Maternal Grandparent Living Arrangements and the Motherhood Wage Penalty for Mothers in China

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Acknowledgements

Abstract

Living arrangements of mothers in China significantly impact their annual wages and motherhood wage penalties. I study how the presence of mothers' parents, or the maternal grandparents, affect mothers' wages for each child living in the mothers' households. Existing literature finds that mothers in China not only experience a motherhood wage penalty, but also observe wage impacts from the living arrangements of their family members, such as the paternal and maternal grandparents. Although existing research on motherhood wage penalties references the China Health and Nutrition Survey, I use data from the China Family Panel Studies, the most recent and comprehensive panel survey that reflects the social and economic transformations of contemporary China. To extend and update the analysis of living arrangements on the motherhood wage penalty, I present evidence of the impact of living arrangements on the motherhood wage penalty, distinguishing between the presence of the maternal grandmother, maternal grandfather, and both maternal grandparents. While I find clear evidence that the presence of the maternal grandmother in the household counters the motherhood wage penalty, due to the lack of data on single mothers, I am not able to find conclusive evidence of a difference in the impact of grandparents on the motherhood wage penalty for single mothers compared with married mothers.

1. Introduction

Women with children in urban China have approximately 25 percent lower annual wages than women without children (Jia & Dong, 2012). This motherhood wage penalty (MHWP) varies by demographic factors, job characteristics, and household dynamics. Research into this area is crucial to understanding gender inequality as it relates to income, gender roles in the household, and women's childbearing responsibilities. Furthermore, the MHWP is essential to conversations regarding the gender pay gap, as working mothers face disadvantages that may impact their effort and productivity, including employers' perceptions on working mothers and the interruption of mothers' career progression and training (Gangl & Ziefle, 2009). This paper examines the MHWP and the impact that the living arrangements of the maternal grandparents may have on the severity of the penalty for mothers in China.

Mothers of differing marital statuses and living arrangements may not experience the same MHWP. I explore the following question: What is the impact of the presence of the maternal grandparents on the mothers' hourly wage, and is that different for single mothers? Due to existing research on traditional gender roles and the quality of childcare offered by grandmothers in China, my initial hypothesis is that mothers who live with their own mothers, or maternal grandmothers, will experience a reduced MHWP. Additionally, although the sample of single mothers living with children may be limited due to traditional norms and social patterns in China, I hypothesize that single mothers who live with their mothers or both parents will also experience a reduced MHWP compared to that of married mothers, as single mothers may have less available assistance with housework and childcare. Research in this area also has many policy implications relating to single-mother households, childcare, and workplace discrimination (Wong, Garfinkel & McLanahan, 1993).

This study adds to existing literature by examining the impact of the living arrangements of maternal grandparents on the wages of mothers in China, as well as by attempting to study the MHWP

experienced by single mothers. There are three main objectives of this study. First, while existing

literature references the 1993-2006 China Health and Nutrition Survey (CHNS), I use the China Family

Panel Studies (CFPS), which provides nationally representative data from post-reform, 21st century

China, to construct a detailed model that allows for an analysis of the MHWP. Second, I explore the

impact of the presence of maternal grandparents living in the mother's household on her MHWP per

child. Third, I aim to compare the impact of this presence for single and married mothers, although the

strength of this analysis is limited by the number of single mothers who live with their children in China.

To address these objectives, the paper is structured as follows. Section 2 provides a review of

relevant literature and existing research on the MHWP, including the theories and explanations behind

the penalties. Section 3 describes the relevant economic theory, theoretical framework, and the models

used. Section 4 details the data used and adjustments to the data. Section 5 presents the results,

limitations, and areas for future research. Section 6 concludes the paper.

2. Literature Review

2.1 Quantifications of the MHWP

In China, research has shown that the MHWP is approximately 12 percent per child, which is

around three times greater than the observed MHWP in the United States (Yu & Xie, 2018; Avellar &

Smock, 2003). However, this penalty does not apply uniformly across all mothers. In a living

arrangement context, this penalty is -28.9 percent for mothers who live with the fathers' parents,

compared with the penalty of -14.5 percent for mothers who live without any parents (Yu & Xie, 2018).

In fact, Yu and Xie (2018) found that mothers living with their own parents did not experience a

significant wage penalty. In an occupational context, mothers in occupations with greater autonomy

experience a lower wage penalty compared to mothers whose work environments require teamwork.

Additionally, mothers in less competitive work environments are less impacted by the penalty (Yu &

Kuo, 2017). In the context of the timing of childbirth, existing literature finds that having children at a young age causes mothers to experience large wage penalties due to disruptions during crucial moments of their career progression (Taniguchi, 1999). In the context of the children's age, Zhao (2018) has found that Chinese mothers with young children face greater difficulties in employment. Similarly, mothers with school-aged children experience an increase of approximately 11 percent in their incomes, compared to mothers with children who are not school-aged.[1] This suggests the existence of motivational factors that result from raising school-aged children, which includes the cost of the children's education (Zhao, 2018).

2.2 Drivers Behind the MHWP

To understand the importance of examining the MHWP, it is crucial to examine the drivers behind this wage difference for mothers. The human capital theory states that the wage penalty can be explained by the reduced work experience and job training that mothers receive compared to non-mothers (Becker, 2008; Mincer, 1974). The mothers' ability to accumulate work experience and spend time at work is limited as they may exit the labor force to care for the children. Other explanations include the limited energy of mothers to meet the demands at work and home, which may force them to soften their focus on work (Becker, 1985). Mothers may also experience a decrease in time flexibility, as well as an increase in distractions from children. These factors could reduce their productivity at work and reduce their income potential (Kühhirt & Ludwig, 2012). The concept of compensating differentials can also explain the MHWP, as it suggests that the gender pay gap is in part due to women choosing jobs with more desirable characteristics (Filer, 1985). This is especially applicable to mothers as they may choose lower paying jobs that have flexible hours and less demands on their energy.

Yu and Xie (2018) separate the factors that drive the MHWP into supply-side and demand-side factors. Supply-side factors include the human capital investment and job performance factors as

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[1] Zhao (2018) defines school-aged children as children between 7 and 15 years old.

discussed above, meanwhile demand-side factors include statistical discrimination and taste. Statistical discrimination refers to assumptions that employers make regarding the mothers' productivity on the basis of available information, meanwhile taste refers to employer prejudice against mothers. Many of these demand-side factors, such as employer prejudice, are difficult to measure. Nevertheless, these theories drive our current understanding of MHWPs.

2.3 Living Arrangements in China

In traditional Chinese society, the patrilocal model, in which the wife lives in the husband's community or home, is the most common living arrangement for families. In fact, in the ideal family structure, daughters-in-law care for the parents-in-law (Zhan & Montgomery, 2003). Daughters are frequently severed from their own families by being excluded from intergenerational transactions once they marry, such as the inheritance of family wealth (Zhang et al., 2019). The wife also is responsible for taking care of the husband's elderly parents, as traditional Chinese customs involve the dominance of the older males in the family. This magnifies the amount of time and energy that the women dedicate to household responsibilities and childcare (Yu & Xie, 2018). The patrilocal model also reinforces the notion that the husband's family, along with the mother herself, should assume the responsibility of taking care of the children, which explains traditional paternal grandparent residence trends (Chen, Short, & Entwisle, 2000). However, in the past two decades, China has experienced demographic, economic, and family dynamic shifts, which have contributed to the increasing prevalence of the matrilocal model in family living arrangements. These household structures, unlike patrilocal households, do not have cultural norms surrounding the care that mothers must provide for the elders residing in the home (Yu & Xie, 2018). This implies a decrease in the mothers' time dedicated for housework, as the mothers' parents help with childcare.

While traditionally the mother would only live with her own parents if she was not able to live with the paternal grandparents, recent studies argue that due to the changing view of gender norms, childcare, and intergenerational dynamics, grandparent care is increasingly involving the maternal grandparents (Zhang et al., 2019; Chen, Short, & Entwisle, 2000). For example, the focus of couples on satisfying practical needs, such as obtaining better living conditions in the home of the maternal grandparents, may explain this rise in the matrilocal model. Furthermore, women's increased incomes and education allow them to provide support for their parents and raise their bargaining power in their relationships with their husbands and the paternal grandparents. Another reason for the matrilocal trend is the mother's strengthened relationship with her parents due to the one-child policy, as the mother receives concentrated attention and resources from her parents (Zhang et al., 2019). Increasingly, parents are more likely to maintain positive relationships with their daughters after marriage (Chen, Short, & Entwisle, 2000). Thus, I am interested in analyzing the quantitative impacts of the matrilocal model in modern China.

2.4 Impact of Social and Economic Transformations in China on Females in the Workforce

Women's improved status in contemporary Chinese society has impacted their workforce participation and incomes, narrowing the gender gap in education and wages (Mu & Xie, 2016). Furthermore, China's implementation of the two-child policy in 2016 has affected MHWPs, as it has been accompanied by insufficient childcare support and increased the importance of grandparental support for working mothers with more than one child (Shen & Jiang, 2020).

Due to economic reforms and the transition to a market-oriented economy, contemporary Chinese society has changed the way in which it values female labor. Many working Chinese mothers, especially those who work in the private sector, have lost the public benefits, such as childcare, that previously encouraged them to work. These benefits historically protected mothers from workplace

discrimination, and their sharp decline starting in 1978 caused working mothers to receive lower pay and less opportunities for career promotion (Jia & Dong, 2012; Du & Dong, 2013). From 1997 to 2006, the rise in the number of private kindergartens contrasted with the fall in the number of publicly funded kindergartens and nurseries, raising concerns about the availability and affordability of childcare in China (Du & Dong, 2013). These changes in childcare availability affect mothers' demand for the grandparents' assistance in childcare.

Studies have found that working mothers in China who live with their own parents experience improvements in wage outcomes, the MHWP, and the burden of childcare (Chen, Short, & Entwisle, 2000; Yu & Xie, 2018). Specifically, parents may seek the involvement of the maternal grandmother in childcare depending on the grandmother's availability and qualifications. According to a recent study by Zhang et al. (2019), contemporary Chinese couples are more likely to decide on grandparent childcare based on the quality of care expected from the maternal grandmother instead of strictly following the traditional patrilocal model and relying on the paternal grandparents for childcare. When examining availability and qualifications, parents are more likely to seek assistance from the maternal grandmother rather than the paternal grandmother. The involvement of the maternal grandmother in childcare also may result in fewer conflicts and household tension (Zhang et al., 2019). In addition, the grandmother's presence may have emotional and psychological consequences, which have shown to be positive in qualitative studies (Gattai & Musatti, 1999). I hypothesize that mothers who live with the maternal grandmothers will experience less severe MHWPs, as in these cases, the quality of childcare offered by the maternal grandmothers justified the mothers' deviation from the traditional patrilocal norm.

