Explaining low employment rates among older urban Chinese

Wenchao Jin*

September 2016

Abstract

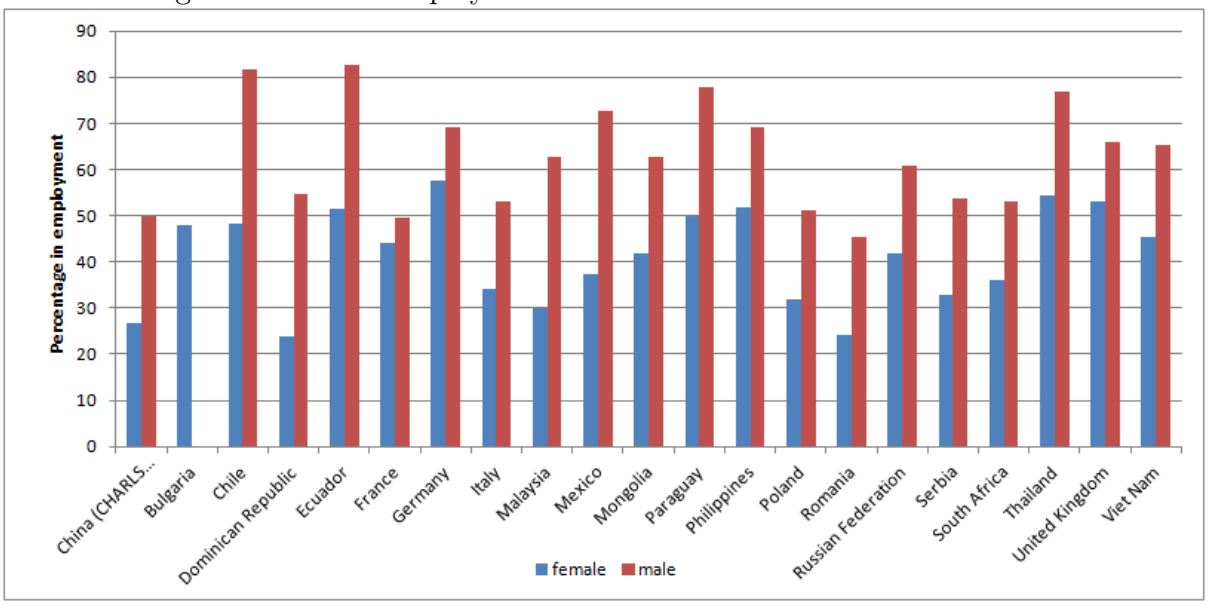
In China, the employment rate among middle-aged and older urban residents is exceptionally low. For example, 27% of 55-64-year-old urban women were in work in 2013, compared to more than 50% in UK, Thailand and Philippines. This paper investigates potential explanations of this low level of employment in urban China. I document the stylized fact that a majority of individuals stop working as soon as they qualify for a public pension, which most often happens at age 50 for women. I also highlight the presence of significant amounts of financial and time transfers between generations. I provide descriptive evidence that transfers from children are responsive to parental incomes, and that mother's labour supply is affected by the expectation of transfers from her children. I then built and calibrate a life-cycle model of labour supply and saving. I find that both the pension system and transfers from children have large effects on female labour supply. Increasing the female pension age from the status-quo to 60 would raise the employment rate of 50-59 year old women by 29 percentage points.

In 2013, the employment rate among 55-64-year-old urban women in China stands at 27%, well below the rates seen in most other countries at all levels of development. Figure 1 shows that the urban female 55-64 employment rate is around $50-55\%$ in the UK, Thailand (which has similar GDP per capita to China) and Philippines (which has lower GDP per capita). China's urban male employment rate is also low by international standards. Note this definition of employment used for China is quite broad. It is based on individuals' report of whether they spent at least an hour last week in any paid

*University College London and Institute for Fiscal Studies. wenchao_j@ifs.org.uk This paper has benefited hugely from disucssions with Richard Blundell, Suphanit Piyapromdee, Monica Costa Dias, and other researchers at the Insitutte for Fiscal Studies.

work, self-employment or unpaid family business, or at least ten days in the past year in agricultural work.[1]

Figure 1: Female employment rate in urban areas across countries



Note: The data points for China are based on people with urban hukou in CHARLS 2013. The CHARLS definition of employment is quite broad, including working at least 10 days in the past year in agriculutral and working at least one hour in the past week in paid work, self-employment or unpaid family business. Alternative definitions would give an even lower employment rate. The statistics for all other countries are from ILOSTAT (the International Labour Organization's website). The statistic is the employment-to-population ratio by sex, age and rural/urban areas. Not all countries have this series. The numbers used here are the 2013 values, or the 2014 or 2015 value if the earlier values are missing.

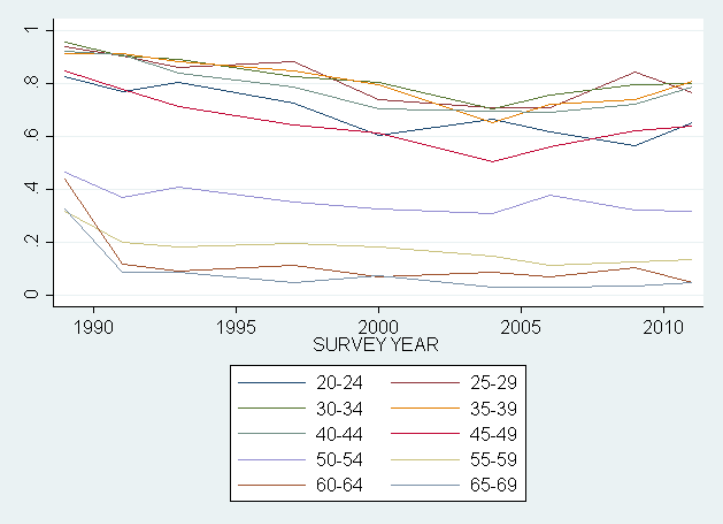
The employment rate of middle-aged and older urban women has been fluctuating around a low level for many years. Figure 2 shows the urban female employment rate by age group, using the China Health and Nutrition Survey.[2] The employment rate declined throughout the 90s and early 2000s among middle-aged women, but the trend is less clear after the early 2000s. The decline in the late 90s is due to restructuring of the state sector, during which older workers were laid off and those near retirement age were encouraged to take early retirements with formal or informal pension payments (Cai et al 2008, Maurer-Fazio et al 2011).

The low employment rate is worrying given the rapid ageing of China's population

[1]It's possible that individuals under-report informal work activities, but there is no strong reason to suspect this is quantitatively important in a household survey. In CHARLS 2013, less than half of all urban workers above 50 classify themselves "employees" in formal organizations (government, public institutions and firms); the others report doing farm work, being self-employed, and working for an individual business.

[2]Unlike CHARLS, the CHNS is not nationally representative and no weights have been constructed to make it representative. Nonetheless the trend is illustrative.

Figure 2: Female employment rate by age



Note: women with urban hukou in CHNS1989-2011. The 5-year age bands are 45-49 (labelled 45), 50-54 (labelled 50) and so on. The level of employment rates measured in CHNS tends to be lower than that in CHARLS. The CHNS questionnaire asks "are you presently working". Whether respondents' interpretion of this includes self-employment or family business is doubtful.

and the unfunded nature of the public pension system. According to United Nations' projections, the total dependency ratio (ratio of population below 15 and 65+ per 100 population 15-64) is estimated to rise from 36.6 in 2015 to 69.7 in 2050, and to peak at 90 in 2085.[3] The biggest public pension scheme (covering enterprise employees) is run mostly on a pay-as-you-go basis and has been projected to have a financing gap equivalent to 95% GDP for the period 2001-2075 [Sin, 2005].[4] The government is already considering a large and gradual increase of the formal retirement age from 50 for female workers (55 for female cadres or managers[5]) and 60 for men to 65 for all. This will obviously help reduce expenditures, but to what extent such a policy will increase employment and thereby contributions to the pension system is an important empirical question.

This paper documents evidence on two major causes of the low level of employment rate among urban women above 50 in China. I focus on female rather than male employ-

[3]Source: World Population Prospects: The 2015 Revision, File POP/11-A: Total dependency ratio $(< 15\&65+)/(15-64)$ by major area, region and country, 1950-2100 (ratio of population 0-19 and 65+ per 100 population 15-64), Medium fertility variant, 2015 - 2100

[4]Sin [2005] uses admin data from a few provinces and municipalities. Under the baseline projection, the NPV of sum of the shortfall of revenue relative to expenditure over the period 2001-2075 is estimated to be 95% of the GDP in 2001.

[5]See subsection 1.1 for more details on the current pension system.

ment for now, because the proposed change to retirement age is much greater for women. The paper most related is Giles et al. [2015]. That paper examines labour supply behaviours among older Chinese people of rural versus urban hukou, and uses descriptive evidence to argue which factors might be at play. This paper documents a different set of descriptive evidence and focuses on two broad explanations: the pension system and the intergenerational links. Moreover, this paper uses a structural model to illustrate the effects of potential policy changes and the importance of intergenerational transfers on older women's labour supply.

The first and foremost explanation is the low pension age for urban women. China's pension system is fragmented and will be described in detail in subsection 1.1. The biggest public pension schemes set the formal retirement age at 50 for female workers and 55 for female "cadres" or managers, and 60 for men. However, there are different rules for people with special circumstances like disabilities and compliance is not perfect, so the age at which a woman becomes eligible for a public pension can be as early as 45 or as late as 60. In general, individuals are supposed to complete the retirement process in the month of becoming eligible, not before or after.[6] According to CHARLS 2011, 90% of current female pensioners completed the retirement process by 55.

Pensions are the biggest source of income for older people in urban China. See Table 1 for a summary of different types of incomes. CHARLS also asks respondents "Whom do you think you can most rely on for old-age support?". About 60% say it's their pensions, 30% say it's their children, and less than 10% say it's their own savings. Thus, pensions currently constitute a large stock of wealth for urban households. An increase of the pension-qualifying age from 50/55 to 65 will be a very significant reduction to women's pension wealth. Together with liquidity constraint, this is likely to push women to work for longer.

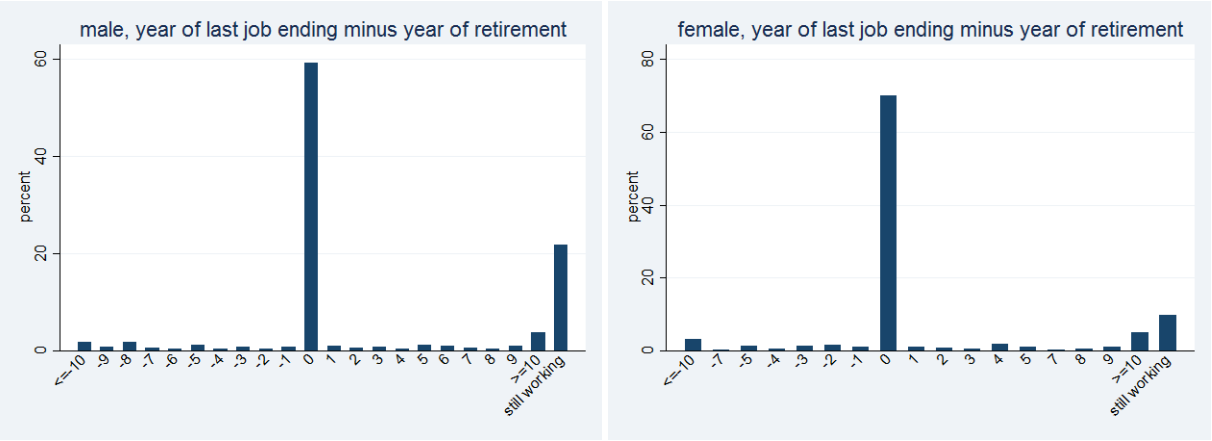
Moreover, the observed timing of exit from the labour force is closely related to the timing of pension incomes. As shown in figure 12, about 70% of current pensioners above 60 had stopped working in the same year as they became elegible for a retirement pension.A small proportion left their last job before retirement and about 10% were still working at the time of the survey.[7]

This coincidence in timing is striking because all the retirement pensions are not means-tested or carry any effective tax rate. Indeed, if one has processed retirement and continues to work, s(he) and the employer will not need to pay social security contribu-

[6]Here and throughout the paper, "completing the retirement process" and "processed retirement" refer to the act of claiming an employment-based public pension for the first time and shall not be confused with individuals' labour force participation status. More institutional background around retirement can be found in subsection 1.1.

