Breaking the "Iron Rice Bowl:" Evidence of Precautionary Savings from Chinese State-Owned Enterprises Reform[1]

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[1]The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of San Francisco.

The elusive quest for precautionary savings?

- Precautionary savings (PS) potentially important for wealth accumulation, esp. for a country with structural changes (China)
- But it's difficult to estimate importance of PS:
  1. Hard to identify large and exogenous variations in income uncertainty (Kennickell and Lusardi, 2005, Carroll and Samwick 1998)
  2. Hard to separate risks from risk attitude – self-selection bias (Fuchs-Schündeln and Schündeln, 2005)
  3. Hard to disentangle uncertainty from income expectations (PS or PIH?)
- Estimates of PS range from very small (Dynan 1993; Guiso, et al. 1992) to very large (Carroll-Samwick 1998; Gourinchas-Parker 2002)

Contributions

1. Identify income uncertainty using SOE reform as a natural experiment: massive layoffs hit SOEs but not GOV

2. Correct self-selection bias related to occupational choice: focus on government-assigned jobs

3. Disentangle PS from PIH effects: use information on household income expectations

Main finding: PS accounts for 30% of wealth accumulation of urban SOE workers from 1995 to 2002 (about 6 months of annual income)

Why is SOE reform a good experiment to use?

- It was big: about 27 million SOE workers were laid off between 1997 and 2002 (*China Labor Statistics Yearbook* 2003)
- It was largely exogenous and unexpected to individual workers
- It created significant cross-sectional variations of job uncertainty
  - Treatment (SOE): unemployment risk ↑
  - Control (GOV): iron rice bowl kept

Empirical strategy

- Build on models of precautionary savings (Lusardi, 1998; Carroll, Dynan, and Krane, 2003):

$$\frac{W_i}{P_i} = \beta_0 + \beta_1 SOE_i + \beta_2 RISK_i + \beta_3 \log(P_i) + \beta_4' Z_i + v_i$$

  - Key coefficient β_1: effects of job uncertainty specific to SOE workers
- Estimate model separately before and after SOE reform
- Identification: diff-in-diff
  - Precautionary savings: $\beta_1^{after} - \beta_1^{before} > 0$

The SOE Reform

Pre-reform: Iron Rice Bowl

"Cradle-to-grave" socialism under central planning regime:

- SOE workers and government employees enjoyed similar job security and benefits
- Jobs in both sectors were mostly assigned by government
- Guaranteed employment and pension; near-free housing, education, and health care

Breaking the Iron Rice Bowl

- Starting in late 1990s, many loss-making SOEs were shut down or privatized
- From 1997 to 2002, over 27m SOE workers were laid off
  - ▸ Massive layoffs
  - ▸ Who were laid off?
- During same period, GOV workers kept the iron rice bowl
  - Among individuals who experienced layoffs prior to 2002, 58% worked in SOEs vs 2.3% in government

" UH OH...IT LOOKS LIKE BOB GOT HIS PINK SLIP! "


G Man
SOE
PHEW!
" UH OH...IT LOOKS LIKE BOB
GOT HIS PINK SLIP! "

The Data

Data

- Chinese Household Income Project surveys (CHIP)
- Conducted by Chinese Academy of Social Science and National Bureau of Statistics (NBS) in 1988, 1995, 2002, and 2007
- Nationally representative and covering 15,000 to 20,000 households in more than 10 provinces
- Focus on CHIP surveys in 1995 and 2002: before and after the SOE reform
  - Focus on prime-aged workers (25-55 years old) in SOE and GOV

Summary statistics: 1995 vs. 2002

Variable	1995		2002	
	Obs.	Mean	Obs.	Mean
Financial wealth	4390	10042	3027	32826
Annual income	4390	7034	3027	12985
SOE	4390	67.8%	3027	56.2%
CV$\times$100	4390	2.61	3027	2.9
Male	4390	63.4%	3027	68.8%
Health Care				
Own payment	4390	9.9%	3027	23.1%
Public health care	4390	71.3%	3027	35%
Health insurance	4390	8.8%	3027	41.9%
Home ownership rate	4390	42%	3027	80.4%
Job assigned by Gov.	4375	82.9%	3018	71.9%

