Living Alone in China: Historical trend, Spatial Distribution and Determinants

Abstract (150 words)

Nearly 60 million people live alone in China now. As one of the fastest growing living arrangements in China, representing 14.0% of all Chinese family households in 2011, little is known about who they are, where they are, and what drive this increase. We takes a historical look at the temporal and spatial distribution trends of the one-person household based on 1982, 1990 and 2005 individual-level census data. We also conduct multi-level analysis to examine what contextual and individual characteristics contribute to an individual's propensity to live alone. Results show that economic development and internal migration are crucial factors for the increasing prevalence. There is an increasing spatial heterogeneity in that these households cluster in economically developed areas. Those who live along vary greatly by age, marital status, and socioeconomic status and are motivated by different socioeconomic and cultural factors quite different from the cultural individualism emphasized in the West.

Living Alone in China: Historical trend, spatial distribution and determinants

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The phenomenon of living alone is not new to family demographers and sociologists. In the 1980s, Burch & Matthews (1987) identified the rise of one-person households as a key demographic characteristic of developed societies. Early studies have examined the trend and the driving forces behind the increase of one-person households in the developed societies, especially in the Western contexts (Kobrin, 1976; Kramarow, 1995; Michael, Fuchs, & Scott, 1980). Longevity and the declining of marriage and fertility have been identified as causes of the increase in one-person households in Japan (Ronald & Hirayama, 2009), the United States (Michael et al., 1980) and France (Ogden & Schnoebelen, 2005). Recently, Klinenberg (2012) argues that socioeconomic development in modern countries laid the structural and cultural conditions for the rise of one-person households. Compared to the Western societies, the percentage of one-person households in Asia is relatively low. For example, the percentage of one-person households in France, United Kingdom and the United States are 33.6%, 30.6% and 26.7% in 2010 and 2011 respectively. Meanwhile, Asian countries, except Japan (32.4%), generally have a lower percentage of one-person households. However, the percentages of one-person households have been increasing rapidly in many Asian countries. It has been estimated that, by 2020, four out of the top ten countries with the highest number of single-person households in the world will be in Asia ( ). Moreover, the largest number of living alone population will be in China and India. This increase raises questions regarding how family functions, and indeed regarding the definition of family system itself. It is important to

understand this phenomenon in Asia and to observe how patterns and determinants may be different from what one sees in the West.

This paper focuses on the trends and determinants of one-person household in the context of rapid socioeconomic changes in China for the past several decades. Since the 1980s, the world has witnessed profound socioeconomic transformations in China. Socioeconomic development and family planning policy in China have led to a sharp decline in fertility rate and family size (Cai, 2010; Morgan, Guo, & Hayford, 2009) which have had significant implications for the living arrangements and household structure in modern China (Logan, Bian, & Bian, 1998). Among major changes, an increase in one-person households have been documented (Guo, 2008). According to the National Bureau of Statistics in China, only 5.9% of all households are one-person households in China in 1995. In 2011, one-person households constituted about 14.0% of all Chinese family households. Given the large population base, the total population living in one-person households in China has tripled from about 19 million in 1995 to about 59 million in 2011. In 2011, the number of one-person householders in China has already exceeded the combined number of one-person householders from the United States (31.2 million), France (9.2 million), and United Kingdom (8.1 million). Little is known about the distribution and determinants of this demographic trend.

[Figure 1 here]

Previous research describes the changing household structure in China and notes an increase in the one-person household over the past few decades (Guo, 2008, 2012; Y. Wang, 2008). This paper aims to build on past literature and fill several gaps in our knowledge about the living alone phenomenon. First, past studies have treated one-person householders as a single

category while ignoring the heterogeneity among those who live by themselves. Statistics show a high level of heterogeneity among those who live alone. One can choose to live alone or do so out of socioeconomic constraints. Those who live alone are of different age, gender, marital status, and social classes, ranging from young adults who leave parental home and choose solo-living, adults who remain single in their mid-age, married adults who leave home to work or whose spouses leave home to work, divorced adults who chose to live alone and widowed elderly. Motivations for these different groups of one-person householders are likely rather varied. Yet, there is little effort in differentiating and explaining the pattern of different types of one-person householders in China to date. Secondly, little research has systemically examined the spatial heterogeneity of one-person households across China despite the spatial heterogeneity on economic development in different regions. Finally, past studies were largely descriptive, providing little evidence on what contextual factors in the changing demographic and socioeconomic contexts in China explain the increase of one-person households in the past three decades or what factors explain an individual's propensity to live alone.

We use the 1% micro-data from the Census and Inter-censual 1% Population Sample Survey to address the following research questions:

- What is the spatial pattern of the prevalence and make-up of one-person households in China in the past three decades?
- Have the spatial pattern and make-up of one-person households changed over time? If so, how?
- How are the demographic and socioeconomic characteristics at both individual and contextual levels related to the spatial variations of one person household?
- What contextual and individual factors explain an individual's propensity to live alone?

BACKGROUND

Since the economic reform started in the late 1970s, rapid urbanization has taken place, though at a highly uneven pace, across the country. There has been a steady growth of regional disparity in China where the coastal cities have experienced a much more dramatic pace of development than the inland areas. Past literature suggests that socioeconomic development laid the cultural and structural condition for the rise of one-person households (Klinenberg, 2012). In the Chinese context, uneven pace of economic development implies that one can expect to see a larger growth and an increasing concentration of one-person households in the coastal, economically developed areas, as compared with the inland areas.

Oneunique Chinese context that needs to be taken into account is the rapid increase in internal migration after economic reform partly as a consequence of uneven economic heterogeneity across different regions. In China, all residents are registered with a *hukou* (a registration status) that is assigned at birth based on one's parents' hukou status. Migrants without a local *hukou* status are regarded as the "floating population". Since the collapse of the *danwei* system in the early years, there is a continuing rise of the floating population since the 1980s (Liang & White, 1997). Liang and Ma (2004) conducted a temporal-spatial pattern of the floating population in China between 1990 and 2000 and showed an increasing regional variation in the number of floating population during the period. In 2000, coastal provinces and municipalities such Guangdong, Zhejiang, Fujian, Jiangsu and Shanghai houses the largest amount (50.35% altogether) of the floating population (Liang & Ma, 2004), wherein the five provinces of largest amount of floating population in 1990 (Guangdong, Jiangsu, Heilongjiang,

Sichuan and Hubei) only housed 37.09% of the floating population in 1990. The increase in floating population during this period was fueled by the increase of long-distance, inter-province migration for work. The 2010 Chinese census shows that there are about 261 millions of migrants. As migrants without local *hukou*, their children have limited access to public education and health care in the cities. Because of the scarce resources, many of them could not afford to bring their family to the city to live together. Hence, many migrants leave their family in their hukou origin. This is similar to migrants in the West who are more likely to live independently (Stone, Berrington, & Falkingham, 2011). This trend also has implications on the spatial variation in the prevalence and propensity of living alone in China, but has rarely been examined in the past studies.

HYPOTHESES

We examine three main sets of hypotheses, derived from past literature, that explain the temporal-spatial pattern and individuals' propensity to live alone. At the aggregate (prefecture)-level, demographic trend, socioeconomic development and internal migration are related to growth of one-person households in China over time. At the individual-level, we hypothesize that these factors determine individuals' propensity to live alone through individual-level and contextual-level effects.

