The Myth of Post-Reform Income Stagnation in Brazil

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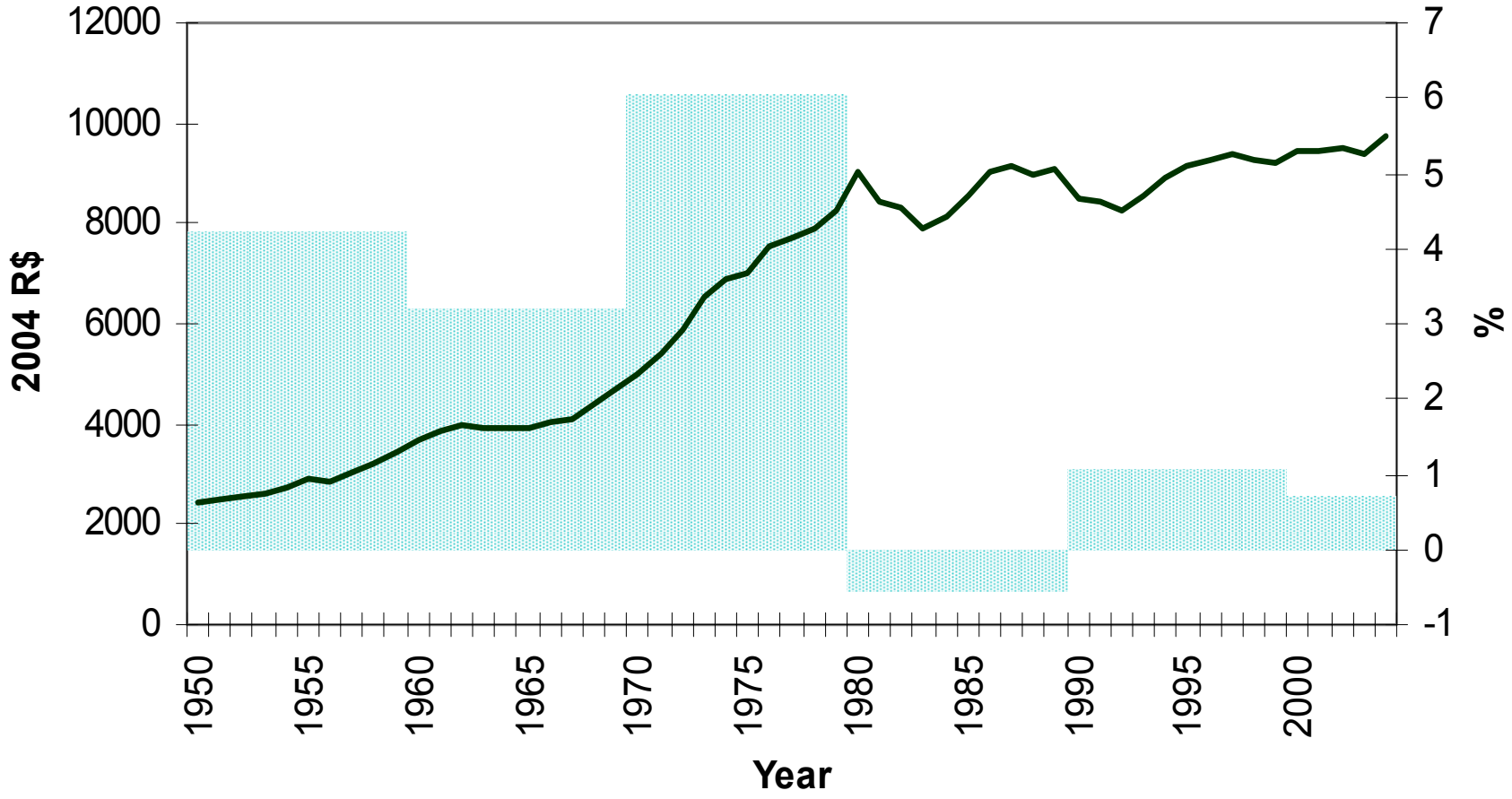
Brazil reformed...

- Brazil in the 80s
  - Hyperinflation
  - Very closed economy; average tariff
  - SOEs
- Brazil in mid 90s
  - Inflation in single digits
  - Relatively open; average tariff at about 10 percent
  - Some privatization, more about to come

And so Brazil has taken off...



Conventional wisdom:

Post-reform growth was disappointing

Puzzle: Low growth after successful reforms

- Trade liberalization, privatization, reduction in inflation, democracy, better fiscal institutions were not enough to jumpstart growth!

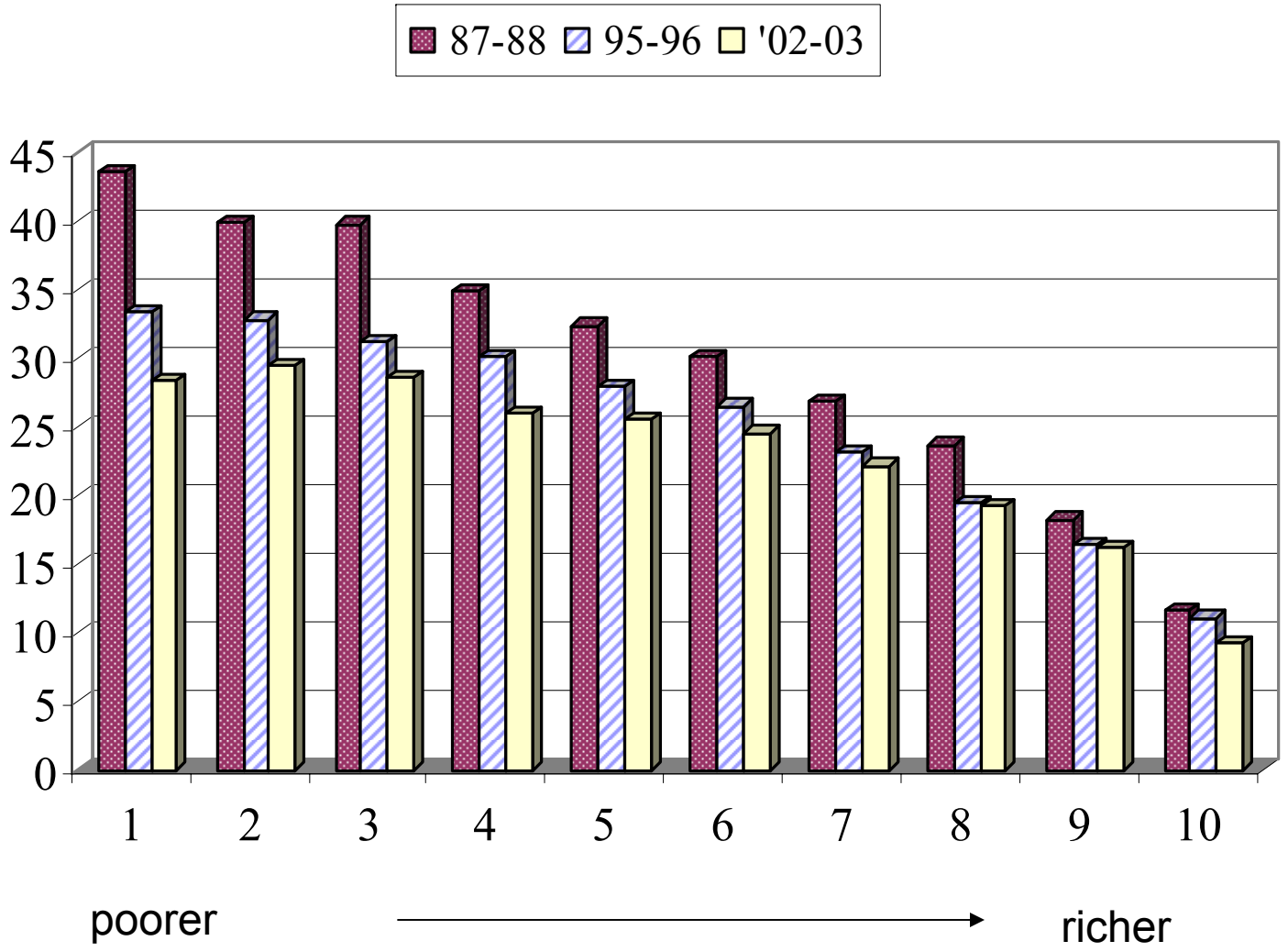
- Intriguing:
  - Limited or no push back against reforms!