Source: CHIP

Summary statistics: GOV vs. SOE

		1995			2002		
	Variable	**Obs.**	**Mean**	**SD**	**Obs.**	**Mean**	**SD**
GOV	Financial wealth	1414	10457	10205	1325	34677	32351
	Annual income	1414	7545	3214	1325	14752	6698
	W/P	1414	1.376	1.386	1325	2.559	2.360
	Non homeowners	1413	0.546	0.498	1325	0.165	0.372
	Job assigned	1409	0.893	0.309	1319	0.757	0.429
	Exp. income loss	N.A	N.A	N.A	1321	0.114	0.318
SOE	Financial wealth	2976	9845	10141	1702	31386	31910
	Annual income	2976	6791	3385	1702	11610	6294
	W/P	2976	1.382	1.448	1702	2.703	2.906
	Non homeowners	2977	0.597	0.491	1702	0.220	0.414
	Job assigned	2966	0.798	0.401	1699	0.689	0.463
	Exp. income loss	N.A	N.A.	N.A.	1699	0.238	0.426

Source: CHIP

Empirical Results

Baseline estimation results

Dep. variable:	1995		2002	
W/P	Full sample	Assigned jobs	Full sample	Assigned jobs
SOE	0.039	0.090	0.327*	0.723**
	(0.114)	(0.117)	(0.221)	(0.298)
CV×100	0.136***	0.111***	0.091***	0.124***
	(0.038)	(0.040)	(0.028)	(0.045)
Controls	Y	Y	Y	Y
Chow-test for SOE				
(p-value)			0.247	0.048
Log-Likelihood	-8875.88	-7167.03	-8240.22	-5803.38
Sample size	4390	3627	3027	2170

Controls: age, gender, occupation, skills, health care access, marriage, children, #boys, HH size, homeownership, and industry/province dummies. ▸ Estimation details

Identifying PS

- All else equal, SOE workers saved slightly more than GOV workers in 1995 ($\beta_1 = 0.039$), but difference insignificant
- SOE workers saved significantly more than GOV workers in 2002 ($\beta_1 = 0.327$)
- $\triangle\beta_1$ identifies diff in W/P due to SOE reform (0.327-0.039=0.288, or 3 months of income)

Self-selection bias (SSB)

- Self selection: occupational choices may be correlated with risk preferences
- Self-selection causes significant downward bias in estimating PS (Fuchs-Schündeln and Schündeln 2005)
- To mitigate SSB, we focus on sample with government-assigned jobs
  - Most jobs in our sample were assigned by government (83% in 1995, 72% in 2002)
  - Gov't has final say in job assignments $\rightarrow$ mitigating correlation between occupational choice and worker preferences

Identifying PS controlling for self-selection bias

Dep. variable:	**1995**		**2002**	
W/P	**Full sample**	**Assigned jobs**	**Full sample**	**Assigned jobs**
SOE	0.039	0.090	0.327*	0.723**
	(0.114)	(0.117)	(0.221)	(0.298)
CV×100	0.136***	0.111***	0.091***	0.124***
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Importance of self-selection bias

- No control for self-selection bias: PS = $0.327 - 0.039 = 0.288$
- Control for self-selection bias: PS = $0.723 - 0.090 = 0.633$
- Without controlling SSB, PS due to SOE reform would be under-estimated by 0.633-0.288=0.345 (or 4 months of permanent income)—a downward bias of about half of PS
  - Magnitude similar to Fuchs-Schündeln and Schündeln (2005)

PIH effects

- Reform might affect SOE workers' expectations of future income levels
- Lower expected future income may also raise current saving, but such saving reflects wealth effects (or PIH effects): different from PS
- Current estimation mixes PS and PIH effects

How to disentangle PS from PIH?