1) Demographic factors – Early studies have already pointed out that demographic trend such as ageing and declining marriage and fertility played an important role in understanding the rise of one-person households. In this study, we posit that:

    a) On temporal-spatial patterns at the prefecture level

<blockquote>

     i.   Prefectures with increasing median age have a stronger growth of one-person households over time

     ii.   Prefectures with increasing proportion of singlehood among young adults have a stronger growth of one-person households over time

     iii.   Prefectures with increasing percentage of ethnic minority have lesser growth of one-person households over time

</blockquote>

b) On individual-level characteristics

     i.   Female, ethnic minority groups, married adults and those with higher education are less likely to live alone

c) On contextual-effects

     i.   Individuals living in prefectures with a higher median age are more likely to live alone

2) Socioeconomic development – Past literature suggests that, with socioeconomic development, individuals are more likely to afford living alone while urbanization brought by socioeconomic development laid the infrastructure and cultural environment favorable for the rise of one-person households. Hence, we hypothesize:

a) On temporal-spatial patterns

     i.   Prefectures with a modernizing occupational structures have a stronger growth of one-person households over time

     ii.   Prefecture with a stronger growth in the proportion of college graduates have a stronger growth of one-person households over time

b) On individual-level associations

     i.   Individuals with higher income are more likely to live alone

ii.   Individuals with better education are more likely to live alone

c) On contextual-effects

i.   Individuals living in prefectures with better economic development (as indicated by GDP per capita and housing price) are more likely to live alone

ii.   Individuals living in prefectures with higher proportion of college graduates are more likely to live alone

3) Internal-migration –On temporal-spatial patterns

i.   Prefectures with stronger growth in percentage of floating population over time has a stronger growth of one-person households than the prefectures with lower growth of floating population

b) On individual-level associations

i.   Migrants without a local hukou are more likely to live alone;

c) On contextual-effects

i.   Individuals living in areas with high proportion of in-migration are more likely to live alone

ii.   Individuals living in areas with high proportion of out-migration are more likely to live alone

We note that one-person households are a heterogeneous population with individuals living alone for different reasons and affected by different factors. Hence, we test the above hypotheses for different types of one-person householders, including those who are not married, married, divorced and widowed, and from different age groups.

METHODS

Data

We draw data from the 1% sample of 1982 and 1990 Census micro-data, and a random sample (15%) of the inter-censual 1% Population Sample Survey in 2005 to examine the patterns of one-person households in China between 1982 and 2005[1]. We exclude the collective households (about 3% of all cases) in the analysis.

Analytical strategy

Temporal-spatial pattern at aggregate levels

We first describe patterns of one-person households at the national-level and provincial-level. Prefecture-level panel data are constructed by aggregating information from the individual-level data into prefecture-level. Each case represents a prefecture-year observation, clustered within a prefecture. As prefecture boundary has changed over time, we harmonized the prefecture boundary at year 2000 for the 1982 and 1990 data while 2005 prefecture boundary was adopted for 2005 data.

With these aggregate level data, we estimate two-way fixed-effect regressions to model the growth of one-person households on prefecture-level from 1982 to 2005. With prefecture fixed-effect and time fixed-effect controlled for, we examined the impact of socioeconomic, demographic and migration factors on the differential growth of different types of one-person households in prefecture level. Each fixed-effect regression presents the association between the within-prefecture change of independent variables and the dependent variables

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[1] Persons in collective households (such as dormitories and institutional settings) are excluded in all three waves of data. In China, only about or less than 3% of the population lived in collective households in China between 1982 and 2005.

Individual-level and contextual-level effect

Literature suggests that, with socioeconomic development, individuals become more capable and willing to live alone as they are more educated and live in area with better infrastructure to sustain one-person households. Empirically, the effects can be decomposed into two parts: individual-effects (individual's capability and preference to live alone) and contextual-effects (contextual settings that favor individuals to live alone such as availability of low-cost small apartment,availability of hired help to outsource domestic labor, or social norms that favor living alone).

In addition to the temporal-spatial pattern in prefecture-level, we conduct multilevel analysis to further distinguish the individual and contextual effect of these factors on individuals' propensity to live alone. Two-level random intercept logistic regression models are estimated with 2005 micro-data. Level-1 units are at individual-level while level-2 units are at prefecture-level. With 345 prefectures in China in 2005, 15 prefectures were excluded in the current analysis (mostly remote areas) due to non-availability of prefectures' data.

With two-level random intercept logistic regression models, level-1 predictors show effect of the above mentioned individual factors on the log-odds of living alone while level-2 predictors examine the contextual effect of the above factors, net of the effect from level-1 predictors. The models also estimate the magnitude of intra-class correlation which represents the concentration of one-person households on the prefecture-level.

RESULTS

Temporal-spatial pattern of living alone in China

Descriptive statistics

[Figure 2 about here]

Not only is there a rise of one-person households in China, but the propensity of living alone has changed among different age groups. Figure 2 shows the age-specific propensity of living alone in China between 1982 and 2005. There is a gradual increase in the age-specific propensity of living alone between the age of 16 and 60. The age-specific propensity of living alone in China reaches its peak in later life-stage presumably due to increasing widowhood in later life stages. After the age of 60, the propensity of living alone increases substantially. However, there is a declining propensity of living alone for the elderly population overtime. We also see an increasing propensity of living alone among young adults. In 2005, the age-specific propensity of living alone for the working-age individuals between the age of 16 and 30 nearly double that in 1982 and 1990. This age-specific propensity curve in China still has a sharp contrast with the Western societies where, , in France for example, the age-specific propensity of living alone has a much obvious peak in young adulthood (Ogden & Schnoebelen, 2005). However, the age pattern is becoming more similar to the Western societies. The increased propensity of living alone for young adults in 2005 can be attributed to the increasing floating population and therefore increasing numbers of married-but-live-alone householders. However, because of the regional economic heterogeneity brought by the economic reform, the floating population mostly concentrated in the coastal areas, where greater job opportunities are available.

[Map 1 about here]

Previous studies show that propensity of living alone varies across regions within developed countries(Vitali, 2010). The spatial heterogeneity of the proportion of one-person

households in developed countries is obvious. For example, the City of London has the highest percentage of one-person households in the United Kingdom, where 56% of all households in London are one-person households. Similarly, more than half of the households in Paris was one-person households (Ogden & Schnoebelen, 2005). In the past several decades, we have also witnessed the increasing concentration of one-person households in the economically developed areas. Map 1 shows the changing provincial-level percentage of population living in one-person households in China between 1982 and 2005

The spatial heterogeneity increased between 1982 and 2005. In 1982, the differences of percentages of one-person householders in China among the provinces with the highest percentage of one-person householders (Zhejiang: 2.98%) and lowest percentage of one-person householders (Gansu: 0.69%) is 2.29 percentage-points. In 2005, the difference is 5.43 percentage-points (Zhejiang: 6.62%; Tibet: 1.19). The standard deviation of the provincial-level percentage of one-person householders from 1982 to 2005 has increased by more than 100%. By reporting overall increase in percentage of one-person householders only, earlier studies undermined the variability of the changing family structures in local contexts in China. While the more economically developed, industrialized provinces such as Zhejiang and Fujian enjoyed a relatively strong growth, other less-developed inland provinces such as Tibet and Shanxi have experienced a decline of percentage of one-person householders between 1982 and 2005.