[7]The sample includes all retirees aged 60 or above, without missing values in the necessary variables.

Figure 3: Distribution of the gap between the year of stopping work and the year of completing the retirement process



Note: the sample are indiviudals with urban hukou who have completed the retirement process as last reported in CHARLS 2011 and 2013 and were at least 60 in 2011. It excludes individuals who have missing values in either the year of retirement or mssing values in the year when their last job ended if they are currently not working.

tions any more. In other words, the effective tax rate is actually lower after completing the retirement process.

In the standard life-cycle framework, if individuals are not liquidity constrained and if the net present value of the pension income is known, then how it's distributed over time should not matter. The bunching observed in figure 12 might reflect discontinuous changes in preferences or wages at the time of the first pension receipt. Another plausible explanation is the default bias or high transition cost: at the time of the retirement process, the default is for the individual to leave the employer. Negotiating a new contract or searching for a new job might be too costly for some pensioners. It is also possible that the formal retirement age has an anchoring effect on individuals deciding when to stop working. In section 2, my model will incorporate a transition cost (for moving back to work), uncertainties in pension income and liquidity constraints. These features alone are able to create a significant amount of bunching in the timing of exit from employment, though not as high as 70%.[8]

The second explanation of low employment rate among older females is their adult children. First, (expected) financial transfers from children when one is old and frail reduce the need to accumulate a large stock of assets through working. As we will see in section 1.2, about 60% women in their 50s live with their children, conditional on having non-coresdient children, about 70% receive financial support from their non-coresident

[8]Incorporating discontinuities in preferences and wages at the point of the retirement process will help match the observed amount of bunching. This is left for future work.

children in the last year.[9] There is some evidence that the financial transfers from children respond to parental incomes. Thus, transfers from children have a wealth effect as well as an insurance effect, both of which have implications for parents decisions of labour supply and saving.

Moreover, demands from adult children for domestic services such as grandchild care meant less time is available for paid work in the market. In urban China, the majority of women have grandchildren before 60 and conditional on having grandchildren, the majority spend time look after their grandchildren for an average of more than 30 hours a week.

Moreover, I find that urban female employment is significantly negatively correlated with having grandchildren (conditional on her own age, education and so on), and this correlation comes from those women with more educated children. This is consistent with the hypothesis that parents cooperate with their adult children when choosing between market and domestic labour supply and leisure. On average, young people today have higher wages than their parents' generation.[10] This means the parents' might have a comparative advantage in providing home production for their children and this inter-generational exchange or cooperation could be an important cause of the low employment rate among women in their 50s.

All these inter-related facts about Chinese households call for a rich structural model. Ideally, such a model should endogenize labour supply, saving, and intergenerational transfers in time and money in a dynamic way, and it should incorporates uncertainties in wages, pensions, transfers, health and mortality. This paper makes a first step towards such a model. In section 2, I build and calibrate a structural model of labour supply and household saving for women from age 45 to 75. The model includes uncertainties in male income, female pension and female wage, and approximates transfers from children as a simple function of parents' incomes.

The calibrated model can generate a rapid and realistic fall in female employment rate over age. It also generates some bunching in the timing of exit from labor force around the pension receipt, without assuming discontinuities in the disutlity of work or in wages. Counterfactual simulations show that the female employment rate depends very much on the pension system. A 10-year increase in the formal retirement age from 50 to 60 would raise the average age of exit from the labour market by 4.9 years. Unfortunately, the current model does not generate realistic predictions of household saving. I will discuss the reasons and what model extensions shall help improve the fit. These are left for future work.

[9] We only observe transfers between parents and non-coresident children in CHARLS.

[10] This is shown in table 13 in the appendix.

1 Background and Descriptives

This section describes the economic environment faced by urban Chinese who are middle-aged and older and some stylized facts about their economic behaviour.

To be specific, the population of interest in this paper are individuals above 45 with urban Hukou. In China, Hukou is a system of household registration that determines a person's right to live in a place. There are two broad categories of Hukou: rural (agricultural) and urban (non-agricultural). One's Hukou status determines one's access to many public services and benefits in the local area, including public pensions, public education, and health care. Given the large differences in the economic environments faced by urban and rural hukou-holders, this paper will focus on the urban ones and will not look at rural migrants.

1.1 The pension system

There are multiple public pension schemes covering different populations in China. In general , government employees (civil servants and military personnel) and employees of public institutions (such as schools and hospitals) enjoy generous fiscally-funded Defined Benefit pensions. For the rest of urban workers (regardless of the employer type), the public pension system has undergone major reforms since the 1980s. The most recent major reform was initiated by the 1997 State Council Document No.26 "Decision of the State Council on Establishment of Unified Basic Old Age Insurance System for Enterprise Staff and Workers".[11] Document No.26 sets out the two-tier pension structure for enterprise workers that has broadly remained in place today. Among urban people who report receiving any sort of pension in CHARLS 2013, 58% receive this public pension (referred to as Urban Workers' Basic Old Age Insurance hereafter). As with previous pension reforms, the State Council Document outlined the main features of the new pension, while the policy parameters and the timing of implementation are left to the discretion of local governments.

The formal retirement age remained and still is 60 for men, and 50 for female workers generally and 55 for female "cadres".[12] There are exceptions to the formal retirement age, based on long-term illness and disabilities, whether the occupation is physically harmful or demanding, and in some places and sectors long service (30 years of work history). The detailed rules, such as which manual occupations and which illness qualify for earlier retirement, are subject to variable interpretations across cities. In the 90s, ealry

[11] Appendix 5 gives a brief description of the pension system prior to that.

[12] "cadre" is an administrative ranking of employees in the public sector. In the private sector, it corresponds to managerial staff.

retirement was commonly granted to employees in bankrupt state-owned-enterprises who were close to their retirement age.[West, 1999]

Document No.26 stipulates that one needs to contribute for at least 15 years before claiming the pension.[13] Those with insufficient contributions upon reaching their retirement age could continue to make contributions past the retirement age or make an one-off payment, but the rules vary geographically and over time and some people might have to take back their past contributions in a lump sum.

Upon reaching the formal retirement age and with at least 15 years of contribution, one will be notified by their employer to initiate the process of retirement claim at the local bureau of social security. There is no option of early retirement with acturial adjustment. The individuals are not supposed to delay the claim; and delaying would not be sensible since they would forgo pensions in the mean time and it would make little difference to their final monthly entitlement given the formula.

In the Urban Workers' Basic Old Age Insurance, Tier 1 is a basic pension funded out of a social pool on a PAYG basis. Contributions are a substantial proportion of employees's gross wages subject to a maximum base and a minimum base.[14] The benefit level was initially set to 20% of the local wage in the last year, but from mid 2000s onwards it also depends on the number of years of past contributions and the individual's relative-wage index (past wages relative to the local average).[15] Tier 2 is an individual account, designed to be fully-funded but is largely notional in practice. The contribution rate also varied across cities and over time, and was unified to 8% by the 2005 State Council Document No.38. The monthly benefit equals the accumulated balance in the individual account divided by a coefficient, which was initially set to 120.[16] For people who worked before the establishment of individual accounts and retired after the reform, there is a transitional supplement which recognizes their implicit pre-reform contributions.[17]

The system does not have fixed rules for benefit indexation after retirement. Every year, the local government would announce how the entitlements of existing pensioners would increase, which might depend on the individual's age, last year's pension, and number of years worked. In general, the entitlement growth for existing pensioners is similar to local average earnings growth.

[13]Continous employment before the reform counts towards the years of contributions.

[14]The contribution rate varies across municipalities and averaged 19% in 2001.[Sin, 2005]

[15]In Liaoning province and a few cities, the basic pension started to depend on the years of past contributions in 2001. The new formula was stipulated in the 2005 State Council Document No.38, which took effect from the start of 2006.

[16]Since the 2005 State Council Document No.38, the coefficient could depend on the claimant's age and the local life expectancy.

[17]The transitional component depends on current average local wage, the individual's relative-wage index and the length of employment before the reform.

The Urban Workers' Basic Old Age Insurance was supposed to cover all urban workers, including workers at privately-owned firms and self-employed individuals. However, its coverage rate among urban employees remained below 50% till the mid-2000s.[18] Moreover, participation rates varied hugely across localities and types of enterprises, with state-owned enterprises more likely to participate than collective-owned ones than other types. This means, the function form of one's pension entitlement (as a function of past earnings and other individual characteristics) varied across individuals even in the same city and the same year.

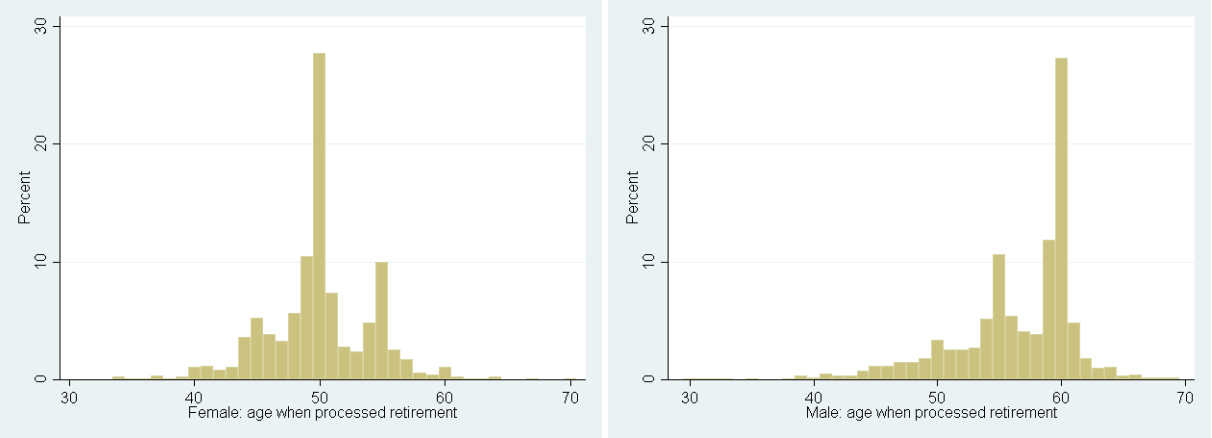
Meanwhile, public-sector employees are covered by more generous Defined Benefit pensions. Among people who report receiving any sort of pension in CHARLS 2013, 8% receive the Government Employees Pension and 18% receive the pension for employees of public instituions (such as universities and hospitals). These public-sector pensions have similar rules about retirement age. Importantly, the age at which one can apply for retirement from the public sector is also not a choice. The pension entitlement of the two public-sector schemes depends on similar factors as the Urban Workers' Basic Old Age Insurance, including the local average wage and the individual's past wages. The public-sector pension schemes require no explicit contribution from earnings before retirement, and tend to have much higher replacement ratios than the Enterprise Employee Basic Pension. At the end of 2014, the national government has passed reform guidelines such that employees in public institutions will be transitioned onto the Urban Workers' Basic Old Age Insurance. This reform is being implemented gradually across provinces, so will not cover the retirees already observed in the data.

The CHARLS survey asked whether the respondent has completed the retirement process from an enterprise or public-sector employer and when. Figure 4 below plots the distribution of the age at which men and women completed the retirement process. The women's distribution has clear spikes at 50 and 55, but large proportions of women retired at other ages.

In addition, a non-employment based public pension called the Urban Residents' Pension has been gradually rolled out since 2011. In some places it has been merged with the New Rural Pension Scheme (piloted and rolled out since 2009) to become the Urban and Rural Residents' Pension. Contributions to these non-employment-based pensions are voluntary and are linked to the future entitlement. Pensions are payable from age 60 onwards. 9% of urban pensioners in CHARLS 2013 receive these pensions. The average

[18] According to table 4-2 and table 22-44 in China Statistical Yearbook 2010, the number of participants in the Urban Workers' Basic Old Age Insurance System as a share of the urban working population rises was 50% in 2006. It appears that the nominator does not include workers in government and public institutions, who had separate pension schemes.

