Rethinking Indian Growth 1950-2005: Misunderstood or Misjudged?

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Objectives

- To analyze the growth process in India for last 55 years, 1950-2005
- Was this growth equitable?
- Has the post-1991 period (post economic reforms) been jobless?
- What policies have delivered growth?
- Can agriculture grow above 4 % as advocated?
- Can India grow at 8 % without additional reforms?

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Data and Methods

- Assessment of "*what happened*" via a production function approach
- Data on capital and labour are obtained from "The sources of economic growth in India, 1950-1 – 1999-00" by S. Sivasubramonian. Updated for 2000-2005.
- Data on education of labour force obtained from Barro-Lee; Updated to 2005. NSSO data for 1983, 1987/88 and 1999/00 are close to Barro-Lee data for trends, and also levels.

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The Importance of rainfall

- Output growth severely affected by rainfall, especially in earlier years when share of agriculture was 40 – 50 %; data crucial for proper estimates of production function, tfpg etc.
- Rainfall data for 30 rainfall stations are obtained from http://mospi.nic.in/stat_act_t14.htm ; time period 1871-2003
- Even Chicago thinks rainfall is exogenous

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Construction of Rainfall Index

For each year, only rainfall for four months, June through September, are considered.

Area of each state $=A_s$

(Mean)Rainfall for each rainfall station, 1871-2003: μ_s

Standard deviation for each rainfall station, 1871-2003: s_s

(4 months mean) Rainfall for each station and year: R_s

Define: $J_s = (R_s - \mu_s)/s_s$; *for each rainfall station and year*

Yearly Rainfall Index $= S(A_s * J_s)/SA_s$

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Impact of Rainfall

Regression Equation:

(growth) Ag. GDP = $a + ß_1$*.Rainfall +* $ß_2$*.Rainfall (lagged) +* e

	1900-1950, (R-Squared: 0.37, #obs:51)		1951-2005, (R-Squared: 0.58, #obs:55)	
	Coefficient	T-value	Coefficient	T-value
Rainfall	0.08	3.34	0.07	6.18
Rainfall (1 year lagged)	-0.09	-4.05	-0.07	-5.78
Constant	0.36	0.36	2.70	4.68

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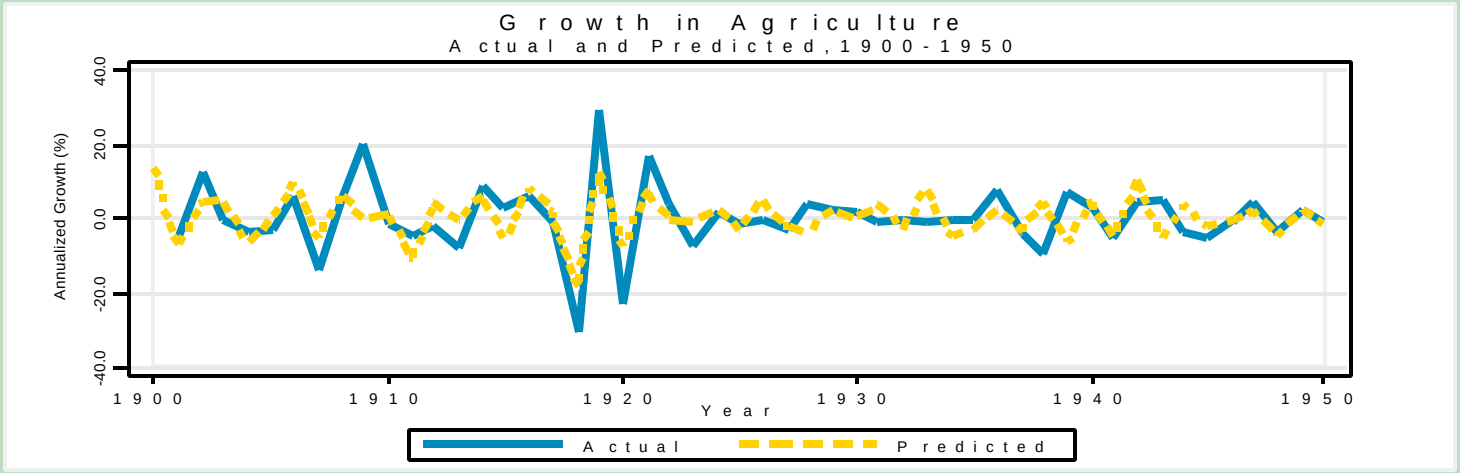
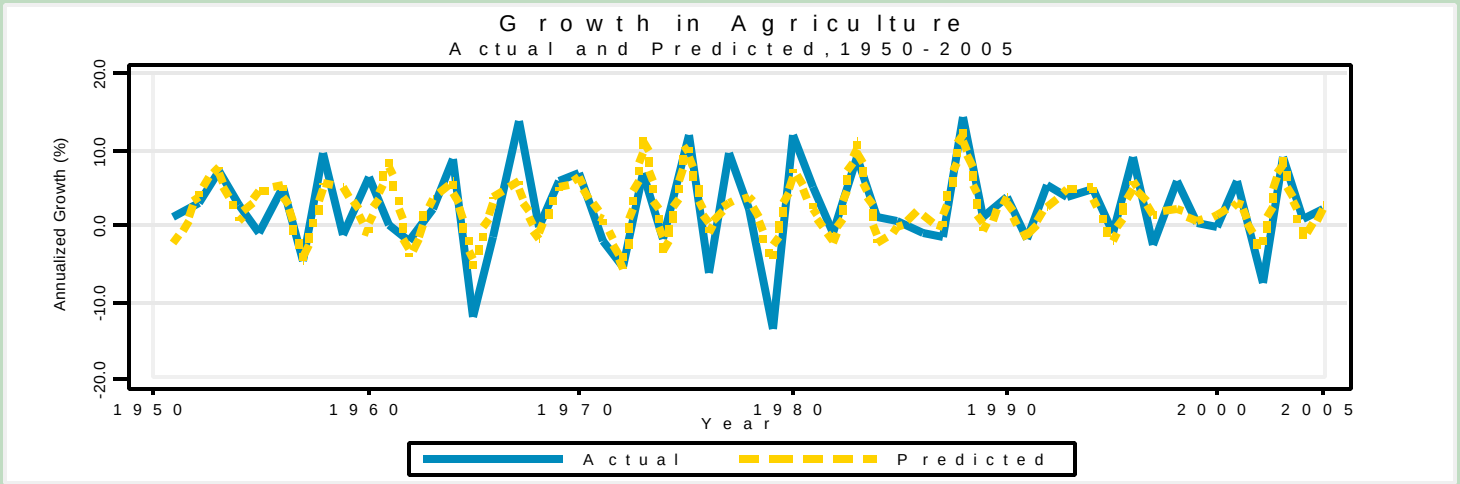
Rainfall and Agricultural Growth: 1900-2005