[Table 1 about here]

In 2005, the percentages of one-person households in coastal, more urbanized provinces in China such as Zhejiang were twice as highas in less developed provinces. The pattern is less obvious during the early years of economic reform. As shown above, the percentage of one-

person households and its composition vary considerably across the country, with individuals from economically developed provinces and municipalities more likely to live alone. 17.09% of all domestic households in Zhejiang were one-person households while only 5.34% of all domestic households in Tibet were one-person household in 2005. Yet, there are still considerable variations in the prevalence of one-person households within provinces over time. Data show that there is an increasing spatial heterogeneity among the one-person households at prefecture level over time.

Fixed-effect regression models on prefecture-level data

To examine how prefecture-level characteristics (economic development indicator, demographic pattern) and spatial heterogeneity of one-person households are related, fixed-effect regression models on prefecture-level data are estimated.

[Table 2 about here]

Table 2 presents the results from the fixed-effect regression models (with prefecture-level data) on the changes in prefecture-level percentages of four types of one-person householders - those who were never married, married, divorced and widowed- between 1982 and 2005. Results from the fixed effect models show that an increasing percentage of ethnic minority (non-*Han* ethnic group) in the prefecture is related to a decreasing percentage of widowed-living alone arrangement in the prefectures. In China, family planning policy are more relaxed with ethnic minority groups than with the *Han* majority. Many ethnic minority couples are allowed to have more than one child, while for many years since the 1980 many couples from the Han ethnic group are only allowed to have on child. This increases the probability of ever-married couples from the ethnic minority groups to live with their children, after they became widowed.

Therefore, the prefectures with a higher percentage of ethnic minority groups are more likely to have less percentage of widowed one-person householders.

An increase in median age in the prefecture population is related to an increase in the percentage of one-person households in the area. However, the effect sizes of the changing median age on the changing percentage of different types of one-person householders are all very small. There are two possible reasons for this pattern. Firstly, the higher median age may indicate a smaller proportion of young people and children in the prefecture, either because of the fewer children born over years or an increase in out-migration of young adults. When young people moved out to work or adults are having fewer children, parents face a higher probability of living alone, especially when they are widowed or divorced. Adolescents may also live alone when both parents leave home to work. In addition, it may also indicate that there are more elderlywho have a higher proportion of becoming widowed, thus increases the percentage of widowed-alone one-person householders.

Surprisingly, in contrast to the speculation that delayed marriage and the declining marriage rate would increase the percentage of one-person households, we found that a stronger growth in singlehood in the prefectures is related to a decrease in one-person households in the prefecture. It is possible that the increase in the percentage of singlehood in the population aged between 25 and 35 does not lead to an increase in the living alone arrangement as the singles may not be able to afford or willing to leave parental home to live independently. Instead, the increasing percentage of single individuals may have led to a decrease in the percentage of married and widowed one-person householders in the prefecture population, as it leads to a smaller proportion of ever-married persons in the population.

Results presented above have demonstrated the impact of the changing demographic factors on the percentage of one-person households. Apart from these demographic factors, economic reform and modernization has brought change to education, occupational structures and work-migration which are also important in understanding the change of the percentages of one-person householders in prefecture-level. As secondary education is more common in China nowadays, there is a growing percentage of high school graduates in the prefecture population. Prefectures with a stronger growth of high school graduate in the population have an increase in the percentage of divorce-alone one-person householders but a decrease in percentages of other types of one-person households. These patterns may be related to the a positive relationship between education and divorce and a lower gender differential mortality rate.

The change in prefecture-level percentage of production workers in the working age population has different effect on the percentage of different types of one-person householders. Increase in production working population increased the percentages of single-living alone and married-living alone arrangements but decreased the percentages of divorced-alone and widowed-alone living arrangement. The change in prefecture-level percentage of managerial, administrative, professional and service workers has similar impact on the percentages of types of one-person householders although the negative impact on the prefecture-level percentage of widowed-living alone arrangement is not statistically significant. Overall, the increase in professional and service workers in the working age population has increased the prefecture-level percentage of one-person householders. These patterns may reflect both a preference and constraints on the living arrangements in industrialized and post-industrialized local contexts, against the agricultural context where family members live together to increase the labor input.

Change in percentage of floating population in the prefecture-level units increases the percentage of one-person households. In particular, the change in percentage of floating population increases the percentage of never married –living alone and married –living alone households more substantially. The percentage of widowed –living alone households is not affected by the change in percentage of floating population in the prefectures.

Summary of the Aggregate Trend

To summarize the temporal-spatial patterns of living alone in China, there is an increasing prevalence of one-person households over time at the national level. The growth of single-OPHs and married-OPHs are stronger than the growth of widowed-OPHs. At the sub-national level, there is an increasing trend of spatial heterogeneity over time in that a stronger growth of one-person households is observed in the more economically developed prefectures, especially for the single and married-OPHs. Prefectures with an aging population, declining fertility, increased proportion of singlehood, increased education, floating population and non-agricultural occupational structure experienced a more rapid increase in the one-person households.

Individual and Contextual Determinants of Living Alone

Descriptive statistics

Results from the prefecture-level fixed effect analysis could not differentiate the effects of these factors into individual-level and contextual-level effects. To examine who are more likely to live alone, and how individual and contextual factors affect the propensity of living alone for different age groups, we first conduct bivariate analyses with the 2005 micro-data for the descriptive patterns of living alone for different demographic subgroups, and then multi-level

analysis on the individual and prefecture-level factors. Figure 3a to 3g shows the subgroup percentages of living alone by three age groups and by other individual and contextual characteristics.

Characteristics of those living alone

For young adults (age 16-30) and mid-age adults (31-59), there are higher percentages of male living alone. However, for the elderly population (aged 60 or above), there is a higher percentage of females living alone. For the three age groups, percentages of living alone for married individuals are consistently the lowest among all marital status subgroups. There are higher percentages of living alone for the divorced for the young and mid-age adults. For the elderly, however, the never married subgroup has the highest percentage of living alone.

There are higher percentages of living alone for the highly educated young adults than those who have lower education level. For the elderly, however, the percentage of living alone among the low educated group is substantially higher. While the percentage of living alone among city, town and county (rural area) are not substantially different among the mid-age adults and the elderly population, the percentages of living alone for young adults who live in city and town areas are substantially higher than those who live in rural area. For the young and mid-age adults, there are higher percentages of living alone among those who do not have a local hukou registration (migrants). For the elderly population, there is a slightly higher percentage of living alone among those who have a local hukou status. For all three age groups, there are higher percentages for those who live in the most economically developed prefectures. For the young and mid-age adults, however, the percentages of living alone among the least developed prefectures are slightly higher than those who live in moderately developed prefectures. For the

all three age groups, the percentage of living alone for those who live in prefectures with the

highest percentage of floating population are higher than those who live in prefectures with

lower percentage of floating population. This pattern is the most obvious for the young adults.