Figure 4: Histogram of age when processed retirement by gender



Note: the sample are individuals who have urban hukou and have completed the process of retirement in CHARLS 2011.

amount of these pensions reported in CHARLS is less than half the average value of the employment-based public pensions. As we will estimate pension dynamics from CHNS 1989-2011, these non-employment-based pensions are unlikedly to be included.

Finally, 8.6% of pensioners in CHARLS 2013 receive a subsidy for "very old" people, with average value below one tenth of that of the Enterprise Employee Basic Pension. Every other type of penson including commericial pension and supplementary pension from one's past employer covers one percent or fewer pensioners in CHARLS.

For structural modelling of labour supply, one important issue is the link between past work history and pension entitlment. In China, working after completing the retirement process has no effect on one's pension entitlement from both the Urban Workers' Basic Old Age Insurance and any public-sector Defined-Benefit pensions. And the time at which one can complete the retirement process is not a choice, aside from fraudulant claims. This exogeneity of pension income is helpful, because the primary question addressed by my model is: why don't women work after completing retirement process in their early 50s. This group clearly do not face any pension incentives to work or not.

Before the retirement process, the complete work history matters in theory.[19] In data, however, the replacement ratio at retirement is almost uncorrelated with the number of years of elegible work for the population of current interest. For urban women born in the 1940s who reported their first pension amount and pre-retirement wage in CHARLS 2011, I regress their replacement ratio on a number of characteristics and found the coefficient

[19]For example, in the Urban Workers' Basic Old Age Insurance, tier 1 depends on the number of years of contributions since 2005, tier 2 is directly linked to one's past contributions to the individual account, and the transitional supplement depends on the length of continuous employment till the establishment of the individual account (generally in 1997).

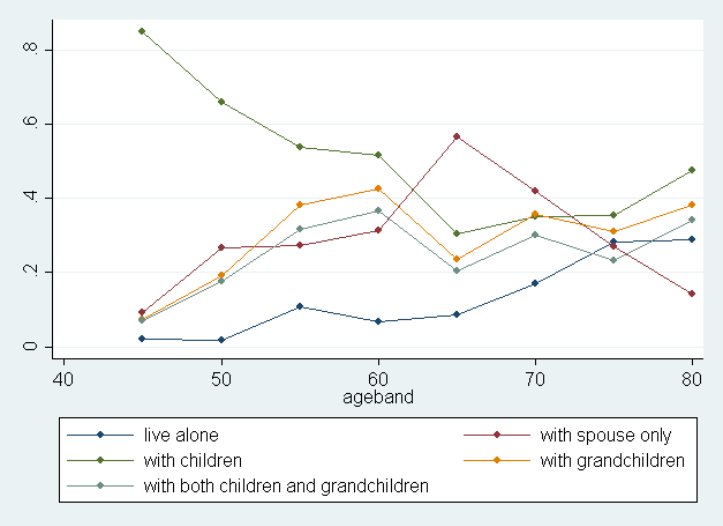
on the years of elegible work to be essentially zero.[20] Given this weak correlation and the fact that post-retirement earnings do not interact with retirement pensions at all, I will assume that pension incomes are independent of past labour supply in the structural model.

1.2 Intergenerational transfers and cooperation

In China, the economic relationship between parents and adult children tends to be much closer than that in Western countries. Supporting and caring for one's elderly parents is not only a long-lasting social norm, but also an obligation of the adult children specified in the Law on the Protection of Rights and Interests of the Aged.

First, it is very common for older people to live with or near their adult children, even after the children get married and have children themselves. As shown in Figure 5, more than 50% urban women in their 50s live with children and about a third between 55 and 65 live with both their children and grandchildren. When the children do not live in the same household, they often live nearby. Table 2 shows that on average, urban women of all age groups (45-79) have more than one child living in the same neighbourhood. And a majority of them see at least one child at least once per week.

Figure 5: Living arrangements of urban women by age



Note: the sample is all women at or above 45 with urban hukou in CHARLS2011. The 5-year age bands are 45-49 (labelled 45), 50-54 (labelled 50) and so on. The categories are not mutually exclusive, nor are they exhaustive.

Physical proximity reduces the cost of time transfers. The parents may help the younger generation with home production (childcare, cooking, cleaning, etc.), while the

[20]The regression results are in table 8 in the Appendix. The coefficient on the log pre-retirement wage is -0.03 and significant at 10% level only.

adult children may care for the parents when they are ill or frail. Unfortunately, CHARLS does not ask parents how much time they spend helping their adult children, except for looking after grandchildren. Table 3 shows that a large share of women in their 50s have grandchildren and conditional on having grandchildren, the majority spend time taking care of the grandchildren. Moreover, the typical amount of time spent on grandchild care is equivalent to a full-time job. This high level of devotion to grandchildren might be based on both altruistic and exchange motives.

Meanwhile, financial transfers between adult children and parents are common. CHARLS asks the amount of monetary and in-kind transfers from and to each non-coresident child and a few other types of givers/recipients in the last year. Table 4 shows that 42% urban women aged 45-75 have received financial transfers from non-coresident children. As the transfers questions are only asked if she has any non-coresident children and about two-thirds do, that 42% represents about 70% of those with non-coresident children. In terms of magnitude, the median amount of finanical transfer from children is 3,500 RMB. This is not negligible, given that the median parental income is about 35,000 RMB. Meanwhile, 23% parents have given financial transfers to their non-coresident children in the last year and the average amount given is even bigger. Overall, parents are a net recepient of transfers from children.[21] There is a great amount of cross-sectional heterogeneity in the amount of transfers between parents and children. Excluding zeros, the 75th percentile of the amount of transfer given to parents is nearly 8 times the 25th percentile. Unsurprisingly, some of that can be explained by the number of children and especially children who are educated or have high income. This can be seen in table 6 in the Appendix, where I regress the incidence and amount of transfers on child characteristics. But most of the variation cannot be explained by demographic observables.

Meanwhile, there is some evidence that parents are more likely to receive financial transfers when their incomes are low. In Table 5, we run Linear Probability Model of transfers from children on parental incomes. Current parental incomes, both unearned and earned, are negatively correlated with the incidence of transfers. The correlation between parental unearned income and transfers from children is particularly significant and does not change much when lagged parental incomes are added to the regression. The coefficients on current parental earnings are smaller, and those on lagged parental earnings are more negative. The next two columns run Tobit regressions of the amount of transfers on the same regressors, with the lower bound being zero. Cross-sectionally, an extra RMB in parental unearned income is associated with a 0.07 RMB reduction in transfer from children. The coefficient on female earnings is more negative at -0.13

[21] For the model in section 2, transfer from children will refer to gross rather than transfers. Conceptually this is treating outward transfer as a form of consumption.

and significant at 10% level. The coefficient on male earnings is close to zero. All the coeffients on current parental income become less negative or more positive when lagged parental earnings are added. If conditional on the transfer being positive, however, the amount appears uncorrelated with parental incomes.

While the negative correlation between parental incomes and transfers from children is intuitive, it's unclear whether it's causal. We do not have a good instrumental variable for parental income in the CHARLS data. However, a credible instrument has been studied. Cai et al 2006 has exploited the pension arrears caused by the restructuring of state owned enterprises in the 90s as an exogenous shock to parental income. They found net transfer was responsive and in a non-linear fashion: the responsiveness is about 0.1-0.16 around the neighbourhood of the poverty line.

For our purpose (to understand parents' saving and labour supply decisions), transfers from children may play multiple roles. First, the Net Present Value of transfers has a wealth effect. As the number of children is declining across cohorts, more recent cohorts of parents might expect a lower NPV of transfers.[22] Second, transfers from children may play an insurance role and therefore reduce precautionary saving. Third, if transfers respond negatively to parental earnings (rather than wage which is unobserved if not in work), that might also reduce the parent's work incentive. In the next section, the structural model will make some assumptions about transfers and compare different assumptions to see how much difference it can make to parental behaviour.

In addition to financial transfers from children, time transfers to children might provide a partial explanation to the low employment rate among middle-aged and older women in urban China. Here is the narrative. The parents can work either in the formal labour market for a wage or in home production for their adult children. The latter could be for altruistic reasons or for (future) financial support. Due to rapid economic growth and improvement in education, the parents' generation tend to have lower wages in the formal labour market than young people in their 20s and 30s (see table 13 in the appendix). Thus, the parents' comparative advantage might be to take care of the grandchildren and housework, allowing their adult children to focus on paid employment outside the home. From the children's perspective, the parents might be a better provider of home-produed services than the market, because their preferences or incentives are more aligned with each other. If this inter-generational exchange or cooperation were responsible for the low rate of formal employment of the middle-aged or older parents, then better provision of child-care and eldelry care might be important for increasing the employment of the middle-aged.

[22]Realistically though, this wealth effect of transfers is likely to smaller than upcoming changes to pensions, since pensions constitute a much larger share of urban older people's total income.

The hypothesis of inter-genrational cooperation is consistent with some findings in the literature. For example, Maurer-Fazio et al 2011 has found using 2000 census data that having a coresident parent increased the labour force participation rate of prime-aged urban women (25-50) by 12 percentage points.

We can also investigate this hypothesis by looking at correlations between parents' employment and the characteristics of their children in CHARLS. These correlations shall be be interpreted as causal evidence, but they are interesting suggestive evidence. Table 6 reports the results of regressing female employment on her children's characteristics, conditional on her own characteristics.

We find that an extra child with upper secondary education (passing exams at age 18) is assoicated with a roughly 5 percentage point drop in the mother's employment. On the one hand, inter-generational transmission of ability and advantage should create a positive assocation between parent's employment and children's education. While we have conditioned on the mother's education, there probably remains some unobserved element of ability that is positively correlated with both children's ability and the mother's employment. On the other hand, parents who expect more financial support from children with high current or permanent income have less of a need to work. Thus, the finding of a negative correlation between mother's employment and her children's education is supportive evidence of the wealth effect of expected transfers. This estimate on the number of children with upper secondary education does not change much when we include more child charateristics in the 2nd column of the regression table.

Meanwhile, having any grandchildren is significantly negatively correlated with the older woman's employment (by about 7 percentage points). In the third column of table 6, we interact the grandchildren dummy with the number of children that are educated at upper secondary levels. We find that the negative correlation between female employment and her children's education is coming from those with grandchildren. As the presence of grandchildren increases the amount of home production required and having more educated children gives the grandmother a comparative advantage in home rather than market work, this interaction effect is consistent with the hypothesis that mother's labour supply decision is made jointly with the decision of home production for their adult children.

The CHARLS survey actually asks older people whether they look after their grandchildren and how much time do they spend on that. The 4th column in table 6 shows that there is indeed a significant and negative correlation between providing grandchild care and working. This obviously does not prove causality in any direction, as in theory the grandmother's labour supply and childcare supply could be determined jointly. The last column in table 6 suggests that the reported intensity of grandchild care is not sig-

nificantly correlated with the grandmother's employment. This conslution remains if we categorize the intensity into dummies. One possibility is that grandchild care requires the carer to be available at some times of the day, which is incompatible with most regular paid jobs in urban China.

Ideally, we would like to track women before and after they become grandmothers and see whether the timing of exiting the labour force coincides with the arrival of a grandchild. However, there are only about 100 women who have become grandmothers between the first two waves of CHARLS. And the survey does not contain the birth dates of one's grandchildren. As an alternative, we look at when the woman's child first got married. Having a married child arguably gives the mother a strong signal for when she can expect a grandchild, since the vast majority of babies in China are born to married couples. In table 7, we use the CHARLS life history survey to run regressions of the year when the woman left her last job. Obviously her birth year and the year that she completed the retirement process are both very significant predictors of when she stopped working. Interestingly, when her child first got married is also positive and significant. This result is robust to the inclusion of more individual characteristics. Overall, the cross-sectional correlations documented in the this section supports the idea that older women's labour supply depend on expected financial transfers from her children and expected time transfers to them.

In the next section, Iwill build and calibrate a model with financial transfers from children, but it will not explicitly contain home production or exchange-motivated intergenerational transfers. These would be interesting extensions, and will require more theoretical work.

