

Demographic Dividend, Saving, and Sex Imbalance

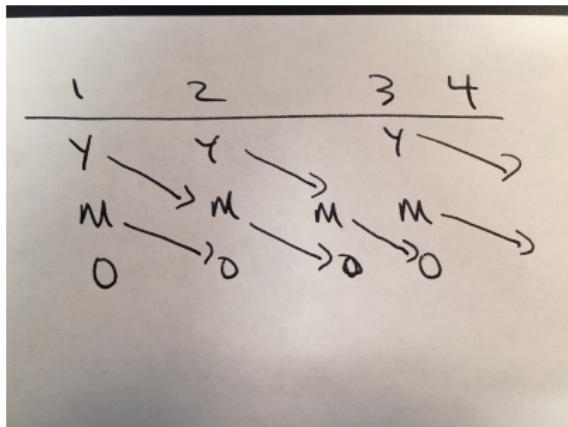
Econ 43750

N.C. Mark

University of Notre Dame and NBER

October 20, 2020

The Overlapping Generations Structure



- Overlapping generations (OLG) structure used to study demographic effects
- Three generations: Young, middle, and old

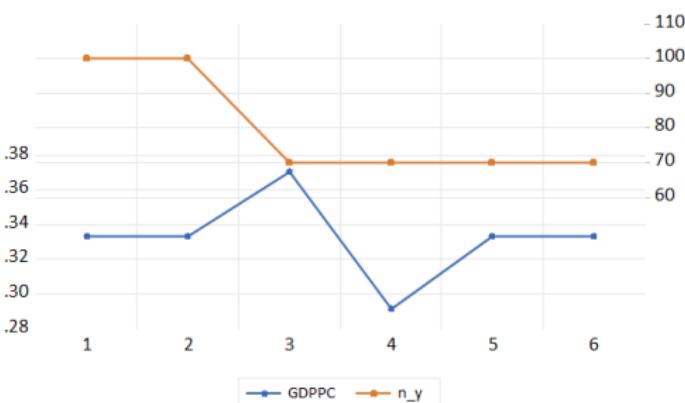
Population: $\text{Pop} = n_{y,t} + n_{m,t} + n_{o,t}$

Demographic Dividend

- Q_t is GDP.
- Production function: $Q_t = n_{m,t}$
- Per capita GDP $\frac{Q_t}{n_{y,t} + n_{m,t} + n_{o,t}} = \frac{n_{m,t}}{n_{y,t} + n_{m,t} + n_{o,t}}$
- One worker produces one unit output. Production uses only labor.
- Only middle aged work.
- Per capita GDP equals the working (middle) aged share of population.
- Changing composition, changing (relative) numbers of the age groups has macroeconomic effects

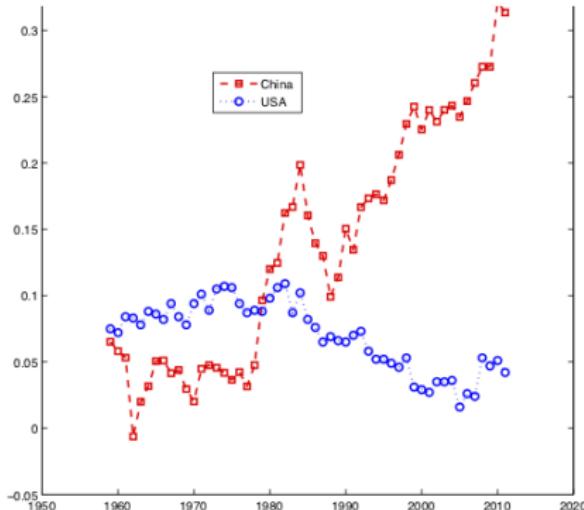
Demographic Dividend

time	n_y	n_m	n_o	pop	GDP	GDPPC
1	100	100	100	300	100	0.333
2	100	100	100	300	100	0.333
3	70	100	100	270	100	0.370
4	70	70	100	240	70	0.292
5	70	70	70	210	70	0.333
6	70	70	70	210	70	0.333



- Fertility drops at time 3. Per capita GDP shoots up. This is the **demographic dividend**.
 - This was Japan in the 1960s and 1970s.
 - This is China from 1978 to 2016.
- At time 4, society becomes old. Per capita GDP falls by a lot.
 - This is Japan today
 - This will be China
 - This will be the high-income countries of the world
- Can you keep the demographic dividend going? Invest in human capital and technology?

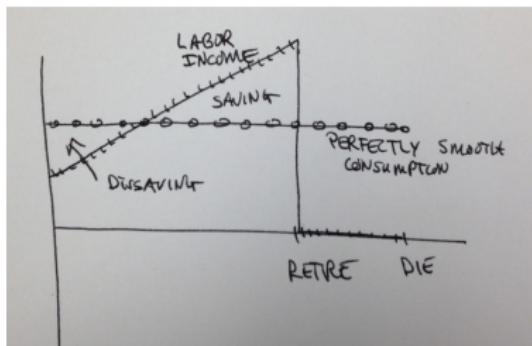
Chinese Household Saving



- Next, we want to explain this. Why? These savings
 - Has helped to fund China's domestic real investment
 - Has helped to buy US Treasury bonds
 - Has contributed to low world real interest rate
- If China were a small country, we wouldn't care. But it's not. It's really BIG!

