A Tale of Transition: An Empirical Analysis of Economic Inequality in Urban China, 1986-2009[1]

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[1] The views expressed in this paper are those of the authors and do not necessarily represent those of the IMF or IMF policy.

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- Increasing concern on widening economic inequality among policy-makers and public
- Compared to our knowledge on China's growth miracle, we know much less about trend of economic inequality in China

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- Sample selection and data construction follow mainstream macro-inequality literature (e.g., RED 2010 special issue on "Cross Sectional Facts for Macroeconomists")
- Treat it as a "stylized facts" paper about inequality in urban China

Preview of Findings

- Economic inequality has been increasing drastically in urban China
  - e.g., Gini of equivalized HH disposable income had increased from about 0.23 in 1992 to about 0.35 in 2009
  - US increased from 0.39 in 1992 to 0.42 in 2005 (Heathcote, Perri and Violante 2010), Japan increased from 0.26 to 0.28 for 1992-2009 (Lise et al. 2014)
- Total consumption inequality is even higher than income inequality for most of time during the period. And consumption inequality closely tracks with income inequality
  - Contrast sharply to what we found in US or other advanced economies
  - Contrast to theoretical prediction of consumption smoothing: puzzle?

Preview of Findings

- Consumption and income inequality over life cycle is consistent with pattern of other countries
  - Earnings inequality >> Disposable income inequality > Non-durable consumption inequality, controlling for cohort & year effect
- Two possible explanations
  - Financial autarky (hand-to-mouth): income = consumption
    - we tend to reject this hypothesis
  - Increasing permanent income shock relative to transitory shock: hard to insure against permanent shock (Blundell, Pistaferri and Preston 2008)
    - we find it empirically plausible

Main Takeaway

- Economic transition fundamentally changed underlying structure of idiosyncratic income shock, uninsurable part kept increasing
- Financial development seems not deep enough to counter the impact from increasing idiosyncratic permanent income shock
- Increasing inequality in China might be inevitable "growing pain"—Kuznets Curve?

Background of Chinese Economic Transformation

- Deng Xiaoping initiated "open door" policy and economic reform in 1978
- After successful household responsibility reform in rural area, the focus of economic reform has been shifted to urban in 1984
- Corruption and rising inflation led to political turmoil in 1989, which halted market-oriented reform
- In 1992, Deng Xiaoping pushed for further radical reform towards market economy in urban
- A large-scale privatization of SOEs began in 1997 under the slogan "Grasp the Big, Let Go of the Small" until 2002
- China's access to WTO in 2001 further boosted the economic growth

Urban Household Survey (UHS)

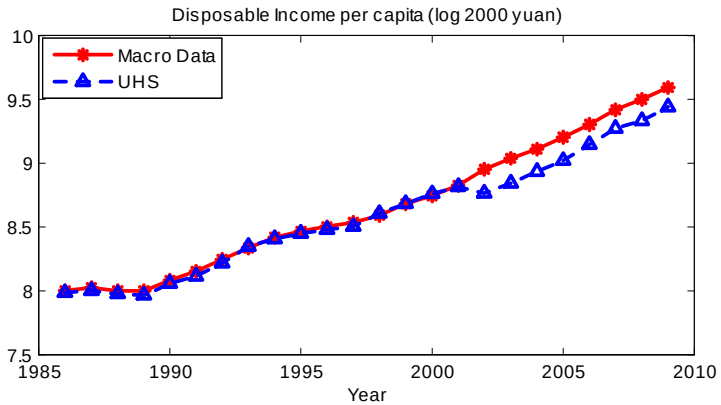
- Annual Urban Household Survey (UHS) is conducted by the National Bureau of Statistics (NBS) of China
- Based on a multi-stage probabilistic sample and stratified design, national representative, repeated cross-section with a rotation structure
- Detailed information about income, consumption expenditure as well as the demographic characteristics of HH members at household and individual level
- Chinese counterpart of a combination of Current Population Survey (CPS) and Consumer Expenditure Survey (CEX)

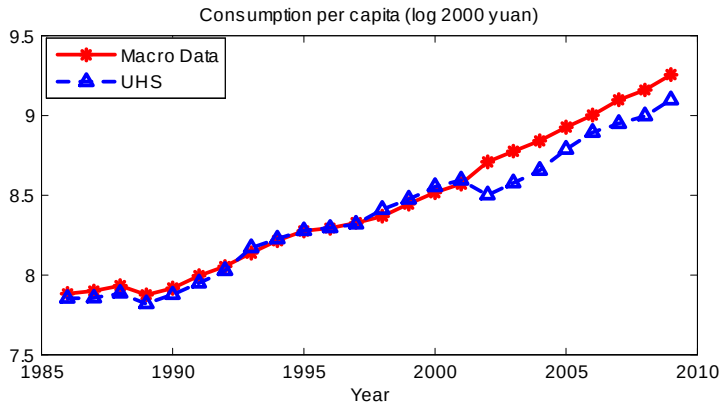
▸ UHS Sampling ▸ UHS Access

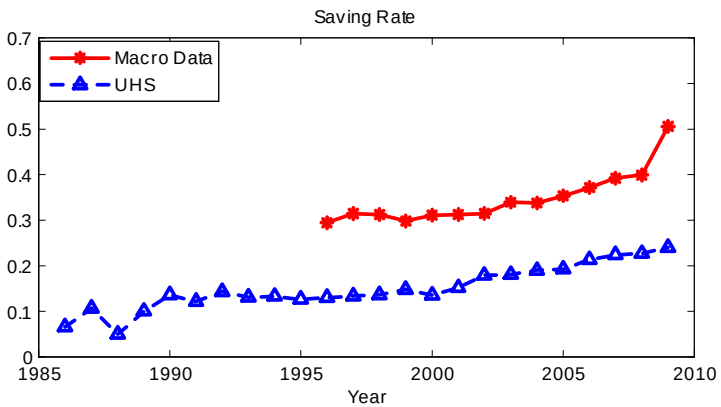
Sample Selection

- Following methodology in Heathcote, Perri and Violante (2010), we construct three different data samples
- **Sample A**: drop records from UHS only if there is no information on age of HH head $\Longrightarrow$ use to check consistency with macro data
- **Sample B**: further restriction from Sample A $\Longrightarrow$ our household sample
  - keep records only if HH head is aged from 25 to 60
  - exclude non-positive values in HH earnings, disposable income, and consumption
- **Sample C**: $\Longrightarrow$ our individual sample
  - select all individuals aged 25-60 from Sample B
  - exclude non-positive earnings
- Deflate every variable by CPI (base year = 2000) ▸ Variables

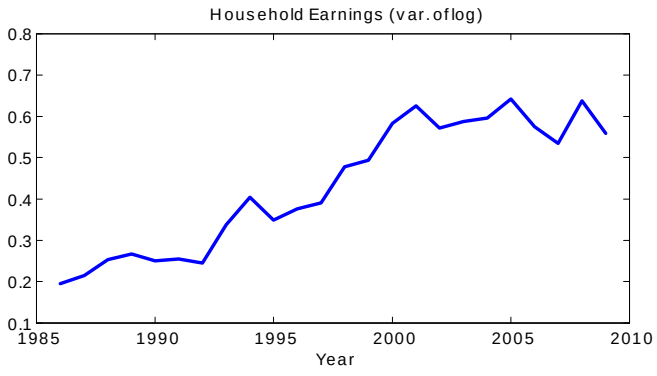
Consistency with Macro data

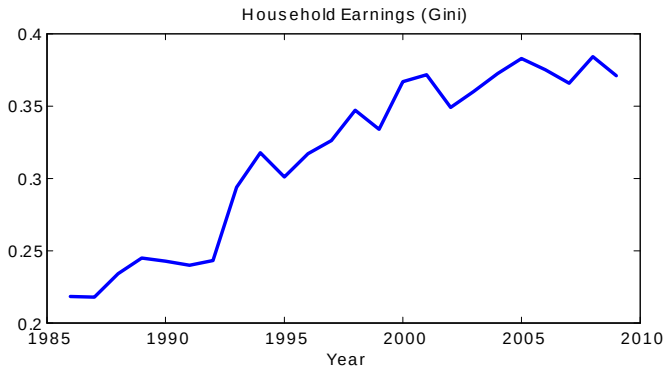


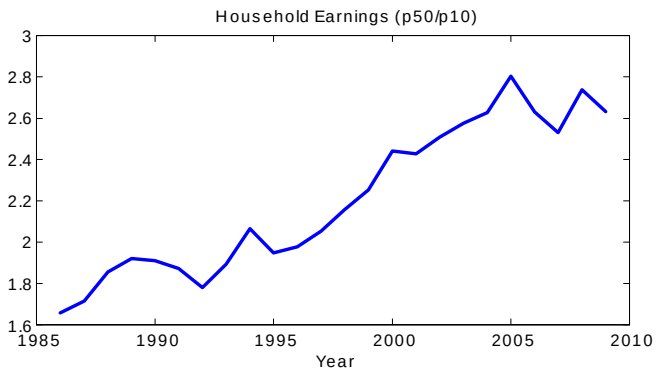


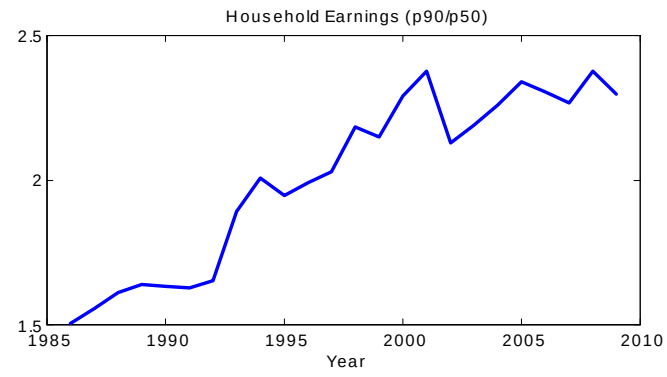


HH Earnings



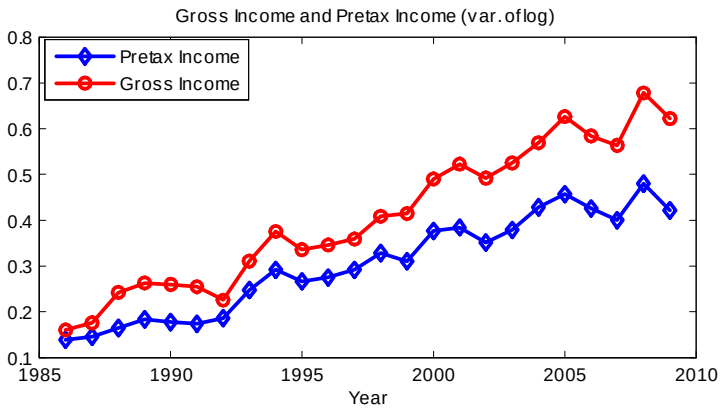


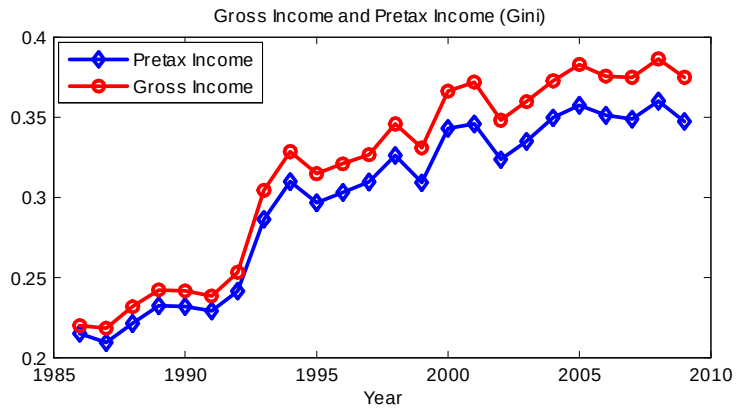


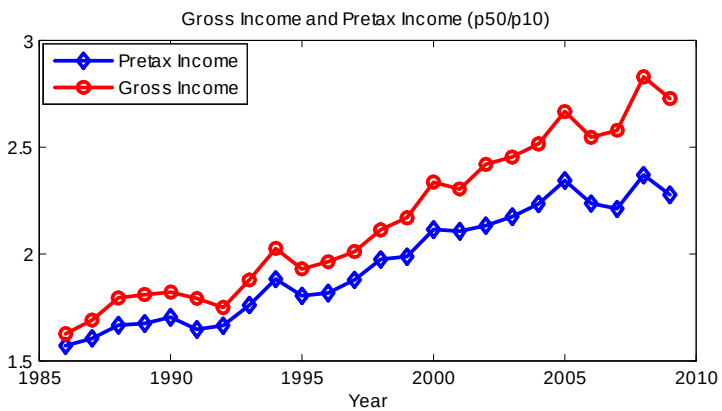


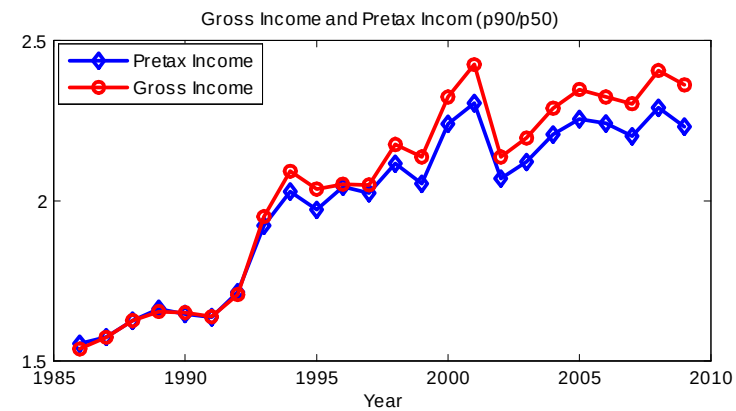
▸ US ▸ Equiv.

