

Understanding Economic Growth: Session #1 Rich vs. Poor Countries

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Outline of Session #1

- Review of Basic Growth Theory
 - Solow
 - What Solow's Theory Cannot Explain
- Adding Human Capital
 - What Human Capital Cannot Explain
- What is Added by the New Growth Theory?
- Summary of Remaining Puzzles

Poor Countries: the Failure to Converge

- Why the Basic Theory Predicts Convergence
- Basic Facts on Lack of Convergence
- Left-out Factors
 - Political Capital and the New Comparative Economics
 - Geography
 - Infrastructure
- The Expanded Production Function

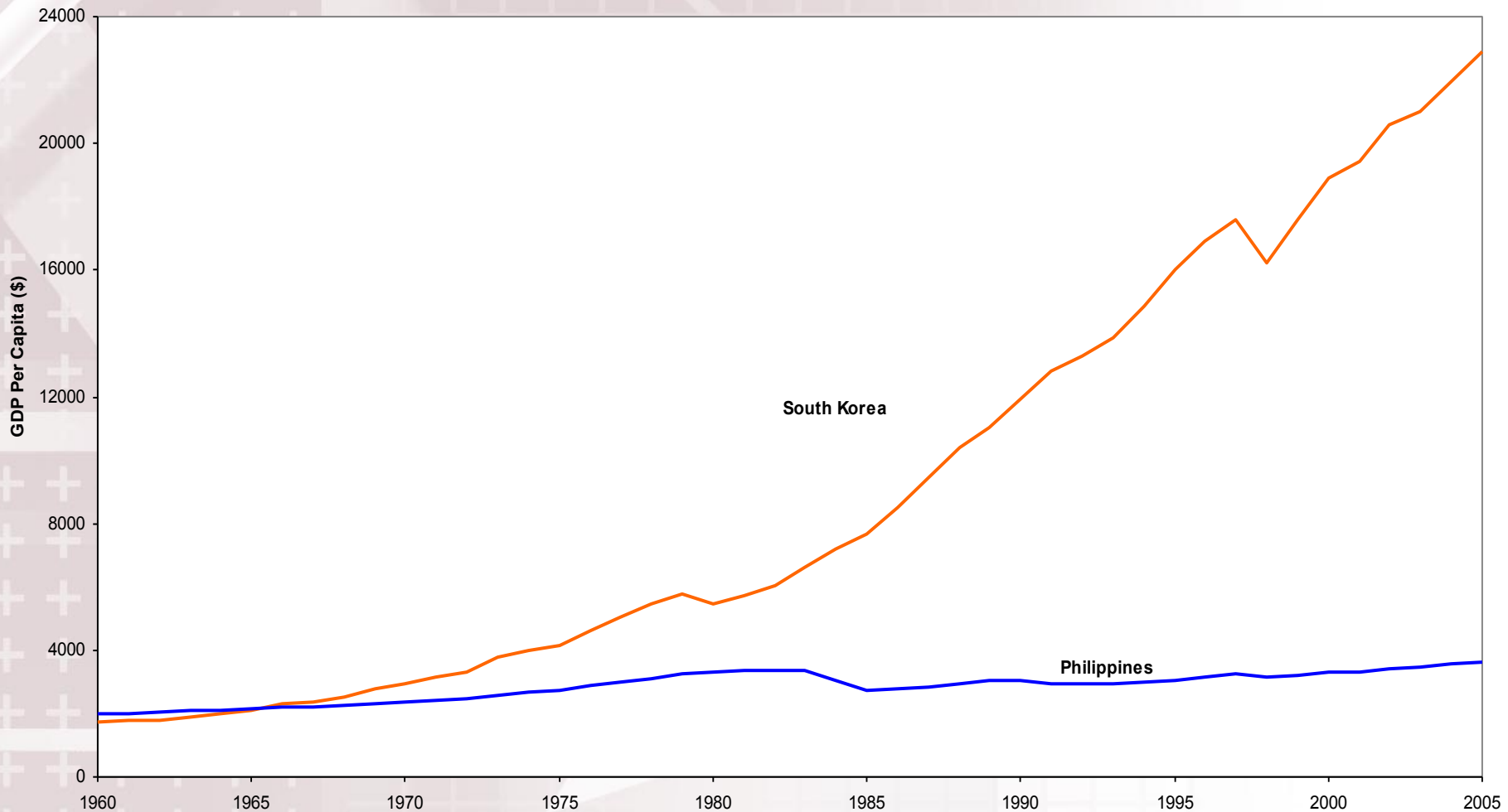
How the Concepts Relate to the Empirical Work

- Barro's Cross-Country Regressions
 - Basic Findings, his and others
 - Qualifications about Methodology
- Easterly's Barriers to Growth
 - Relating Anecdotes to the Expanded Production Function
 - Relating Easterly to the Cross-Country Regressions

The Power of Compounding

- The Rule of 70
 - How Long for anything to double?
 - Divide 70 by growth rate?
- Why? (the log of 1 is 0; log of 2 is 0.693)
- How long to double at 5.7%? 12.3
- How long to double at 1.4%? 50
- A far-fetched example? No, Korea vs. Philippines

What a Difference Four Decades Makes: South Korea vs. the Philippines



How far from this Example to Solow Growth Theory

- Key Elements of Solow without Technical Change
 - Per-person Production Function $Y = F(K, N)$
 - Fixed Saving Rate, $S/N = s(Y/N)$
 - Investment Requirement $I/N = (n+d)(K/N)$
 - Equilibrium Condition $s(Y/N) = (n+d)(K/N)$

Figure 10-1

A Production Function
Relating per Person
Output to per Person Capital

WHAT LEVEL OF PER PERSON OUTPUT WILL THE ECONOMY ATTAIN?

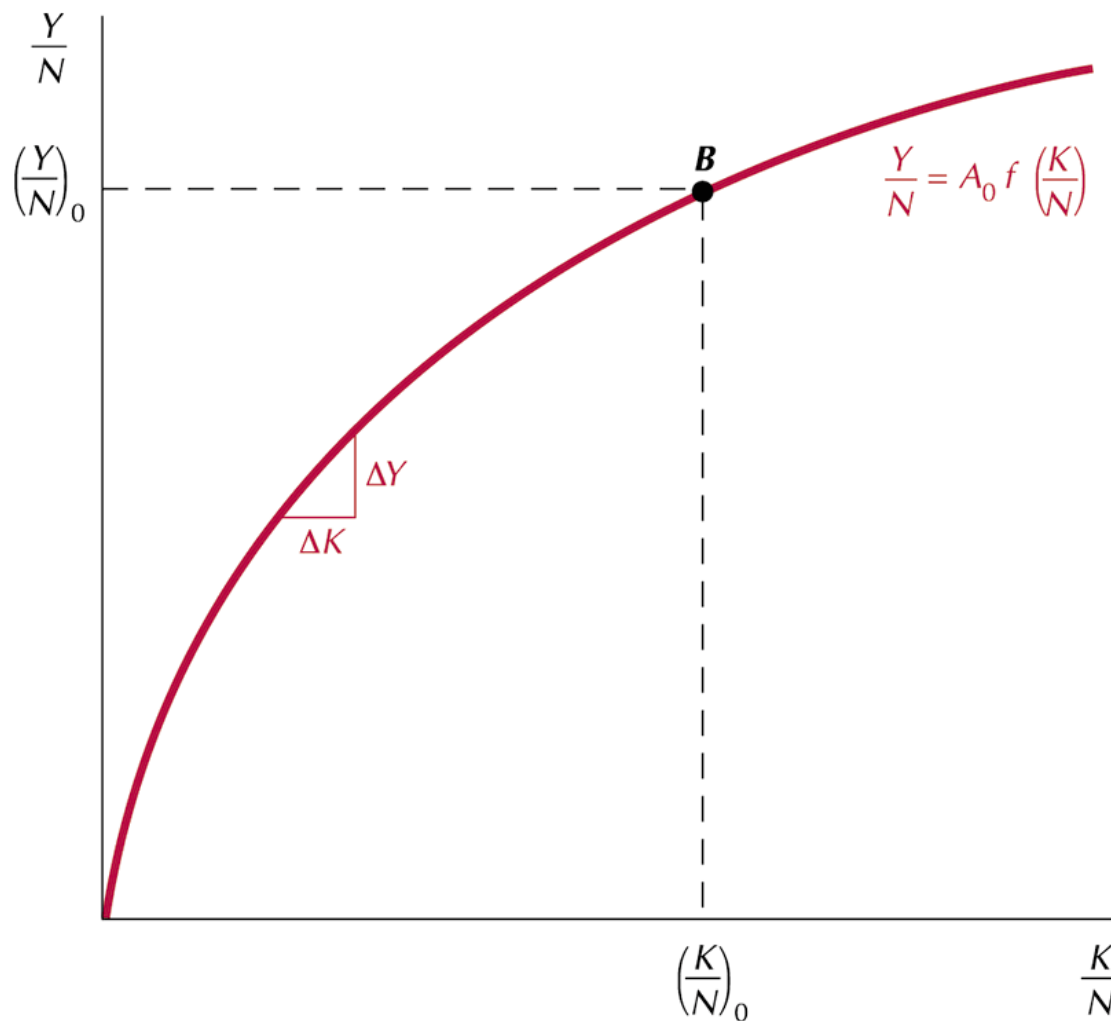


Figure 10-2 Output, Saving, and Steady-State Investment per Person

SAVING AND INVESTMENT ARE THE OUTCOME OF SEPARATE DECISIONS

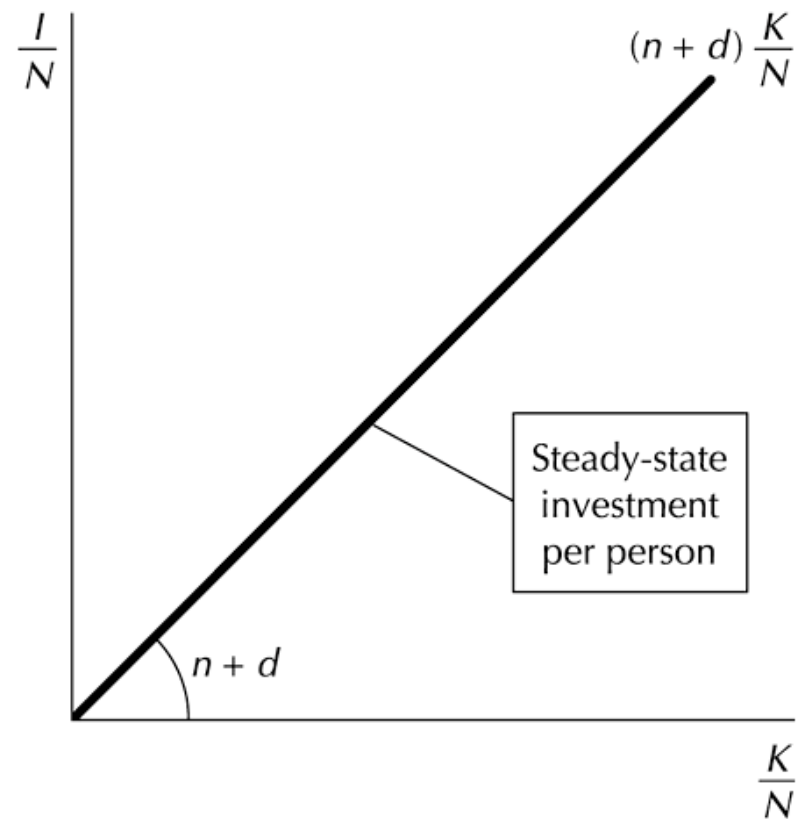
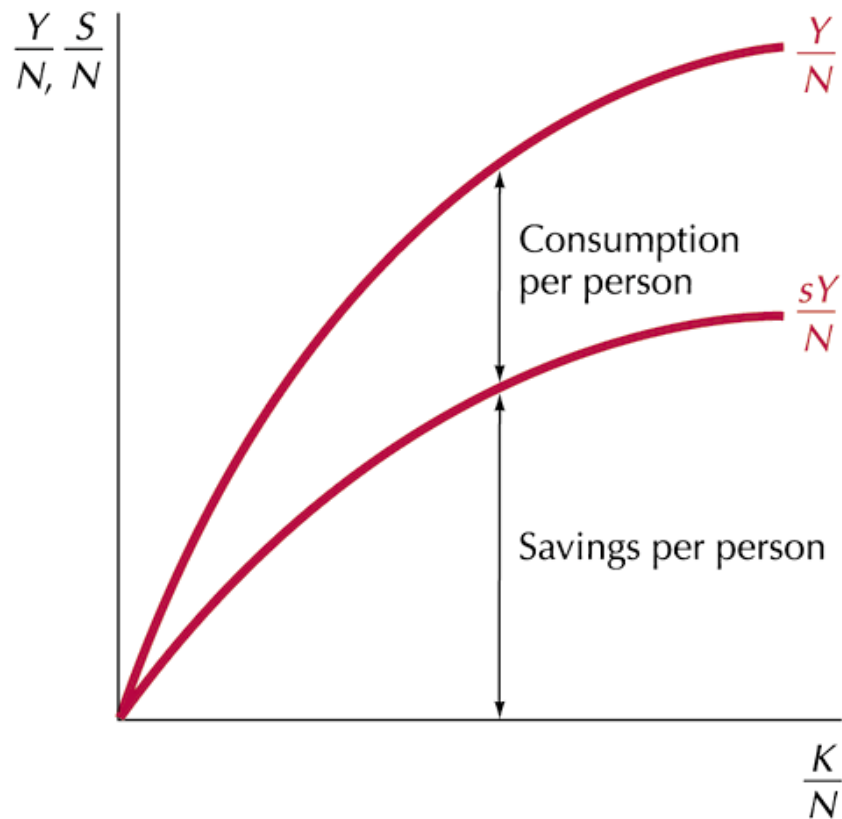