- 2002 CHIP survey reported households' expected income for next five years: up, down, or unchanged (not reported in 1995 survey)
- We focus on households who expect non-declines in income
- Estimates of PS likely a lower-bound:
  - HH who expected income to fall excluded from sample, but they likely have higher unemployment risks
  - HH who expected income to rise included in sample, but they likely save less

Regression for 2002 sample controlling for PIH effects

	Expected future income	
Dep. variable: W/P	**Decline**	**Non-decline**
SOE	1.257**	0.603**
	(0.531)	(0.305)
CV×100	0.120**	0.123***
	(0.061)	(0.046)
Controls	Y	Y
p-value of Chow test for SOE	0.032	0.116
N	1284	1876

Note: Sample restricted to government assigned jobs (to control for self-selections).

Quantify Precautionary Savings

- With SSB and PIH both controlled, PS = 0.603-0.09=0.513 (6 months of income)
- Steps to calculate importance of PS:
  1. Calculate mean predicted wealth holdings of SOE HH from estimated model: $\hat{W}_t^{soe}$
  2. Calculate *counterfactual* wealth holdings by SOE HH had they faced same job risks as in GOV (by setting $SOE = 0$): $\tilde{W}_t^{soe}$
  3. Compute magnitude of precautionary savings due to SOE reform

$$W^{ps} \equiv (\hat{W}_{2002}^{soe} - \tilde{W}_{2002}^{soe}) - (\hat{W}_{1995}^{soe} - \tilde{W}_{1995}^{soe})$$

- Contributions of PS to SOE HH wealth accumulation: 30% (likely lower bound)

$$\frac{W^{ps}}{\hat{W}_{2002}^{soe} - \hat{W}_{1995}^{soe}} = 0.303 \quad (s.e. = 0.166)$$

Robustness

Robustness

- Worker composition effects
  - survival bias
  - voluntary quits
- Other robustness checks:
  - Excluding zero-wealth observations
  - Conventional risk measures
  - Alternative wealth measures
  - Pension effects

For all experiments, we control for self-selection and PIH effects

Survival bias

- Workers who survived massive layoffs might be different from those before reform ▸ Who were laid off?
- We estimate prob of layoffs for SOE workers using 2002 sample, expanded to include those who had layoff experience

$$\Pr(\text{layoff}_i = 1 \mid Z_i) = \Phi(Z_i\delta + \varepsilon_i)$$

- Then impute prob of layoff for SOE workers in 1995 sample
- Keep only workers in the 1995 sample who are likely to survive reform (with prob of layoff below some threshold)

Voluntary quits

- Some workers quit from SOE for private-sector jobs (quit rate in 2002=1.88%)
- If more risk-averse workers remained in SOE, estimated PS could be biased upward
- To control for effects of quits:
  1. Expand 2002 sample to include those who had quit from SOEs to estimate probability of quitting using the Probit model

$$\Pr(\text{quit}_i = 1 \mid Z_i) = \Phi(Z_i\delta + \varepsilon_i)$$

  2. Impute probability of quit for SOE workers in 1995 sample; restrict sample to non-quitting workers to make SOE sample comparable between 1995 and 2002

Worker composition effects

A. Controlling for survival biases				
Dep. variable	1995 survival threshold			
W/P	100%	90%	80%	70%
SOE	0.090	0.122	0.192	0.195
	(0.117)	(0.122)	(0.131)	(0.133)
Controls	yes	yes	yes	yes
Sample size	3627	3415	3198	2971
B. Controlling for voluntary quits				
Dep. variable	1995 non-quit threshold			
W/P	100%	98%	96%	94%
SOE	0.090	0.119	0.066	0.076
	(0.117)	(0.125)	(0.143)	(0.151)
Controls	yes	yes	yes	yes
Sample size	3627	3582	3532	3435

Other robustness checks

Case	1995	2002	Contributions of precautionary savings
A. Eliminating zero wealth	0.100 (0.104)	0.467* (0.268)	21.8% (0.133)
B. Conventional risk measures	0.083 (0.117)	0.713** (0.346)	37.3% (0.197)
C. Very liquid assets	0.062 (0.114)	0.439* (0.248)	33.6% (0.218)
D. Non-housing non-business wealth	0.210 (0.159)	0.632* (0.355)	29.5% (0.210)
E. Pension effects	0.09 (0.117)	0.580** (0.307)	29.4% (0.172)

All estimation results here have controlled for self-selection, PIH, and pension effects.