"Demographic Patterns and Household Saving in China," *American Economic Journal: Macroeconomics*, 2015

- Observe huge demographic changes in China in relatively short time.
- Lower fertility jeopardizes old-age support
 - People need to do their own retirement saving.
 - There's no social security to speak of these days in China. Especially in the rural areas
 - This is called life-cycle saving.
 - Fertility reduction results in smaller families
 - Lower total expenses. Can save more.
- Is there any evidence for this?
- Can we show these are reasonable mechanisms?



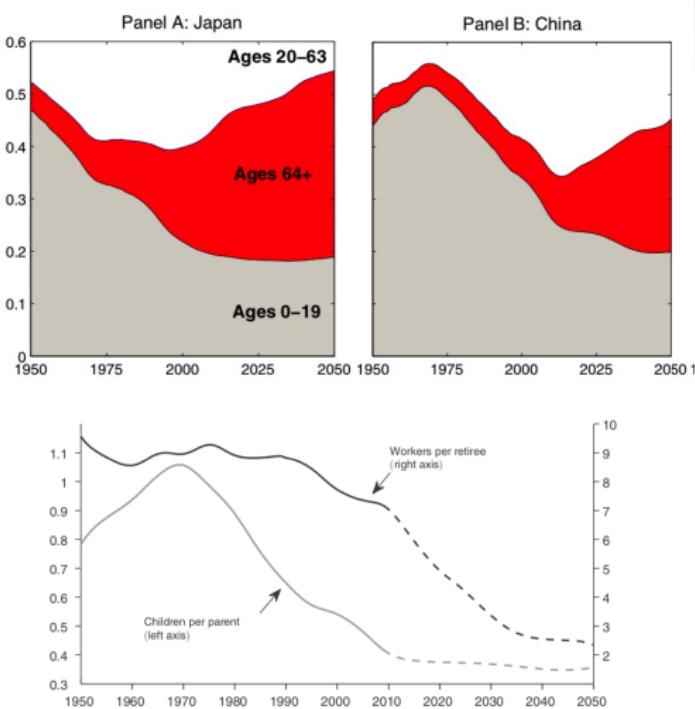


FIGURE 5. THE RATIO OF CHILDREN, AGES 0–19, TO PARENTS, AGES 20–63 (left axis) AND THE NUMBER OF WORKERS, AGES 20–63, PER RETIREE, AGES 64+ (right axis) FROM 1950 TO 2050

- Share of working aged peaks in 2015
- Dramatically smaller household sizes
- Sketch: 2 generations, middle and old. Middle work, old retired
Individual saves for retirement:
 $s_{m,t} = \omega y_{m,t}$,
 $c_{m,t} = y_{m,t} - s_{m,t} = (1 - \omega)y_{m,t}$

The old eat their saving,

$c_{o,t+1} = s_{m,t}$ and are dissaving:

$$s_{o,t+1} = -s_{m,t}$$

National saving rate

$$\frac{S}{Y} = \frac{n_{m,t}\omega y_{m,t} - n_{o,t}\omega y_{m,t-1}}{n_{m,t}y_{m,t}}$$

Each guy produce one unit $y_{m,t} = 1$.

$$\text{Hence, } \frac{S}{Y} = \omega \left(1 - \frac{n_{o,t}}{n_{m,t}}\right)$$

The surge in $n_{m,t}/n_{o,t}$ increases aggregate saving rate.

Household-level evidence: Effect of family size

TABLE 1—THE EFFECT OF THE NUMBER OF CHILDREN ON THE HOUSEHOLD'S SAVING RATE, 2007

Explanatory variable	Dependent variable: saving rate	
	(1)	(2)
Number of children	-0.047 (0.015***)	-0.043 (0.018**)
Further restrictions	None	Omit HH with children age > 19
Observations	3,234	2,200
R ²	0.113	0.107

Notes: Saving rate is defined as (Income-Consumption)/Income. The data is restricted to nuclear families. Additional controls include a quartic in income, age, age squared, and the natural log of education. Standard errors are reported in parentheses.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

A Serious Model

- People live for 85 years. Children (age 0 to 19) don't make economic decisions, and eat what parents give them.
- Age 20-49 have children in the household. The parents value children's consumption in utility.
- Age 50-63 are empty nesting workers
- Age 64-85 are retired, live off saving and adult children
- 65 generation OLG model
- Each living generation maximizes (remaining) lifetime utility subject to their budget constraints.
 - Utility and budget constraints vary over the life cycle
 - People have perfect foresight over labor income
 - Solve for individual's consumption function (and hence saving function). Account for changing age distribution. Plug in the income and demographic data and run the model.

The Result: Ta Da!