Figure 10-3 Equilibrium of Saving and Investment in the Solow Growth Model

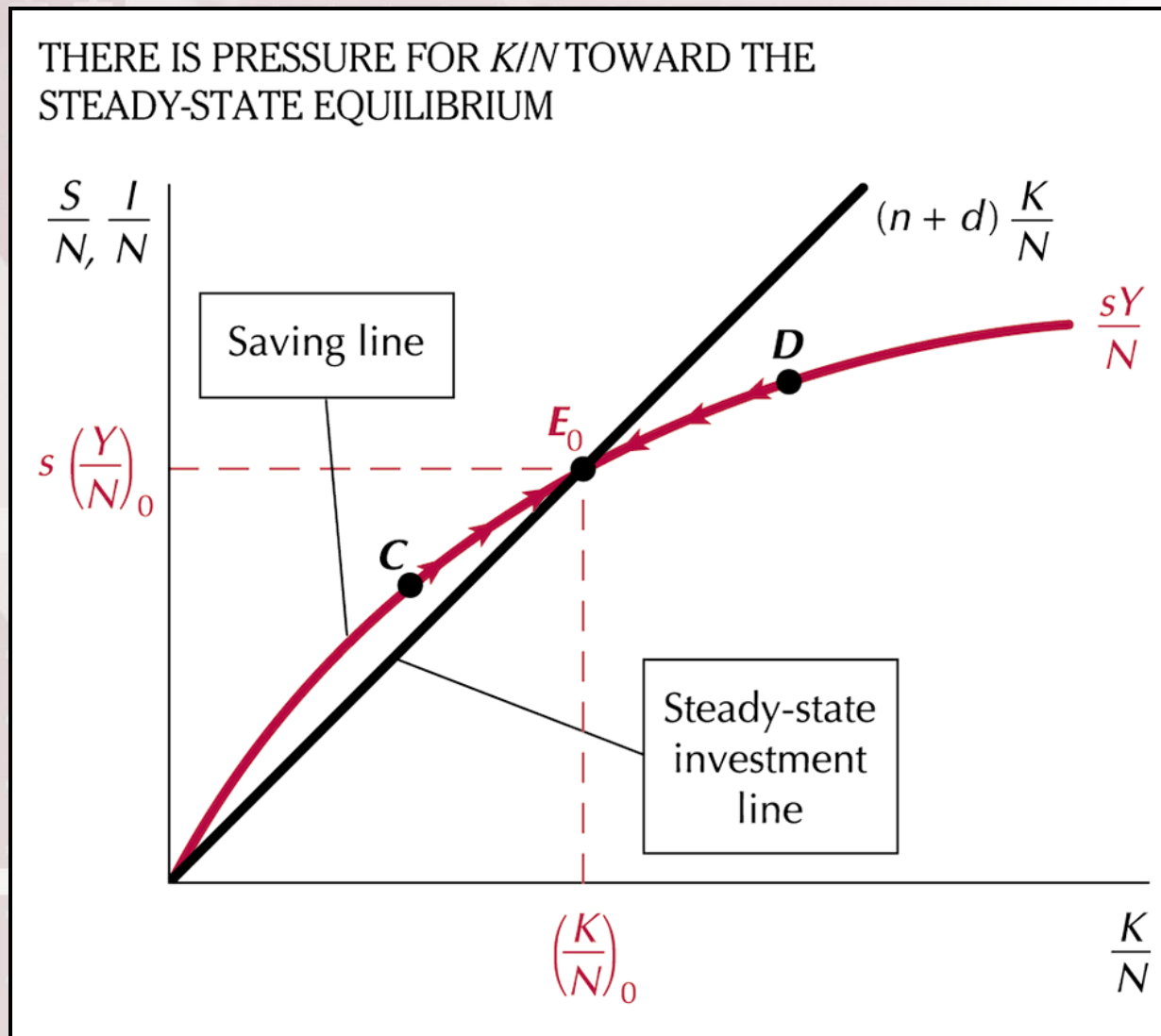
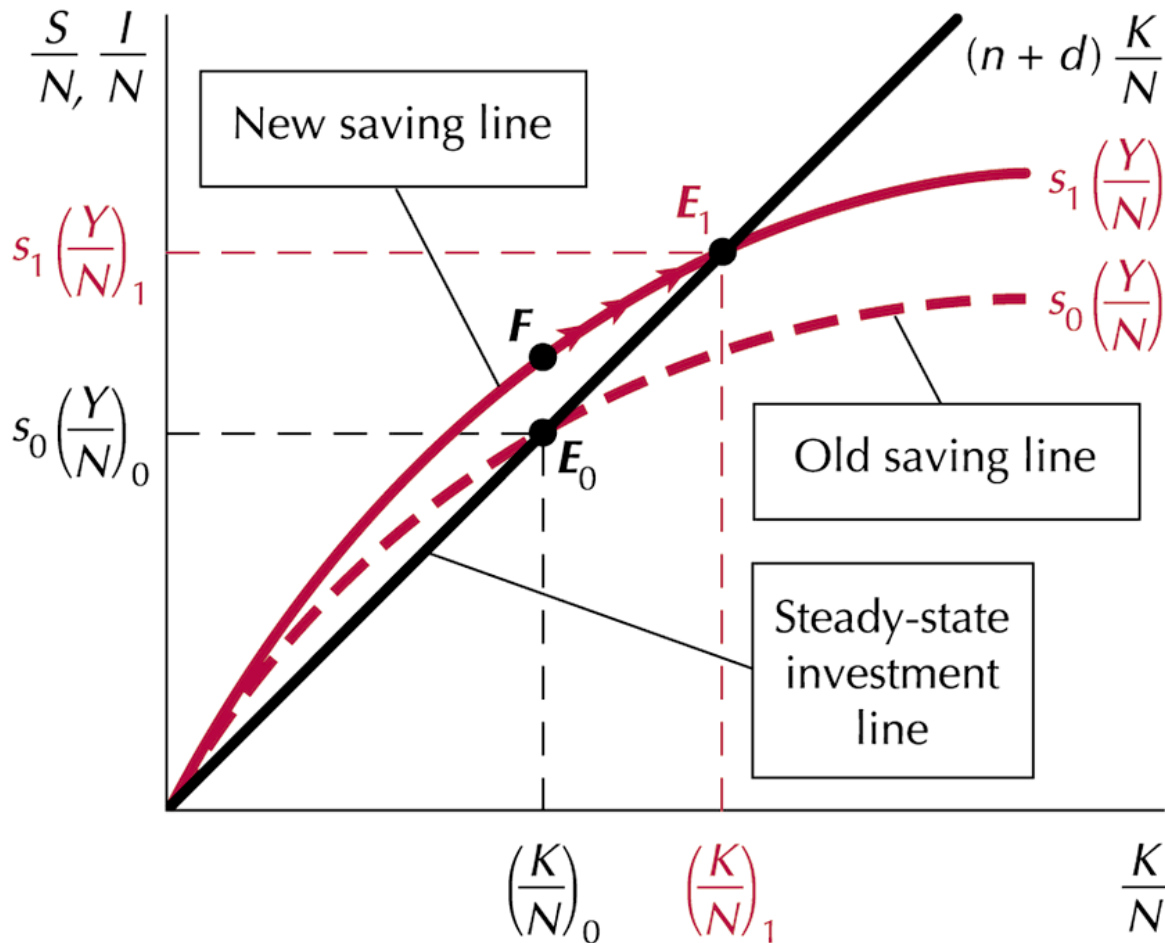


Figure 10-4 T
of a Higher Sa
on Capital and
per Person

A HIGHER SAVING RATE BOOSTS CAPITAL AND INCOME PER PERSON



Conclusions to This Point

- The Model without Tech Change offers no Route to Permanently Faster Growth
- Temporarily Faster Growth Created by
 - Higher saving rate (s)
 - Slower population growth (n)
 - Lower depreciation rate (d)
- Does Technical Change hold the Key to Growth?

Neutral Technical Change

- Adds an Exogenous Multiplier of the production function

$$Y/N = A f(K/N)$$

- Convert to growth rates, where

$$x = d\ln(X)/dt$$

$$y = a + bk + (1-b)n$$

$$y-n = a + b(k-n)$$

What technical change adds to the Solow growth model

- The growth rate a is exogenous and unexplained
- To increase the growth rate permanently, the growth rate a must rise permanently
- No change in other conclusions
 - No permanent effect on growth of s , n , d
- Technical change a free good, so prediction of universal convergence

Figure 11-1 Saving, Investment, and Capital per Hour in Long-Run Equilibrium for a Poor Nation