Income and Government Redistribution via Pension

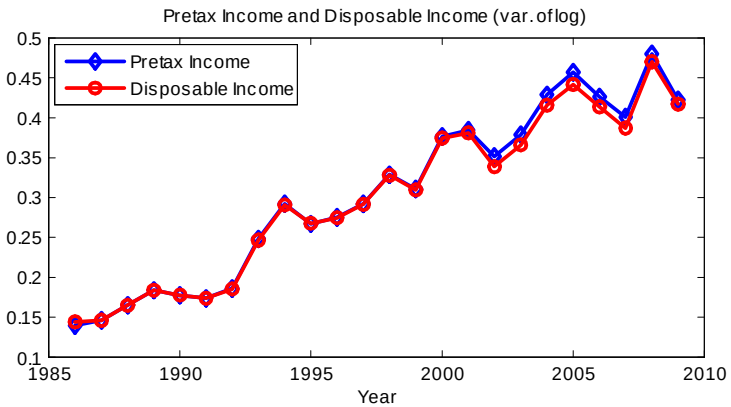


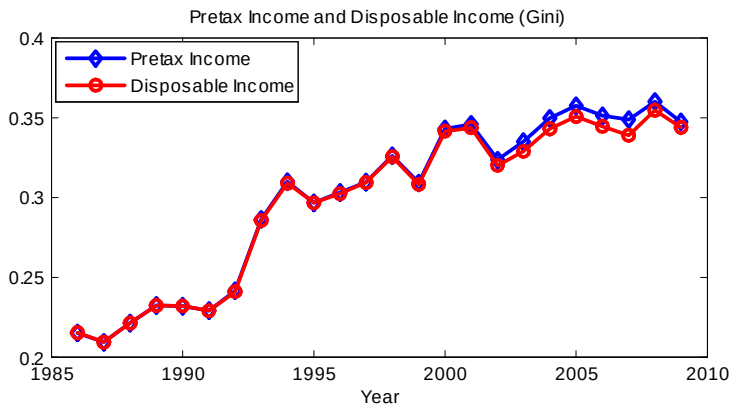


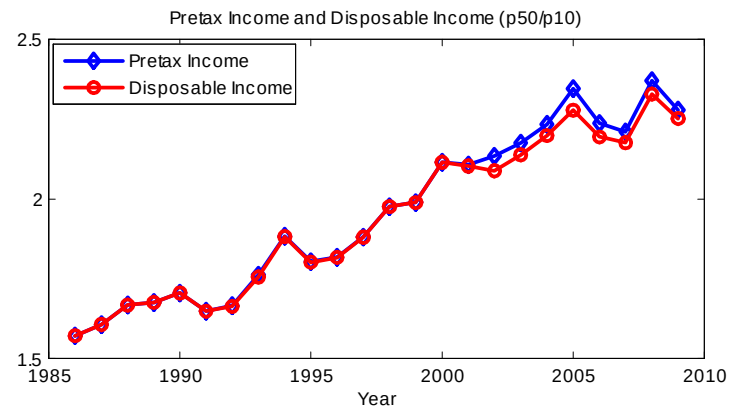


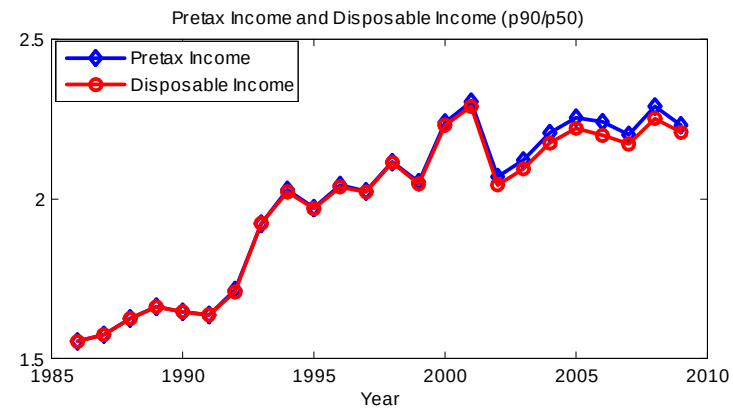


Government Redistribution via Tax

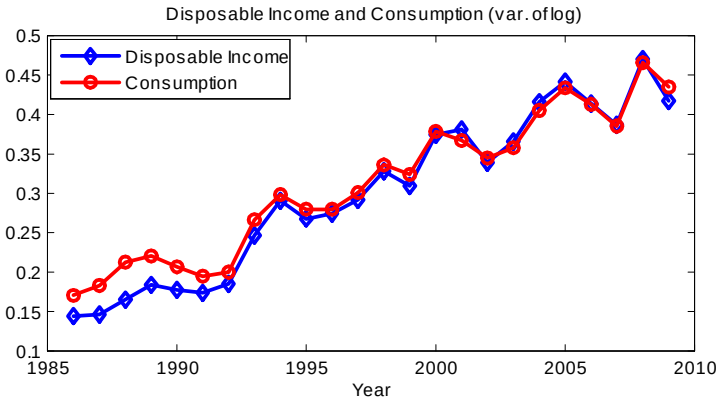


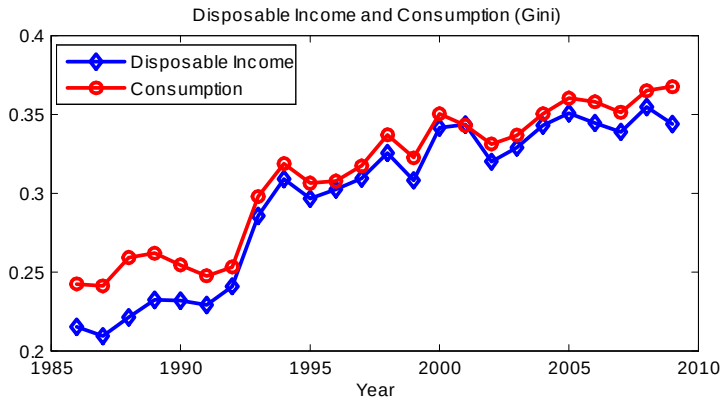


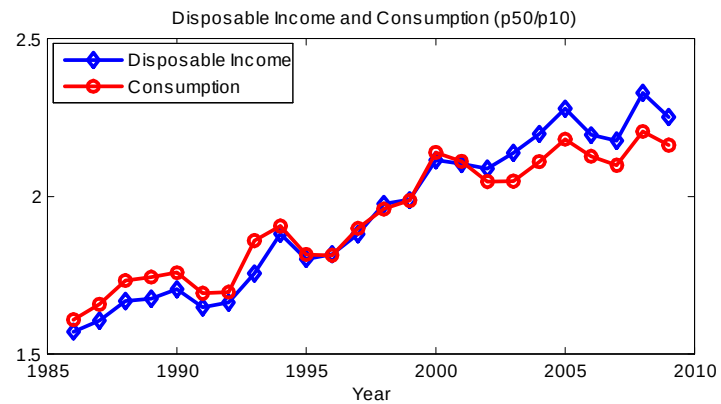


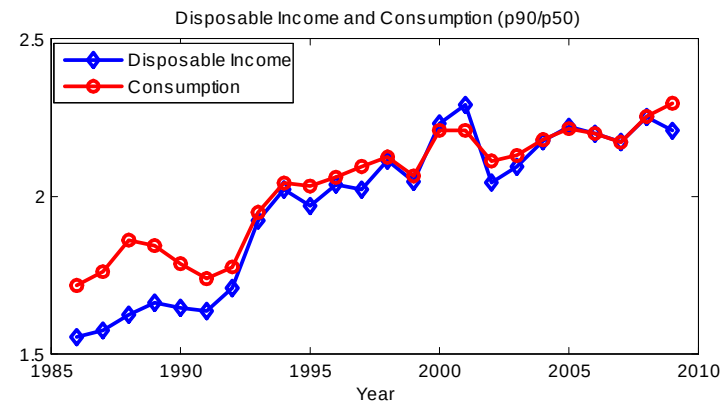


Total Consumption and Income Inequality



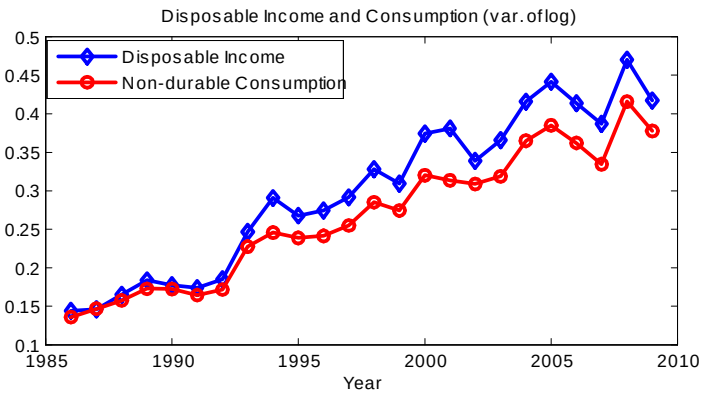


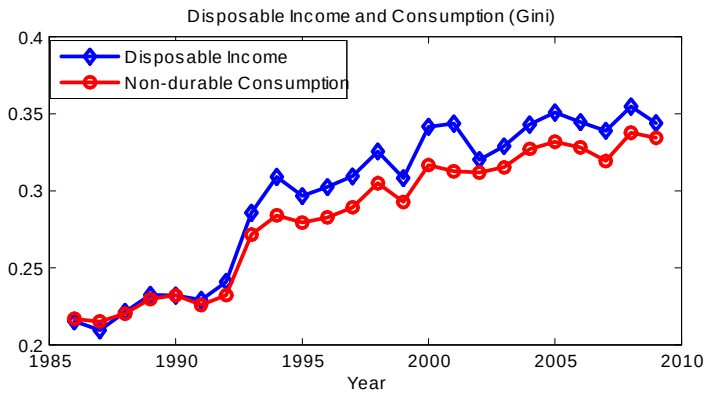


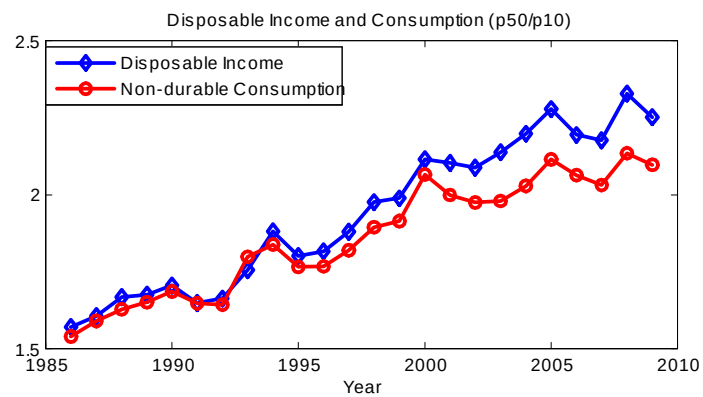


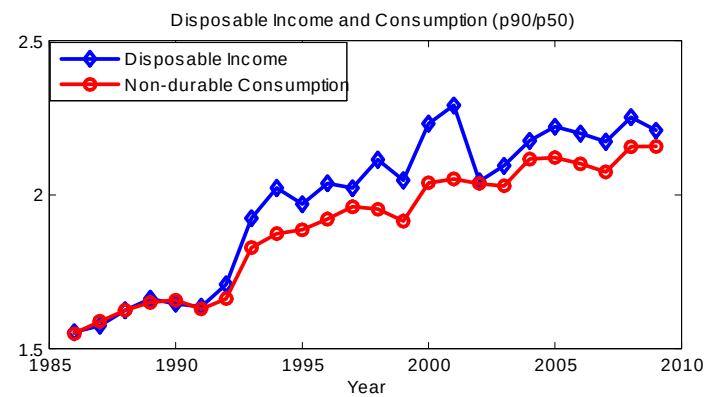
▸ Equiv. ▸ SOE

No-durable Consumption and Income Inequality

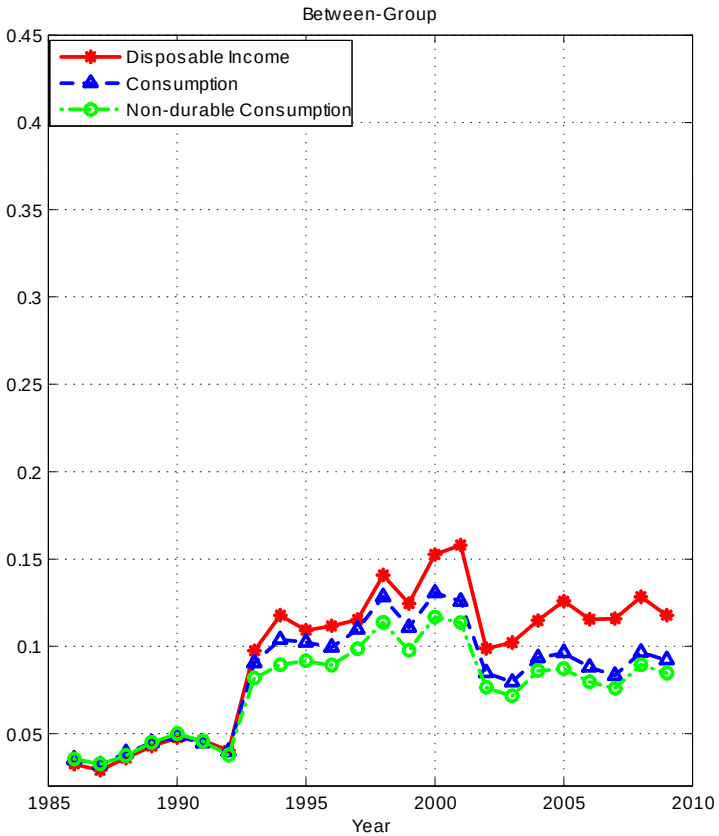


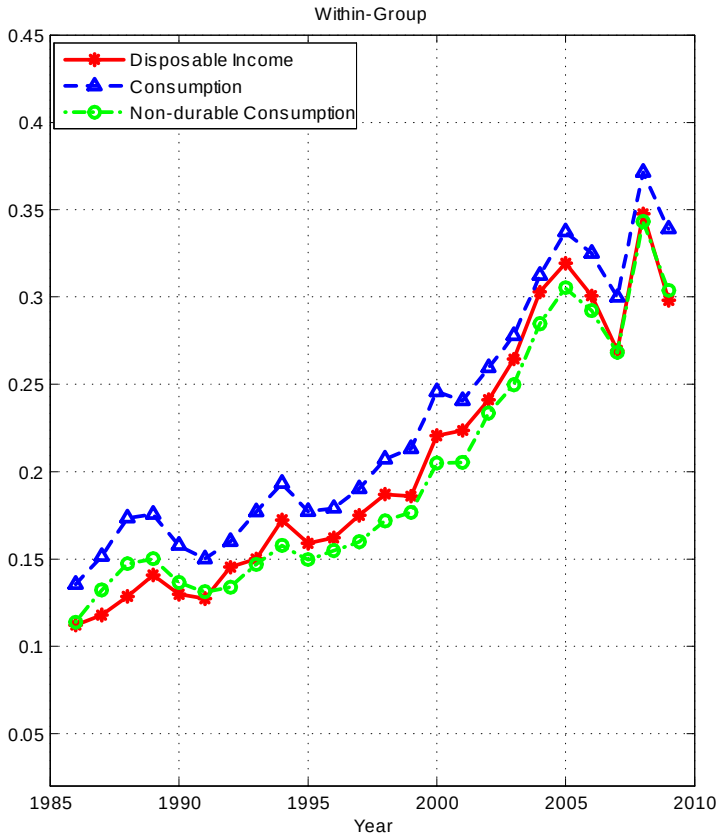






Between- vs. Within-Group Inequality





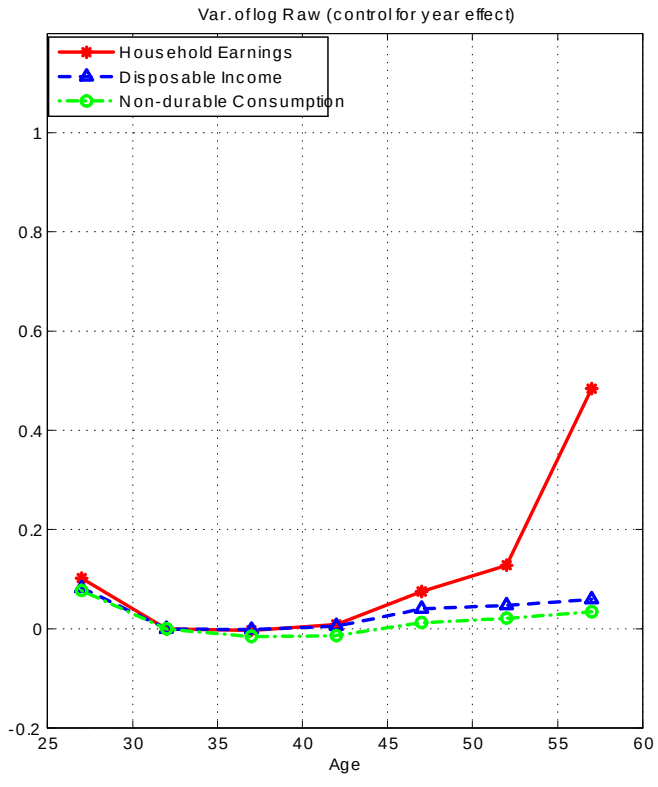
Methodology

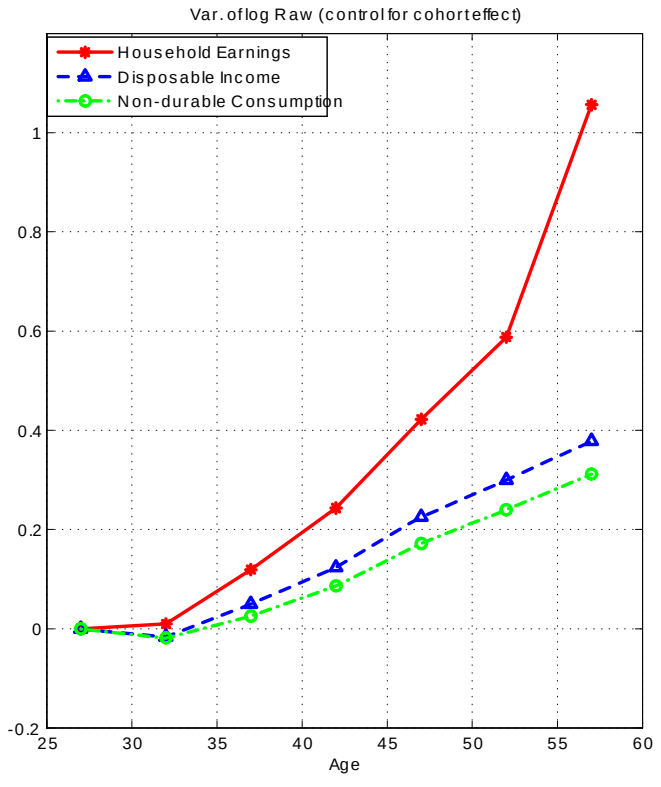
- Follow Deaton and Paxson (1994) and Heathcote, Perri and Violante (2010)
- Denote $m_{a,c,t}$ be a cross-sectional moment of interest (e.g., variance of log HH earnings) for group of HH head with age a belonging to birth cohort c at year t ($a + c = t$), run the following two regressions separately to control for year effects and cohort effects respectively

