



Munich Personal RePEc Archive

**Liberated from care: Long-term care
insurance policy and Employment for
women**

Zhu, Ge

24 January 2024

Online at <https://mpra.ub.uni-muenchen.de/120472/>
MPRA Paper No. 120472, posted 27 Mar 2024 14:56 UTC

Liberated from care:

Long-term care insurance policy and Employment for women

Abstract

In the context of an increasingly aging population, this paper examines the economic incentives of long-term care insurance policies for women to disengage from informal care responsibilities within the household. Through constructing both theoretical analytical frameworks and empirical identification strategies, we seek to comprehend the causal relationship between women benefiting from long-term care insurance policy pilot programs and their entry or re-entry into the labor market. Our findings indicate that long-term care insurance policies significantly stimulate female employment. This discovery implies that aiding women in shifting family responsibilities to the market contributes to enhancing female labor participation. Robustness checks corroborate our findings, and the outcomes of competitive hypotheses demonstrate that alleviating family care burdens is more conducive to promoting female employment than providing care job opportunities. Further analysis suggests that long-term care insurance policies may also potentially undermine China's "raising children to support old age" mechanism and the preference for sons over daughters. However, there exist heterogeneities concerning enhancing women's bargaining power in both the household and society.

Keywords

Long-term Care insurance policy; Women employment; Informal care; China; Competing hypotheses; Bargaining power of women

1 Introduction

The aging population has emerged as a significant societal issue with long-term implications for economic development in the 21st century, attributable to declining birth rates and increased life expectancies. According to the results of China's seventh national census, by the end of 2020, the population aged 60 and above reached a staggering 264 million, accounting for 18.7% of the total population. This marked a 5.44 percentage point increase from 2010. As the trend of population aging deepens, the number of disabled elderly individuals in China continues to rise, expanding from 40 million at the end of 2015 to 42.5 million by the end of 2020. Projections estimate that by the end of 2030 and 2050, the disabled elderly population in China will reach 62.9 million and 96 million¹, respectively. This increase substantially augments the demand for elderly care and exacerbates the burden of family care.

Presently, women remain the primary caregivers within the context of informal family care[1]. Nearly half of middle-aged women shoulder responsibilities for elderly family members, while fewer than one-third of middle-aged men assume similar care duties. Consequently, the rise in disabled elderly individuals significantly affects female employment[2]. However, prevailing literature tends to view this phenomenon as a contradiction between the care needs of elderly family members and female employment tendencies[3]. While we cannot outrightly dismiss this viewpoint as flawed, it appears somewhat superficial and lacks depth.

This paper aims, during the theoretical analysis phase, to construct a framework elucidating the economic relationships between long-term care insurance policies, family care, and female employment. As a pivotal societal institution addressing population aging, the primary objective of long-term care insurance policies is to provide care services for disabled individuals. This shifts the care responsibility, traditionally borne by families, into the societal (market) realm. Why does this shift occur? The underlying reason lies in the unequal allocation of care resources within families. In section three, we construct an intra-family care demander-supplier game model, assessing the potential mismatch between care intensity and capacity. We find a substantial possibility of mismatches in care capacity vis-à-vis care intensity within families. This implies a high probability of resource mismatches within each family, which are almost impossible to resolve internally due to the ambiguous delineation of care capacity and intensity, coupled with exorbitant transaction costs. However, the implementation of long-term care insurance policies may resolve these twin issues. By defining the mismatch in care resources within families and establishing a three-dimensional coordinate system, we microscopically analyze the mechanisms underlying the effects of long-term care insurance policies. We contend that these policies might establish an inclusive care market through means such as transfer payments or subsidies, facilitating a clearer delineation of care intensity and capacity within the market and enabling low-cost transactions. Consequently, women burdened with family care responsibilities may find relief. Thus, we argue that long-term care insurance policies resolve the contradiction between internal family care delineation and transaction costs.

Subsequently, empirical testing of long-term care insurance policies' impact on female employment ensues. Previous works on this topic encountered impediments due to identification issues: the policy is piloted at the urban level, and considering labor mobility and policy spillover effects, merely studying urban female employment becomes inadequate. Therefore, we employ provincial-level data and the Triple Difference (DDD) method to establish causal impacts of long-term care insurance policies on enhancing female employment.

The results indicate that the policy pilot of long-term care insurance directly and positively influences female employment. For every 1% expansion in the policy pilot scope, female employment increases by 236,600 to 368,300 individuals. We conducted a series of robustness tests, including conventional parallel trend tests, placebo tests, substitution of key variables, and propensity score matching, all supporting the

¹ Data comes from the Seventh China Census Bulletin (https://www.gov.cn/guoqing/2021-05/13/content_5606149.htm)

robustness of our primary results. Additionally, based on competitive hypotheses establishing the causal relationship between long-term care insurance policies and female employment, the results indicate that these policies promote female employment by increasing care positions and alleviating female care burdens, with the latter exerting greater explanatory power than the former. Simultaneously, we further analyzed the gender preference benefits potentially brought about by long-term care insurance. We discovered that these policies might challenge China's traditional "raising children to support old age" mechanism and preference for sons over daughters. However, this doesn't necessarily imply an increase in women's bargaining power within families; instead, the reduction in family size tends to equalize gender preferences. Furthermore, long-term care insurance policies are more likely to yield societal gender preference benefits, as they tend to enhance women's societal status.

The empirical findings of this paper hold significant theoretical implications for understanding family decision-making and market relations. The problem of internal family resource allocation can be easily explained by combining models of family supply-demand bargaining and result-oriented three-dimensional space. In this model, supply and demand sides are distinctly defined, and analyzing the results of resource mismatches will aid in understanding the primary operational mode of policy implementation. This straightforwardly influences policymakers: alleviating the burden on families by transferring care responsibilities is effective in enhancing women's economic value and promoting gender equality in society. Moreover, compared to prior research, this study makes substantial marginal contributions in assessing the economic impact of accessible family care services (childcare and elderly care) on female employment. Theoretically, this paper introduces the idea of analyzing the effects of long-term care insurance policies from the perspective of internal family care resource mismatches and innovatively presents the effects of long-term care insurance policies through a three-dimensional space model. Methodologically, this study employs provincial panel data and employs a continuous DDD method to analyze the impact of long-term care insurance policies on female employment. Resultantly, this paper verifies, for the first time, the challenge long-term care insurance policies pose to China's traditional "raising children to support old age" mechanism and preference for sons over daughters. Additionally, it highlights the heterogeneity in the increase of women's economic value, potentially leading to improvements in family and societal bargaining powers.

Figure 1 illustrates the research framework and process of this paper. The remaining sections are arranged as follows: Section 2 provides a literature review on long-term care insurance policies, family care, and female employment; Section 3 outlines the theoretical framework of this study; Section 4 reports the data and key variables used in this study; Section 5 introduces our estimation strategies and the rationale behind continuous DDD; Section 6 presents the estimated impact of long-term care insurance policies on female employment and the results of robustness tests. The potential mechanisms and consequences resulting from long-term care insurance policies will also be reported and analyzed in this section. Finally, Section 7 concludes this study.

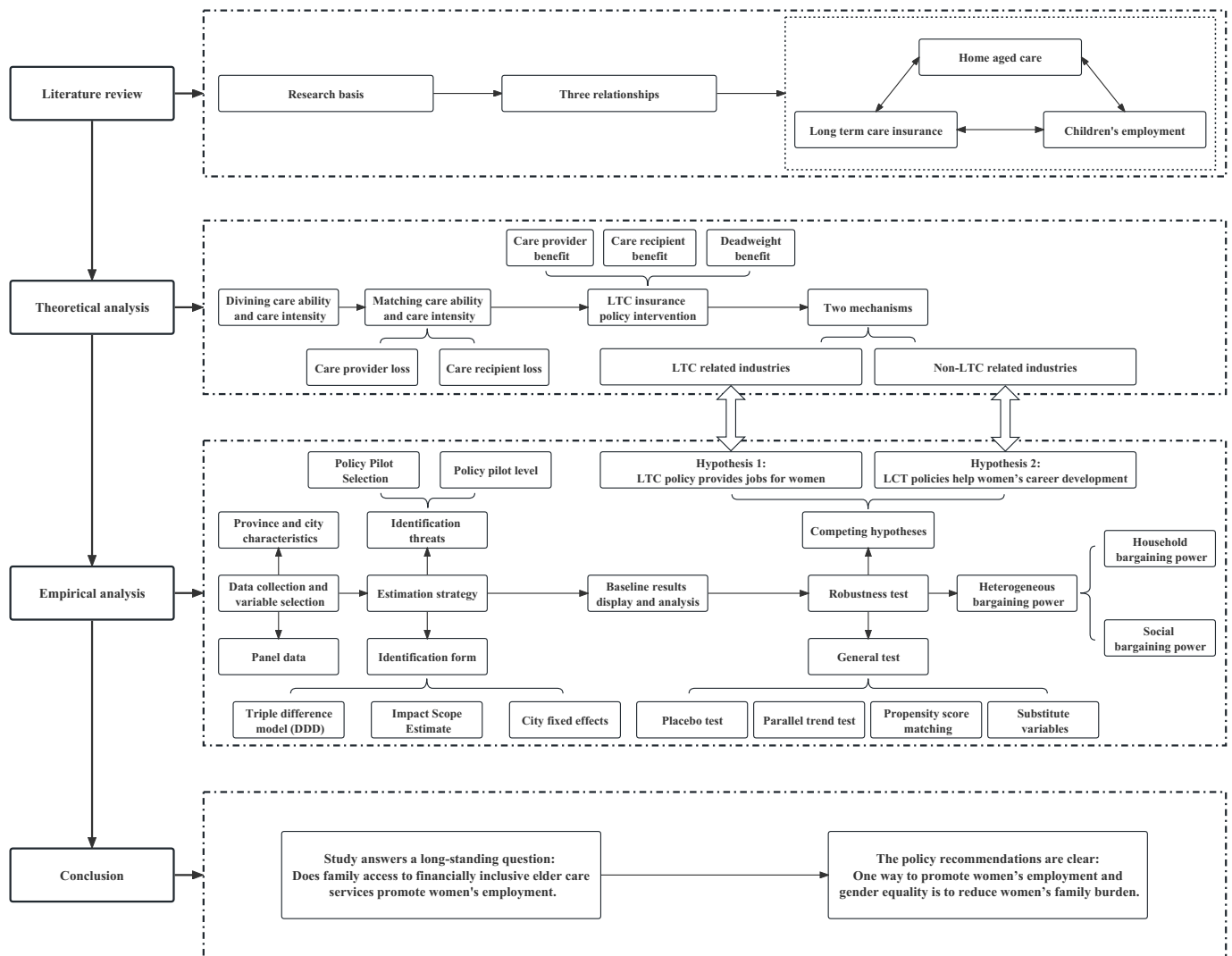


Figure 1 Research framework and process

Note: This framework contains the main research process of this article, and we express the work we will do next in as much detail as possible. We believe that our research is relatively compact, for example, empirical analysis and theoretical analysis are closely combined. In order to avoid the disconnection of ideas during reading, we express the possible connections between different parts in this framework, which combines our All efforts are concentrated so that our research can be closely centered around the central thesis.

