“Growing Pains” in China’s Social Security System

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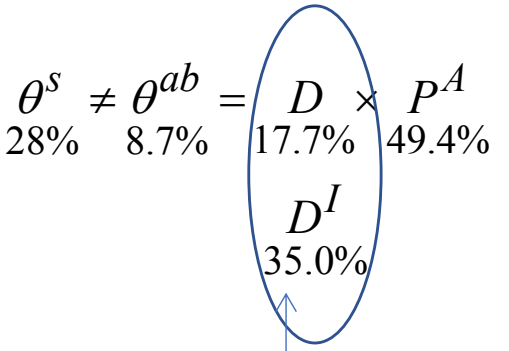
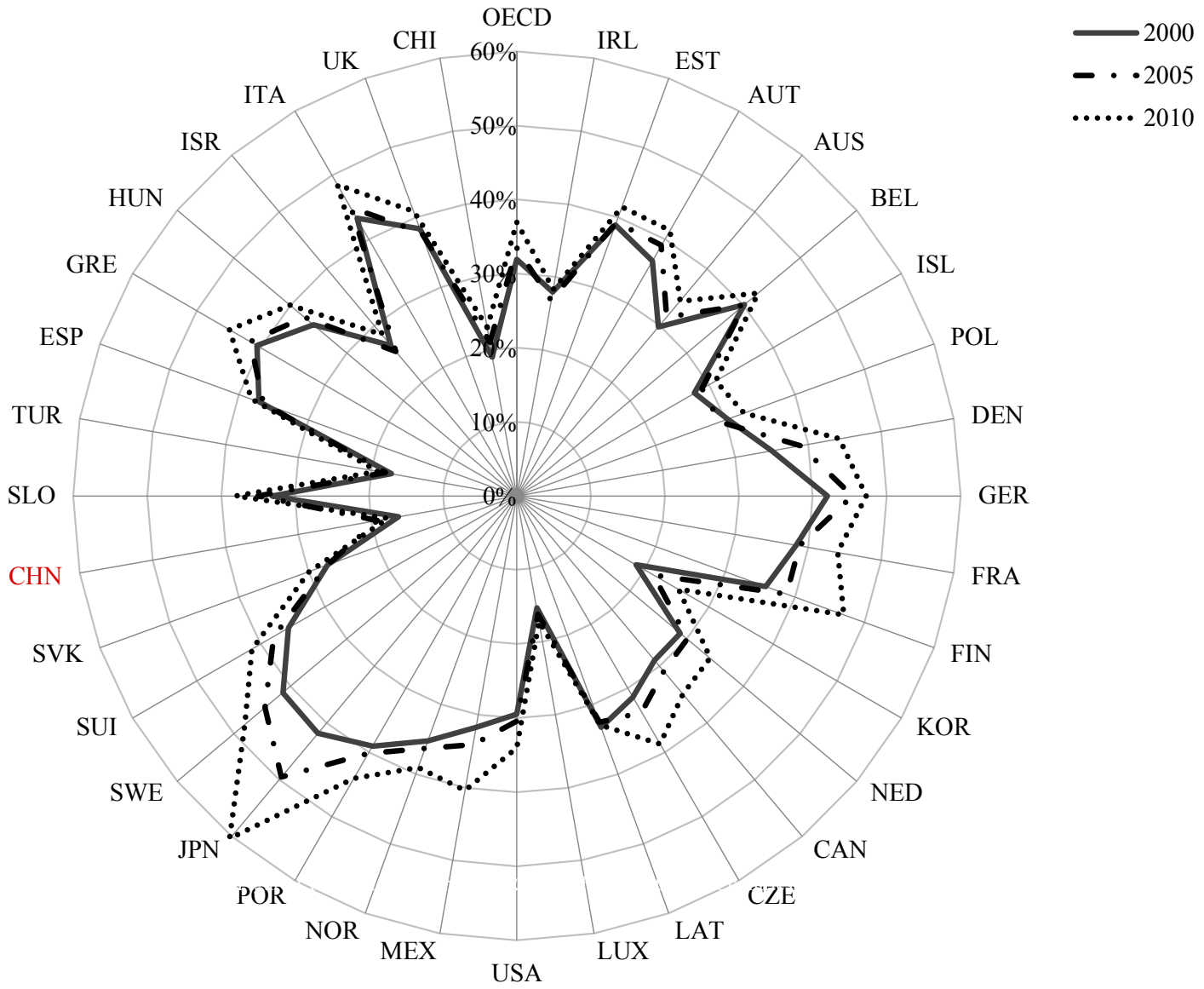
Introduction

- It seems that China's Social Security System is disappointing and confusing



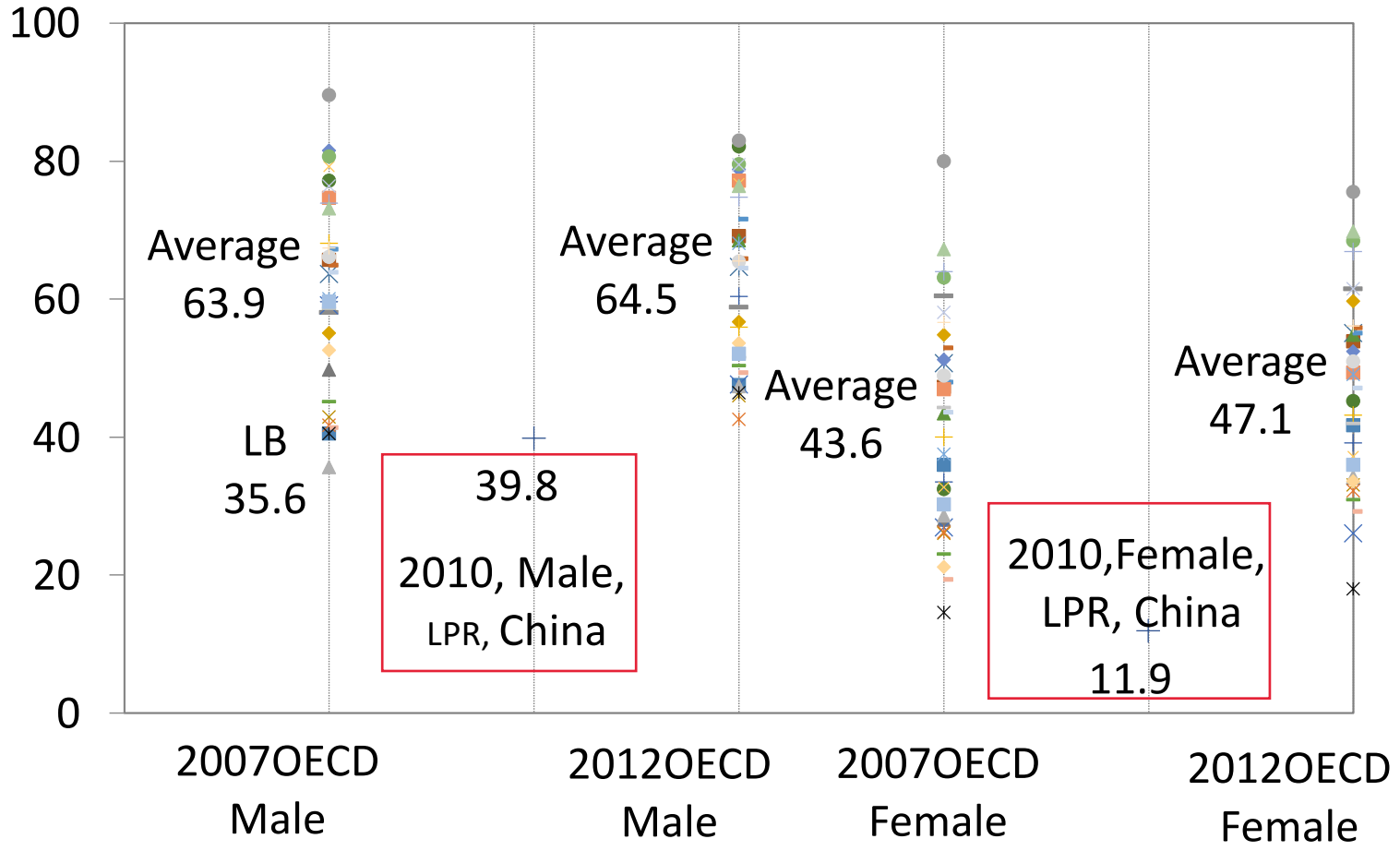
- Puzzle 1
  - High Statutory Contribution rate (28%!)
  - Relatively low Pension Benefit Rate
  - Relatively young demographic structure
  - Social Security Fund is in deficit since 2014
- Puzzle 2
  - Low labor participation rate and early retirement as a developing country
- Serious deviations of two pairs of indicators
  - Population Dependency Rate (1:5.65) vs. DR in pension system (1:2.86)
  - Pension Benefit Rate (49%) vs. Pre-retirement Replacement Rate (74% and maybe more)