$$\begin{aligned} m_{a,c,t} &= \beta_a' D_a + \beta_t' D_t + \varepsilon_{a,c,t} \\ m_{a,c,t} &= \beta_a' D_a + \beta_c' D_c + v_{a,c,t} \end{aligned}$$

  where D_a, D_t, and D_c are vectors of age, year, and cohort dummies
- We are interested in β_a

Inequality over Life Cycle





▸ Equiv.

What We Learn?

- Var of log HH earnings rises over life cycle by more than that of disposable income, which in turn more than that of non-durable consumption
- HHs are able to *self-insure* against some fraction of idiosyncratic income shock over life cycle
- Similar to US and other countries, but consumption profile is convex instead of concave ▸ US

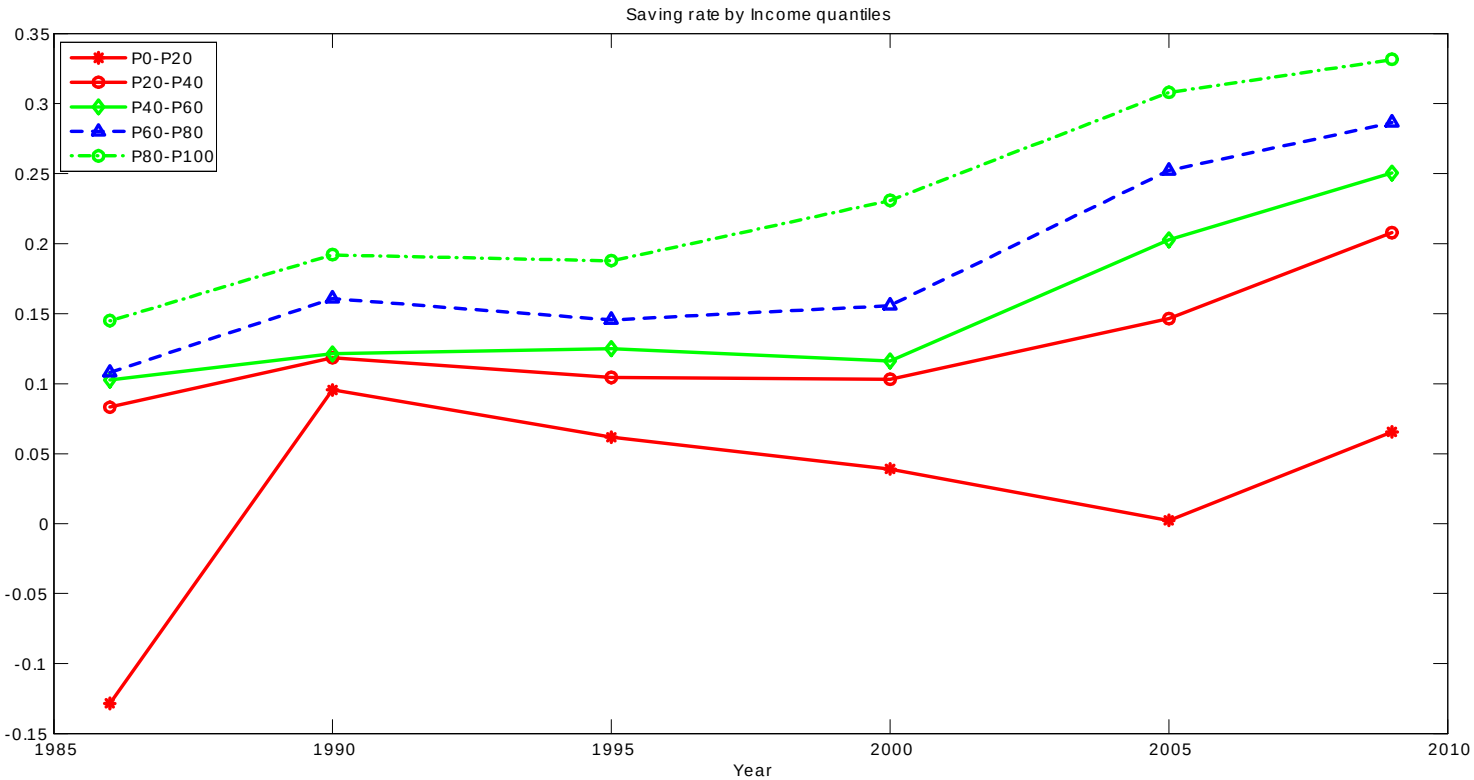
Inequality over Time and Life Cycle

- Like other countries, HHs are able to self-insure against at least some fraction of idiosyncratic income shock over life cycle
- Unlike other countries, cross-sectional risk-sharing among individuals over time is very limited
- Two possible explanations
  - Financial autarky (hand-to-mouth): no borrowing and lending across individuals, income = consumption
  - Change in underlying structure of idiosyncratic income shock: over time fraction of uninsurable income shock ↑

Financial Autarky?

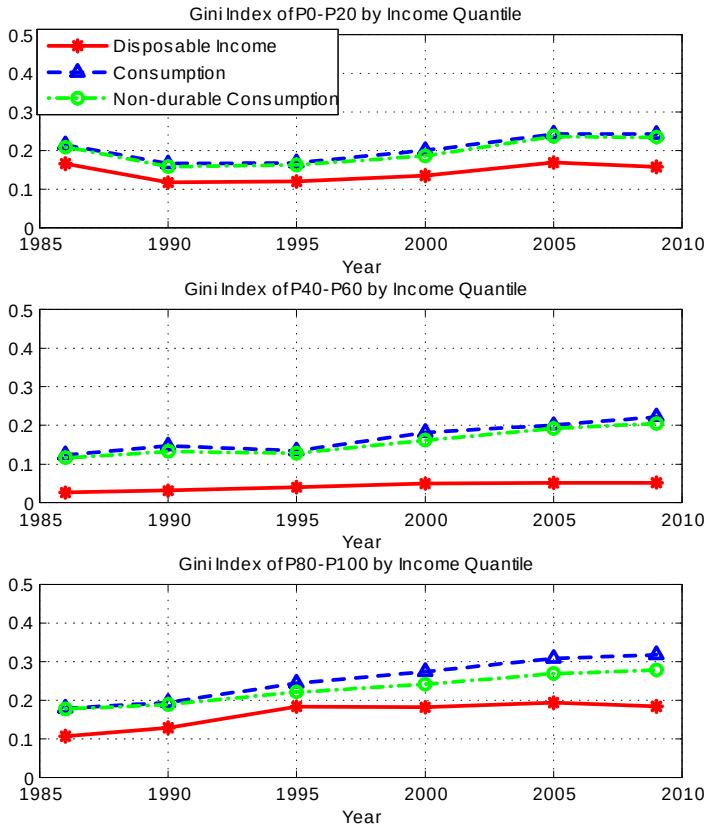
- Financial autarky (hand-to-mouth) story implies consumption = income, saving rate could be close to zero
- This could more likely happen in bottom income quintile, and unlikely in top income quintile
- Some evidence of hand-to-mouth behavior in bottom income quintile
  - Saving rate on average close to zero over time
  - Total consumption = non-durable consumption inequality, and its level is very close to income inequality (also closely tracks each other)
- Clearly no supporting evidence for other income quintiles

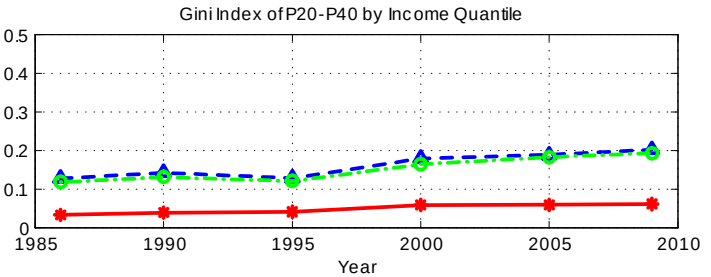
Saving rate by Income Quintiles

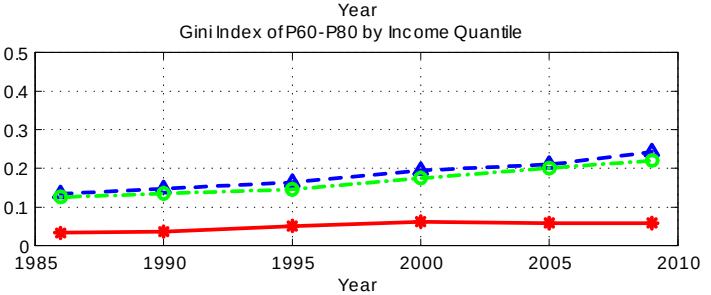


▸ Quantiles

Consumption Inequality by Income Quintiles







Income Dynamics

- Well established literature on estimating structural models of income dynamics from panel data (e.g., Lillard and Willis 1978, Moffitt and Gottschalk 1995)
- Follow Heathcote, Perri and Violante (2010)
- First run a Mincerian regression to regress log earnings against HH characteristics such as age, age^2, education, employment status, and provincial dummies
- Then decompose the residual dispersion $w_{i,c,t}$ for individual i of cohort c at year t into a permanent and transitory part

$$\begin{aligned} w_{i,c,t} &= z_{i,c,t} + \varepsilon_{i,c,t} \\ z_{i,c,t} &= z_{i,c,t-1} + \eta_{i,c,t} \end{aligned}$$

where $\varepsilon_{i,c,t}$ and $\eta_{i,c,t}$ are uncorrelated over time, i.i.d. across individuals, and orthogonal to each other, with zero mean and variances $\sigma_{\varepsilon,t}$ and $\sigma_{\eta,t}$

Estimation Methodology

- Two methods
  - "Difference" approach: use first-differences in log earnings, need at least three year panel data
  - "Level" approach: use log earnings level, need at least two year panel data

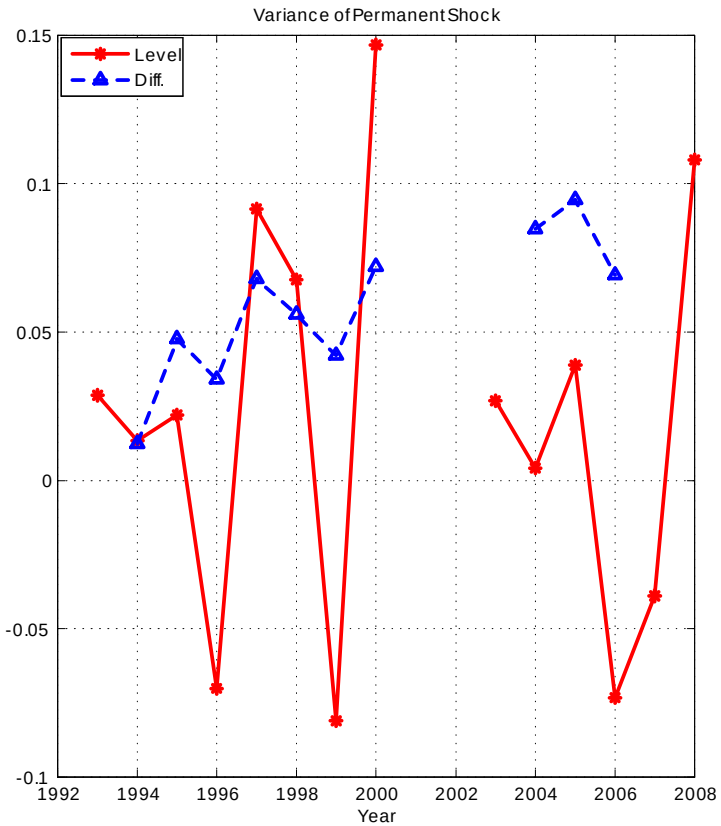
▸ Difference ▸ Level

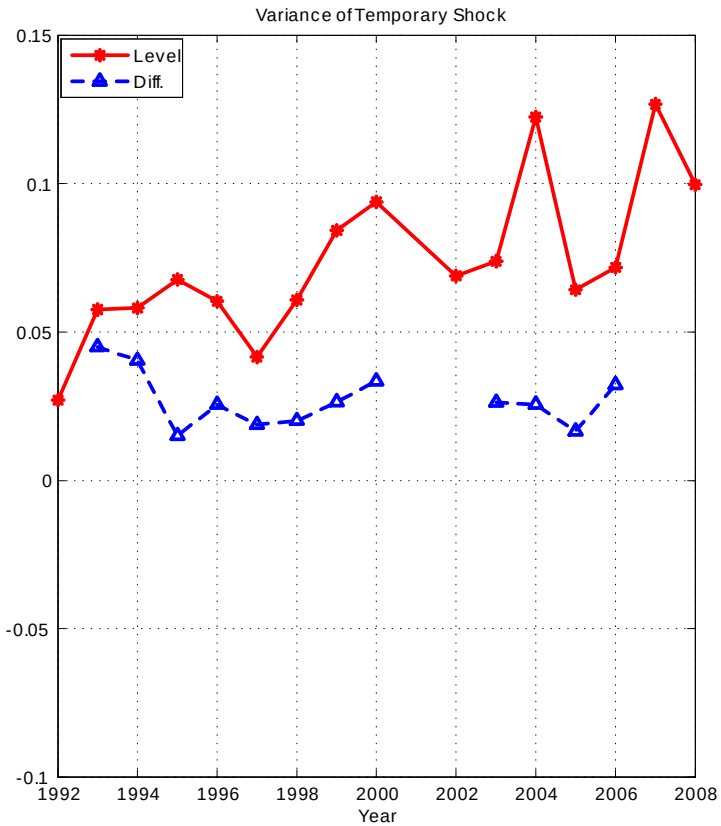
Constructing Panel from UHS

1. Merge UHS every two years and keep HH IDs show up in both years in the combined data
2. Check HH head's age in the combined data to make sure it increases when year increases, drop observations that do not satisfy this criteria
3. After the age check, we also go to the remaining sample to visually check each observation to see if its variables make sense

▸ Sample1 ▸ Sample2 ▸ Representative

Transitory vs. Permanent Income Shock





What We Learn?