This paper:

- Analyzes household consumption and income data

- Finds:
  - household per capita real income increased by modest 1.5 percent per year
  - But large changes in consumption patterns imply greater improvements in real income

Food shares have declined for all expenditure deciles in Brazil...



A Solution for Brazilian Growth Puzzle:

The conventional wisdom is wrong!

Claim: Brazil's post-reform real income and expenditure growth have been underestimated due to CPI bias

Sources of CPI bias

- Substitution bias
  - Consumers substitute away from goods whose relative prices increase
- New goods
  - Typically very expensive at first, then become affordable. The longer the lag for inclusion in the CPI basket the larger the bias
    - (E.g. cell phones and PCs only introduced in 1999, based on their weight in the 1995-96 basket)
- Better goods
  - CPI typically fails to account for quality improvement
    - (E.g. 286 PC worthless today)

All likely relevant during trade liberalization

Relevant for CPI bias between 87/88 and 02/03

Sources of CPI bias

- Hyperinflation

  Middle class, rich use ATM card, cheques, interest-bearing bank account; poor hold cash

  – During hyperinflation, $100 in the hands of a richer person purchased **more** than $100 in the hands of a poor one because the latter paid more inflation tax.

  – Neri (1995): when inflation is 40 percent/month, real income falls by 9 percent for consumer without access to interest-earning account.

Relevant for CPI bias between 87/88 and 95/96

Data: Household Income and Expenditure Data from POF Survey

- Surveys conducted over:
  - March 1987-February 1988 (pre-reform)
  - October 1995-September 1996 (post-reform)
  - July 2002-June 2003 (post-reform)

- Probabilistic sample, stratified by income, good quality data

- Each survey deflates income and expenditures to same reference date (using item specific deflators)

- Expenditure does not include rental value of owner-occupied houses

Data: Household Income and Expenditure Data from POF Survey

- Expenditure information is collected using different questionnaires:
  - Everyday collective (food, cleaning materials) and individual expenditures (e.g. food outside) are reported on a notebook for a week;
  - Infrequent expenditures are reported using different recall windows (1 to 12 months).
  - Each expenditure is then deflated and annualized.

- 10 metropolitan areas, representative of CPI target population (only in 2002-03 POF was nationally representative)