Multilevel models on living alone

[Table 3 about here]

Table 3 shows the fully unconditioned two-level random-intercept logistic regression

models on living alone for the three different age groups (age 16-30, age 31-59, and age 60 or

above). The results indicate a larger intra-class correlation on living alone for the young adults in

China than the middle-aged adults and the elderly population. This suggests a higher

concentration of living alone for the young adults in the prefecture level. In comparison, the

proportions of living alone for the other two age groups are more evenly distributed in the

prefecture level.

[Table 4 about here]

Table 4 shows the results of two-level random intercept logistic regression models with

covariates. Separate ananlysis are conducted for the three age groups. In model 1, only

individual-level predictors and random intercept are included. In model 2, both individual-level

and prefecture-level predictors, and random intercept are included. After these covariates are

added to the model, the intra-class correlations are substantially smaller than the unconditioned

models for the respective subgroups in the table 3.

For the young adults (age 16-30), female, non-Han ethnic groups, and those who live in cities or counties (as compared with towns) are less likely to live alone. Never married, widowed, and divorced young adults are more likely to live alone than those who are married. Beside, educational attainment and individual earnings increases the likelihood of living alone for young adults. Young adults who do not have a local hukou status are also more likely to live alone. In model 2, after including prefecture-level characteristics, these associations between individual-level characteristics and living alone remain largely unchanged. Ageing does not have a direct contextual effect on living alone for the young adults. Young adults living in a prefecture with higher median age do not have a higher propensity to live alone. Contradicting some previous speculations, young adults living in prefecture with better economic development and education do not have a significantly higher propensity to live alone. However, in-migration and out-migration in the prefectures are related to the propensity of living alone in the prefectures. Young adults who live in the prefectures that are the top ten net-migration outflow areas are more likely to live alone. The percentage of floating population in the prefectures also has a positive contextual effect on young adults' propensity of living alone.

For mid-age adults (age 31-59), the individual-level correlates are associated with living alone in similar directions. However, ageing in the prefectures are positively and significantly related to the propensity of living alone for the mid-age adults. Adults who live in the prefecture with a higher median age are more likely to live alone. Surprisingly, adults who live in the prefectures with a better development are less likely to live alone. Similar to young adults, mid-age adults who live in prefectures with high percentage of floating population are more likely to live alone. However, prefectures with better education and outmigration do not have a contextual effect of living alone for these adults.

For the elderly, local hukou registration is not significantly associated with the propensity of living alone. Besides, elderly living in city areas are more likely than those who live in town to live alone. Our bivariate analysis previously showed that female was more likely to live alone for the elderly population. However, it was mainly due to their higher propensity of being widowed. After controlling for the marital status, elderly women are less likely than men to live alone. The associations between other individual-level predictors and living alone are similar to younger adults. For the contextual level predictors, the contextual effect of median age of the prefectures, out-migration and in-migration on living alone for the elderly are positive and significant. The contextual effect of economic development on living alone for the elderly population is not significant. However, elderly living in a prefecture with high percentage of young college graduates are less likely to live alone.

As shown above, the individual-level and contextual-level predictors affect the propensity to live alone for the three age groups differently. It suggests their reasons to live alone may differ from the other groups, and socioeconomic development may affect their propensity to live alone differently.

DISCUSSION AND CONCLUSION

Nearly 60 million of Chinese live alone today and yet little is known about who they are, where they are, and what factors drive the increasing prevalence of solo living. Past studies hypothesized that socioeconomic development is closely related to the rise of one-person households. This study further takes spatial variation among different age groups and marital status of those one-person householders into account. Different age groups and marital status

groups have different motivation of living alone, affected by different socioeconomic and cultural factors.

In this study, we find that the growth of one-person households in China differ substantively in different areas. In general, there is an increasing spatial heterogeneity in one-person households over time. As compared with 1982, one-person households are more likely to cluster in economically developed areas, such as Zhejiang, Shanghai and Beijing in 2005. The socioeconomic factors and internal migration are strongly related to growth of single and married one-person householders. The multilevel analysis also shows that clustering of one-person households is more likely for the young adults, compared with older adults. We note that past studies that take one-person households as a single category in understanding the rise of living alone phenomenon have undermined the complexity of the issue.

In addition, past studies fail to distinguish the effects of socioeconomic development into individual and contextual level. We show that one-person householders cluster mostly in economically developed areas because individual socioeconomic status is positively associated with the propensity of living alone. It is likely that they prefer and are more capable to afford living alone. However, contextual-level development in more developed areas may also hinder the rise of living alone because of the high housing cost.

However, socioeconomic development has attracted a vast number of work-migrants in the economically developed areas. We find that internal migration has played a crucial role in shaping the regional variation of living alone at both individual and contextual level. Not only are young migrants without local hukou more likely to live alone, individuals living in high proportion of in-migration and out-migration are also more likely to live alone.

These findings have policy implications. In the Chinese context, the *hukou* system, education expansion, uneven regional development, and the one-child policy jointly shape the increase in one-person household. Our results underscore the importance to recognize the heterogeneity of the one-person household population. People live alone with different reasons. Some are forced to live alone because of their spouse passed away or because of migration. Some choose to live alone as they are willing and capable to do so. But there are also some people who leave their family to work and live alone and some live alone because their family members leave home to work elsewhere. The policy context that shaped the rise of one-person households in China differ from the western experiences that emphasize more on the culture of individualism, social welfare system and urban infrastructure (Klinenberg, 2012). Consequences of living alone in these vastly different contexts may be substantively different. Further studies should examine the well-being of those who are living alone for different reasons, and in different areas of China.

Figure 1. National trend of one-person households in China

Trend of One-Person Households in China
National Trend (1995-2011)
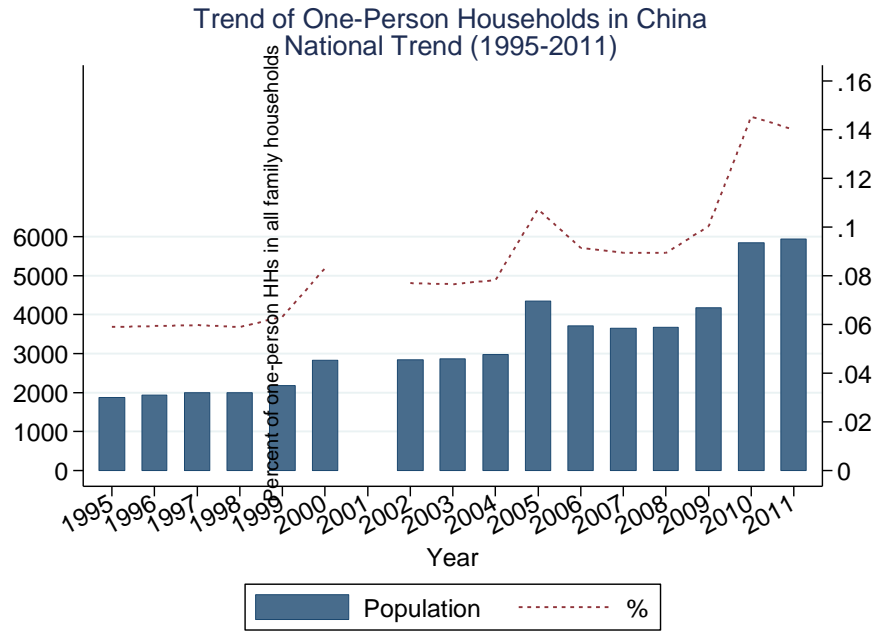
Sources: China Statistical Yearbook, 1996 - 2012