Dependency Ratio: China vs. OECD



LPR of the Old: China vs. OECD

- Labor Participation Rate (Age 55-64)



Source: OECD "Pension at a glance" and 2010 population census

LPR in Different Age Groups in China

Average LPR decreased from 26.97% → 25.25%
Life Expectancy increased from 71.4 → 74.83

2010 Census	50-54	55-59	60-64	55-64	65+
Male	0.753	0.547	0.184	0.398	0.055
Female	0.296	0.15	0.075	0.119	0.02
2000 Census	50-54	55-59	60-64	55-64	65+
Male	0.754	0.551	0.239	0.399	0.101
Female	0.339	0.181	0.096	0.139	0.038

Source: 2000 population census and 2010 population census

Benefit Replacement Relative to Pre-Retirement Income

Pre-Retirement Income	CHARLS2011	CHARLS2013	CFPS2012
Low Income Group	288.3	339.4	176.3
Medium Income Group	147.0	122.9	102.7
High Income Group	100.5	97.6	71.3
Obs.	169	358	67

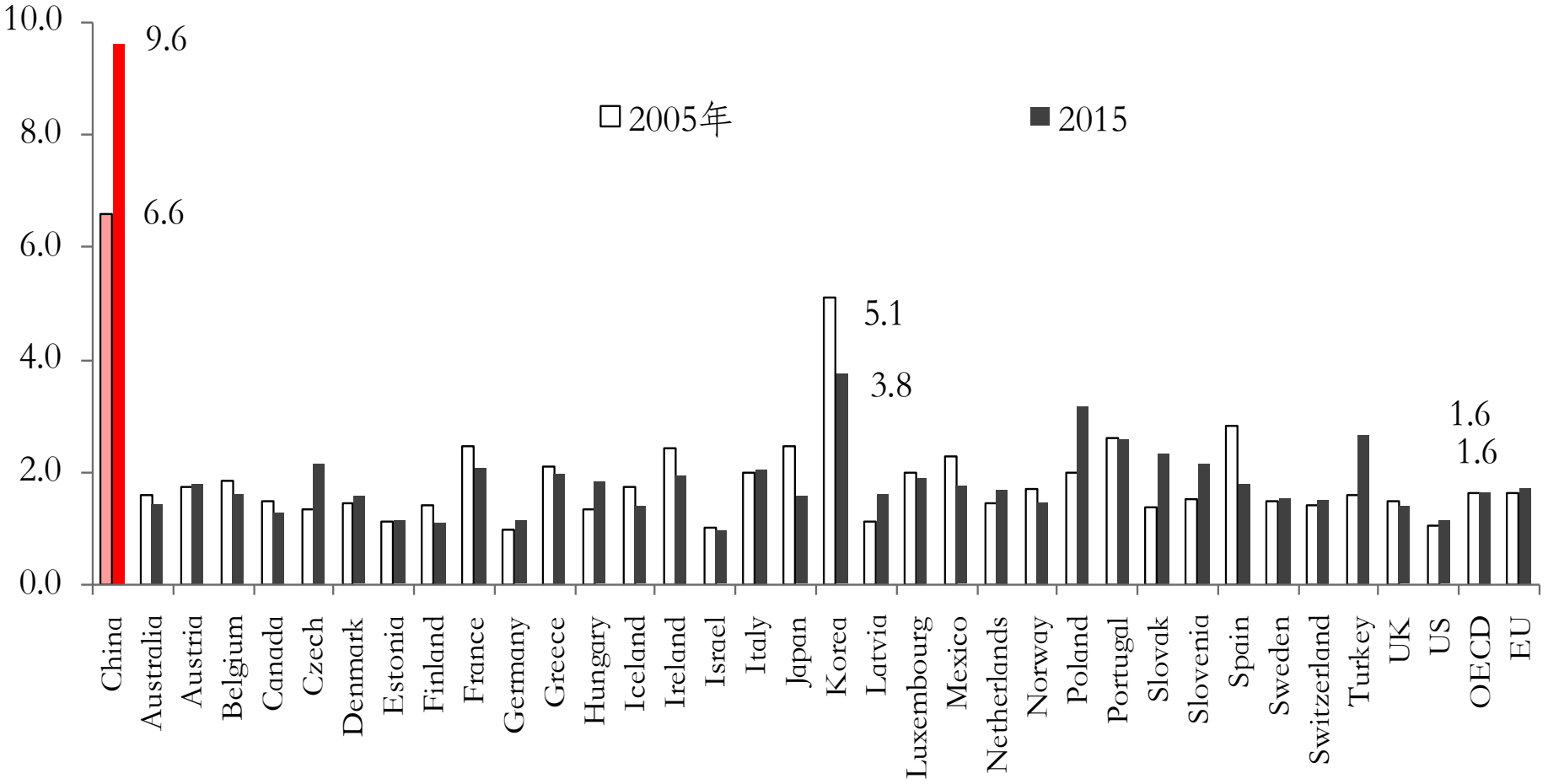
Key to Our Story

- Productivity Growth Across Chinese Cohorts are Particularly Fast!