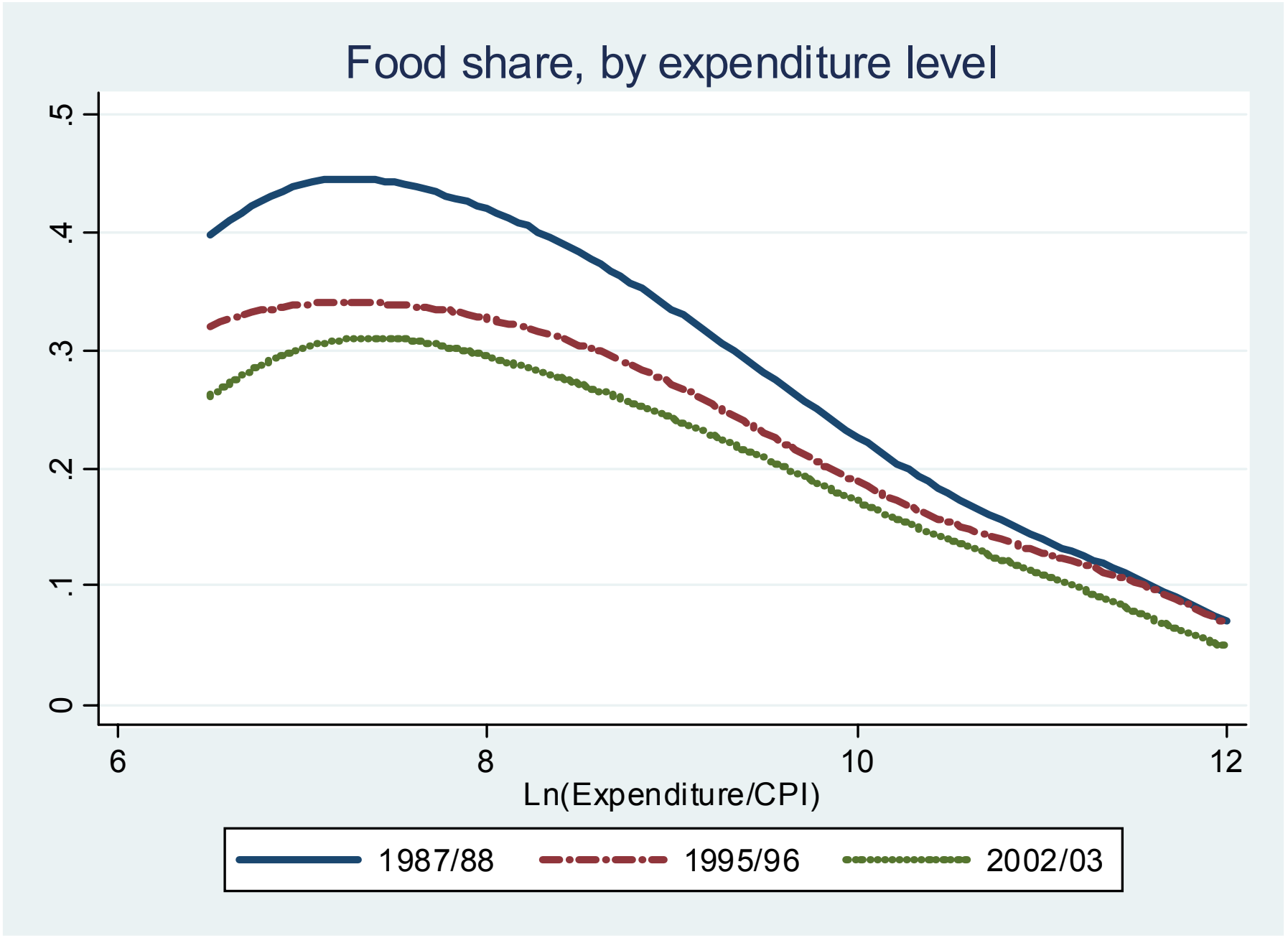
Results for different samples

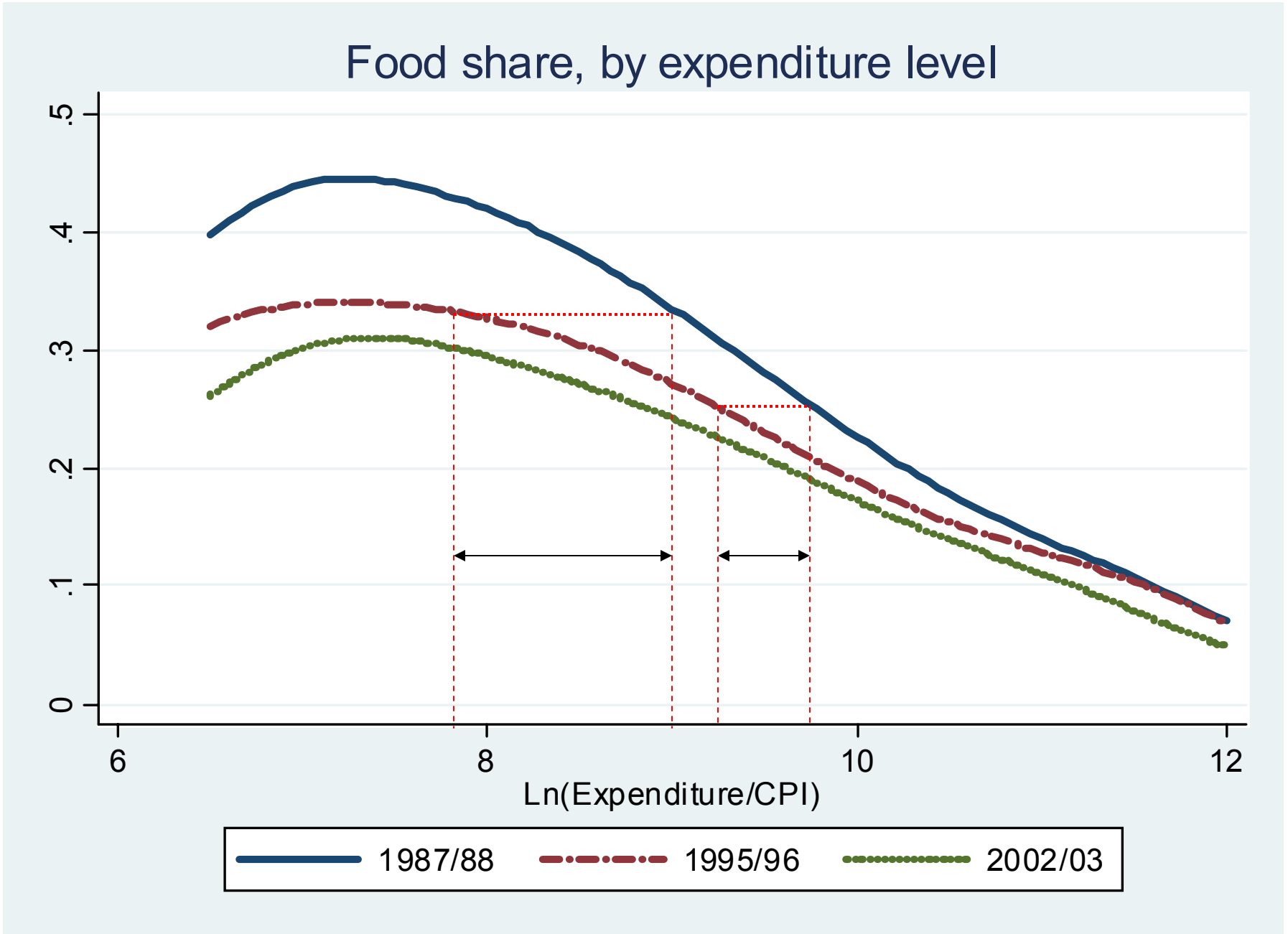
- Full sample
- “Compliant” sample:

  Excludes 1-2 percent of non-compliant households that report no expenditure in the weekly notebook
- Winsorized sample:

  Food consumption and total expenditure below 5 percentile and above 95 percentile is recoded to those percentiles (useful for robustness check)
- Tenants sample:

  Expenditure data does not cover rental value of owner-occupied homes; hence interesting to check if results hold for the tenants sub-sample


Food share, by expenditure level
0
.1
.2
.3
.4
.5
6
8
10
12
Ln(Expenditure/CPI)
1987/88
1995/96
2002/03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8
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1987/88
1995/96
2002/03

Linear specification

$$w_{i,j,t} = \phi + \delta_t + \gamma(\ln P_{F,j,t} - \ln P_{N,j,t}) + \beta(\ln Y_{i,j,t} - \ln P_{G,j,t}) + \sum_x \theta_x \mathbf{X}_{i,j,t} + \mu_{i,j,t}$$

w is share of food for household i in region j at time t

P_F, P_N and P_G are the true but unobservable price indices of food, nonfood and all goods

Y is household nominal income

X is vector of household characteristics

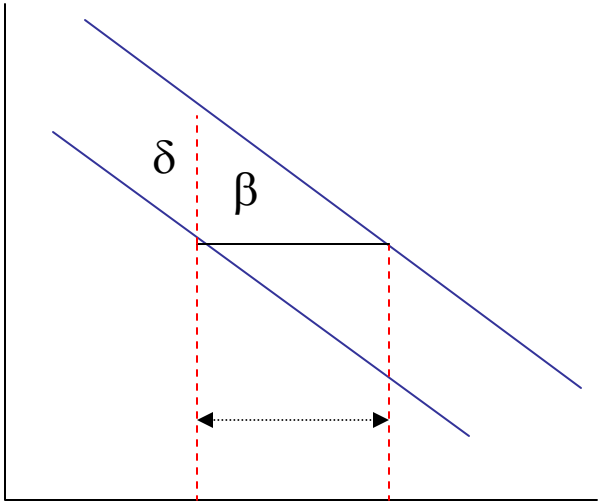
Bias is determined by parameters β and δ for the linear case