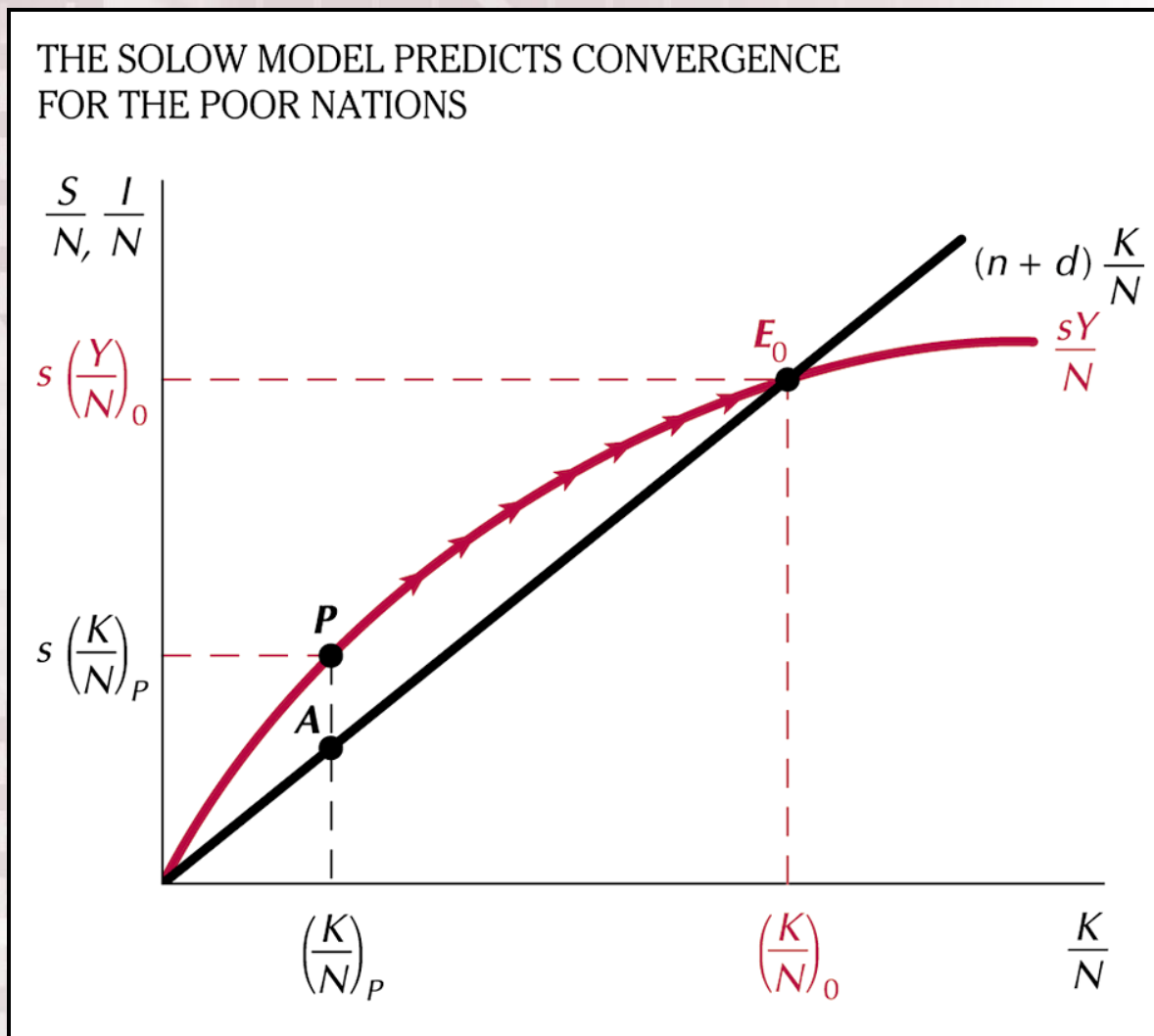


Figure 11-2 Output of Rich and Poor Nations During the Period of Convergence

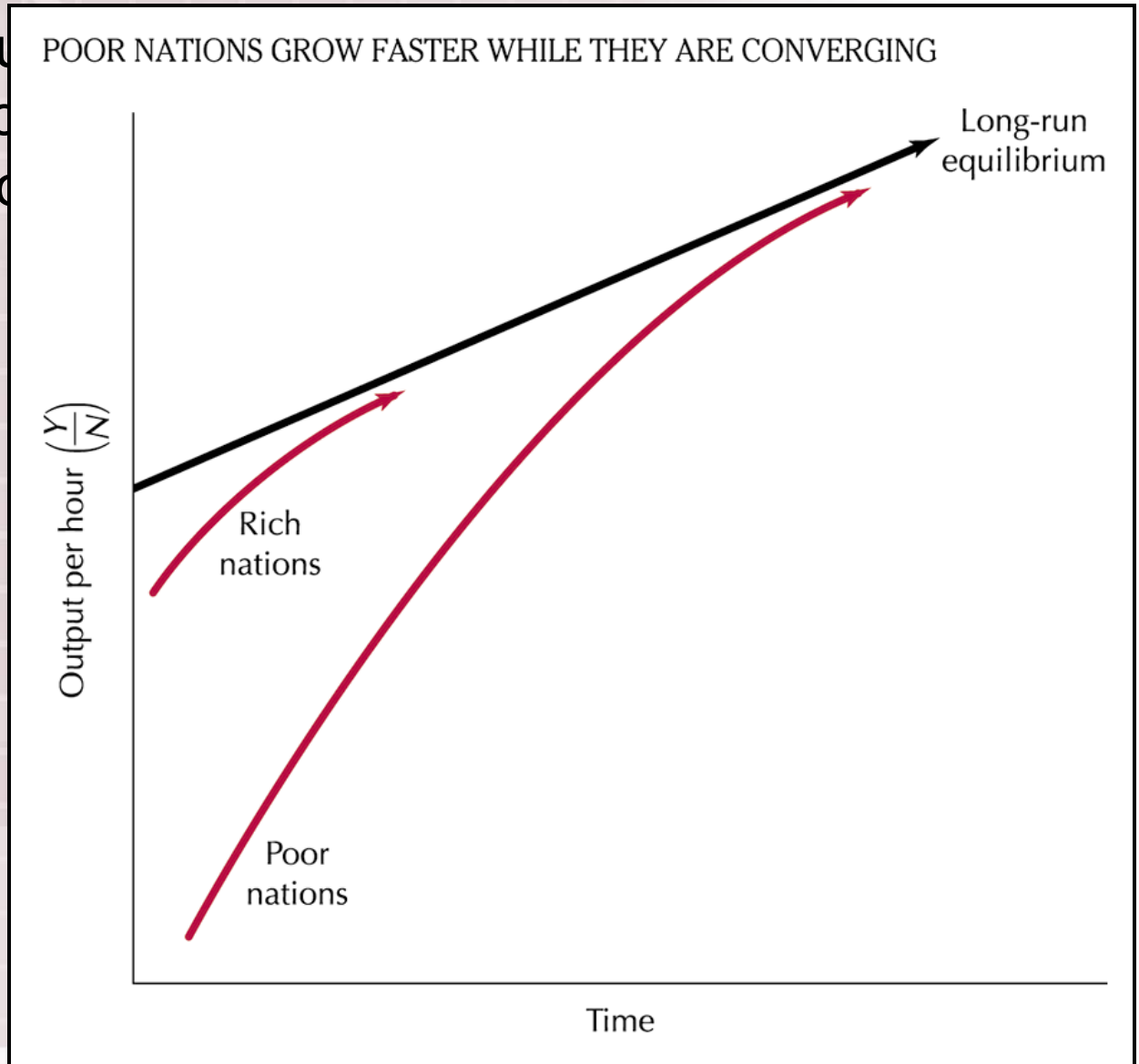
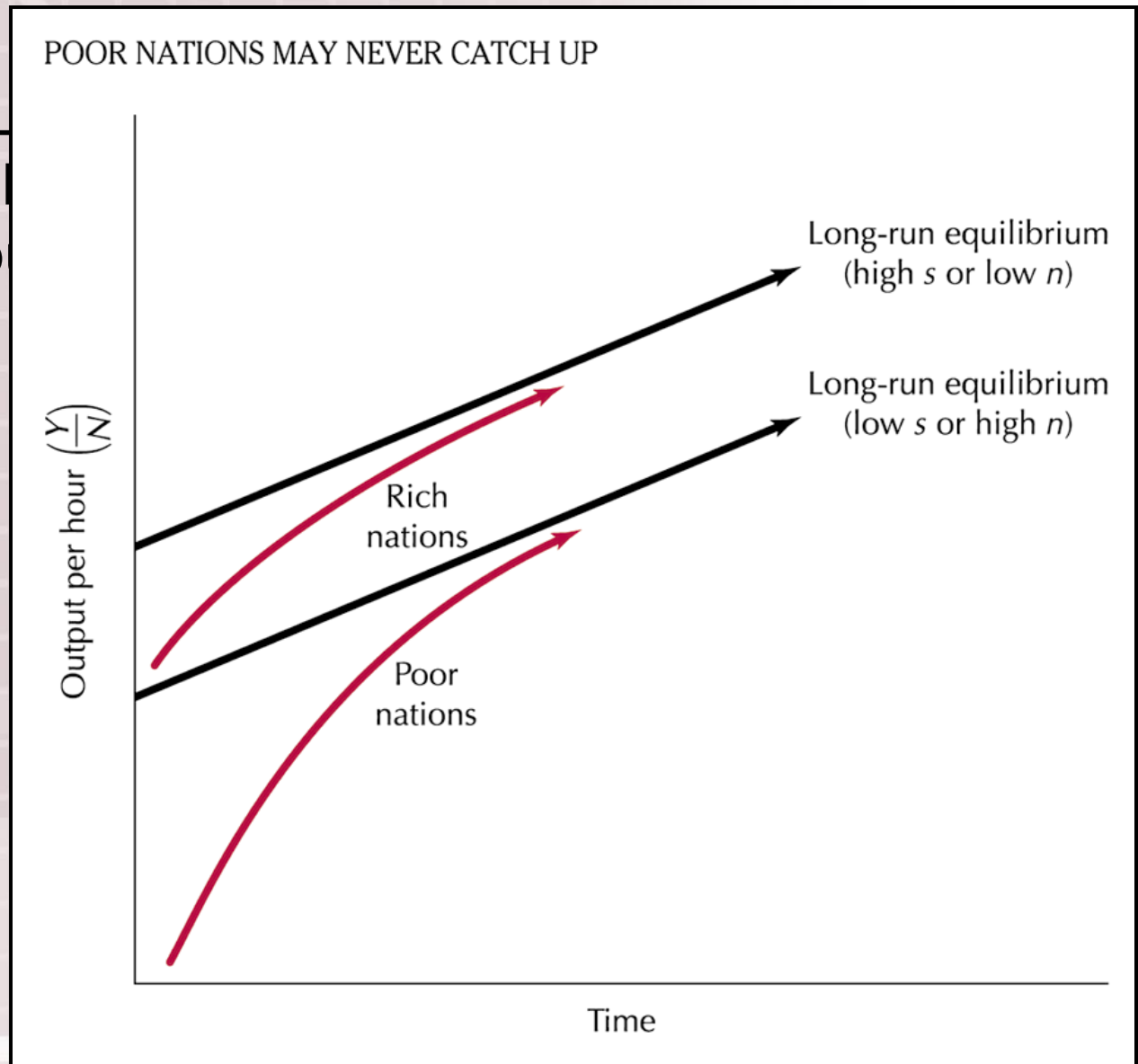


Figure 11-4

The Effect of a Low
or High Rate of
Growth on Output



Conditional vs. Unconditional Convergence

- Traditional Solow factors can explain convergence to a lower level
- List of factors greatly expanded in empirical work by Barro and others
- Barro's concept of "target GDP" related to this diagram
- Barro is too sanguine on conditional convergence; hasn't stopped many countries from having little or no growth

This is the First Puzzle: Failure of Unconditional Convergence

- As We'll See, Many Poor Countries Haven't Converged at All
- No Evidence that Unsuccessful Poor Countries can be Classified by s , n , or d
- Technical change is a free good, so this is an initial candidate for lack of realism, but what are the barriers to obtaining it?

Second Puzzle that the Solow Theory Cannot Explain

- Capital per Capita doesn't vary enough

$$Y/N = (K/N)^b$$

$$K/N = (Y/N)^{1/b}$$

- Compare Poor and Rich ($b = 0.25$)

Y/N	1	10
K/N	1	10,000

Third Puzzle

the Solow Theory can't Explain

- Rate of Return on Capital Should be Much Higher in Poor Countries
- If Y/K is 10 times higher in rich than poor country, then MPK in Rich Country should be just .00025 times MPK in Poor Country. Why doesn't all K flow to poor countries?

$$MPK = b(Y/N)^{(b-1)/b}$$

$$MPK = 0.25(10)^{-3.0}$$

Does Human Capital Provide the Missing Explanation

- Expand the Production Function

$$Y = A F(K, H, N)$$

- Solving Puzzles 2 and 3 by Fixing the Exponents

$$Y/N = (K/N)^{0.25}(H/N)^{0.65}$$

- Now the sum on capital is 0.9, not 0.25
- Is this enough?

The Rio Grande Puzzle

- Guatemalan crosses the Rio Grande
- Finds job for \$10 per hour instead of \$1 per hour
- Yet there has been no change in human capital
- The answer to the Rio Grande Puzzle is the same as the answer to the overall puzzle of rich vs. poor

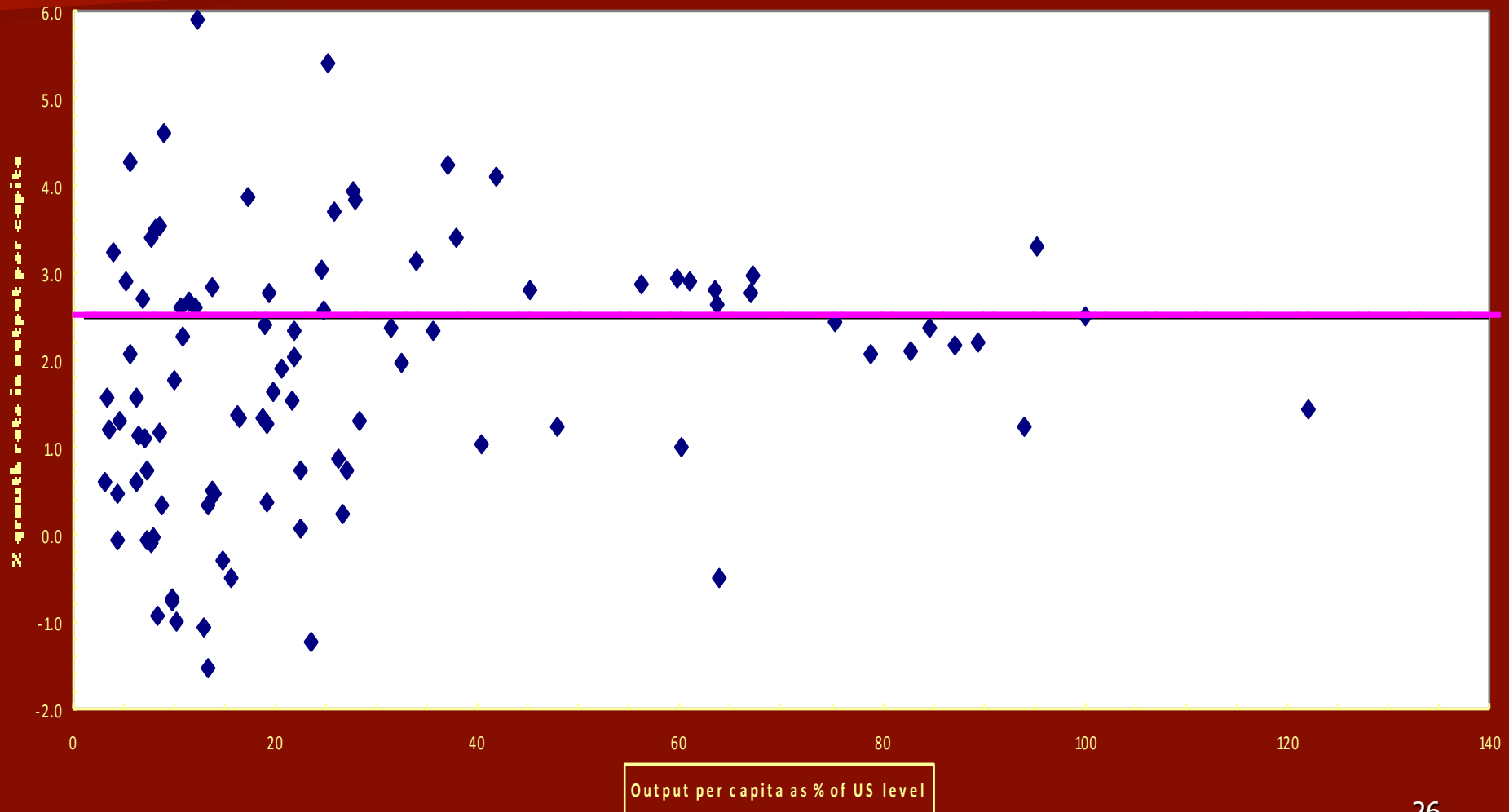
What Does New (“Endogenous”) Growth Theory Contribute?

- First contribution to build models without Solow-like diminishing returns
 - Continuing flow of ideas, spillovers among ideas
- Second contribution is to show why Technical Change is not a free good and doesn't flow to poor countries
 - Innovation Activity must be rewarded by patents and copyrights
 - Complementarity of innovation, physical capital, human capital
 - Explains why poor countries typically import technical change through foreign direct investment and why they send their smart youth to rich country graduate schools

Problems with New Growth Theory

- We still can't explain what's wrong with the non-converging poor countries
 - Can't use modern technology without human capital
 - Low educational attainment
 - High fertility
 - Can't attract foreign direct investment
- How to cut through the vicious circle?
- Barro emphasizes that empirical work builds on neoclassical (Solow) theory not new theory

The “Failure of Convergence” Diagram: the Inverted Flute



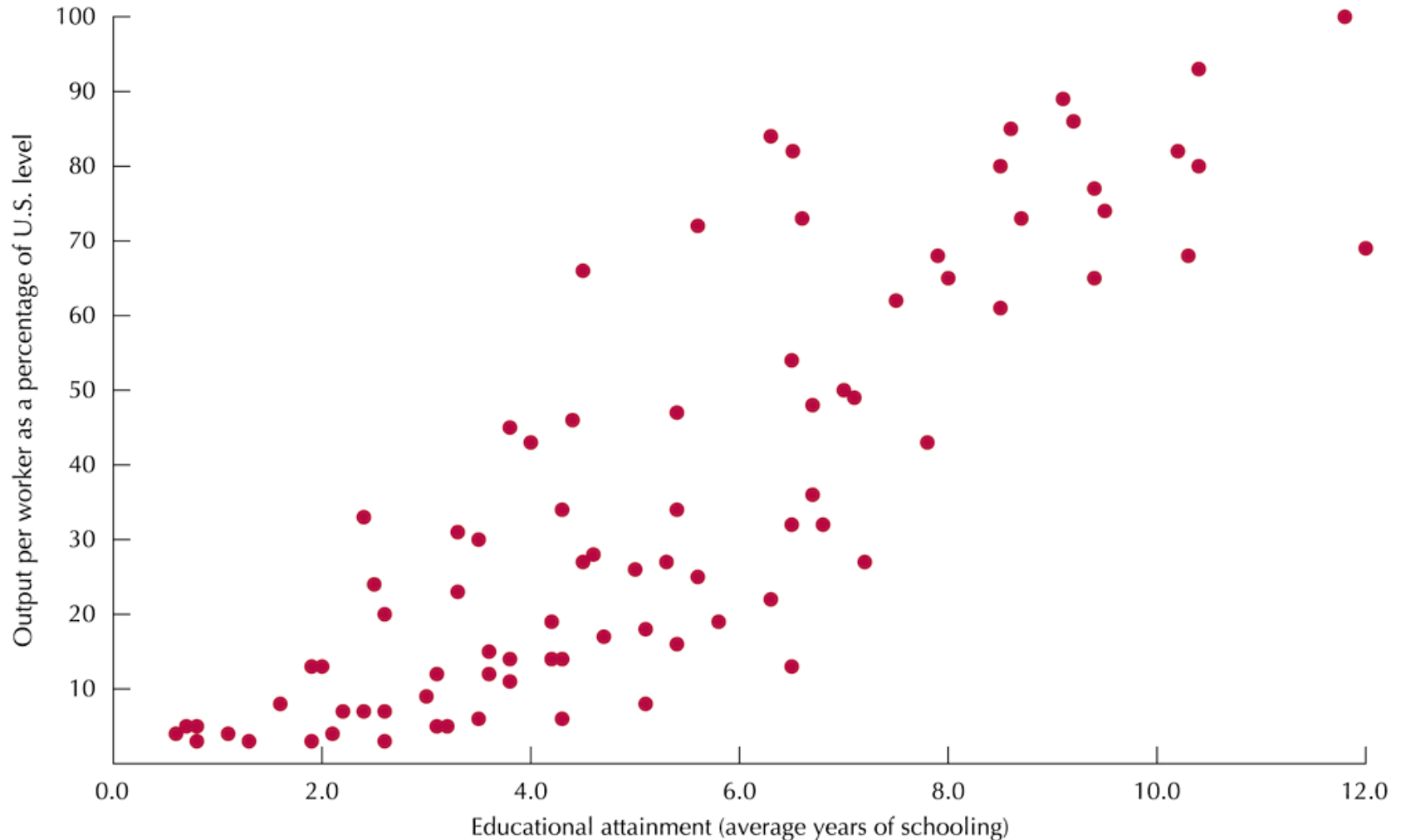
Country	Output per worker relative to the United States		Growth rate of output per worker, 1960-2000	
	2000	1960	Actual	Relative to US
Rich countries that converged				
Austria	71	60	2.9	0.4
Italy	65	56	2.9	0.4
France	67	64	2.6	0.1
Rich countries that failed to converge				
New Zealand	57	94	1.2	-1.3
Venezuela	19	64	-0.5	-3.0
Argentina	33	60	1.0	-1.5
Poor countries that converged				
Hong Kong	80	25	5.4	2.9
Japan	74	37	4.2	1.7
South Korea	48	12	5.9	3.4
Poor countries that fell back				
Ghana	4	7	1.1	-1.4
Cameroon	6	14	0.5	-2.0
Mali	3	8	0.0	-2.5
Poor countries that made no progress				
Morocco	11	11	2.6	0.1
India	7	7	2.7	0.2

How to Explain?