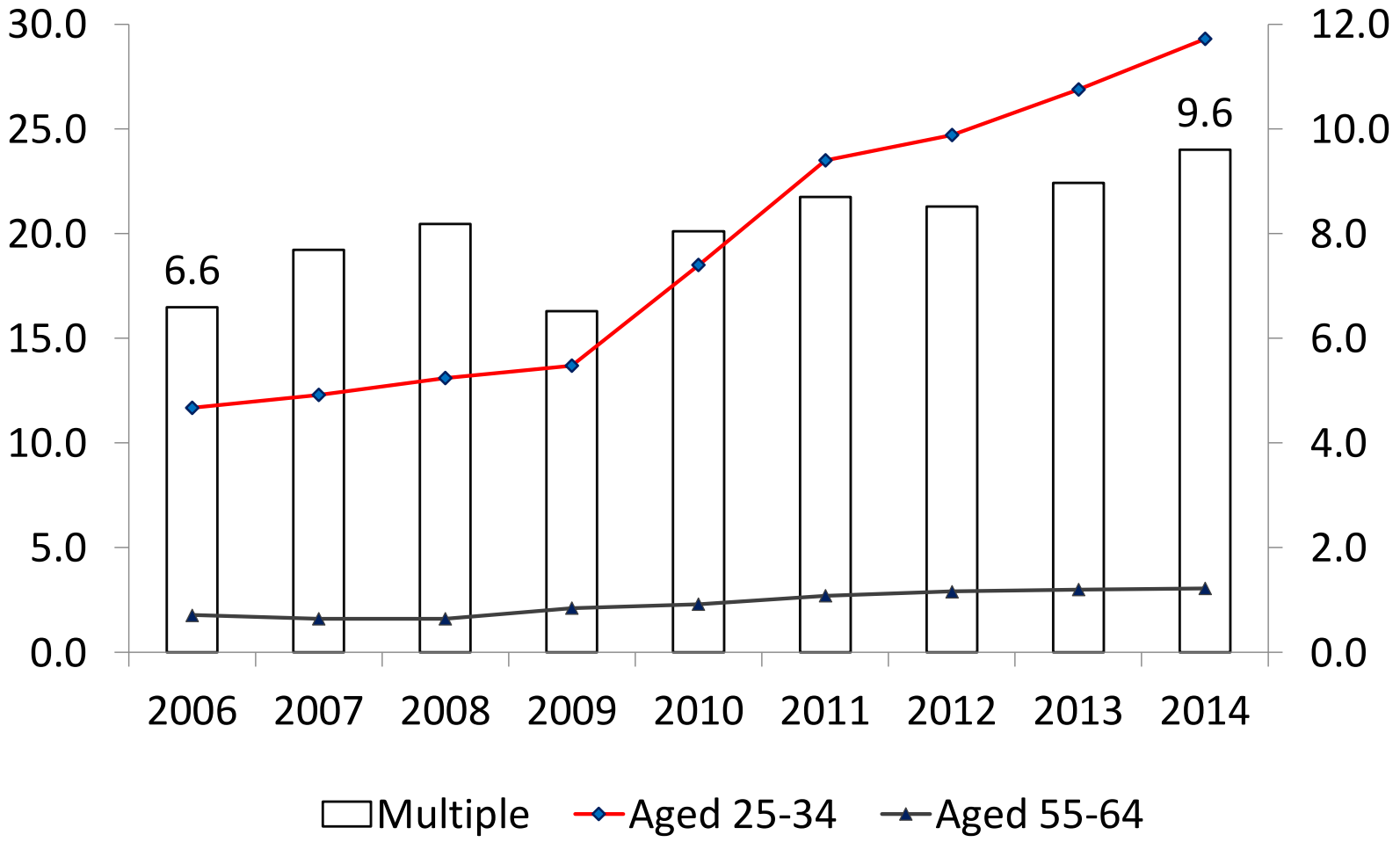
1. Much higher multiple of college educated young (25-34 yr olds) to college educated old (55-64 yr olds): the multiple increased from 6.6 to 9.6;
2. The cross sectional Wage-Age Profile peaks in China at much earlier age: 32 (2014 CFPS data); (vs. US, peaked in 47);
3. The peak age in China was moving earlier (documented in another paper, Fang and Qiu, 2018).

Note: Cross-Sectional Wage-Age profile can be used to separately identify cohort to cohort productivity growth and returns to experience.

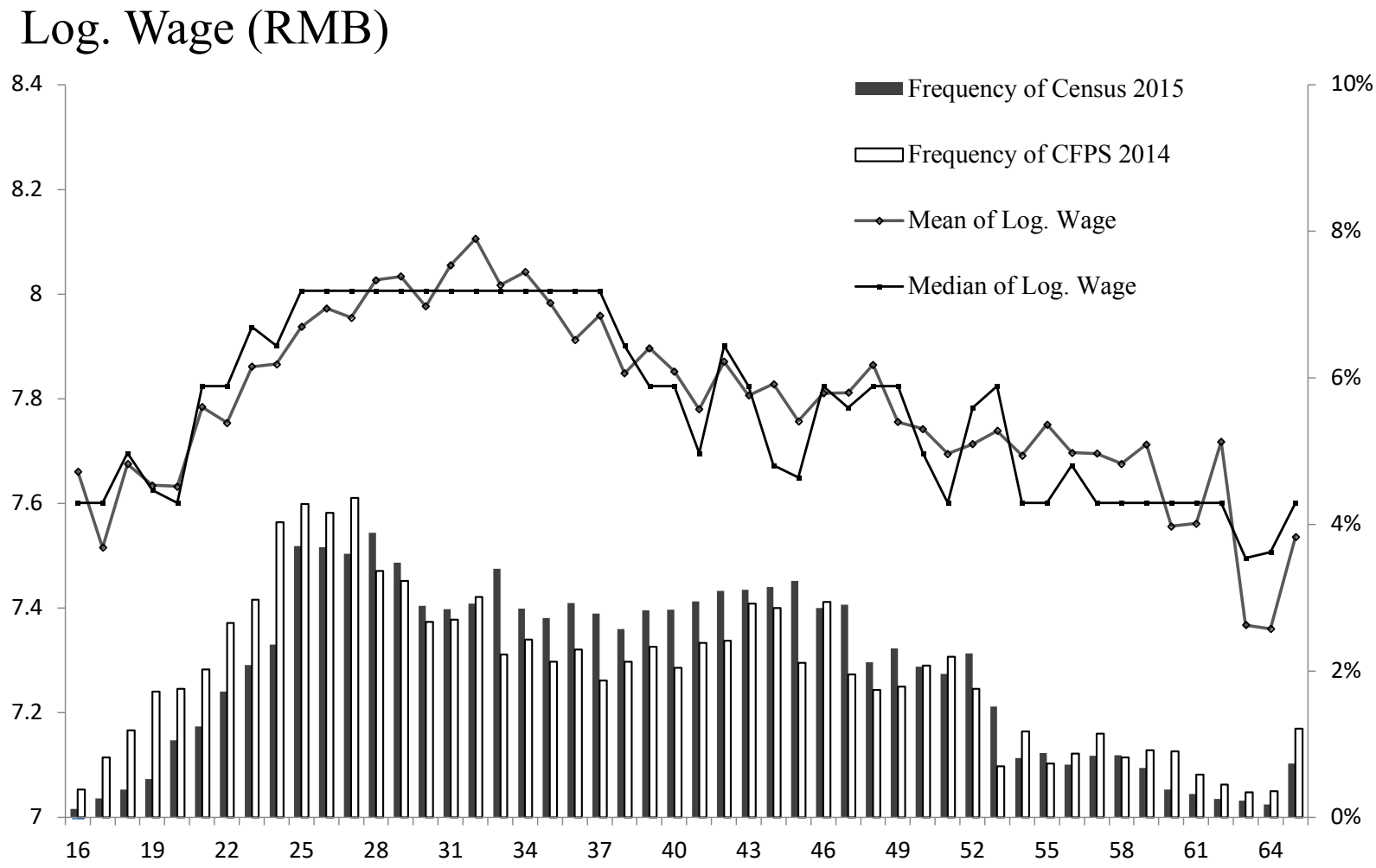
Multiples of Highly-Educated Among Young (25-34) and Old (55-64)