$$\delta_t = \gamma(\ln(1+E_{F,t}) - \ln(1+E_{N,t})) - \beta \ln(1+E_{G,t})$$

If γ is positive and "small", one can show that

$$\ln(1+E_{G,t}) = -\delta_t / \beta$$

is an underestimate for the actual bias



Linear specification

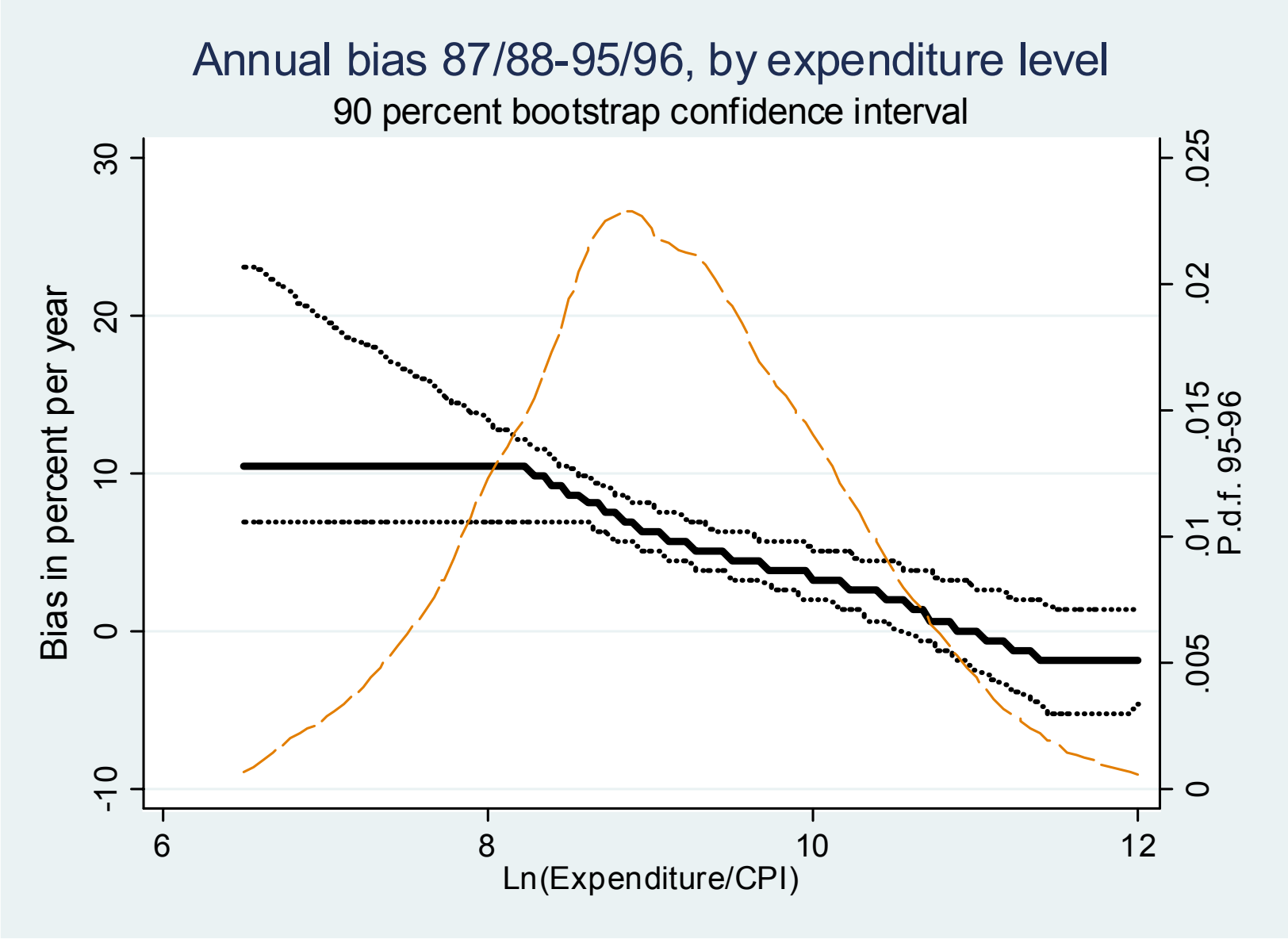
		(1)	(2)	(3)	(4)
		Tenant-OLS	**Tenant-IV**	**Full-OLS**	**Full-IV**
Dummy for 1996	δ	-0.049 [0.016]	-0.047 [0.017]	-0.043 [0.012]	-0.039 [0.013]
Dummy for 2003		-0.050 [0.019]	-0.047 [0.020]	-0.064 [0.013]	-0.057 [0.013]
Ln(Relative price of food)	γ	0.031 [0.050]	0.035 [0.054]	0.002 [0.038]	0.041 [0.038]
Ln (Expenditure/CPI)	β	-0.056 [0.005]	-0.076 [0.005]	-0.072 [0.003]	-0.093 [0.004]
Observations		6753	6753	32681	32681
R-squared		0.224	0.210	0.295	0.283
Cumulative bias 87-96 (%)		**58.82 [13.46]**	**45.73 [13.45]**	**44.41 [9.46]**	**34.04 [9.35]**
Annual equivalent 87-96 (%)		**9.82**	**6.87**	**6.61**	**4.73**
Cumulative bias 96-03 (%)		**1.08 [14.80]**	**0.40 [11;64]**	**25.30 [5.65]**	**18.07 [4.41]**
Annual equivalent 96-03 (%)		**0.16**	**0.06**	**4.23**	**2.91**
Mean Dependent Variable:		0.237	0.237	0.264	0.264

Notes: Robust standard errors in brackets. Controls include demographic, labor participation, family characteristics and regional dummies. Total income is used as an instrument to total expenditure in the IV regressions.

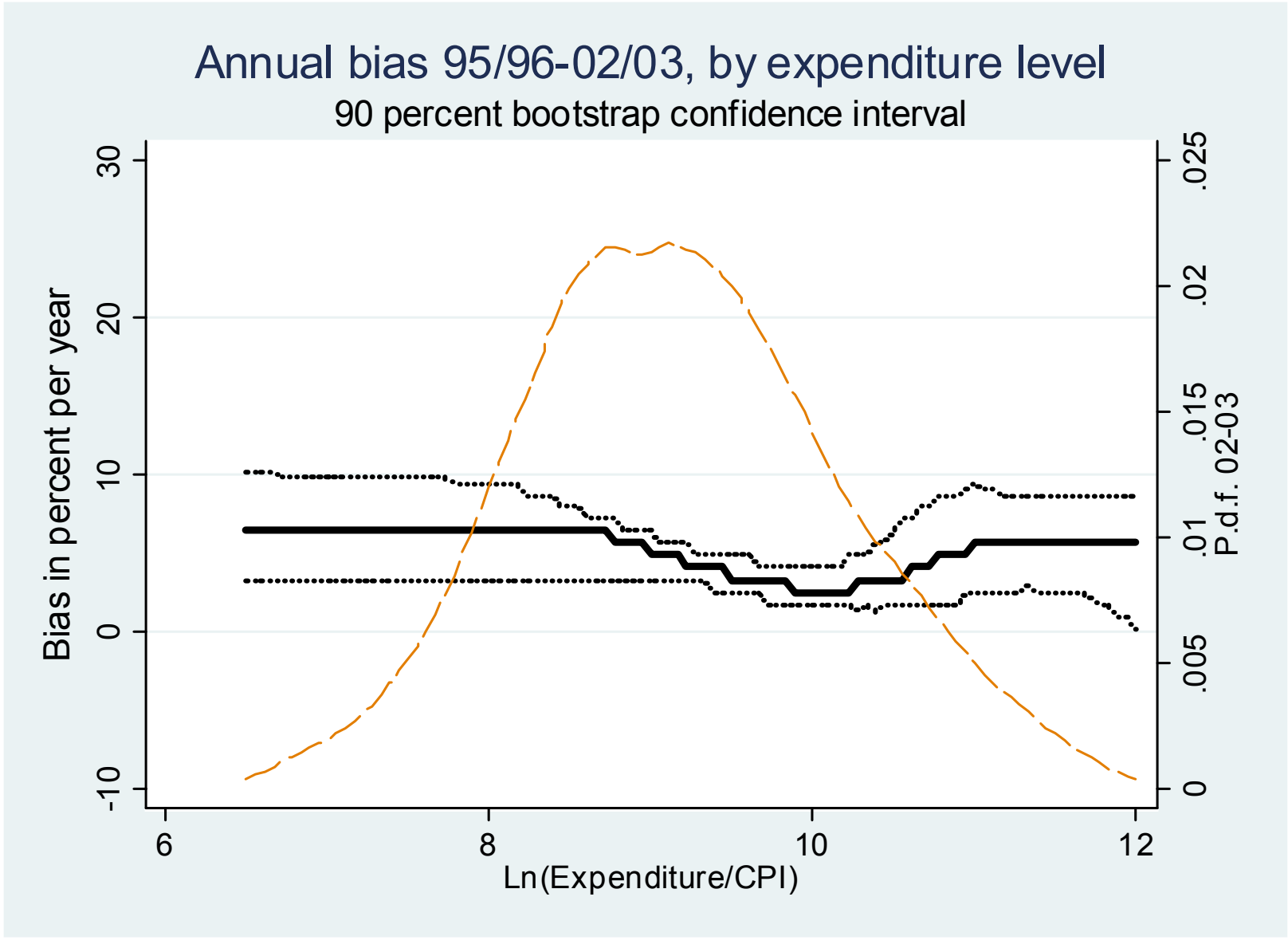
But bias may vary across expenditure distribution