2 Literature review

The primary objective of the implementation of long-term care insurance policies is to address the care needs of disabled elderly individuals². Families, as the primary unit for elderly care, have historically borne the majority of elderly care responsibilities in China. Before the introduction of long-term care insurance policies, informal care provided by children, spouses, and other relatives constituted the predominant care mode for the elderly in China.

Soldo (1983)[4] and others analyzed statistical data of care within families and assessed the likelihood of interference in various types of care arrangements concerning the care needs of the elderly and competitive demands for caregivers. They suggested that family care not tethered by blood ties or marriage might be more prone to dissolution. This study was seminal in investigating the relationship between family elderly care and labor employment. Subsequent domestic and international scholars have engaged in years of research and discussions, resulting in diverse conclusions regarding the causal relationship and impact between family elderly care and children's labor market participation. The prevalent viewpoints can be broadly categorized into four types: firstly, family care significantly reduces children's labor force participation[5][6][7][8], a viewpoint supported by a majority of scholars; secondly, family elderly care markedly reduces women's working hours[9][10][11]; thirdly, children providing care to the elderly tend to have relatively lower incomes, implying "wage penalties"[12][13]; fourthly, family elderly care increases the probability of early retirement for children[14][15].

The prevailing research suggests that informal family care may have adverse effects on children's performance in the labor market. Consequently, there is an urgent need to establish a more extensive and equitable social long-term care insurance system to better address the challenges posed by population aging on the burden of elderly care within families and society. In 2016, the Chinese Ministry of Human Resources and Social Security issued guidelines for piloting a long-term care insurance system, marking the first instance of planning 15 cities in China as pilot cities for this insurance scheme. Prior to this, several countries had explored long-term care insurance. Scholars assessed the implementation effects of long-term care insurance policies in these countries, particularly focusing on their impact on family care and children's employment. Their research perspectives primarily concentrate on two aspects. On one hand, the impact of long-term care insurance on family care manifests as a significant reduction in medical expenses and short-term effects on substituting family care[16]. This effect might exhibit regional disparities; for instance, Spain's long-term care insurance system notably decreased the acceptance of family care, whereas Italy did not observe such an impact. This indicates that the influence of public welfare on family care depends on the type of public coverage for long-term care, implying that receiving proportionate benefits might negatively affect family care, while receiving cash benefits might yield positive outcomes[17]. On the other hand, the anticipated effect of long-term care insurance on children's employment is expected to notably reduce the time women spend on family care, especially those with higher education backgrounds[18]. This reduction might stem from long-term care insurance serving as an alternative choice, alleviating pressure on women in terms of family care. Simultaneously, the implementation of this policy seems to generate positive spillover effects on the labor force participation of family caregivers. However, this impact does not apply uniformly across all age and gender groups, as gender and age differences exist[19]. Unexpectedly, long-term care insurance policies might

² The core of long-term care insurance policies is not solely to protect people who have become disabled. One concept that needs to be understood here is that long-term care insurance policy is a universal and extensive policy. It covers all groups that have become disabled and may become disabled in the future. This group is mainly composed of the elderly. Therefore, long-term care insurance is a continuous guarantee for every individual and family, that is, continuous payment before disability and continuous care after disability. Unlike other short-term insurance, such as China's resident medical insurance, one year's payment only covers one year.

also introduce moral risks within families. Parents benefiting from long-term care insurance are more likely to choose not to live with or near their children and are more inclined to pursue full-time employment. This may trigger changes in family relationships and ethical considerations, particularly concerning the arrangements and responsibilities associated with long-term care[20].

Especially in developing countries, the cultural and economic ties to elderly care within families have traditionally been deeply ingrained[21]. However, transitioning to long-term care insurance policies seems to impact the dynamic structure of family care and labor force participation. These policies can indeed alleviate the burden of family care, encouraging more family members, especially women, to actively participate in the labor force. However, their limitations and potential unintended consequences are foreseeable[22]. For instance, there's a moral risk within families, indicating that long-term care insurance might potentially reduce intimate relationships or cohabitation among multiple generations within families, affecting traditional support systems and family bonds. Comprehensive social policies considering various aspects of family dynamics, societal values, and economic structures are thus required. Therefore, different countries or regions often exhibit varying impacts of long-term care insurance policies. This divergence may stem from the nature of the benefits provided—whether in proportional or cash form—highlighting the necessity for meticulous approaches in policy design[23].

In summary, as a crucial social institution addressing population aging, the primary objective of the long-term care insurance system is to provide care services for disabled individuals, ensuring that family members of care recipients can participate in employment normally. Hence, social security represented by the long-term care insurance system not only serves the fundamental function of enhancing residents' welfare but also plays a crucial role in ensuring the sustainable operation of the labor market.

3 Theoretical analysis

When discussing the relationship between family care and offspring employment, most scholars reference the theoretical analytical frameworks of microeconomics, such as the time allocation model (Killingsworth, 1983)[24] and the personal utility model (Becker, 1991)[25]. Utilizing mathematical language, they preliminarily analyze the causal relationship between family care and offspring employment. Scholars approach this by specifically considering the maximization of personal utility from the perspectives of both offspring and elderly individuals (parents or in-laws). Their conclusions tend to align: there exists a negative correlation between the leisure time of offspring and the expenses incurred in caring for the elderly, in contrast to a positive correlation between the non-labor income and pensions of offspring and the time devoted to caring for the elderly. Following Carmichael's viewpoint (2003)[26], the leisure time of offspring in contrast to the time devoted to caring for the elderly represents a substitution effect, whereas the income (inclusive of non-labor income and pensions) and expenses (related to caring for the elderly) denote an income effect. Therefore, the influence of family care on offspring employment depends on the magnitude of these substitution and income effects.

While the aforementioned analysis effectively addresses the relationship between family care and offspring employment, it may fall short when confronted with exogenous policy impacts. This is because interpreting the policy effects of long-term care insurance systems simply through some form of time allocation or individual utility becomes inadequate. Thus, we propose a novel and simplistic dynamic model to analyze and aid in understanding the role of long-term care insurance in family care and offspring employment³.

We interpret family care as a product resulting from the combination of care intensity and care ability. Care intensity strongly correlates with the level of disability among elderly family members, roughly categorized as low, medium, and high degrees. Care ability, on the other hand, correlates highly with the care skills of female members within the household (based on China's prevalent moral principles and traditional culture, where the role of family care is predominantly assumed by women), also roughly categorized as low, medium, and high levels. We construct a matrix model akin to game theory, representing the potential matches between different care intensities and abilities.

For ease of analysis, we define low care intensity and ability as 1, medium as 2, and high as 3. Considering all possible matching scenarios, we obtain the results depicted in Figure 1A (a). The nine regions correspond to the random matches of three care intensities and three care abilities. Among these, three matching regions represent a state where care intensity and ability levels are the same, achieving an equilibrium state termed as richly efficient matching. However, the other six regions denote a lack of equilibrium, where care intensity and ability levels differ, termed as inefficient matching. To explain this scenario of richness and lack of efficiency, we calculate the difference between care intensity and ability, defining this difference as misallocation of resources, as depicted in Figure 1A (b). When care ability and intensity reach an equilibrium state, the misallocation of resources is zero. When care ability fails to match care intensity, a positive misallocation indicates ineffective care. Conversely, when care ability exceeds care intensity, a negative misallocation indicates that the caregiver's abilities have not been fully utilized, despite the care recipient receiving effective care.

Based on these observations, we identify two issues contributing to the misallocation of resources in family care. Firstly, the unclear definition of property rights regarding care intensity and ability; secondly, the lack of mutual selection between caregivers and care recipients, indicating the absence of a market or high transaction costs within the market (lack of inclusiveness). Adhering to the concept in Figure 1A(b), we

³ This new approach resembles a combination of game theory (J. Nash, 1953)[27], misallocation of resources (Hsieh and Klenow, 2009)[28], and the Coase theorem (Coase, 1960)[29].

rigorously define the property rights of care intensity and ability, resulting in Figure 2(a). Only when care intensity and ability are highly matched does the misallocation of resources reach zero, represented by the red line segment (due to high transaction costs, transactions occur only along the red line segment, with almost no externalities). When care intensity and ability are mismatched, we identify varying degrees of resource misallocation in the market, with the total misallocation in the market represented by the combined volume of the blue and orange tetrahedra. We define these respectively as Care Provider Loss and Care Recipient Loss. It becomes apparent that without an inclusive market, even with clearly defined property rights, the likelihood of consciously achieving an efficiently allocated resource is extremely low.