- Example of Weak albeit Positive Correlations
 - Share of Investment in GDP vs. Ratio of Y_{pc} to U. S.
 - Educational Attainment in Years vs. Ratio of Y_{pc} to U. S.
- Where does the Technology Come From?
 - Copy? Requires Education
 - Pay for Imported Machinery? Too Poor
 - Import via Foreign Investment?
 - That's the big question

Figure 11-6 Output per Worker Relative to the United States and Educational Attainment

EDUCATION BOOSTS INCOME, OR DOES OUTPUT PROMOTE EDUCATION?



Foreign Investment Opens the Door for Broader Explanations

- “Political Capital”
- Legal System: Property Rights, Protection from Thieves
- Fair Tax System
- Opportunity for all, not just relatives of Corrupt Dictators

The Cost of Permits and “Diversions”

- At one extreme, the United States, few permits easily obtained
- At other extreme, one study estimated cost of starting a small business in Peru at 32 times the monthly wage
 - On the convergence chart Peru 26=>14
- Chad Jones concept of diversion:
 - Theft outside and inside; high taxes; protection money (the road through Chad)
- Predictability: Russia vs. oil companies

What is the Cause of Diversion?

- Government officials want to maximize own income, own power
- Government officials may not want the “nuisance” of getting rid of the offenders
- Acemoglu and Robinson:
 - “Innovations reduce advantage of incumbency”
 - “Fearing replacement, political elites block change”

Barro's Political Hypothesis

- Some Democracy but not too much
- Very poor countries often have dictators, corruption, incentives for incumbents to block growth
- Does growth feed democracy or democracy feed growth?
- Barro hypothesis: too much democracy in rich countries heightens concern for redistribution, leads to high taxes

Geography: Why are the non-converging poor in the Tropics?

■ Sachs' four hypotheses

- #1. Technologies from temperate zone may not be applicable to tropical soils, diseases
- #2. Economies of poor tropical regions too poor to develop tropical-relevant techniques
- #3. Poor agricultural productivity delays the demographic transition experienced by rich countries
- #4. Lingering effect of colonialism, neglecting human capital, focus on ag and mining

Success and Failure in the Tropics

- Botswana:
 - 7% real GDP growth in 2003 despite being a tropical, landlocked country (mining)
 - Minimal diversion – legacy of British legal system (compare with Zimbabwe)
 - Despite dominance of one political party
 - Biggest problem: pervasive AIDS, declining population
- Success in SE Asia. SIN and HK are islands, common thread of ethnic Chinese entrepreneurs and encouragement of foreign investment

Infrastructure

- Roads, ports, airports, telephones that work, electricity
- Can be financed by government or private firms (France vs. Britain)
- India vs. China
 - Private outsourcing firms often have own generators
 - Primitive airports in India

Summing Up: the Expanded Production Function

- Traditional, with Human Capital

$$Y = A F(K, H, N)$$

- Expanded with

- Political Capital (P)
- Geography (G)
- Infrastructure Capital (R)

$$Y = A(P, G, T) F(K, R, H, N)$$

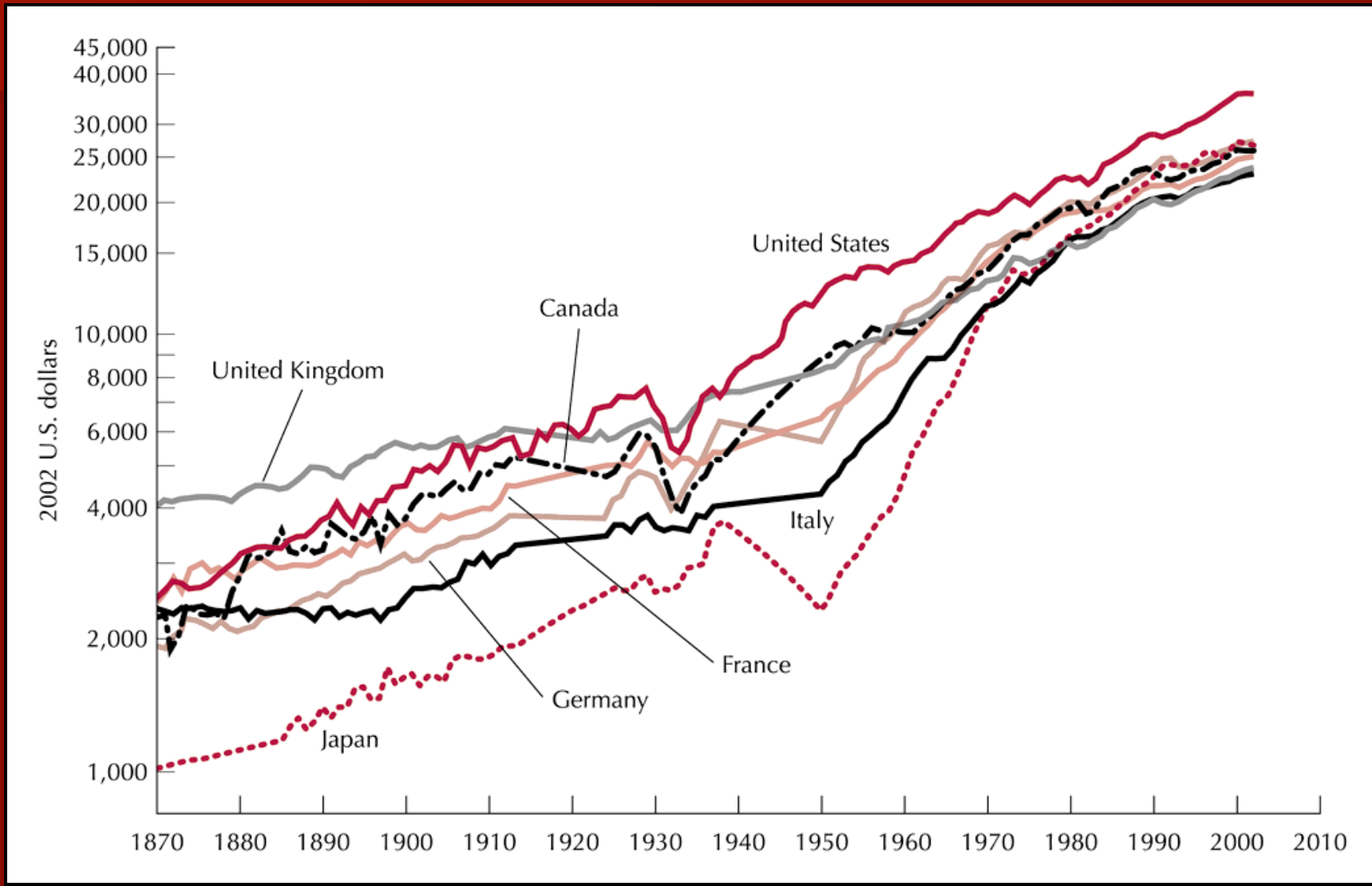
Compare to Barro's List

- Higher initial schooling
- Higher initial life expectancy
- Lower fertility
- Lower government consumption
- Rule of law index
- Terms of trade
- Inflation Rate

*BUT HOW MANY OF THESE ARE
ENDOGENOUS, CAUSED BY GROWTH
RATHER THAN CAUSING IT?*

Understanding Economic Growth: Session #2, Europe vs. the U. S.

Session #2: Europe vs. the U. S.



Understanding the Facts: Y per capita vs. Y per hour

- Standard of Living = Income per capita
 - 1.3% growth, doubles every 53 years (Philippines)
 - 5.6% growth, doubles every 12 years (Korea)
- For very long-term growth or comparing rich and poor nations, Income per capita and productivity are the same thing
- Not the same thing for short-term or comparisons among rich nations
- Y per capita vs. Y per hour is the crux of understanding the data on Europe vs. U. S.

How Productivity is Related to Output per Capita

Output (Q) Equal to the product of:

- Productivity (Q/A)
- Hours per Employee (A/E)
- Employment Rate (E/L), that's just $(1 - U/L)$
- Labor-force Participation Rate (L/N)
- Working-age Population (N)

$$\frac{Q}{N} \equiv \frac{Q}{A} \cdot \frac{A}{E} \cdot \frac{E}{L} \cdot \frac{L}{N}$$

How Could Europe be So Productive Yet So Poor

Output per Capita (Q/N)

In Europe 75% of U. S.

Productivity 95% of U. S.

The Difference:

- Hours per Employee (A/E)
- Employment Rate (E/L)
- Labor-force Participation Rate (L/N)

$$\frac{Q}{N} \equiv \frac{Q}{A} \cdot \frac{A}{E} \cdot \frac{E}{L} \cdot \frac{L}{N}$$

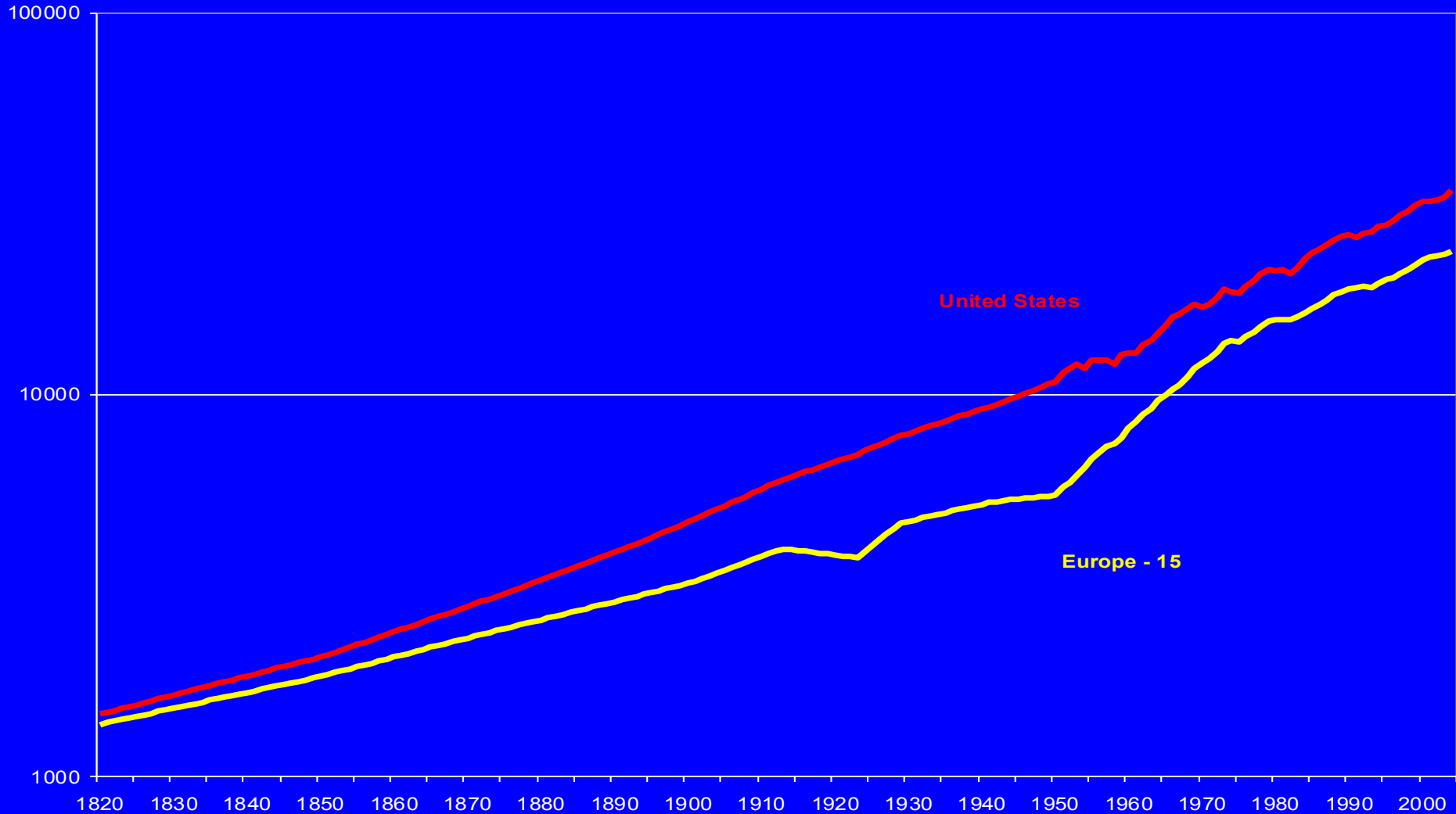
Europe vs. the U. S. since 1870

- The History: Europe falls back 1870-1950 and then catches up
- The catch-up in 1995 was almost complete in productivity (Q/A)
- The catch-up since 1970 has been incomplete in output per capita (Q/N)
- Why?
 - The collapse of Europe's A/N
 - Why? The Disagreement with Blanchard
 - Q/A: Europe is no longer catching up but falling back. Why?