- Different effects of high inflation
  - poor more vulnerable to inflationary tax
- Different composition of consumption basket
  - poor more heavily into traded goods

Bias 1987/88 – 1995/96



Bias 1995/96 – 2002/03



Semi-parametric bias estimates

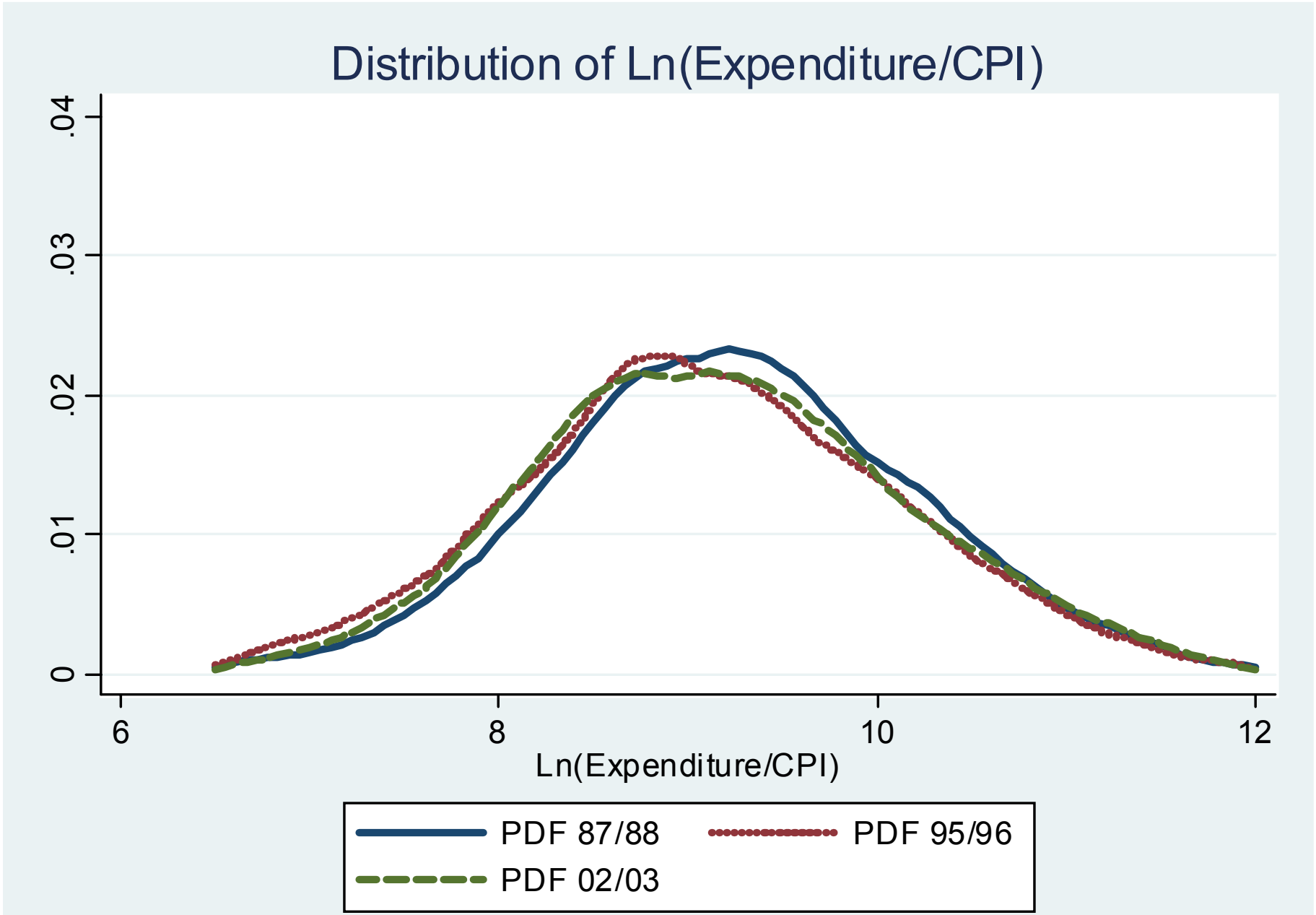
(95 percent bootstrap confidence intervals)

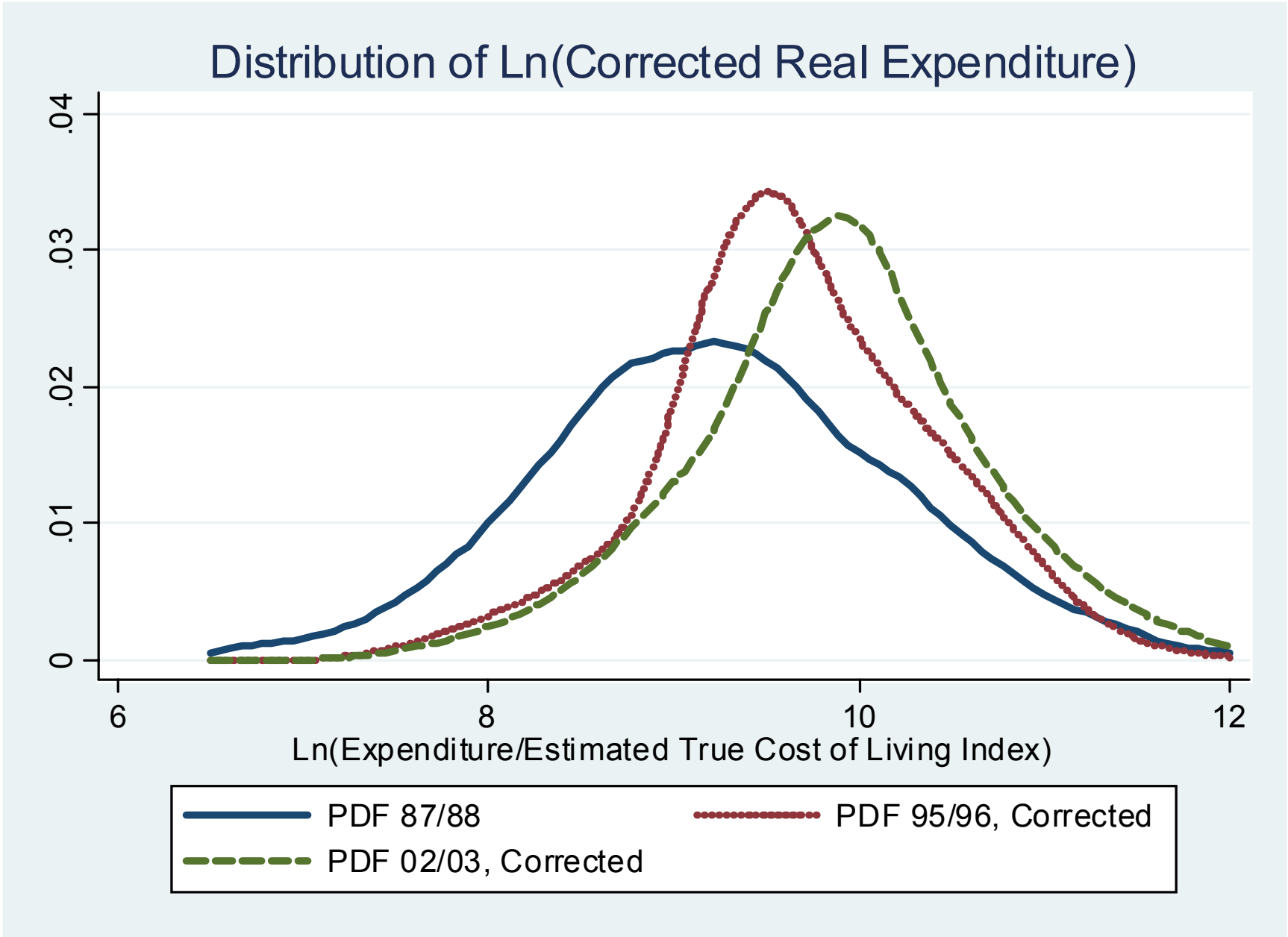
- Bias for the average household:
  - 1987/88-1995/96: 6.1% [4.3% - 8.2%]
  - 1995/96-2002/03: 4.9% [2.9% - 6.3%]