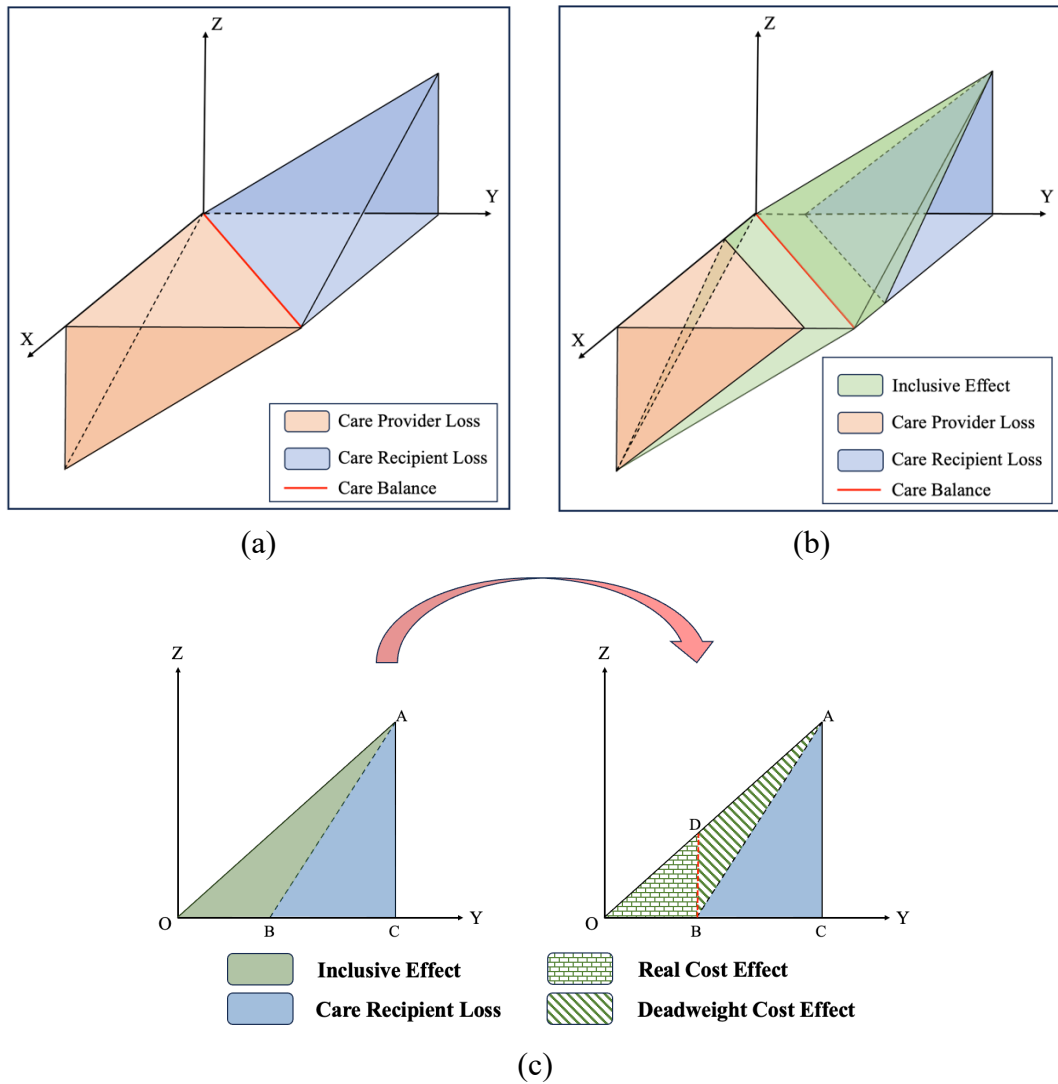


Figure 2 resource misallocation and long-term care insurance policy

Note: (a) clearly defines the property rights of family care intensity and ability on the premise of figure 1A (b), where the X-axis represents the family Care ability, the Y-axis represents the intensity of family care, and the Z-axis represents the degree of resource misallocation. At this time, there is no long-term care insurance policy; (b) is the policy effect of adding long-term care insurance under the premise of (a), where X The axis represents family care capabilities, the Y-axis represents family care intensity, and the Z-axis represents the degree of resource misallocation. We simplify the part in (b) where the Z value is greater than zero and obtain (c), which can more clearly represent some of the inclusive effects in (b).

The effect of long-term care insurance policy is aimed at enhancing the potential for efficient allocation of resources and establishing a long-term care market that is inclusive and characterized by lower transaction costs. As illustrated in Figure 2(b), the volumetric representation of the light green upper and lower cones represents the impact of the long-term care insurance policy. Termed as the inclusive effect⁴ of the market. So, we also get two bridges between long-term care insurance policies and women's employment. One is to encourage women with the ability to care to find a caring job with adequate intensity, that is, to shift to a caring position; the other is to encourage women without the ability to care to engage in other jobs, that is, to shift to a non-care position. In China, whether in families with or without care capabilities, women continue to be the primary caregivers. Therefore, we firmly believe that the long-term care insurance system can significantly release women, who bear the primary responsibility for family care, into the labor market. However, it is imperative to note that the long-term care insurance system still faces challenges in addressing all issues pertaining to care providers and recipients. The extent of reducing these issues depends on the scope, methodology, and intensity of the policy implementation.

4 Data and variables

The Chinese government officially released its initial guidelines on the long-term care insurance pilot in 2016⁵, encompassing 14 cities in 13 provinces⁶, municipalities, or autonomous regions. For our study, we selected Hebei, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Jiangxi, Hubei, Guangdong, Chongqing, and Sichuan as the experimental group, while the remaining provinces served as the control group. The study spanned from 2010 to 2020. All data for this sample were sourced from the China Statistical Yearbook, China Population and Employment Statistics Yearbook, China Labor Statistics Yearbook, and China City Statistical Yearbook.

Unlike previous studies, our aim is to examine the impact of long-term care insurance on female employment at the provincial level. This necessitates the use of relevant data to define the scope of long-term care insurance policy implementation within provinces. Simply defining this scope based on the number of pilot cities or their physical area seems inadequate. As the policy primarily targets the elderly population, we constructed the ratio of the elderly population aged 65 and above in pilot cities to the total elderly population aged 65 and above in the respective provinces as an indicator of the policy's implementation scope⁷.

Our primary outcome variable for this paper is the number of urban female employees from 2010 to 2020. This variable, as the most direct measure of female employment, allows us to observe whether the policy and its associated economic incentives effectively promote female employment. We anticipate variations in this

⁴ We define the green volume in Figure 2(b) as the inclusion effect. This effect is very interesting (for the convenience of analysis, we simplify (b) and get (c)). It contains two aspects: (i) The actual cost effect (the area of the triangle OBD), which is determined by the government's actual cost effect. The degree of resource misallocation caused by the cost of input is reduced; (ii) deadweight cost effect (the area of triangle ABD). The government does not actually invest in this area, but the degree of resource misallocation of the entire society is also reduced.

⁵ Specifically derived from the "Guiding Opinions of the General Office of the Ministry of Human Resources and Social Security on Launching the Pilot of Long-term Care Insurance System" (https://www.gov.cn/xinwen/2016-07/08/content_5089283.htm)

⁶ Specifically, they are Hebei Chengde, Jilin Changchun, Heilongjiang Qiqihar, Shanghai, Jiangsu Nantong, Jiangsu Suzhou, Zhejiang Ningbo, Jiangxi Shangrao, Shandong Qingdao, Hubei Jingmen, Guangdong Guangzhou, Chongqing, Sichuan Chengdu and Xinjiang Shihezi. Among them, Shandong Qingdao was first established in 2012. The long-term care insurance policy has been implemented, and data for Shihezi, Xinjiang are not available, so Shandong and Xinjiang were excluded.

⁷ The population range ranges from 0 to 1. Generally, if the policy is piloted in a municipality directly under the central government, the impact scope of the policy implementation is 1, and in other cases it is less than 1. The specific number depends on the increase of pilot cities in the province.

variable due to the differing sizes of the long-term care insurance policy's pilot scope between 2016 and 2020. Controlling for other potential influencing factors is crucial in this study. We selected variables such as per capita GDP, industrial structure (value of the secondary industry/value of the tertiary industry), and resident population as economic and demographic variables. Additionally, we chose urban workers' average wages as an income variable, human capital (number of students in higher education/inhabitant population) as an educational indicator, urbanization rate (proportion of urban population), consumer price index as indicators of living standards, urban unemployment rate as a measure of unemployment, and government intervention level (government expenditure/GDP) as a social security indicator. Table 1 summarizes the descriptive statistics of the main variables used in our analysis.

Table 1 Descriptive Statistics

Variables (Project)	Definition	Control group (Pilot=0)		Treatment group (pilot=1)	
		Mean	S.D.	Mean	S.D.
Observations		187		132	
Key variables					
Number of women employed	The number of women employed in urban units, expressed in 10,000 people.	259.08	177.55	142.15	98.21
Post (Binary variable of 0 or 1)	Before and after the policy pilot, it is 0 before the pilot and 1 after the pilot.	0.46	0.50	0.45	0.49
Scope (Continuous variable from 0 to 1)	Population scope, urban population over 65 years old accounts for the proportion of provincial population over 65 years old.	0.29	0.32	0.25	0.29
Province characteristics					
GDP per capita (Ln)	The province's per capita GDP is taken as the natural logarithm.	10.87	0.44	10.71	0.48
Industry structure	The ratio of the secondary industry to the tertiary industry in the province.	1.10	0.44	1.28	0.81
Resident population	The province's permanent population is measured in 10,000 people.	3306.01	2346.19	5784.04	2675.84
Average salary of urban employees (Ln)	The average salary of urban units in the province is taken as the natural logarithm.	10.98	0.37	10.98	0.37
Human capital	The proportion of students studying in the province with a bachelor's degree or above accounts for the province's population. The unit is percentage.	1.93	0.67	2.01	0.35
Degree of government intervention	The proportion of government fiscal expenditure to the province's GDP is also said to represent the level of social security.	0.20	0.05	0.33	0.24
Consumer price index	the price of a weighted average market basket of consumer goods and services purchased by households.	102.58	1.09	102.61	1.19
Urbanization Rate	Proportion of urban population to total population in the	0.61	0.11	0.55	0.14

Urban unemployment rate	province. The proportion of urban unemployed people in total employment.	3.36	0.55	3.23	0.71
City characteristics					
GDP per capita (Ln)	The urban GDP per capita is calculated by taking the natural logarithm. Represents the city's economic level.	11.05	0.76	10.87	0.54
Number of hospital beds per 1000 people	The number of hospital beds per 1,000 people represents the city's medical level.	5.37	1.93	5.68	1.72
Savings per capita	Per capita bank savings represent the city's residents' ability to cope with emergencies.	7.91	6.59	6.06	4.48
*GDP per capita (Ln)	The urban GDP per capita was calculated using the natural logarithm. Represents the city's economic level in 2015.	11.08	0.76	10.94	0.64
*Number of hospital beds per 1000 people	The number of hospital beds per 1,000 people represents the city's medical level in 2015.	5.83	1.95	6.23	1.70
*Savings per capita	Per capita bank savings represent the city's residents' ability to cope with emergencies in 2015.	7.41	5.77	6.29	3.52

Note: The data comes from the "China Labor Statistics Yearbook", "China Population and Employment Statistics Yearbook", and "China Urban Statistical Yearbook". The data spans from 2010 to 2020 and is matched according to year-city-province. From 2016 to 2020, the provinces in the control group did not have any pilot cities. Combining the second batch of pilot lists from the Central Committee of China and the pilot policy documents issued by the control group provinces, we also selected the corresponding cities in the control provinces as Virtual pilot cities during the study period.