Table 1: Summary statistics on household incomes

Nuclear households				
income	percent positive	mean inc. 0	mean exc. 0	median exc. 0
pensions	77.3	29,068	37,612	30,480
transfer from children	59.1	4,876	8,245	4,500
other private transfer	27.6	2,162	7,823	1,200
earnings	25.9	8,820	34,039	31,200
public transfers	17.4	650	3,732	1,012
self emp	5.3	1,553	29,233	20,000
total		47,129	50,920	41,760
Non-nuclear households				
income	percent positive	mean inc. 0	mean exc. 0	median exc. 0
pensions	61.4	18,181	29,626	24,000
other HH members	50.5	20,977	41,553	24,000
transfer from children	36.6	2,538	6,931	2,500
earnings	34.4	11,916	34,651	30,000
other private transfer	27.1	2,380	8,782	2,000
public transfers	20.3	768	3,783	1,000
self emp	11.5	2,724	23,614	24,000
total		59,485	68,431	51,600

Note: the first panel is based on 775 households in CHARLS2013 where the female is aged 45-75 and has urban hukou and the household contains no person other than her spouse or dependent child (below 16), and where the household has completed the individual income and household income modules. The second panel is based on all other households in CHARLS2013 where the female is 45-75 and has urban hukou. There are 1518 such households who have completed the individual income and household income modules. The self-employment income includes incomes from agriculture, livestock and family business. For the first column, missing values are treated as zeros. The 2nd column, the mean including zero, is the product of the first and third columns. The "total" of "mean inc.0" is simply the sum of all the income types in the same column. For "total" in the last two columns, I add up incomes at the household level, drop those with some missing earnings, pensions or public transfers, and then find the mean and median of the resulting non-zero distribution.

Table 2: Number of children who are alive and living nearby, and are in regular contact

age band	observations	Mean number of children who				%
		are alive	live in the same			in regular
			dwelling or adjacent	neighborhood	city or county	contact with child
45-49	378	1.4	1.1	1.2	1.3	0.900
50-54	279	1.5	0.9	1.0	1.2	0.796
55-59	362	1.7	0.8	1.0	1.3	0.805
60-64	274	2.3	0.7	1.1	1.9	0.869
65-69	183	2.5	0.5	1.1	2.1	0.769
70-74	162	2.9	0.6	1.3	2.4	0.864
75-79	102	3.9	0.6	1.8	3.2	0.925

Note: the sample is women with urban hukou in CHARLS 2011. For each non-coresident child, the respondent answers whether the child lives in the same/adjacent dwelling or courtyard, in the same village/neighborhood, and in the same city/county, and how often they see the child. I define "Regular contact" in the last column as seeing at least one child at least once a week. Co-resident children are assumed to be in regular contact. All columns about number of children reported above include the number of co-resident children.

Table 3: Summary statistics on grandmothers' provision of childcare

age band	observations	% has grandkids< 16	% providing care	median hours
45-49	378	0.185	0.605	70
50-54	279	0.440	0.501	30
55-59	362	0.712	0.635	40
60-64	274	0.845	0.297	32

Note: the sample is women with urban hukou in CHARLS 2011. For each grandchild under 16, the survey asks whether the respondent and their spouse provided childcare in the last year and the usual number of hours per week spent on taking care of the grandchild. The proportion of women providing care is conditional on having at least one grandchild under 16, because otherwise the questions are not applicable. For median hours, I have added up the hours spent by the woman on all her grandchildren.

Table 4: Inward and outward financial transfers

Sources of private transfers						
Givers	% positive	mean inc 0	mean exc 0	median exc 0	25th pct	75th pct
children	42.3	2,856	6,758	3,500	1,000	7,800
other	15.0	861	5,736	2,000	500	8,000
siblings	12.1	479	3,965	1,000	500	3,000
grandchildren	4.2	183	4,380	1,000	400	2,400
parents	3.7	220	5,916	5,000	1,000	8,000
Destinations of private transfers						
Recipients	% positive	mean inc 0	mean exc 0	median exc 0	25th pct	75th pct
children	23.3	2,602	11,159	5,000	1,500	15,000
other	36.3	1,537	4,229	2,000	1,000	5,000
parents	25.8	1,076	4,180	2,300	1,000	4,000
grandchildren	17.6	1,027	5,841	1,920	500	6,000
siblings	16.4	381	2,322	600	500	2,000

Note: the sample is women with urban hukou and aged 45-75 in CHARLS 2013. Transfers may be reported by the woman or her spouse. Both monetary and in-kind transfers are included. All percentiles are from distributions excluding zeros.

Table 5: OLS of Transfers from children on levels of parental eanrings and pooled unearned income

	(1) any in	(2) any in	(3) amount, Tobit	(4) amount, Tobit
Main R or Spouse				
parents' unearned incomes	-0.409***	-0.388**	-0.0731*	-0.0445
	(0.113)	(0.141)	(0.0291)	(0.0364)
male earnings	-0.213	-0.0811	0.0136	0.0491
	(0.158)	(0.171)	(0.0410)	(0.0442)
female earnings	-0.551*	-0.219	-0.126	-0.0498
	(0.238)	(0.276)	(0.0699)	(0.0776)
lagged parents' unearned incomes		-0.0534		-0.0456
		(0.129)		(0.0332)
lagged male earnings		-0.317		-0.107*
		(0.202)		(0.0528)
lagged female earnings		-0.732*		-0.214*
		(0.310)		(0.0868)
lagged transfer amount			0.498***	0.518***
			(0.130)	(0.129)
Observations	577	577	577	577
R^2	0.203	0.220		

Standard errors in parentheses

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

Note: The regressions are at the couple level. The sample is urban couple where the woman is between 45 and 75. It excludes couples who have no non-coresident children, because transfers from co-resident children are not observed. All the income regressors have been scaled down by 100,000. The regressions also condition on each parent's age (linear, squared and 5-year bands) and education (5 categories), home ownership, number of children alive, number of children living away from home, number of sons, number of children who have secondary education, who have higher education, who work, who are managers, who are professionals, and who have income above 50,000RMB a year.

Table 6: LPM of women's employment on child characteristics (the number of children who...)

	(1)	(2)	(3)	(4)	(5)
are male	0.0476*	-0.00542	0.0471*	0.0486**	0.0497**
	(0.0246)	(0.0290)	(0.0246)	(0.0247)	(0.0247)
are female	0.0240	-0.0137	0.0229	0.0221	0.0223
	(0.0241)	(0.0267)	(0.0241)	(0.0242)	(0.0242)
finished lower secondary school	-0.0112	-0.0250	-0.0148	-0.0131	-0.0133
	(0.0197)	(0.0199)	(0.0198)	(0.0197)	(0.0198)
finished upper secondary school	-0.0483***	-0.0595***	0.00644	-0.0469***	-0.0458***
	(0.0151)	(0.0163)	(0.0334)	(0.0151)	(0.0151)
are married	-0.0203	-0.0417*	-0.0192	-0.0215	-0.0239
	(0.0221)	(0.0238)	(0.0221)	(0.0221)	(0.0221)
whether have grandkids	-0.0702**	-0.0607*	-0.0186	-0.0352	-0.0328
	(0.0326)	(0.0326)	(0.0430)	(0.0359)	(0.0360)
number of grandkids above 1	0.0367**	0.0297**	0.0375***	0.0390***	0.0400***
	(0.0143)	(0.0143)	(0.0143)	(0.0143)	(0.0143)
work		0.0990***			
		(0.0212)			
has income above 100k		-0.119***			
		(0.0367)			
has income above 50k		0.0593***			
		(0.0204)			
grandkids and num of child w upper 2nd edu			-0.0641*		
			(0.0349)		
if she cares for grandkids				-0.0576**	-0.000588
				(0.0259)	(0.0518)
her weekly hours on grandkids					-0.000267
					(0.000348)
her grandkid care, weeks/year					-0.00107
					(0.00101)
Observations	1689	1689	1689	1689	1689
Adjusted R^2	0.121	0.136	0.122	0.124	0.125

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: sample restricted to 50-64 year old women with urban hukou. Controls include their age, age dummies (in 5-year bands), education dummies, marital status and hukou at birth. The 2nd column also includes the number of children living at home, the number of children economically dependent, the number of children working in professional occupations, and the number of children working as managers, which are all insignificant.

Table 7: When woman stopped working on key events in life

	(1)	(2)	(3)
Year Took Retirement Procedures	0.412***	0.365***	0.356***
	(0.0466)	(0.0462)	(0.0475)
own year of birth	0.176***	0.214***	0.184**
	(0.0527)	(0.0533)	(0.0643)
when child first got married	0.127***	0.0968**	0.0841*
	(0.0365)	(0.0361)	(0.0384)
education==Middle School		1.077	0.962
		(0.572)	(0.592)
education==High school		2.136**	2.022**
		(0.676)	(0.690)
education==Vocational school		3.240***	3.185***
		(0.879)	(0.887)
education==College or above		5.610***	5.560***
		(0.984)	(1.005)
when first got urban or unified hukou			0.000169
			(0.0129)
when oneself got married			0.0487
			(0.0529)
Observations	862	862	862
Adjusted R^2	0.443	0.467	0.465

Standard errors in parentheses

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

Note: the sample is women with urban hukou and who are not currently working.

2 Structural model and calibration results

In this section, we build and calibrate a model of female labour supply and consumption for urban Chinese households. In each period, a couple household observes the realization of the woman's wage w_t, the woman's pension y_t, and the man's income m_t. They know that they will receive a non-negative transfer from children T_t, which is a given function of their own sources of incomes. The couple choose whether the woman should work P_t and how much to consume c_t. We do not differentiate between part-time and full-time work, because less than 10% of the urban women doing non-agricultrual work have weekly working hours below 25.[23] The period is indexed by t, which corresponds to the woman's age. The horizon modelled here is from age 45 to 75, because one of my data source (the CHARLS) samples households with individuals of age 45 or above and the urban female employment rate falls to around 5% by 75.

The household optimization problem is formally set out below: In each period $45 \geq t < 75$, given $A_t, y_t, w_t, m_t, P_{t-1}$, the couple maximize expected life-time utility by choosing female labour supply $P_t \in (0, 1)$ and how much to consume c_t.

$$\max_{c_t, P_t} U(c_t, P_t, S_t) + E_t[\sum_{s=t+1}^{T} \beta^{s-t} U(c_s, P_s, S_t)] + \beta^{T+1-t} bequest(A_{T+1}) \tag{1}$$

s.t.

$$\frac{A_{t+1}}{R_t} = A_t + y_t + m_t + T_t + w_t P_t - c_t \quad t \leq T \tag{2}$$

$$T_t = F(y_t, m_t, w_t P_t) \tag{3}$$

$$A_t \geq 0 \tag{4}$$

$$S_t = S_t(P_{t-1}, P_t, y_{t-1}, y_t) \tag{5}$$

where

- A_t is the level of asset at the start of period t. All assets are liquid and there is zero borrowing constraint.
- c_t is consumption in period t. For the calibration, the unit will be 1000 RMBs in 2011 prices.
- P_t indicates whether the female works in period t. Last period's employment status enters current utility because of job searching cost.

[23] Among women with urban hukou in CHARLS 2013 who report a positive number of hours in non-agricultural work, the 10th percentile is 30 hours a week.

- m_t is male income, it's also exogenous and uncertain. m_t would be zero if the husband dies.

- T_t is transfer from child in period t, which follows a known function of the parents' current incomes.

- t is the woman's age. T is the final period the household makes any choices. In period $T+1$, the woman dies and collects utility from leaving a bequest. We start the model from $t = 45$ and assume $T = 74$.

- S_t is the search cost for getting a new job. As will be specified below, S_t is positive only when the person moves from not working to working or when the person has just completed the retirement process.

The population for calibration is married women with urban hukou in CHNS 1989-2011, who were 45 years old in 1989 and hence 67 in 2011. Most empirical moments will be estimated from CHNS, and the rest will be based on CHARLS.