College educated young worker/College educated old worker: Time Trends in China



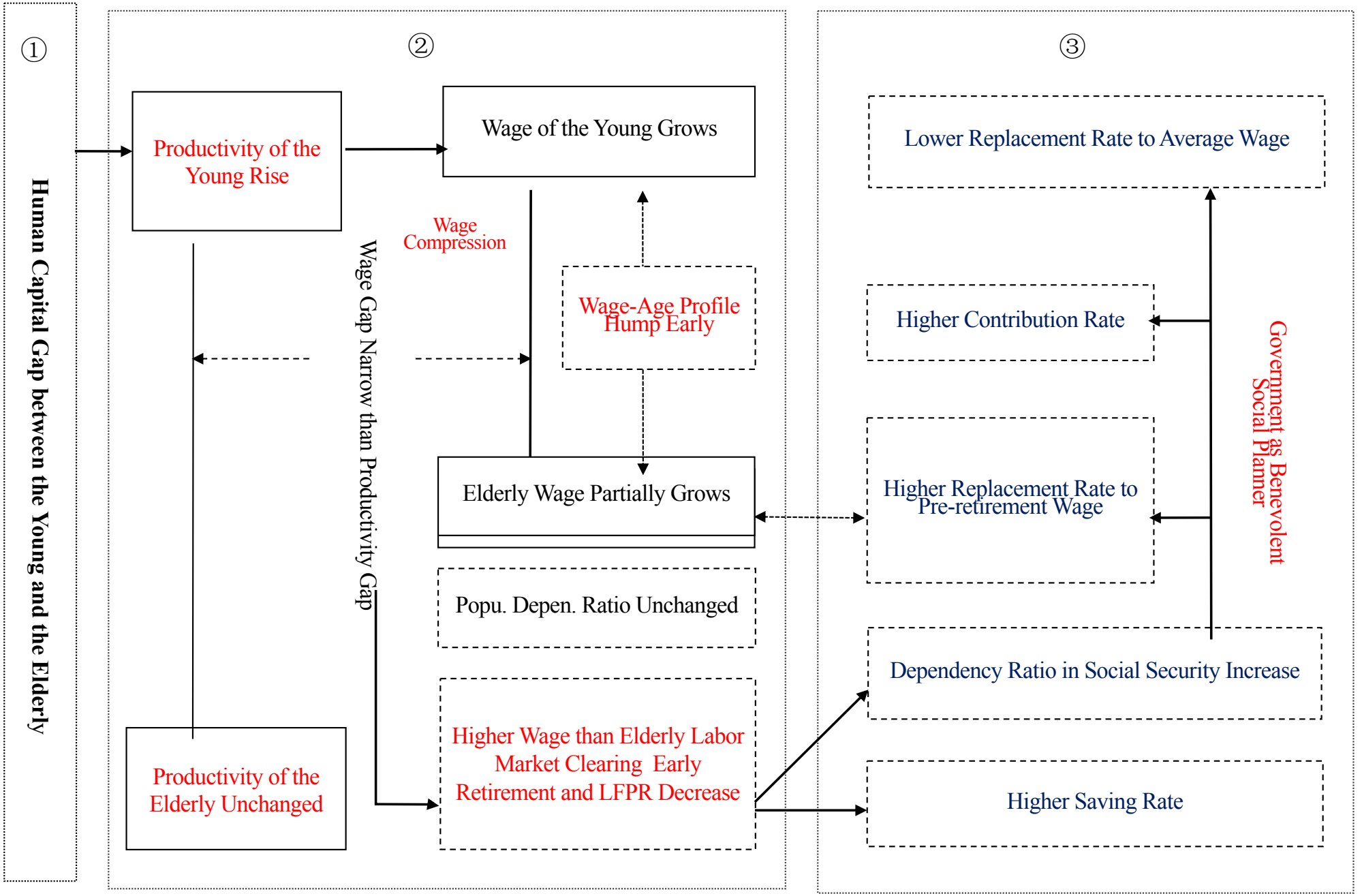
Wage-Age Profile in CFPS Data



How to Fit All These Facts Together?

- Blaming the Defects of Chinese Social Security System?
  - Low pensionable age;
  - Contribution evasion or avoidance;
  - Insufficient link between contribution and benefits;
  - No strict eligibility scrutiny;
  - Generous pension benefit
  - Population Ageing
- Problems with the These Explanations
  - Fragmented explanation; can’t fit all the facts
  - Eg. Low pensionable age: why not reform? Why early retirement with such a low pensionable age? Why decreasing LPR?

Key Mechanism of the Model



Key Mechanism in Words …

- Fast productivity progress of the young generation vs. old generation is the key driving force of the model.
  - Thus the word "Growing Pains" in the title.
- Wage compression (e.g., due to fair-wage hypothesis) leads to the wage of the old to be higher than the market clearing wage (similar to the efficiency wage hypothesis);
- The old's employment is rationed as a result – namely, low LFPR for the old results from the labor demand side;
- As a result, the in-system dependency ratio is high even though the population-wide dependency ratio is low;

Key Mechanism in Words …

- The old saves more because of the longer time in retirement.
- Contribution rates of the workers must also be higher as a result.
- Our explanation does not reply on:
  - Population ageing (such as prolong life expectancy and descend TFR)
  - Defects of social security system

An Illustrative Model

- Consider a two-period Overlapping Generations (OLG) model;
- First period: youth, length of the period normalized to 1;
- Second period: old, length of the period T;
- Time is indexed by t;
- At time t, youth population: N_t^y
- Old population N_t^o
- Population growth: N_t^y=(1+n) N_t^o
- Population Dependency Ratio: $\frac{T}{1+n}$

An Illustrative Model

- Period-*t* firms solve

$$\max_{L_t^y, L_t^o} \Pi_t = \left(H_t L_t^y\right)^\gamma + \left(H_{t-1} L_t^o\right)^\gamma - W_t^y L_t^y - W_t^o L_t^o$$

- Where H_t is the human capital of youth at time t and H_{t-1} is that for the old: $H_t = (1+g)H_{t-1}$;
- L_t^y and L_t^o are the labor supply of young and old, respectively;
- For simplicity, suppose that wage for the youth W_t^y is such that the market for youth labor clears, i.e. $L_t^y = N_t^y$. The youth wage must satisfy:

$$\ln W_t^y = \ln\gamma + \gamma \ln H_t + (\gamma - 1)\ln L_t^y$$

An Illustrative Model

- However, suppose for whatever reason (later we will provide a micro-foundation based on fair-wage hypothesis), there is wage compression and the old workers' labor market does not clear

$$\ln W_t^o = M\left(W_t^y\right) = \ln\phi + \kappa \ln W_t^y$$

Where $\kappa \in (0,1)$.