5 Estimation Strategies

The long-term care insurance policy pilot initiatives in China were exclusively implemented at the urban level. Despite current assessments of China's long-term care insurance policy mostly focusing on panel data at the urban level and cross-sectional survey data, our approach aims to evaluate the policy using provincial-level panel data. This decision is primarily motivated by two factors. First, owing to the reform of China's household registration system, there are minimal restrictions and substantial fluctuations in labor mobility within provinces. Consequently, spillover effects of policy implications on promoting female employment are likely significant⁸. Second, limitations exist in the availability of data concerning the number of urban female employees at the city level. This data limitation is a key reason why most arguments supporting the potential for China's long-term care insurance policy to foster female employment remain theoretical.

Given our choice to conduct empirical research at the provincial level, we need to address issues related to identification accuracy and additional endogeneity arising from the increased research level.

Most articles analyzing city panel data and survey cross-sectional data employ the standard Difference-in-Differences (DID) strategy. They usually establish clear definitions for experimental and control groups. In a standard DID model, the policy group variable is a binary dummy variable, effectively distinguishing between the implementation and non-implementation of a policy. However, when utilizing provincial panel data, defining the experimental and control groups becomes ambiguous, as the policy's extent of change within a province due to urban policy experiments often varies. The difference in our estimation strategy compared to the standard DID approach lies in replacing the city-level policy grouping dummy variable with a continuous variable at the provincial level. This is achieved by defining the policy impact range of pilot cities relative to the pilot province. The long-term care insurance policy targets disabled elderly individuals, aiming to alleviate the pressure of aging in a region. Therefore, we construct the ratio of the population aged 65 and above in pilot cities to the total population aged 65 and above in their respective provinces to measure the policy scope at the provincial level.

Pilot cities are often unique within their provinces⁹. This leads to a potential identification threat as the selection of pilot cities might be non-random, chosen by central and local governments based on predetermined urban-level characteristics. We use the second batch of pilot cities as controls for the first batch of newly added pilot cities and take the policy scope of the second batch of newly added pilot cities as the policy scope for the first batch of non-pilot provinces¹⁰. The rationale is that the second batch of pilot cities, chosen by central and local governments, share more similarities in certain characteristics relative to the first batch of cities. Therefore, the policy impact scope in the first batch of pilot provinces can be compared to the policy impact scope in the second batch of pilot provinces, serving as controls. Specifically, we compiled relevant features of all pilot cities from 2016 to 2020, aiming to control for these cities' characteristics to minimize the potential endogeneity of selection by central and local governments[30].

Based on the above analysis, we employ the Triple Difference (DDD) strategy to examine the impact of

⁸ The argument studied in this article is that long-term care insurance policies will promote female employment rather than promote female employment transfer (the transfer of female labor from policy non-pilot cities to policy pilot cities).

⁹ Among our research subjects, there were only two pilot cities in Jiangsu Province from 2016 to 2020—Nantong City and Suzhou City.

¹⁰ The second batch of pilot cities are Beijing, Tianjin, Jincheng in Shanxi, Hohhot in Inner Mongolia, Panjin in Liaoning, Kunming in Yunnan, Gannan in Gansu, Fuzhou in Fujian, Kaifeng in Henan, Xiangtan in Hunan, Nanning in Guangxi, and Guizhou Qianxinan City, Shanxi Hanzhong City. Appropriately, the provinces to which the second batch of cities belong are not the provinces to which the first batch of pilot cities belong, so we can make direct comparisons. At the same time, although Lhasa City in Tibet and Haikou City in Hainan Province are not among the second batch of pilot cities, they are the first pilot cities in the province like the second batch of pilot cities.

the long-term care insurance policy on female employment. We establish three main variables: two binary dummy variables representing pre- and post-policy implementation time and participation in the policy pilot, and one continuous variable representing the policy implementation's impact range. The coefficient interactions among these three variables measure the effect of the long-term care insurance policy pilot on female employment. The specific specification for the DDD is as follows:

$$\begin{aligned}
Y_{i,t} = & a_0 + a_1 Pilot_i \times Scope_{i,t} \times Post_t + a_2 Pilot_i \times Scope_{i,t} + a_3 \sum_{i=0}^{29} \sum_{\tau=1}^3 City_{i,\tau,t} \times Post_t + \gamma X \\
& + \delta_i + \varphi_t + \sum_{i=0}^{29} \sum_{\tau=1}^3 \mu_{i,\tau,2015} \times \varphi_t + \varepsilon_{i,t}
\end{aligned} \tag{1}$$

The formula outlines the estimation strategy used, with i representing a particular province, and t denoting time (year). y stands for the outcome variable (representing female employment in the baseline results). $Post$ is a dummy variable for the pilot time, taking the value 0 before 2016 and 1 from 2016 onwards. $Scope$ signifies the policy's implementation impact range and is a continuous variable. $Pilot$ is a dummy variable for the pilot provinces, taking the value 1 for pilot provinces and 0 otherwise. a_1 represents the coefficient of the interaction between the dummy variable and the continuous variable, a focal point in this study to capture the heterogeneity in the policy's impact on female employment within the policy's impact range. It also reflects the gradient effect brought about by the long-term care insurance policy pilot. X comprises provincial characteristics that might affect female employment, while δ_i and φ_t are provincial fixed effects and year fixed effects, respectively. $Pilot_i \times Scope_{i,t}$ is an essential component, aiming to control for differences in the policy's impact range between pilot and non-pilot cities.

Several optional identification strategies aim to address potential identification threats. Firstly, we collect data on the changing characteristics of selected cities from 2016 to 2020¹¹, which could be included in X for control. Secondly, the interaction term $City_{i,t} \times Post_t$ is intended to control for the pre- and post-policy implementation changes in pilot cities, with a_3 as the coefficient for this interaction term. Finally, to refine the above options, the year before the pilot start date is considered as the base year. Using the city characteristics from 2015 as the base, interaction fixed effects $\mu_{i,\tau,2015} \times \varphi_t$ are incorporated, controlling for variations in variables other than existing city characteristics that change during the initial period. τ signifies a specific city feature. Throughout all estimations, standard errors are concentrated at the provincial level.

¹¹ Relevant characteristics of these cities include GDP per capita, number of hospital beds per 1,000 people, and savings per capita. These characteristics are also added to Table 1 as important variables in this study.

6 Empirical analysis

6.1 Baseline results

Table 2 reports the estimated impact of the long-term care insurance policy pilot on female employment. The first column presents the baseline estimation results without any handling or control of city-level characteristics in this model. The DDD estimation results indicate a coefficient of 37.97 for the impact of the long-term care insurance policy pilot on female employment, which is statistically significant at the 5% level. This suggests that for each 1% expansion in the pilot scope of the long-term care insurance policy (meaning a 1% increase in the proportion of elderly people in the province covered by the pilot), there is an estimated increase of 37.97 thousand female employees in urban units within the province.

In the second column, we included full-time period characteristics of pilot cities in the pilot provinces and quasi-pilot cities in non-pilot provinces¹². For reference, in the third column, we introduced the interaction term between full-time period city characteristics and 'Post' to control for differences before and after policy implementation. The specific coefficient results show 35.94 and 36.93, respectively, both still statistically significant at the 5% level. The slight decrease in the impact coefficient of the long-term care insurance policy on female employment in the second and third columns implies the potential non-randomness of the policy pilot.

Efforts were made to mitigate the endogeneity of this non-random policy pilot. In the fourth and fifth columns, we added dual fixed effects of city (pilot and quasi-pilot) characteristics and time based on the second and third columns. This aimed to control for certain unobservable (or unobserved) city characteristics that change over time. The results indicate that the impact coefficient of the long-term care insurance policy pilot on female employment decreased to 26.56 and 24.86, both statistically significant at the 1% level. This indicates that for each 1% expansion in the pilot scope of the long-term care insurance policy, approximately 24.86 to 26.56 thousand female employees in urban units within the province are estimated to increase.

Based on these regression results, a simple estimation was conducted to assist in understanding the precise marginal effect of the long-term care insurance policy in promoting female employment¹³. The estimated results suggest that in the absence of controlling for city characteristics, within the policy pilot provinces, for every additional elderly person aged 65 and above covered by the policy after the pilot initiation, approximately 5 female laborers would potentially enter the job market. When initial controls for city characteristics were implemented, although this effect reduced, it maintained a similar impact level. With further control of city characteristics, the long-term care insurance policy covering an additional elderly person aged 65 and above would likely lead to approximately 3.5 female laborers entering the job market.

¹² The pilot cities in the pilot provinces refer to the cities and their respective provinces listed as pilots for long-term care insurance policies in the 2016 "Guiding Opinions of the General Office of the Ministry of Human Resources and Social Security on Carrying out the Pilot of Long-term Care Insurance Systems"; non-pilot provinces Quasi-pilot cities refer to cities that were not included in the pilot program in 2016, but were included in the 2020 "Guidance Opinions of the National Medical Insurance Administration and the Ministry of Finance on Expanding the Pilot Program of the Long-term Care Insurance System" (https://www.gov.cn/zhengce/zhengceku/2020-11/05/content_5557630.htm) and the cities and provinces included in the pilot program and subsequent relevant policy documents. The period of our study is from 2010 to 2020, so the quasi-pilot cities in non-pilot provinces are regarded as the control group in this study.

¹³ The estimated formula is: Marginal impact = DDD interaction term coefficient / (provincial elderly population × 1%), where the DDD interaction term coefficient is the estimated coefficient of Pilot × Scope × Post, and the province's elderly population refers to all long-term care insurance policies The average number of elderly people aged 65 and above in the pilot provinces after the pilot is launched. It should be noted that this impact margin may change due to different provinces in different periods and is only used as a reference value for analysis.