- Aggregate bias (households weighted by expenditure):
  - 1987/88-1995/96: 2.8% [0.9% - 5.3%]
  - 1995/96-2002/03: 4.3% [2.4% - 6.2%]
    - But alternative definition of non-compliance and a robust estimator that downplays the role of outliers lowers aggregate bias estimates to 3%

Based on the full sample

Implications for Inequality


Distribution of Ln(Expenditure/CPI)
.04
.03
.02
.01
0
6
8
10
12
Ln(Expenditure/CPI)
PDF 87/88
PDF 95/96
PDF 02/03


Distribution of Ln(Corrected Real Expenditure)
0
.01
.02
.03
.04
6
8
10
12
Ln(Expenditure/Estimated True Cost of Living Index)
PDF 87/88
PDF 95/96, Corrected
PDF 02/03, Corrected

Implications for inequality

Table 6. Expenditure Inequality Corrected for CPI Bias: Expenditure Gini Coefficients

Panel I: Gini coefficients based on CPI deflated expenditures	
1987/88	0.456
1995/96	0.469
2002/03	0.462
Panel II: Gini coefficients based on expenditures correcting for the CPI bias	
1987/88	0.456
1995/96	0.318
2002/03	0.335

Notes: Based on semi-parametric bias estimates from the compliant sample.

Bottom line

Per capita household net income:

Growth of 4.5 percent instead of 1.5 percent over the last 15 years!

More so for the poor!

Much of the post-reform debate may have been mislead by measurement problems

Table 5. Household Per Capita Expenditure and Net Income: Headline and Corrected, in 1996 R$

		1987-88	1996-95	2002-03	Annual percent change
Using official CPI as the deflator					
Household per capita expenditure	Mean	5,003	5,219	5,985	1.2
	Median	2,748	2,646	2,976	0.5
	Bottom 20%	790	701	850	0.5
	Top 20%	14,928	16,463	18,874	1.5
Household per capita net income	Mean	5,461	4,935	6,610	1.3
	Median	2,912	2,569	2,821	-0.2
	Bottom 20%	1,145	1,151	1,152	0.0
	Top 20%	15,379	13,560	20,325	1.8
Correcting for estimated CPI bias					
Household per capita expenditure	Mean	4,067	5,219	7,914	4.4
	Median	1,723	2,646	3,942	5.5
	Bottom 20%	335	701	1,143	8.3
	Top 20%	14,604	16,463	24,940	3.6
Household per capita net income	Mean	4,125	4,935	8,359	4.7
	Median	1,773	2,569	3,711	4.9
	Bottom 20%	462	1,151	1,548	8.2
	Top 20%	14,500	13,560	26,219	3.9

Notes: Based on estimates of the semi-parametric specification in the "compliant" sample. The bottom and top 20% refer to quintiles of expenditure per survey year in the "compliant" sample.

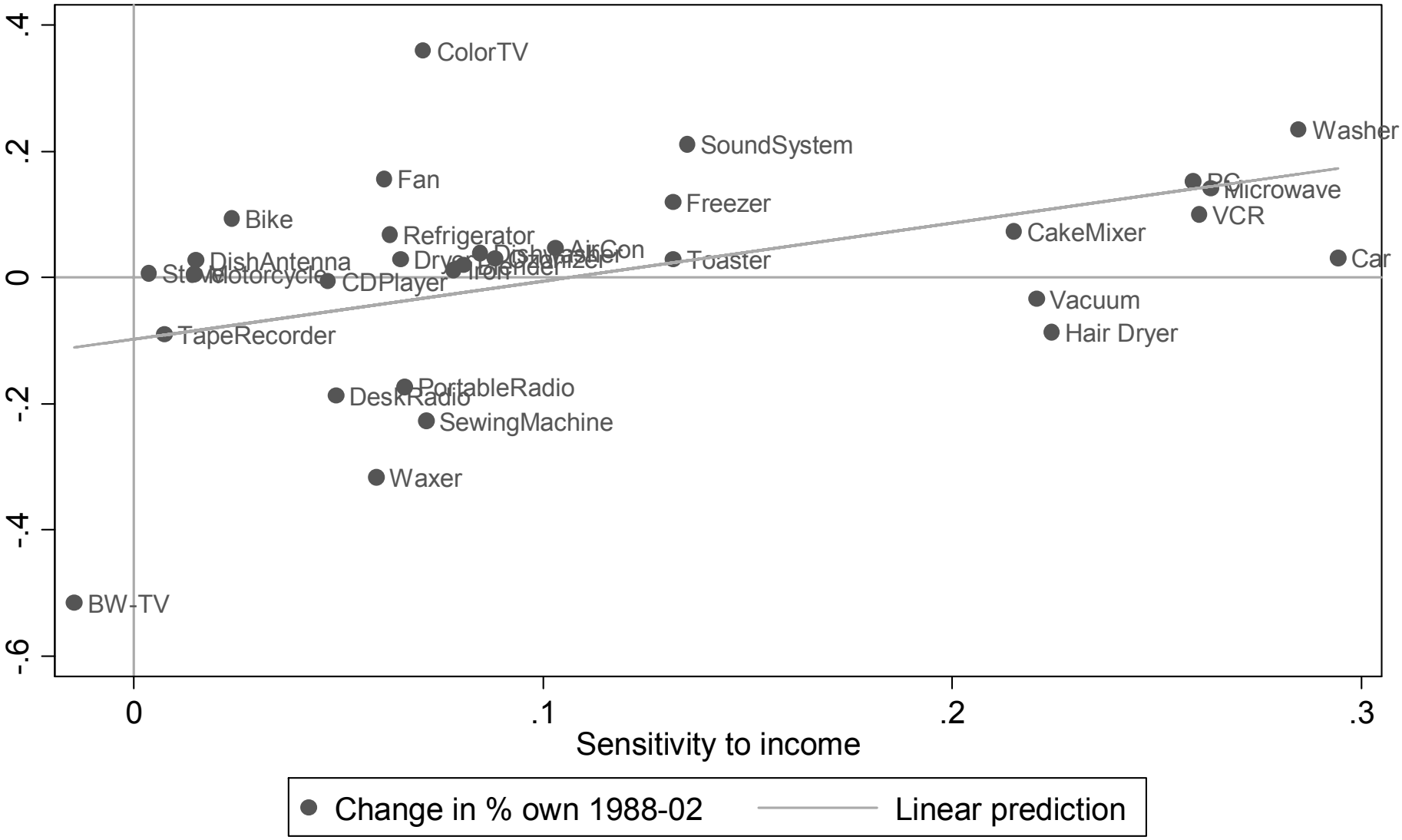
Further evidence:
Durable goods ownership