- This, together with the firms' labor demand function

$$\ln W_t^o = \ln\gamma + \gamma \ln H_{t-1} + \left(\gamma - 1\right)\ln L_t^o$$

which implies that the fraction of old that will be employed

$$\pi_t^o = \frac{L_t^o}{N_t^o} \in (0,1)$$

and $\varepsilon(\pi_t^o, 1+h) < 0$ where $1 + \mathrm{h} = (1 + \mathrm{g})^{\gamma}$.

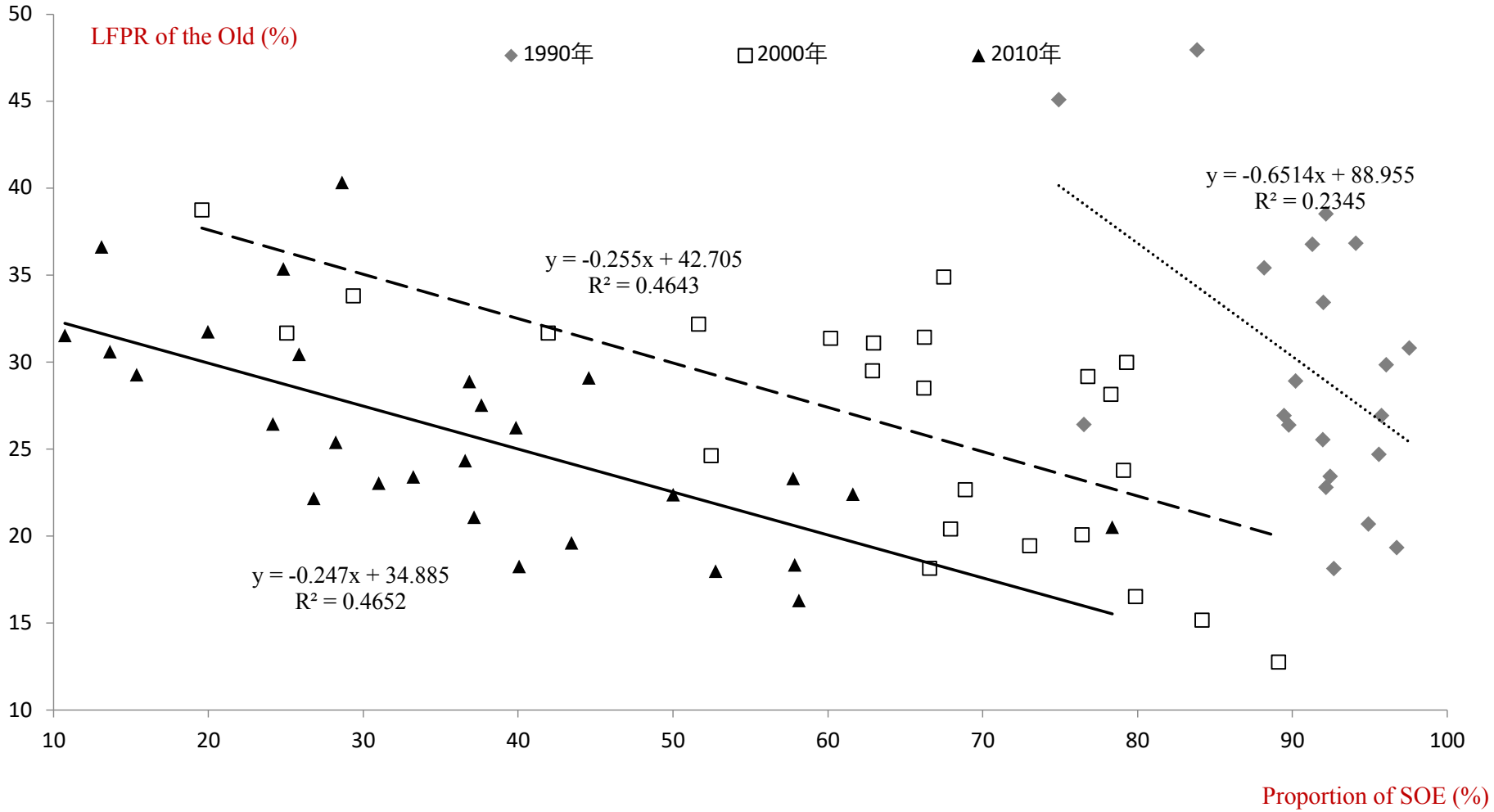
Summary

- Due to the high intergenerational growth in human capital ($H_t = (1+g)H_{t-1}$; high g), any mechanism that may lead to "wage compression" – namely, wage difference is smaller than the productivity difference – will result in low labor demand for the old, i.e. low π_t^o);
- Low π_t^o in term implies:
  - A low actual retirement age: $R^A = 1 + T\pi_t^o$.
  - A high in-system dependency ratio