Table 2 The impact of long-term care insurance policies on women's employment

Variables	Number of women employed				
	(1)	(2)	(3)	(4)	(5)
Pilot × Scope × Post	36.83 (14.17) **	37.29 (12.17) ***	34.22 (13.86) **	29.41 (9.48) ***	23.66 (8.28) ***
GDP per capita	40.76 (22.56) *	42.72 (21.65) *	28.87 (33.21)	46.82 (48.03)	30.01 (44.87)
Industry structure	26.41 (9.36) ***	18.10 (8.98) *	28.27 (10.16) ***	-3.62 (27.07)	-4.66 (25.63)
Resident population	0.14 (0.03) ***	0.14 (0.03) ***	0.14 (0.03) ***	0.10 (0.03) ***	0.10 (0.03) ***
Average salary of urban employees	-112.27 (52.56) **	-121.98 (57.16) **	-118.71 (55.66) **	-216.46 (96.59) **	-225.71 (94.79) **
Human capital	-0.21 (24.17)	2.21 (22.70)	-2.67 (23.36)	39.12 (35.70)	41.93 (27.51)
Degree of government intervention	121.29 (56.23) **	89.24 (41.13) **	113.13 (54.08) **	27.20 (118.05)	31.65 (131.70)
Consumer price index	2.77 (3.03)	2.54 (2.82)	2.49 (3.09)	2.32 (5.11)	2.25 (5.02)
Urbanization Rate	15.99 (160.79)	-26.78 (220.45)	33.77 (173.87)	380.03 (217.81) *	450.81 (227.76) *
Urban unemployment rate	-10.78 (4.67) **	-10.68 (4.37) **	-10.47 (4.87) **	-21.32 (4.60) ***	-18.63 (4.84) ***
Constant	-32.21 (576.84)	213.94 (609.53)	-4.33 (586.29)	1195.70 (1053.78)	1247.05 (982.85)
Observations	319	319	319	319	319
R-squared	0.982	0.982	0.983	0.997	0.997
Pilot × Scope	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y
City characteristics	N	Y	N	Y	N
City characteristics × Post	N	N	Y	N	Y
2015 City characteristics FE	N	N	N	Y	Y

Note: The robust standard errors of clustering at the provincial level are reported in parentheses and focus on the provincial level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The explained variable is the number of female employees in urban units, and the explanatory variables are all Pilot × Scope × Post, and the focus is on the changes in their coefficients. Columns 1 to 5 all contain provincial control variables that may affect female employment, among which per capita GDP, average wages, and human capital levels are all the results of taking the natural logarithm. The fixed effects of time and province cannot fully absorb the intercept term of Pilot × Scope × Post, so Pilot × Scope is controlled in columns 1 to 5. City characteristics include per capita GDP, number of hospital beds per 1,000 people, and per capita savings. We believe that City characteristics and City characteristics × Post are control effects at the same level, so we display them separately, specifically in columns 2 and 3. In columns 4 and 5, we add the double fixed effect term of city characteristics and year in 2015, that is, 2015 City characteristics FE, on the basis of columns 2 and 3.

6.2 Robustness analysis

To address concerns about identification assumptions and substantiate the research findings, a series of robustness checks were conducted¹⁴.

6.2.1 Placebo Test

To examine the extent of any impact from omitted variables on the results, a placebo test was performed by randomly assigning the adoption of the long-term care insurance policy to different provinces[31]. Specifically, regression was carried out following the equation in Table 2, and the probability of obtaining the baseline regression estimated coefficients from the sham experiment was used to assess the reliability of the conclusions[32]. To bolster the efficacy of the placebo test, this sham experiment was repeated 500 times, and a distribution plot of the estimated coefficients for the interaction term was generated. This was done to validate whether the female employment-related variables in pilot provinces were significantly influenced by factors outside the long-term care insurance policy, confirming that the impact effects in the baseline analysis were indeed a result of the policy under study. The results of the test are depicted in Figure 3 (a), showing the estimated coefficients of the false double difference clustered around zero, indicating no serious issue of omitted variables in the model specification.

6.2.2 Parallel Trends Test

We replaced the original DDD interaction term with the interaction between policy treatment and year dummy variables[33]. Figure 3 (b) reports the results of the parallel trends test. We considered the pre-policy year 2015 as the baseline control group. Before 2016, there was almost no statistically significant difference in female employment numbers between the treatment and control groups. Strictly speaking, this indicates that the provinces selected for the long-term care insurance policy pilot and those not selected followed similar time trends for at least two years before the adoption of the pilot. Simultaneously, after the policy implementation, the coefficients became statistically significant. Taken together, these point estimates suggest that following the policy pilot, differences in female employment between pilot and non-pilot provinces began to diverge.

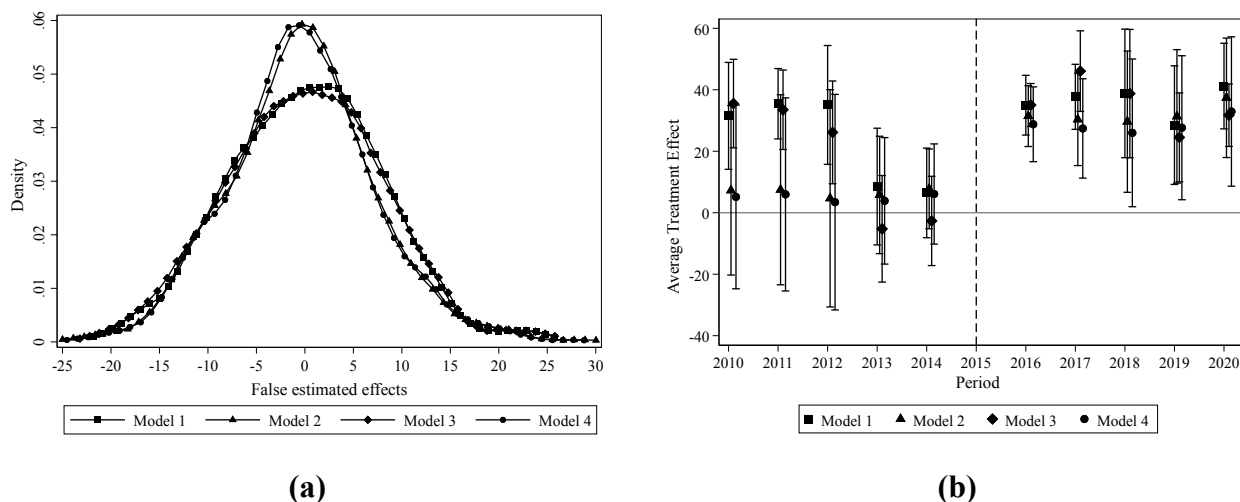


Figure 3 Placebo test and parallel trend test

Note: (a) shows the results of the placebo test, replacing the interaction term of the original DDD with the interaction between the policy treatment and the year dummy variable, and randomizing 500 times and re-estimating the coefficients to obtain the placebo test plot. For visual reasons, we do not show all error estimates,

¹⁴ At this point, our main body of research on the impact of long-term care insurance policy pilots on female employment has ended, and we will continue to improve our research. In subsequent research, we may add other variables, which will serve as key variables for further research. We summarize the descriptive statistics of these variables in the appendix, as shown in Table 1A.

but we can still show the overall distribution characteristics. (b) shows the results of the parallel trend test, using the first year before the introduction of long-term care insurance policies (2015) as the base period, with a 95% confidence interval. That is, when there is 95% significance, there is a significant difference in the employment situation of women between pilot provinces and non-pilot provinces. In the figure, model 1 represents the regression equation in column 5 of Table 2, model 2 represents the regression model in column 3, model 3 represents the regression equation in column 4, and model 4 represents the regression equation in column 2.

6.2.3 Variable Replacement

Replacing core variables is a crucial step in conducting robustness checks. The results are presented in Table 3, columns 1-4. In this section, we replaced the treatment effect of the policy (Scope) and the outcome variable. Firstly, we expanded the policy impact scope, changing the statistical criteria from the proportion of the population aged 65 and above to those aged 60 and above, indicating that the long-term care insurance policy pilot still had a positive impact on female employment. Simultaneously, we substituted the scope with an economic ratio, demonstrating a positive impact of the pilot policy on female employment. Secondly, we replaced the outcome variable with female labor participation rates and registered female job seekers. The results indicated that the long-term care insurance policy pilot increased female labor participation rates (with changes in the population of women of working age) and the number of registered female job seekers. These variables all reflect female employment to varying extents, once again confirming the promotional effect of the long-term care insurance policy on female employment.

6.2.4 Propensity Score Matching

To test the causal relationship between the long-term care insurance policy and female employment under similar conditions, propensity score matching was conducted. Controlling for known provincial characteristics, a Logit model was established to identify whether a province was a pilot province. Subsequently, three different matching methods were employed to match pilot provinces, and the matched sample underwent a basic regression. The results, displayed in Table 3, columns 5-7, demonstrate that all three matching methods robustly confirm the causal relationship between the long-term care insurance policy and female employment, providing significant evidence underlining this association in matched samples where other conditions are similar.

6.2.5 Competing hypotheses

Up to this point, we've examined whether the long-term care insurance policy leads to women leaving home care roles to engage in the job market. To confirm this hypothesis, we gathered various evidence indicating that when certain family burdens are shifted to the market via governmental regulation, women experience a form of "liberation". In our theoretical analysis in Section 3, we explored two potential mechanisms by which women might transition from home to career.

The first explanation is relatively straightforward: the long-term care insurance policy promotes utility for both care providers and recipients through market transactions, resulting in an inevitable increase in care providers. This transition allows women with certain care capabilities to shift from household care to market-based care. However, a second explanation is also plausible. The policy may affect women's choices, reducing concerns about elderly family care before stepping into a professional career. Subsequently, after entering the workforce, these women prioritize their career development over potential future family burdens.

Methodologically, we employed two identification strategies to empirically test these two channels. The first test examines whether the long-term care insurance policy significantly affects the respective outcome variables. By simply replacing the dependent variable, we obtained a preliminary assessment of the mechanisms. The second test involved adding fixed effects of these mechanism variables in the baseline regression, allowing these tested variables to influence the main coefficient on a unified scale. The key was to infer the competitive impact of these two channels based on changes in the main utility coefficient.

In the first test, the implementation of the long-term care insurance policy might encourage or fund the

construction or expansion of care homes to meet the growing demand for long-term care. This expansion would require a substantial workforce, including caregivers, healthcare professionals, administrative staff, potentially creating more job opportunities, many of which could be occupied by women. We replaced the female employment figure with the total number of care home beds within a province, as indicated in Table 4, column 1, confirming this mechanism.

In columns 2 and 3, we reported the relationship between the long-term care insurance policy and female unemployment and reemployment, specifically, the number of registered unemployed women and the female reemployment rate. The results indicate that the policy significantly reduces the number of registered unemployed women and significantly increases the female reemployment rate, providing credible evidence for our second explanation. This is because the policy provides more support and opportunities, making women more willing to re-enter the workforce, reducing the perceived barriers of family care responsibilities, enabling them to return to work or re-enter the workforce after leaving due to care responsibilities. Additionally, for women who previously left the workforce to care for family members, the long-term care insurance policy offers an opportunity to reintegrate into the job market, mitigating the effects of career interruptions by providing support and opportunities for professional development.