- Negative permanent income shock from level method is a sign of mis-specification (HPV 2010)
- We trust "difference" method
- Significant increasing permanent income shock from early 1990s until mid 2000s
- Blundell, Pistaferri and Preston (2008) find that only partial insurance for permanent shocks and nearly full insurance for transitory shocks ▸ BPP
- Rising permanent income shock, increases difficulty of risk-sharing across individuals over time

Blaming Transition?

- We decompose permanent & transitory shocks estimated by "difference" method along different dimensions
  - SOE vs. POE ▸ SOE
  - young (25-40) vs. old (40-60) ▸ Age
  - skilled vs. unskilled ▸ Edu
- Disadvantaged groups who hurt by economic transition in general face higher income shocks

Conclusion

- Economic inequality has been increasing drastically in China, much faster than other countries
- Total consumption inequality is even higher than income inequality for most of time during the period. And consumption inequality closely tracks with income inequality
- Consumption and income inequality over life-cycle is consistent with other countries
- Rising permanent income shock due to economic transition impedes risk-sharing across individuals over time, which possibly lead to close track b/w consumption and income equality
- Financial development is not deep enough to eliminate "growing pain" of economic transition

UHS Sampling

- NBS draws a first-stage sample (called "big sample") of HHs randomly from selected cities and towns in each province every three years
- A final sample (called "small sample") is then randomly selected from big sample for recurrent interviews and diary-keeping for detailed consumption expenditure every month
- 1986-2006, every year one third of HHs in final sample is replaced by other HHs from the first-stage sample. Since 2007, each year half of HHs in small sample is replaced. However, rotation design has not been always strictly enforced.
- Survey questionnaires have been updated several times, with two major changes in 1992 and 2002, and minor changes in 1997 and 2007.

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Our UHS Access

Period	# of OBs	Provinces
86-92	>12000	28
93-97	5751-5907	10
98-01	5450	9
02-09	26990-38944h	16
02-09	109326-154400p	16

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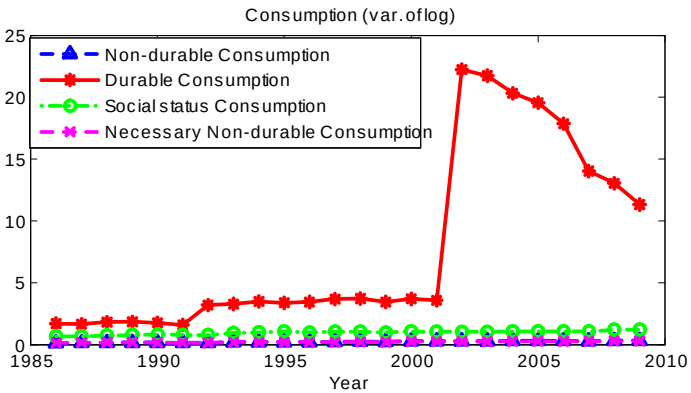
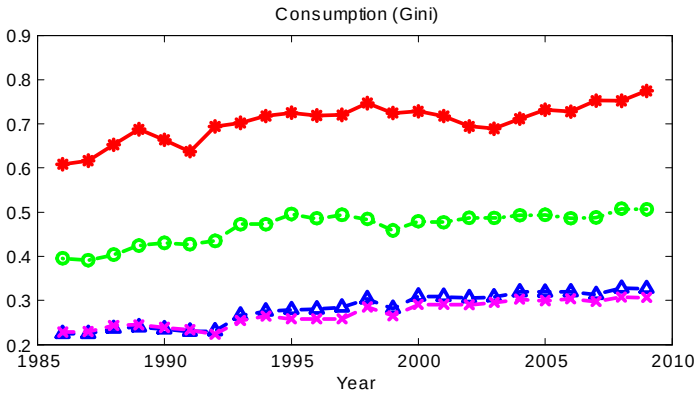
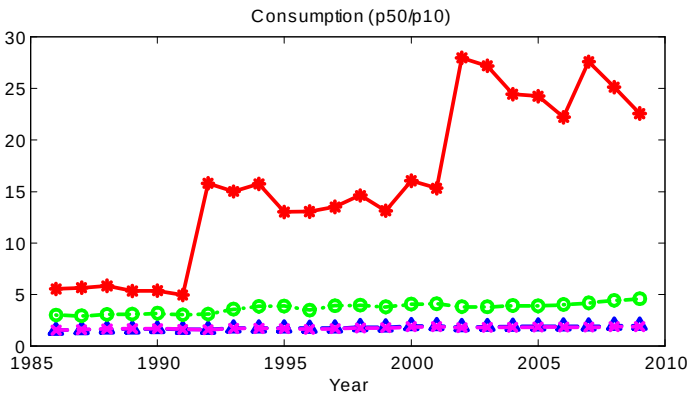
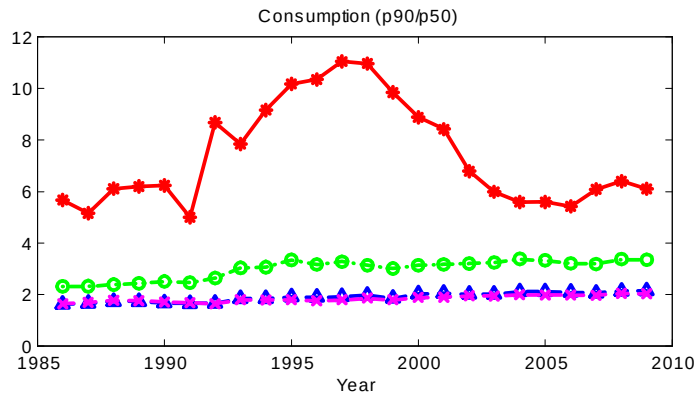
Disentangle Consumption Inequality









Variable Definition

1. Household (HH) earnings: regular earnings, temporary earnings and bonuses of HH head, spouse, and other HH members.
2. Gross income: HH earnings + private transfers + asset income.
3. Pre-tax income: gross income + public pension benefits + other social security benefits.
4. Disposable income: pre-tax income - taxes.
5. Consumption: food, clothing, household appliances, health, transportation and communications, education and entertainment, rent and utilities, and other.
6. Durable consumption: durable goods for household appliances, transportation tools, communication tools, durable goods for entertainment.
7. Non-durable consumption = consumption - durable consumption - housing rent.

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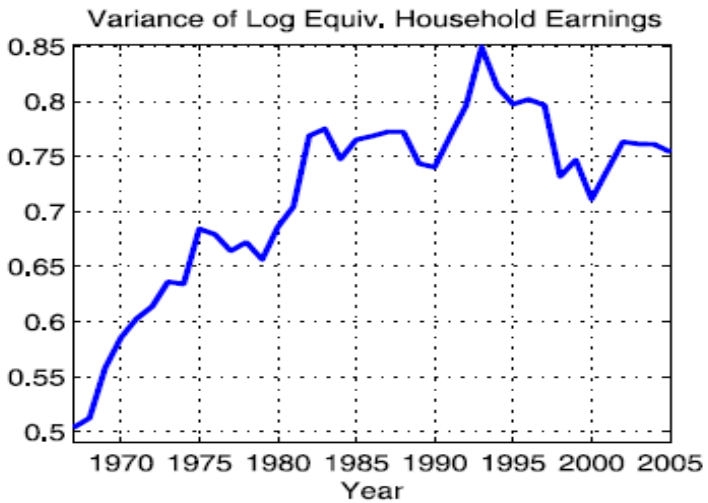
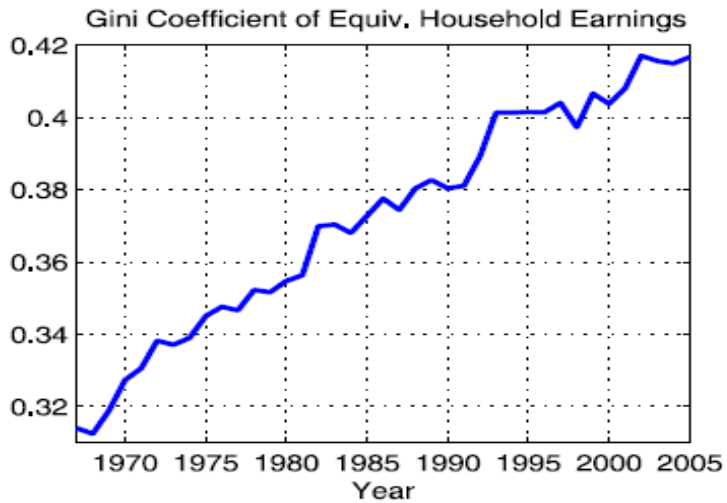
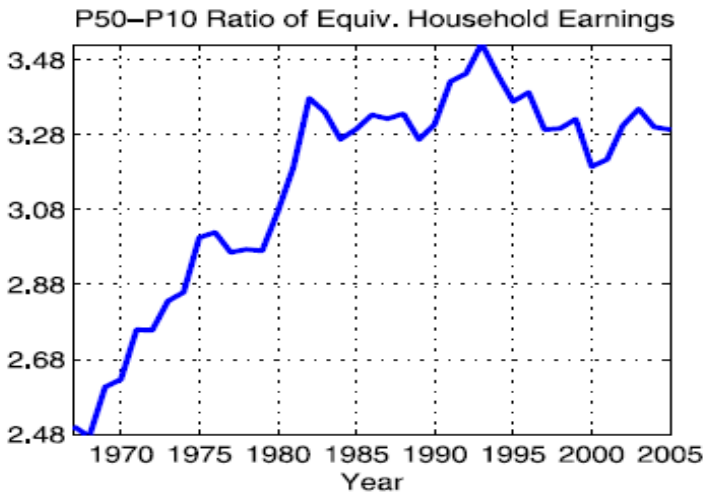
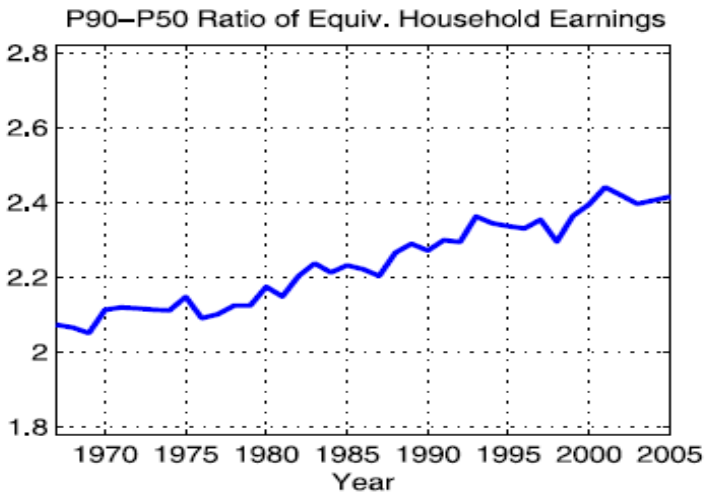
US HH Earnings: HPV (2010)