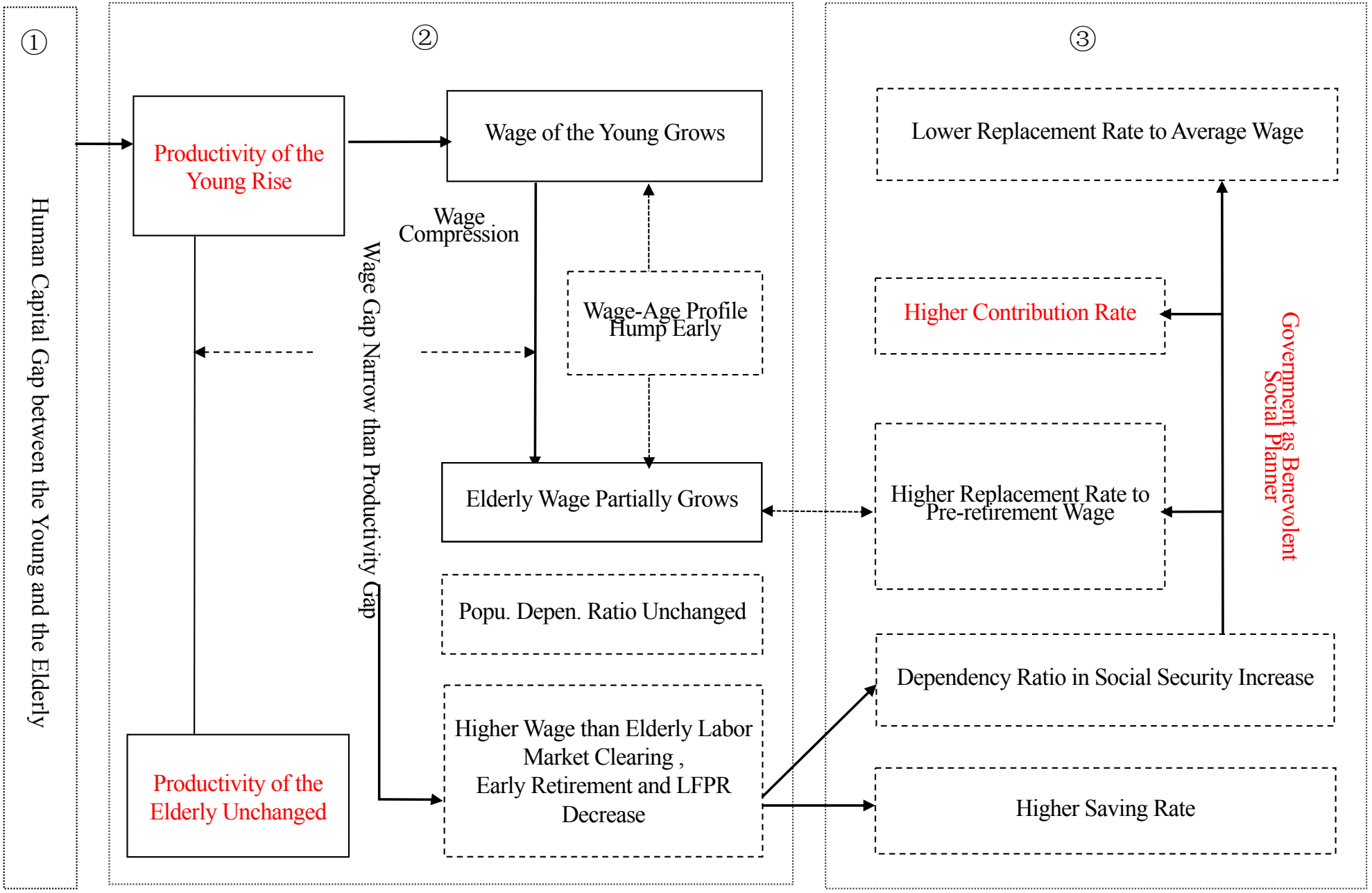
$$D_t^I = \frac{(1-\pi_t^o)TN_t^o}{N_t^y + \pi_t^o TN_t^o}$$

Even though the population wide dependency ratio $\frac{T}{1+n}$ does not change.

Wage Compression via SOE: A Possible Mechanism (CFPS Data)



Key Mechanism of the Model



An Illustrative Model (Continued)

- Now we can examine the third part of the key mechanism: to determine the optimal contribution rate θ.
- We follow the model of Feldstein (1985): The Optimal Level of Social Security Benefits (QJE).
- Timing:

1. Government sets contribution rate;
2. Firms and workers then decide on labor supply and demand.

- Suppose the contribution rate is θ, then the retirees' benefit level is $P_t = \frac{\theta \overline{W_t}}{D_t^I}$ where

$$\bar{W}_t = \frac{N_t^y W_t^y + N_t^o \pi_t^o W_t^o}{N_t^y + N_t^o \pi_t^o} = \frac{(1+n) W_t^y + T \pi_t^o W_t^o}{\left[(1+n) + T \pi_t^o\right]} = \delta_t^y W_t^y + \delta_t^o W_t^o$$

is the average social wage.

An Illustrative Model (Continued)

- Following Feldstein, assume myopic individuals for now (in the full model, we will consider optimal saving), and suppose that they have log utility function. The social planner's problem is

$$\max_{\theta} SW_t = N_t^y \ln\left[(1-\theta)W_t^y\right] + N_t^o T\pi^o \ln\left[(1-\theta)W_t^o\right] + N_t^o T\left(1-\pi^o\right)\ln\left(P_t\right)$$

- The optimal contribution rate is

$$\theta^* = \frac{T(1-\pi^o)}{1+n+T}$$

And the optimal benefit replacement rate relative to social average wage is

$$P^{a*} = \frac{\theta}{D^I} = \frac{1+n+T\pi^o}{1+n+T}$$

Summary

- Due to the high intergenerational growth in human capital, the optimal contribution rate will be high, and optimal benefit replacement relative to the social average wage will be low;
- However, the benefit replacement relative to pre-retirement wage W_t^o, denoted by P^p, can increase with *h*. To see this, note

$$P^p = \frac{P_t}{W_t^o} = \frac{P_t}{\overline{W_t}} \frac{\overline{W_t}}{W_t^o} \approx P^a \frac{W_t^y}{W_t^o}$$

Where the approximation is based on the fact that the fraction of old labor in the economy is relatively small (for example, in CFPS data, workers older than 50 accounts for about 14% of the total labor).

General Model

- Explicitly consider a micro-foundation for the wage compression based on fair-wage hypothesis (Summers, 1988; Akerlof and Yellen, 1990).
  - Old workers decide on effort choice, and the cost of effort is a function of the old wage relative to a reference wage.
  - Consider two specifications of reference wages: (1) a function of the wage of the young; (2) a function of the social average wage.
- Model workers' saving decisions explicitly.
  - Shows that the earlier retirement of the old also leads them to save more when they are working.
  - Can be a reason for the "high savings rate puzzle" in China.
- All the qualitative predictions of the illustrative model regarding the impact of a higher rate of intergenerational growth of human capital g carries over to the general model.

Calibration for the Two-Period Model

- Yong: 20-49 Yr olds;
- Old: 50-74 Yr olds.
- → T = 25/30=0.833
- Population dependency ratio from 2015 1% Population Survey: 0.484
- T/(1+n) = 0.484 → 1+n = 1.721

- Etc.