2.5 Single Mothers in China

Compared with married women, single women have lower wages and face more severe MHWPs (Staff & Mortimer, 2011; Molina & Montuenga, 2009; McLanahan & Kelly, 1999; Budig & England,

2001). Single mothers may particularly be affected by the MHWP as they have less help in household and childcare duties due to the absence of the fathers (Cukrowska-Torzewska & Matysiak, 2020). Single mothers living with grandparents may therefore experience a greater reduction in the MHWP relative to married mothers living with grandparents as the grandparents may dedicate significant effort towards caring for the children as a result of the absence of partners to help with housework or childcare. In fact, research has found that single parents are more likely to receive significant childcare support from grandparents (Zhang, 2019; Hank & Buber, 2008).

Single mothers are one of the fastest growing groups living in poverty in China, as around 25.6 percent of single-mother families live in poverty (Li, 2020; CAMF et al., 2019). Aspects of traditional Chinese culture that disapprove of divorce and single motherhood have led to the social exclusion of single mothers and the lack of policies to help them. Single mothers are also impacted by workplace discrimination, and often face physical and mental challenges (Li, 2020).

This paper adds to the existing literature on the MHWP for mothers in China, and attempts to distinguish the impact of maternal grandparents living in the households of both single and married mothers. I test two main hypotheses: 1) Mothers who live with the maternal grandmothers will experience reductions in the MHWP, and 2) single mothers, compared to married mothers, will experience greater reductions in the MHWP from living with their parents.

3. Theoretical Framework & Empirical Specification

In this section, I describe a theoretical model that explains the drivers behind the MHWP, as well as the model that I use to explore the variations of this penalty on mothers with different living arrangements. Existing literature on the MHWP frequently references the human capital theory developed by Becker (1985) which explains the increasing returns obtained through the specialization of human capital. Thus, earnings are maximized by devoting time towards a single activity. This theory is

relevant to the MHWP as limitations exist for the ability of the mother to invest time towards one single activity. Because taking care of children requires more effort and time than other leisure activities, mothers spend less effort on each hour of work and devote less time to work, both of which negatively impact earnings (Becker, 1985). Next, I use a model by Yu and Xie (2018) to derive the empirical specification of my analysis, which incorporates the factors that impact mothers' effort and time investments into their work.

Yu and Xie (2018) construct fixed effects and random effects models that incorporate three factors that impact mothers' wages: human capital, job, and family. Human capital factors are measured by work experience, which involves the time investment concept of wage maximization. Following the work by Mincer (1974), work experience is calculated by subtracting the number of schooling years from the respondent's age, and reducing the result by seven. The $WorkExperience^2$ term captures the quadratic nature of the impact that work experience has on wages (Mincer, 1974). Additionally, Yu and Xie (2018) control for the mother's education, as education has shown to significantly affect wages and wage penalties (Amuedo-Dorantes & Kimmel, 2005). They incorporate regional indicators to account for the variations in economic development by region. In regards to the job factors, the occupation variable isolates the effect that working in different industries may have on mothers' wages, which includes an industry's productivity and output growth (Gittleman & Wolff, 1993). The analysis also considers the part-time nature of the job, as studies have shown that having a part-time job significantly impacts the MHWP (Anderson, Binder & Krause, 2003; Budig & England, 2001).

I incorporate the three factors from Yu and Xie's (2018) model as discussed above into my regression, but I also include additional variables from the CFPS. Within the human capital factors, I include self-rated health status, as health impacts the performance and productivity of mothers in the workplace, and the province that the mother resides in. Within the family factors, I add the age of the

youngest child at home if the mother has at least one child. This factor measures the level of care

demanded of the mother by her children, as previous studies have noted the employment impact of

caring for young children (Connelly, 1992). I also add a variable that measures adjusted family size, to

control for the additional members of the household that may assist with household and childcare

responsibilities, such as the parents of the respondent's husband. I include the health status of the

maternal grandparents at home, as indicated by whether the grandparents are over the age of 65, to

control for their ability to help the mother or for the increased demand on the mother to care for

additional members of the household. I control for the highest education of the maternal grandparents, as

parent education may impact the children's future outcomes (Davis-Kean, 2005). I also include variables

specific to living arrangement, marital status, the MHWP, and the MHWP dependent on living

arrangement and marital status.

I use a random effects panel model to estimate the effect of children, living arrangements, and

marital status on the MHWP, incorporating time-invariant variables into the discussion. For the rest of

the paper, "grandmother" and "grandfather" refer to the maternal grandparents (the respondent's mother

and father), unless stated otherwise. "Single" refers to women who were never married, are divorced, or

are widowed. "Married" refers to women who are married or are coresiding with a partner. The models

define "child" as a child as indicated in the questionnaire who is below 18 years old. For each individual

i at time t, I estimate the MHWP based on the following two relationships:

(1) $Ln\,(Mother\ Hourly\ Wage)_{it} = \beta_0 + \beta_1 Single_{it} + \beta_2 NumChild_{it} + \beta_3 AnyGrandparent_{it}$
$$+ \beta_4 (AnyGrandparent \times NumChild)_{it}$$
$$+ \beta_5 Year\ of\ Interview_{it} + \beta_6 HumanCapital_{it} + \beta_7 Family_{it} + \beta_8 Job_{it} + e_{it};$$
$$e_{it} = \alpha_i + \mu_{it}$$

(2) $Ln\,(Mother\ Hourly\ Wage)_{it} = \beta_0 + \beta_1 Single_{it} + \beta_2 NumChild_{it} + \beta_3 GMO_{it}$
$$+ \beta_4 (GMO \times NumChild)_{it} + \beta_5 GFO_{it} + \beta_6 (GFO \times NumChild)_{it} + \beta_7 Both_{it} + \beta_8 (Both \times NumChild)_{it}$$
$$+ \beta_9 Year\ of\ Interview_{it} + \beta_{10} HumanCapital_{it} + \beta_{11} Family_{it} + \beta_{12} Job_{it} + e_{it}$$
$$e_{it} = \alpha_i + \mu_{it}$$

The primary outcome variable is $Ln(Mother\ Hourly\ Wage)_{it}$, which varies by both individual i and by time t. The mother's hourly wage is defined as the respondent's primary non-operating wage after tax, adjusted using China's national Consumer Price Index (CPI) to real 2019 yuan. Primary income denotes the income of the individual's primary job and non-operating income refers to income earned by working for an organization or institute, excluding income from agricultural work, agricultural work units, and farmers. The wage is calculated by dividing the individual's monthly after-tax income by the number of hours worked per month.[2] Equation **(1)** is used for the baseline models to measure the difference in the MHWP for mothers with varying grandparent living arrangements. In subsequent models, I modify Equation **(1)** to measure the impact of the presence of the grandmother on the MHWP and to attempt to determine the difference in the MHWP between single and married mothers. β_4 reflects the marginal effect of the grandparent on the MHWP with each additional child. As a result, the total effect of an additional child on the mother's wage is $\beta_2 + \beta_4$ if the mother lives with a grandparent. I assume linearity for the impact of the number of children in the household, following the findings of Yu and Xie (2018).

Equation **(2)** examines the MHWP by further specifying the types of living arrangements and including additional control variables. In Equation **(2)**, GMO_{it} is a dummy variable that equals one if only the grandmother lives in the household. Similarly, GFO_{it} represents whether only the grandfather lives in the household, and $Both_{it}$ represents whether both grandparents live in the household. Some key variables of interest are $(GMO \times NumChild)_{it}$, $(GFO \times NumChild)_{it}$, and $(Both \times NumChild)_{it}$, where $NumChild_{it}$ represents the number of children that reside with the mother.

$HumanCapital_{it}$, $Family_{it}$, and Job_{it} are the control variables for the two equations. For $Family_{it}$, I control for the age of the mothers' youngest child, excluding observations that may be

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[2] See **Appendix A1** for the definitions of the non-operating income from the primary job for each questionnaire and China's CPI data for 2010-2018.

affected by inconsistencies in the data such as contradictory information on the living status (whether or not the child is alive), the reported age, and the living arrangement of the child. When measuring the adjusted family size, I take the reported family size and subtract the respondent, her children, and the grandparents. For Job_{it}, I control for whether the respondent's primary job is a part-time job, defined as working less than 35 hours a week. $Year\ of\ Interview_{it}$ controls for the effects of that particular year on the respondent's wages, including the effect of an ambiguity in the income survey question in 2010. Lastly, the error term contains both the individual- and time-varying characteristics of each respondent.[3]

4. Data

4.1 Data Set

I use data from the CFPS, a national, longitudinal survey launched in 2010 and designed by the Peking University research team.[4] The survey collects individual, family, and community data to assess the economic and non-economic situations of people in contemporary China. Eligible households for the survey include independent economic units located in a residential area that include at least one family member of Chinese nationality. In 2010, the survey captured data from 14,960 households, which included 33,600 adults and 8,990 youths. All family members with blood/marital/adopted ties present in the baseline survey, along with newly born or adopted children in future survey years, are tracked permanently (Xie et al., 2017). I use the 2010, 2012, 2014, 2016, and 2018 waves of the survey.

4.2 Sampling Method

The households from the baseline CFPS survey cover 25 provinces/cities/autonomous regions in China, excluding Hong Kong, Macao, and Taiwan. The population in these regions compose 95 percent of China's total population, supporting the use of the sample to represent national trends. Using the

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[3] See **Appendix A2** for the full list of human capital, family, and job control variables and their descriptions. Refer to the Results Section for the different control variables used in Equation **(1)** and Equation **(2)**.

[4] The data are from China Family Panel Studies (CFPS), funded by Peking University and the National Natural Science Foundation of China, and maintained by the Institute of Social Science Survey of Peking University.

probability-proportional-to-size sampling method with implicit stratification, the CFPS drew samples by ordering the local GDP per capita in each administrative unit. The subsamples were chosen in a multi-stage process of administrative districts/counties, villages/neighborhood communities, and households. Households were selected using random starting points on street listings and an equal probability method (Xie et al., 2017).