Evidence for durable goods

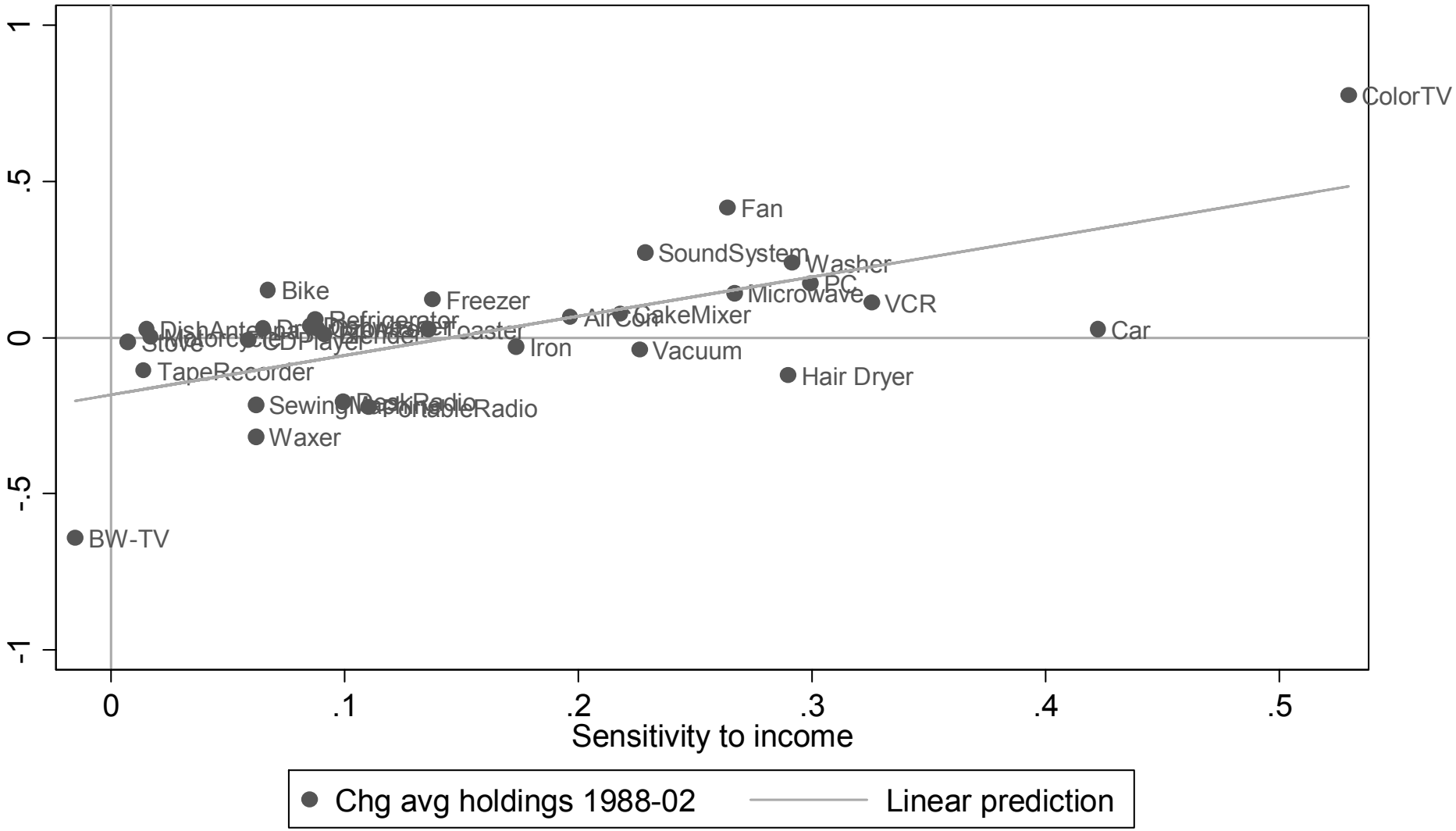
- For each durable good, calculate how probability of ownership increases with income
- Then for each good, compare how increase in ownership is correlated with “sensitivity to income”

When we “forecast” income growth based on growth in the demand for durables, controlling for changes in relative prices, real income growth between 1987-88 and 2002-03 is more than 100%

Increase in ownership stronger for goods more sensitive to income



Increase in average holdings stronger for goods more sensitive to income



Further evidence: Anthropometrics

Brazil converging to international standards of children's height for age

Table 8. Anthropometric Measures for Children 0-60 months old.

Year	Sample	Height for Age		Real Minimum Wage (in 2006 R$)
		Percentage Below 3 Std. Dev. from U.S. Median	Percentage Below 2 Std. Dev. from U.S. Median	
1975	National	14.2	32.0	310.78
	Urban	10.0	25.9	
1989	National	4.2	15.4	238.48
	Urban	3.0	12.3	
1996	National	2.5	10.5	212.68
	Urban	1.6	7.8	

Note: Anthropometric Data from the World Health Organization Global Database on Child Growth and Malnutrition. Real minimum wage data from IPEADATA.

What does the result tell about growth regressions?

