

# Partial Insurance and Consumption inequality

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# Income and Consumption Inequality

- Inequality has many linked dimensions: wages, incomes and consumption
- The literature on the first two types is huge
- The literature on consumption inequality is less developed, but growing.
- The link between the various types of inequality is mediated by multiple insurance mechanisms
- The amount of insurance available to consumers depends on the durability of income shocks
- The more persistent are income shocks, the lower is the amount of insurance

# This paper

- Uses the evolution of income and consumption inequality in the US to identify
  - Income inequality due to permanent and transitory components
  - Amount of insurance available with respect to the two type of shocks
- Fact # 1: Consumption inequality is lower than income inequality
- Fact # 2: Income inequality grows more rapidly than consumption inequality
- This is true of US as well as other countries

Figure 1a: Income and Consumption Inequality, USA

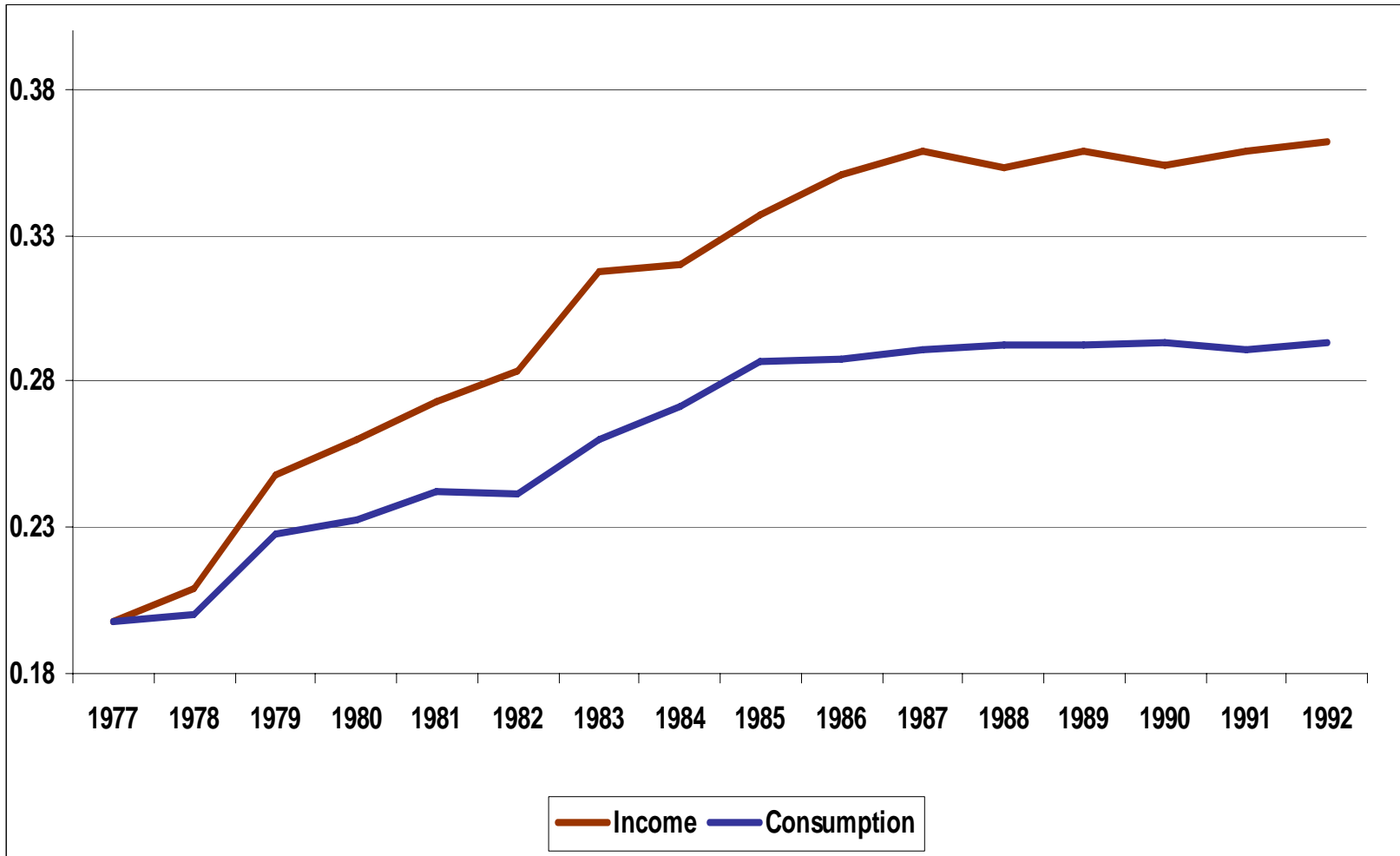


Figure 1b: Income and Consumption Inequality, UK

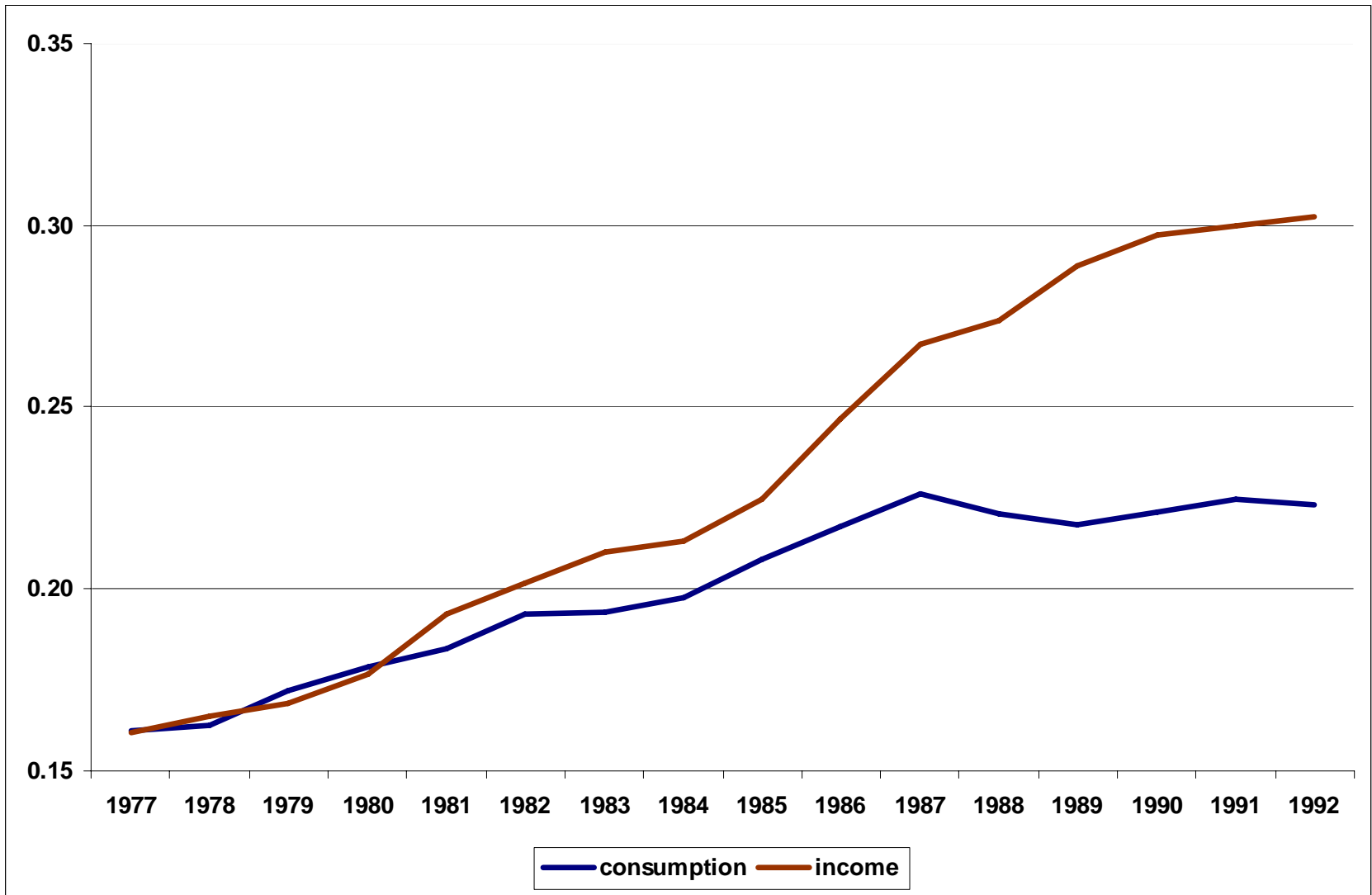


Figure 1b: Consumption and Income Inequality in the UK

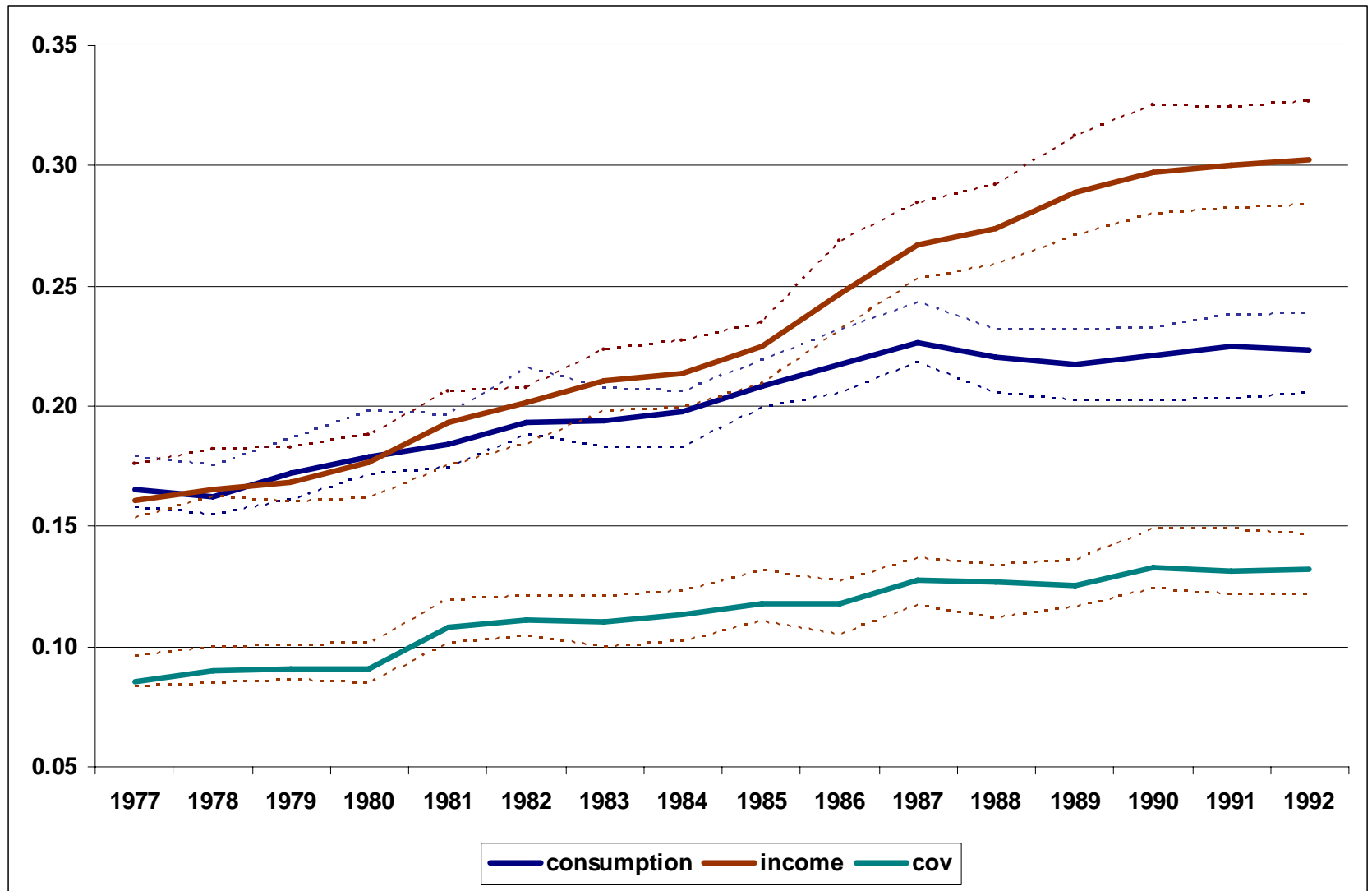


Figure 1c: Income and Consumption Inequality, China

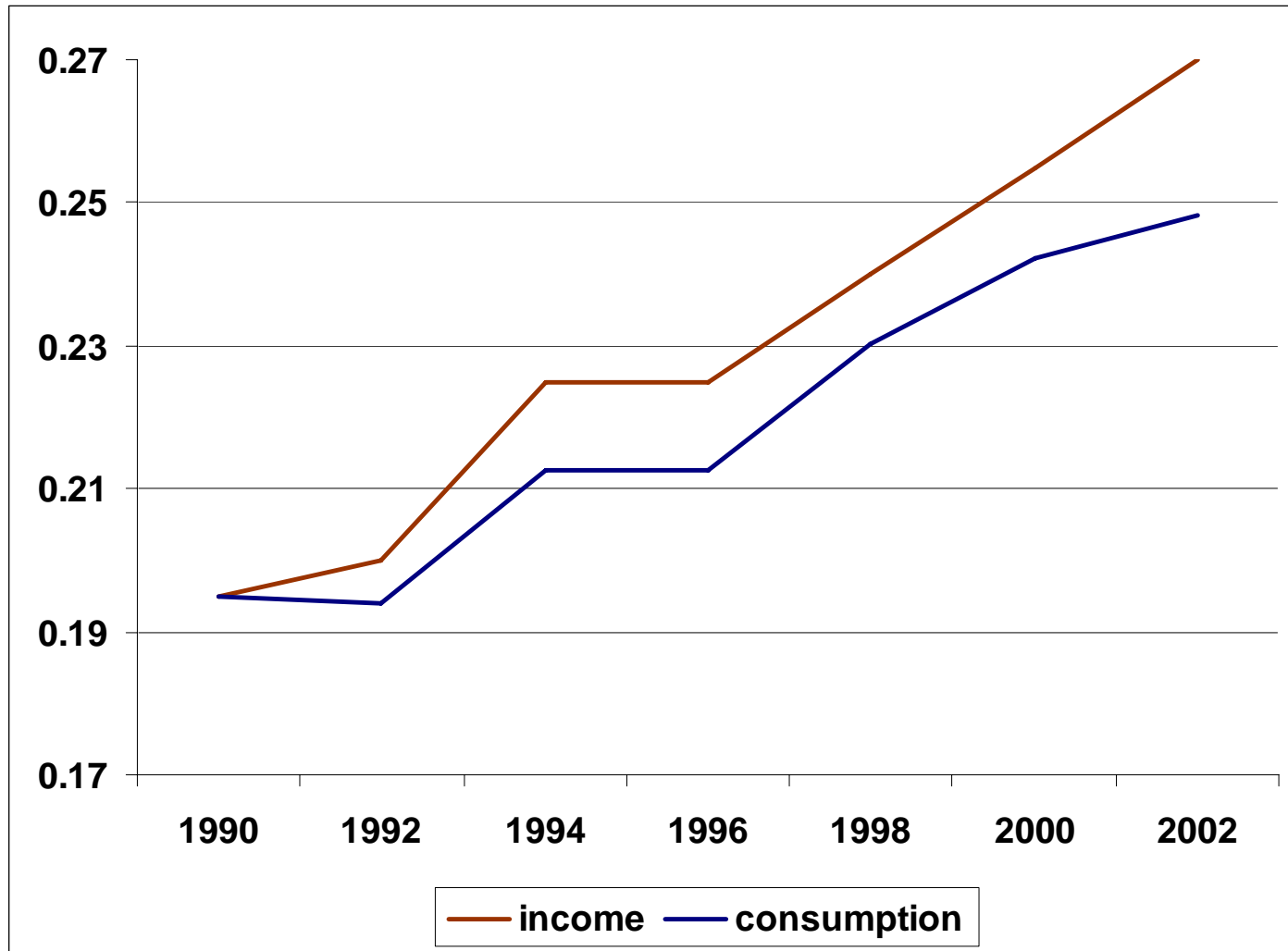


Figure 1d: Income and Consumption Inequality, Japan

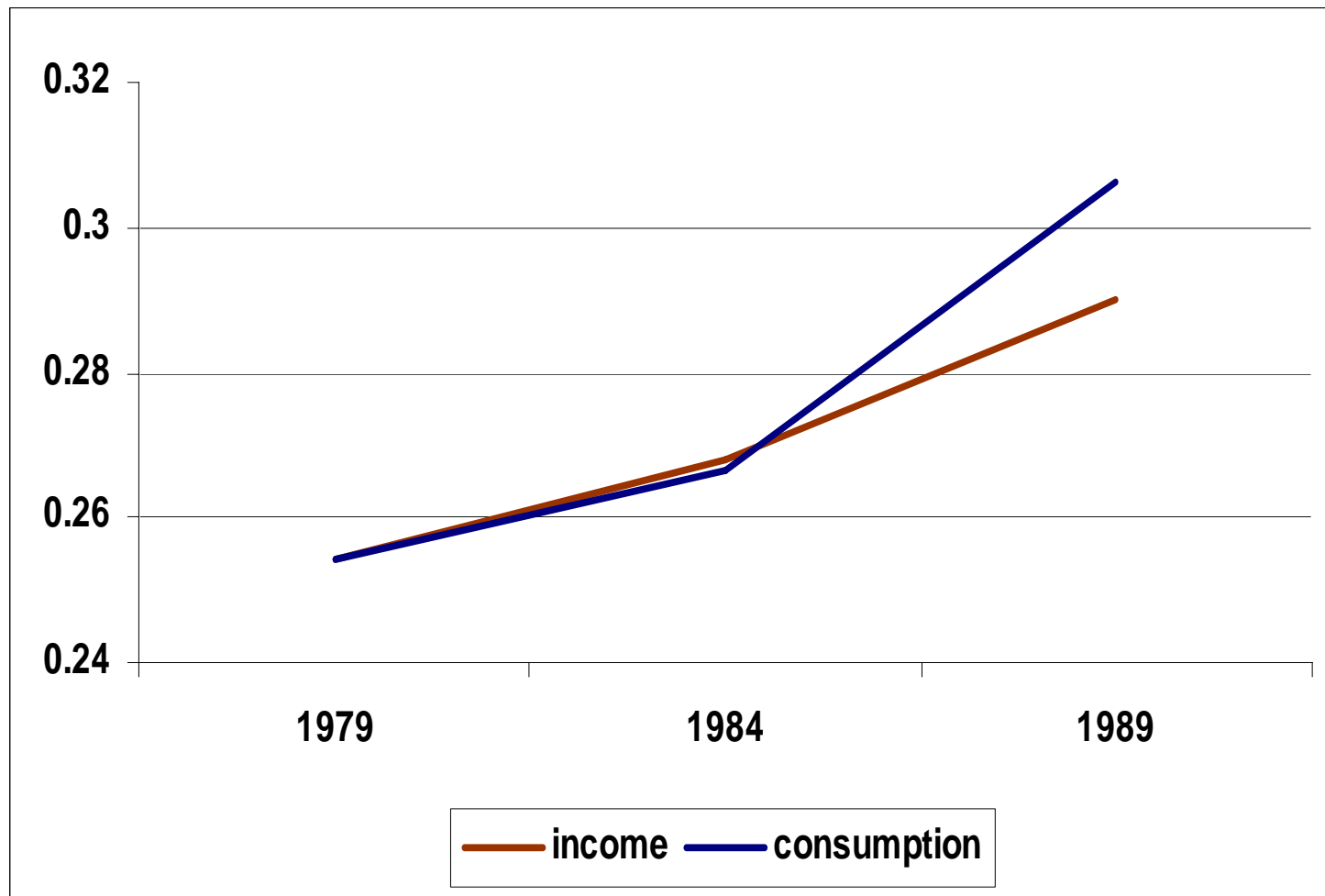
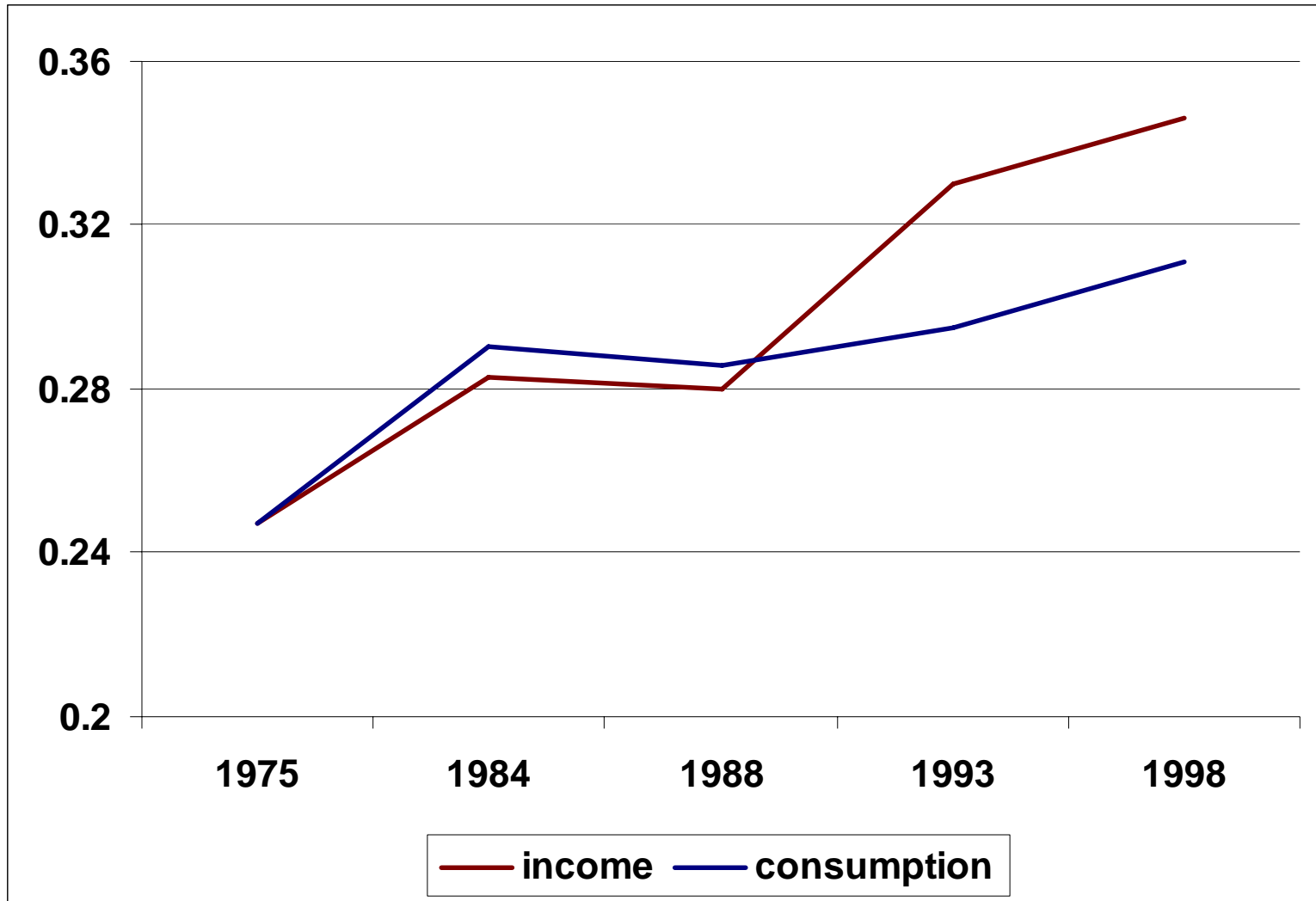