2.1 Parametric specifications and calibration

The utility function takes the usual CRRA form. δ_t is the disutility of work, which is separable from consumption. I model δ_t as a polynomial of t, and as it turns out a linear function is sufficient to predict a realistic employment-age profile. $\zeta\delta_t$ represents the psychic cost of going back to work or searching for a new job, and is proportional to the disutility of work. The search cost is payable in the period when one transits from not working to working, and also in the period when one first receives a pension. The latter is motivated by the fact that when completing the retirement process, the default is that the pensioner would leave the employer. While continuing to work for the same employer is possible, it requires negotiation for a new contract that could be as difficult as finding a new job.

$$U(c_t, P_t, S_t) = \frac{c_t^{1-\alpha}}{1-\alpha} - \delta_t P_t - \zeta\delta_t max(1[P_t = 1 \& P_{t-1} = 0], 1[y_t > 0 \& y_{t-1} = 0]) \quad (6)$$

The bequest function takes the following form, with parameters b, b_0 and the same CRRA α.

$$bequest(A_{T+1}) = b\frac{(A_{T+1} + b_0)^{1-\alpha}}{1-\alpha} \quad (7)$$

The woman's pension income is uncertain at first and deterministic after the first positive amount was received. If the woman did not receive a pension last year, the likelihood that she will start receiving a pension at age t is π_t. If she becomes elegible for pension at age t, the replacement ratio y_t/w_{t-1} is drawn from an approximate normal

distribution. If the woman received a pension last year $y_{t-1} > 0$, she will continue to receive a pension and the amount will be uprated in line with the age profile μ_t^y.

$$\texttt{if} \quad y_{t-1} > 0, \texttt{then} \quad \log y_t = \log y_{t-1} + \mu_t^y - \mu_{t-1}^y$$

$$\texttt{if} \quad y_{t-1} = 0, \begin{cases} \texttt{with probability} \quad 1-\pi_t, & y_t = 0 \\ \texttt{otherwise}, & \frac{y_t}{w_{t-1}} \in N(\mu_r, \sigma_r^2) \end{cases}$$

The age profile of pension income μ_t^y is estimated from CHNS. We regress log female pension income on age and cohort.[24] μ_t is the predicted log pension amount for the 1944 birth cohort at age t. Also in CHNS we can track individuals over waves. We select waves that are two years apart, and infer the annual transition probabilities π_t from the observed between-wave transition probilities using a minimum distance estimator.

These assumptions about pension dynamics are designed to capture two stylized facts. First, there could be significant uncertainty in pension entitlements because the exact formula and eligibility rules (including how people with insufficient past contributions could buy contributions) are determined by local governments and change over time. Second, existing retirees' pension entitlements are usually uprated by the local government every year, based mainly on their last pension amount and their age. Thus, there is little uncertainty about future pension entitlements once an individual starts to receive it. These assumptions also mean that only one state variable is required to model pension dynamics. An AR(1) process, for example, would require two state variables.

The structure of pension dynamics assumed here means there can be quite a lot of uncertainty in lifetime total pension wealth due to the uncertainty in timing and the initial pension amount, and that there is no uncertainty in pension income after the first receipt. In other words, all the uncertainty in pension wealth is revealed at the time of the first pension receipt. This may help explain why so many people stop working at the same time as when they start to receive pensions.

The log of woman's market wage is a fixed age profile plus a random walk. This assumption is made so that only one state variable is needed to model the wage process. In reality, wage shocks are probably not as persistent as assumed here.[25]

$$\log w_t = \log w_{t-1} + \mu_t^w - \mu_{t-1}^w + u_t, \quad u_t \in N(0, \sigma_w^2)$$

The age profile in female log wage μ_t^w is estimated from CHNS in the same way as that for log female pension.

[24] Higher orders of age are found to be insignificant, so age is only included linearly.

[25] I have also estimated the log wage process as a deterministic age trend plus an AR(1) persistent shock plus a transitory shock, and found the correlation coefficient in the persistent shock to be around 0.35.

Male income m_t is uncertain and exogenous. We observe quite a lot of zeros in the data (due to unemployment or the woman being a widow), so we will model the transitions between zeros and positive values. Conditional on $m_{t-1} > 0, m_t > 0$, we assume the value of m_t is deterministic. This is again a simplifying assumption that shall be relaxed in the next revision of the model.

$$\texttt{if} \quad m_{t-1} > 0 \begin{cases} \texttt{with probability} \quad q_t, & m_t = 0 \\ \texttt{otherwise}, & \log m_t = \log m_{t-1} + \mu_t^m - \mu_{t-1}^m \end{cases}$$

$$\texttt{if} \quad m_{t-1} = 0 \begin{cases} \texttt{with probability} \quad p_t, & m_t = 0 \\ \texttt{otherwise}, & \log m_t = \mu_t^m + \varepsilon_t, \quad \varepsilon_t \sim N(0, \sigma_m^2) \end{cases}$$

The age profile μ_t^m is estimated from CHNS in the same way as μ_t^y. Likewise, the annual transition probabilites p_t, q_t are estimated from the observed between-wave transition probabilites in CHNS using minimum distance estimation.

Transfer from children is assumed to be a linear function of parental incomes in the current period, bouned by zero from below.

$$T_t = max(0, \gamma_t - \gamma_y y_t - \gamma_m m_t - \gamma_w w_t P_t) \tag{8}$$

Because transfers are not well measured in CHNS [26], we use CHARLS to run regressions of transfers on parental incomes to gauge the magnitude of $(\gamma_y, \gamma_w, \gamma_m)$. In the calibration, we set all three to 0.1 in the baseline case. As for the age profile γ_t, the level is based on the observed mean in CHARLS 2013 whereas the slope is estimated from the longer-runing CHNS.[27]

In summary, the model has four continuous state variables A_t, y_t, m_t, w_t and one binary state variable P_{t-1}.

[26] In CHNS, there is a list of income questions about how much the household has received in the last year from different sources, one of them being children. The majority of responses are zeros. By contrast, CHARLS asks the amounts of monetary of in-kind, regular and irregular, transfers from each non-coresident child. The majority of parents in CHARLS report receiving transfers from their non-coresident children.

[27] γ_t is linear in t. The constant is set so that a parent with average incomes receive the average level of transfer observed in CHARLS 2013, and the linear coffiicent on time is estimated from CHNS 2004-2011.

In the benchmark case, I set the following parameters[28]

$$\alpha = 3$$
$$\beta = 0.97, R = 1/\beta$$
$$\zeta = 1$$
$$b = 200, b_0 = 1$$
$$\sigma_w = 0.05, \sigma_r = 0.2, \sigma_m = 0.7$$
$$\gamma_y = 0.1, \gamma_w = 0.1, \gamma_m = 0.1$$

The baseline assumption of δ_t is plotted in Figure 15 in the appendix. I have tried alternative assumptions of δ_t and plotted the resulting simulated employment rates in Figure 15 as well.

For simulation, we have one simulated household for each value combination of the initial state variables. The distribution of the initial values of the state variables are based on data (mostly CHNS) and assumptions.[29]

2.2 Results

Figure 6 shows the key results in the baseline case. The simulated female employment-age profile is quite similar to the observed one from CHNS.[30] Th simulation shows a little uptick in the employment rate in the last couple of years of life. This is driven by the bequest motive (figure 11) and the relatively high wage at those ages.[31] Also, the assumed disutility of work is not very steep over age (shown in Figure 15), whereas that in reality it probably increases much more rapidly towards 75.

The second graph in figure 6 tabulates the gap between the time of exiting labour force and the time of first receiving pensions in the baseline simulation. The density at 0 is 41.85%, significantly higher than the surrounding values, but not as high as the 70% observed in CHARLS. Part of this bunching is due to the assumed search cost that would occur if one works in the year of the first pension receipt. But even without

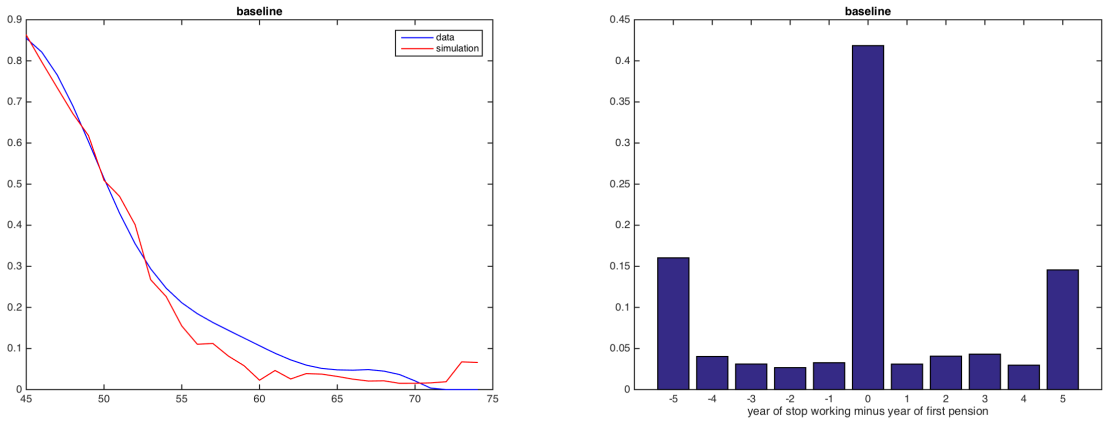
[28]The choice of α is not far from French [2005]. The bequest parameter b is close to the sum of the two bequest parameters in Chen [2014].

[29]All women are assumed to have zero pension at 44. 87% were in work at age 44 (the rate observed in CHNS). 20% of them have zero male income (as in CHNS). Because the CHNS does not contain much information about assets (other than durable goods and housing), we look at the asset distribution in CHARLS 2013, and assume the initial 1989 distribution has the same density at zero and the log level is lower by 2.4. That is 0.1 increase in log level per year, similar to the annual increase in mean incomes observed in CHNS.

[30]The observed rate is smoothed by a 10th order polynomial of age.

[31]As few urban women are in work at those ages, we have few wage observations. But the data look broadly consistent with a simple linear increase in log wages over age.

Figure 6: Age profiles of Employment rate and timing of exit from labour market , baseline



Note: the left panel is the female employment rate over age. The right panel tabulates the gap between the time of exiting labour force and the time of first receiving pensions, where -5 and 5 mean the gap is ≤ -5 and ≥ 5 respectively.

search cost, the model could predict 29% bunching at the time of retirement.[32] The rest of the bunching is due to liquidity constraint. In reality, discontinuities in wages and in the disutility of work might be important causes of this bunching phenomenon. The disutility of work might increase discontinuously after the retirement process due to reference-point effects or some desire to conform to the social norm. It is also likely that many people's market wage fall at the point of retirement, because those who are forced to retire from the public sector are not as productive in the private sector, or those near retirement age are paid above their productivity for institutional or contractual reasons. For example, during the restructuring of state-owned-enterprises in the 90s, many women close to retirement age were allowed and indeed encouraged to take early retirement. For those who did not seek or find work elsewhere, the year when their last job ended would obviously be the same as their year of retirement.

In the baseline, the probabilities of starting to receive pensions at each age are estimated from the data. The age at which women start to receive pensions varies across individuals and has a mean of 50.6 in the simulation.[33] And the average age at which simulated women exit the work force is 52.0.[34] These two are quite strongly correlated in the simulations.[35]

[32]See figure 12.

[33]That is conditional on ever receiving a pension by 75. 15.6% of the simulated individuals never received pensions.

[34]That is conditional on not working at age 74, and about 6% of simulated individuals work at 74.

[35]See Figure 13 in the appendix for the entire distribution of the age of leaving the work force condi-

For comparison, we consider three counterfactual scenarios: first, if all women become eligible for pension at age 50 for sure, not earlier or later; second, if all women become eligible for pension at age 60 for sure; and third, 65 for sure. As shown in figure 7, the employment rate would fall much faster at age 50 under the first counterfactual than under the baseline. Under the second counterfactual, the employment rate would be 12-35 percentage points higher than the baseline between age 50 and 59, with the mean difference over the 10 years reaching 29 percentage points. At 60 however, the employment rate would fall very sharply to zero in the second counterfactual, in comparison to 2% in the baseline. Similarly, the third counterfactual of retirement age at 65 would signficantly increase the employment rate before 65: the increase relative to the baseline between age 50 and 64 averages 26 percentage points. On average, the age at which women exit the workforce would be 50.6, 55.5 and 57.5 respectively under the three counterfactuals.[36] In other words, increasing the retirement age for all women from 50 to 60 would extend the working life by 4.9 years on average.

Another counterfactual we consider in Figure 13 is that pension income does not grow at all relative to CPI since 1989 (when the cohort was 45). This is a rather extreme scenario, given that pensions tend to grow with average earnings. But it is illustrative of the effects of significantly reducing pension generosity. Figure 13 shows that in this extreme scenario, the female employment rate would fall much slower over age, reaching 15% at 60 rather than the 2% in the baseline simulation.