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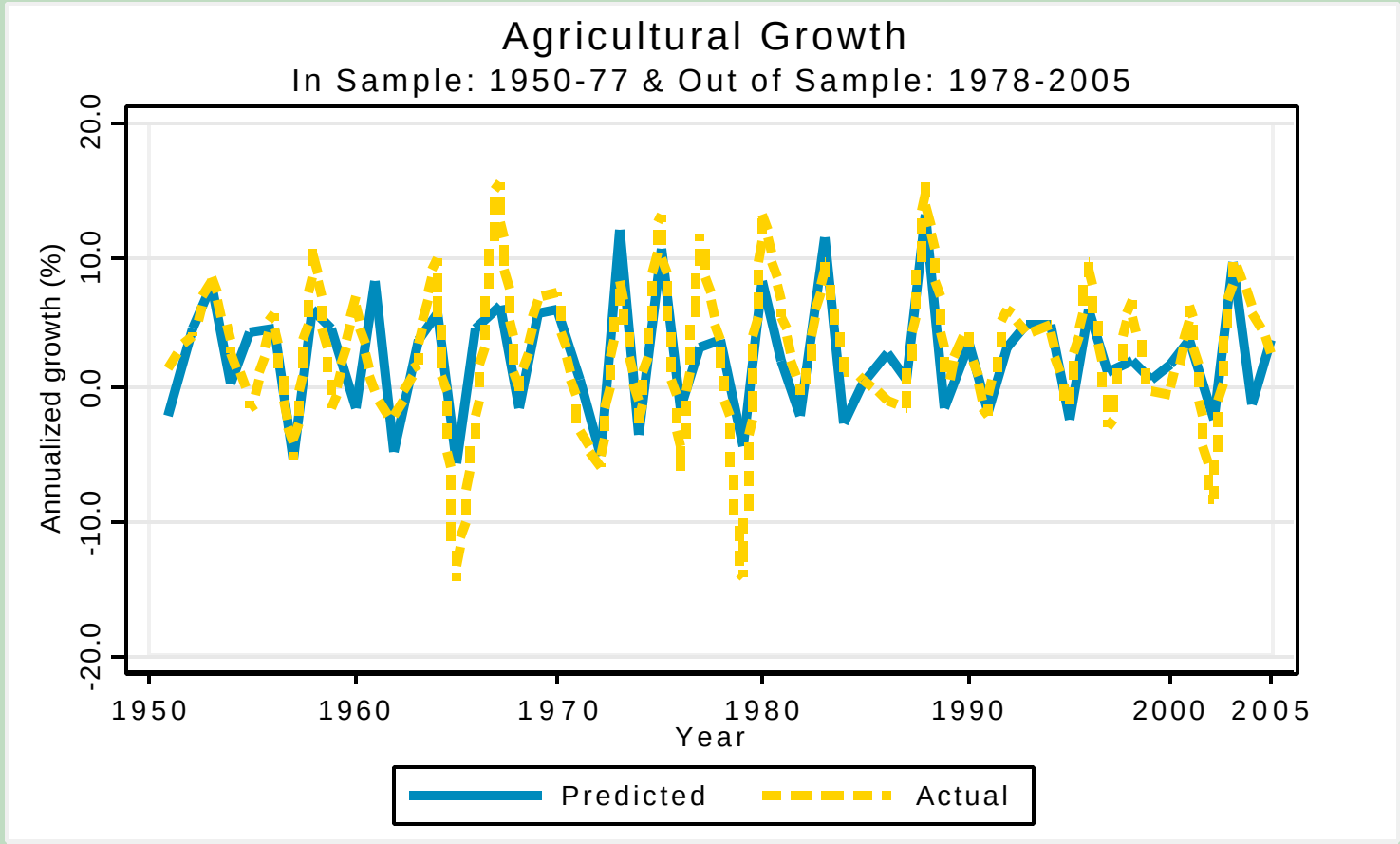
Agricultural Growth, 1950-77 & 1978-2005: Adjusted for Rainfall, Both at 2.6 % p.a.



Can Agriculture Grow at 4 %?

- Only time it has done so was during the following five-year periods ending in 1970, 1971, 1977, 1984, 1992, and 1996
- In (5 years ending) 1970 and 1977, rainfall index was in the top 5 % of rainfall in 135 years; other years, top 18 percent
- Incidentally, rainfall ending in 2002 (1998-2002) was the 4th worst on record, just below 1962-1966

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Can Agriculture Grow at 4 %? (contd.)

- In the pre-green revolution period, 1950-1964, average (rain adjusted) agricultural growth was 2.9% p.a. ; for the post green-revolution period, 1978-2005, it was 2.5 % p.a.
- Isn't development about moving people out of agriculture? NSSO data confirms that the absolute level of employment in agriculture fell between 1993/94 and 1999/00 (173 million vs. 175 million).
- What extra GDP growth will 4 % agricultural growth (rather than trend 2.7 %) bring? An extra 0.26 % per annum!

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Production Function – Share of Capital, 0.47

Production function, 1950-2005

$\acute{Y} = f(k/l; Z)$

Z variables are rainfall index, lagged rainfall index, mean years of education, and year dummies for 1973, 1079 and 1991.

Share of capital estimated to be 0.47

Share of labour, Cobb-Douglas, as 0.53

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Perplexing Issue # 1

What caused the growth rate to “jump” by almost 2 % per annum in the early 1980s?

- Factor accumulation, extra 0.1 % p.a.
- Better quality labor, extra 0.6 %
- less exchange rate overvaluation – extra 1.6 %
- Extra growth – 2.5 % (from 3 to 5.5%)
- So contribution of market friendly policies, outside of exchange rate, 0.2 % p.a.

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Contribution of Various Factors

	1950s	1960s	1970s	1980s	1990s	2000s	Long run average
GDP growth	3.8	3.6	***3.0***	***5.5***	5.9	6.4	4.5
GDP growth, per worker	2.3	1.9	***0.7***	***3.5***	4.7	3.9	2.7
Contribution of various							
Capital	1.6	1.9	1.6	1.9	2.5	3.6	2.1
Labour	0.8	0.9	1.2	1.1	0.6	1.3	1.0
Factors (Aggregate)	2.4	2.8	2.9	3.0	3.1	4.9	3.0
Education	0.8	1.1	1.5	2.1	2.6	3.0	1.7
Under valuation	0.1	0.1	-0.6	1.0	1.1	0.5	0.3
Interest rates		-0.5	-0.2	-0.4	-0.6	-0.5	-0.4
TFPG	1.4	0.8	0.2	2.5	2.8	1.4	1.5
Rainfall	0.1	0.1	-0.1	-0.1	0.0	-0.8	-0.1

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Perplexing Issue # 2

Did the *economic reforms* initiated in 1991 actually achieve so little extra growth as compared to 1980s ?

- Actually, GDP growth rate the same (in 1990s and 1980s)
- 2 % p.a. deceleration in industrial growth, 1 % deceleration in agricultural growth
- 1 % p.a. acceleration in services growth

The Start of The Reform Period

- Reforms started in July 1991 with a 20 % devaluation of the rupee; over the next year (1991/92) most reforms were complete
- So decadal results not valid for assessment of pre and post reform analysis
- To which regime does April 1991/March 1992 belong?
- Analysis done for all three assumptions – 1991/92 belongs to pre-reform, post-reform and both

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How Much Difference A Year Makes

Annualized growth (%)	1991/92 in pre reforms	1991/92 in post reforms	1991/92 in neither
GDP	5.1	5.5	5.5
Pre reforms, 1980s	6.1	5.8	6.1
Post reforms, 1990s			
GDP per worker			
Pre reforms, 1980s	3.1	3.5	3.5
Post reforms, 1990s	4.4	4.1	4.4
TFPG			
Pre reforms, 1980s	2.1	2.5	2.5
Post reforms, 1990s	2.3	2	2.3
Industry			
Pre reforms, 1980s	6.8	7.5	7.5
Post reforms, 1990s	6.3	5.7	6.3
Services			
Pre reforms, 1980s	6.1	6.2	6.2
Post reforms, 1990s	7.5	7.2	7.5
Agriculture			
Pre reforms, 1980s	2.9	3.4	3.4
Post reforms, 1990s	2.7	2.4	2.7