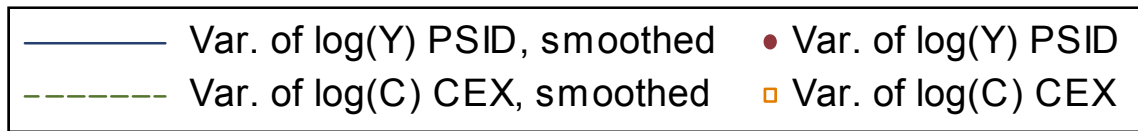
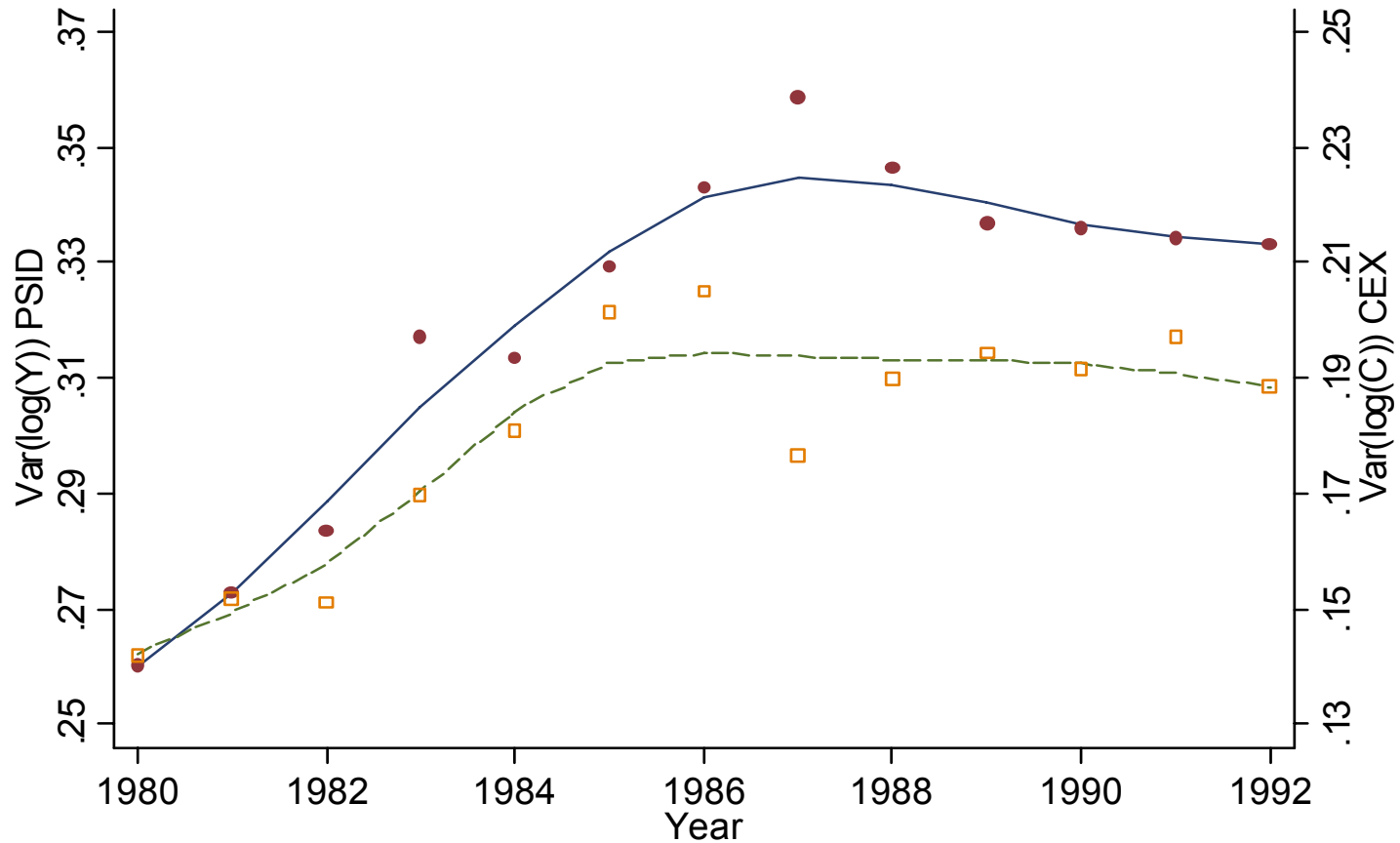
Figure 1e: Income and Consumption Inequality, Australia



# Related Literature

- Examination of inequality over time via consumption and income
  - Studies from the BLS, Johnson and Smeeding (2005); early work in the US by Cutler and Katz (1992) and in the UK by Blundell and Preston (1991) and Atkinson (1997)
- Econometric work on the panel data decomposition of income processes
  - MaCurdy(1982), Abowd and Card (1989), Gottschalk and Moffitt (1995), Meghir and Pistaferri (2004), Guvenen (2006)
- Work on intertemporal consumption and insurance, especially on ‘excess’ insurance and excess sensitivity
  - Hall and Mishkin (1982), Campbell and Deaton (1989), Cochrane (1991), Attanasio and Davis (1996), Krueger and Perri (2006), Heathcote, Storesletten and Violante (2006), Primiceri and Van Rens (2004), Attanasio and Pavoni (2006)

# The US case again



# The self-insurance model of consumption choices

$$\max E_t \sum_{j=0}^{T-t} \frac{1}{(1+\delta)^j} \frac{C_{it}^\beta - 1}{\beta} e^{Z_{it}\theta}$$

- Individuals can self-insure using a simple credit market (risk-free bond)
- Consumption and income are linked through the intertemporal budget constraint

$$A_{t+1} = (1+r_t)(A_t + Y_t - C_t)$$

$$A_T = 0; A_t \text{ given}$$

- Individuals retire at L. Die with certainty at T. The only source of uncertainty is about income.