Further Evidence

Lifecycle effects

Younger households have stronger precautionary saving motive (Gourinchas-Parker, 2002)

	2002		
Dep variable: W/P	**25-45**	**46-55**	**Full sample**
SOE	0.857**	0.193	0.603**
	(0.414)	(0.932)	(0.305)
CV×100	0.145***	0.104	0.123***
	(0.049)	(0.130)	(0.046)
Controls	yes	yes	
Sample size	1087	789	1876

PS stronger for workers in smaller SOEs

- SOE reform featured "Grasp the large, let go of the small" (Hsieh and Song, 2013)
- Workers in smaller SOEs face higher layoff risks

Dep. variable: W/P	**1995**	**2002**
CSOE	0.0001	0.088
	(0.146)	(0.294)
LSOE	0.160	1.082**
	(0.180)	(0.425)
Controls	yes	yes
Sample size	3627	1876

Conclusion

- We use the Chinese SOE reform as a natural experiment to identify the existence and importance of precautionary savings
- Our identification of PS takes into account self-selection bias and PIH effects on savings
- We estimate that precautionary savings triggered by SOE reform account for about 30% of the increase in Chinese urban SOE household savings from 1995 to 2002

SOE Layoffs

Year	SOE layoffs (million)	Effective Urban U (%)
1997*	6.92	7.7
1998	5.62	8.5
1999	6.19	9.0
2000	4.46	10.8
2001	2.34	10.8
2002	1.62	11.1
Total	27.15	

Source: China Labor Statistical Yearbook 2003; Cai, Park, and Zhao (2008); Giles, Park, and Zhang (2005)

Who Were Laid Off?

	Never laid off	Experienced layoffs
No. of observations	5770	1159
Demographics		
Male (%)	56.8	38.7
Education (in years)	11.4	9.96
Not generally healthy (%)	3.8	8.4
Ownership (%)		
Central SOEs	36.8	12.1
Local SOEs	40.9	47.8
Urban collective	9.9	31.1
Occupation (%)		
Professional/technical	23.2	9.5
Administrative/clerical	31.9	13.0
Industrial	33.0	59.1
Commercial and Services	10.0	16.5

Source: 1999 CASS Survey, from Appleton, Knight, Song and Xia (2002)

▸ Back to Size ▸ Back to Survivor ▸ Back to Reform

Case Study: Lay-off in Fushun, Liaoning

- Fushun is one of state-owned heavy industrial bases in "rust belt" of China
- Before 2000, 91% of workers employed either by SOEs or collective-owned enterprises (COEs)
- In 2000, 42% of SOE and COE workers were laid off, the highest in Liaoning province
- Layoff concentrated in coal, textiles, light industry, electronics, machinery and chemicals
  - 71000 workers in COEs in the coal sector, 35000 or 49.7% of workers were classified as "xia gang" ("left job post")
- Lots of laid-off workers barely got any compensation from firms, but still remained ties with them
- Main avenue for laid-off workers to find new jobs was through re-employment centers sponsored by the local government. But re-employment rate was low

Dependent variable: W/P

- Financial wealth (W): checking accounts, saving accounts, CDs, stocks, bonds, and other business assets (Item 401 in CHIP)
  1. Financial wealth is not easily affected by high-frequency income fluctuations (unlike flow of saving) $\rightarrow$ mitigates measurement errors
  2. It's liquid: useful to safeguard against uncertainty (Carroll and Samwick, 1998)
- Measurement of permanent income (P):
  - Constructed using same approach as in Fuchs-Schündeln and Schündeln (2005)
- W/P captures cumulative saving

Back

Independent variables

- SOE: dummy (1 for SOE workers and 0 for GOV)
- $RISK$: measured by coefficient of variation (CV) of log real income in past years
- P: permanent income
- Z: demographics (age, gender, HH size, occupation, home ownership, health care, child information, # boys, industry/province, . . .)