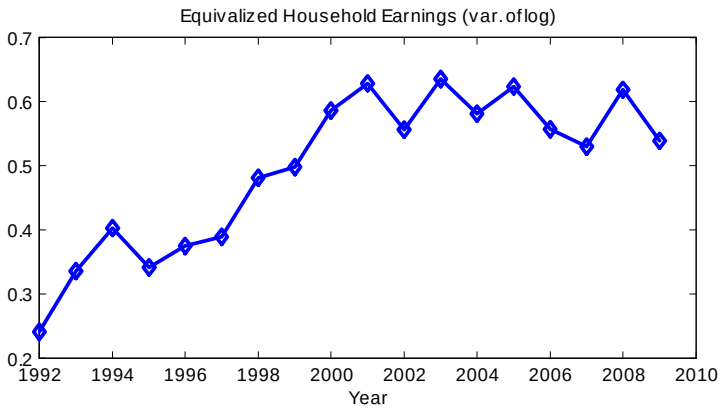


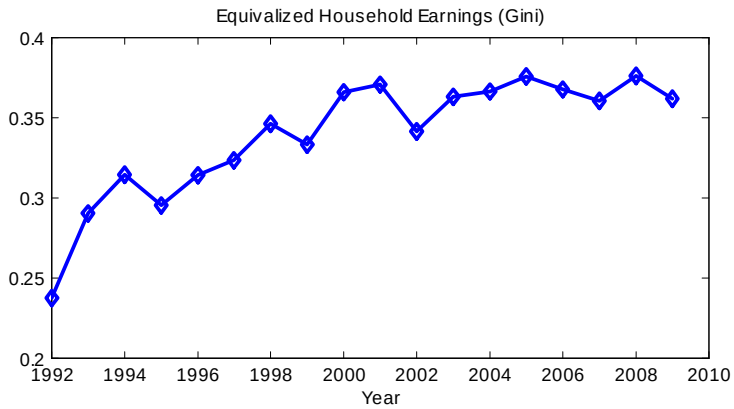


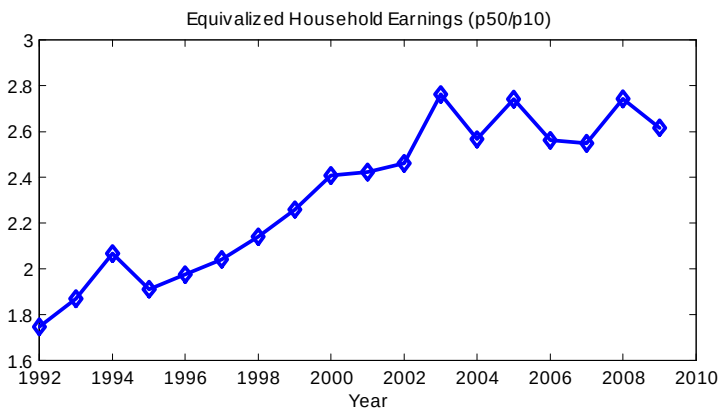


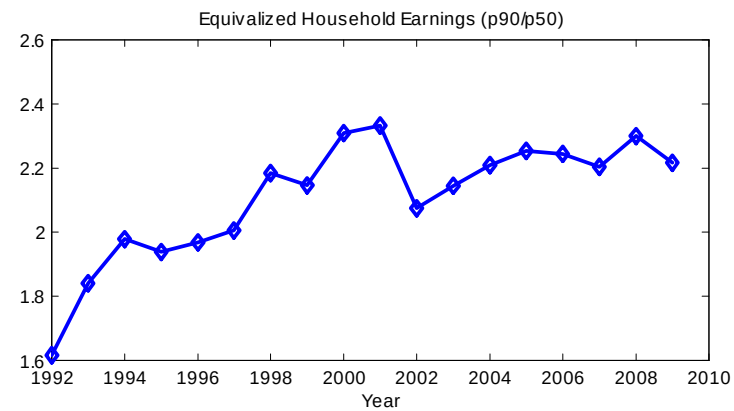


Equiv. HH Earnings









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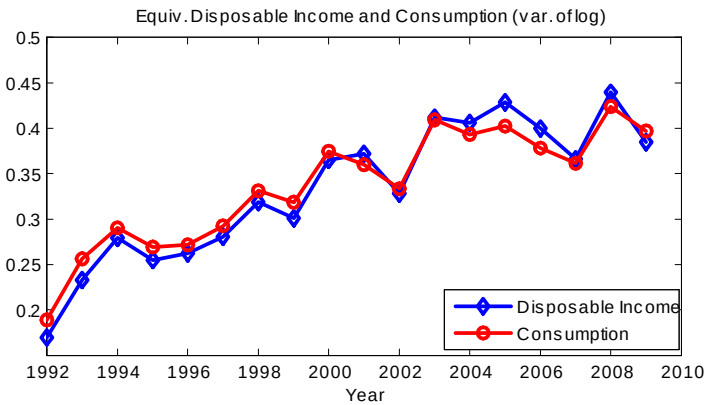
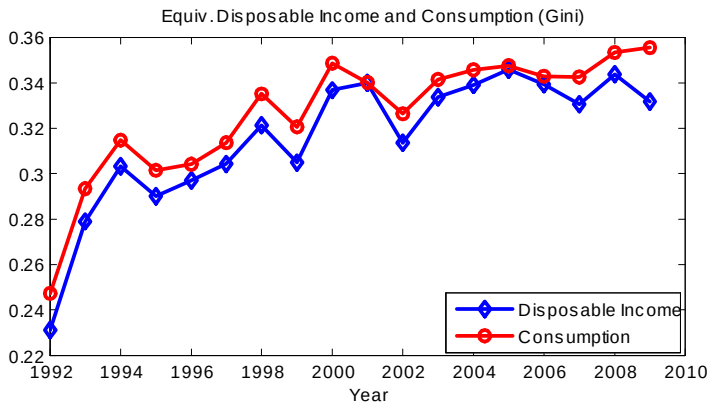
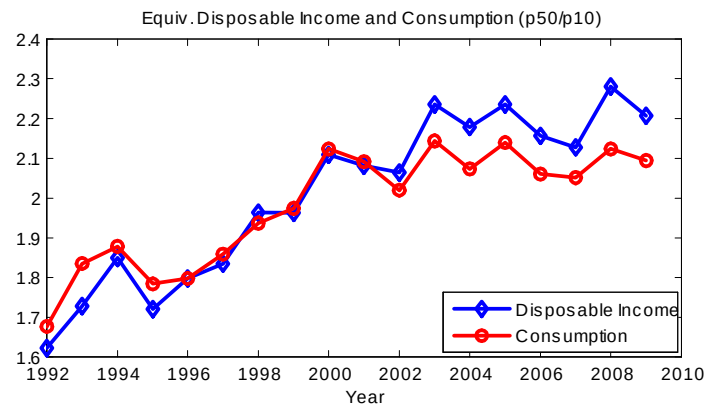
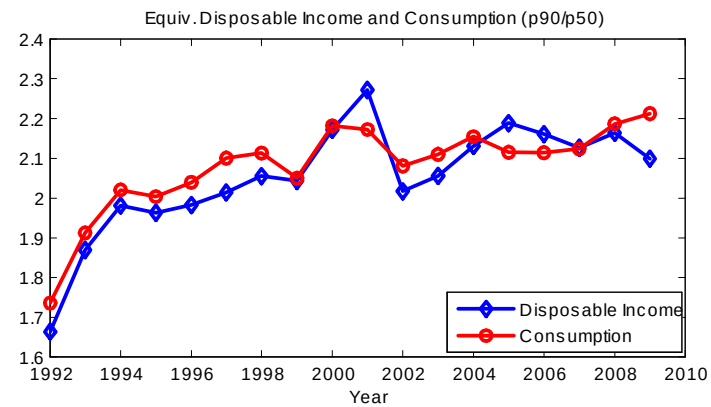
Equiv. Consumption and Disposable Income









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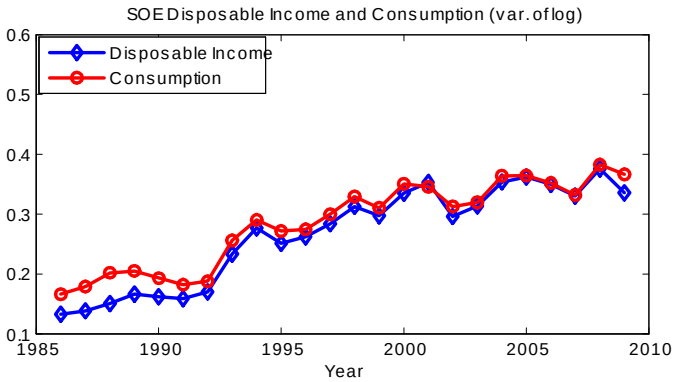
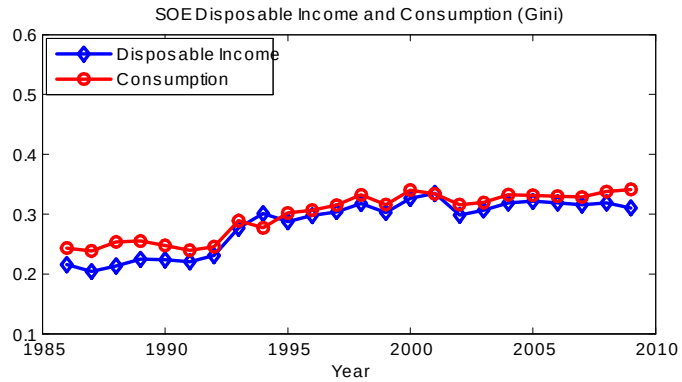
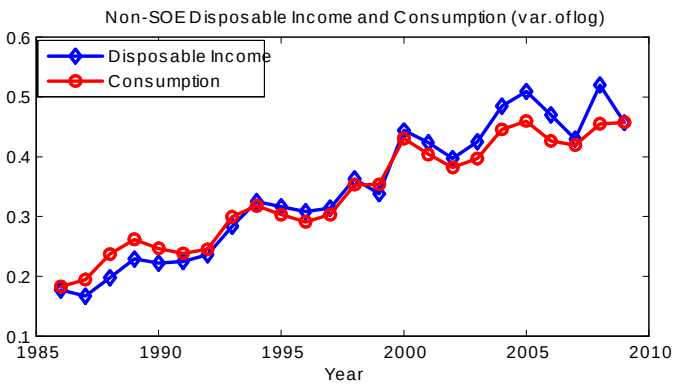
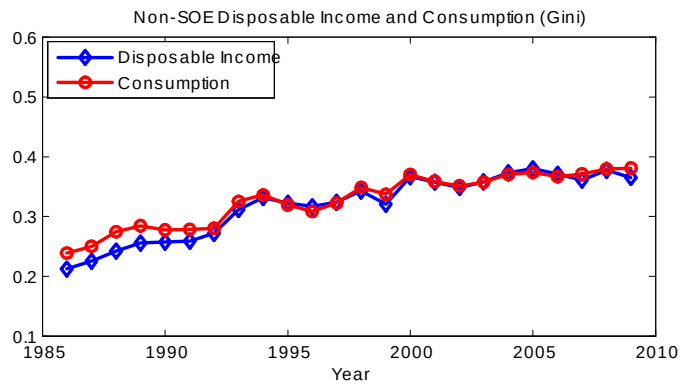
SOE/Non-SOE Consumption and Income Inequality









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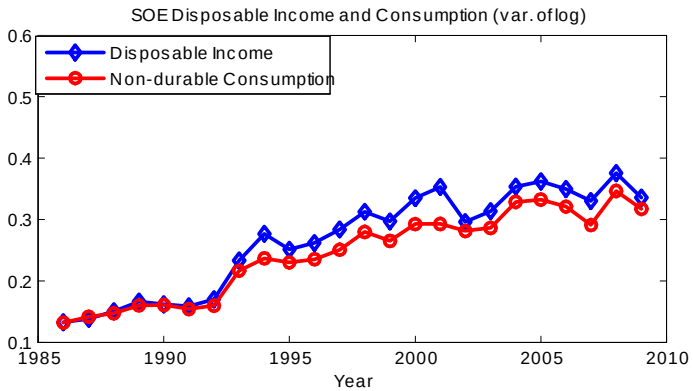
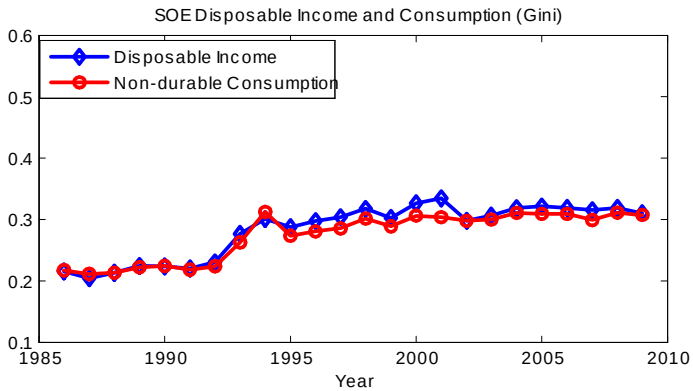
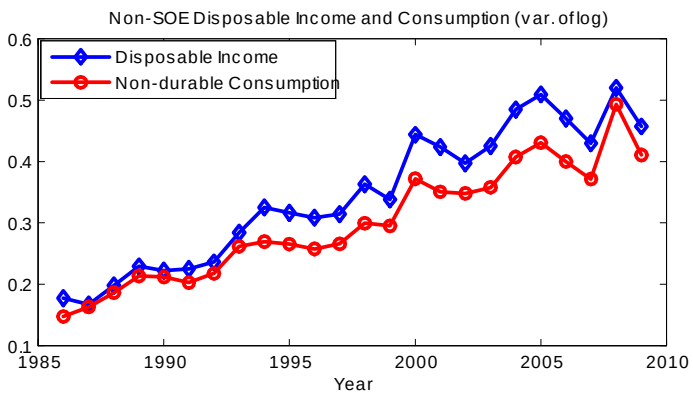
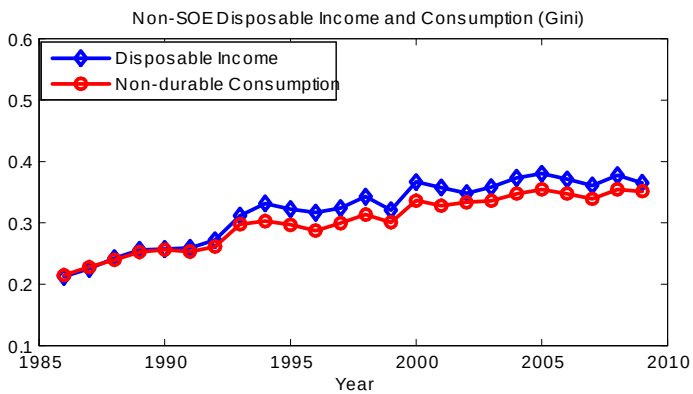
SOE/Non-SOE Non-durable Consumption and Income Inequality









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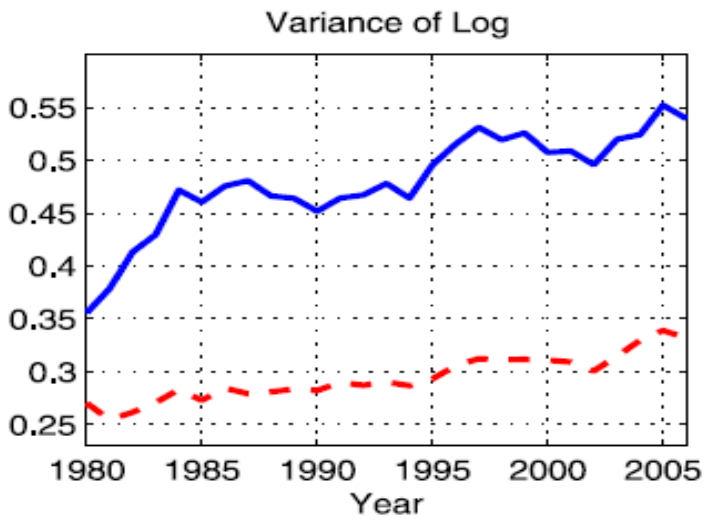
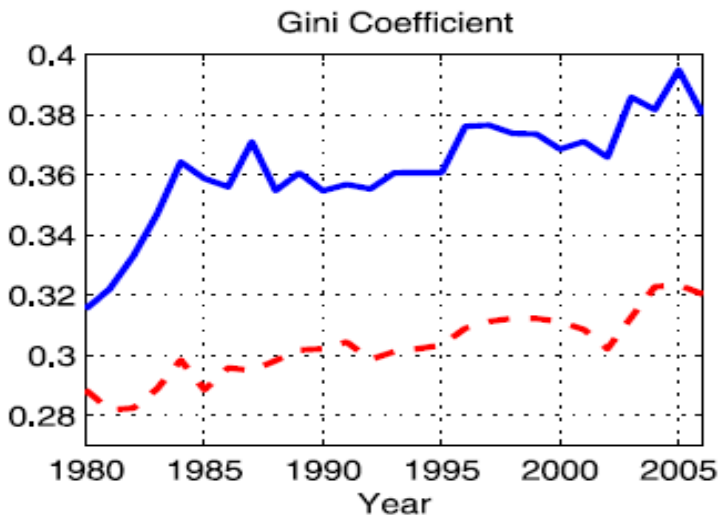
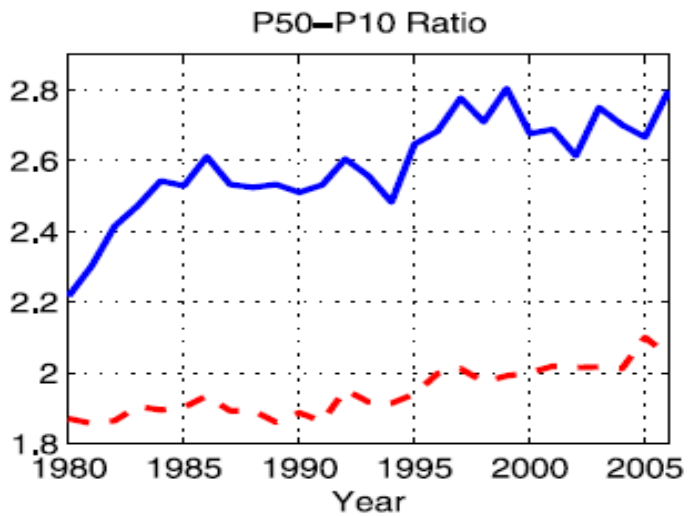
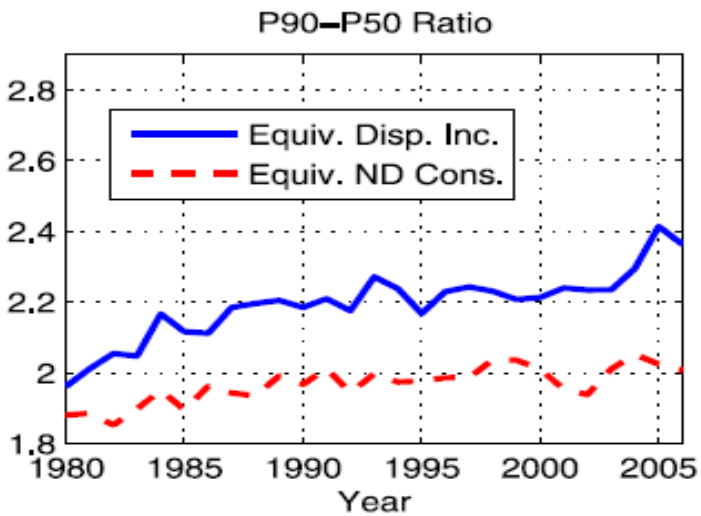
US Consumption and Income Inequality: HPV (2010)