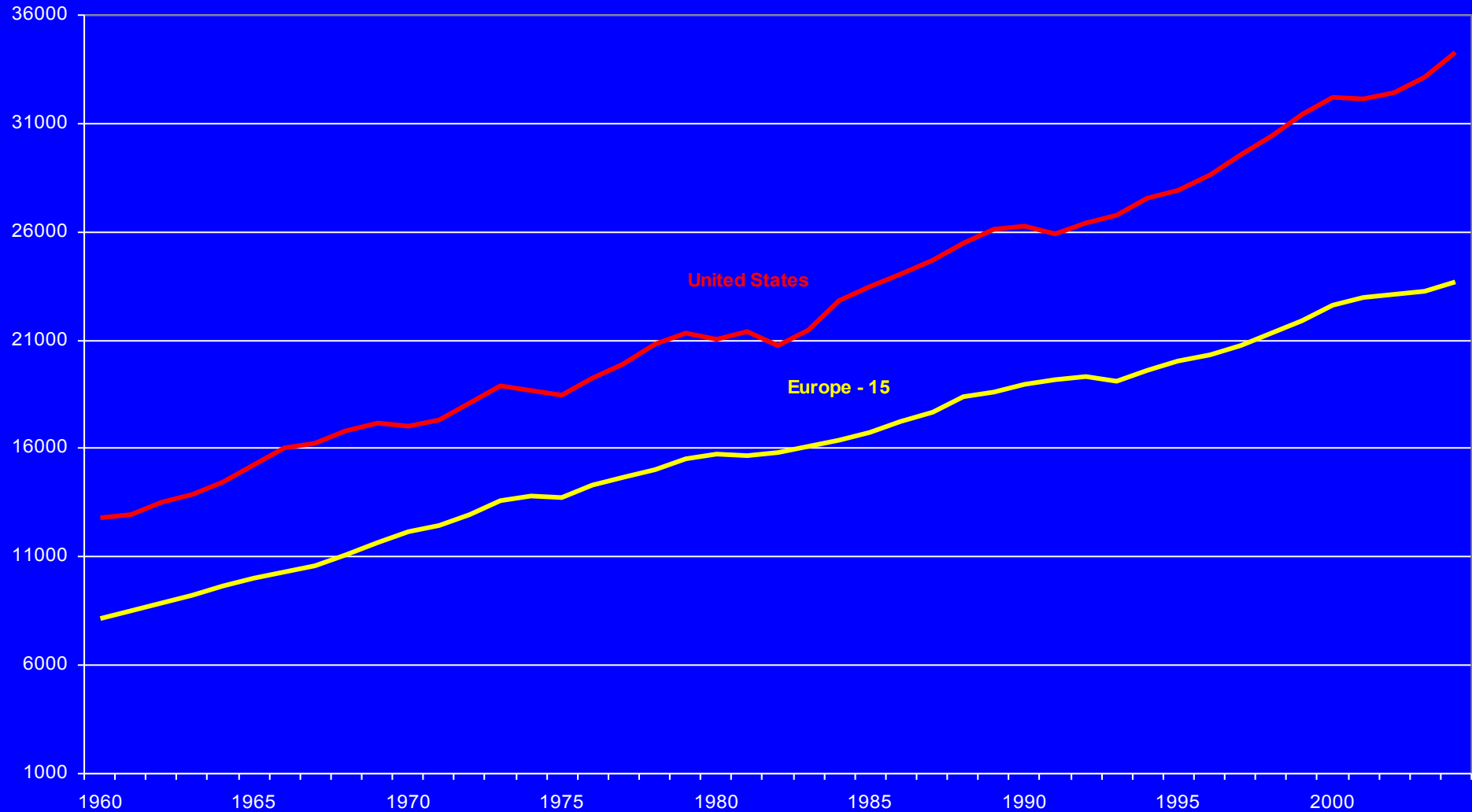
Part #1: Lots of Data Slides, What are the Data Issues?

- Thanks to Peter Neary AER Dec 2004:
 - Geary vs. EKS vs. “QUAIDS”
- Alternative methods of converting Ypc to international PPP
 - Maddison (1820-1950) uses Geary-Khamis
 - OECD uses EKS
 - Groningen web site gives both
- My calculations from Neary for EU-15
 - 1980 Neary preferred QUAIDS = 74
 - Average Groningen GK and EKS = 74

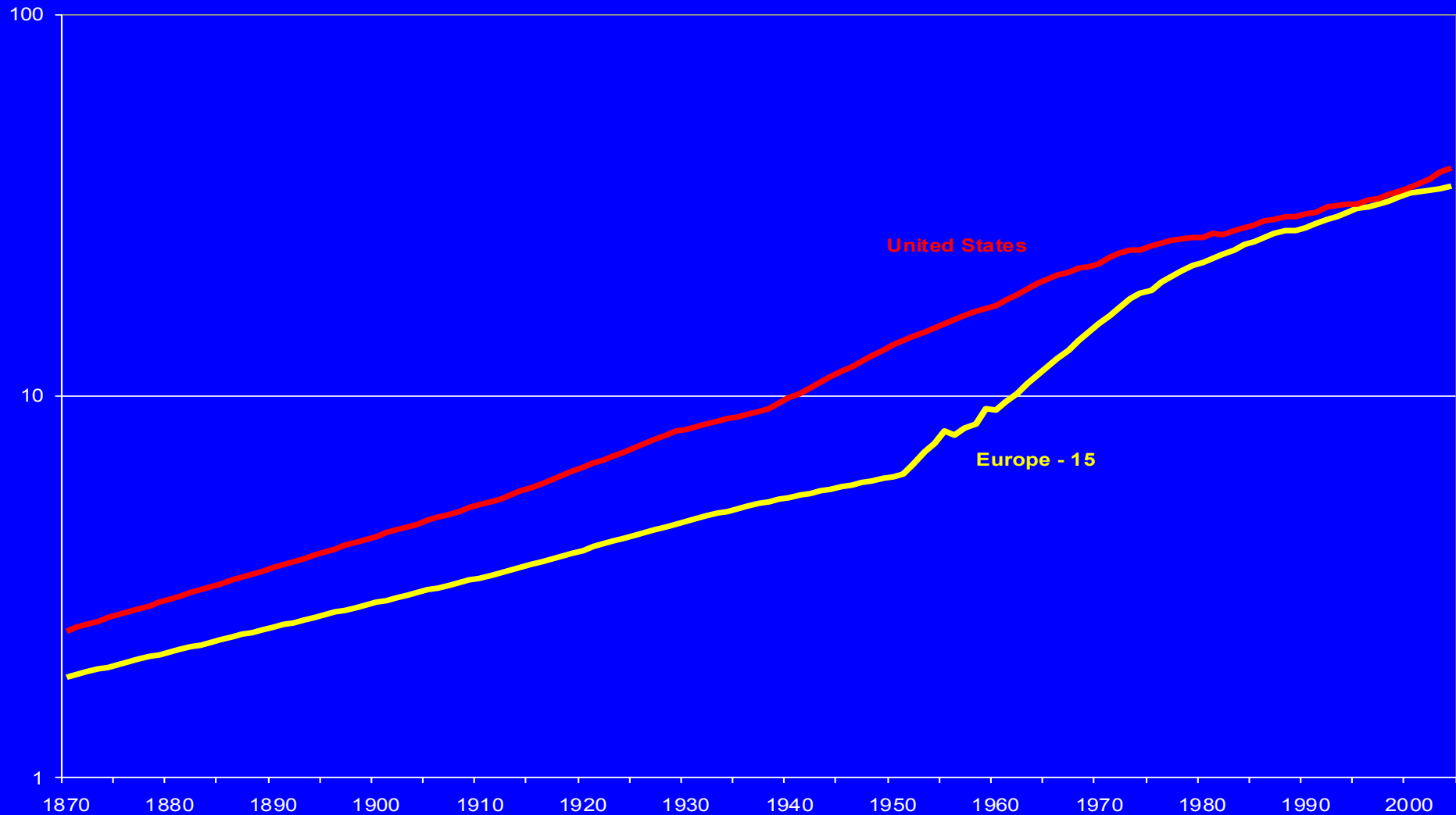
The Broad Sweep of 2 Centuries: Income per Capita



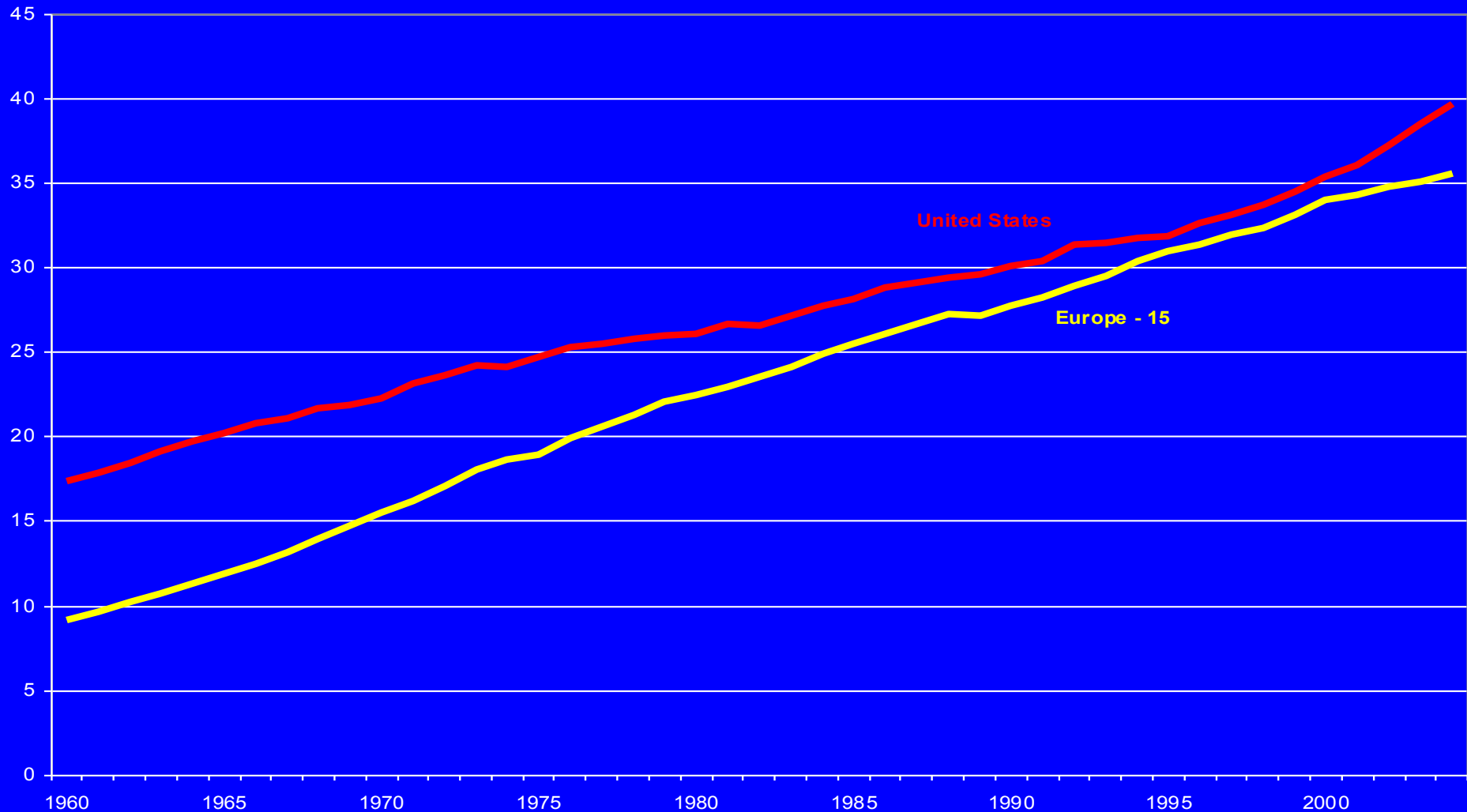
Since 1960: Europe Fails to Converge and then Falls Behind



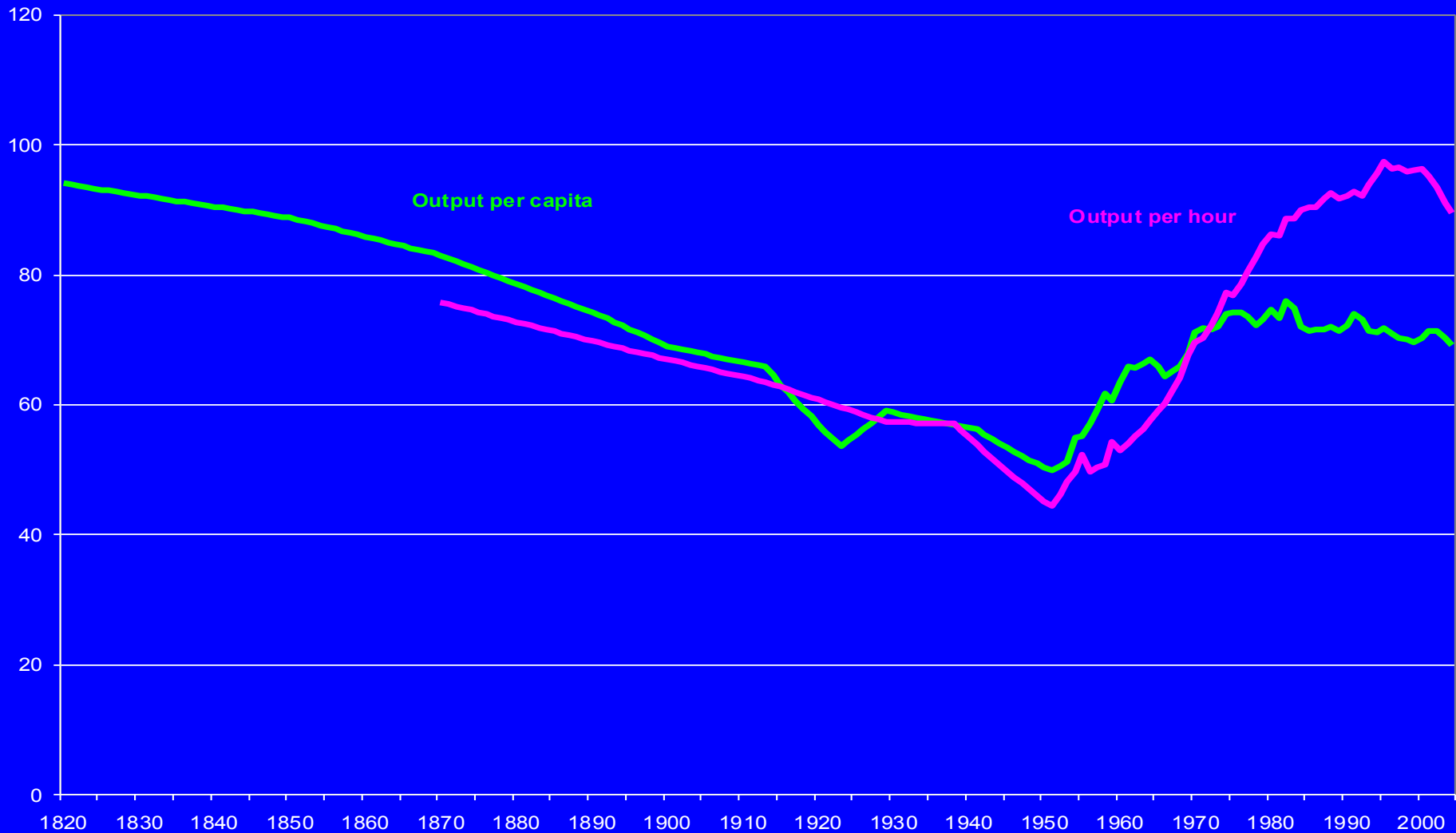
Productivity since 1870: Almost Catching Up is Not Enough