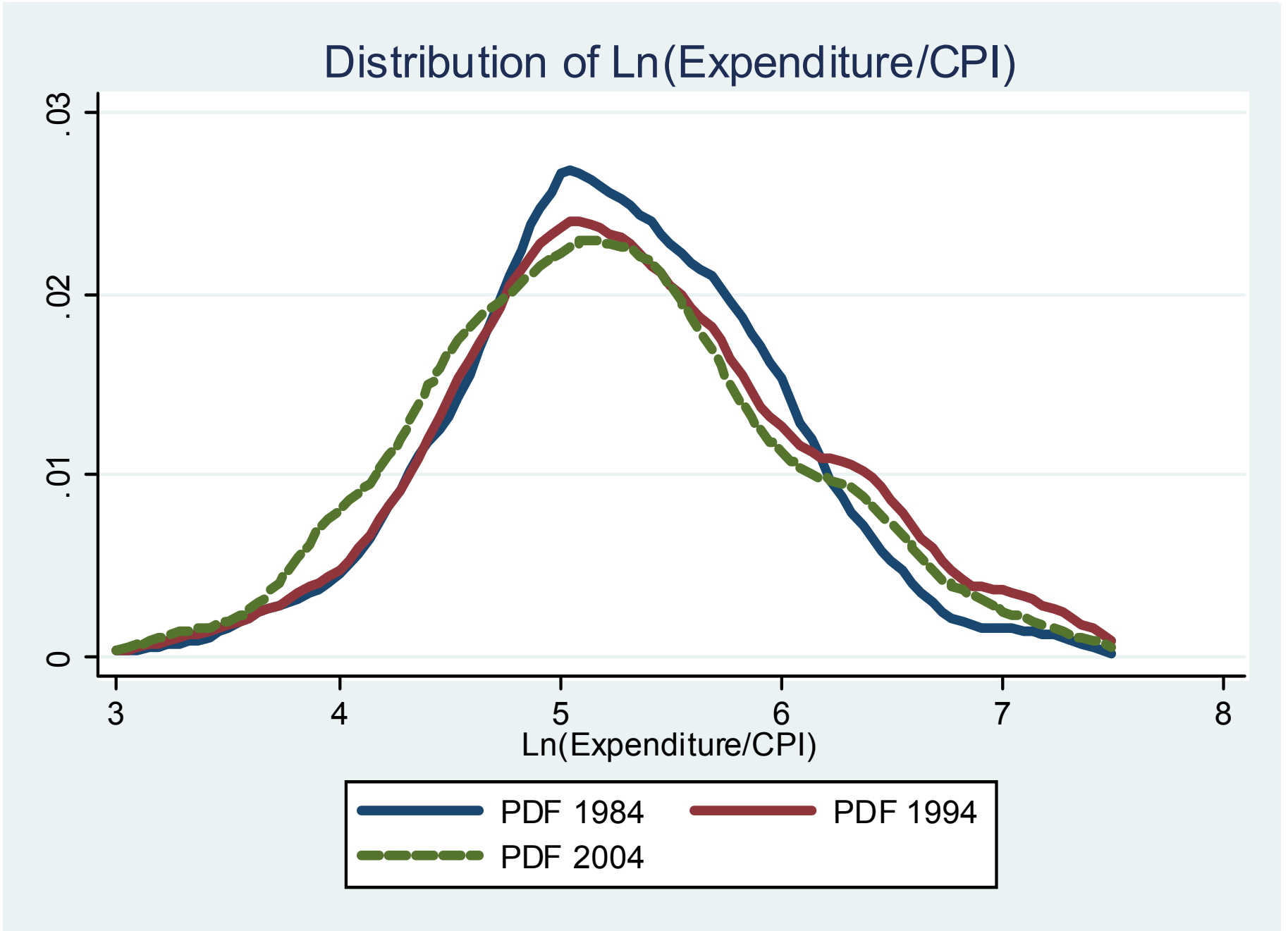
Is Brazil unique?

Mexico:
Semi-parametric bias estimates

- Bias for the average household:
  - 1984-1994: 2.7%
    - 1989-1994: 2.8%
  - 1994-2004: 2.4%

- Aggregate bias (households weighted by expenditure):
  - 1984-1994: 1.6%
    - 1989-1994: 3.1%
  - 1994-2004: 1.4%

Based on the full sample


Distribution of Ln(Expenditure/CPI)
.03
.02
.01
0
3
4
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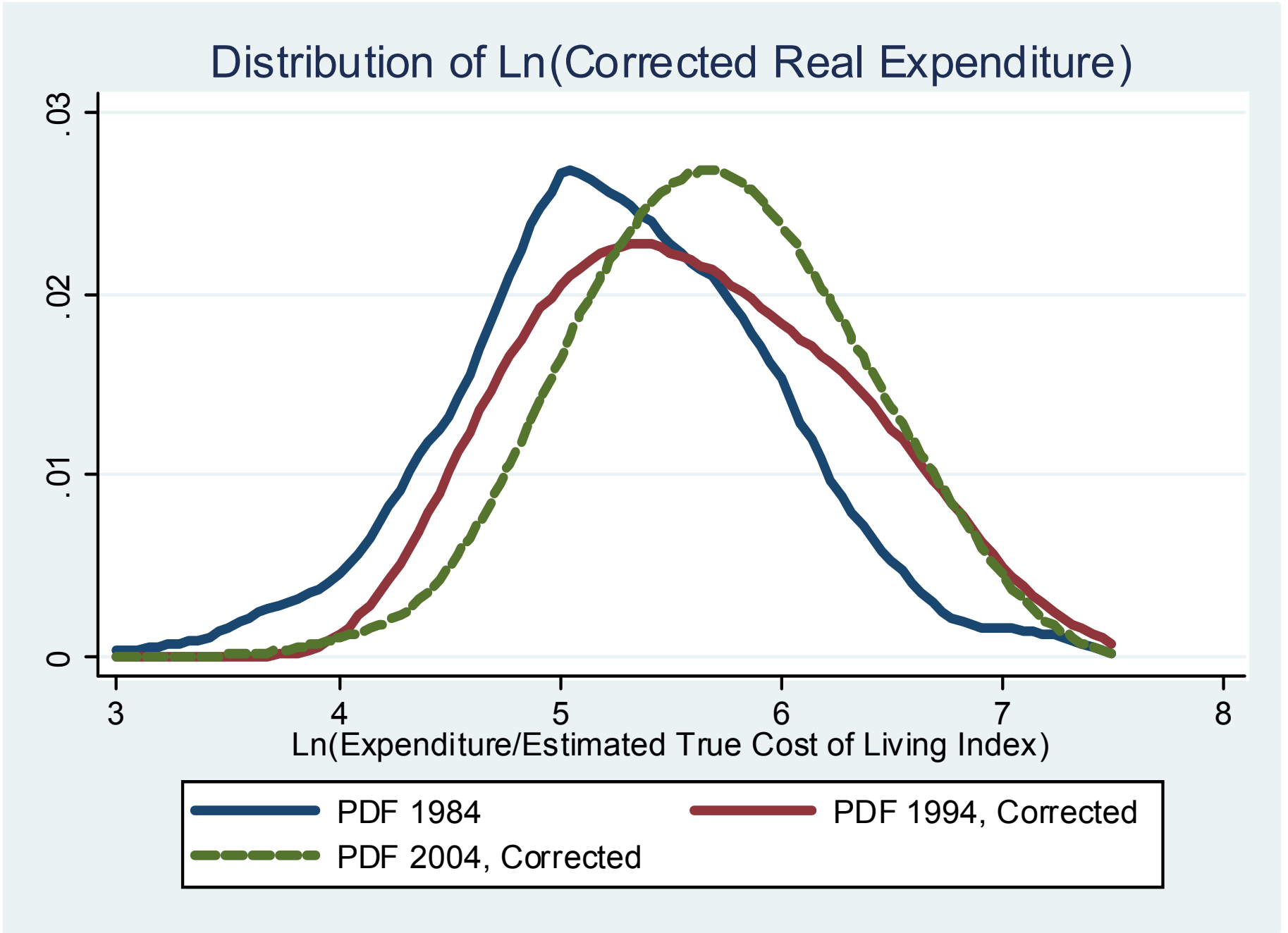
7
8
Ln(Expenditure/CPI)
PDF 1984
PDF 1994
PDF 2004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