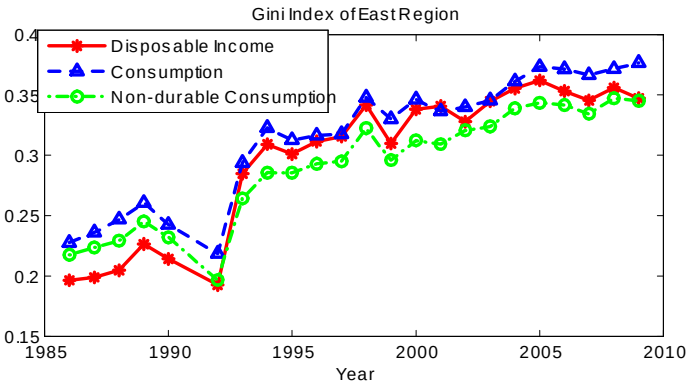


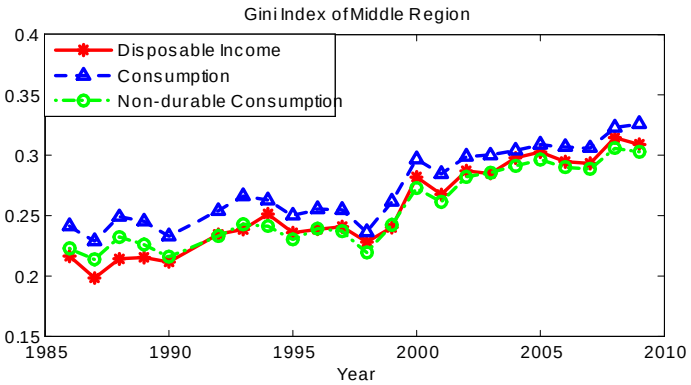


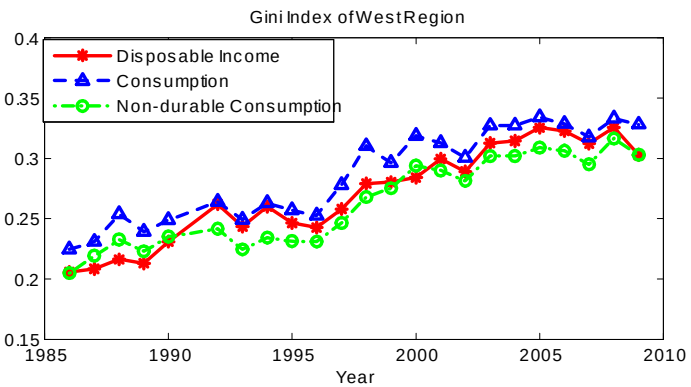




Consumption and Income Inequality: Regions







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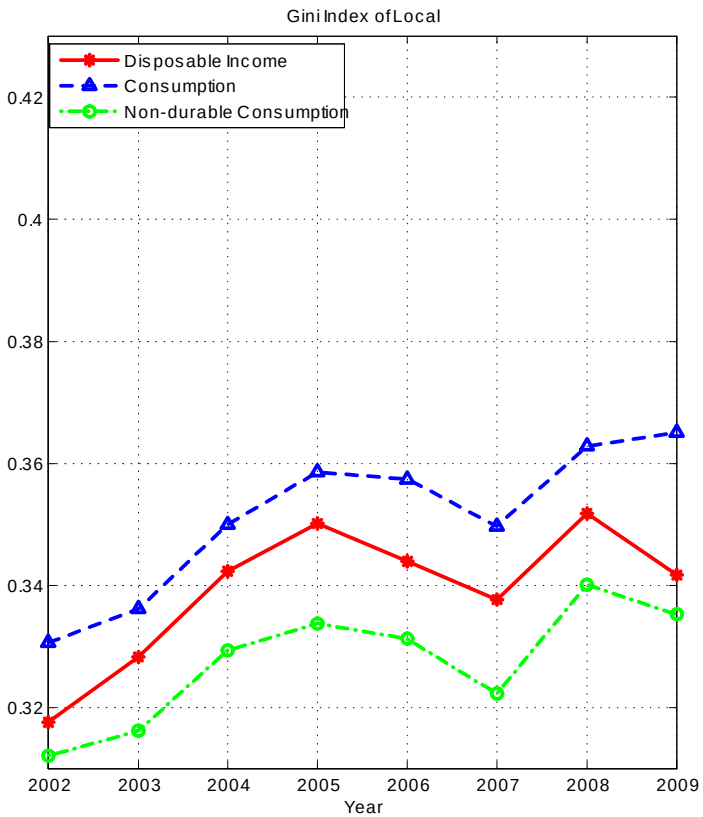
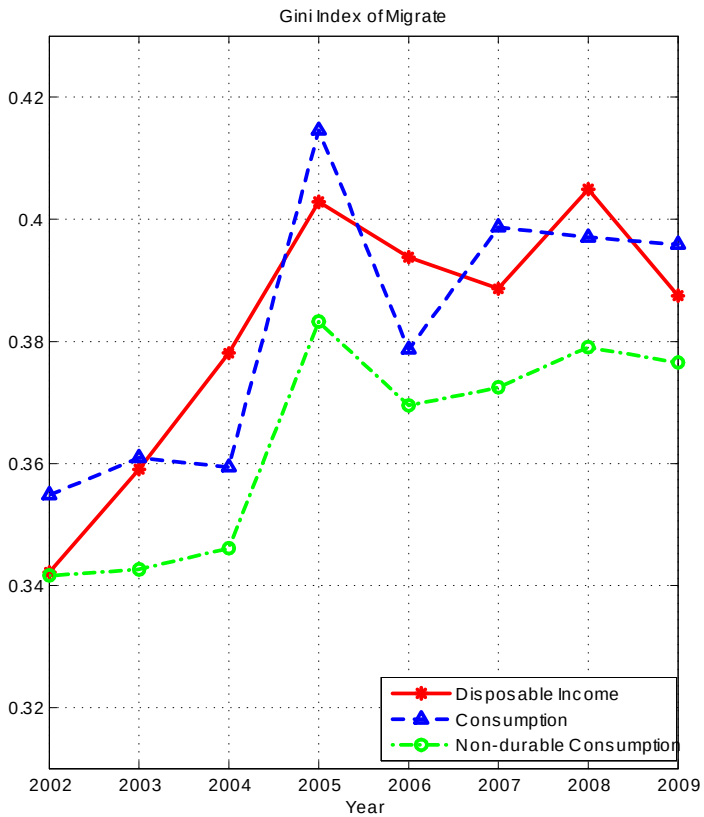
Consumption and Income Inequality: Hukou vs. Migrated Workers





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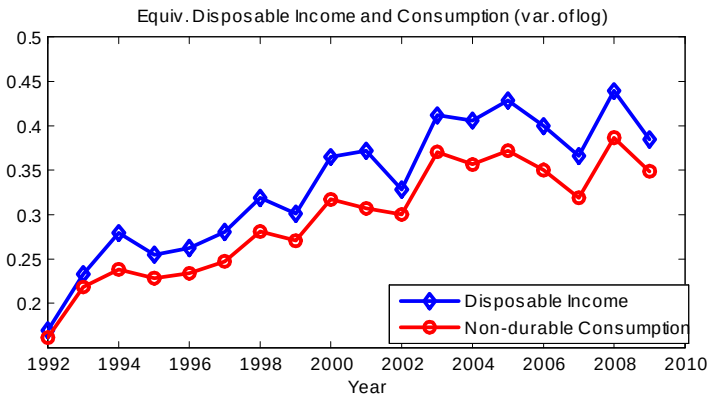
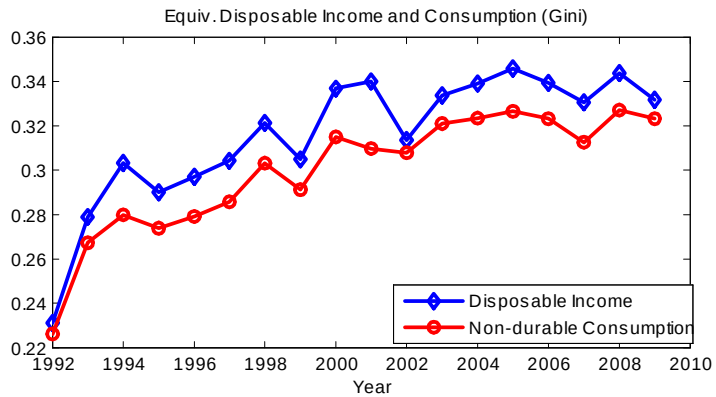
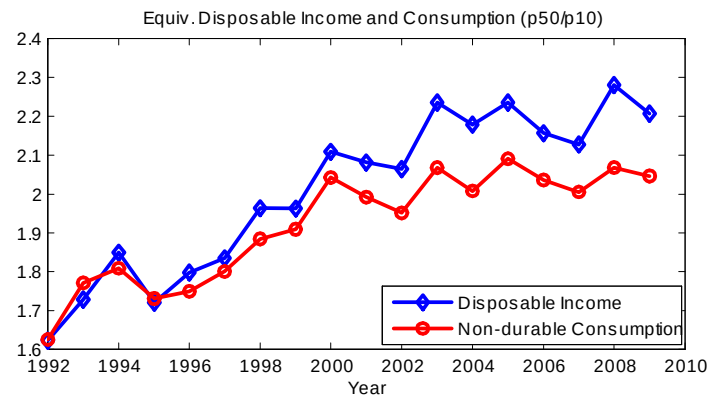
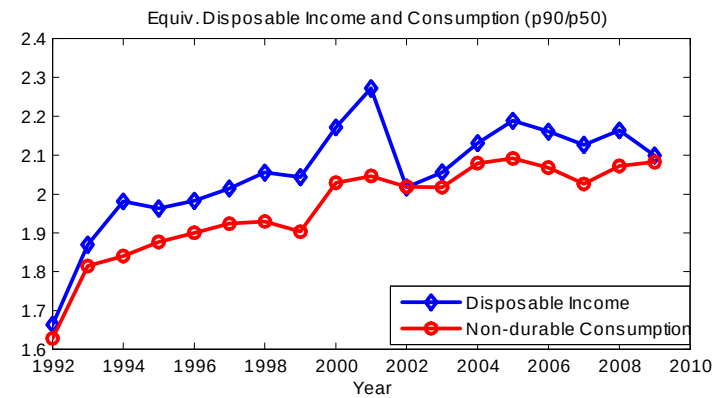
Equiv. Nondurable Consumption and Disposable Income









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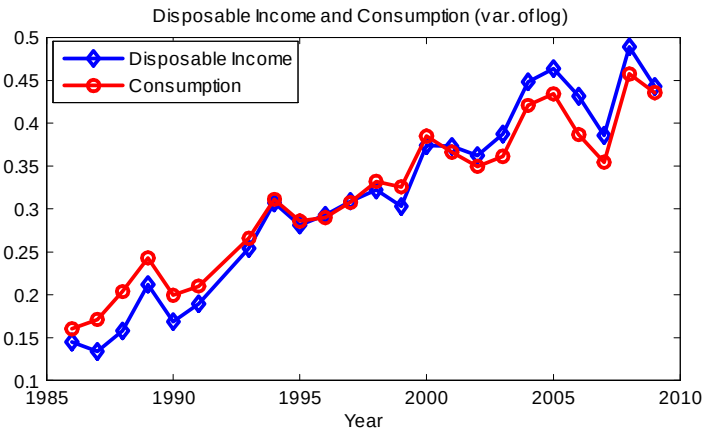
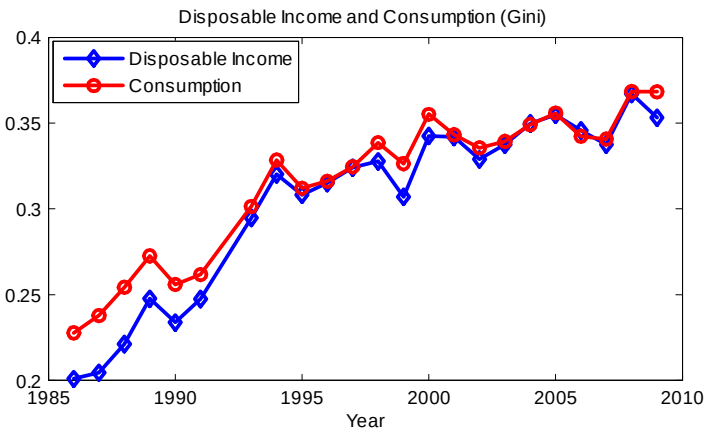
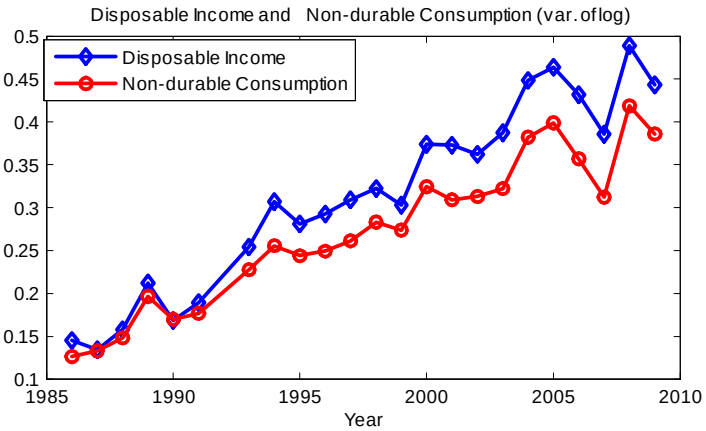
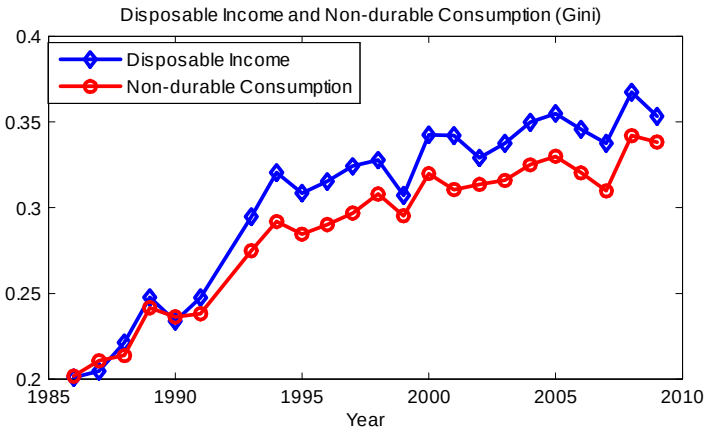
Consumption and Income Inequality: Same 9 Provinces