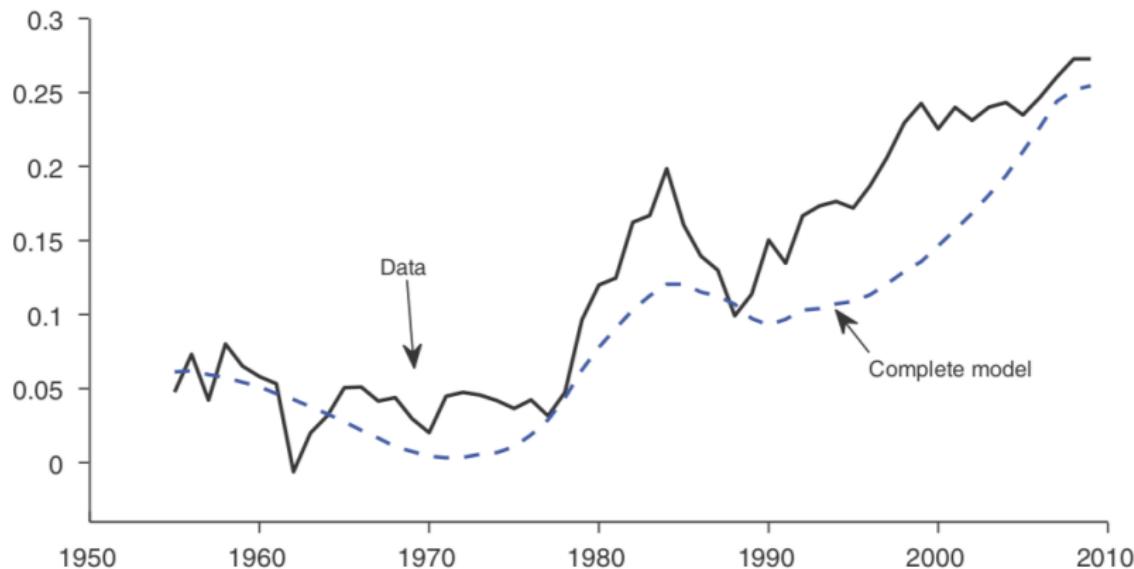


FIGURE 12. HOUSEHOLD SAVING RATES FROM 1955 TO 2009 IN THE CHINESE DATA (*solid line*) AND THE COMPLETE MODEL (*dashed line*) WITH TIME VARYING WAGES AND INTEREST RATES

Sex Imbalance

- Marriage really important to Chinese people
- Girls are scarce and have more bargaining power, can be selective. Boys face stiff competition.
- How to compete? Parents try to help out the poor boy. Accumulate assets (like a house).

<https://www.youtube.com/watch?v=u4orQ0p788k>

Wei and Zhang: Competitive Saving Motive

"The Competitive Saving Motive: Evidence from rising sex ratios and saving rates in China," *Journal of Political Economy*, 2011.

- People (parents) save to improve their children's ability to compete in the marriage market.
- Will parents of girls also save aggressively?
 - Maybe yes, but not for marriage market competition: If only child is girl, she goes to husband's family and won't be available to provide old-age support. Parents had better save more for retirement.

Event Study

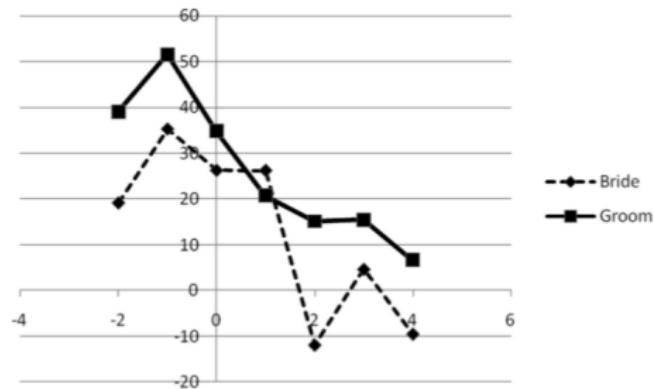


FIG. 2.—Time profile of household savings rate in relation to the timing of a wedding: evidence from 26 natural (three administrative) villages in Guizhou Province. Authors' calculation based on surveys designed by one of the authors and conducted by IFPRI.

Key Empirical Results

- Data is from 122 rural counties and 70 cities. Just finding that households with sons save more than those with daughters is not compelling evidence.
- Compelling evidence is this:
 - Compare two households of sons that are identical in all respects except one lives in a high sex imbalance location and the other lives in a low sex imbalance region.
 - Make them identical by regression with controls for local income, social safety net, age profile of local population, province and year fixed effects.
 - Key result (from their Table 5)

	FULL SAMPLE	
	Son (1)	Daughter (2)
Local sex ratio (county level)	1.34** (.52)	-.17 (.55)
Per capita income (log)	2.88** (.63)	2.49** (.45)
Per capita income squared (log)	-.15** (.04)	-.12** (.03)
Child aged 5–9	.01 (.10)	-.03 (.08)
Child aged 10–14	-.07 (.10)	-.14 (.09)
Child aged 15–19	-.23* (.12)	-.20* (.11)
Household head age	.00 (.01)	.01 (.01)