# Income dynamics

$$\ln Y_{it} = Z_{it}' \lambda + P_{it} + \varepsilon_{it}$$

$$P_{it} = P_{it-1} + \zeta_{it}$$

$$\varepsilon_{it} = \sum_{j=0}^q \theta_j v_{t-j}, \theta_0 \equiv 1$$

- P: Permanent component (a martingale)
- $\varepsilon$ : Transitory component (an MA(q))
- Meghir and Pistaferri (2004) show how to identify the variances of the shocks in a general model with measurement error using panel data (PSID)
- Here we allow the variances of the permanent and transitory components to vary non-parametrically with cohort, education and time.
- It follows from above that:

$$\Delta y_{it} = \zeta_{it} + \Delta \varepsilon_{it}, \text{ where } \Delta y_{it} = \Delta \ln Y_{it} - \Delta Z_{it}' \lambda_t$$

# Consumption dynamics

- With CRRA preferences, the Euler equation is:

$$C_{it}^{\beta-1} = \frac{1+r_t}{1+\delta} E_t e^{\Delta Z_{it+1} \vartheta} C_{it+1}^{\beta-1}$$

- We show that this can be approximated by:

$$\Delta \ln C_{it} \approx \Gamma_{it} + \Delta Z_{it}' \vartheta + \pi_{it} \zeta_{it} + \alpha_t \pi_{it} \varepsilon_{it} + \xi_{it}$$

Impatience, Precautionary savings, intertemporal substitution

Deterministic preference shifts

Impact of permanent income shocks

Impact of transitory income shocks,  $\alpha < 1$

Impact of shocks to higher income moments

- Define (unobserved) consumption growth:

$$\Delta c_{it} = \Delta \ln C_{it} - \Gamma_{it} - \Delta Z_{it}' \vartheta$$

# Self-insurance

- In this model, self-insurance is driven by the parameter  $\pi$ , which corresponds to the ratio of human capital wealth to total wealth (the sum of financial and human capital wealth)
- For given level of human capital wealth, past savings imply higher financial wealth today, and hence a lower value of  $\pi$ : Consumption responds less to income shocks (precautionary saving)
- Individuals approaching retirement have a lower value of  $\pi$
- In the certainty-equivalence version of the PIH,  $\pi \approx 1$  and  $\alpha \approx 0$

# Complete markets

- Under some circumstances, it is possible to insure consumption fully against income shocks
- In this case,  $\pi=0$
- Theoretical problems: *Moral hazard*, *Limited enforcement*, ecc.
- Empirical problems: The hypothesis  $\pi=0$  is soundly rejected (Cochrane, 1991; Attanasio and Davis, 1996; Hayashi, Altonji and Kotlikoff, 1996).



# Partial Insurance

- It's plausible that there is less insurance than predicted by the complete markets hypothesis
- It's also plausible that there is more insurance than predicted by the permanent income hypothesis with just a risk-free bond
- Attanasio and Pavoni (2005) consider an economy with moral hazard and hidden asset accumulation - individuals now have hidden access to a simple credit market. They show that, depending on the cost of shirking and the persistence of the income shock, some partial insurance is possible. A linear insurance rule can be obtained as an 'exact' solution in a dynamic Mirrlees model with CRRA utility.

# Insurance to Transitory and Permanent Shocks

- Adjustment in assets
- Redistributive mechanisms: social insurance, transfers, progressive taxation
  - Gruber; Gruber and Yelowitz; Blundell and Pistaferri; Kniesner and Ziliak
- Family and interpersonal networks
  - Kotlikoff and Spivak; Attanasio and Rios-Rull
- Individual and household labor supply
  - Stephens; Heathcote, Storesletten and Violante; Attanasio, Low and Sanchez-Marcos
- Durable replacement
  - Browning and Crossley
- Implicit contracts between employers and employees
  - Guiso, Pistaferri and Schivardi

# Consumption dynamics with partial insurance

$$\Delta c_{it} \approx \phi_t \zeta_{it} + \psi_t \varepsilon_{it} + \xi_{it}$$

Partial insurance coefficient  
w.r.t. *permanent* shocks,  $0 \leq \phi \leq 1$

Partial insurance coefficient  
w.r.t. *transitory* shocks,  $0 \leq \psi \leq 1$

- In this notation,  $\phi$  and  $\psi$  subsume  $\pi$  and  $\alpha$  from the self-insurance model
- Need panel data on consumption and income to identify the parameters of interest
  - CEX
    - Provides consumption and income, but it's not a panel
  - PSID
    - Provides panel data on income, but limited information on consumption (food)

# How to “create” panel data on consumption in the PSID

- We create a “mapping” from food consumption to non-durable consumption
- The “mapping” is a demand function for food

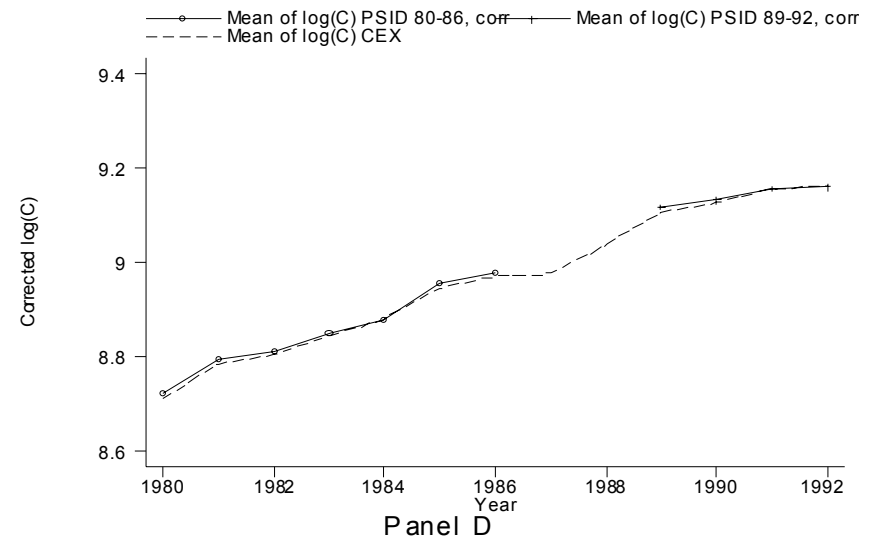
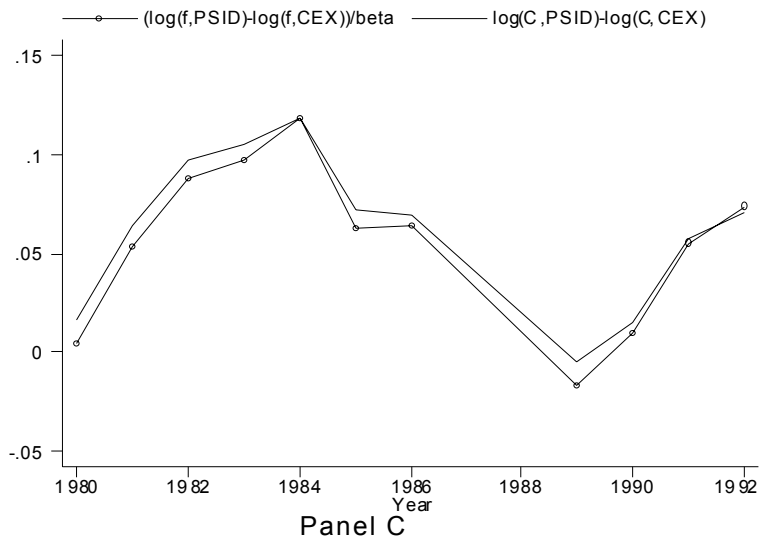
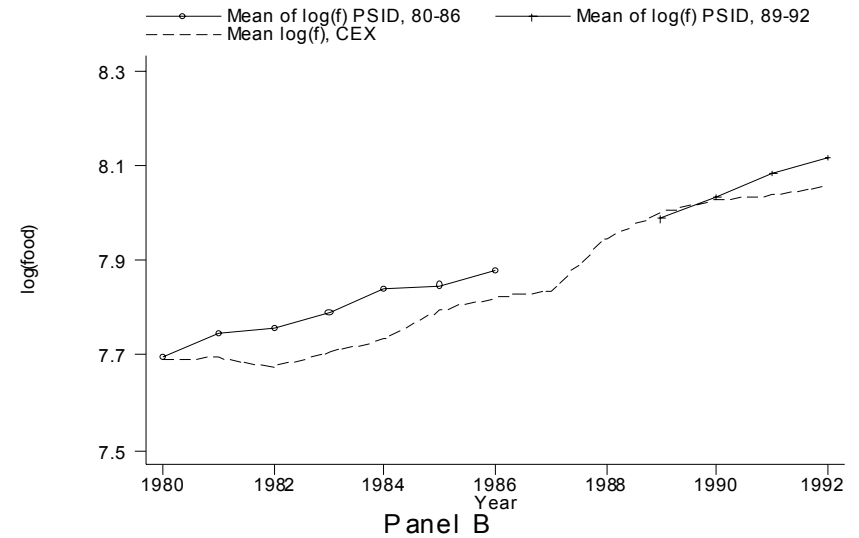
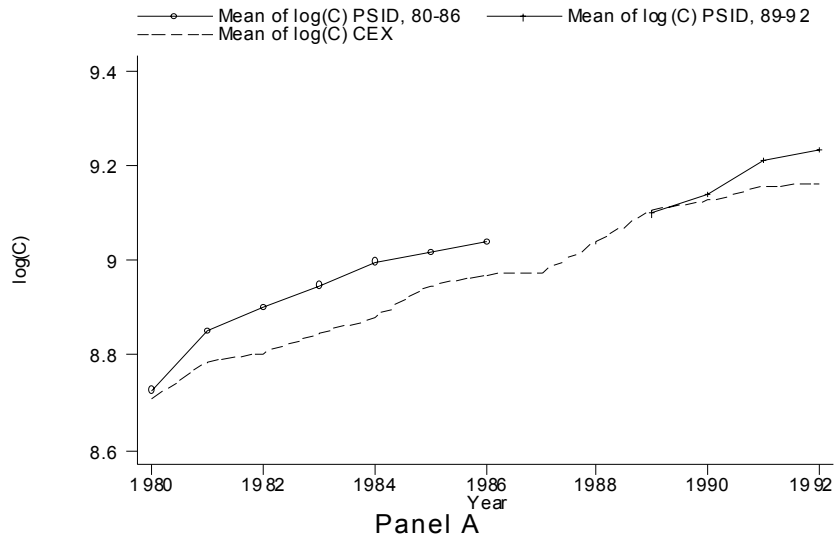
$$\ln f_{it} = Z_{it}' \gamma + \beta_t \ln C_{it} + \ln p_t' \nu + e_{it}$$