4.3 Data Compatibility with Research Question

I choose this data set for two key reasons. First, it is the most recent and comprehensive panel survey describing the social and economic conditions in China, with a nationally representative sample (Xie and Hu, 2014). While existing literature on the MHWP references the CHNS, the CHNS only covers nine provinces and encountered certain design problems (Yu & Xie, 2018; Xu & Xie, 2016). Second, not only does the CFPS offer comprehensive information from family arrangements to the marital statuses of the respondents, but also it includes additional information such as respondents' self-rated health statuses, contributing to more accurate models. The CFPS gathered information on all of the members of a household, which is crucial when studying the impact of household living arrangements on mothers' wages. As China's first large-scale, academically oriented longitudinal survey, the CFPS allows for an in-depth analysis of Chinese households.

4.4 Analytical Sample

I analyze all employed women with income data who reside with their families as indicated by the Family ID, and refer to this as the restricted sample used for the models in the next section of this paper.[5] **Table 1** shows the summary statistics of the restricted sample for the 2010 baseline survey. When assessing the representativeness of the sample along with the national population of working women, I note that studies that use CFPS data highlight its sampling method, in addition to its national coverage

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[5] Hence, I do not consider the impact of living arrangements and children on the mother's decision to work, although **Table 11** illustrates the probability that a mother is employed given grandparent living arrangements and other key variables.

Table 1. 2010 CFPS Summary Statistics.

Summary Statistics for 2010 Baseline Survey	
Unique Women	7,252
Unique Mothers *	6,444
Unique Single Mothers *	306
Highest Level of Education Attained	
Illiterate/Semi-Literate	32.58%
Primary School	20.38%
Junior High School	24.61%
Senior High School/Secondary School	11.90%
3-Year College	6.23%
4-Year College/Bachelor's Degree	3.99%
Master's Degree	0.26%
Doctoral Degree	0.04%
Non-Operating Hourly Wage Last Year From Primary Job (Yuan) **	
25th Percentile	5.13
50th Percentile	7.82
75th Percentile	14.06
90th Percentile	23.66
# Children Living with Mother ***	
0	32.86%
1	27.81%
2	11.65%
3	1.88%
4+	0.36%
Grandparent Living Arrangements ****	
R's Mother Only Living with R	1.77%
R's Father Only Living with R	0.43%
Both Parents Living with R	8.92%
Work Hours per Month ******	
25th Percentile	176
50th Percentile	200
75th Percentile	240
90th Percentile	300
Marital Status	
Never Married	7.24%
Married (Having a Spouse)	88.10%
Cohabitation	0.33%
Divorced	1.20%
Widowed	3.10%

Notes: Sample statistics only include women who were employed in 2010 and lived in the household as indicated by their reported Family ID. Percentages represent the frequency of an observation with respect to the entire sample.

* Mothers include women with at least one living child. Single mothers include women with at least one living child and have never been married, are divorced, or are widowed. Includes children reported by the respondent, regardless of age.

** Excludes individuals working in agriculture or those who are self-employed. Hourly wage is calculated by dividing the reported monthly wage by monthly working hours, and is in units of real 2019 yuan.

*** Describes the number of living children younger than 18 years old living in the designated household with the mother.

**** Describes whether the respondent's parent lives in the designated household with the respondent. R indicates the Respondent.

***** Describes the number of family members that live with the respondent, excluding the respondent, the respondent's parents, and the respondent's children. Only considers the designated households in which the respondent resides. Children only include those who are younger than 18 years old.

****** If the respondent indicated working >0 hours per day and >0 days per month.

of 25 provinces (Xu & Xie, 2016; Xie and Hu, 2014). They also note that the age and sex distribution patterns of the 2010 CFPS baseline survey resemble that of the 2010 Census (Xie and Hu, 2014). I compare the age composition of a modified 2010 CFPS sample that includes both working and non-working women with the statistics released by the National Bureau of Statistics of China, which includes men and women. I find that the distributions of individuals under 65 and 65 and above in both data sets are similar, with an average age of approximately 44 years old for my restricted CFPS sample.[6]

Second, I analyze the education levels of my restricted 2010 CFPS sample of working women, which implies a literacy rate of approximately 67 percent. In comparison, the literacy rate for females older than 15 years old in China in 2010 was 93 percent ("Literacy Rate, Adult Female (% of females ages 15 and above)," 2012). This difference in literacy rate between the CFPS sample and the World Bank data may be explained by the semi-literate description within the CFPS illiterate/semi-literate category. However, this may indicate that the CFPS sample may overrepresent less educated individuals.

Table 2 suggests that although modern Chinese society has been shifting towards a matrilocal model, the coresidence of women with their own parents is still not widespread, especially if they have at least one child living at home. Women who have no children at home are more likely to live with at least one of their parents. This, along with the results shown in **Table 3**, which show that married mothers are not likely to live with the maternal grandparents, is consistent with existing studies that confirm the popularity of the patrilocal norm in household living arrangements even in modern Chinese society (Chen, Liu, & Mair, 2011; Chen, Short, & Entwisle, 2000). Therefore, I hope to capture the potential benefit for women from this rising untraditional living arrangement pattern. **Table 4** supports further analysis into the wage impacts of grandparent living arrangements, especially for single women, as single women are more likely to live with their own parents compared with married women.

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[6] See **Appendix A1** for the distributions of individuals under 65 and 65 and over for the 2010 CFPS baseline survey with working and non-working women and the data from the National Bureau of Statistics of China.

Table 2. 2010 CFPS Grandparents Living in Households With and Without Children.

	At least one grandparent living in household	No grandparent living in household	Total
No child at home	547	679	1,226
	44.62	55.38	100.00
	71.22	56.92	62.52
Has at least one child at home	221	514	735
	30.07	69.93	100.00
	28.78	43.08	37.48
Total	768	1,193	1,961
	39.16	60.84	100.00
	100.00	100.00	100.00

Notes: The first, second, and third row statistics shown include frequency, row percentage, and column percentage, respectively. Sample includes employed women who reported consistent information on the living arrangements of the grandparents and the children. Children living with the mother only include those who are younger than 18 years old. Sample size differs from that of **Table 1** due to some inconsistent data for the number of children living with the mother and grandparent living arrangements.

Table 3. 2010 CFPS Grandparents Living in Households of Single and Married Women.

	At least one grandparent living in household	No grandparent living in household	Total
Married / Cohabiting	311	2,162	2,473
	12.58	87.42	100.00
	38.59	92.27	78.53
Single	495	181	676
	73.22	26.78	100.00
	61.41	7.73	21.47
Total	806	2,343	3,149
	25.60	74.70	100.00
	100.00	100.00	100.00

Notes: The first, second, and third row statistics shown include frequency, row percentage, and column percentage, respectively. Sample includes employed women who reported consistent information on the living arrangements of the grandparents and marital status. Sample size differs from that of **Table 1** and **Table 2** due to the differences in available information for the respondents' marital statuses and grandparent living arrangements, and for the children living at home and grandparent living arrangements.

The mean wage for women who live with at least one of the grandparents is lower than that of women who do not live with their parents; however, this may be due to selection bias as women may choose to live with their parents due to their lower incomes. I note this potential selection bias in the discussion of the results later in this paper. Although conclusions may be drawn for trends that involve single mothers, I note that only 56 single women in the 2010 baseline survey live with at least one young child. Because

Table 4. 2010 CFPS Hourly Wages With and Without Grandparents.

	At least one grandparent living in household	No grandparent living in household
25th Percentile	5.62	4.72
50th Percentile	8.52	6.89
75th Percentile	16.25	12.13
90th Percentile	28.19	21.94
Mean	13.06	15.69
Standard deviation	13.17	95.82

Notes: Sample includes employed women who reported consistent information on grandparent living arrangements, monthly incomes, and working hours. Hourly wage is calculated by dividing the reported monthly wage by monthly working hours, and is in units of real 2019 yuan.[7]

the sample of single mothers living with at least one child is small, there is a low likelihood of finding significant results regarding the MHWP for single mothers with children. Nevertheless, **Table 5** supports further investigation of the grandparents' impact on the MHWP for single mothers. In the sample, single women living without grandparents have a lower average wage than single women living with grandparents. In fact, single women living without grandparents also have a lower average wage than single mothers living with at least one grandparent and one child.

4.5 Data Limitations

The CFPS surveys ask respondents to self-report their wages, which may introduce errors to this measure. The 2010 questionnaire does not specify whether the respondent should record the primary income before or after tax expenses. As a result, I use the reported wages but control for the year of the survey in each of the models in the next section of this paper. Due to the variations in the structure and style of questions in the work/job modules in the questionnaires, the non-operating income from the primary job (after-tax) is defined slightly differently throughout the years.

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[7] See **Appendix A1** for the definition of 2010 income.

Table 5. 2010 CFPS Hourly Wages of Single Women With and Without Grandparents.

	No grandparent living in household	At least one grandparent living in household	At least one grandparent & one child living in household
25th Percentile	4.97	5.21	6.25
50th Percentile	6.09	7.55	8.41
75th Percentile	10.04	14.53	12.36
90th Percentile	12.22	26.92	15.50
Mean	8.88	12.52	10.08
Standard deviation	8.85	13.94	5.06

Notes: Sample includes employed, single women who reported consistent information on the living arrangements of their parents, monthly incomes, monthly working hours, and children. Hourly wage is calculated by dividing the reported monthly wage by monthly working hours, and is in units of real 2019 yuan.[8] "No grandparent living in household" includes women who do not have any grandparents living in the household, regardless of the number of children present in the household. "At least one grandparent living in household" includes women who have at least one grandparent living in the household, regardless of the number of children present in the household.

For the 2012 questionnaire, the respondents report their number of schooling years in multiples of three. In all other years, the respondent is able to record the exact number of schooling years. Consequently, I use the same number of schooling years reported in 2010 for 2012. Because I impute the mothers' work experience using this data, this limitation may cause slight inaccuracies when controlling for work experience in the regressions.

Due to the small sample of single women with children in the CFPS sample, conclusions regarding the impact of grandparent living arrangements for single women may be insignificant. Furthermore, as mentioned during the previous analysis of literacy rates for the CFPS sample, the sample may overrepresent less educated women, and thus women with lower earnings (Card, 1999).

Lastly, each respondent may interpret and answer the survey questions differently. For example, questions that ask respondents to report the number of hours performing an activity per day may receive inaccurate answers, as respondents may misremember or inaccurately report the exact hours. Evidence of misreporting can be seen through various inconsistencies in the data, such as when the respondent's

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[8] See **Appendix A1** for the definition of 2010 income.

grandparent is alive but the "Not Applicable" answer choice in the questionnaire is recorded for whether the grandparent lives with the respondent, instead of, simply, "No."