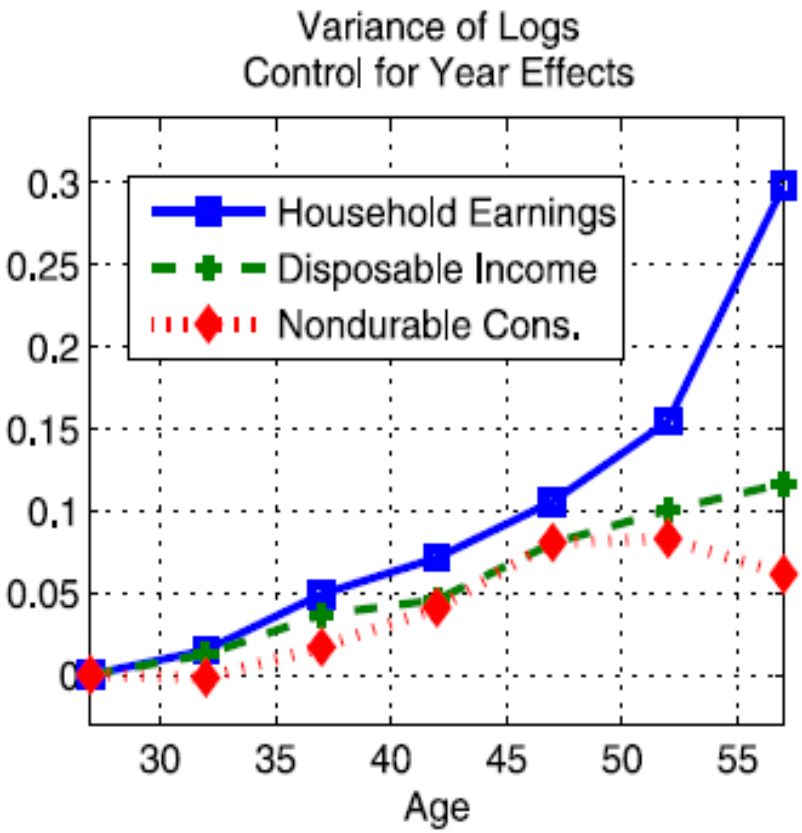


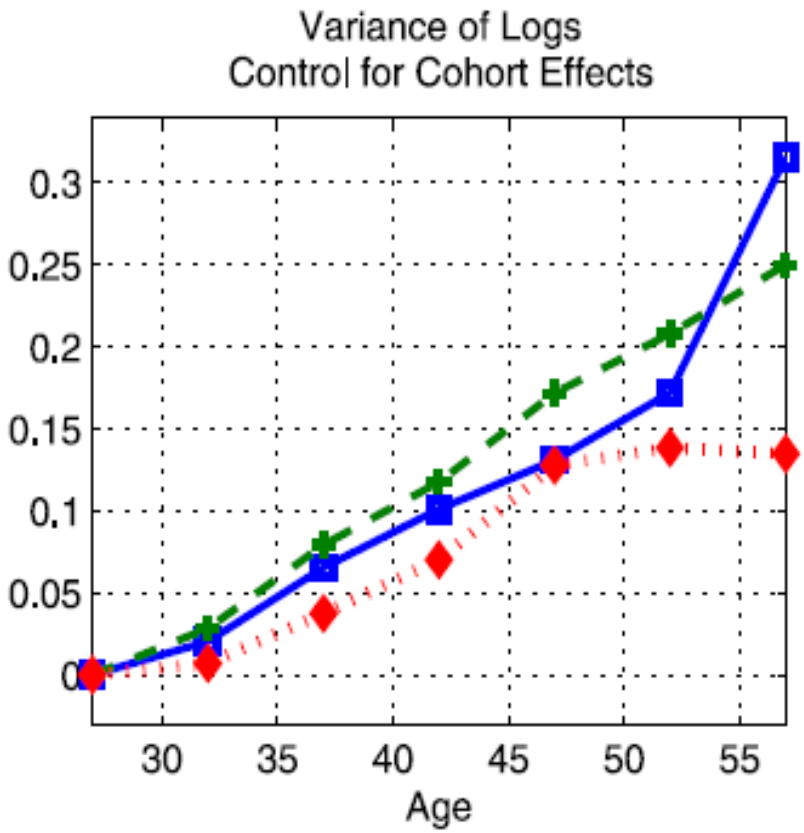






US Inequality over Life Cycle: HPV (2010)





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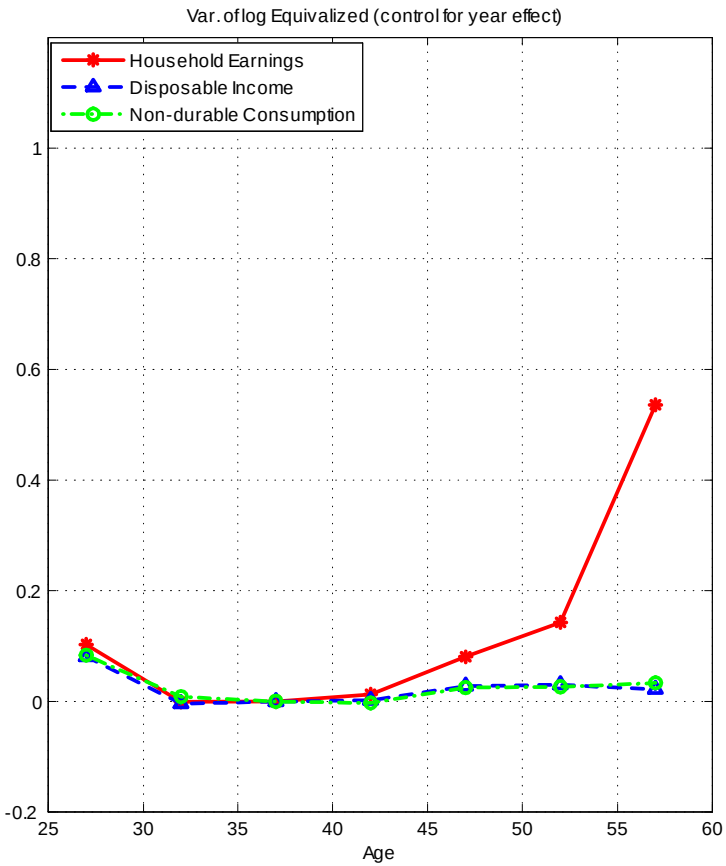
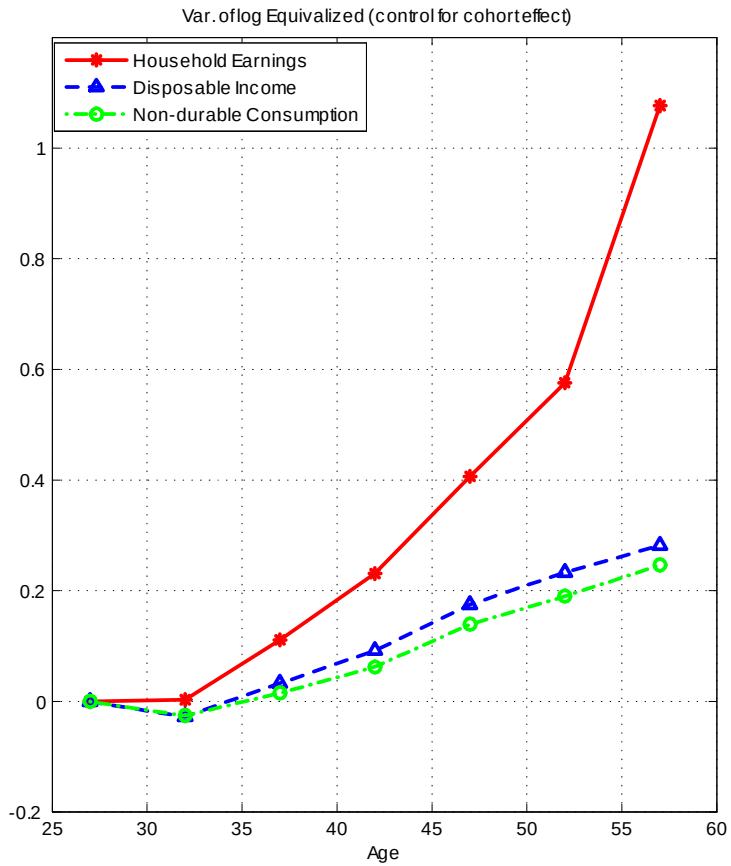
Equiv. Inequality over Life Cycle





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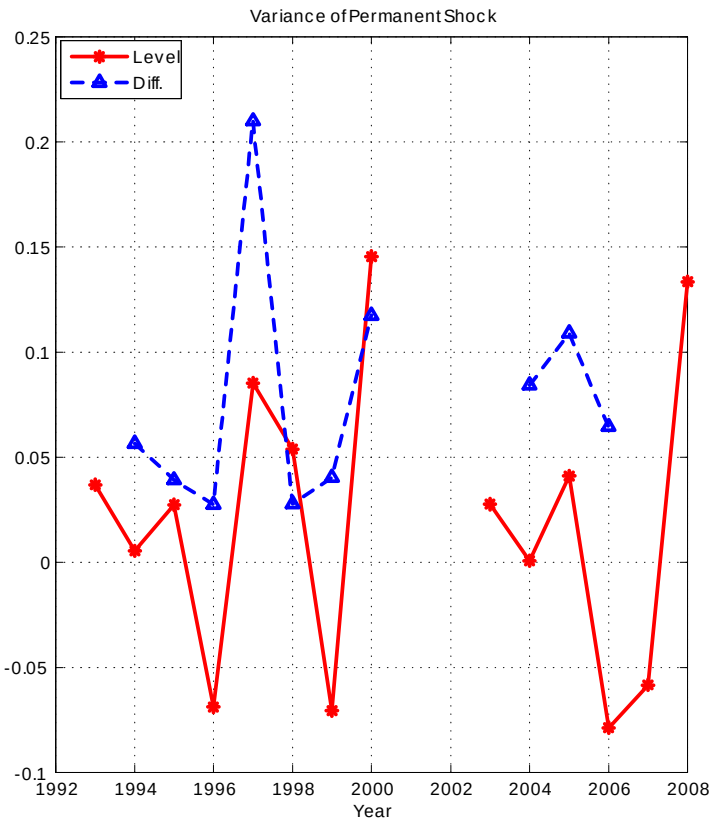
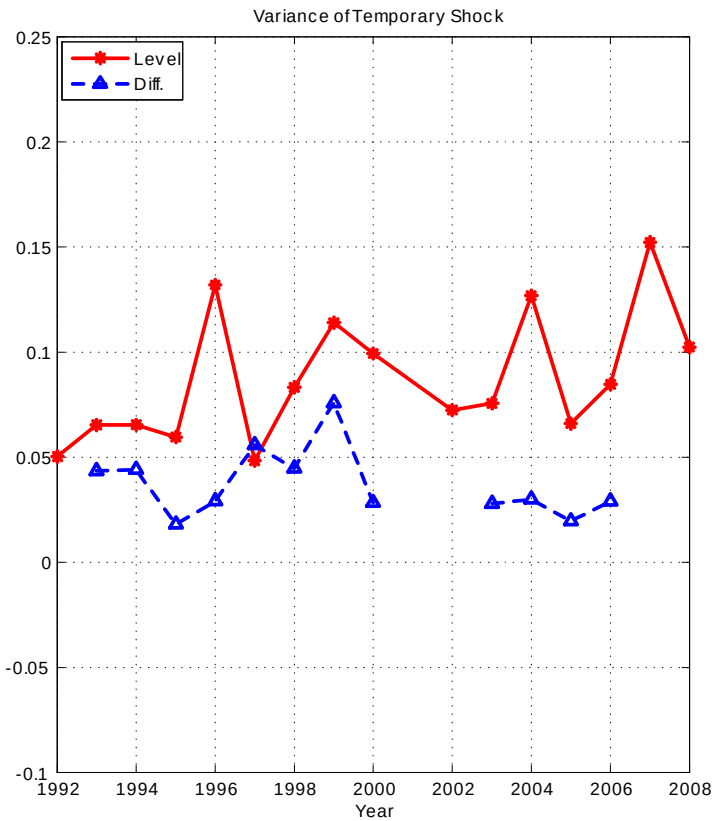
Transitory vs. Permanent Income Shock: Age Relaxation





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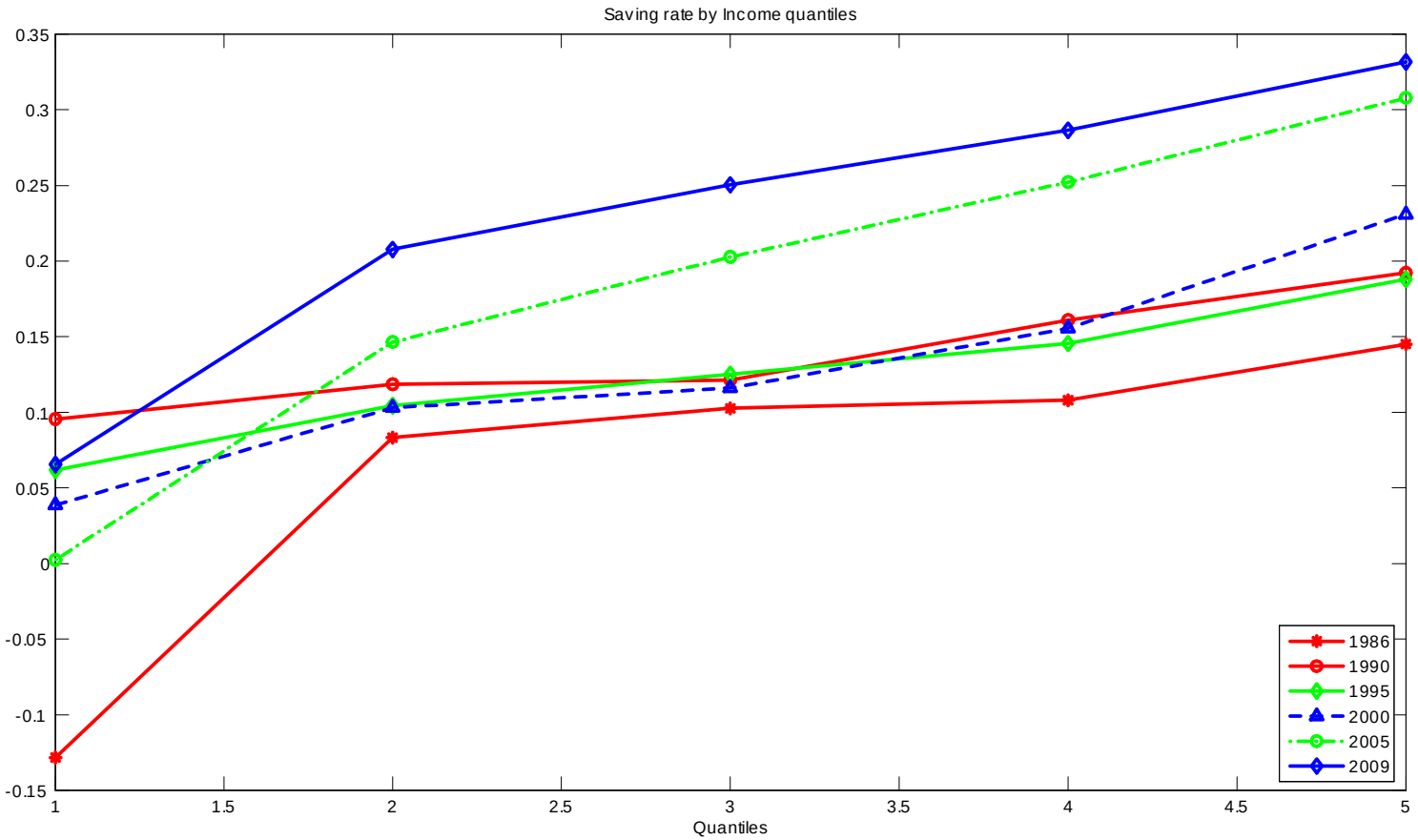
Saving Rate by Income Quantiles