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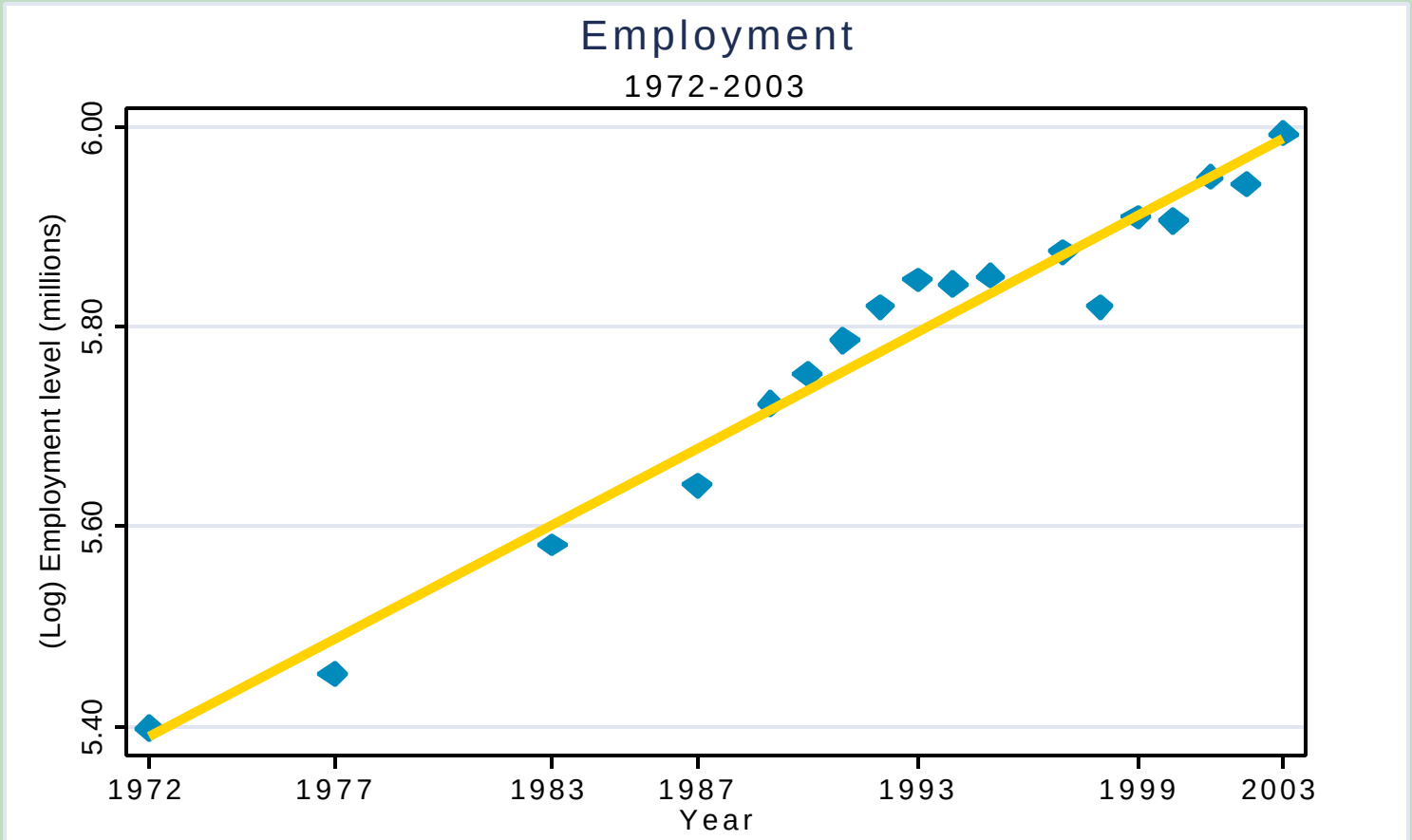
Perplexing Issue # 3

Jobless growth in the post-reform 1990s?

- NSSO large sample surveys between 2 post-reform years 1993/94 and 1999/00 yield employment growth of only 1.1 % p.a.
- NSSO “small sample surveys” (one-third to half the sample size of large surveys) subsequent to 1999/00 (2000 to 2003) yield employment growth of 2.9 % p.a. (as reported in Planning Commission, Mid-Term Appraisal, 2005)
- Employment growth in 1980s, 1990s, and 2000s as follows: 2.4 %, 1.5% and 2.5 % p.a.

Jobless Growth in the 1990s?



Employment Growth

	(log) Annualized growth (%)		
All	**1983 to 1993/94**	**1993/94 to 1999/00**	**1983 to 1999/00**
Profs. Admin, Tech, Manager	5.6	4.6	5.3
Clerical & etc.	3.9	1.5	3.0
Sales	4.8	0.7	3.3
Production & related etc.	3.9	2.3	3.3
Service	2.6	3.6	2.9
Farmer, fisherman etc.	2.9	0.0	1.9
Total	3.4	1.0	2.5

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Decadal Averages of Unemployment Rates (%), Different Definitions

	1970s	1980s	1990s	2000s	2003
Daily	8.3	7.2	6.7		
Weekly	4.4	4.7	3.1	3.1	3.1
Usual (principal)	4.2	3.3	2.4	2.3	2.2

In 2003, unemployment rates lowest in recorded history

In 2003/04, GDP growth above 8 %; in Dec. 2004, GoI announces the largest ever jobs program in the world – cost from 1 % to 4 % of GDP

Was the Post-reform Growth Equitable?

Post-reform growth – equity effects

(1991/92 in both years)

- Wage growth for agricultural workers – acceleration from 3 % p.a. to 3.3-3.7 % p.a.
- Regardless of category, all workers report an acceleration in wage and income growth
- Only SC/ST workers report a deceleration in per capita consumption growth

Consumption and Wages

	Annualized growth(%)		
	Pre reforms	Post reforms	Acceleration
Agricultural Wages (AWI), 1980-91 & 1991-2003	3.1	3.3	0.2
Agricultural Wages (CoC), 1980-91 & 1991-2003	3.1	4.1	1.0
NA			
Private Income per worker	1.6	4.7	3.1
NSSO			
Per capita consumption, Old definition	0.9		
Per capita consumption, New definition	1.2	1.3	0.1
Per capita income	3.1	4.2	1.1
Wages, NSSO			
Professional, Manegerial	2.8	5.9	3.1
Construction	2.7	2.9	0.2
Agriculture	2.3	3.0	0.7
Production	2.1	3.5	1.4
Sales and Services	2.7	5.0	2.3