5. Results and Limitations

5.1 Results

I show my results in four tables. **Table 6** shows the results of two models that follow Equation **(1)** to determine the effect of grandparent living arrangements on the MHWP. **Table 7** shows the results of two models that follow Equation **(1)**, with an additional interaction term to measure the difference of the impact of grandparent living arrangements on the MHWP between single and married mothers. **Table 8** continues the analysis of the results from Equation **(1)** by examining the impact of grandmothers on the MHWP for low-income mothers. **Table 9** follows Equation **(2)**, separating the various types of living arrangements in the model. I discuss the results mainly in the context of two aspects of the MHWP per child: 1) the impact of maternal grandparent living arrangements, and 2) the comparison of the impact of grandparent living arrangements between single and married women.

In **Table 6,** Model 1 is a baseline random effects model that follows the regression as outlined in Equation **(1)**, focusing on the impact of the presence of any grandparent in the household on the MHWP. Model 2 also follows Equation **(1)**, although the focus is on the presence of the grandmother. I note that the random effects models may suffer biases due to non-measured, time-invariant characteristics of the women. However, the fixed effects models present few significant results as the key variables show limited variation over time, with 4.3 percent of the 2010 baseline survey respondents experiencing a change in grandparent living arrangements throughout the waves of the questionnaire.[9] In Model 1, I observe the impact of having any grandparent living in the household through the $AnyGrandparent_{it}$ variable, which equals one if either the grandmother, grandfather, or both grandparents reside in the

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[9] See **Appendix B1** for results from the baseline fixed effects models.

Table 6. Baseline Models.

	Model 1		Model 2	
Marital Status: Single	-0.0244	(0.0488)	-0.0375	(0.0460)
Health Status	**-0.251***	(0.0823)	**-0.163**	(0.0733)
Work Experience (Years)	**0.0617******	(0.00570)	**0.0582******	(0.00524)
Work Experience^2 (Years)	**-0.00135******	(0.000122)	**-0.00127******	(0.000113)
Part-time	**0.625******	(0.0523)	**0.619******	(0.0490)
Number of Children at Home	**-0.184******	(0.0450)	**-0.179******	(0.0399)
Adjusted Family Size	**0.0248***	(0.0120)	**0.0198***	(0.0114)
Grandmother at Home x Health	0.116	(0.0860)	0.0636	(0.0891)
Grandfather at Home x Health	0.00213	(0.0702)		
Any Grandparent	**-0.252***	(0.0880)		
Any Grandparent x Number of Children at Home	**0.145**	(0.0627)		
Grandmother Living at Home			**-0.167***	(0.0912)
Grandmother Living at Home x Number of Children at Home			**0.144**	(0.0584)
Year of Interview (See Appendix C1)				
Highest Education (see Appendix C1)				
Grandmother: Highest Degree of Education (see Appendix C1)				
Grandfather: Highest Degree of Education (see Appendix C1)				
Province (see Appendix C1)				
Occupation Code (see Appendix C1)				
Constant	**1.584******	(0.231)	**1.494******	(0.217)
Observations	3572		3910	
R-squared (Within)	0.138		0.148	
R-squared (Between)	0.321		0.319	
R-squared (Overall)	0.313		0.315	

Standard errors in parentheses
* $p<0.10$, ** $p<0.05$, *** $p<0.01$, **** $p<0.001$

Notes: The dependent variable is the natural log of the mothers' hourly wages. The *GrandmotherLivingAtHome*$_{it}$ variable takes on the value of one if the grandmother is present in the household, regardless of whether the grandfather is also present.

household. Model 1 shows an expected result: having a grandparent in the household reduces the negative impact of the MHWP.[10] Mothers with no grandparent living in the household experience a MHWP of -18.4 percent per child, while mothers that have a grandparent experience a MHWP of -3.9 percent. In Model 2, I find a similar conclusion, as having the grandmother living at home also reduces the magnitude of the MHWP from -17.9 percent to -3.5 percent per child.[11] Analyzing the results of

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[10] Although the effect of each additional child is still negative, this penalty is less negative for mothers that live with a grandparent. Similarly, although the impact of a grandparent living in the household is negative, this impact is less negative for each child that lives with the mother.

[11] Although I attempt to analyze the impact of the grandfather's presence on the MHWP, the results are not significant. Grandfathers may not produce a significant change in the MHWP as they spend less time on childcare compared to grandmothers (Chen, Short, & Entwisle, 2000; Chen, 2013). See **Appendix B1** for results from the random effects model focusing on the living arrangement of the grandfather.

Table 6, I conclude that the positive effect of having any grandparent living in the household is primarily driven by the presence of the grandmother, supporting the first hypothesis of the paper.

I provide a few potential reasons for the improvement in the MHWP for mothers who live with grandmothers. First, grandmothers may provide high quality childcare and significantly reduce the required housework of the mothers, in part due to the traditional role of women in Chinese society to assume household responsibilities. As a result, the grandmothers may also improve the productivity of the mothers by allowing them to focus at work, gain more leisure time, and devote more energy to their jobs. Second, the dynamic of childcare may involve less tension with the grandmother in the household, as compared to the dynamics of households with the grandfather or even both grandparents. Third, the presence of the maternal grandmothers in households with children may increase the motivation of the mothers to generate higher earnings. Other psychological and emotional implications may exist depending on the relationships between the mothers and the grandmothers.

Although the $AnyGrandparent_{it}$ and $GrandmotherLivingAtHome_{it}$ variables in Models 1 and 2, respectively, are not the main variables of interest since they do not reflect the MHWP, they are statistically significant and negative. However, this is likely due to selection bias. As discussed previously, women with lower wages may be more likely to live with their grandparents as contemporary couples are focused on satisfying practical needs when determining living arrangements with grandparents. These mothers also may not be able to afford childcare, thus seeking the help of the grandparents. This reasoning is further corroborated by studies that find that mothers who live close to the grandparents tend to earn lower wages (García-Morán & Kuehn, 2017). **Table 4** shows a lower average hourly wage for women who live with their grandparents compared to those who live independently, indicating that there may exist unobserved characteristics of the families that lead to lower wages. Due to this selection bias, I note that although having a grandparent and having the

grandmother at home improve the MHWP, the presence of grandparents at home is correlated with lower maternal earnings independent of the children living with the mother. Still, if the mother has more than one child, the marginal effect of the grandparents with the children is positive as the wage penalty per child decreases in the presence of the grandmother.

I find an insignificant effect of the mother's marital status on wage; this is consistent with research that finds a declining marital wage differential (Blackburn & Korenman, 1994). In Model 2, the wages for healthy women are over 15 percent greater than the wages for unhealthy women, as permanent health conditions negatively impact women's wages (Pelkowski & Berger, 2004). Each additional member of the household causes an increase in wage of approximately two percent. Holding a part-time job also positively impacts wages; although this may seem counterintuitive, there exist reasons to offer part-time workers a wage premium. For example, certain jobs may require work during peak work hours, workers may experience increased productivity due to the shortened work day, and the bonuses amongst full- and part-time workers may not be divided proportionally. These explanations have been shown empirically in studies that focus on the wage impacts of short-term part-time, long-term part-time, and full-time work (Paul, 2016).

In **Table 7,** Models 3 and 4 find a large difference in the impact of grandparents on the MHWP for single and married mothers, although the difference is not significant; the result fails to provide strong evidence for the second hypothesis of the paper. Single mothers do not have fathers to help with housework and childcare, thus magnifying the potential impact that grandparents may have on the mothers' wages. Additionally, grandparents in single mother households may dedicate significant effort towards caring for each child due to the lack of a partner's assistance with housework or childcare. Nevertheless, although single mothers may be receiving childcare support from the grandparents, and specifically the grandmother, due to the small sample size of single mothers who live with young

Table 7. Baseline Models with Single Mother Interactions.

	Model 3		Model 4	
Marital Status: Single	-0.0410	(0.0518)	-0.0517	(0.0487)
Health Status	**-0.251*****	(0.0823)	**-0.163****	(0.0733)
Work Experience (Years)	**0.0610******	(0.00574)	**0.0576******	(0.00529)
Work Experience^2 (Years)	**-0.00134******	(0.000122)	**-0.00126******	(0.000114)
Part-time	**0.625******	(0.0523)	**0.618******	(0.0490)
Number of Children at Home	**-0.188******	(0.0452)	**-0.182******	(0.0401)
Adjusted Family Size	**0.0250****	(0.0120)	**0.0200***	(0.0114)
Grandmother at Home x Health	0.114	(0.0860)	0.0639	(0.0891)
Grandfather at Home x Health	0.00233	(0.0702)		
Any Grandparent	**-0.248*****	(0.0882)		
Any Grandparent x Number of Children at Home	**0.130****	(0.0648)		
Any Grandparent x Number of Children at Home x Single	0.114	(0.119)		
Grandmother Living at Home			**-0.164***	(0.0912)
Grandmother Living at Home x Number of Children at Home			**0.129****	(0.0606)
Grandmother Living at Home x Number of Children at Home x Single			0.104	(0.116)
Year of Interview (see Appendix C2)				
Highest Education (see Appendix C2)				
Grandmother: Highest Degree of Education (see Appendix C2)				
Grandfather: Highest Degree of Education (see Appendix C2)				
Province (see Appendix C2)				
Occupation Code (see Appendix C2)				
Constant	**1.604******	(0.232)	**1.511******	(0.217)
Observations	3572		3910	
R-squared (Within)	0.138		0.147	
R-squared (Between)	0.322		0.319	
R-squared (Overall)	0.313		0.315	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: The *GrandmotherLivingAtHome*$_{it}$ variable takes on the value of one if the grandmother is present in the household, regardless of whether the grandfather is also present.

children (56 mothers), evidence of a difference in the improvement in the MHWP for single mothers compared to married mothers is still insignificant.

Model 5 in **Table 8** shows the impact of the grandmother on the MHWP for low-income mothers, or mothers whose wages fall below the 25th percentile of the wages in the sample. Expectedly, low-wage mothers experience a greater alleviation of the MHWP when the grandmother lives in the household. Low-wage mothers are more likely to be in need of childcare assistance from the grandparents as they may not be able to afford other means of childcare. Thus, the grandparents that are in these mothers' households are more likely to cohabit with the mothers to help them with childcare and housework responsibilities. Previous research has not only found that grandparents are more

Table 8. Grandmothers Living with Low-Income Mothers.