- This demand function can be estimated consistently using CEX data
- It can be inverted in the PSID using the estimates from the CEX to obtain an imputed measure of non-durable consumption

$$\ln \hat{C}_{it} = \hat{\beta}_t^{-1} (\ln f_{it} - Z_{it}' \hat{\gamma} - \ln p_t' \hat{\nu})$$

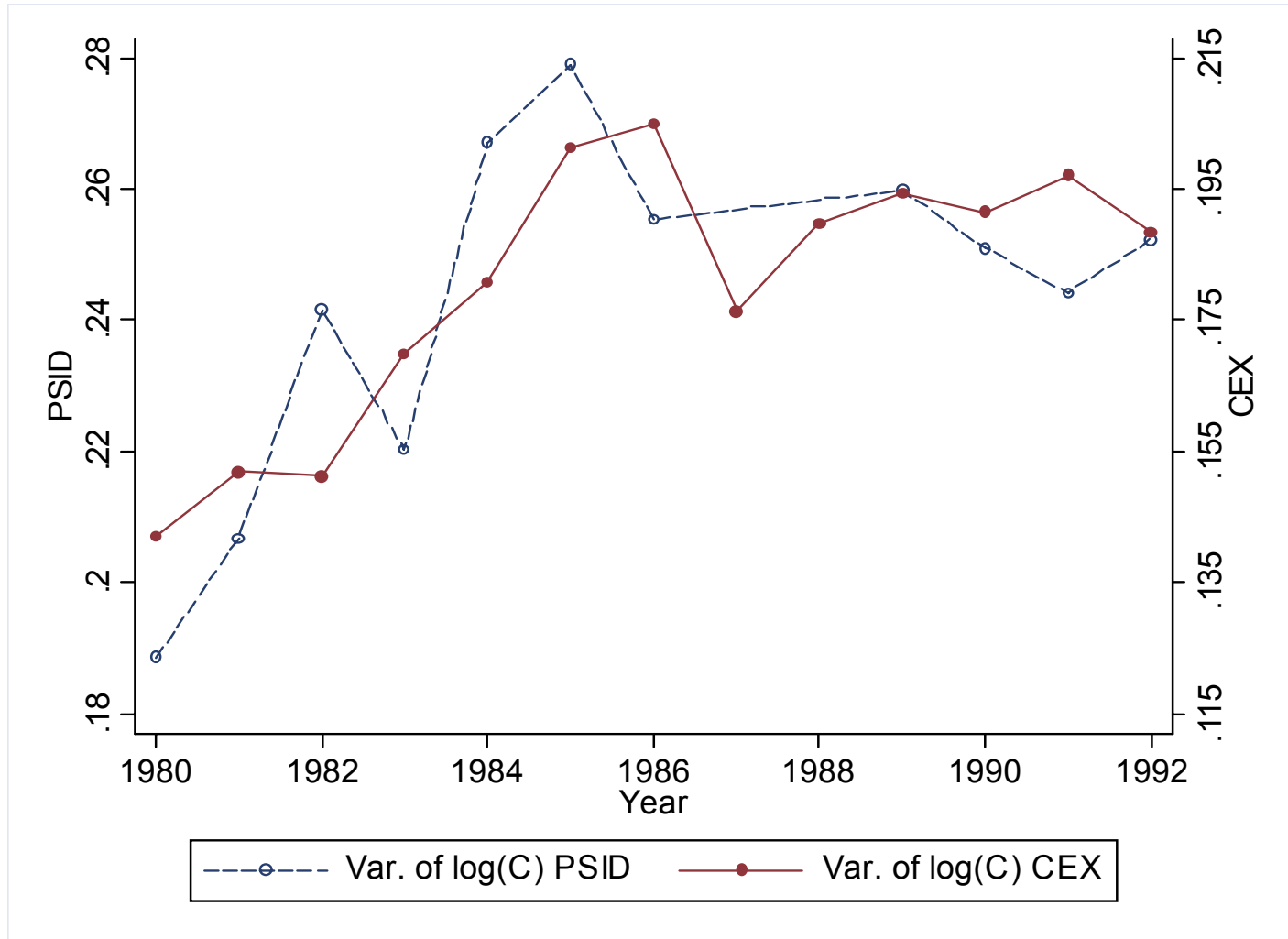
# Does the method work? (1)