In the second test, we added the aforementioned outcome variables in a stratified manner to the baseline regression through fixed effects¹⁵. The regression results in columns 5 to 7 in Table 4 show that without these fixed effects, using the same observation sample, the estimate of the main effect (Pilot \times Scope \times Post) was 23.66 (with a standard error of 8.28)[34]. We observed different degrees of fluctuation in the baseline regression coefficient with the addition of fixed effects. Specifically, controlling for the evaluation of care home beds led to a 7% decrease in the estimated coefficient's magnitude, while controlling for the number of registered unemployed women increased the estimated coefficient's magnitude by 18%. Controlling for the female reemployment rate led to a 7% decrease in the estimated coefficient's magnitude. This result implies that in estimating the relationship between long-term care insurance and female employment, the second mechanism has twice the explanatory power compared to the first mechanism¹⁶[35].

In conclusion, while the long-term care insurance policy partially liberates women's labor productivity, it doesn't necessarily lead to their massive entry into the care industry. Women's considerations in career choices are multifaceted, including personal interests, vocational inclinations, educational backgrounds, career prospects, and compensation. The policy empowers women with more autonomy and provides more opportunities to balance family responsibilities and career development. However, the pathways through which these liberated women choose to enter the job market are the result of multiple personal and societal factors.

¹⁵ These variables include the number of beds in care homes, the number of women registered as unemployed, and the rate of women returning to work. They are all continuous variables, so we sort these continuous variables year by year, that is, in the same year, according to the value of the variable, the first third is defined as 1, and the middle third is defined as 2, and the last third is defined as 3, that is, these variables are evaluated hierarchically between provinces in the same year.

¹⁶ Here we have to make necessary explanations. Since we have no way to collect statistics on female employment data by industry in each province, we can only look for related majors instead. As for the results obtained through fixed effects, they cannot fully represent the employment destination of women, but they can, to a certain extent, qualitatively analyze the intensity of the employment destination of this part of women under the two mechanisms.

Table 3 Robustness Checks: Alternative Variables and Propensity Score Matching

Variables	Alternative Explanatory Variables		Alternative Explained Variable		Propensity Score Matching		
	Expand Scope	Economic Scope	Labor Participation	Job registration	Radius	Kernel	Neighbor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Pilot × Scope × Post	24.36*** (7.73)	23.59*** (5.40)	2.38*** (0.43)	14.31** (6.22)	31.45*** (8.20)	29.79*** (8.67)	25.01*** (4.18)
Constant	1215.34 (1007.65)	162.51 (506.55)	35.79 (28.80)	-10.63 (489.11)	-27.34 (594.73)	-199.81 (606.22)	252.39 (560.68)
Observations	319	319	319	319	151	164	319
R-squared	0.997	0.998	0.997	0.983	0.992	0.993	0.997
Province characteristics	Y	Y	Y	Y	Y	Y	Y
Pilot × Scope	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y	Y
City characteristics × Post	Y	Y	Y	Y	Y	Y	Y
2015 City characteristics FE	Y	Y	Y	Y	Y	Y	Y

Note: The robust standard errors of clustering at the provincial level are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. This table package contains multiple regression results respectively. Specifically, columns 1 to 4 are the results of regression after replacing the key variables. In the first column, we use the proportion of the number of elderly people over 60 years old in cities to the number of elderly people over 60 years old in provinces instead of the original proportion of elderly people over 65 years old. This is an expansion of the scope of the long-term care insurance policy pilot in this article. In column 2, we use the proportion of the city's GDP to the province's GDP to replace the original variable. Considering the close relationship between employment and economic development, this is the population coverage scope of the long-term care insurance policy pilot replaced by the economic impact scope. In column 3, we use the female labor force participation rate as the outcome variable, which represents the proportion of female employees in urban units to the female working-age population. In column 4, we replace the outcome variable with the number of registered female job seekers. Columns 5 to 7 are the regression results of propensity score matching. The main difference is the different matching methods, which are radius matching, kernel matching and neighbor matching respectively. Last but not least, all regression equations refer to the model in column 5 of Table 2.

Table 4 Competing Hypotheses

Variables	Institutional	Unemployment	Return to work	Number of women employed		
	Beds	registration	rate	(4)	(5)	(6)
	(1)	(2)	(3)			
Pilot × Scope × Post	0.38** (0.17)	-3.05* (1.60)	0.11* (0.06)	22.02*** (6.77)	27.86*** (8.92)	21.94** (8.06)
Constant	13.85 (23.33)	22.60 (81.09)	1.14 (1.53)	1308.14 (1044.08)	1286.91 (954.83)	1326.00 (934.14)
Institutional Beds FE	N	N	N	Y	N	N
Unemployment registration FE	N	N	N	N	Y	N
Return to work rate FE	N	N	N	N	N	Y
Observations	319	319	319	319	319	319
R-squared	0.984	0.965	0.862	0.997	0.998	0.997
Province characteristics	Y	Y	Y	Y	Y	Y
Pilot × Scope	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y
City characteristics × Post	Y	Y	Y	Y	Y	Y
2015 City characteristics FE	Y	Y	Y	Y	Y	Y

Note: The robust standard errors of clustering at the provincial level are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. This table contains two parts. In the first part, we followed the method of replacing variables in the previous section. We used some variables as substitute variables for the number of women employed. These variables include the number of beds in care homes, the number of women registered as unemployed, and the rate of women returning to work. The results of this section are shown in columns 1-3. In the second part, we sort these continuous variables year by year, that is, in the same year, according to the value of the variable, the first third is defined as 1, and the middle third is defined as 2. The second third is defined as 3, i.e., these variables are graded across provinces in the same year. Through the evaluation method of medium, high and low, we include it into the fixed effects, and the results are shown in columns 4-6. Of course, all these regression equations refer to the model settings in column 5 of Table 2.

6.3 Heterogeneity in bargaining power of women

6.3.1 Family bargaining power of women

The traditional concepts of "favoring sons over daughters" and "raising children for old age support" are considered to be prevalent in traditional Chinese families. Based on the research results of this study, the emergence of long-term care insurance leads women, previously involved in family care, toward the job market. Does this shift impact the traditional beliefs of "favoring sons over daughters" and "raising children for old age support"? In this section, we will conduct additional regression analyses to assess the impact of long-term care insurance policy on other outcomes, including family size, gender ratios within families, and the gender ratios of children across different age groups. With this additional evidence, we aim to evaluate the impact of the long-term care insurance policy on women's bargaining power within the family.

We'll first assess the correlation of the long-term care insurance policy with the gender ratio within families. If the policy disrupts the traditional mechanisms of "raising children for old age support" and "favoring sons over daughters," parents might not seek to have more children (especially boys) to secure old age care. This implies that family sizes might decrease, and the proportion of females within families might increase. If women have more bargaining power within the family, their influence on family planning and fertility-related decisions might be more significant. In many cases, women with greater say in these matters might opt to have fewer children. A cyclical reduction in family size would lead to a balanced gender ratio within families (compared to the current reduced ratio).

To evaluate this mechanism, we initially used data on the proportion of different family sizes. If the long-term care insurance policy impacts the "raising children for old age support" mechanism, the proportion of large families will decrease, while that of small families will increase. The results in Table 5, columns 1 and 2, report significant positive impacts of the long-term care insurance policy on small families. Column 3 reports changes in large families, indicating a significant reduction due to the policy, signifying a disruption in the "raising children for old age support" mechanism. Preferences within families relying on bearing more children to achieve old age care goals are changing. Next, we'll investigate changes in the gender ratio within families to assess if the reduction in family size challenges the "favoring sons over daughters" notion.

We utilize data on gender ratios within families. However, a lack of extensive time-series data prevents us from conducting regression analyses similar to previous models. As an alternative, we chose the family sample survey data for the second year before the policy initiation (2014) and the second year after the policy initiation (2017) to evaluate the average gender ratios within families in pilot versus non-pilot provinces. The results in Figure 4 show the average male-to-female gender ratio within families across provinces for both 2014 and 2017. After the implementation of the long-term care insurance policy, the gender ratio within families in relevant pilot provinces improved, evidenced by a lighter color for these provinces, aligning with the policy's implementation. It's essential to note that while the policy's correlation displayed in Figure 4 doesn't necessarily imply causation, it does provide suggestive evidence, in tandem with Table 5, supporting the hypothesis that the long-term care insurance policy is altering views on childbirth and elderly care within families.

To further understand the impact of long-term care insurance on intra-family bargaining, we investigated whether the policy affects the gender ratio among children. The underlying premise of this test is that if the traditional mechanisms of favoring males over females ("son preference") and the concept of "raising children for old age" are disrupted within families, the policy might result in equal attitudes toward birthing boys or girls, which would then be reflected in a decline in the gender ratio among children. To conduct this examination, we integrated data from the China Population Sampling Survey and Census. This collated data enabled us to apply the Difference-in-Differences (DDD) method to estimate the effects of long-term care insurance policy on the gender ratio among children. Table 5 presents the DDD estimation results, reporting the gender ratio for children aged 0-5, 0-10, and 0-15 in columns 4 to 6, respectively. For all three age groups,

the effect of long-term care insurance shows a nonsignificant negative correlation with the gender ratio among 0-5-year-olds, a nonsignificant positive correlation with 0-10-year-olds, and a significant positive correlation with 0-15-year-olds. This, evidently, does not provide credible evidence for a decrease in the gender ratio among children.

The results obtained from our examination of the family gender ratio and children's gender ratio are inconsistent with the predictions derived from the model of women's intra-family bargaining. One potential explanation for this outcome is that within families, there may not be a preference difference in allocating limited resources between male and female members. However, this explanation contradicts previous research findings; numerous studies indicate that the phenomenon of "missing women" results from a cultural bias favoring males over females and acknowledge that economic factors can influence the gender ratio at birth [36][37][38][39]. Perhaps a more rigorous explanation could be that the changes in intra-family bargaining power induced by the long-term care insurance policy are insufficient to significantly shift the intra-family bargaining power in favor of women. Even if there is a shift, it might be due to family size rather than an increase in women's intra-family bargaining power. This conclusion aligns somewhat with the findings of Cheng (2022) [40], suggesting that women's engagement in economic activities might not be adequate to enhance their intra-family bargaining power.