	Model 5	
Marital Status: Single	-0.0494	(0.116)
Health Status	-0.0720	(0.129)
Work Experience (Years)	0.00700	(0.0109)
Work Experience^2 (Years)	-0.000112	(0.000210)
Part-time	0.0186	(0.128)
Number of Children at Home	**-0.147***	(0.0842)
Adjusted Family Size	-0.00216	(0.0246)
Grandmother at Home x Health	-0.0108	(0.248)
Grandfather at Home x Health		
Grandmother Living at Home	-0.106	(0.247)
Grandmother Living at Home x Number of Children at Home	**0.254****	(0.124)
Constant	**1.388****	(0.440)
Observations	905	
R-squared (Within)	0.152	
R-squared (Between)	0.134	
R-squared (Overall)	0.138	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: I control for the year of the interview, the respondent's highest education, the grandmother's highest education, and the grandfather's highest education, the province in which the respondent lives, and the occupation of the respondent, as in **Table 6**. Model 5 performs the regression on all wage data that falls below the 25th percentile of the wage rates of all eight years of the survey.

common in low-income households, but also state the need of these households for pooled resources as a cause for this pattern (Albuquerque, 2011).

    Table 9 shows the results from a regression model that follows Equation **(2)**, as it further specifies the living arrangements of the grandparents and controls for the age of the youngest child at home. I create three separate categories of grandparent living arrangements: Living with Grandmother Only, Living with Grandfather Only, and Living with Both Grandparents. Model 6 confirms the results from **Table 6**, as the grandmother improves the MHWP. Model 6 suggests that the MHWP is -20.3 percent per child, although this converts into a positive 7.7 percent when only the grandmother lives in the household. As referenced in the discussion regarding the trends found in **Table 6**, the overall positive effect of each additional child for mothers who live with grandmothers may indicate the increase in the mothers' motivation to generate higher earnings, the significant household and childcare assistance that

Table 9. Full Model with Distinct Living Arrangements.

	Model 6	
Marital Status: Single	-0.0151	(0.0517)
Health Status	**-0.257***	(0.0825)
Work Experience (Years)	**0.0625****	(0.00603)
Work Experience^2 (Years)	**-0.00136****	(0.000126)
Part-time	**0.624****	(0.0523)
Number of Children at Home	**-0.203***	(0.0788)
Adjusted Family Size	**0.0246***	(0.0121)
Grandmother at Home x Health	0.0491	(0.109)
Grandfather at Home x Health	0.0458	(0.0978)
Living with Grandmother Only	**-0.228***	(0.135)
Living with Grandfather Only	**-0.331***	(0.173)
Living with Both Grandparents	**-0.224***	(0.104)
Living with Grandmother Only x Number of Children at Home	**0.280***	(0.143)
Living with Grandfather Only x Number of Children at Home	0.0335	(0.248)
Living with Both Grandparents x Number of Children at Home	**0.126***	(0.0655)
Has Child at Home	0.0183	(0.126)
Has Child at Home x Age of Youngest Child	0.0156	(0.0239)
Has Child at Home x Age of Youngest Child^2	-0.00139	(0.00143)
Constant	**1.577****	(0.233)
Observations	3572	
R-squared (Within)	0.139	
R-squared (Between)	0.322	
R-squared (Overall)	0.313	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: I control for the year of the interview, the respondent's highest education, the grandmother's highest education, and the grandfather's highest education, the province in which the respondent lives, and the occupation of the respondent, as in **Table 6**.

the grandmothers provide, and improvements in productivity as the mothers are able to devote greater focus and energy at work. This finding is consistent with existing research that shows the potential wage benefits of children on average female wages (Molina & Montuenga, 2009).

The results do not draw a conclusion on the impact on the MHWP for mothers who live with grandfathers. Although the results suggest an improvement in the MHWP for mothers who live with both grandparents, this improvement is less than that of the mothers who live with only the grandmothers. This observation may be due to the decrease in grandfather involvement in households in which the grandmother is also present (Hank & Buber, 2008). This also indicates that grandfathers may

not offer the same quality of childcare, reduction in household responsibilities, or positive psychological and emotional benefits as the grandmothers.

For an enhanced understanding on the drivers behind the alleviation of the MHWP for mothers who live with grandmothers, I analyze the results of a random effects panel regression on monthly working hours, using the same key and control variables as Models 1 and 2. However, the results show no significant impact of the grandmother on monthly working hours of the mother. This suggests that factors beyond working hours are driving the wage increases, such as changes in productivity at work or emotional and mental benefits.[12] The insignificant difference in hours worked for mothers that live with the grandparents may be due to the emphasis that the Chinese women place on their performance at work. As a result, they are not willing to significantly compromise their work schedules after having a child (Short et al., 2002).

5.2 Limitations

Although I find a positive effect of the presence of the grandmother on the mother's wages, selection bias may exist as mothers may choose their living arrangements based on the number of children they have. Although I cannot remove the selection bias, I perform an analysis of the MHWP based on living arrangements as shown in **Table 10**. Models 7 and 8 suggest that the improvement in the MHWP from the grandmother is similar to that of the results in **Table 6** for women who have one child.

The results may have underestimated the impact of grandmothers on the MHWP, as I only include mothers with positive wages in the sample. However, having a child may cause a mother to drop out of the labor force or become unemployed. Thus, I analyze the results from Models 9 and 10 in **Table 11**, two probit models that determine the probability that a woman is employed based on selected control variables. The results suggest a significant increase in the probability that the mother is employed for

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[12] See **Appendix C3** for regression results with monthly working hours as the dependent variable.

Table 10. Robustness Check.

	Model 7		Model 8	
Marital Status: Single	-0.0199	(0.0504)	-0.0304	(0.0502)
Health Status	-0.251***	(0.0824)	-0.250***	(0.0824)
Work Experience (Years)	0.0618****	(0.00570)	0.0610****	(0.00571)
Work Experience^2 (Years)	-0.00136****	(0.000123)	-0.00133****	(0.000122)
Part-time	0.626****	(0.0523)	0.625****	(0.0524)
Number of Children at Home				
One Child	-0.189***	(0.0632)	-0.179***	(0.0626)
Two Children	-0.426****	(0.113)	-0.420****	(0.111)
Three or More Children	-0.145	(0.323)	-0.130	(0.323)
Adjusted Family Size	0.0249**	(0.0120)	0.0222*	(0.0119)
Grandmother at Home x Health	0.113	(0.0861)	0.115	(0.103)
Grandfather at Home x Health	0.00531	(0.0704)	-0.0357	(0.0677)
Any Grandparent	-0.260***	(0.0893)		
Any Grandparent x Number of Children at Home				
Any Grandparent x One Child	0.180**	(0.0835)		
Any Grandparent x Two Children	0.261	(0.171)		
Any Grandparent x Three or More Children	0.143	(0.543)		
Grandmother Living at Home			-0.203**	(0.0973)
Grandmother Living at Home x Number of Children at Home				
Grandmother Living at Home x One Child			0.158*	(0.0827)
Grandmother Living at Home x Two Children			0.252	(0.172)
Grandmother Living at Home x Three or More Children			0.130	(0.544)
Constant	1.596****	(0.232)	1.601****	(0.232)
Observations	3572		3572	
R-squared (Within)	0.138		0.139	
R-squared (Between)	0.322		0.321	
R-squared (Overall)	0.313		0.312	

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: Table displays regression results from Models 1 and 2, incorporating the number of children as a categorical variable. I control for the year of the interview, the respondent's highest education, the grandmother's highest education, and the grandfather's highest education, the province in which the respondent lives, and the occupation of the respondent, as in **Table 6**.

each child she has if she is single and lives with the grandmother. Although I did not find a significant difference in the impact of grandmother on the MHWP for single and married women, this finding reveals that the previous models may have understated the positive impact of the grandmother on the employment and job outcomes of single mothers.

This paper analyzes the wages for women working in non-agricultural jobs and excludes income from self-employment. However, approximately two-thirds of women in China work in areas where non-wage work is more prevalent (Short et al., 2002). Thus, different trends in the MHWP may appear in analyses that include these other sources of income.

Table 11. Probability of Employment.

	Model 9		Model 10	
Marital Status: Single	**-0.764******	(0.0336)	**-0.772******	(0.0330)
Health Status	**-0.238******	(0.0261)	**-0.235******	(0.0258)
Number of Children at Home	**0.0889******	(0.0165)	**0.0924******	(0.0162)
Adjusted Family Size	**-0.0175*****	(0.00621)	**-0.0179*****	(0.00616)
Any Grandparent	**-0.330******	(0.0395)		
Any Grandparent x Number of Children at Home	-0.000504	(0.0471)		
Any Grandparent x Number of Children at Home x Single	**1.057******	(0.161)		
Grandmother Living at Home			**-0.314******	(0.0390)
Grandmother Living at Home x Number of Children at Home			-0.0224	(0.0477)
Grandmother Living at Home x Number of Children at Home x Single			**1.076******	(0.162)
Constant	**-0.426*****	(0.133)	**-0.428*****	(0.131)
Ln(Variance)	**0.278******	(0.0328)	**0.270******	(0.0324)
Observations	45887		46606	

Standard errors in parentheses
* $p<0.10$, ** $p<0.05$, *** $p<0.01$, **** $p<0.001$

Notes: I control for the year of the interview, the respondent's highest education, the grandmother's highest education, and the grandfather's highest education.

5.3 Suggestions for Future Research

The size of the sample of single mothers who live with young children is limited in this data set, in part due to the cultural norms and attitudes in China. Although I find a strong positive effect of grandparents living with single mothers, this result is not significant. For more conclusive results on the impact of grandparent living arrangements on single mothers, further research should use data sets with more information on single mothers.

In the results above, I did not determine the exact living arrangements of the paternal grandparents, and instead controlled for them through the adjusted family size. Therefore, I suggest that future research incorporates the living arrangements of the paternal grandparents, as they may impact not only the living arrangements of the maternal grandparents, but also the maternal grandparents' impact on the MHWP. Also, as I was unable to distinguish between hourly and salaried workers even though they may have different compensation structures and incentives, I encourage further study on the

MHWP for these two types of workers. For a more comprehensive understanding of the reasons behind the trends shown in this paper, I suggest further qualitative studies on the experiences of women and mothers who live with either or both of their parents. I also suggest future research on populations outside of China to confirm any impact of the living arrangements of maternal grandparents in other cultures, as traditional norms may still penetrate modern Chinese society and may produce results specific to Chinese family dynamics. Lastly, I recommend analyzing the impact of grandparent living arrangements on the mother's non-wage work, including income from agricultural work and self-employment, as I excluded mothers whose primary income is derived from non-wage work.