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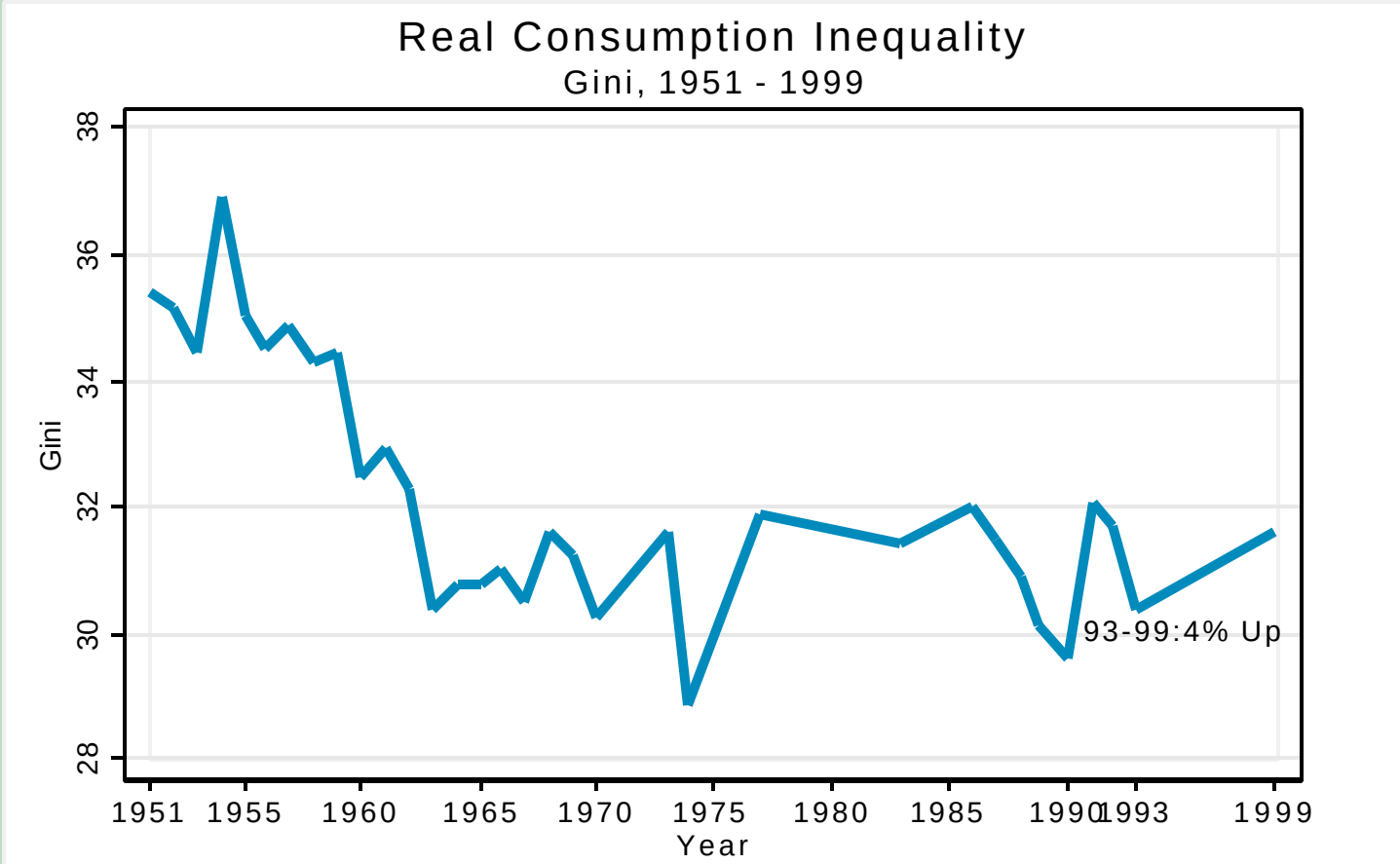
By Religion and Caste

	Annualized growth (%)		
	Pre Reforms	Post Reforms	Acceleration
Per capita consumption			
General	1.3	1.5	0.2
Muslim	1.1	1.7	0.6
SC/ST	1.3	0.9	-0.4
Total	1.2	1.3	0.1
Per capita income			
General	3.1	4.7	1.6
Muslim	2.2	3.5	1.3
SC/ST	3.2	3.8	0.6
Total	3.1	4.2	1.1

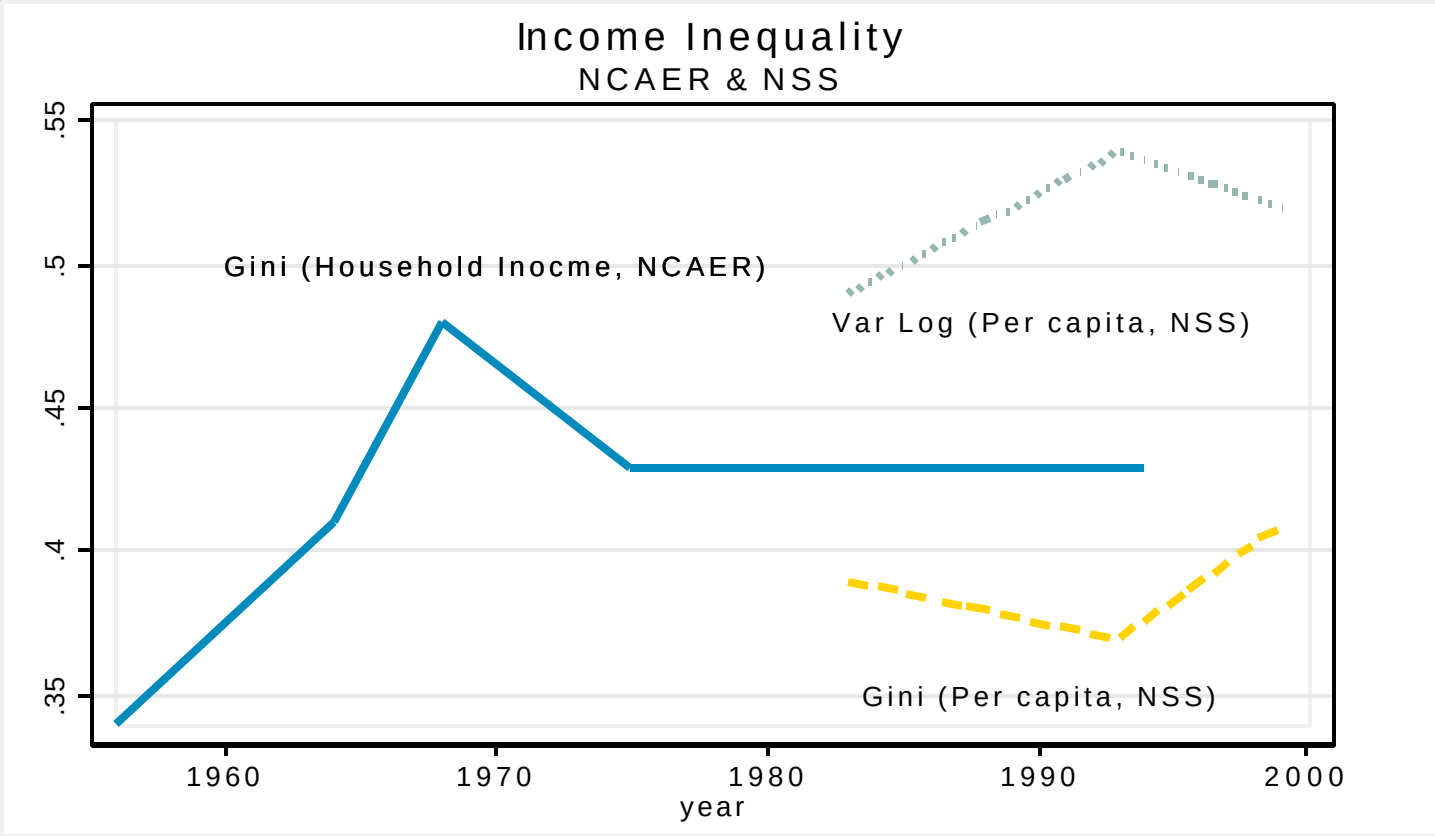
Was the post-reform growth equitable?