Figure 7: Employment rate under alternative pension policies

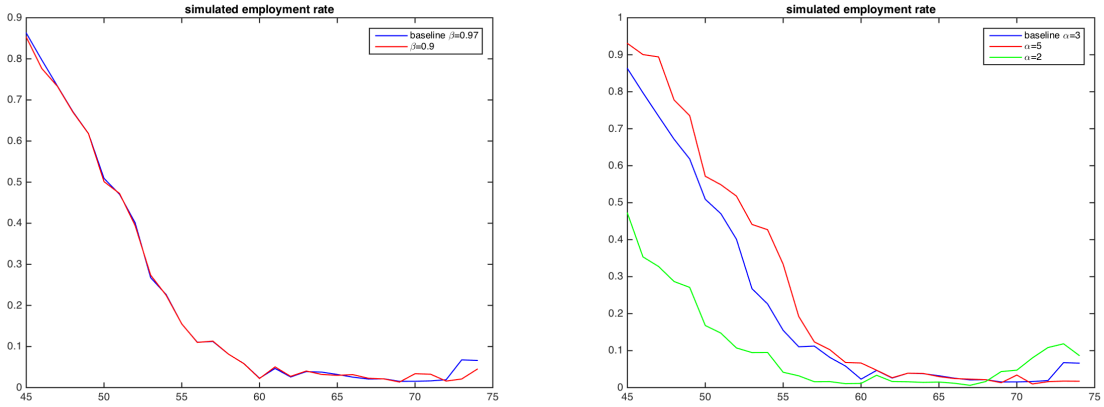
The employment rate is not sensitive to the assumed discount rate. But it would be much lower if households were less risk averse (figure 8).

Transfers from children also have significant effects on female labour supply (Figure 9). If there were no transfers at all, the simulated employment rate would be 5-27

tional on the age of the first pension receipt.

[36]There is essentially no one who would work at age 74 in any of these three counterfactuals.

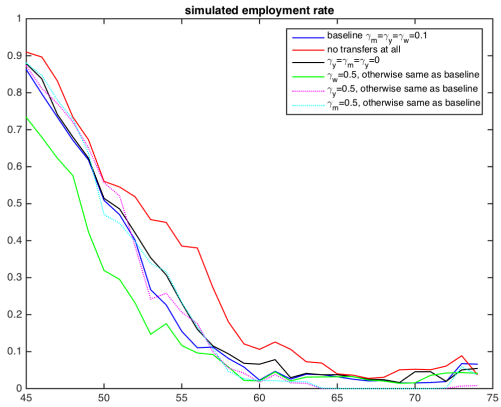
Figure 8: Employment rate under alternative preference paramters



Note: consumption at age t generates utility $c_t^{(1-\alpha)}/(1-\alpha)$ in the same period. For alternative α scenarios, δ_t are set such that $(\delta_t * (\alpha - 1))^{-1/\alpha}$ is the same as in the baseline.

percentage points higher than the baseline between age 50 and 59, with a mean difference of 14.8 percentage points. This appears to work through both the income channel and the insurance channel. If transfers are totally irresponsive to parental incomes, that is, having only an income effect, the employment rate would be 3.6 percentage points higher than the baseline on average between age 50 and 59.[37] Thus, even a small degree of responsiveness of transfers to parental income (0.1 in the baseline simulation versus 0 in the last scenario) can have a non-trivial effect on parents' labour supply. If transfers from children were very responsive to parental earnings (acting as a 50% effective tax rate), the employment rate would be substantially lower than the baseline (by an average of 8.4 percentage points over age 50-59).

Figure 9: Employment rate under alternative transfer functions



Meanwhile, the households appear to save too little, according to all measures of

[37] In the counterfactual scenarios of different $\gamma_w, \gamma_y, \gamma_m$, the mean profile γ_t is shifted so that the average level of transfer in 2013 is roughly the same as in the data and hence the baseline.

savings shown in figure 10. Here, the top left panel compares the age profile of the mean asset with that for income (the sum of male income, woman's earning and pension, and transfer) and consumption. In both income and consumption, there is strong growth over age, because we are modelling one birth cohort and incomes have grown rapidly over time in China. Mean asset remains pretty flat until the mid 60s, and it increases rapidly towards the end. In fact, roughly half of households have zero asset between age 50 and 65 under the baseline simulation.

The overall level of saving according to the baseline simulation is clearly lower than the reality. The median household saving rate observed in CHARLS is in the range of 0.2-0.4 for those households with women aged 50 or above. In the simulation, the median household saving rate is essentially 0 till 63, because a large proportion of the households have zero asset and consume all their income at those ages. The mean of household saving rate tends to be more negative than the median, because, by definition, if a household has moderate level of consumption and extremely low income, their saving rate would be very negative.

The rapid increase in saving from around age 65 onwards is due to the bequest motive. If bequest yields no utility, the aggregate saving rate would be around zero throughout the life (Figure 11).

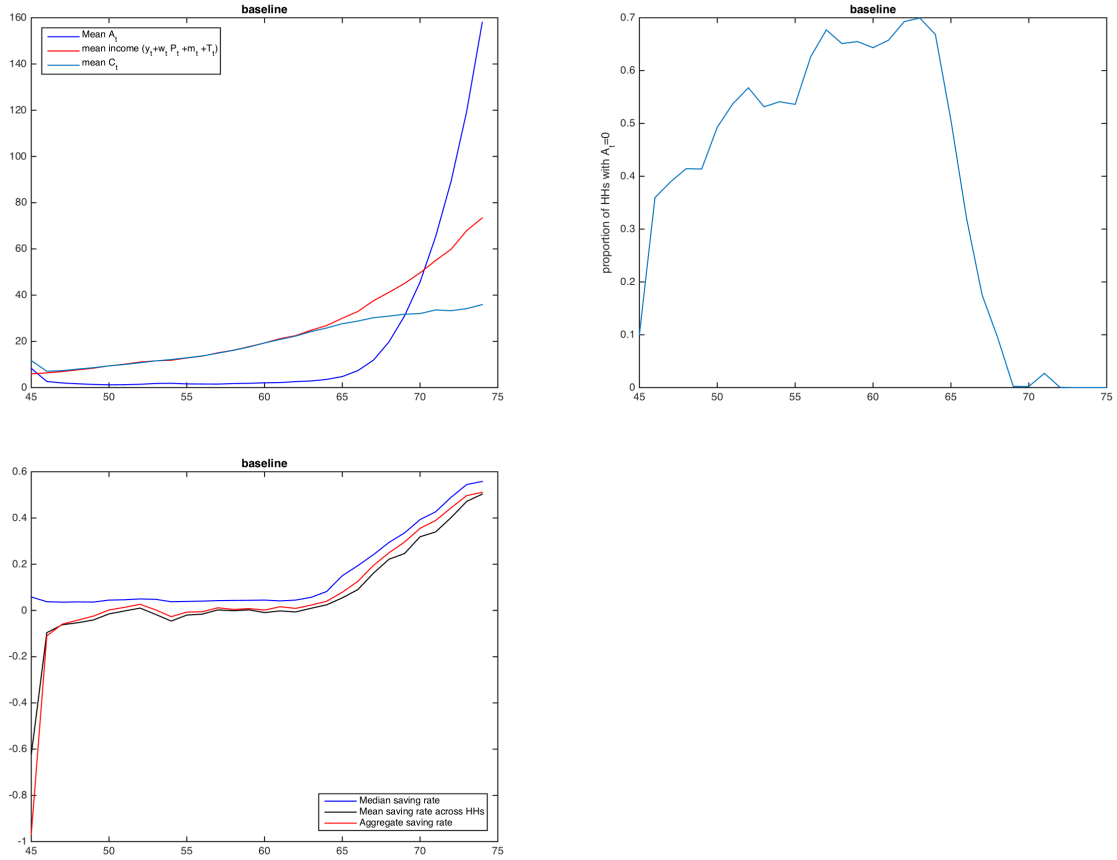
In the current calibrated model, the main driver of saving is the bequest motive. In the baseline, we set $b = 200, b_0 = 1$ and $\alpha = 3$. This means the marginal utility of consumption is roughly equal to the marginal utility of bequest when bequest is 4.5 times the consumption level in the final year. As shown in figure 11, a higher level of b would increase the aggregate saving rate and a lower b would reduce it. But all the changes happen towards the end of life, rather than spread throughout the life cycle.

Part of the reason for the low simulated saving rate before 65 is that all wages and incomes have a fast-growing time trend in expectation - the growth is around 10% per year. Together with a zero-bound liquidity constraint, fast growing incomes induce households to delay saving. I have tried a counterfactual scenario where all types of incomes are expected to and did remain at the same level in real terms. That would yield median saving rate around 0.2-0.3 before age 60.[38] A future step would be to try counterfactual scenarios where income realizations systematically exceed the expectations.

Meanwhile, I believe the model does not contain enough shocks to induce precautionary saving. The assumed dynamics of pension income means that once a woman starts to receive pensions, as the majority do by 60, there is no uncertainty in her future stream of pension income. As pension income constitutes a large share of household income at old age, increasing uncertainty in the pension dynamics specification will probably improve

[38]See figure 14 in the Appendix.

Figure 10: Age profiles of assets and saving rate in the baseline



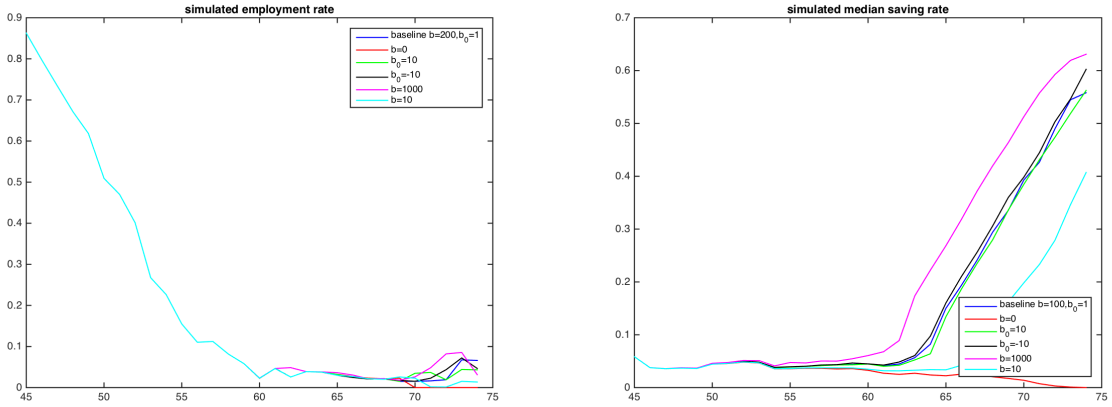
Note: In the bottom left graph, household saving rate is defined as 1 minus current consumption divided by current income (including male income, female earnings and pensions, and transfers). The aggregate saving rate equals 1 minus the ratio of aggregate consumption to aggregate income.

the prediction of saving rate. In addition, the current specification of transfers means there is an effective consumption floor, which is relatively high at old age. Thus, to create the possibility of having very low income later in life, it is necessary to add uncertainties to both pension incomes and transfers at all ages. Moreover, uncertainties about health, mortality and medical expenditures might be important drivers of precautionary saving in reality. Further extensions of the model should incorporate these, as will be discussed below.

2.3 Next step: model extensions

The current model is simplistic and should be thought of as a first step towards a richer model of uncertainties faced by older Chinese households and insurance mechanisms available to them. I expect to extend the model in the following ways.

Figure 11: Age profiles under alternative bequest parameters b, b_0



Note: the bequest utility function is $b((A_{T+1}+b_0)^{1-\alpha})/(1-\alpha)$.

First, we will add a household fixed effect and a shock in the transfer function. In the data we observe very large dispersion in the amount of transfers and that the best predictor for the current amount of transfer is its lagged value. Some of the heterogeneity is likely to reflect preferences of the children. Some of the variation can be explained by the the number of children and their education. The variance of the household fixed effect will be estimated from CHARLS. The shock to transfers will mean that transfers no longer guarantee an ever-increasing level of minimum income.

Second, I will make the pension and wage specifications more realistic. The log female wage will include a persistant AR(1) shock and a transitory shock, rather than folllowing a random walk. I have already estimated the former process, but chose the random walk specification for now because the latter requires only one state variable. The dynamics of male wages and pensions will be modelled separately and the male labour supply will be a binary choice. Currently the wage dynamics are estimated ignoring selection. In future, I will account for selection in both spouses' wages using an iterative approach similar to French [2005].