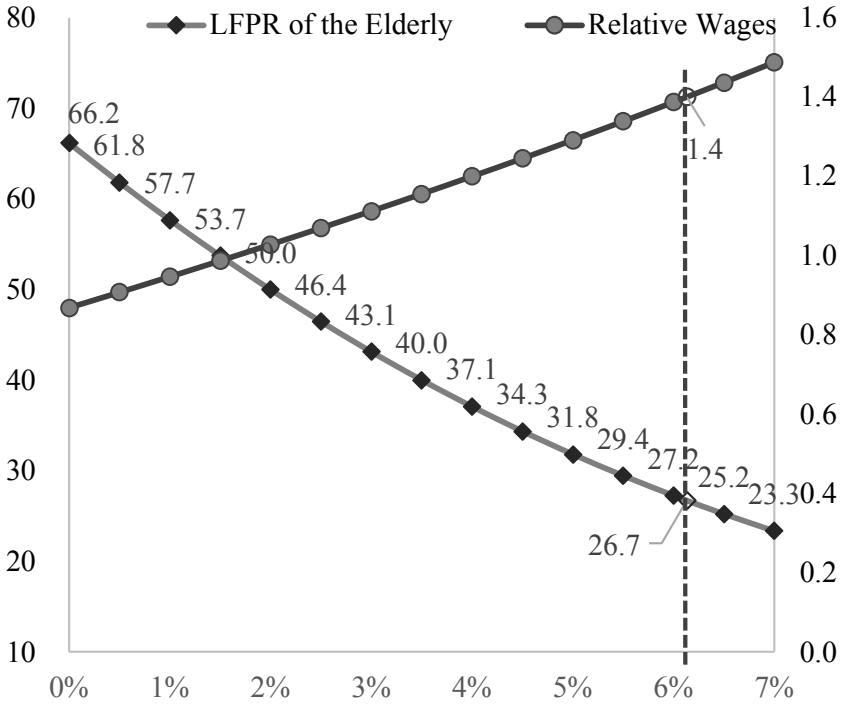
Calibration of the General Model

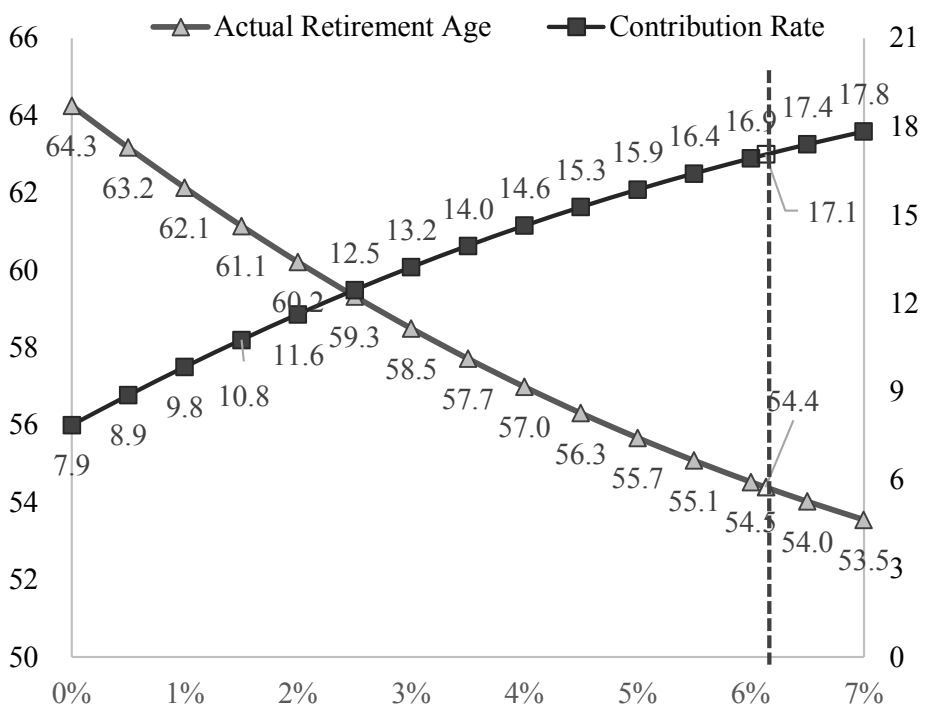
Calibration and Simulation			
Parameters			
T	0.833	T/(1+n): $\frac{POP\ 50-74}{POP\ 20-49}$	0.484
1+n	1.721	γ: labor share	0.551
λ	0.445	1+g	4.985 (annual: 6.13%)
Targeted Moments		Calibrated Exogenous Variables	
π^o	0.267	φ/(1-α)	1.332
D^I	0.337	π^γ	0.924
P^a	0.506	ϕ	0.626
w^γ	1.000	A	2.048
w^γ/w^o	1.400	$(Xe)^\gamma$	0.777
Other Endogenous Variable: Non-Targeted			
1+r	8.580	k	0.169
R^A	54.39	θ	0.171
s	0.163	P^p	0.684
W	0.965	P^n	0.824
δ^γ	0.877	C^γ	0.909
ε(1+ω,1+h)	0.503	ε(θ,1+h)	0.403
$\varepsilon(\pi^o,1+h)$	-1.107	ε(s,1+h)	0.403
$\varepsilon(R^A,1+h)$	-0.215	$\varepsilon(P^a,1+h)$	-0.136
ε(D,1+h)	0.000	$\varepsilon(P^p,1+h)$	0.402
$\varepsilon(D^I,1+h)$	0.539	$\varepsilon(P^n,1+h)$	0.485

Non-Targeted Moments: Model vs. Data

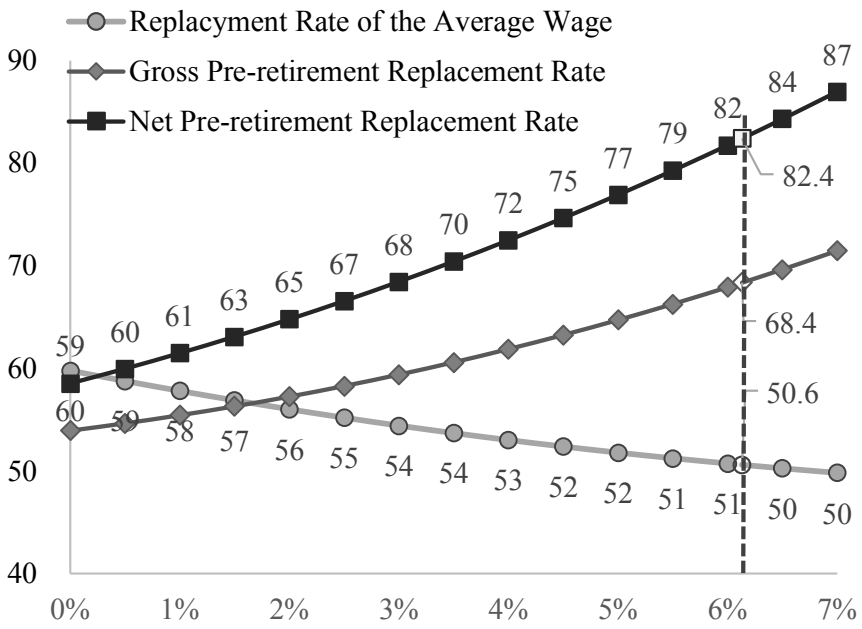
Endogenous Variable		Model	Data	Data Source
R^A	Actual Retirement Age	54.39	54	Ministry of Human Resources and Social Security
θ	Contribution Rate	17.1%	16.0%	NBS
P^p	Gross Benefit Retirement Rate Relative to Pre-retirement Wage	68.4%	74.0%	OECD《Pension at a Glance》
P^n	Net Benefit Retirement Rate Relative to Pre-retirement Wage	82.4%	81.0%	OECD《Pension at a Glance》
δ^y	Fraction of Youth Employment	87.7%	83.1%	CFPS，2014
C^y	Youth Income Share	90.9%	86.2%	CFPS，2014