6. Conclusion

What are the consequences of the rising matrilocal model in China? This paper addresses this question through an analysis of the impact of the living arrangements of maternal grandparents on the MHWP in China. I also attempt to measure any difference in the impact of grandparent living arrangements between single and married mothers, as single mothers are a vulnerable and growing population in China; unfortunately, single mothers are not greatly present in my data set. I find that the MHWP is reduced when the mother lives with her mother. Moreover, although I find a greater alleviation of the MHWP for single mothers who live with grandparents compared with married mothers, this difference is insignificant in part due to the small sample size of single mothers living with children. The former finding confirms the first hypothesis of the paper and is supported by research on childcare assistance provided by Chinese grandmothers; the latter finding is not sufficient to prove the second hypothesis. I provide potential reasons behind these trends, including the quality of care offered by the grandmother and the resulting increase in the mother's productivity at work. I find that the impact that the grandmother has on the MHWP is weakened when she is accompanied with the grandfather. These findings contribute to the assessment of the benefits of the rise in non-traditional living

arrangements in contemporary China. Due to the relevance of childcare policies and intergenerational family politics, the relationships between the MHWP, family living arrangements, and marital status continue to have policy and economic implications for mothers across China and the world.

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Appendix Description

The Appendix is divided into 1) Appendix A1, 2) Appendix A2, 3) Appendix B1, and 4) Appendix C1-C3. Appendix A1 includes descriptions of the age distributions of the 2010 CFPS baseline survey respondents and of the statistics provided by the National Bureau of Statistics of China. Appendix A1 also describes the income variable from the CFPS data used throughout the paper, including the conversion of the incomes to the units of real 2019 yuan. Appendix A2 has three tables that outline and describe the human capital, family, and job control variables used in the full regression model in **Table 9**. Appendix B1 includes the regression results from the fixed effects baseline models, as well as the baseline model that shows the effects of the living arrangement of the grandfather. Appendix C1 and C2 include tables showing the regression coefficients of the variables not shown in **Table 6** and **Table 7**, respectively. These control variables include the province in which the respondent lives, the occupation of the respondent's primary job, the highest degree of education received by the respondent, the grandmother's highest degree of education received, the grandfather's highest degree of education received, and the year of the interview. Lastly, Appendix C3 shows the regression results from analyzing the impact of grandparent living arrangements on the mother's monthly working hours.

Appendix A1

Table A1.1. Age Composition of 2010 CFPS and National Bureau of Statistics Samples.

	CFPS	Census Data
Below 65	87.36%	89.36%
65 and Above	12.64%	10.64%

Notes: Minimum age of the 2010 CFPS sample of 17,313 women is 16. CFPS statistics shown above include employed and unemployed women. Statistical data from the National Bureau of Statistics contains both men and women and has been reduced to only contain individuals older than 15 years old.
Source: CFPS; National Bureau of Statistics of China's 2010 China Statistical Yearbook

Table A1.2. 2010 - 2018 China Consumer Price Index.

Year	Consumer Price Index
2010	105.4
2011	102.6
2012	102.6
2013	102.0
2014	101.4
2015	102.0
2016	101.6
2017	102.1
2018	102.9

Notes: Preceding year = 100.
Source: National Bureau of Statistics of China's 2010 China Statistical Yearbook

Table A1.3. Description of Non-Operating Primary Income After-Tax Measure.

Survey Year	Income Description
2010	Reported income from current primary job, excluding agricultural work and self-employment
2012	After-tax income from current job indicated as main occupation, only including employment by nonagricultural individuals, organizations, enterprises, or work units
2014 - 2016	After-tax income from current primary job, excluding agricultural work and individual / private business / other self-employment

Notes: For the 2010 questionnaire, if the respondent had more than one job at the time of the interview, the primary job was the one that took the most time. For the other survey years, if the respondent had only one job, the primary job was defined as that job. If the respondent had multiple jobs at the same time, she chose which one was considered the main job. If the respondent was not working, her latest job was considered the main job. Income refers to wage, salary, floating wage, overtime pay, bonuses, subsidies, cash benefits, and material benefits earned in the past year. The 2010 questionnaire did not specify whether the respondent should report her before- or after-tax income; 2010 income data is used as reported.
Source: CFPS User's Manual (3rd Edition) and Questionnaires

Appendix A2

Table A2.1. List of Human Capital Control Variables.

Variable Name	Description
Highest Education	Highest education of the respondent. Categories include: Illiterate/Semi-literate, Primary School, Secondary School, Junior High School, Senior High School, 2- or 3-Year College, 4-Year College/Bachelor's Degree, Master's Degree, and Doctoral Degree.
Health Status	Self-reported health status of the respondent. Dummy variable that equals one if the mother has poor health, and zero if the mother reports fair/good/excellent health.
Province	Province in which the respondent lives, as indicated by the province code.

Table A2.2. List of Family Control Variables.

Variable Name	Description
Grandmother at Home x Health, Grandfather x Health	Health of the grandparent living at home. Equals one if the grandparent is living at home and has good health (if the grandparent is younger than 65 years old).
Adjusted Family Size	Number of family members living in the household, excluding the respondent, the respondent's children, and the respondent's parents.
Has Child at Home	Dummy variable that equals one if the mother has at least one child, and zero otherwise.
Has Child at Home x Age of Youngest Child, Has Child at Home x Age of Youngest Child^2	Age of the youngest child if the respondent has a child at home.
Grandmother: Highest Degree of Education, Grandfather: Highest Degree of Education	Highest grandparent education. Categories include: Illiterate/Semi-literate, Primary School, Secondary School, Junior High School, Senior High School, 2- or 3-Year College, 4-Year College/Bachelor's Degree, Master's Degree, and Doctoral Degree.

Table A2.3. List of Job Control Variables.

Variable Name	Description
Work Experience, Work Experience^2	Number of years of work experience, calculated by: age - number of schooling years - 7.
Part-Time	Equals one if the respondent works less than 35 hours/week for her primary job, and zero otherwise.
Occupation Code	Categorical variables indicating the occupation code category of the respondent's occupation. Occupation codes are derived from the national standard classification of occupations GB/T 6565-2009.

Appendix B1

Table B1.1. Results from Baseline Fixed Effects Models & Grandfather Living at Home.

	Model 1: FE		Model 2: FE		Grandfather Living at Home	
Marital Status: Single	-0.127	(0.1000)	-0.138	(0.0917)	-0.0329	(0.0445)
Health Status	0.111	(0.145)	0.124	(0.126)	**-0.185***	(0.0666)
Work Experience (Years)	-0.00858	(0.0531)	0.00121	(0.0478)	**0.0492****	(0.00493)
Work Experience^2 (Years)	**-0.00113**	(0.000567)	**-0.00100**	(0.000504)	**-0.00108****	(0.000106)
Part-time	**0.680****	(0.0923)	**0.687****	(0.0829)	**0.669****	(0.0456)
Number of Children at Home	-0.136	(0.0935)	**-0.143***	(0.0828)	**-0.0946***	(0.0354)
Adjusted Family Size	-0.00119	(0.0315)	0.00307	(0.0288)	0.0141	(0.0108)
Grandmother at Home x Health	0.0352	(0.161)	0.0807	(0.153)		
Grandfather at Home x Health	0.141	(0.152)			0.0589	(0.0780)
Any Grandparent	0.149	(0.193)				
Any Grandparent x Number of Children at Home	-0.0916	(0.134)				
Grandmother Living at Home			0.198	(0.174)		
Grandmother Living at Home x Number of Children at Home			-0.0831	(0.121)		
Grandfather Living at Home					-0.103	(0.0804)
Grandfather Living at Home x Number of Children at Home					0.0721	(0.0571)
Year of Interview (see Appendix B1)						
Highest Education (see Appendix B1)						
Grandmother: Highest Degree of Education (see Appendix B1)						
Grandfather: Highest Degree of Education (see Appendix B1)						
Province (see Appendix B1)						
Occupation Code (see Appendix B1)						
Constant	**2.361***	(1.087)	**2.707***	(0.954)	**1.608****	(0.207)
Observations	3572		3910		4389	
R-squared (Within)	0.196		0.198		0.144	
R-squared (Between)	0.0633		0.0654		0.309	
R-squared (Overall)	0.0665		0.0663		0.309	

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: The *GrandmotherLivingAtHome*$_{it}$ variable takes on the value of one if the grandmother is present in the household, regardless of whether the grandfather is also present. The *GrandfatherLivingAtHome*$_{it}$ variable takes on the value of one if the grandfather is present in the household, regardless of whether the grandmother is also present.

Table B1.2. Regression Coefficients for Province Variable.

Province (Reference Province: Beijing)	Model 1: FE		Model 2: FE		Grandfather Living at Home	
Tianjin					0.127	(0.203)
Hebei	-0.859	(0.622)	-0.803	(0.595)	-0.493****	(0.131)
Shanxi	-1.530*	(0.804)	-1.346*	(0.729)	-0.496****	(0.141)
Inner mongolia	2.152	(1.519)	2.146	(1.450)	-0.388	(0.475)
Liaoning	-1.089	(0.939)	-1.160	(0.894)	-0.276**	(0.126)
Jilin	-0.618	(0.820)	-0.630	(0.785)	-0.326*	(0.168)
Heilongjiang	1.438	(1.160)	1.447	(1.104)	-0.400***	(0.143)
Shanghai	0.845	(0.782)	0.508	(0.713)	0.448****	(0.124)
Jiangsu	0.922	(0.910)	0.822	(0.870)	-0.00766	(0.141)
Zhejiang	-0.0266	(1.000)	-0.125	(0.955)	0.0806	(0.141)
Anhui	0.0576	(1.077)	-0.121	(1.022)	-0.295*	(0.165)
Fujian	-2.009	(1.527)	-2.107	(1.459)	-0.318*	(0.189)
Jiangxi	0.916	(0.867)	0.779	(0.824)	-0.0998	(0.163)
Shandong	-0.593	(1.114)	-0.272	(0.999)	-0.349**	(0.138)
Henan	-0.445	(0.656)	-0.481	(0.623)	-0.389***	(0.125)
Hubei	1.595	(1.508)	1.290	(1.438)	-0.283*	(0.163)
Hunan	-0.642	(0.824)	-0.679	(0.787)	-0.0835	(0.144)
Guangdong	1.056	(0.806)	0.950	(0.768)	0.0251	(0.124)
Guangxi Zhuang Autonomous Region	-1.775	(1.759)	-1.044	(1.501)	-0.232	(0.178)
Hainan					-1.001	(0.679)
Chongqing					-0.152	(0.204)
Sichuan	1.123	(1.187)	0.986	(1.133)	-0.244*	(0.140)
Guizhou	-0.0238	(1.765)	0.256	(1.574)	-0.368**	(0.167)
Yunnan	-1.376	(1.957)	-1.331	(1.874)	-0.305*	(0.157)
Shaanxi	-1.834	(1.238)	-1.309	(1.025)	-0.393**	(0.153)
Gansu	-1.517	(1.289)	-0.788	(0.968)	-0.269**	(0.129)
Qinghai					-2.607***	(0.949)
Ningxia Hui Autonomous					0.448	(0.680)
Xinjiang Uygur Autonomous Region	-1.834	(1.770)	-1.100	(1.517)	-0.225	(0.373)
Observations	3572		3910		4389	
R-squared (Within)	0.196		0.198		0.144	
R-squared (Between)	0.0633		0.0654		0.309	
R-squared (Overall)	0.0665		0.0663		0.309	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: Coefficients correspond to the results in **Table B1.1**.