In theory, the first pension amount (at the time of retirement) should depend on the entire work history. Obviously it won't be feasible to have the entire work history in the state space, so the question is how can we approximate pension as a function of a small number of variables. Because China's pension system has been very decentralized, the actual function varies substantially across individuals and is hard to observe. In the current specification, the first pension amount is the last wage times some uncertain replacement ratio. This seems to be a reasonable approximate for women born in the 1940s, but more work is needed for estimating male pension.[39]

[39]See table 8 in the appendix, where I regress the replacement ratio on individual characteristics using CHARLS data.

Third, I believe one of the main reasons of high saving rate in urban China in reality is the uncertainty in healthcare costs. To incorporate this into the structural model, we would need two extra state variables, one for health status and one for health care expenditure. The health staus will follow a first-order Markov process and can be estimated from the tranistions of self-reported health status in CHARLS.[40] Health status will affect the marginal utility of consumption and of work. Healthcare expenditure will depend on health status and the amount will be uncertain. The distribution can also be estimated from CHARLS.[41] Healthcare expenditure will affect utility directly or indirectly though survival probabilities.

In addition, I want to add uncertainty to survival and extend the potential life-span to at least 85 years old. Age-specific mortality rates have been estimated for urban Chinese in Zimmer et al. [2007].[42] The uncertainty in longevity should contribute to pre-cautionary saving.

Finally, there will be more preference parameters and the model will be estimated rather than calibrated. As I plan to endogenize male labour supply, there will be a parameter to reflect the man's disutility of work, and another to allow complementarity in leisure between the spouses. Moreover, I will add a parameter to represent the discontinuous jump in the disutility of working after becoming a pensioner, to reflect the anchor effect of the pension age. This will be identified from the extent of co-incidence between when one receives the first pension and when one stops working.

3 Conclusion

This paper has examined the low employment rate of older women in urban China and the related stylized facts about retirement and intergenerational interactions. I hypothesized that the low employment rate is primarily due to the early age at which urban women become eligible for pensions, and that women's labour supply decision also depends on financial transfers from children and time transfers to children.

I have documented a range of descriptive evidence that supports these views. Pensions are the biggest source of income for the urban elderly. The timing of leaving the labour market tends to coincide with the timing of the first pension income. Transfers from

[40]CHARLS not only asks individuals to rate their health status into a few categories, but also contains a wide range of more objective measure such as whether has been diagnosed of certain diseases.

[41]For example, I observe in CHARLS 2013 that among those who rated their health as "good" or "very good" or "excellent", 18% had reported out-of-pocket medical expenditure. Among those with worse health ratings, 38% did.

[42]If we want to allow one's survival probability to depend on their health status, we will need to examine death-related attritions and health measure in the CHNS 1989-2011.

children constitute a non-trivial share of the parents' income. Grandmother provision of child care is common and the average hours are long. Female employment is significantly negatively correlated with their children's education and having granchildren, and indeed, the interaction of the two. And transfers from children are significantly negatively correlated with female earnings.

I have built and calibrated a simple structural model of female labour supply and saving. The model contains uncertainties in male income, female wage and pension income. Transfers are assumed to be an exogenous function of parental incomes. The model produces realistic predictions of the female employment rate. It also generates a large amount of bunching in the timing of exiting the workforce around the point of qualifying for a pension.

The simulations suggest that both pensions and transfers have substantial effects on the female employment rate. For example, raising the female pension age from its current level (which varies across individuals and has a mean of 50.6) to 60 would increase the employment rate by 29 percentage points on average over age 50-59. The average age at which women leave the labour force would also increase from 52.0 in the baseline to 55.5. Had there been no transfers at all, the female employment rate would be 15 percentage points higher over age 50-59.

In future, I intend to extend the model in a number of directions discussed above. Most importantly, incorporating health shocks and uncertain health expenditure shall improve the fit of the model for saving rate.

References

Yi Chen. Never too old to save & explaining the high saving rates of the chinese elderly. Technical report, Working paper, 2014.

Eric French. The effects of health, wealth, and wages on labour supply and retirement behaviour. *The Review of Economic Studies*, 72(2):395–427, 2005.

John Giles, Xiaoyan Lei, Yafeng Wang, and Yaohui Zhao. One country, two systems: Evidence on retirement patterns in china. *World Bank, Washington, DC, and Peking University, Beijing*, 2015.

Felix Salditt, Peter Whiteford, and Willem Adema. Pension reform in china. 2007.

Yvonne Sin. Pension liabilities and reform options for old age insurance. *World Bank working paper*, 1, 2005.

Loraine A West. Pension reform in china: Preparing for the future. *The Journal of Development Studies*, 35(3):153–183, 1999.

Zachary Zimmer, Toshiko Kaneda, and Laura Spess. An examination of urban versus rural mortality in china using community and individual data. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 62(5):S349–S357, 2007.

4 Appendix: data

Two household survey data have been used repeatedly in this paper.

The China Health and Retirement Longitudinal Study (CHARLS) surveys a nationally-representative sample of Chinese people aged 45 or older. The first two waves of CHARLS were collected in 2011 and 2013, and those waves of data are used in the paper. The third wave of CHARLS has been collected and will be only available in 2017. The CHARLS wave 1 data contains about 10,000 households and more than 17,000 adults aged 45 or above. As this paper only considers those with urban hukou, the effective number of adults are around 3,800.

Like most household surveys, CHARLS contains the usual information such as age, education, employment and incomes. As its focus is on the elderly, it contains a great amount of detailed information on pension incomes and participation, health insurance, past diagnoses and health expenditures. CHARLS is also unique in the amount of information that is available about one's children, who may or may not live in the same household. For each child, it contains age, gender, education, employment, broad occupation group and bands of family income. Moreover, for each non-coresident child, both waves of CHARLS contain the amount of financial transfer in both directions. In this paper, I have used CHARLS to look at income composition, pensions, parental employment, and inter-generational co-residency and transfers.

The China Health and Nutrition Survey (CHNS) is the longest-running panel survey of Chinese households. There have been 9 waves of data, unevenly spaced between 1989 and 2011. There are a bit over 2000 adults aged 45 or above per wave. All waves of the CHNS contains some information on earnings and pensions, but it's not always consistently defined over time and it's less detailed than CHARLS. For example, pension income is reported as one figure at the household level for the first 5 waves and at the adult level afterwards, whereas CHARLS 2013 explicitly asks about 9 types of pensions. In this paper, the CHNS is mainly used to estimate income profiles for model calibration, because the CHARLS panel is too short and too recent for this purpose.

5 Appendix: historical pension system

Before 1986, enterprises were solely responsible for the pensions of their employees. At that time, state-owned enterprises (SOEs) and collective-owned enterprises (SOEs) accounted for most of the employment in urban areas.[43] Most enterprise pensions were Defined Benefit, with the mandatory retirement age set at 60 for men, and 50 for female workers generally and 55 for female "cadres". "cadre" is an adminisitrative ranking of employees, and it usually corresponds to managerial or professional positions.

Since 1986, Social Insurance Agencies were established at the county and city level to take contributions from SOEs and their employees. Two thirds of workers in SOEs were covered by the end of 1991 and Collective-owned enterprises (COEs) became covered in 1992 [Salditt et al., 2007].[44] But the system remain decentralized, with diffferent programmes being piloted in different cities.

The 90s saw a series of State Council documents attempting to integrate the system. For example, the 1991 State Council Resolution on the Reform of the Pension System for Enterprise Workers recommended a three-tier pension, where the first tier would be jointly funded by the government, employer and individual and funding of the first tier would be pooled at the province level. However, some provinces adopted two-tier pensions which were funded by employer and employee and did not have a government-backed socially-pooled tier, because it's more popular with private and joint-ownership enterprises [Salditt et al., 2007]. In 1995, the State Council Document no. 6 recommended two models of social pension and required the city and prefecture governments to select one or design a third model.[45] In practice, the design of the Enterprise Workers' pension (e.g. entitlement formula and indexation rules) continued to vary substantially across local governments.[46]

6 Appendix: additional tables and figures

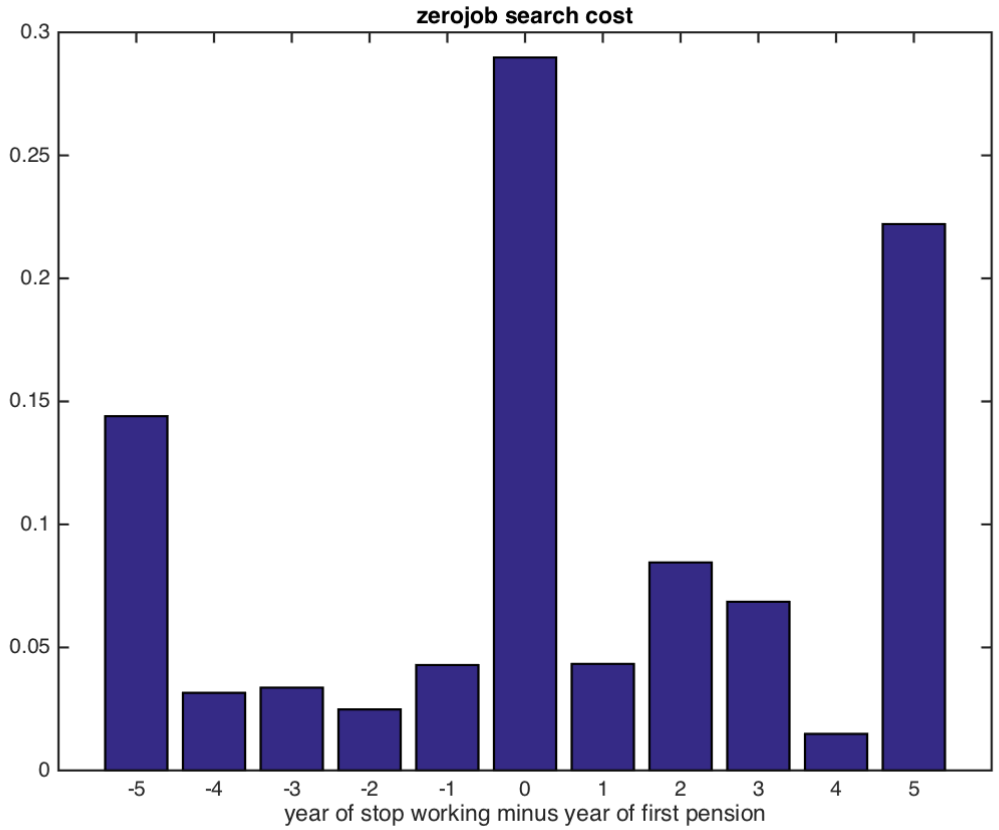
[43] According to the 2014 China Statistical Yearbook table 4-2, there are 128 million employerd persons in 1985, of which 90 million were at state-owned units, 33 were at collective-owned units and 4.5 million were self-employed.

[44] According to the 1996 China Statistical Yearbook table 4-4, in 1991 there were 153 million urban employees, of which 103 million were at State-owned units and 35 million at urban collective-owned units.

[45] There are 300+ of prefecture-level cities in China.