- Real C inequality has declined since the 1950s; since the 1980s, a mild V shape is observed with 1999/00 below the 1983 level.
- Income inequality – longest time-series for household incomes (not per capita incomes); this peaked in the late 1960s
- Wages of 10/90th and 20/90th percentile also show an improvement in the 1990s
- Only "measure" of inequality that yields a steady increase – urban/rural mean consumption.

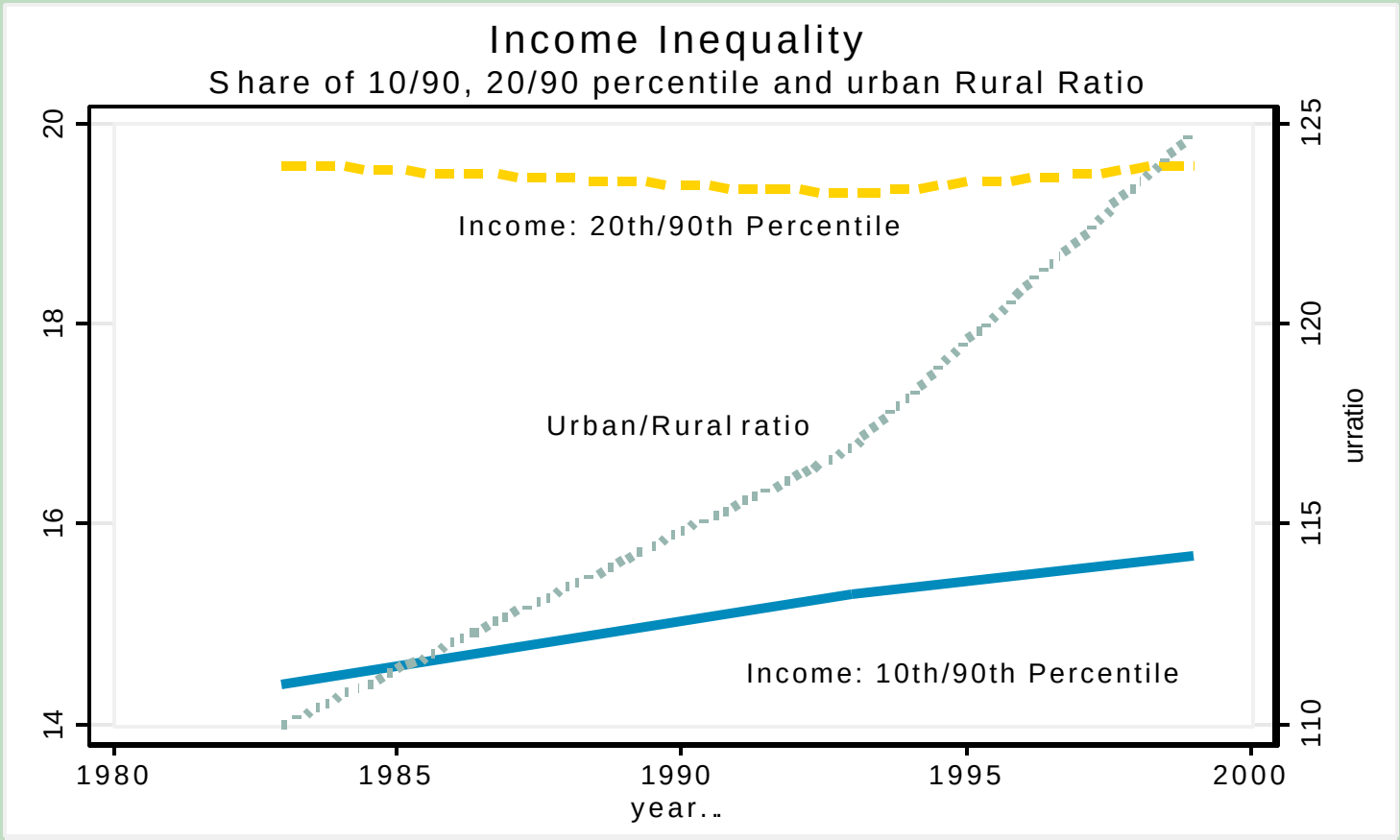
Consumption Inequality



Income Inequality



Share of Bottom 10% and 20% and Urban/Rural ratio



Forecast for next 5 years; GDP growth approx. 8 % per annum

- Contribution of labor and capital, 1.3 % and 3.6 %, to yield 4.9 % p.a.
- Contribution of education 3 % p.a.
- So 8 % growth a reasonable forecast with NO additional reforms
- Alternatively: industry to grow above 8 %, services 9 %, agriculture 3 % : GDP growth 8 %

Some Special Issues

Industrial Growth in India – Past and Future

- Repressive monetary and exchange rate policy has kept industrial growth down; India one of the worst industrial growth performers in the developing world
- Both have improved in the last few years, though the benefits of an undervalued exchange rate not appreciated as much by India as by China
- Real interest rates are down by over 500 basis points in the last few years – this is expected to continue

Countries Where IP growth Has Averaged Over 8% for a Decade–India Not There (as yet)

Developed Economies	East Asia	Latin America	Middle East	South Asia	Sub saharan Africa
Greece(4)	China(29)	Brazil(6)	Algeria(4)	Bangladesh(1)	Botswana(22)
Japan(6)	Indonesia(16)	Costa Rica(10)	Egypt(8)	Nepal(5)	Burundi(1)
	Lao(10)	Haiti(1)	Jordan(4)	Pakistan(6)	Cameroon(10)
	Malaysia(8)		Syria(15)		Congo(13)
	Myanmar(3)		Tunisia(6)		Cote d'Ivoire(11)
	Singapore(19)				Kenya(8)
	South Korea(17)				Mali(1)
	Thailand(25)				Mozambique(5)
	Vietnam(8)				Nigeria(11)
					Swaziland(8)
					Uganda(9)

Note: Number in parenthesis indicate the number of years for which a moving average of 10 years industrial growth was above 8 % per annum

