography of Aging from 2009-2013. In addition, she received the Edward and Josefina Tiryakian Endowment for International Research in summer 2011, which enabled her to serve as a visiting scholar at the Chinese Center for Disease Control in Beijing, China. During the academic year 2008-2009, Melanie received a Foreign Language and Area Studies (FLAS) Fellowship for the study of Mandarin Chinese. In the summer of 2008, she participated in the Duke University Leadership in an Aging Society Program. Melanie is also a member of several professional organizations including the Population Association of America, the American Sociological Association, the Gerontological Society of America, and the Southern Sociological Society.

Melanie currently resides in Durham, North Carolina with her husband and two cats, Sydney and Kashgar. During the 2013-2014 academic year, Melanie Sereny Brasher will be a Visiting Assistant Professor in the department of Sociology at Dickinson College in Carlisle, Pennsylvania.