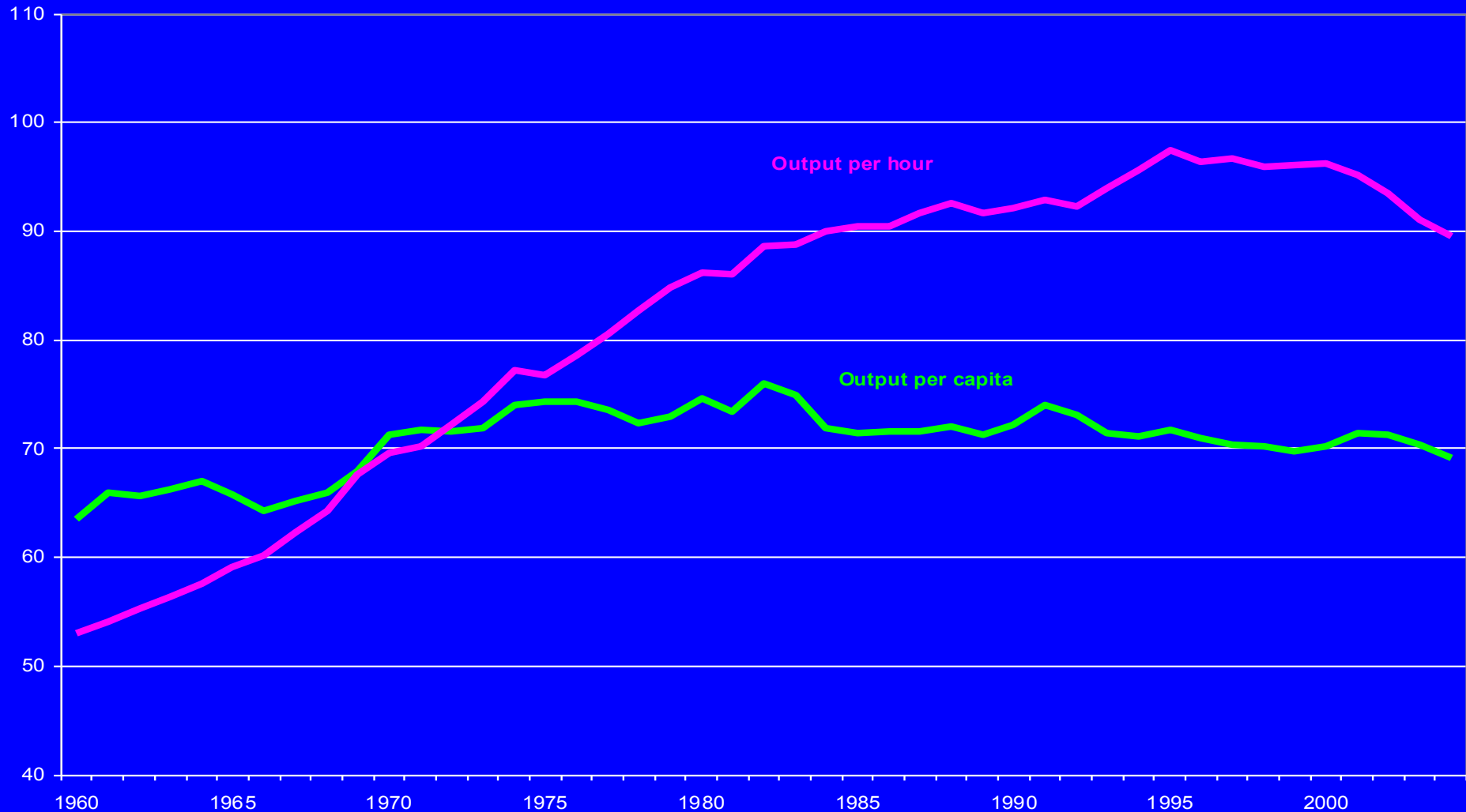
Productivity: A Closer Look at Post-1960



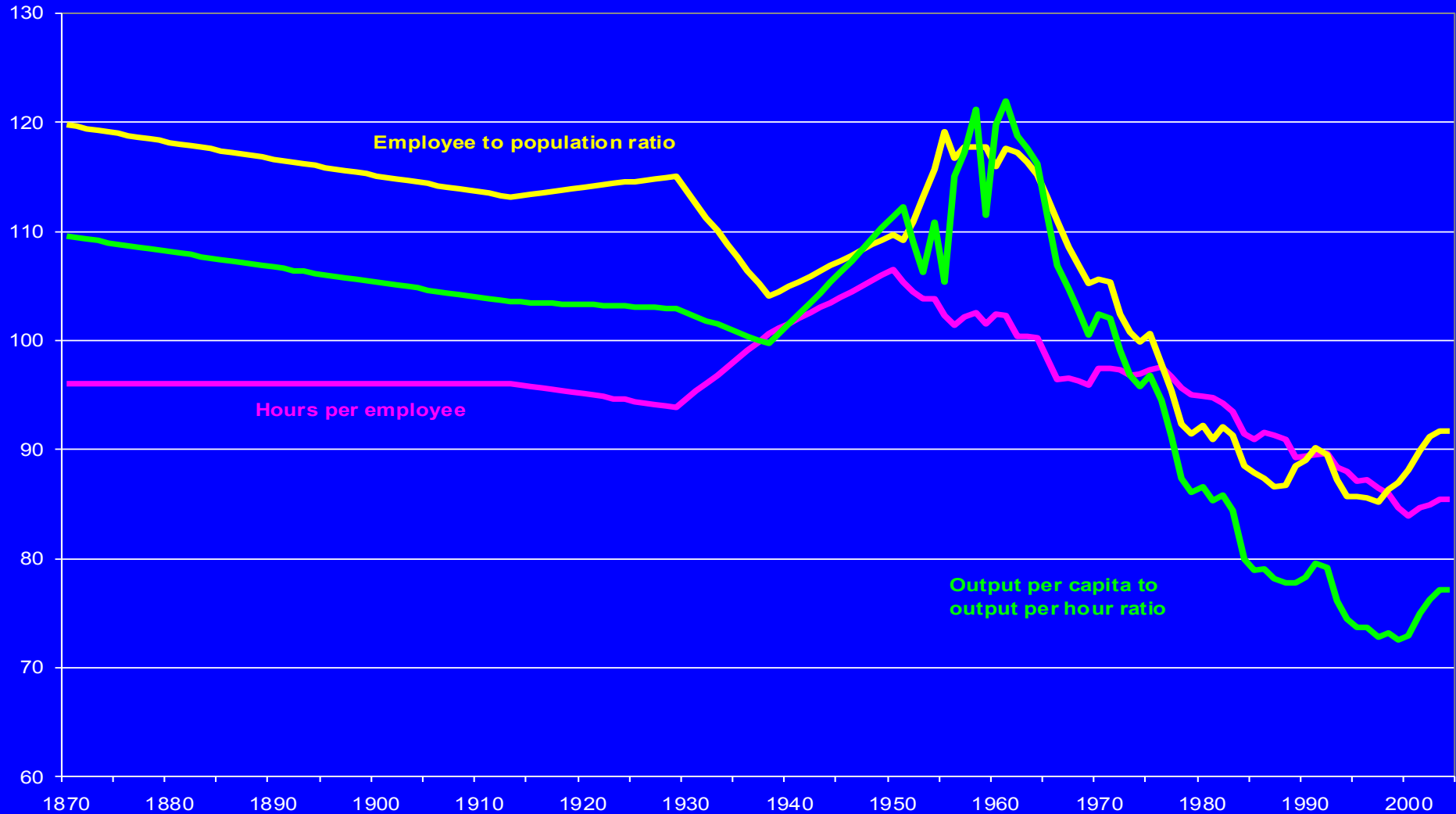
The Europe / US Ratios Are Much More Dramatic



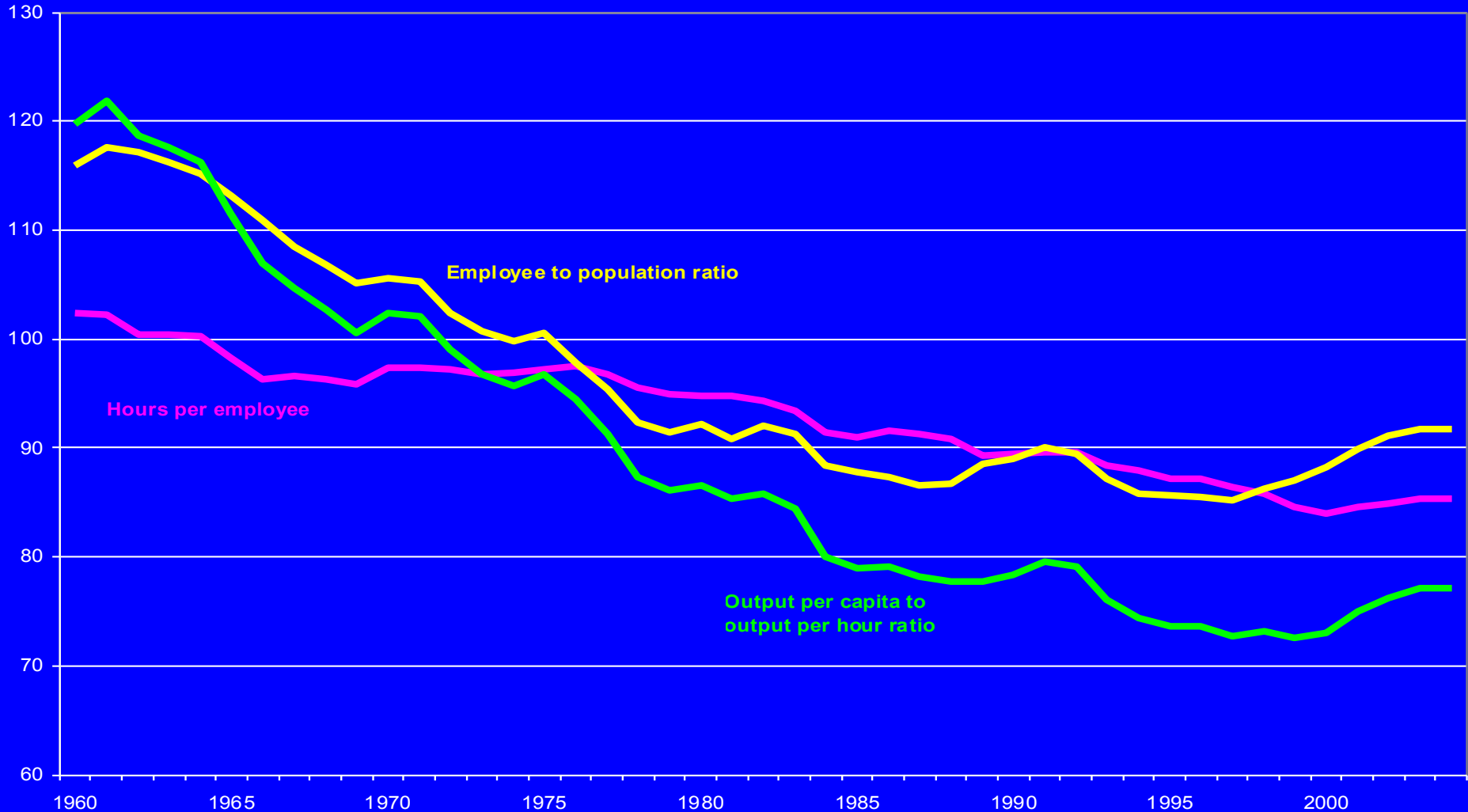
The Ratios Again: A Post-1960 Close-up



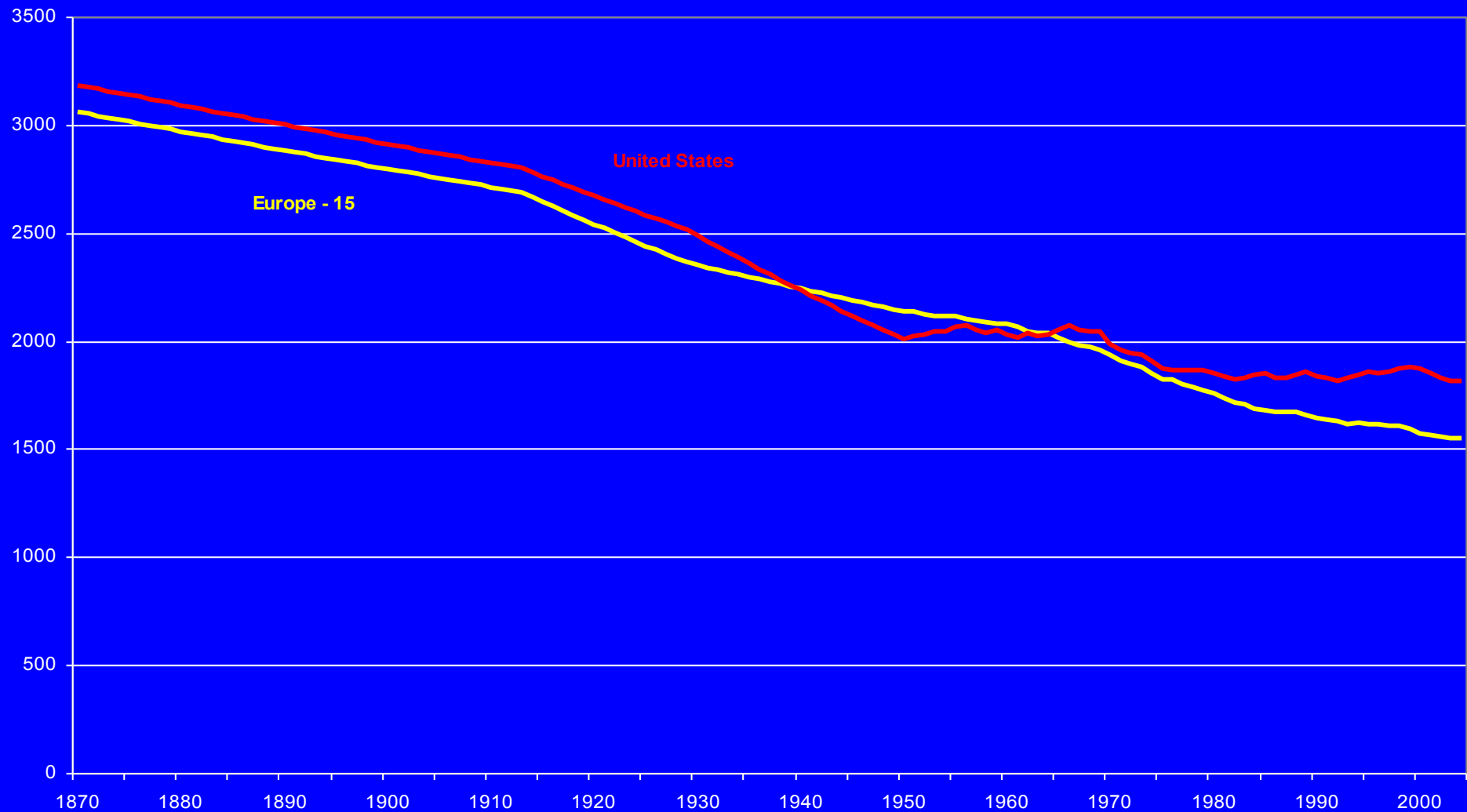
Ratios of Ratios: The Real Clue to What is Going On