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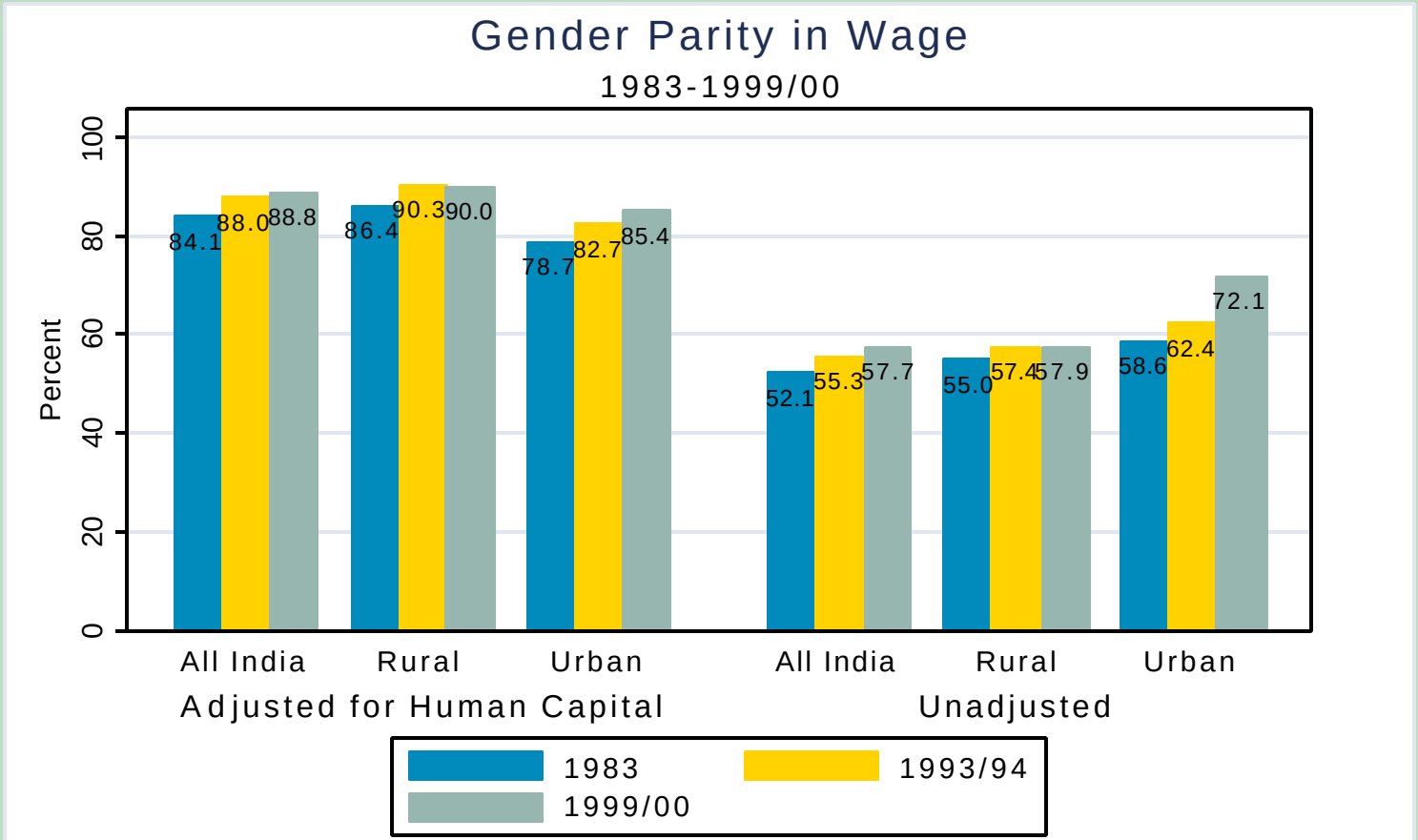
Gender Equality in India

- Enrollment in schools: for each boy, 0.9 girls are enrolled
- Wages: close to parity today if human capital controlled for;
- Unadjusted mean female wages only 58 % of mean male wages.

Gender Equality in India



Shares in GDP: Agriculture, Industry and Services

- In 1960, share of services in India was 32 percent and its predicted share was 40 %
- In 2000, share in services is as predicted, while share in industry is about 3 % lower
- Model used is share = a + b^yppp
- This model works much better than conventional model of share = a + b*log(yppp)

Agriculture

	In 1960		In 2000		Excess	
	Actual	Predicted	Actual	Predicted	1960	2000
Bangladesh	57.5	40.8	24.6	27.6	16.7	-3.0
Brazil	17.7	28.1	5.7	6.3	-10.4	-0.6
China	22.3	45.3	16.4	15.8	-23.0	0.6
India	**44.0**	**43.3**	**22.4**	**22.3**	**0.7**	**0.1**
Indonesia	51.5	42.2	17.2	16.3	9.3	0.9
Mexico		17.8	3.8	4.1	-17.8	-0.3
Nigeria	58.8	41.1	27.9	35.9	17.7	-8.0
Pakistan	43.7	46.0	24.3	25.3	-2.3	-1.0

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Industry

	In 1960		In 2000		Excess	
	Actual	Predicted	Actual	Predicted	1960	2000
Bangladesh	7.0	19.3	24.4	27.0	-12.3	-2.6
Brazil	31.8	22.9	21.8	28.0	8.9	-6.2
China	44.9	18.4	50.2	27.3	26.5	22.9
India	**18.4**	**18.8**	**24.2**	**27.1**	**-0.4**	**-2.9**
Indonesia	15.0	19.0	46.1	27.3	-4.0	18.8
Mexico		28.3	25.4	28.3	-28.3	-2.9
Nigeria	7.1	19.2	42.1	26.8	-12.1	15.3
Pakistan	14.7	18.2	21.0	27.0	-3.5	-6.0

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Services

	In 1960		In 2000		Excess	
	Actual	Predicted	Actual	Predicted	1960	2000
Bangladesh	35.6	40.2	47.5	43.9	-4.6	3.6
Brazil	36.3	42.3	50.5	49.6	-6.0	0.9
China	32.8	39.6	33.4	46	-6.8	-12.6
India	**32.2**	**39.8**	**44.4**	**44.7**	**-7.6**	**-0.3**
Indonesia	33.5	40.0	36.7	45.9	-6.5	-9.2
Mexico		45.1	61.6	51.4	-45.1	10.2
Nigeria	26.2	40.1	26.7	43	-13.9	-16.3
Pakistan	36.1	39.5	47.6	44.2	-3.4	3.4

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Role of the Middle Class, Its Growth and Effects

- Middle Class defined as not poor in industrialized countries i.e. GDP per capita above PPP$ 7.5 a day
- The growth of middle class means better governance, checks and balances, more savings and more foreign investment
- Size of middle class also helps explain international attention, “power” etc.
- In 1980, size was 3.5 %; in 1990, 10 %, in 2000, 15 %, and expected to be 50 % in 2015