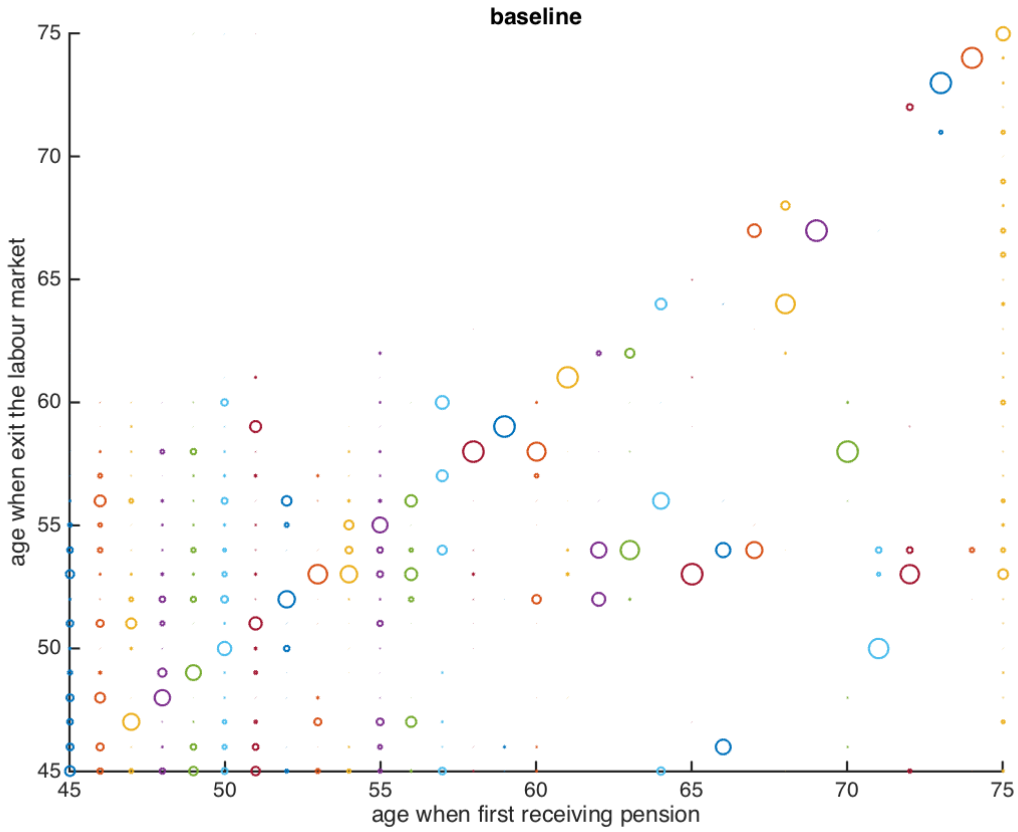
[46] Some examples are provided in [West, 1999].

Figure 12: Year when stop working minus year when first received pension



Note: 5 means 5 or more, -5 means -5 or below.

Figure 13: Age when qualifying for the retirement and age when leaving the labour market



Note: The size of the bubbles are proportional to the share of women who left the labour market at the specified age conditional on receving pension at the specified age. A person who is still in work at 74 is labelled as leaving the work force at 75, and a person who has never received any pension from 45 to 74 is labelled as 75 on the x axis.

Table 8: OLS of the replacement ratio

	(1)	(2)	(3)	(4)
VARIABLES	female 1940-49	male 1940-49	female 1950-59	male 1950-59
log pre-retire wage	-0.0287*	-0.0648***	-0.0898***	-0.161***
	(0.0154)	(0.0169)	(0.0207)	(0.0379)
birth year	0.00709	0.0114***	0.000120	0.00516
	(0.00490)	(0.00405)	(0.00539)	(0.0102)
age at retirement	0.00329	0.00519	0.000669	0.00432
	(0.00390)	(0.00339)	(0.00463)	(0.00663)
years of elegible work	-0.000571	0.00166	0.00535**	0.00853
	(0.00204)	(0.00194)	(0.00247)	(0.00528)
GongLin_ms	-0.00687	0.129**	0.0281	0.0250
	(0.158)	(0.0596)	(0.129)	(0.0793)
cadre	0.0208	0.0324	0.1000**	0.127**
	(0.0330)	(0.0238)	(0.0435)	(0.0494)
Constant	-12.78	-21.03***	1.155	-8.510
	(9.547)	(7.878)	(10.52)	(19.95)
Observations	152	247	177	82
R-squared	0.032	0.087	0.142	0.239

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: the replacement ratio is the first pension amount divided by the pre-retirement wage. Extreme observations with the replacement ratio below 0.5 or above 1.5 are excluded. The sample is urban retirees in the specified birth cohorts in CHARLS 2011.

Table 9: Summary statistics on household saving rate by total number of children alive

number of children	observations	25the percentel	median	75th percentile
0	27	0.355	0.373	0.373
1	419	-0.361	0.303	0.600
2	373	-0.320	0.236	0.515
3	307	-0.424	0.280	0.572

Note: the sample is households in CHARLS 2011 where the woman is aged between 45 and 75 and has urban hukou. Observations with income or expenditure more extreme than the first and 99th percentiles are treated as missing values. The household saving rate is defined as one minus household expenditure last year divided by household income (including all earnings, pensions and public transfers).

Table 10: LPM of men's employment on child characteristics (the number of children who...)

	(1)	(2)	(3)	(4)	(5)	(6)
are male	0.00276	-0.0134	-0.0476	-0.0409	-0.0355	-0.0310
	(0.0153)	(0.0211)	(0.0287)	(0.0287)	(0.0295)	(0.0295)
are female	0.0246	0.00949	-0.0161	-0.0104	-0.00511	-0.00292
	(0.0148)	(0.0210)	(0.0272)	(0.0272)	(0.0281)	(0.0282)
if wife is in work	0.211***	0.212***	0.207***	0.215***	0.216***	0.215***
	(0.0224)	(0.0226)	(0.0227)	(0.0227)	(0.0227)	(0.0227)
finished lower secondary school		0.0170	0.0145	0.0111	0.00824	-0.00809
		(0.0196)	(0.0198)	(0.0197)	(0.0199)	(0.0452)
finished upper secondary school		-0.00351	-0.0108	-0.0255	-0.0233	0.0358
		(0.0151)	(0.0153)	(0.0162)	(0.0166)	(0.0430)
are married			-0.0148	-0.00932	-0.0247	-0.0232
			(0.0185)	(0.0187)	(0.0244)	(0.0244)
work			0.0539**	0.0385	0.0391	0.0349
			(0.0199)	(0.0203)	(0.0203)	(0.0204)
work as professionals				0.0539**	0.0539**	0.0536**
				(0.0195)	(0.0195)	(0.0195)
work as managers				0.0671*	0.0664*	0.0697**
				(0.0264)	(0.0265)	(0.0265)
has income above 100k				0.120**	0.117**	0.119**
				(0.0407)	(0.0408)	(0.0408)
has income above 50k				-0.0431*	-0.0425*	-0.0402
				(0.0212)	(0.0212)	(0.0212)
number of grandkids					0.00376	0.00422
					(0.0138)	(0.0140)
whether have grandkids					0.0371	0.0835
					(0.0330)	(0.0474)
interaction term, lower 2nd						0.0113
						(0.0464)
interaction term, upper 2nd						-0.0722
						(0.0454)
Observations	1728	1728	1728	1728	1728	1728
Adjusted R^2	0.249	0.250	0.252	0.259	0.259	0.260

Standard errors in parentheses

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

Note: sample restricted to 50-64 year old married men with urban hukou. Controls include for each spouse, their age, age dummies (in 5-year bands), education dummies and hukou at birth; and whether the wife is in work. Source: CHARLS

Table 11: OLS whether receive any transfers from children on child characteristics

	(1)	(2)	(3)	(4)
are co-resident	0.0279	-0.0305	-0.0442	-0.0510
	(0.0254)	(0.0293)	(0.0306)	(0.0325)
are not co-resident	0.0490**	-0.0352	-0.0511	-0.0641*
	(0.0171)	(0.0276)	(0.0291)	(0.0311)
are male	-0.0140	-0.0200	-0.0203	-0.0267
	(0.0196)	(0.0195)	(0.0195)	(0.0199)
are married		0.0965***	0.0920***	0.0752*
		(0.0249)	(0.0250)	(0.0300)
have finished middle school			0.0281	0.0150
			(0.0177)	(0.0185)
have bachelor degrees			0.0174	0.00132
			(0.0244)	(0.0273)
work				0.0302
				(0.0243)
work as managers				-0.0121
				(0.0297)
work as professionals				0.000657
				(0.0234)
has income above 20k				0.0504**
				(0.0157)
has income above 50k				-0.000571
				(0.0225)
Observations	818	818	818	818
Adjusted R^2	0.079	0.095	0.097	0.109

Standard errors in parentheses

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

Table 12: OLS log amount of transfers from children on child characteristics

	(1)	(2)	(3)	(4)
are co-resident	0.0700	0.148	0.0585	0.0189
	(0.0985)	(0.121)	(0.122)	(0.130)
are not co-resident	0.145*	0.248*	0.124	0.0756
	(0.0620)	(0.111)	(0.115)	(0.124)
are male	-0.0382	-0.0355	-0.0315	-0.0614
	(0.0717)	(0.0717)	(0.0697)	(0.0703)
are married		-0.114	-0.120	-0.134
		(0.102)	(0.0993)	(0.113)
have finished middle school			0.158*	0.0857
			(0.0631)	(0.0656)
have bachelor degrees			0.442***	0.245*
			(0.0883)	(0.0994)
work				0.141
				(0.0901)
work as managers				0.146
				(0.105)
work as professionals				0.146
				(0.0858)
has income above 20k				0.0657
				(0.0551)
has income above 50k				0.177*
				(0.0763)
Observations	615	615	615	615
Adjusted R^2	0.072	0.073	0.124	0.151

Standard errors in parentheses

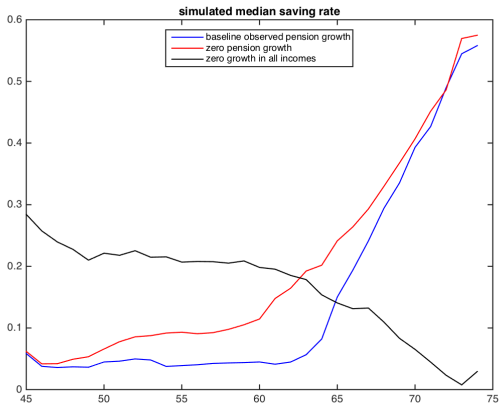
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 13: Monthly wage by age band, urban hukou

age band	number of observations	% in work	wage observations	mean wage	median
20-24	228	0.62	110	2,250	2,000
25-29	374	0.83	279	2,695	2,000
30-34	450	0.85	338	2,796	2,100
35-39	524	0.85	367	2,825	2,000
40-44	642	0.85	443	2,734	2,000
45-49	763	0.74	475	2,707	2,000
50-54	689	0.52	304	2,513	2,000
55-59	888	0.35	255	2,663	2,000
60-64	659	0.12	61	2,154	2,000

Note: the sample is individuals with urban hukou in 2011 CHNS. Zero wage observations and exteremly large (above the 99th percentile) wage observations are excluded for the last three columns.

Figure 14: Median household saving rate under counterfactual income profiless



Note: in each scenario, growth expectations are assumed to be consistent with the mean growth rate of incomes.

Table 14: Healthcare cost by age band, urban hukou

out-of-pocket cost for out-patient treatments in the last month							
age band	% w cost	num observed	mean cost	25th pct	50th pct	75th pct	% w high cost
45-49	0.191	91	775	100	200	500	0.039
50-54	0.200	91	686	100	300	900	0.032
55-59	0.219	127	827	100	400	1,000	0.041
60-64	0.236	130	1,462	90	200	800	0.025
65-69	0.262	100	444	100	200	525	0.016
70-74	0.288	76	1,826	100	300	650	0.013
75+	0.279	84	967	115	353	1,000	0.017
45+	0.234	699	990	100	270	700	0.027
out-of-pocket cost for hospitalization in the last year							
age band	% w cost	num observed	mean cost	25th pct	50th pct	75th pct	% w high cost
45-49	0.084	46	6,278	1,000	2,850	6,000	0.022
50-54	0.105	58	7,233	1,800	3,000	6,700	0.012
55-59	0.133	84	7,136	1,200	3,000	6,000	0.013
60-64	0.173	105	7,003	1,500	3,030	6,000	0.013
65-69	0.155	74	8,258	1,150	3,000	6,000	0.012
70-74	0.207	69	6,776	2,000	3,000	6,000	0.023
75+	0.246	88	9,056	1,550	3,000	7,750	0.020
45+	0.151	524	7,478	1,455	3,000	6,000	0.016

Note: the sample is individuals with urban hukou in 2013 CHARLS. "num observed" is the number of observations with positive costs. Observations are weighted by the individual weight in CHARLS 2013. The means and percentiles are based on the non-zero distribution. For the last column in the upper panel, "high cost" is defined as whether the cost of medical treatment last month exceeds one twelveth of last year's household income (the sum of both spouses' earnings, pensions and public transfers). For the last column of the lower panel, "high cost" is defined as whether the cost of hospitialization last year exceeds last year's hosuehold income.

Figure 15: Age profiles with alternative paths of disutility of work