Figure 2. Age-specific propensity of living alone in China between 1982 and 2005

Age-specific propensity of living alone (Mainland China, 1982 - 2005)
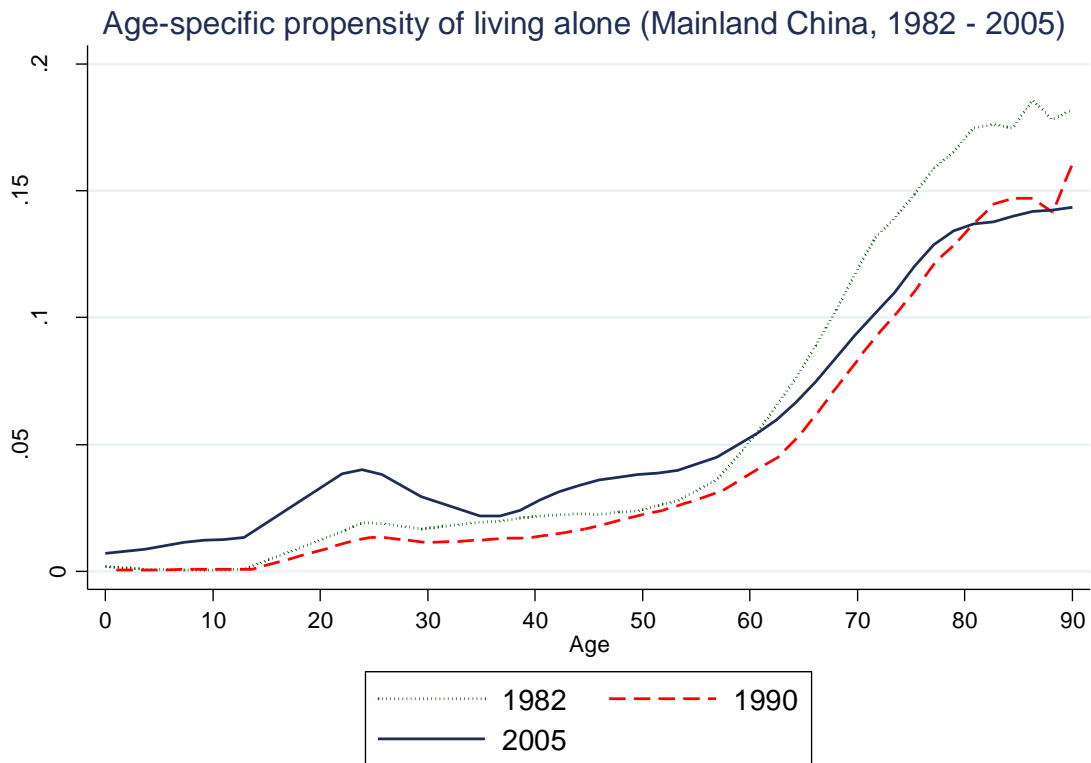
Map 1. Province/Municipality-level percentage of population living in OPHs, 1982-2005

Percentage of population living in one-person households in China

Provincial-level percentage, 1982

Provincial-level percentage, 1990

| (6,7] |
| (5,6] |
| (4,5] |
| (3,4] |
| (2,3] |
| (1,2] |
| [0,1] |

| (6,7] |
| (5,6] |
| (4,5] |
| (3,4] |
| (2,3] |
| (1,2] |
| [0,1] |

Provincial-level percentage, 2005

Change of percentage-point, 1982-2005

| (6,7] |
| (5,6] |
| (4,5] |
| (3,4] |
| (2,3] |
| (1,2] |
| [0,1] |

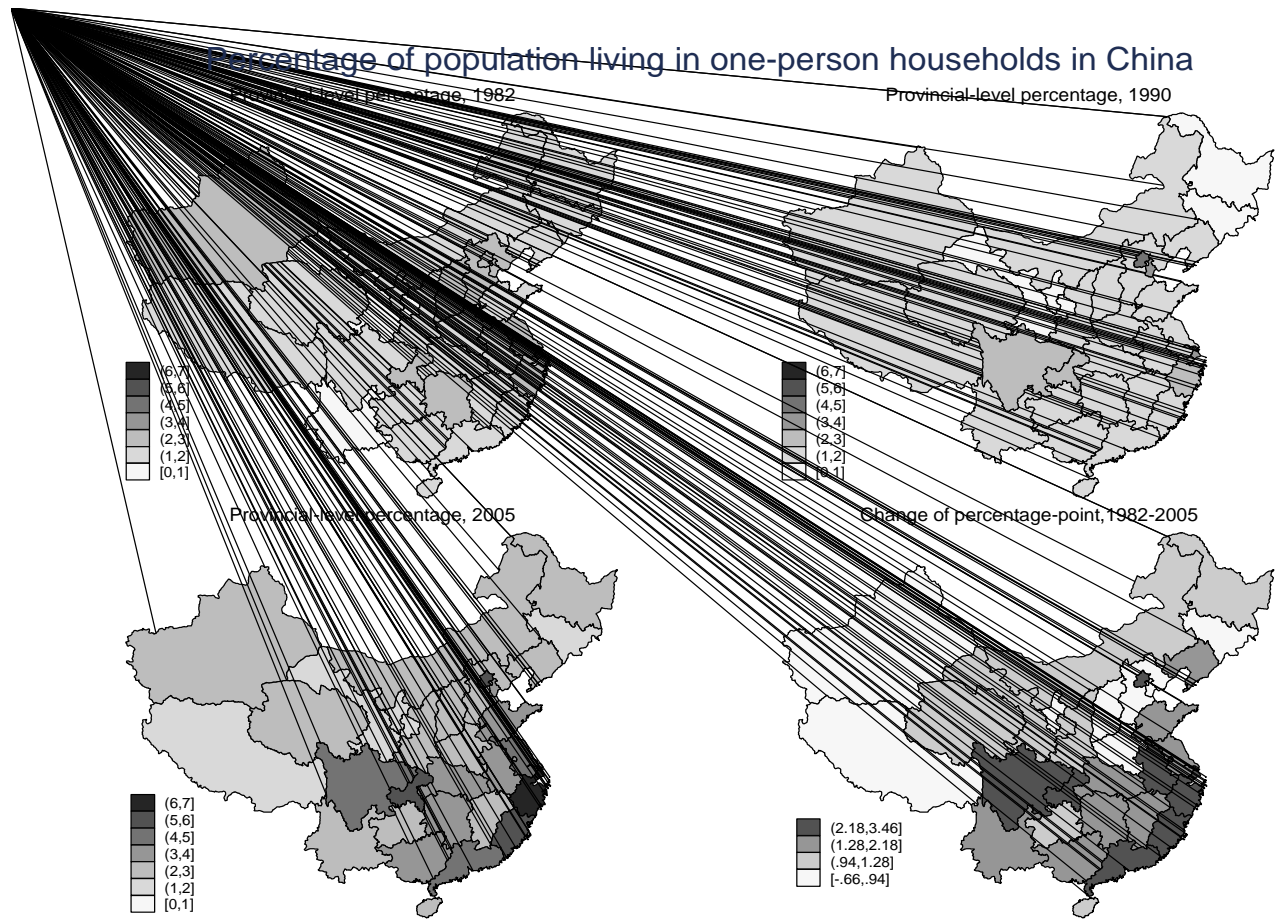| (2.18,3.46] |
| (1.28,2.18] |
| (.94,1.28] |
| [-.66,.94] |