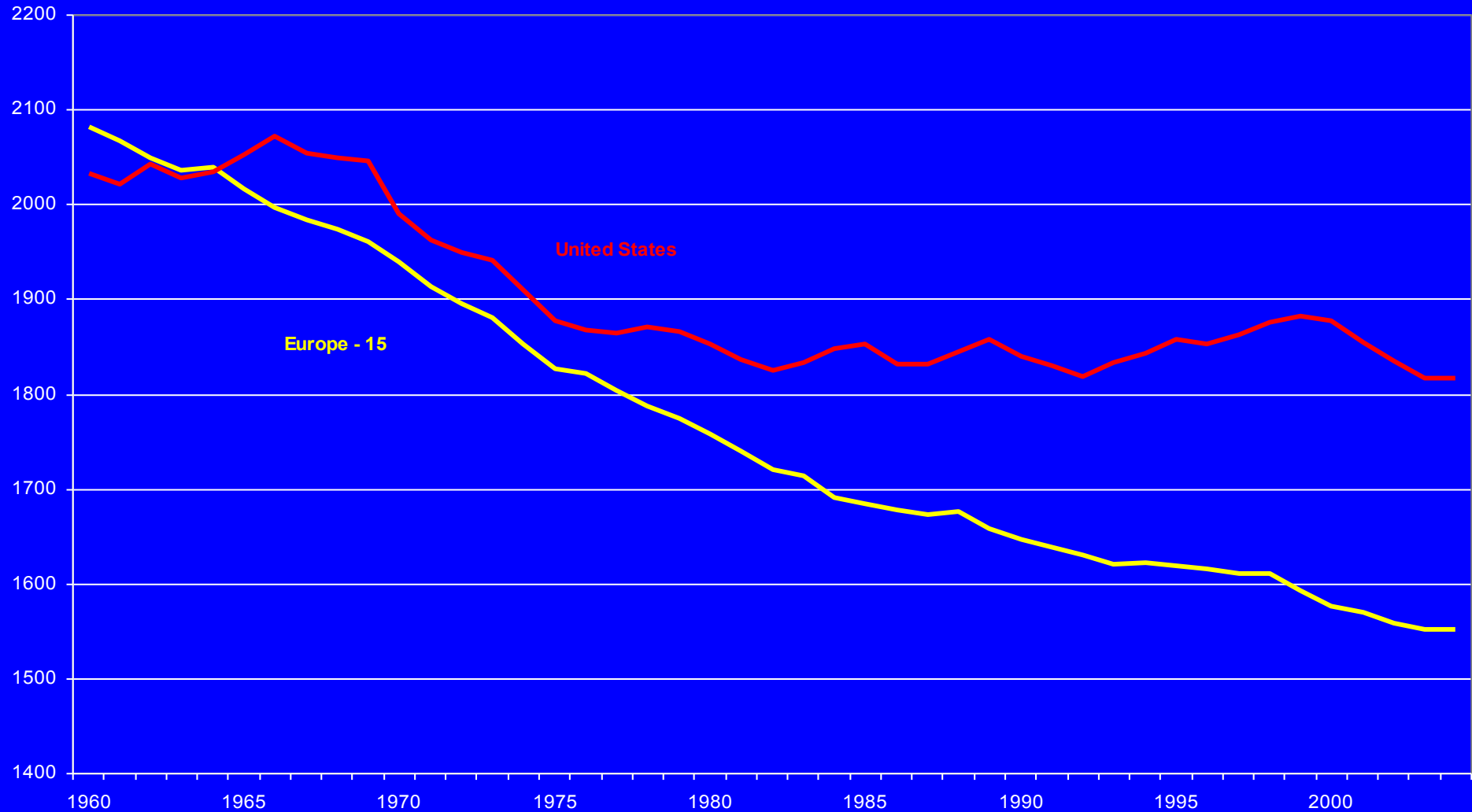
Ratios of Ratios: The Post-1960 Close-up



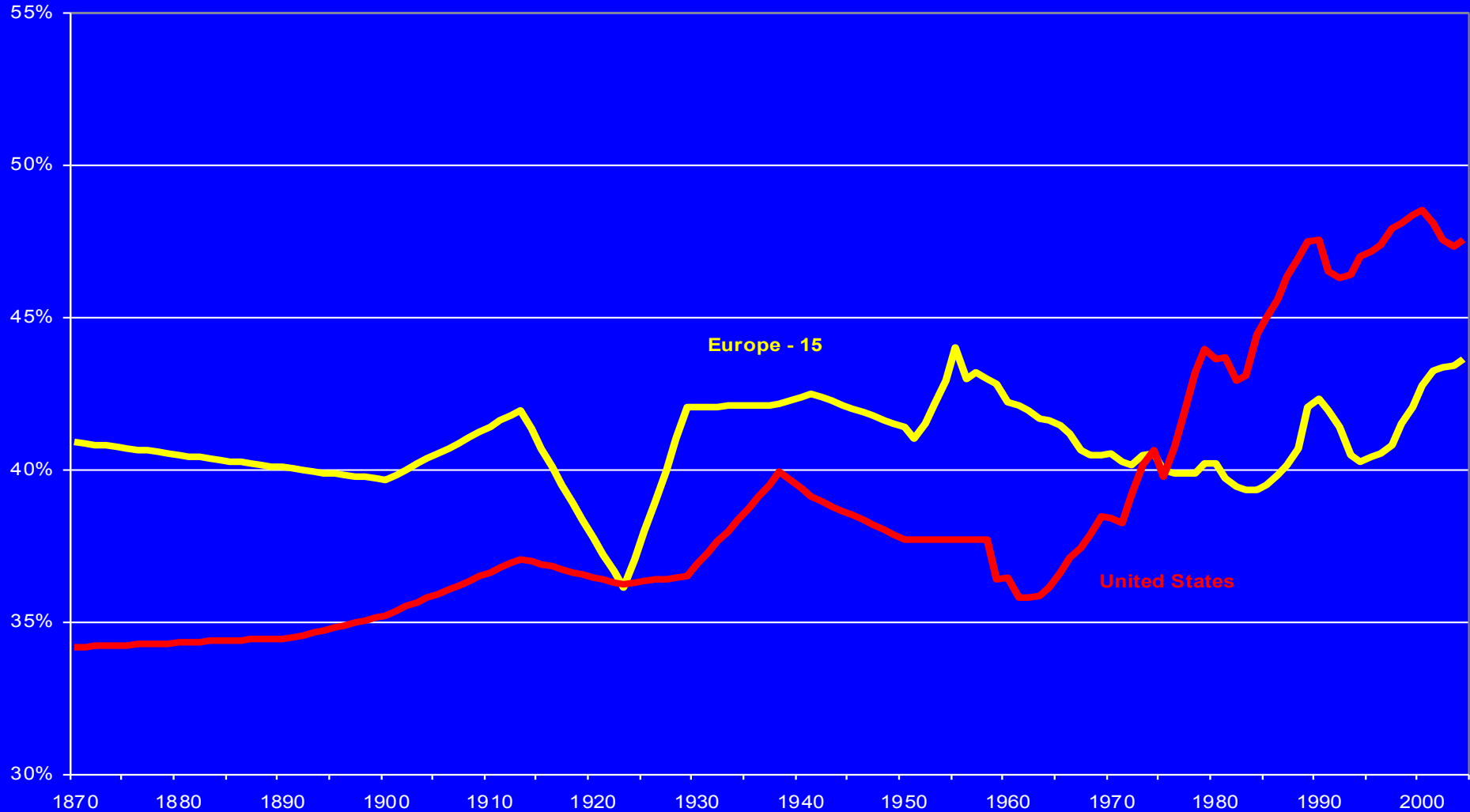
Hours per Employee Declined in Tandem until 1970, then diverged



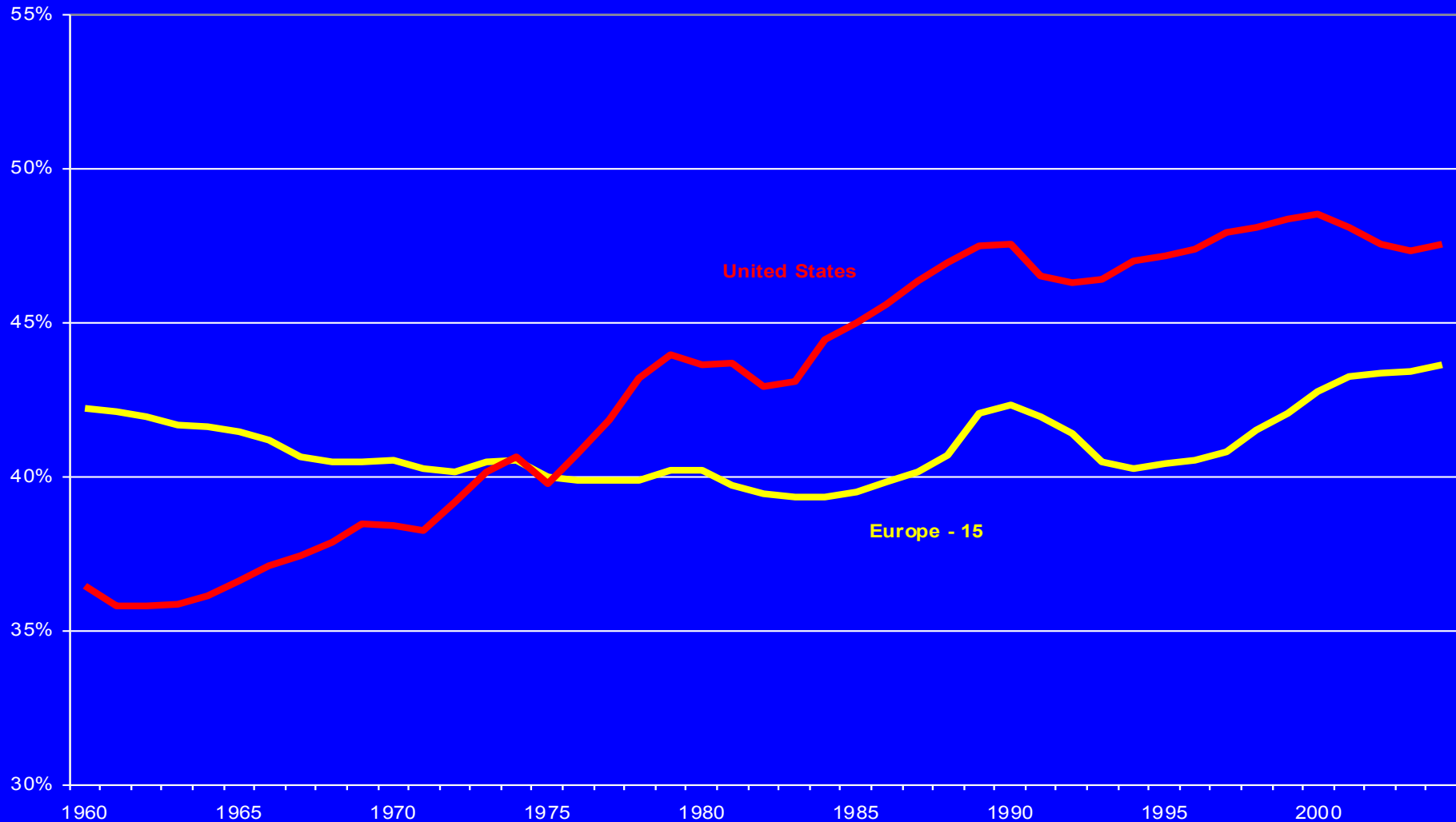
A Close-up of Hours per Employee after 1960