## Means



# Does the method work? (2)

## Variances



# Income and consumption growth variances

- From our income-consumption model we have a set of covariance restrictions (allowing for measurement error)

$$\begin{aligned} \text{var}(\Delta y_{it}) &= \text{var}(\zeta_{it}) + \text{var}(\Delta \varepsilon_{it}) \\ \text{cov}(\Delta y_{it}, \Delta y_{it+1}) &= -\text{var}(\varepsilon_{it}) \\ \text{var}(\Delta c_{it}) &= \phi_t^2 \text{var}(\zeta_{it}) + \psi_t^2 \text{var}(\varepsilon_{it}) + \text{var}(\xi_{it}) + \text{var}(u_{it}^c) \\ \text{cov}(\Delta c_{it}, \Delta c_{it+1}) &= -\text{var}(u_{it}^c) \\ \text{cov}(\Delta c_{it}, \Delta y_{it}) &= \phi_t \text{var}(\zeta_{it}) + \psi_t \text{var}(\varepsilon_{it}) \\ \text{cov}(\Delta c_{it}, \Delta y_{it+1}) &= -\psi_t \text{var}(\varepsilon_{it}) \end{aligned}$$

- A useful decomposition:

$$\Delta \text{var}(\Delta c_{it}) = \underbrace{\text{var}(\zeta_{it-1}) \Delta \phi_t^2}_{\text{An increase in insurance (for given inequality)}} + \underbrace{\phi_{t-1}^2 \Delta \text{var}(\zeta_{it})}_{\text{An increase in inequality (for given insurance)}} + \text{var}(\varepsilon_{it-1}) \Delta \psi_t^2 + \psi_{t-1}^2 \Delta \text{var}(\varepsilon_{it})$$

An increase in insurance (for given inequality)

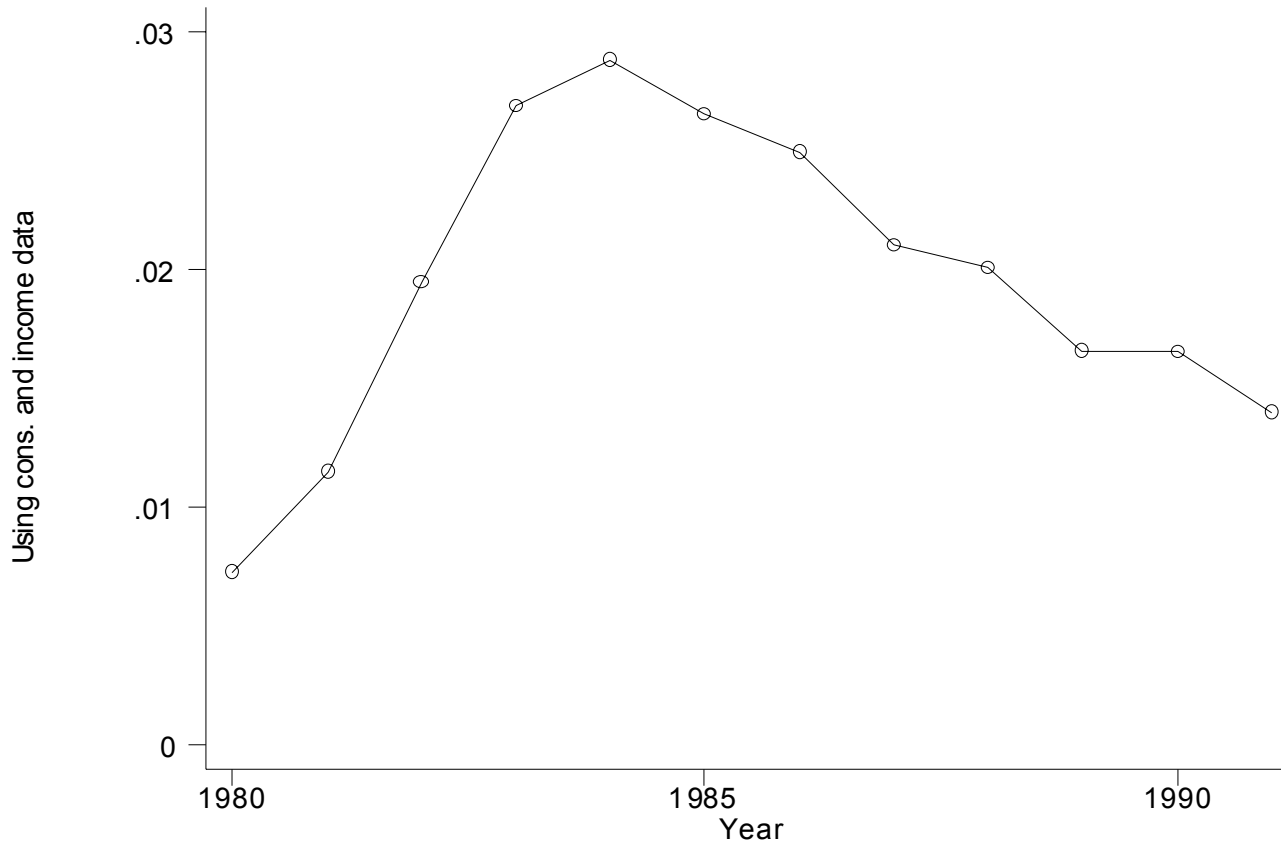
An increase in inequality (for given insurance)

# Results

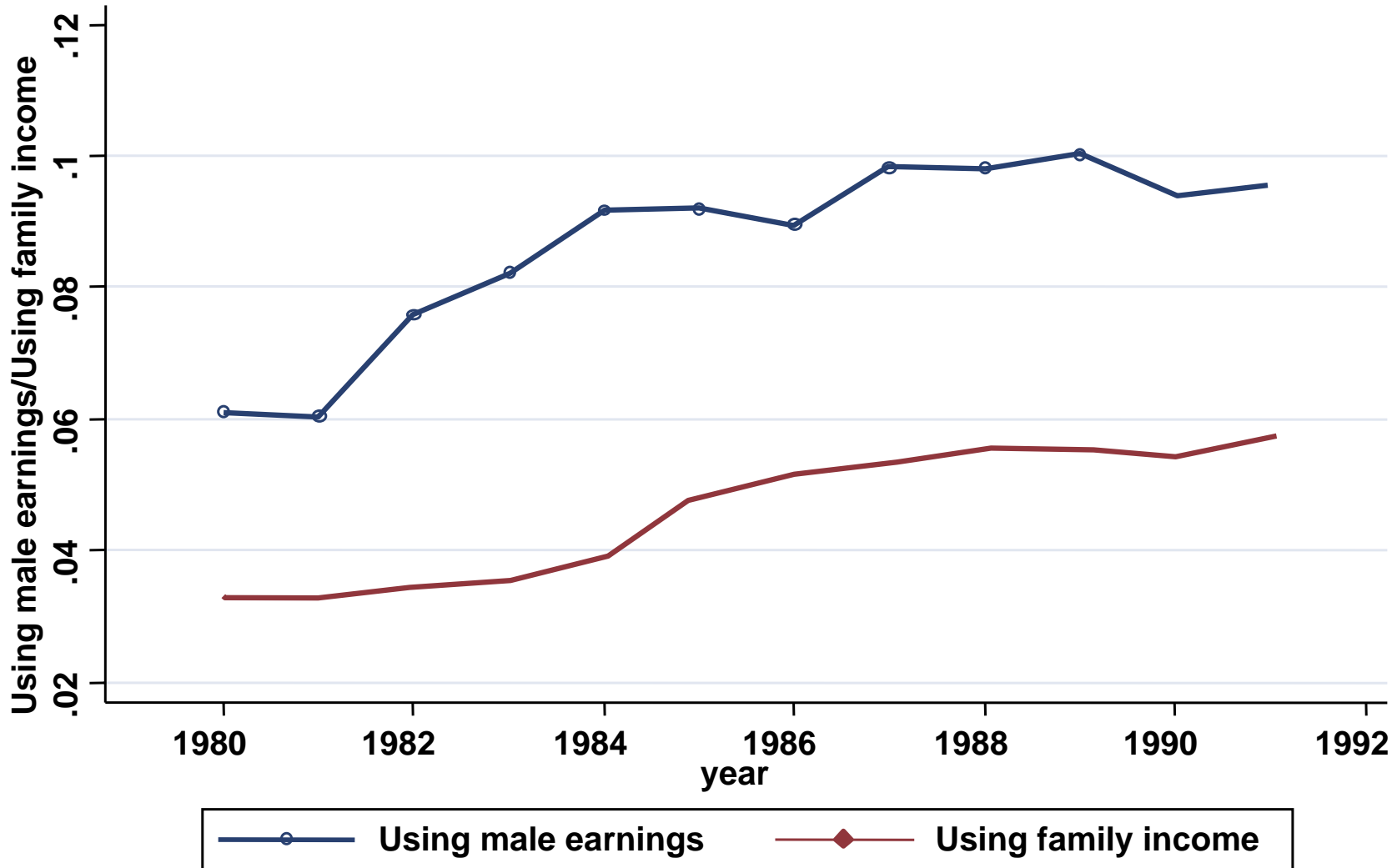
	Whole sample	George W. Bush cohort (born 1940s)	Donald Rumsfeld cohort (born 1930s)	Low educ.	High educ.
Var. measur. error	0.0632 (0.0032)	0.0582 (0.0049)	0.0609 (0.0061)	0.0753 (0.0055)	0.0501 (0.0032)
Var. preference shocks	0.0122 (0.0038)	0.0151 (0.0064)	0.0164 (0.0073)	0.0117 (0.0067)	0.0156 (0.0042)
Coeff. partial insur. perm. shock ( $\phi$ )	0.6167 (0.1118)	0.7445 (0.2124)	0.5626 (0.2535)	0.8211 (0.2232)	0.3262 (0.0867)
Coeff. partial insur. trans. shock ( $\psi$ )	0.0550 (0.0358)	0.0845 (0.0657)	0.0215 (0.0592)	0.0869 (0.0517)	0.0437 (0.0513)
P-value test equal $\phi$	33%	16%	45%	81%	2%
P-value test equal $\psi$	58%	43%	14%	46%	14%