Table 1. Province/Municipality-level percentage of population living in OPHs in 2005

Province/ Municipality[1]	% of population	% of all domestic households
Municipality		
Beijing	5.55%	15.02%
Tianjin	3.08%	9.01%
Shanghai	6.04%	16.04%
Chongqing	5.09%	14.42%
North		
Hebei	2.29%	7.60%
Shanxi	2.26%	7.65%
Inner Mongolia	2.95%	8.59%
Northeast		
Liaoning	2.96%	8.64%
Jilin	1.87%	5.86%
Heilongjiang	2.32%	6.91%
East & Coastal		
Jiangsu	4.24%	12.34%
Zhejiang	6.25%	17.09%
Anhui	3.88%	11.73%
Fujian	5.09%	15.22%
Jiangxi	2.92%	9.61%
Shandong	3.65%	10.57%
Guangdong	4.12%	14.00%
Central & South		
Henan	2.30%	7.88%
Hubei	3.16%	9.71%
Hunan	3.52%	11.07%
Guangxi	3.31%	11.18%
Hainan	2.44%	9.38%
Southwest		
Sichuan	4.80%	14.13%
Guizhou	2.45%	8.46%
Yunnan	2.23%	7.99%
Tibet	1.06%	5.34%
Northwest		
Shaanxi	2.70%	8.81%
Gansu	1.78%	6.54%
Qinghai	2.11%	7.73%
Ningxia	1.81%	6.48%
Xinjiang	2.39%	8.32%

Table 2. Fixed-effect regression: Prefecture-level % of population living in a one-person household in China, 1982-2005

	Fixed-Effect Models				
	Δ% of all one-person households	Δ % of single-alone	Δ % of married-alone	Δ % of divorced-alone	Δ % of widowed -alone
Δ % of male	-0.113***	-0.004	-0.035**	-0.012**	-0.063***
	(0.028)	(0.013)	(0.012)	(0.004)	(0.009)
Δ % of ethnic minority	-0.010	-0.000	-0.004	-0.001	-0.005**
	(0.006)	(0.003)	(0.003)	(0.001)	(0.002)
Δ Median age of the prefecture	0.001***	0.000*	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δ % of singlehood in population aged between 25 and 35	-0.026*	-0.005	-0.015**	-0.001	-0.007*
	(0.011)	(0.005)	(0.005)	(0.002)	(0.003)
Δ % of high school graduate	-0.031*	-0.021***	-0.012*	0.008***	-0.007
	(0.013)	(0.006)	(0.006)	(0.002)	(0.004)
Δ % of production workers	0.014	0.009**	0.016***	-0.006***	-0.008***
	(0.008)	(0.003)	(0.004)	(0.001)	(0.002)
Δ % of cadres/ professional / service workers	0.022*	0.021***	0.017***	-0.009***	-0.006
	(0.010)	(0.004)	(0.004)	(0.001)	(0.003)
Δ % of floating population	0.094***	0.048***	0.038***	0.006***	0.002
	(0.007)	(0.003)	(0.003)	(0.001)	(0.002)
Constant	0.056***	0.003	0.014*	0.007***	0.032***
	(0.014)	(0.006)	(0.006)	(0.002)	(0.004)
Prefecture fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
R-sq.	.651	.558	.627	.466	.520
Prefecture-Year Observations [1]	1034	1034	1034	1034	1034

* p<.05 **p<.01 ***p<.001
Standard errors are in parentheses
[1] Prefectures in Tibet for 1982 are excluded due to poor data quality for some covariates

Figure 3a. Percent of living alone by gender (2005, China)

Percent Living Alone by Gender

- Male
- Female

(16-30: Male 3.9%, Female 2.4%; 31-59: Male 3.8%, Female 2.6%; 60 and above: Male 8.0%, Female 10.0%)
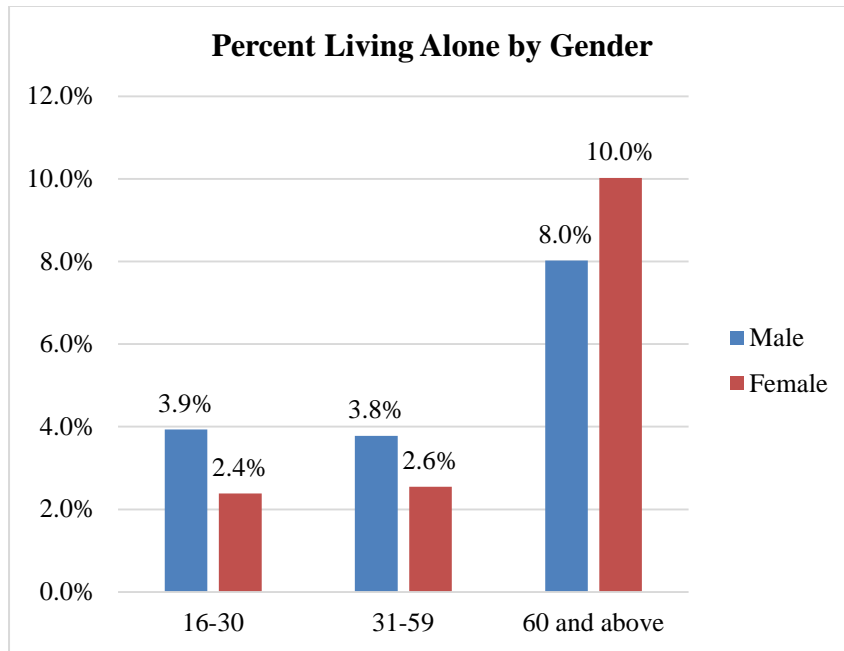
Figure 3b. Percent of living alone by marital status (2005, China)