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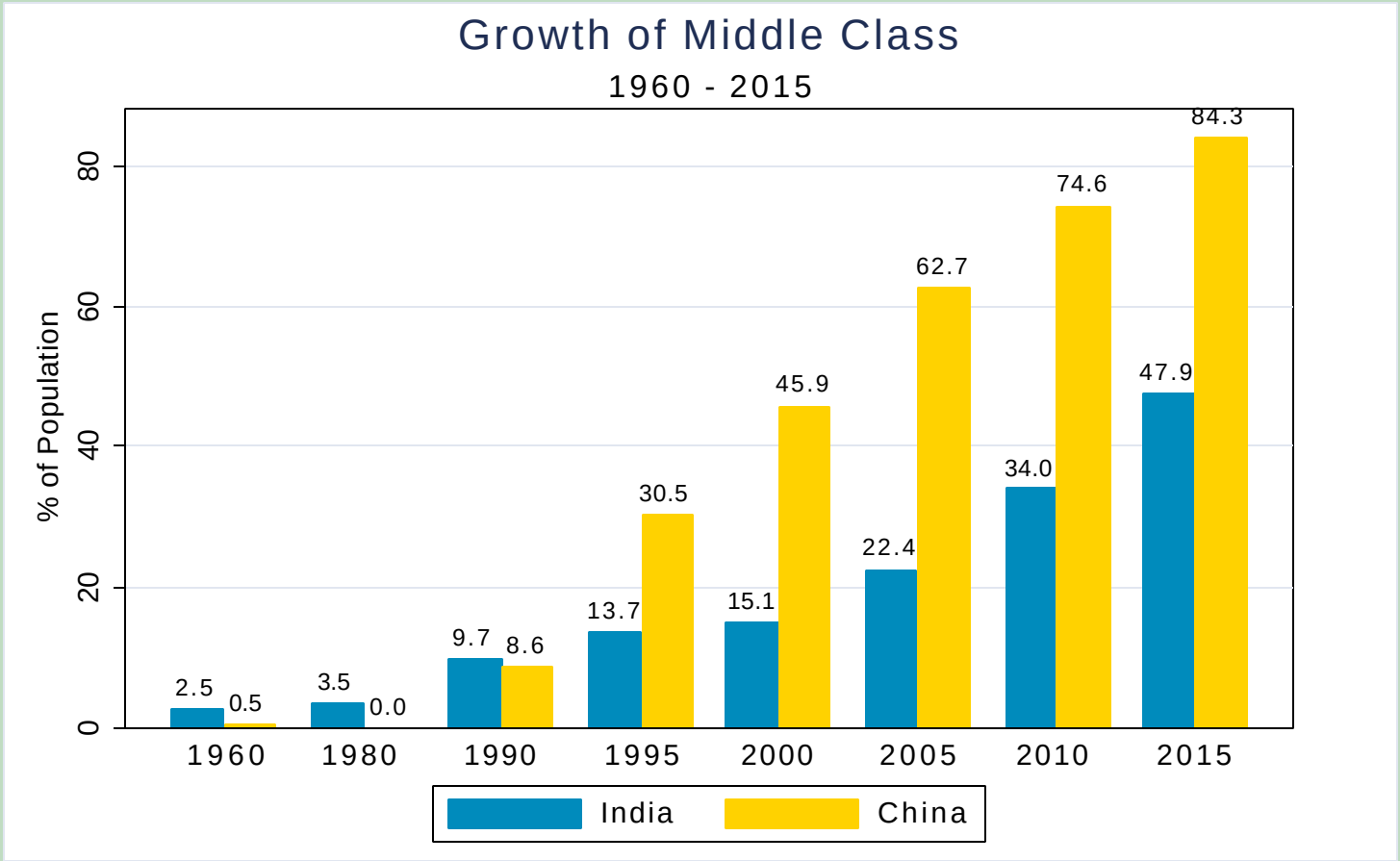
Role of the Middle Class, Its Growth and Effects



Savings, Investments, Interest Rates

- Savings rate rising at about 0.5-0.6 % per annum; should reach 35 % by 2015
- Investment rates rising 0.4-0.5 % p.a.
- Real interest rates stabilizing at 4 % long-term and 1.5 % overnight money (call rates)

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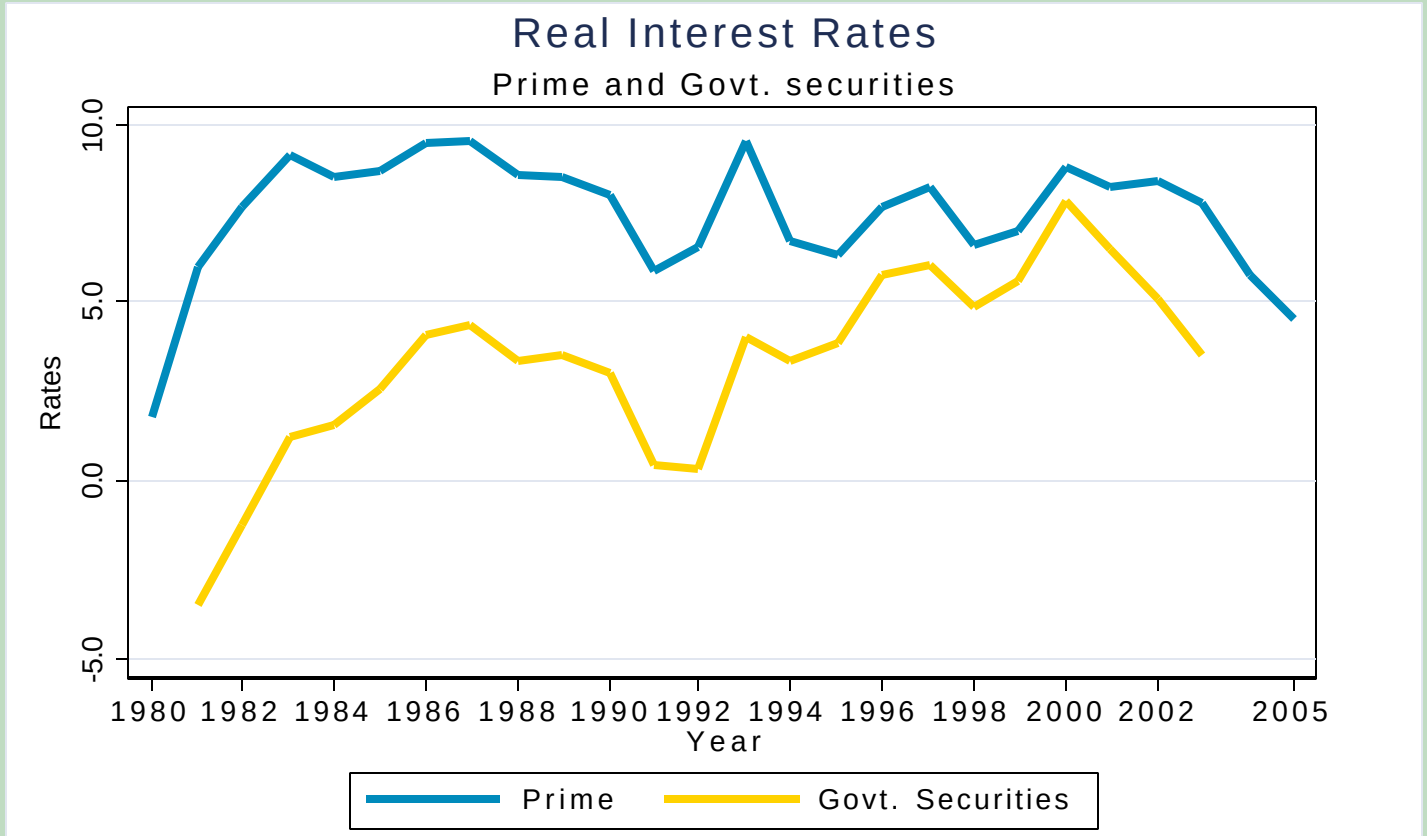
Savings, Investments, Interest Rates