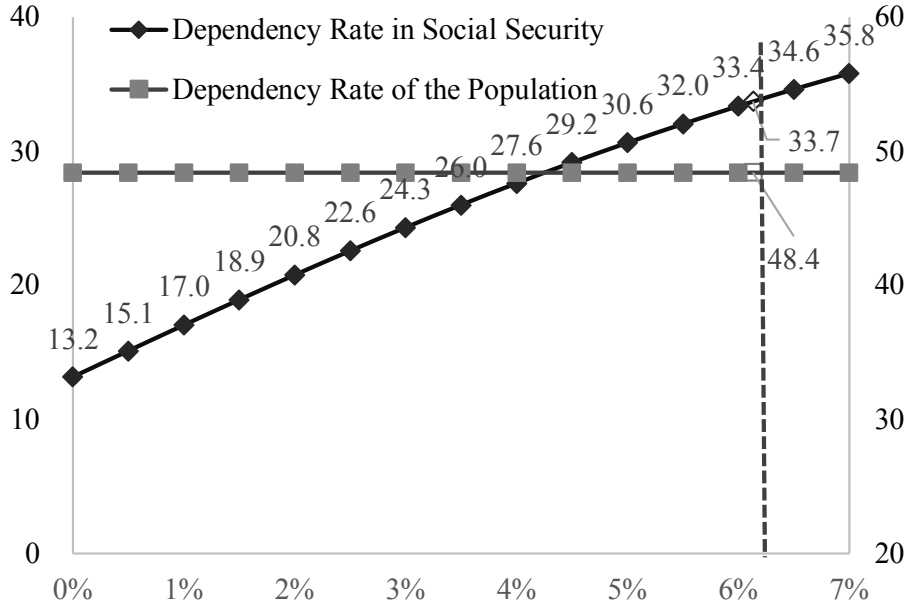
Model Simulation with Different g Values: actual g: 6.13% annual





Model Simulation with Different g Values: actual g: 6.13% annual





Delaying the Retirement Age

- One of the most prominent proposal to address the fiscal imbalance of China's Social Security is to delay the retirement age;
- In this paper, the policy parameter of the social security, namely the contribution rate, is chosen to maximize the social welfare;
- Retirement age is an endogenous equilibrium outcome of the system given the policy parameter;
- Low actual retirement age is the result of high human capital growth in China + "wage compression";
- Problems facing China's Social Security System is a "Growing Pain"!

Delaying the Retirement Age

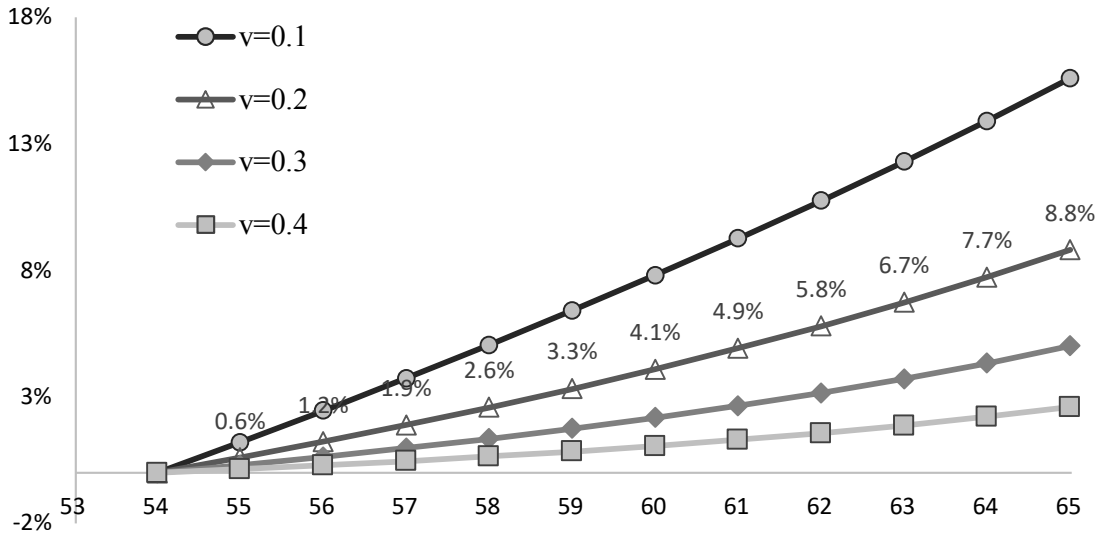
- In this OLG model, the retirement age is given by $R^A = \pi^y + T\pi^o$
- Suppose that the government sets a minimum retirement age of

$$\hat{R}^A = \pi^y + T\hat{\pi}^o$$

where $\hat{\pi}^o > \pi^o$ is the extent of the mandated delay of retirement.

- If the old does not work between π^o and $\hat{\pi}^o$, he/she has to rely on personal savings.
- Life cycle savers will be able to undo the effect of the policy change, if the retirement benefits proportionately increase at retirement
- For myopic workers, such a delay can be welfare decreasing, depending on what social safety net program is introduced to finance the non-workers between π^o and $\hat{\pi}^o$.

Welfare Loss from Delaying Retirement Age
v: fraction of welfare support when not eligible for SS



$$p = \left\{\theta\left[(1+n)\pi^{y}W_t^{y} + T\pi W_t^{o}\right] - T(\hat{\pi}^{o} - \pi^{o})\tilde{c}\right\}/T(1-\hat{\pi}^{o})$$

Summary

Empirical Facts	Model*	Theory**	Empirical Facts	Model	Theory
Human Capital Growth	√	√	Increasing TFP	√	√
Intergenerational Education Achievement Difference		√	Increasing Intergenerational Education Achievement Difference		√
Hump Shaped Cross Sectional Wage-Age Curve	√	√	Earlier Hump in the Cross Sectional Wage-Age Curve		√
Low LFPR of the Old	√	√	Decreasing LFPR of the Old		√
Low Retirement Age	√	√	Old LFPR Regional Difference		√
Early Retirement and Hidden Retirement		√	Obstacles in the Reform to Delay the Retirement Age	√	√
High Savings Rate	√	√	Obstacles to the Systemic Reform of the Social Security System		√
High Contribution Rate	√	√	Social Security Imbalance	√	√
Low Replacement Rate Relative to Social Average Wage	√	√	High Replacement Rate relative to Pre-Retirement Wage	√	√
Low Population Wide Dependency Ratio	√	√	High In-System Dependency Ratio	√	√

Conclusion

- We present a simple theory to explain many puzzling facts related to China's Social Security System
- The theory is built on two legs: (1) very high intergenerational human capital growth; (2) mechanisms (e.g. fair wage hypothesis) that may lead to wage compression.
- Most of the problems associated with China's social security system is "growing pains": high intergenerational human capital growth!
- Welfare implication: reforms to delay retirement age will hurt welfare because of lack of labor demand.
- Complements other explanations such as: population ageing, and various defects of social security system （e.g., Contribution evasion or avoidance, low contribution-benefit relation， low pensionable age， not strict eligibility scrutiny， empty individual account）

Thank you!