Percent Living Alone by Marital Status

- Never married
- Married
- Widowed
- Divorced

(16-30: Never married 4.4%, Married 1.4%, Widowed 2.8%, Divorced 10.0%; 31-59: Never married 23.1%, Married 1.9%, Widowed 19.7%, Divorced 24.7%; 60 and above: Never married 53.9%, Married 2.2%, Widowed 23.4%, Divorced 40.8%)
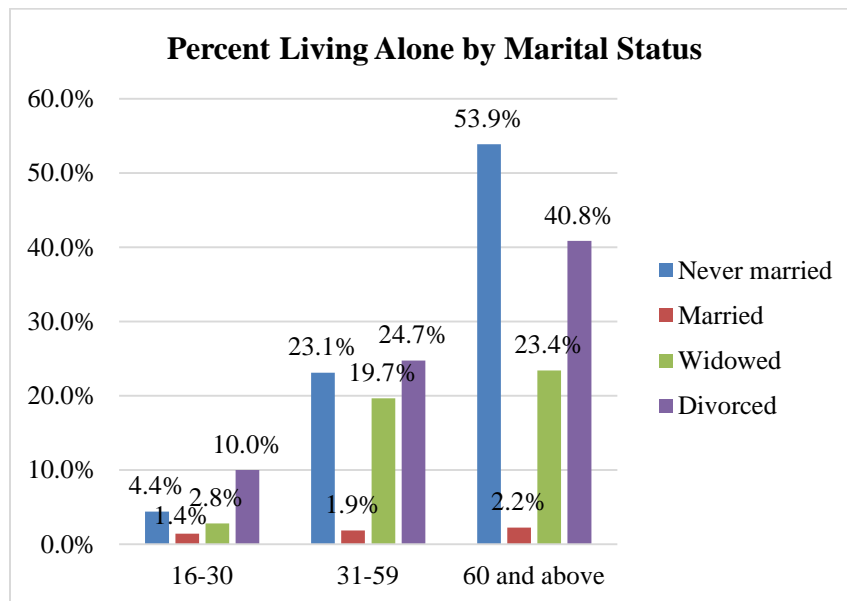
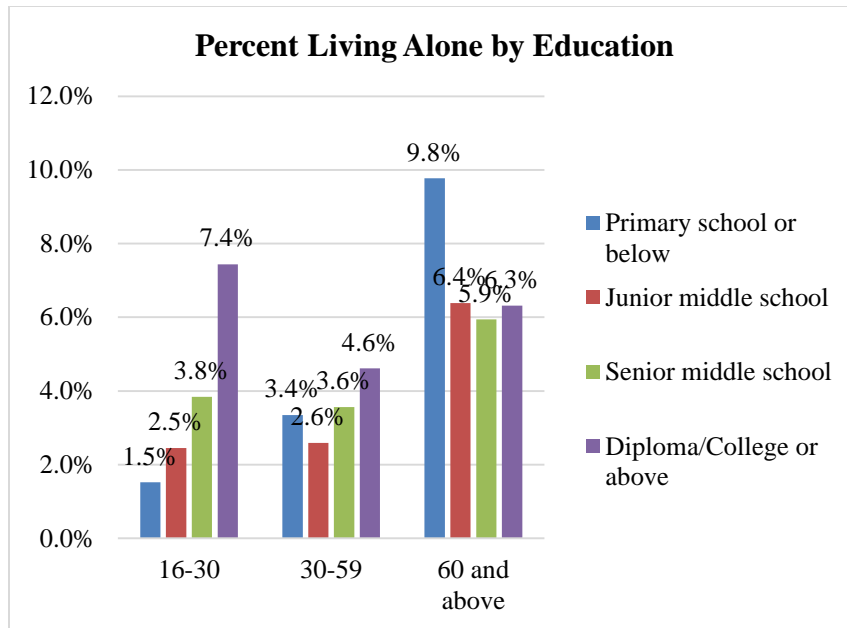**Figure 3c. Percent of living alone by education (2005, China)**

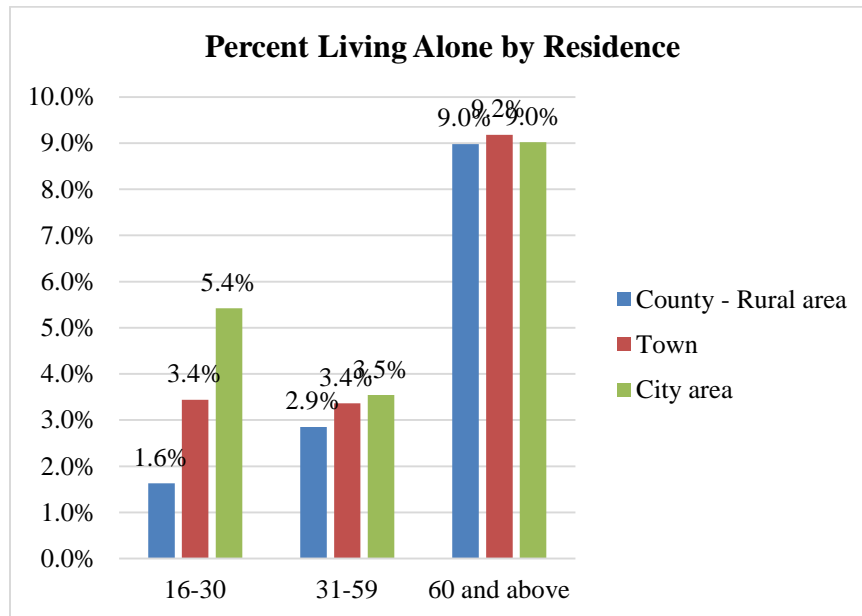**Figure 3d. Percent of living alone by urban/rural residence (2005, China)**

Figure 3e. Percent of living alone by local hukou registration (2005, China)

Percent Living Alone by Whether a Migrant

Legend:
- With local hukou
- Floating (without local hukou)

Data:
- 16-30: With local hukou 1.3%, Floating 10.7%
- 30-59: With local hukou 2.6%, Floating 7.1%
- 60 and above: With local hukou 9.1%, Floating 8.4%
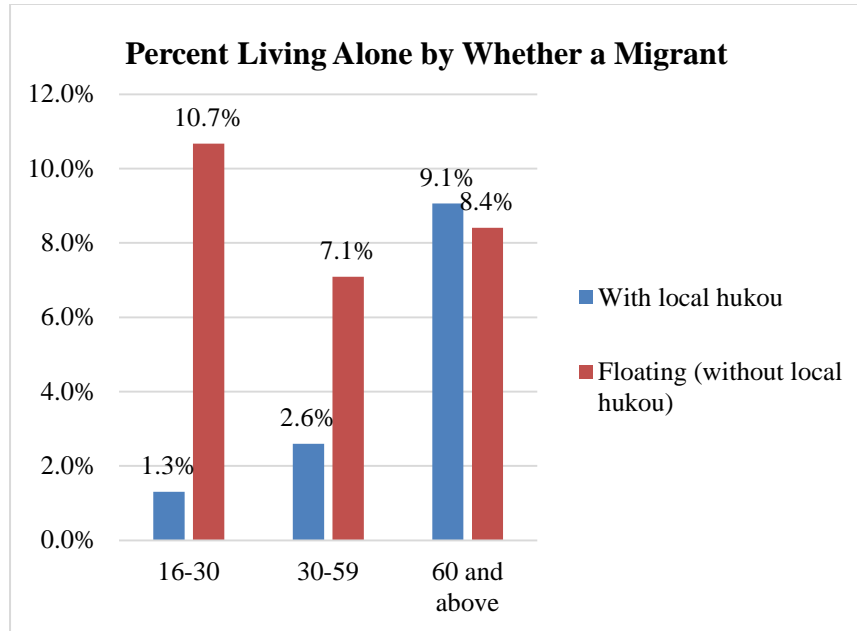
Figure 3f. Percent of living alone by prefecture development index (2005, China)