Table B1.3. Regression Coefficients for Occupation Variable.

Occupation Code (Reference Occupations: 90000+)	Model 1: FE		Model 2: FE		Grandfather Living at Home	
10000-19999	-0.457	(0.289)	-0.477*	(0.261)	0.338**	(0.150)
20000-29999	-0.617**	(0.269)	-0.621**	(0.243)	0.158	(0.136)
30000-39999	-0.619**	(0.270)	-0.642***	(0.244)	0.0463	(0.137)
40000-49999	-0.580**	(0.261)	-0.606**	(0.235)	-0.0871	(0.133)
50000-59999	-0.447	(0.503)	-0.557	(0.432)	-0.281	(0.214)
60000-69999	-0.487*	(0.263)	-0.529**	(0.234)	-0.0980	(0.135)
70000-79999	-1.244	(1.710)	-0.993	(1.601)	0.605	(0.672)
80000-89999					-0.464	(0.378)
Observations	3572		3910		4389	
R-squared (Within)	0.196		0.198		0.144	
R-squared (Between)	0.0633		0.0654		0.309	
R-squared (Overall)	0.0665		0.0663		0.309	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: Occupations codes are derived from the national standard classification of occupations GB/T 6565-2009. Occupations with codes above 90000 indicate workers not classified elsewhere. Coefficients correspond to the results in **Table B1.1**.

Table B1.4. Regression Coefficients for Highest Education, Grandmother Education, and Grandfather Education Variables.

	Model 1: FE		Model 2: FE		Grandfather Living at Home	
Highest Education (Reference Group: Illiterate / Semi-literate)						
Primary School	-0.00359	(0.867)	-0.464	(0.568)	**-0.174***	(0.0893)
Junior High School	0.0654	(0.870)	-0.261	(0.603)	-0.00268	(0.0862)
Senior High School / Secondary School / Technical School/						
Vocational Senior School	-0.0800	(0.870)	-0.377	(0.638)	**0.160***	(0.0902)
2- or 3-Year College	0.148	(0.895)	-0.102	(0.683)	**0.550*****	(0.0971)
4-Year College / Bachelor's Degree	0.155	(0.916)	-0.0855	(0.714)	**0.810*****	(0.102)
Master's Degree	1.010	(1.164)	0.759	(1.003)	**1.436*****	(0.165)
Doctoral Degree					**1.297***	(0.680)
Grandmother: Highest Degree of Education						
(Reference Group: Illiterate / Semi-literate)						
Primary School	0.0558	(0.209)	0.0529	(0.199)		
Junior High School	-0.00573	(0.278)	0.0407	(0.262)		
Senior High School / Secondary School / Technical School/						
Vocational Senior School	1.046	(0.739)	0.649	(0.673)		
2- or 3-Year College	0.972	(1.230)	0.600	(1.160)		
4-Year College / Bachelor's Degree						
Grandfather: Highest Degree of Education						
(Reference Group: Illiterate / Semi-literate)						
Primary School	0.129	(0.212)	0.150	(0.193)	0.0512	(0.0453)
Junior High School	0.115	(0.301)	0.139	(0.281)	0.0501	(0.0480)
Senior High School / Secondary School / Technical School/						
Vocational Senior School	-0.172	(0.423)	-0.173	(0.399)	**0.101***	(0.0570)
2- or 3-Year College	0.149	(0.641)	0.105	(0.576)	**0.189***	(0.105)
4-Year College / Bachelor's Degree					0.0864	(0.126)
Master's Degree	-0.144	(1.059)	-0.174	(0.993)	0.416	(0.682)
Observations	3572		3910		4389	
R-squared (Within)	0.196		0.198		0.144	
R-squared (Between)	0.0633		0.0654		0.309	
R-squared (Overall)	0.0665		0.0663		0.309	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: Coefficients correspond to the results in **Table B1.1**.

Table B1.5. Regression Coefficients for Year of Interview Variable.

	Model 1: FE		Model 2: FE		Grandfather Living at Home	
Year of Interview (Reference Year: 2010)						
2011	-0.0976	(0.399)	-0.112	(0.381)	-0.156	(0.232)
2012	0.0403	(0.0807)	0.0495	(0.0691)	-0.0798	(0.0519)
2014	0.319	(0.218)	0.274	(0.192)	0.0342	(0.0410)
2015	**1.104***	(0.362)	**0.849***	(0.323)	**0.428*****	(0.109)
2016	0.375	(0.317)	0.291	(0.280)	**-0.163*****	(0.0494)
2017	0.614	(0.381)	0.504	(0.341)	0.128	(0.0827)
2018	**1.034****	(0.412)	**0.909****	(0.364)	**0.210*****	(0.0468)
2019	**1.403***	(0.475)	**1.287***	(0.429)	**0.474*****	(0.135)
Observations	3572		3910		4389	
R-squared (Within)	0.196		0.198		0.144	
R-squared (Between)	0.0633		0.0654		0.309	
R-squared (Overall)	0.0665		0.0663		0.309	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: Coefficients correspond to the results in **Table B1.1**.

Appendix C1

Table C1.1. Regression Coefficients for Province Variable.

	Model 1		Model 2	
Province (Reference Province: Beijing)				
Tianjin	0.0721	(0.223)	0.0648	(0.214)
Hebei	**-0.419***	(0.139)	**-0.407***	(0.136)
Shanxi	**-0.458***	(0.153)	**-0.459***	(0.148)
Inner mongolia	-0.396	(0.488)	-0.389	(0.433)
Liaoning	**-0.247***	(0.136)	**-0.263****	(0.131)
Jilin	-0.176	(0.191)	-0.226	(0.183)
Heilongjiang	**-0.312****	(0.153)	**-0.329****	(0.148)
Shanghai	**0.516*****	(0.131)	**0.509*****	(0.128)
Jiangsu	0.0335	(0.153)	0.0299	(0.150)
Zhejiang	0.249	(0.153)	0.240	(0.150)
Anhui	-0.172	(0.183)	-0.170	(0.180)
Fujian	-0.272	(0.200)	-0.236	(0.195)
Jiangxi	0.0846	(0.178)	0.0514	(0.172)
Shandong	-0.244	(0.149)	**-0.269***	(0.146)
Henan	**-0.314****	(0.132)	**-0.311****	(0.129)
Hubei	-0.275	(0.174)	-0.259	(0.166)
Hunan	0.0473	(0.157)	-0.0174	(0.149)
Guangdong	0.111	(0.132)	0.110	(0.128)
Guangxi Zhuang Autonomous Region	-0.101	(0.195)	-0.134	(0.191)
Hainan	-0.885	(0.692)	-0.874	(0.682)
Chongqing	-0.0544	(0.227)	-0.0764	(0.209)
Sichuan	-0.202	(0.149)	-0.207	(0.146)
Guizhou	-0.206	(0.188)	-0.207	(0.180)
Yunnan	-0.194	(0.168)	-0.178	(0.164)
Shaanxi	**-0.359****	(0.166)	**-0.338****	(0.161)
Gansu	-0.175	(0.138)	-0.190	(0.134)
Qinghai	**-2.571***	(0.966)	**-2.570***	(0.953)
Ningxia Hui Autonomous	0.545	(0.694)	0.576	(0.684)
Xinjiang Uygur Autonomous Region	-0.103	(0.409)	-0.114	(0.403)
Observations	3572		3910	
R-squared (Within)	0.138		0.148	
R-squared (Between)	0.321		0.319	
R-squared (Overall)	0.313		0.315	

Standard errors in parentheses
* $p<0.10$, ** $p<0.05$, *** $p<0.01$, **** $p<0.001$

Notes: Coefficients correspond to the results in **Table 6**.

Table C1.2. Regression Coefficients for Occupation Variable.

Occupation Code (Reference Occupations: 90000+)	Model 1		Model 2	
10000-19999	**0.337****	(0.165)	**0.358****	(0.152)
20000-29999	0.125	(0.149)	0.126	(0.137)
30000-39999	0.0298	(0.150)	0.0290	(0.139)
40000-49999	-0.0976	(0.146)	-0.0952	(0.134)
50000-59999	-0.233	(0.262)	-0.279	(0.239)
60000-69999	-0.0820	(0.149)	-0.0785	(0.136)
70000-79999	0.664	(0.692)	0.650	(0.676)
80000-89999	**-1.559*****	(0.575)	**-0.978****	(0.493)
Observations	3572		3910	
R-squared (Within)	0.138		0.148	
R-squared (Between)	0.321		0.319	
R-squared (Overall)	0.313		0.315	

Standard errors in parentheses
* $p<0.10$, ** $p<0.05$, *** $p<0.01$, **** $p<0.001$

Notes: Occupations codes are derived from the national standard classification of occupations GB/T 6565-2009. Occupations with codes above 90000 indicate workers not classified elsewhere. Coefficients correspond to the results in **Table 6**.

Table C1.3. Regression Coefficients for Highest Education, Grandmother Education, and Grandfather Education Variables.