What Blanchard Neglects: Employment per Capita



Employment per Capita: The Postwar Close-up



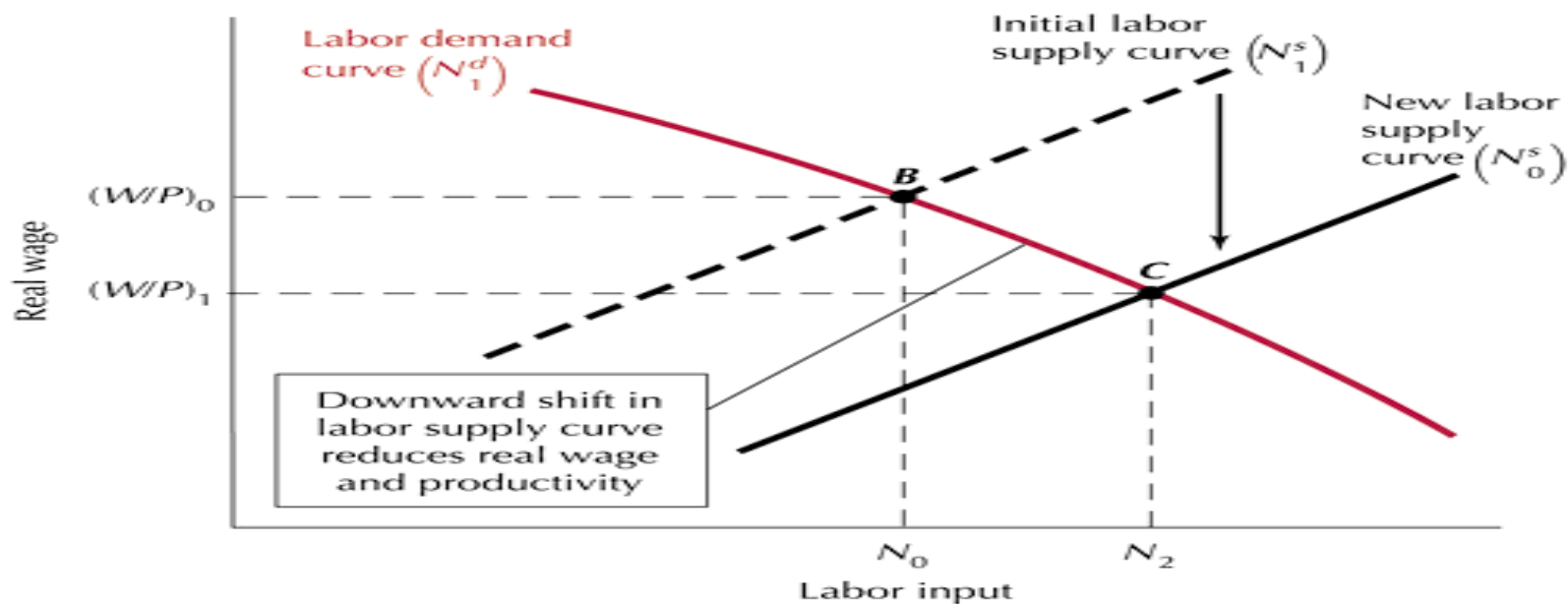
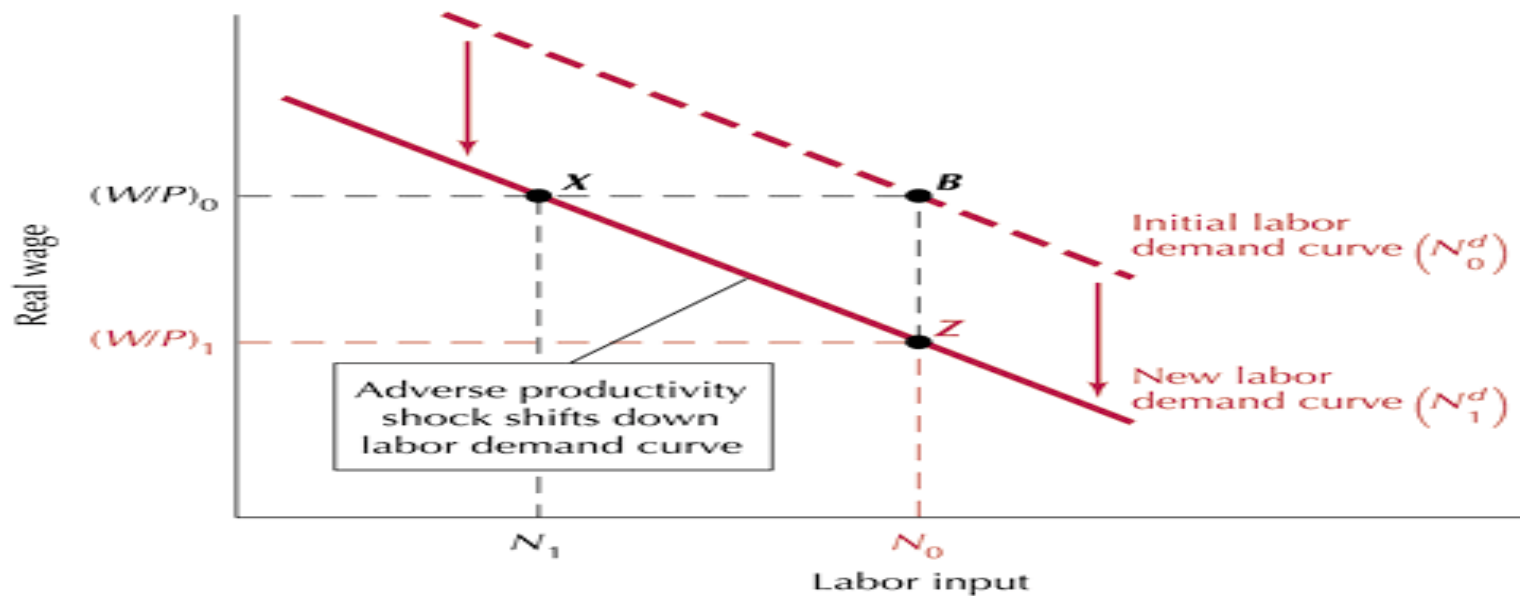
An Outline of Issues for Discussion

- Contra Blanchard, Europe's failure to converge is not a matter of voluntary vacations!
- Much more is low employment per capita
- Even lower hours are not entirely voluntary
 - “If the French really wanted to work only 35 hours, why do they need the hours police?”
 - Short hours are a victory for parliamentary politics, not for free choice

What Matters is Y_{pc} , not Productivity

- Europeans have “bought” their high productivity ratio with every conceivable way of making labor expensive
 - High marginal tax rates (payroll and income taxes)
 - Firing restrictions
 - Early retirement (55! 58!) with pensions paid for by working people

REAL WAGES AND PRODUCTIVITY:
WHICH IS THE CHICKEN AND WHICH THE EGG?



Europe's Low E/N Matters as much as Low A/E

- High Unemployment
 - High Youth Unemployment
 - High long-term Unemployment
- Low Labor-force Participation
 - Of Youth (defer to Phelps on Italian 30-year-olds)
 - Of Elderly
 - Would you believe these French and Italian retirement ages?
- The OFCE seminar I organized on this
 - Casual, just raise taxes
 - Casual, just raise retirement age
 - No Bush #43 hysteria

Welfare Issues to be Postponed for General Discussion

- GDP Exaggerates U. S. GDP per Capita
 - Extreme climate, lots of air conditioning, low petrol prices, huge excess energy use
 - U. S. urban sprawl: energy use, congestion
 - Crime, 2 million in prison
- Undeniable U. S. advantage, all those square feet
 - Inside the housing
 - Outside the housing in the residential lot sizes
- U. S. Medical Care Inefficiency
 - Raises Business Costs, like French taxes
 - Inefficiency, Insecurity

The History: Reorganizing an Old Story

- Organized by time, pre-1913, 1913-50, 1950+
- Within time periods, political union vs. other (USE device -- notice footnote 17)
 - Political union vs. “newness”
 - The heavy role of government in creating the late 19th century U. S. growth miracle
- Within time periods, reversible or nonreversible?

Political Union: Materials-intensive manufacturing

- Wright, raw materials
 - part of political union, not just natural endowment
 - US has advantage in resources vs. individual nations, but not all of Europe
 - No fear of Minnesota and Indiana going to war
 - Wright: doesn't emphasize enough ag, transport, trade
- Late 19th Century: The Dynamo of Chicago
 - Fastest Growing City in the World: 1870-1929
 - James Cronon's "Nature's Metropolis"
 - "Devil and the White City"

But it was not all Political Union: Even a USE Would Have Lagged

- Clear advantages of the New World (which U. S. uniquely? Which others (C, AU, NZ, Argentina?)
 - Agricultural
 - Land intensity indirectly responsible for ascendancy of American manufacturing
 - Newness
 - Common language, self-selection of ambitious immigrants, high motivation, labor mobility
 - American system of manufacturing (guns, watches, British anquish at Crystal Palace 1851)
 - Policy
 - Land for the railroads
 - The Homestead Act!

Post-1913: Exploiting the great inventions

- Vs. David-Wright on electricity in 1920s US mfg
 - Much more emph needed on ICE
 - Much more emph needed on 1930-50, not just 1920s
- Huge US lead in exploiting both electricity and ICE
 - U. S. in 1929 had 80% of world motor vehicle production
 - U. S. in 1929 had 90% of world motor vehicle registrations
- No mystery about the “Arsenal of Democracy”

Post-1913: The Great Compression

- Immigration
 - Restrictive legislation in the 1920s
 - A respite for low-skilled workers (compare now)
- Trade barriers
 - No importation of low-skilled labor via goods (compare now via China)
- New deal pro-union legislation
 - Pure rents for semi-skilled high-school drop-outs

World War II!

The Victory of the Arsenal

- The miracle occurred in an ad-hoc system of government loose control over business improvisation
- The basis was laid starting with Henry Ford in 1914
- Herbert Hoover did something good
- Role of the American system and the engineer
- References: Overy, Walton

Post WWII

- France: penetration of electricity and ICE: exactly 40 years later
 - That wonderful Landes quote
- Reversal of initial U. S. advantages
 - Raw materials
 - Political union
 - Newness depreciates
 - Reversal of the Great compression
- Did Europe do anything creative except catch up?
 - Welfare state

Combining auto with public transport

The Great Paradox: Europe's catching up stops after 1995

- 1973-95 Europe, starting 40 years late, continues to exploit great inventions
 - Copies U. S. interhighway system but retains railroads and builds TGV
- The teetering U. S. has run into diminishing returns
 - Old inventions, electricity and ICE, fade away
 - The Solow “computer paradox”
- 1995-2004. Europe's productivity growth doesn't revive, the great European funk.

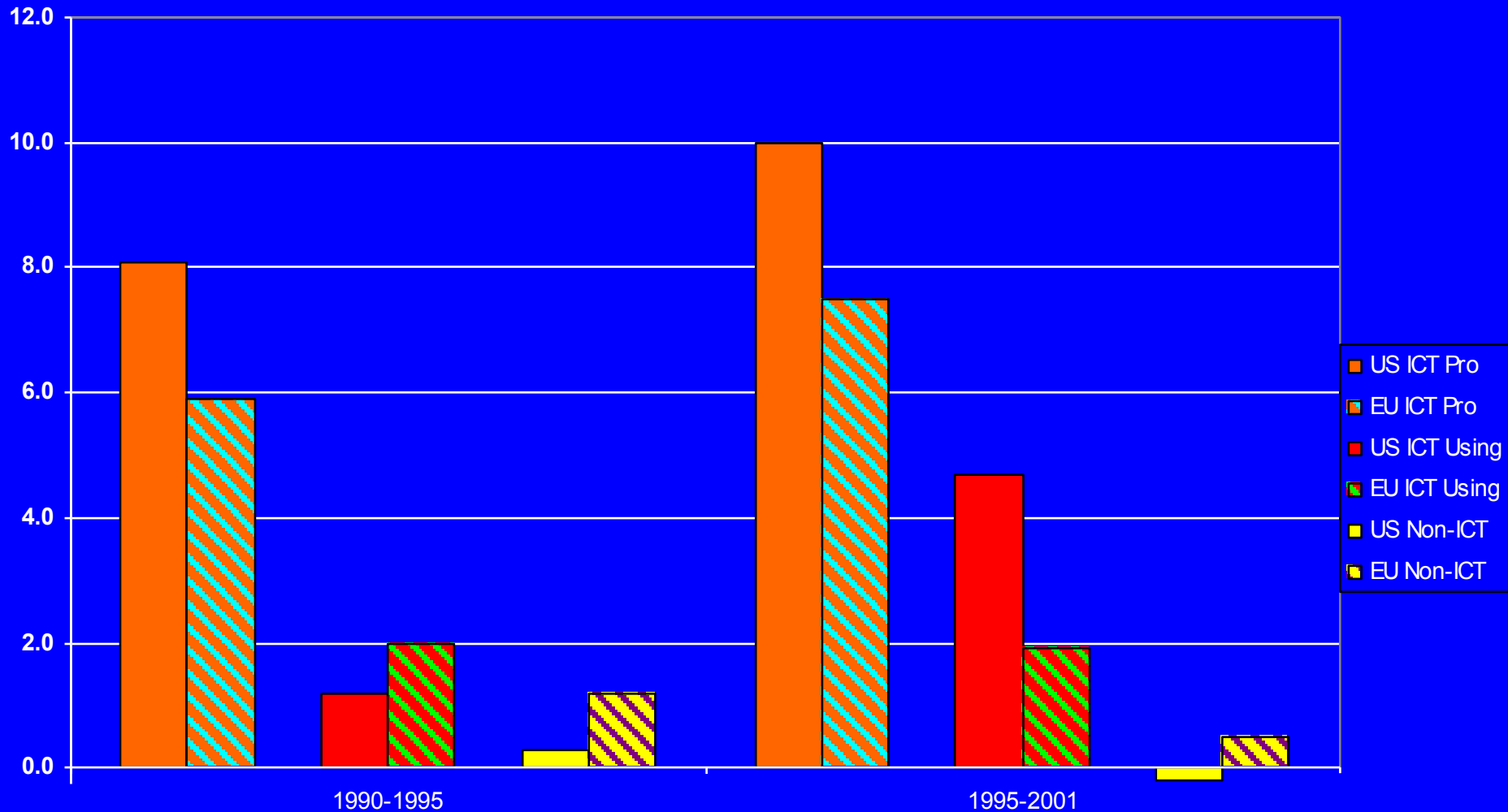
Topic #3: The Diagnosis

Basic Paradox about IT

- Both Europe and U. S. Rapidly Adopted New Economy Technology
 - Personal Computers
 - Web Access
 - Mobile Phones
- But Europe hasn't taken off
- Conclusion: Role of IT in U. S. revival must have been exaggerated

Finding the Culprit Industries

Output per Hour by Industry Group, EU and US, 1990-2003



Where is the Difference?

The Van-Ark Decomposion

- Explaining the difference in Europe vs. US productivity growth post-1995
 - 55% retail trade
 - 24% wholesale trade
 - 20% securities
 - Rest of the economy: ZERO
- U. S. negative in telecom, backwardness of mobile phones

U. S. Retail Miracle

- Not uniform, concentrated in “large stores charging low prices with self-service format”
- *ALL* of productivity gains post-1990 attributable to *NEW* establishments and closing of old establishments
- Average pre-1990 establishment had *zero* productivity growth

Europe in Retailing

- Not uniform – Carrefour, Ikea
- U. S. “Big Boxes” (Wal-Mart, Home Depot, Best Buy, Target)
- Europe:
 - Land-use regulation, planning approval
 - Shop-closing restrictions on hours
 - Central-city congestion, protection of central-city shopping precincts
 - Prohibition on discounting by large new stores
 - Related to Phelps’ corporatism

Not enough emphasis on new vs. old

- It's not just that land-use planning prevents Wal-mart from setting up a new big box on every highway interchange in Europe
- It's that the MIX of retailing in Europe is heavily composed of small, old-fashioned firms

Education and University Research

- U. S. leadership in secondary education, 1910-40
- U. S. leadership in college education, post WWII
- U. S. research universities America's leading export industry even in dismal 1972-95, still the envy of the world
 - Competition between state and private
 - U. S. peer reviewed grants to young professors, not young students
 - Contrast with Europe tuition subsidies

Let's not Forget: Germany is being Strangled by Euro

- No more monetary policy
- If inflation soars in Portugal or Ireland, German workers are unemployed
- Fiscal policy is strangled by the 3% deficit rule
- Germany is MUCH MORE threatened by Poland and Czech than U. S. by Mexico
- Different immigration dynamics

Conclusion (for now)

- Economic research has focused on particular European problems
 - Land use vs. big boxes
 - Employment taxes and low empl per capita
- Bigger issues
 - Low fertility rate vs. retirement ages
 - Stark contrast: Czech/Poland vs. Mexico
 - Stark contrast: U. S. can absorb immigrants and Europe cannot