Percent Living Alone by Development Index Quartile

Legend:
- Development index < 25th Percentile
- Development index - 25th - 75th Percentile
- Development index > 75th Percentile

Data:
- 16-30: 2.3%, 1.8%, 5.7%
- 31-59: 3.2%, 2.7%, 3.8%
- 60 and above: 8.1%, 8.8%, 10.1%
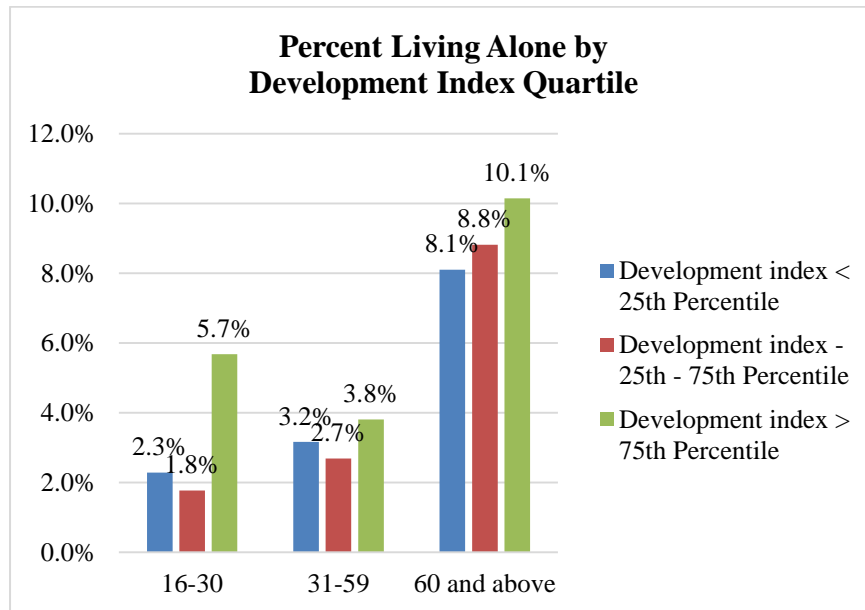
Figure 3g. Percent of living alone by prefecture % of floating population (2005, China)

Percent Living Alone by
% of Floating Population Quartile

■ % of floating population < 25th Percentile
■ % of floating population 25th - 75th Percentile
■ % of floating population > 75th Percentile

Age group	< 25th	25th - 75th	> 75th
16-30	1.6%	2.1%	5.9%
31-59	2.5%	3.0%	4.0%
60 and above	7.4%	9.0%	10.3%
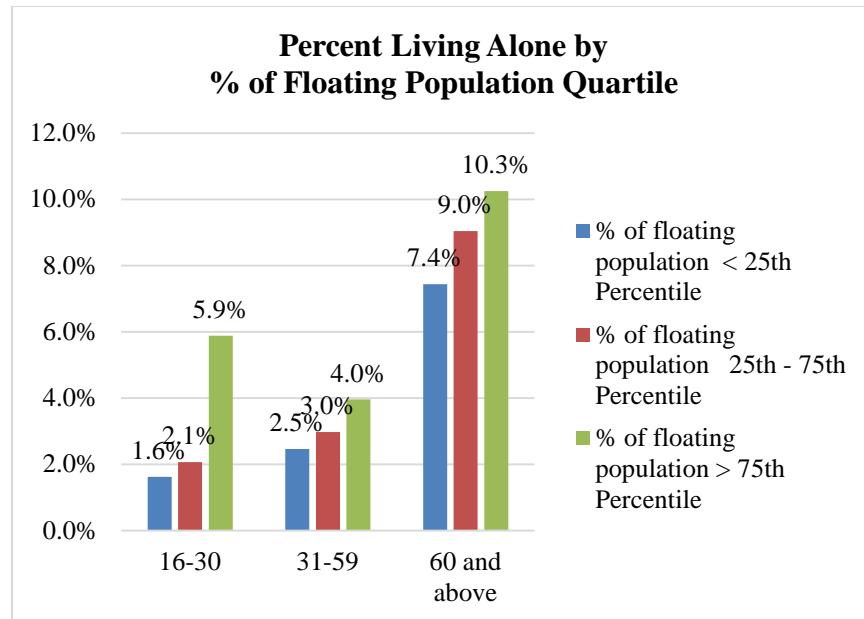
Table 3. Two-level random-intercept model: Fully unconditioned models

	Age 16-30	Age 31-59	Age 60+
Intercept μ	-3.792***	-3.497***	-2.387***
σ_μ	0.715***	0.400***	0.419***
Intra-class correlation	0.134	0.046	0.051
Level 1 units (Individuals)	492,560	1,096,237	307,719
Level 2 units (Prefectures)	330	330	330

*** p<0.001, ** p<0.01, * p<0.05

Table 3. Two-level random-intercept model: Individual and contextual effects on living in OPHs in China, 2005

	Age 16-30		Age 31-59		Age 60+	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Fixed part						
Level-1 (Individual) covariates						
Female	-0.314***	-0.314***	-0.095***	-0.095***	-0.162***	-0.162***
Age (in years)	0.107***	0.107***	0.048***	0.048***	-0.010***	-0.010***
Marital Status (ref=married)						
Never married	2.162***	2.161***	3.109***	3.108***	4.050***	4.050***
Widowed	1.068**	1.070**	2.622***	2.623***	2.836***	2.836***
Divorced	2.686***	2.687***	3.064***	3.062***	3.507***	3.509***
Education (ref=Primary or less)						
Junior Secondary School	0.209***	0.205***	0.090***	0.087***	0.089***	0.087***
High School	0.464***	0.461***	0.310***	0.308***	0.105**	0.103**
Diploma/College or above	0.618***	0.616***	0.533***	0.532***	0.292***	0.289***
Logged income	0.128***	0.128***	0.055***	0.055***	0.030***	0.031***
Ethnicity (ref=Han)						
Non-Han ethnic group (=1)	-0.095*	-0.086*	-0.251***	-0.236***	-0.359***	-0.335***
Migrant (without local hukou =1)	1.998***	1.993***	1.394***	1.391***	0.027	0.023
Urbanicity of residence (ref=town)						
City area	-0.205***	-0.210***	-0.357***	-0.362***	0.060*	0.051*
County - Rural area	-0.385***	-0.383***	-0.101***	-0.099***	-0.145***	-0.143***
Level-2 (prefecture city) covariates						
Median age of the prefecture		0.018		0.037***		0.049***
Development index		-0.068		-0.109**		0.065
% college graduate (18-30 yrs old)		-0.009		-0.005		-0.012*
Top out migration area		0.402**		0.189		0.298*
% of floating population		0.027***		0.026***		0.025***
Random part						
Intercept μ	-8.517***	-9.337***	-6.521***	-8.050***	-3.022***	-4.882***
σ_μ	0.498***	0.470***	0.358***	0.315***	0.474***	0.401***
Intra-class correlation	0.070	0.063	0.037	0.029	0.064	0.047
Level 1 units (Individuals)	492,560	492,560	1,096,237	1,096,237	307,719	307,719
Level 2 units (Prefectures)	330	330	330	330	330	330

*** p<0.001, ** p<0.01, * p<0.05