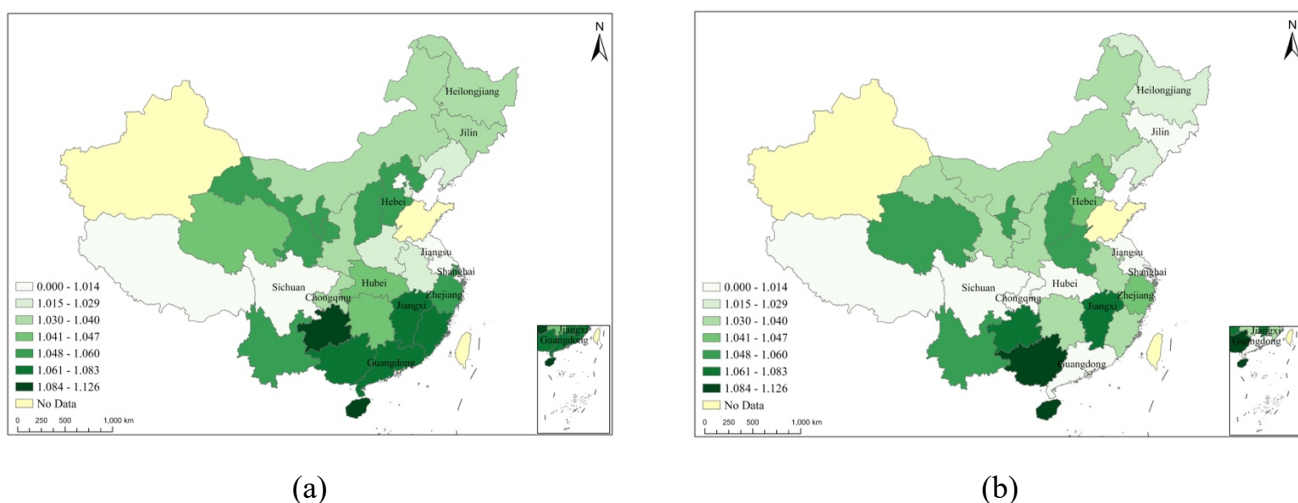


Figure 4 Average gender ratio of households in each province in 2014 and 2017

Note: Geographic data comes from the Ministry of Natural Resources of China and the National Basic Geographic Information Center (<http://bzdt.ch.mnr.gov.cn>). Household sex ratio data comes from China's 2014 and 2017 Chinese Family Sample Survey data. (a) and (b) correspond to 2014 and 2017 respectively. Data on Taiwan, Hong Kong and Macao are missing, and data on Shandong and Xinjiang are actively deleted.

6.3.2 Social bargaining power of women

The introduction of long-term care insurance policies incentivizes women to engage in societal roles beyond their households. Human capital investment theory posits that individuals participate in societal activities based on the potential future returns. Engaging in social organizations and groups can enhance women's economic opportunities and independence, thereby elevating their bargaining power within society. In the relevant data from the Chinese Ministry of Civil Affairs, we found the proportion of women participating in social organizations and groups for each province in 2014 and 2018, using this as a measure of the independence of women in society. Figures 5 (a) and (b) respectively depict the participation of women in social organizations and groups before and after the introduction of long-term care insurance policies. It is observed that from 2014 to 2018, there seems to be an increase in female participation in social organizations in the trial provinces of long-term care insurance policies, as these regions exhibit a deepening color. In contrast, non-trial provinces not only fail to show a significant increase in the proportion of women in social organizations but also exhibit a decrease. However, this method is just one way to measure the bargaining power of women within society; it may not conclusively establish a causal relationship between long-term

care insurance policies and the proportion of women in social organizations, but it does provide a generally accurate direction for further exploration of the relationship between long-term care insurance and women's status.

There exists a close interplay between women's income and their status in society. Broadly, factors such as economic independence, education, career choices, wage disparities, social recognition, and influence contribute to women's societal status, with income playing a pivotal role. Therefore, promoting gender pay equality and supporting women's professional development stand as key measures to enhance the social bargaining power of women. However, the long-term care insurance policy liberates women from varying degrees of family care responsibilities, creating more job opportunities and labor income for them. With increased income, women are likely to demonstrate heightened attention and investment in career development. Hence, to gauge the impact of long-term care insurance policies on women's income, we utilized data from the China Labor Statistical Yearbooks spanning 2010 to 2020. While this data does not record the average wages of women across provinces, it reports the proportion of female worker representatives in workers' congresses and the Consumer Price Index (CPI) for cosmetics in each province. The rationale behind this lies in the fact that an increase in the proportion of female representatives in workers' congresses signifies a greater influence on wage negotiations and labor rights outcomes, thus improving the wage levels and welfare benefits of female workers. Conversely, in the cosmetics consumer market, women remain the primary consumer group. Higher female income would steer women towards higher-end cosmetics, leading to an increase in the CPI for cosmetics[41]. The outcomes in Table 6, columns 7 and 8, demonstrate the significant positive impact of the long-term care insurance policy's trial on the CPI for cosmetics and the proportion of female representatives.

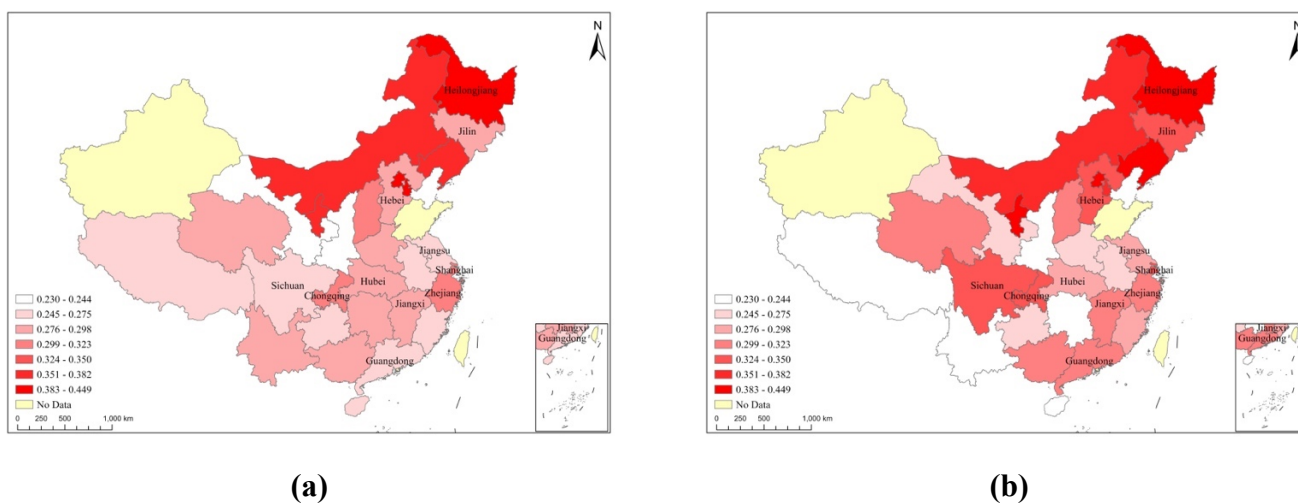


Figure 5 Proportion of women in social organizations in various provinces in 2014 and 2018.

Note: Geographic data comes from the Ministry of Natural Resources of China and the National Basic Geographic Information Center (<http://bzdt.ch.mnr.gov.cn>). The data on the proportion of women in social organizations comes from the relevant information on women and children from the China Civil Affairs Bureau. (a) and (b) correspond to 2014 and 2018 respectively. Data on Taiwan, Hong Kong and Macao are missing, and data on Shandong and Xinjiang are actively deleted.

Table 5 Heterogeneity in bargaining power of women

Variables	Family size proportion			Male-to-female gender ratio			Social Bargaining	
	Two-person Family	Three-person Family	Four-person Family	Age 0-5	Age 0-10	Age 0-15	CPI for Cosmetics	Women representation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pilot × Scope × Post	0.10*** (0.02)	0.09*** (0.02)	-0.09*** (0.03)	-0.015 (0.01)	0.001 (0.01)	0.009** (0.004)	1.14** (0.51)	0.14** (0.06)
Constant	1.60 (3.06)	1.38 (2.81)	-0.38 (2.81)	2.19*** (0.45)	2.04*** (0.43)	1.66*** (0.57)	136.36*** (33.74)	-2.42 (2.45)
Observations	261	261	261	319	319	319	319	319
R-squared	0.858	0.881	0.881	0.995	0.997	0.996	0.737	0.847
Province characteristics	Y	Y	Y	Y	Y	Y	Y	Y
Pilot × Scope	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y	Y	Y
City characteristics × Post	Y	Y	Y	Y	Y	Y	Y	Y
2015 City characteristics FE	Y	Y	Y	Y	Y	Y	Y	Y

Note: The robust standard errors of clustering at the provincial level are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. All regressions are at the provincial level and span 2011 to 2019. The data comes from China Household Sample Survey data. The independent variable is the proportion of different family sizes, among which "two-person families" are the proportion of families with two or less people; "three-person families" are the proportion of families with three or less people; "four-person families" are the proportion of four or less people. Proportion of households of above size. All regressions are at the provincial level, and the time span is from 2010 to 2020. The dependent variable is the social child sex ratio in the corresponding year. 2010 and 2020 are census data, and other years are 1% population sample survey data. All regressions are at the provincial level, and the time span is from 2010 to 2020. Data comes from China Labor Statistics Yearbook.

7 Conclusion

This study has addressed a longstanding question: whether inclusive elderly care services provided by families facilitate women's employment. From a theoretical standpoint, the implementation of long-term care insurance policies creates an inclusive market for elderly care, addressing the mismatch between the supply capacity of family care and the intensity of demand. This paper achieves its goal by analyzing the changes in the number of employed women and female labor force participation rates before and after the introduction of the long-term care insurance policy in 2016 in China. Empirical research results offer a resounding affirmation: long-term care insurance policies precisely alleviate homemakers from specific care duties, enabling women to break free from care responsibilities and subsequently fostering female employment.

Previous studies found that at the micro-level, long-term care insurance policies induce women to "return" to the labor market by reducing the time spent on family care. However, our robustness checks using mechanism analysis methods for the main utility yield a distinct finding: the long-term care insurance policy also absorbs female labor by increasing the number of professional and non-professional care positions within the macro care market. Throughout the competitive hypothesis testing process, we verify that the first mechanism is more explanatory in elucidating the relationship between long-term care insurance policies and female employment compared to the second mechanism.