# Variance permanent shocks



# Variance transitory shocks



# Interpretation

$$\Delta \text{var}(\Delta c_{it}) = \text{var}(\zeta_{it-1}) \Delta \phi_t^2 + \phi_{t-1}^2 \Delta \text{var}(\zeta_{it}) + \text{var}(\varepsilon_{it-1}) \Delta \psi_t^2 + \psi_{t-1}^2 \Delta \text{var}(\varepsilon_{it})$$

- We find that the amount of insurance has not changed over this period (Krueger and Perri), i.e.,  $\Delta \phi_t = 0$ ,  $\Delta \psi_t = 0$
- In the first half of the sample period,  $\Delta \text{var}(\zeta) > 0$  and  $\Delta \text{var}(\varepsilon) \approx 0$ , and thus

$$\Delta \text{var}(\Delta c_{it}) \approx \phi_{t-1}^2 \Delta \text{var}(\zeta_{it})$$

- In the second half of the sample period the opposite is true,  $\Delta \text{var}(\zeta) = 0$  and  $\Delta \text{var}(\varepsilon) > 0$ , and since  $\psi \approx 0$ ,

$$\Delta \text{var}(\Delta c_{it}) \approx 0$$

- Level effects - *excess smoothness*.
- But *excess smoothness* is not a spurious phenomenon: We don't find it exactly where we don't expect it to be, e.g., among low educated, low wealth, low initial income individuals.

# Where is insurance coming from? (1)

- Family and interpersonal networks

	Baseline	Excluding private transfers
$\phi$	0.6167 (0.1118)	0.6531 (0.1187)
$\psi$	0.0550 (0.0358)	0.0532 (0.0359)

- Wealth accumulation, Initial income

	Baseline	High initial wealth sample	Low initial wealth sample	Low initial wealth sample, use total consumption	Including SEO sub-sample	Including younger households
$\phi$	0.6167 (0.1118)	0.5567 (0.1076)	0.9589 (0.3696)	0.7800 (0.3131)	0.6840 (0.1001)	0.7112 (0.1189)
$\psi$	0.0550 (0.0358)	0.0165 (0.0357)	0.2800 (0.0896)	0.4159 (0.1153)	0.1339 (0.0332)	0.0592 (0.0421)

# Where is insurance coming from? (2)

- Transfers and Family labor supply

	Baseline	Excluding transfers	Excluding and transfers and spouse's earnings
$\phi$	0.6167 (0.1118)	0.4668 (0.0977)	0.2902 (0.0611)
$\psi$	0.0550 (0.0358)	0.0574 (0.0286)	0.0436 (0.0291)

# Misleading evidence (1)

- Suppose we ignore the distinction between permanent and transitory shocks
- The partial insurance coefficient is now a weighted average of the coefficients of partial insurance  $\phi$  and  $\psi$ , with weights given by the importance of the variance of permanent (transitory) shocks on the overall variance of income growth
- This weight grows in the first period and falls in the second
- Thus, one will have the impression that insurance is growing
- But this is misleading. What is growing is not the availability of insurance, but the relative importance of more insurable shocks.

# Misleading evidence (2)

- Suppose we replicate the same analysis using food data
- This means there's no need to impute
- The coefficients of partial insurance now are the product of two things: partial insurance of non-durable consumption and the budget elasticity of food consumption
- In the data, these coefficients fall over time, i.e., one finds evidence that insurance has increased
- But this assumes that the budget elasticity of food consumption is constant over time
- But this is wrong! In the data, this elasticity falls over time
- Thus, what is a decline in the relative importance of food in overall non-durable consumption is interpreted as an increase in the insurance of consumption with respect to income shocks

# Anticipation

Test $\text{cov}(\Delta y_{t+1}, \Delta c_t) = 0$ for all $t$ :	p-value 0.3305
Test $\text{cov}(\Delta y_{t+2}, \Delta c_t) = 0$ for all $t$ :	p-value 0.6058
Test $\text{cov}(\Delta y_{t+3}, \Delta c_t) = 0$ for all $t$ :	p-value 0.8247
Test $\text{cov}(\Delta y_{t+4}, \Delta c_t) = 0$ for all $t$ :	p-value 0.7752

- We find little evidence of anticipation.
- This suggests the shocks that were experienced in the 1980s were not anticipated.
- These were largely changes in the returns to skills, shifts in government transfers and the shift of insurance from firms to workers.



# Conclusions

- The link between income and consumption inequality depends on two things:
  - Durability of income shocks
  - Insurance against them
- In the USA, in the early 1980s the increase in inequality is of permanent nature; later, it is of transitory nature
- Our evidence suggests insurance against the two types of shocks *over this period* hasn't changed
- If institutional changes have occurred, they have worked in opposite directions
  - Financial and insurance market development
  - *Risk shifting* from firms and governments to workers
- The *level* of consumption inequality is lower than that of income inequality
  - Part of the income shocks is transitory, and most families use savings/access to credit to insure them (but not the poor). Another important role is played by family labor supply.
  - About 30% of permanent shocks are insured (but not for the poor or the low educated). An important insurance role is played by the tax system and welfare state (disability insurance, social security, food stamps, etc.).
- The *changes* in consumption inequality are due to changes in the nature of income shocks (more permanent at first, more transitory later on)

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