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Difference Method

- Define $\triangle w_{i,c,t} \equiv w_{i,c,t} - w_{i,c,t-1} = \eta_{i,c,t} + \varepsilon_{i,c,t} - \varepsilon_{i,c,t-1}$
- We have

$$cov_c(\triangle w_{i,c,t+1}, \triangle w_{i,c,t}) = -\sigma_{\varepsilon,c,t} \quad (1)$$

$$var_c(\triangle w_{i,c,t}) = \sigma_{\eta,c,t} + \sigma_{\varepsilon,c,t} - \sigma_{\varepsilon,c,t-1} \quad (2)$$

- We then identify $\sigma_{\varepsilon,c,t}$ $\forall t$ from (1), and identify $\sigma_{\eta,c,t}$ from (2)
- Finally, we average out $\sigma_{\varepsilon,c,t}$ and $\sigma_{\eta,c,t}$ across all cohorts c at year t

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Level Method

- We have

$$var_c(w_{i,c,t}) - cov_c(w_{i,c,t+1}, w_{i,c,t}) = \sigma_{\varepsilon,c,t} \quad (3)$$

$$var_c(w_{i,c,t}) - cov_c(w_{i,c,t}, w_{i,c,t-1}) = \sigma_{\eta,c,t} + \sigma_{\varepsilon,c,t} \quad (4)$$

- We then identify $\sigma_{\varepsilon,c,t}$ from (3), and identify $\sigma_{\eta,c,t}$ from (4)
- Finally, we average out $\sigma_{\varepsilon,c,t}$ and $\sigma_{\eta,c,t}$ across all cohorts c at year t

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Panel Constr. from UHS: 2-year Panel for Level Method

Year	# of HHs	# of HHs (relaxed age rest.)
$1992-93$	1109	1631
$1993-94$	684	1174
$1994-95$	1289	1912
$1995-96$	1648	2418
$1996-97$	475	891
$1997-98$	1118	1478
$1998-99$	1731	2218
$1999-00$	791	1095
$2000-01$	2098	2434
$2002-03$	12133	12397
$2003-04$	15939	16150
$2004-05$	7629	7940
$2005-06$	17011	17252
$2006-07$	1382	2736

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Panel Constr. from UHS: 3-year Panel for Difference Method

Year	# of HHs	# of HHs (relaxed age rest.)
1992 – 94	140	387
1993 – 95	263	526
1994 – 96	162	1176
1995 – 97	152	437
1996 – 98	137	346
1997 – 99	506	841
1998 – 2000	293	515
1999 – 2001	401	657
2002 – 2004	8636	8975
2003 – 2005	3780	4030
2004 – 2006	4120	4374
2005 – 2007	1187	2355

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Constructed Panel vs. UHS Whole Sample

Variables	Age		% Male		% Married		Education		HH Size	
Year	Panel	UHS	Panel	UHS	Panel	UHS	Panel	UHS	Panel	UHS
1993 – 95	46.6	45.6	67.7	68.0			3.7	3.9	3.2	3.2
1994 – 96	46.7	45.8	67.2	66.6			3.9	3.9	3.2	3.2
1995 – 97	45.3	46.0	69.3	66.2			3.9	3.9	3.1	3.2
1996 – 98	43.8	46.3	64.1	65.1			3.9	3.9	3.1	3.2
1997 – 99	45.5	46.5	62.0	64.1			3.9	3.8	3.1	3.1
1998 – 00	46.9	47.0	62.6	64.6			3.9	3.8	3.2	3.1
1999 – 01	47.7	44.4	69.0	66.3			3.8	3.8	3.1	3.1
2002 – 04	48.2	48.5	70.9	70.5	95.1	94.2	5.4	5.3	3.0	2.9
2003 – 05	48.4	48.7	67.6	70.7	94.9	93.8	5.4	5.4	3.0	2.9
2004 – 06	49.5	49.0	63.3	70.5	94.0	93.6	5.4	5.4	2.9	2.9
2005 – 07	47.1	49.1	74.4	70.2	94.6	93.5	5.5	5.5	3.0	2.9

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Blundell, Pistaferri, and Preston (2008, AER)

- Theoretical foundation: Permanent Income Hypothesis (PIH) with quadratic preference

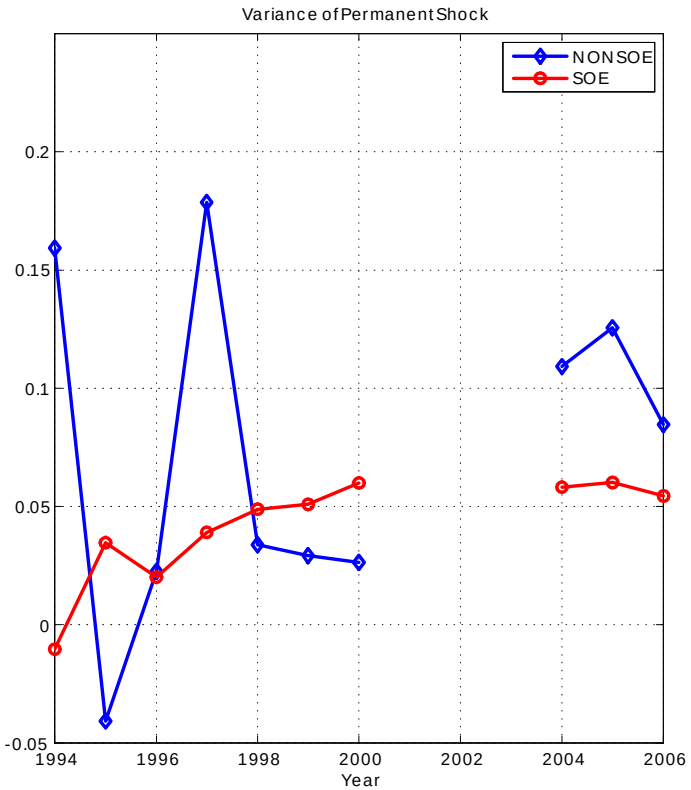
$$\triangle c_t = \underbrace{\eta_t}_{\text{perm shock}} + \underbrace{\frac{r\theta^{-1}}{1+r}}_{\text{age-dependent annu. factor}} \underbrace{\varepsilon_t}_{\text{trans shock}}$$

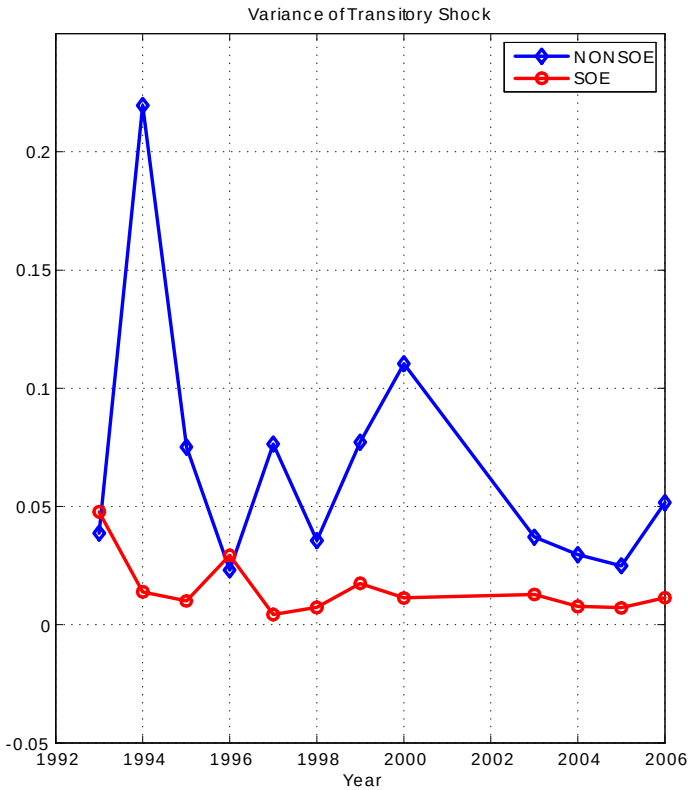
  where $\theta = (1 - \frac{1}{(1+r)^{T-t+1}})$;
- When $t \ll T$ (agent very young), $\theta \longrightarrow 1$, transitory income shock can almost be fully insured; Permement income shock however passes 1-to-1 to consumption
- BPP (2008) estimate for US 1978-1992

$$\triangle c_{i,t} = \underbrace{\phi_{i,t}}_{\text{partial insurance coeff}} \eta_{i,t} + \underbrace{\psi_{i,t}}_{\text{partial insurance coeff}} \varepsilon_{i,t} + \xi_{i,t}$$

- They find $\phi = 0.64$, $\psi = 0.05 \Longrightarrow$ Perm income shock is much harder to insure! Back

Income Shock: SOE vs POE





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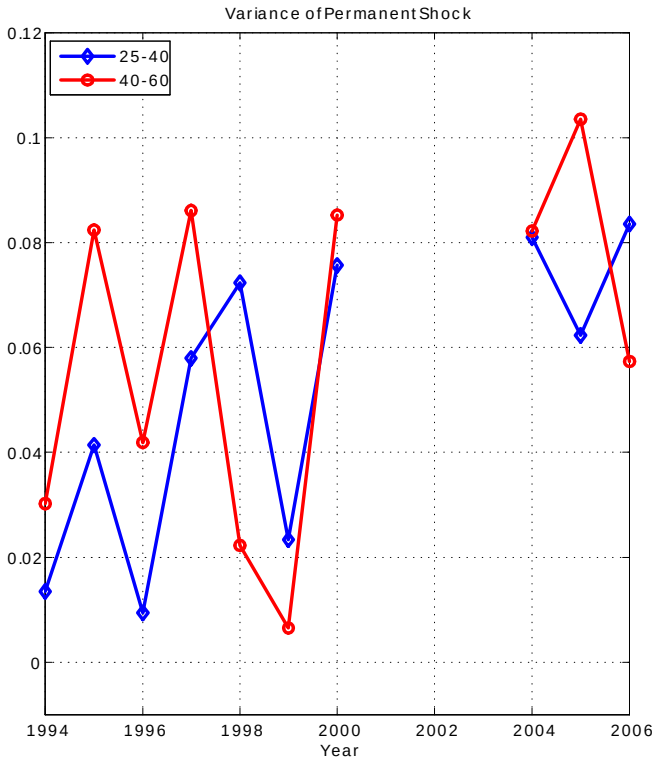
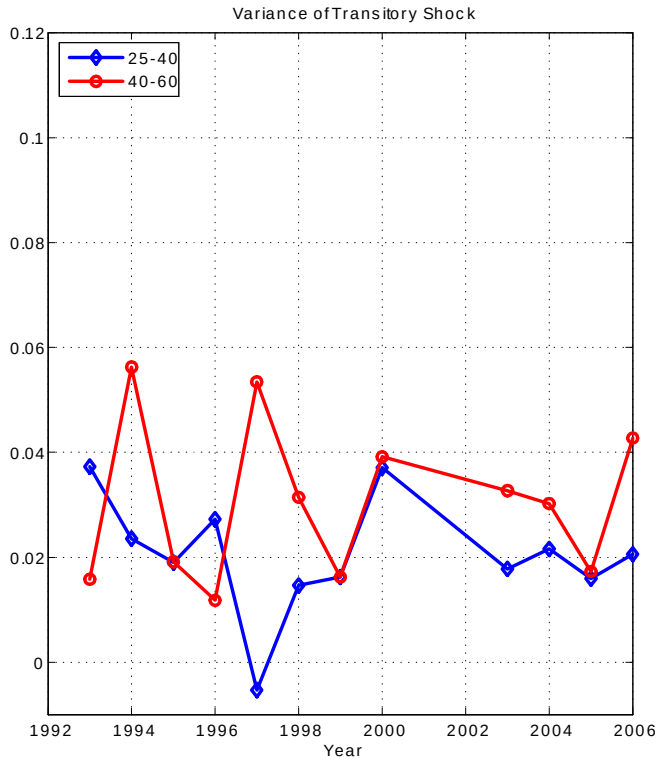
Income Shock: Young vs Old





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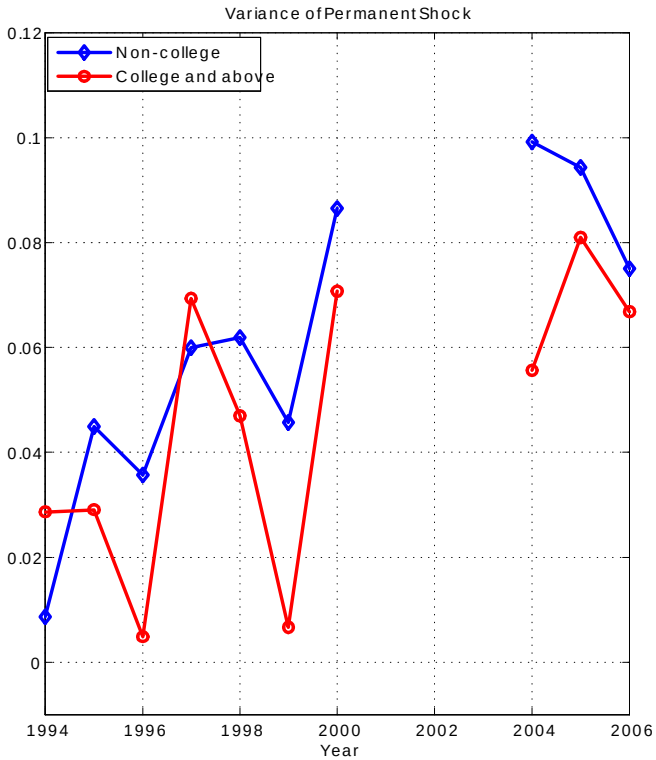
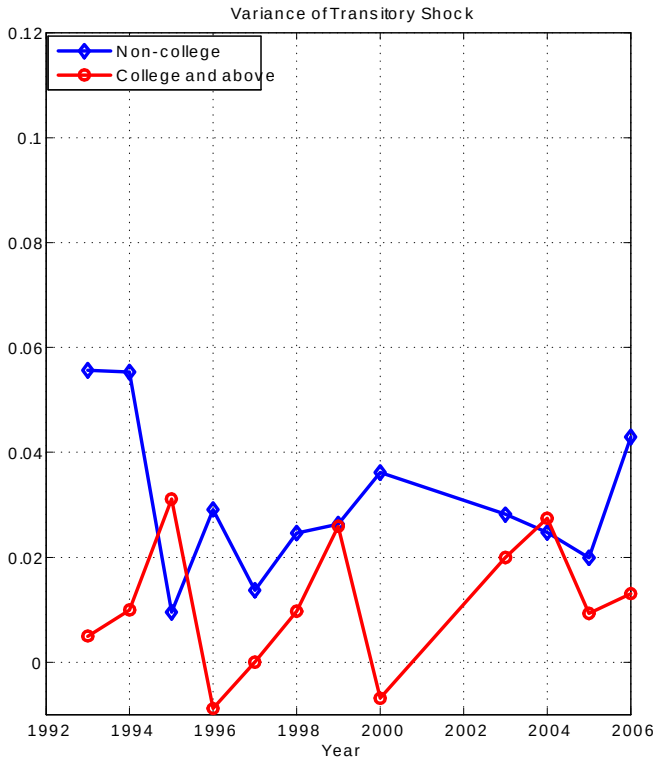
Income Shock: Skilled vs Unskilled





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