Moreover, within the deeply rooted context of traditional Chinese notions like "raising sons to provide for old age" and "favoring males over females," promoting female employment through long-term care insurance policies does not necessarily redirect internal household resources in favor of women. This finding contradicts past research suggesting that an increase in female labor force participation accompanies an enhancement in women's bargaining power within the family. However, this paper, through additional analyses, demonstrates the coherence between the improvement in female social bargaining power and the enhancement of female employment, indicating the environmental heterogeneity of women's bargaining power. The policy implications derived from these results are clear: one method to promote female employment and gender equality is by alleviating women's family burdens. In the future, policies related not only to elderly care within families but also childcare measures will diversify at relevant junctures in social development, tailored to specific regional needs.

Appendix

Care Intensity / Care Ability	Low (1)	Medium (2)	High (3)
Low (1)	(1,1)	(2,1)	(3,1)
Medium (2)	(1,2)	(2,2)	(3,2)
High (3)	(1,3)	(2,3)	(3,3)

(a)

Care Intensity / Care Ability	Low (1)	Medium (2)	High (3)
Low (1)	(1,1,0)	(2,1,1)	(3,1,2)
Medium (2)	(1,2,-1)	(2,2,0)	(3,2,1)
High (3)	(1,3,-2)	(2,3,-1)	(3,3,0)

(b)

Figure 1A

Matching care ability and care intensity

Note: (a) It is the possibility of matching care ability and care intensity in a single family. At this time, the definition of property rights of family care capability and family care intensity is relatively vague, and the concept of "resource misallocation degree" has not yet been introduced; (b) It also matches the possibility of care ability and care intensity in a single family. At this time, the property rights definition of family care ability and care intensity are still vague. However, by roughly calculating the difference between family care intensity and care ability, we introduce the concept of "resource misallocation" is introduced to express the gap between care intensity and care ability.

Table 1A

Descriptive statistics of other variables

Variables	Control group (Pilot=0)			Treatment group (pilot=1)		
	Obs.	Mean	S.D.	Obs.	Mean	S.D.
Expand Scope	187	0.251	0.297	132	0.286	0.328
Economic Scope	187	0.287	0.299	132	0.320	0.328
Labor Participation	187	10.774	5.982	132	10.685	5.065
Job registration	187	53.457	56.495	132	62.181	69.460
Institutional Beds	187	10.52	1.248	132	11.810	0.644
Unemployment registration	187	12.513	10.193	132	13.735	16.922
Return to work rate	187	0.452	0.063	132	0.448	0.071
Two-person Family	150	0.417	0.076	111	0.412	0.073
Three-person Family	150	0.677	0.093	111	0.678	0.091
Four-person Family	150	0.322	0.093	111	0.322	0.091
Age 0-5	187	1.142	0.058	132	1.142	0.053
Age 0-10	187	1.148	0.060	132	1.151	0.050
Age 0-15	187	1.149	0.061	132	1.151	0.052
CPI for Cosmetics	187	101.102	1.031	132	101.120	0.977
Women representation	187	0.307	0.058	132	0.304	0.057

Note: These variables are used for robustness testing and subsequent analyses. The unit of Job registration is 10,000 people; the unit of Institutional Beds is the natural logarithm; the unit of Unemployment registration is 10,000 people. In addition, since there are only two periods of data on the average gender ratio within households and the proportion of women in social organizations, we did not conduct descriptive statistics on these two data.

References

- [1] Goldin C. The quiet revolution that transformed women's employment, education, and family[J]. *American economic review*, 2006, 96(2): 1-21.
- [2] Liu L, Dong X, Zheng X. Parental care and married women's labor supply in urban China[J]. *Feminist Economics*, 2010, 16(3): 169-192.
- [3] Feng J, Zhang X. Retirement and grandchild care in urban China[J]. *Feminist Economics*, 2018, 24(2): 240-264.
- [4] Soldo B J, Myllyluoma J. Caregivers who live with dependent elderly[J]. *The Gerontologist*, 1983, 23(6): 605-611.
- [5] Leigh A. Informal care and labor market participation[J]. *Labour Economics*, 2010, 17(1): 140-149.
- [6] Wang Y, Zhang C. Gender inequalities in labor market outcomes of informal caregivers near retirement age in urban China[J]. *Feminist Economics*, 2018, 24(2): 147-170.
- [7] He D, McHenry P. Does formal employment reduce informal caregiving? [J]. *Health economics*, 2016, 25(7): 829-843.
- [8] Nguyen H T, Connelly L B. The effect of unpaid caregiving intensity on labour force participation: Results from a multinomial endogenous treatment model[J]. *Social Science & Medicine*, 2014, 100: 115-122.
- [9] Van Houtven C H, Coe N B, Skira M M. The effect of informal care on work and wages[J]. *Journal of health economics*, 2013, 32(1): 240-252.
- [10] Chen L, Zhao N, Fan H, et al. Informal care and labor market outcomes: Evidence from Chinese married women[J]. *Research on Aging*, 2017, 39(2): 345-371.
- [11] Chen L, Fan H, Chu L. The hidden cost of informal care: An empirical study on female caregivers' subjective well-being[J]. *Social Science & Medicine*, 2019, 224: 85-93.
- [12] Van Houtven C H, Norton E C. Informal care and health care use of older adults[J]. *Journal of health economics*, 2004, 23(6): 1159-1180.
- [13] Liang H, Wang B, Wu Y, et al. The association between financial support of adult children to their parents and informal care provision in China and its differences in household registration, residence arrangement and community-based care services: 2008~ 2018[J]. *International Journal for Equity in Health*, 2023, 22(1): 46.
- [14] Broese van Groenou M I, De Boer A. Providing informal care in a changing society[J]. *European journal of ageing*, 2016, 13: 271-279.
- [15] Bauer J M, Sousa-Poza A. Impacts of informal caregiving on caregiver employment, health, and family[J]. *Journal of population Ageing*, 2015, 8: 113-145.
- [16] Kim H B, Lim W. Long-term care insurance, informal care, and medical expenditures[J]. *Journal of public economics*, 2015, 125: 128-142.
- [17] Courbage C, Montoliu-Montes G, Wagner J. The effect of long-term care public benefits and insurance on informal care from outside the household: Empirical evidence from Italy and Spain[J]. *The European journal of health economics*, 2020, 21: 1131-1147.
- [18] Kan M, Kajitani S. The Impact of Public Long-term Care Insurance on Time Spent on Informal Care among At-home Caregivers-Findings from Japanese Micro Data[J]. *Economic Review*, 2014, 65(4): 345-361.
- [19] Fu R, Noguchi H, Kawamura A, et al. Spillover effect of Japanese long-term care insurance as an employment promotion policy for family caregivers[J]. *Journal of health economics*, 2017, 56: 103-112.
- [20] Coe N B, Goda G S, Van Houtven C H. Family spillovers of long-term care insurance[R]. *National Bureau of Economic Research*, 2015.)
- [21] Chen H, Ning J. The impacts of long-term care insurance on health care utilization and expenditure: evidence from China[J]. *Health Policy and Planning*, 2022, 37(6): 717-727.

- [22] Carmichael F, Charles S, Hulme C. Who will care? Employment participation and willingness to supply informal care[J]. *Journal of health economics*, 2010, 29(1): 182-190.
- [23] Arno P S, Levine C, Memmott M M. The Economic Value Of Informal Caregiving: President Clinton's proposal to provide relief to family caregivers opens a long-overdue discussion of this "invisible" health care sector[J]. *Health Affairs*, 1999, 18(2): 182-188.
- [24] Killingsworth M R. Labor supply[M]. Cambridge: Cambridge university press, 1983.
- [25] Becker G S. A treatise on the family: Enlarged edition[M]. Harvard university press, 1991.
- [26] Carmichael F, Charles S. The opportunity costs of informal care: does gender matter? [J]. *Journal of health economics*, 2003, 22(5): 781-803.
- [27] Nash J. Two-person cooperative games[J]. *Econometrica: Journal of the Econometric Society*, 1953: 128-140.
- [28] Hsieh C T, Klenow P J. Misallocation and manufacturing TFP in China and India[J]. *The Quarterly journal of economics*, 2009, 124(4): 1403-1448.
- [29] Coase R H. The problem of social cost[J]. *The journal of Law and Economics*, 1960, 3: 1-44.
- [30] Liu H, Ma J, Zhao L. Public long-term care insurance and consumption of elderly households: Evidence from China[J]. *Journal of Health Economics*, 2023, 90: 102759.
- [31] Chetty R, Looney A, Kroft K. Saliency and Taxation: Theory and Evidence[J]. *American Economic Review*, 2009, 99.
- [32] Ferrara E L, Chong A, Duryea S. Soap operas and fertility: Evidence from Brazil[J]. *American Economic Journal: Applied Economics*, 2012, 4(4): 1-31.
- [33] Pierce J R, Schott P K. The surprisingly swift decline of US manufacturing employment[J]. *American Economic Review*, 2016, 106(7): 1632-1662.
- [34] Nunn N, Wantchekon L. The slave trade and the origins of mistrust in Africa[J]. *American economic review*, 2011, 101(7): 3221-3252.
- [35] Korovkin V, Makarin A. Conflict and intergroup trade: Evidence from the 2014 Russia-Ukraine crisis[J]. *American Economic Review*, 2023, 113(1): 34-70
- [36] Edlund L. Son preference, sex ratios, and marriage patterns[J]. *Journal of political Economy*, 1999, 107(6): 1275-1304.
- [37] Foster A, Rosenzweig M. Missing women, the marriage market and economic growth[J]. Unpublished manuscript available at <http://adfdell.pstc.brown.edu/papers/sex.pdf>, 2001.
- [38] Duflo E. Grandmothers and granddaughters: old-age pensions and intrahousehold allocation in South Africa[J]. *The World Bank Economic Review*, 2003, 17(1): 1-25.
- [39] Qian N. Missing women and the price of tea in China: The effect of sex-specific earnings on sex imbalance[J]. *The Quarterly journal of economics*, 2008, 123(3): 1251-1285.
- [40] Cheng N, Fan E, Wu T M. Sweet unbinding: Sugarcane cultivation and the demise of foot-binding[J]. *Journal of Development Economics*, 2022, 157: 102876.
- [41] Chao A, Schor J B. Empirical tests of status consumption: Evidence from women's cosmetics[J]. *Journal of Economic psychology*, 1998, 19(1): 107-131.