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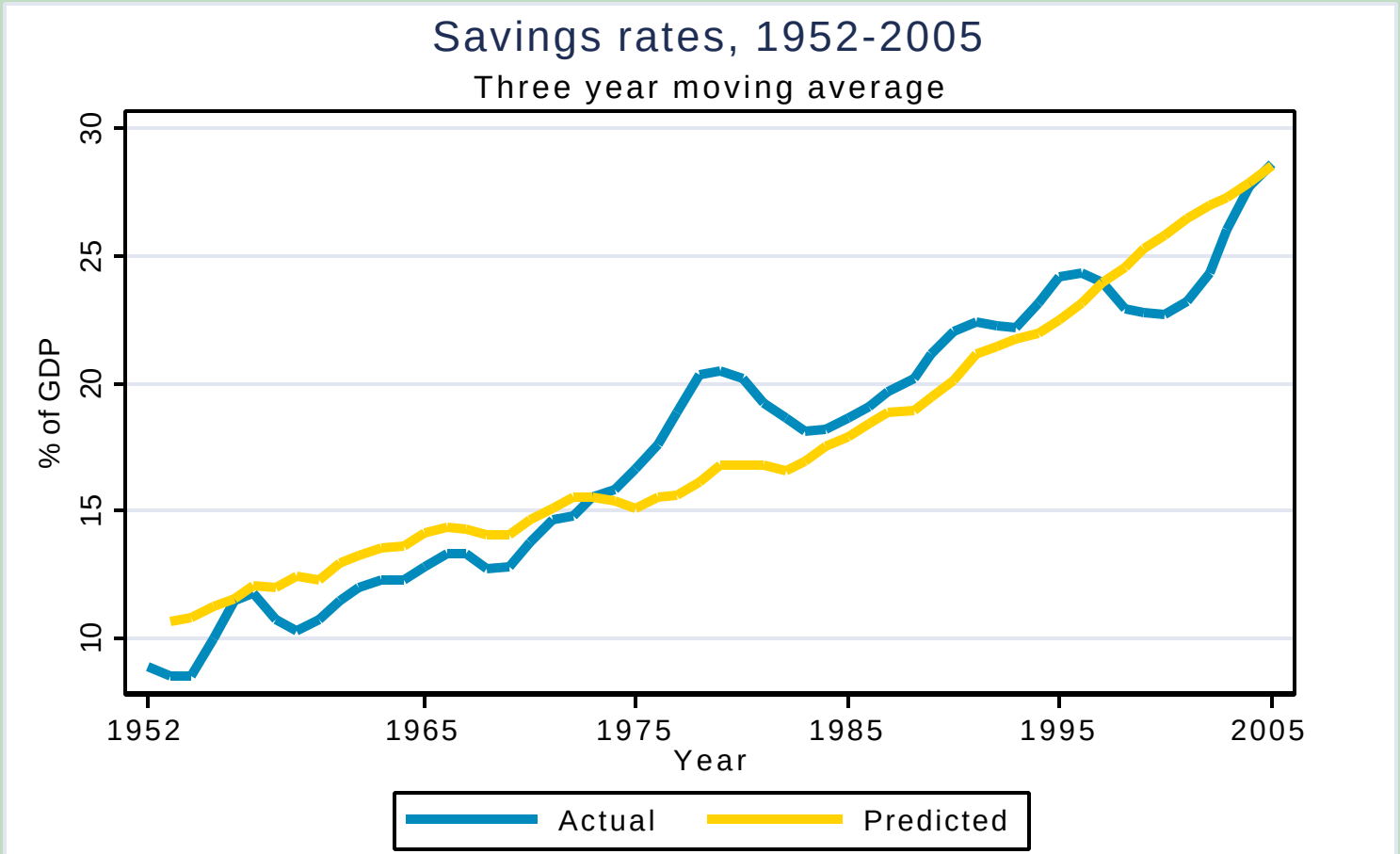

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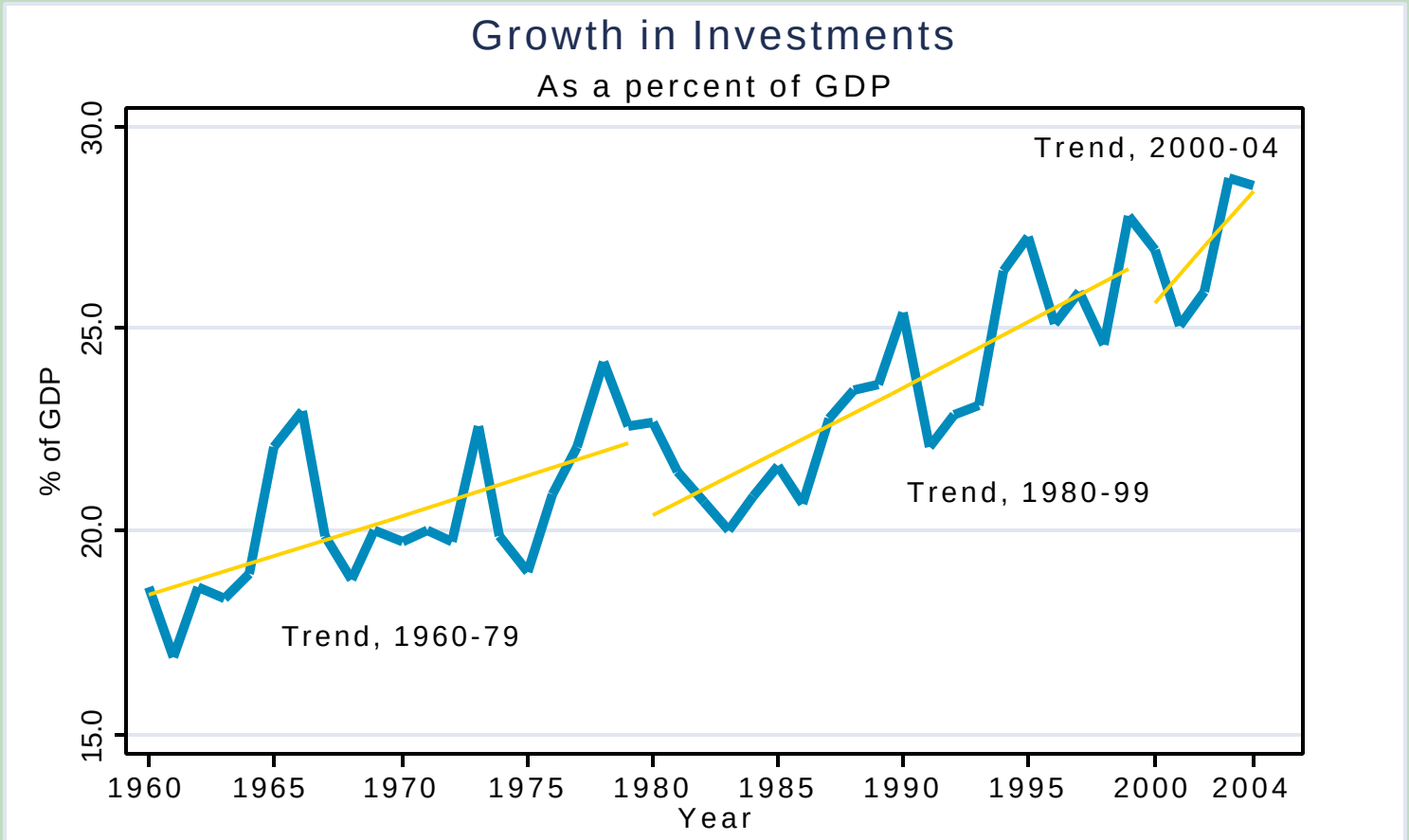

The Endogeneity of Infrastructure

- Excepting Roosevelt's post-depression America, infrastructure rarely done before it's time
- Demand for infrastructure creeps up, like the evolution of the middle class

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India is China With 5-10 Year Lag

- Most parameters, way to understand India is that it is China with a 5 to 10 year lag
- Chinese savings and investment rates to decline; India's to increase
- Chinese exchange rate to appreciate; India's to appreciate less
- Indian growth rate to exceed China's on a sustained basis by 2010
- India to reach replacement level fertility by 2015

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Why Was India Not Noticed Till The Late 1990s

- Because the first 15 to 20 years, the growth lifted the poor from absolutely poor to less absolutely poor
- It is growth of middle class that explains the attention to India, not Y2k, or software, or Aishwarya Rai.

On The Importance of Undervaluation

- Mercantilism pays – just ask China
- In cross-section analysis, our undervaluation variable swamps most others
- Variable is deviation from expected value of the ratio of current (PPP exchange rate/USD exchange rate)

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Evolution of the PPP real exchange rate