Wealth measures

CHIP data

A.	*Financial wealth*
	1. Checking account balances
	2. Saving account balances
	3. Stocks
	4. Bonds
	5. Loans to others
	6. Own funds for family business
	7. Other business assets (excluding stocks and bonds)
	8. Housing fund
	9. Value of commercial insurance
	10. Estimated present market value of collections
B.	*Estimated value of durable goods*
C.	*Estimated value of farms and businesses*
D.	*Estimated value of houses owned*
E.	*Estimated value of other family assets*
F.	*Total household debt*

Wealth measures:

- Financial wealth: A
- Very liquid assets: A1+A2+A3+A4+A5
- Financial net worth: A-F
- Nonhousing, nonbusiness wealth: A+B+E-F
- Total net worth: A+B+C+D+E-F

Benchmark estimation details

Back

Dep. variable:	1995		2002	
W/P	(i)	(ii)	(iii)	(iv)
SOE	0.090	0.039	0.723**	0.327*
	(0.117)	(0.114)	(0.298)	(0.221)
CV×100	0.111***	0.136***	0.124***	0.091***
	(0.040)	(0.038)	(0.045)	(0.028)
log(permanent income)	0.759	1.225	4.512***	3.533***
	(1.028)	(0.900)	(1.497)	(0.992)
Age	0.020	-0.020	0.028	0.240*
	(0.052)	(0.050)	(0.150)	(0.125)
Age squared(*100)	-0.030	0.019	-0.039	-0.274*
	(0.059)	(0.059)	(0.175)	(0.147)
Male	-0.362***	-0.463***	-1.180***	-1.176***
	(0.102)	(0.094)	(0.202)	(0.148)
Professional	0.102	0.031	4.776***	0.370
	(0.212)	(0.200)	(1.648)	(0.787)
Director	0.295	0.185	4.780***	0.183
	(0.214)	(0.208)	(1.636)	(0.800)
Skilled worker	0.042	0.004	4.993***	0.341
	(0.182)	(0.168)	(1.661)	(0.762)
Unskilled worker	-0.031	0.039	6.093***	0.981
	(0.201)	(0.179)	(1.770)	(0.767)
Public med service	0.047	0.036	-1.228**	-0.978***
	(0.192)	(0.166)	(0.501)	(0.362)
Public med insurance	0.031	0.102	-0.908**	-0.755**
	(0.166)	(0.150)	(0.434)	(0.318)
Married	0.520***	0.488***	0.637	0.406
	(0.192)	(0.161)	(0.429)	(0.363)
Age of children (mean)	0.008	0.005	0.004	-0.000
	(0.006)	(0.006)	(0.013)	(0.010)
Num. of boys	0.044	0.022	-0.253*	-0.198*
	(0.048)	(0.045)	(0.145)	(0.118)
Num. of children at school	-0.086	-0.035	-0.317*	-0.363***
	(0.066)	(0.063)	(0.176)	(0.140)
Household size	-0.037	-0.008	0.279	0.357***
	(0.051)	(0.048)	(0.171)	(0.136)
No house owned	0.080	0.138	-0.244	-0.221
	(0.101)	(0.097)	(0.264)	(0.228)
No house owned×SOE	-0.114	-0.106	0.356	0.300
	(0.109)	(0.104)	(0.376)	(0.300)
Industry & Province dummies	yes	yes	yes	yes
Log-Likelihood	-7167.03	-8875.88	-5803.38	-8240.22
p-value of Chow test for SOE			0.048	0.247
Number of observations	3627	4390	2170	3027