	Model 1		Model 2	
Highest Education (Reference Group: Illiterate / Semi-literate)				
Primary School	-0.178	(0.112)	-0.0925	(0.101)
Junior High School	-0.0383	(0.107)	0.0239	(0.0956)
Senior High School / Secondary School / Technical School/				
Vocational Senior School	0.121	(0.111)	**0.196****	(0.0999)
2- or 3-Year College	**0.491******	(0.117)	**0.576******	(0.106)
4-Year College / Bachelor's Degree	**0.775******	(0.121)	**0.852******	(0.111)
Master's Degree	**1.410******	(0.180)	**1.467******	(0.172)
Doctoral Degree	**1.247***	(0.702)	**1.078***	(0.568)
Grandmother: Highest Degree of Education				
(Reference Group: Illiterate / Semi-literate)				
Primary School	**0.101****	(0.0489)	**0.0893***	(0.0461)
Junior High School	**0.132*****	(0.0513)	**0.123****	(0.0493)
Senior High School / Secondary School / Technical School/				
Vocational Senior School	0.0640	(0.0685)	0.0552	(0.0667)
2- or 3-Year College	0.163	(0.146)	0.134	(0.143)
4-Year College / Bachelor's Degree	0.209	(0.254)	0.205	(0.231)
Grandfather: Highest Degree of Education				
(Reference Group: Illiterate / Semi-literate)				
Primary School	0.0667	(0.0538)	0.0476	(0.0505)
Junior High School	0.0568	(0.0553)	0.0493	(0.0528)
Senior High School / Secondary School / Technical School/				
Vocational Senior School	0.108	(0.0658)	0.0986	(0.0624)
2- or 3-Year College	**0.192***	(0.113)	0.174	(0.107)
4-Year College / Bachelor's Degree	0.0236	(0.151)	0.0759	(0.141)
Master's Degree	0.471	(0.702)	0.418	(0.686)
Observations	3572		3910	
R-squared (Within)	0.138		0.148	
R-squared (Between)	0.321		0.319	
R-squared (Overall)	0.313		0.315	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: Coefficients correspond to the results in **Table 6**.

Table C1.4. Regression Coefficients for Year of Interview Variable.

	Model 1		Model 2	
Year of Interview (Reference Year: 2010)				
2011	-0.125	(0.256)	-0.0798	(0.250)
2012	-0.105	(0.0655)	-0.0548	(0.0574)
2014	-0.0435	(0.0501)	-0.00256	(0.0453)
2015	**0.317****	(0.133)	**0.325*****	(0.124)
2016	**-0.228******	(0.0571)	**-0.182******	(0.0523)
2017	0.00973	(0.0921)	0.0590	(0.0872)
2018	**0.138****	(0.0541)	**0.183******	(0.0496)
2019	**0.377*****	(0.143)	**0.408*****	(0.139)
Observations	3572		3910	
R-squared (Within)	0.138		0.148	
R-squared (Between)	0.321		0.319	
R-squared (Overall)	0.313		0.315	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: Coefficients correspond to the results in **Table 6**.

Appendix C2

Table C2.1. Regression Coefficients for Province Variable.

	Model 3		Model 4	
Province (Reference Province: Beijing)				
Tianjin	0.0650	(0.223)	0.0585	(0.214)
Hebei	**-0.420***	(0.139)	**-0.408***	(0.136)
Shanxi	**-0.458***	(0.153)	**-0.459***	(0.148)
Inner mongolia	-0.400	(0.488)	-0.392	(0.433)
Liaoning	**-0.247***	(0.136)	**-0.263**	(0.131)
Jilin	-0.177	(0.191)	-0.226	(0.183)
Heilongjiang	**-0.314**	(0.153)	**-0.331**	(0.148)
Shanghai	**0.516****	(0.131)	**0.509****	(0.128)
Jiangsu	0.0336	(0.153)	0.0298	(0.150)
Zhejiang	0.248	(0.153)	0.239	(0.150)
Anhui	-0.172	(0.183)	-0.170	(0.180)
Fujian	-0.286	(0.201)	-0.247	(0.196)
Jiangxi	0.0824	(0.178)	0.0496	(0.172)
Shandong	**-0.246***	(0.149)	**-0.271***	(0.146)
Henan	**-0.316**	(0.132)	**-0.312**	(0.129)
Hubei	-0.277	(0.174)	-0.260	(0.166)
Hunan	0.0477	(0.157)	-0.0167	(0.149)
Guangdong	0.110	(0.132)	0.110	(0.128)
Guangxi Zhuang Autonomous Region	-0.0991	(0.194)	-0.133	(0.191)
Hainan	-0.883	(0.692)	-0.873	(0.682)
Chongqing	-0.0548	(0.227)	-0.0764	(0.209)
Sichuan	-0.204	(0.149)	-0.208	(0.146)
Guizhou	-0.208	(0.188)	-0.208	(0.180)
Yunnan	-0.196	(0.168)	-0.180	(0.164)
Shaanxi	**-0.358**	(0.166)	**-0.337**	(0.161)
Gansu	-0.176	(0.138)	-0.191	(0.134)
Qinghai	**-2.567***	(0.966)	**-2.567***	(0.953)
Ningxia Hui Autonomous	0.549	(0.694)	0.580	(0.684)
Xinjiang Uygur Autonomous Region	-0.108	(0.409)	-0.117	(0.403)
Observations	3572		3910	
R-squared (Within)	0.138		0.147	
R-squared (Between)	0.322		0.319	
R-squared (Overall)	0.313		0.315	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: Coefficients correspond to the results in **Table 7**.

Table C2.2. Regression Coefficients for Occupation Variable.

Occupation Code (Reference Occupations: 90000+)	Model 3		Model 4	
10000-19999	0.338**	(0.165)	0.358**	(0.152)
20000-29999	0.125	(0.149)	0.126	(0.137)
30000-39999	0.0291	(0.150)	0.0285	(0.139)
40000-49999	-0.0998	(0.146)	-0.0968	(0.134)
50000-59999	-0.231	(0.262)	-0.277	(0.239)
60000-69999	-0.0839	(0.149)	-0.0798	(0.136)
70000-79999	0.663	(0.692)	0.649	(0.676)
80000-89999	-1.558***	(0.575)	-0.974**	(0.493)
Observations	3572		3910	
R-squared (Within)	0.138		0.147	
R-squared (Between)	0.322		0.319	
R-squared (Overall)	0.313		0.315	

Standard errors in parentheses
* $p<0.10$, ** $p<0.05$, *** $p<0.01$, **** $p<0.001$

Notes: Occupations codes are derived from the national standard classification of occupations GB/T 6565-2009. Occupations with codes above 90000 indicate workers not classified elsewhere. Coefficients correspond to the results in **Table 7**.

Table C2.3. Regression Coefficients for Highest Education, Grandmother Education, and Grandfather Education Variables.

	Model 3		Model 4	
Highest Education (Reference Group: Illiterate / Semi-literate)				
Primary School	-0.181	(0.112)	-0.0950	(0.101)
Junior High School	-0.0412	(0.107)	0.0215	(0.0956)
Senior High School / Secondary School / Technical School/				
Vocational Senior School	0.113	(0.111)	**0.190***	(0.100)
2- or 3-Year College	**0.484****	(0.117)	**0.570****	(0.107)
4-Year College / Bachelor's Degree	**0.768****	(0.121)	**0.846****	(0.111)
Master's Degree	**1.401****	(0.180)	**1.460****	(0.172)
Doctoral Degree	**1.233***	(0.702)	**1.070***	(0.568)
Grandmother: Highest Degree of Education				
(Reference Group: Illiterate / Semi-literate)				
Primary School	**0.102****	(0.0489)	**0.0902***	(0.0461)
Junior High School	**0.132*****	(0.0513)	**0.122****	(0.0493)
Senior High School / Secondary School / Technical School/				
Vocational Senior School	0.0649	(0.0685)	0.0560	(0.0667)
2- or 3-Year College	0.163	(0.146)	0.134	(0.143)
4-Year College / Bachelor's Degree	0.216	(0.254)	0.209	(0.231)
Grandfather: Highest Degree of Education				
(Reference Group: Illiterate / Semi-literate)				
Primary School	0.0677	(0.0538)	0.0484	(0.0506)
Junior High School	0.0589	(0.0554)	0.0511	(0.0528)
Senior High School / Secondary School / Technical School/				
Vocational Senior School	**0.111***	(0.0658)	0.101	(0.0624)
2- or 3-Year College	**0.195***	(0.113)	**0.177***	(0.107)
4-Year College / Bachelor's Degree	0.0221	(0.151)	0.0749	(0.141)
Master's Degree	0.477	(0.702)	0.422	(0.686)
Observations	3572		3910	
R-squared (Within)	0.138		0.147	
R-squared (Between)	0.322		0.319	
R-squared (Overall)	0.313		0.315	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: Coefficients correspond to the results in **Table 7**.

Table C2.4. Regression Coefficients for Year of Interview Variable.

	Model 3		Model 4	
Year of Interview (Reference Year: 2010)				
2011	-0.124	(0.256)	-0.0784	(0.250)
2012	-0.105	(0.0656)	-0.0552	(0.0574)
2014	-0.0450	(0.0502)	-0.00391	(0.0453)
2015	**0.316**	(0.133)	**0.324***	(0.124)
2016	**-0.229****	(0.0571)	**-0.183****	(0.0523)
2017	0.00953	(0.0921)	0.0588	(0.0872)
2018	**0.137**	(0.0541)	**0.182****	(0.0496)
2019	**0.372***	(0.143)	**0.404***	(0.139)
Observations	3572		3910	
R-squared (Within)	0.138		0.147	
R-squared (Between)	0.322		0.319	
R-squared (Overall)	0.313		0.315	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: Coefficients correspond to the results in **Table 7**.

Appendix C3

Table C3.1. Impact of Grandparent Living Arrangements on Working Hours Per Month.

	Model 1: Working Hours		Model 2: Working Hours	
Marital Status: Single	**4.213***	(2.485)	**4.900***	(2.441)
Health Status	2.079	(4.102)	3.556	(3.844)
Work Experience (Years)	-0.403	(0.298)	-0.416	(0.281)
Work Experience^2 (Years)	-0.00179	(0.00633)	-0.00101	(0.00604)
Part-time	**-109.2****	(2.594)	**-111.3****	(2.552)
Number of Children at Home	-1.576	(2.283)	-0.828	(2.115)
Adjusted Family Size	0.569	(0.624)	0.611	(0.612)
Grandmother at Home x Health	-2.214	(4.339)	-1.866	(4.739)
Grandfather at Home x Health	-0.219	(3.577)		
Any Grandparent	-1.959	(4.551)		
Any Grandparent x Number of Children at Home	0.936	(3.228)		
Grandmother Living at Home			-2.144	(4.873)
Grandmother Living at Home x Number of Children at Home			0.495	(3.122)
Constant	**253.6****	(11.82)	**255.0****	(11.47)
Observations	3690		4034	
R-squared (Within)	0.335		0.334	
R-squared (Between)	0.471		0.465	
R-squared (Overall)	0.449		0.439	

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01, **** p<0.001

Notes: I control for the year of the interview, the respondent's highest education, the grandmother's highest education, and the grandfather's highest education, the province in which the respondent lives, and the occupation of the respondent, as in **Table 6**.