Productivity Growth: Concepts, Causes, and the Diverging U. S. Performance

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Ultimate Measure of Economic Success

- 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
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)

\[ Q = \frac{Q}{A \cdot E \cdot L \cdot N} \]
How Productivity is Related to Output per Capita

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\[
\frac{Q}{N} \equiv \frac{Q}{A \cdot E \cdot L \cdot N}
\]
How Could Europe be So Productive Yet So Poor

Output per Capita \( \frac{Q}{N} \)

In Europe 75% of U. S. Productivity 95% of U. S.

The Difference:

- Hours per Employee \( \frac{A}{E} \)
- Employment Rate \( \frac{E}{L} \)
- Labor-force Participation Rate \( \frac{L}{N} \)

\[
\frac{Q}{N} \equiv \frac{Q}{A \cdot E \cdot L \cdot N}
\]
Determinants of Productivity Growth

- Simplest Production Function
  \[ Q = F(K,N) \]
- Add Technology
  \[ Q = F(K,N,T) \]
- This is the Solow Growth Model
- Predictions:
  - Raising saving rate affects growth rate only temporarily
  - Universal convergence
Puzzles the Solow Model Does Not Explain

- Lack of Convergence (East Asia vs. Africa and Latin America)
- To explain a 10-1 ratio of $Q_{pc}$ in rich vs. poor countries, unrealistically requires:
  - 10000 times as much capital per capita
  - 1/1000 the rate of return on capital
POOR NATIONS GROW FASTER WHILE THEY ARE CONVERGING

Long-run equilibrium

Output per hour \( (\bar{x}) \)

Rich nations

Poor nations

Time
MANY NATIONS ARE FALLING BACK RATHER THAN CONVERGING

- Black dots: Nations converging to United States
- Red line: United States growth rate
- Pink dots: Nations falling back from United States

Percentage growth rate in output per worker vs. Output per worker as a percentage of the U.S. level.
What is Missing?

- Lack of Human Capital
- \( Q = F(K,N,T,H) \)
- Instead of receiving 25% of national income, total capital (human and physical) receives 90%
- Labor’s 75% income share is interpreted as 10% “brute force labor” and 65% as reward to education and experience
What Else is Missing?

- Human capital resolves the problem about unrealistic ratios of rich-to-poor K/N and return to capital
- But it leaves the “Rio Grande Puzzle”
- How to go from 40c per hour to $10 per hour in one easy wade
- Human capital is not changed, must be something else
Technology is not Free

- The “New” Growth Theory Makes Technology part of economics
  - Must pull resources from production to work in R&D labs
  - Must provide an incentive for innovation
  - Patent Protection
  - Technology requires H, K to be used

- Case of the drug companies, AIDS in Africa, importing drugs from Canada
The New Comparative Economics: What Else is Missing?

- Geography: The Tragedy of the Tropics (soil, diseases, enervation)
- Crime, corruption
- Infrastructure
  - Lack of phones, electricity, roads
Putting it Together

- The augmented production function, it starts to explain rich vs. poor
- How this solves the Rio Grande puzzle
  
  \[ P = \text{political capital (legal system etc)} \]
  \[ G = \text{geography} \]
  \[ R = \text{infrastructure} \]
  \[ Q = F(K,N,T,H,P,G,R) \]
Application #1: How Can Europe be So Productive Yet So Poor

- The History: Europe falls back 1870-1950 and then catches up
- The catch-up is almost complete in productivity (Q/A)
- The catch-up is incomplete in output per capita (Q/N)
- Why?
  - Must be that Europe’s A/N is lower
  - Why?
Per Capita Real GDP

per Capita Real GDP, Europe and the United States, Selected Years, 1820-2000
Essential Features of Income per Capita since 1870

- Steady rate of real GDP per capita growth in the US
  - 1.81% per year growth between 1870-2000
  - Huge acceleration between 1963-73

- Slower growth in Europe
  - 1.67% per year growth between 1870-2000
  - Downward dislocations due to the World Wars
  - Golden years of catch-up between 1950-1973

- Since 1973 catch-up is complete
Summarizing the Productivity Record

- U.S. record of productivity growth is not as steady as for output-per-capita
  - Strongest performance between 1938-50
  - Slowdown between 1973-92
- Europe plays catch-up
  - Much slower growth than the U.S. between 1870-1950 (1.50% vs 2.15% for the US
  - Nearly closes the gap by 2000
- In this section we’re ignoring the new divergence after 2000
Output per Capita and Output per Hour

Ratio of Europe to the United States, Output per Capita and Output per Hour, selected years, 1820-2000

Output per Capita

Output/Hour

Percent

Output per Capita and Output per Hour
Features of the Output per Captia, Europe/U.S. ratio

- The Europe/U.S. ratio of output per capita declines steadily from 1829 to 1950.
- Upsurge from 1950-1973
- Stagnation between 1973-2000
Europe/U.S. ratio for productivity growth

- The same downward slide between 1870 and 1950
- Europe has a higher level of hours per capita
- After 1950 much faster growth in the productivity ratio
# Real GDP per Capita and Real GDP per Hour

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The Post-1950 Reversal

- Sharp turn of Europe/U.S. ratios of output per capita and productivity after 1950.

- Sharp retardation in growth of output per capita in Europe relative to productivity growth after 1950.
  - Longer vacations contribute to few hours worked per employee
The Contributions of E/N and H/E

Ratio of Europe to the United States, Ratio of Output per Capita to Output per Hour, Decomposed into Hours/Employee and Employees/Population Ratios, selected years, 1870-2000
Standard of living: held down by vacations (H/E)

- Have citizens chosen to use their prosperity to take longer vacations in contrast to Americans?
- Have Europeans been forced to take vacations because of union or parliamentary politics?
Ian on Work Hours

- “To call long work hours in America a bad thing seems odd”
- “People here have the choice to work as long as they want”
  - “Europeans would work longer if they could”
  - “France wouldn’t need labor police if nobody wanted to work more than 35 hours”
Europe’s Low E/N Matters as much as Low H/E

- High Unemployment
  - High Youth Unemployment
  - High long-term Unemployment
- Low Labor-force Participation
  - Of Youth
  - Of Elderly
Causes of Low E/N

- Lack of Job Opportunities for Youth:
  - Late Marriage Ages
  - Late Development of Independence
    - U. S. Youths working in High School and College
  - Low Fertility Rates
  - Italy: Living at Home with Mama
Poor Labor-Market Performance in Europe

- Why is Average EU Unemployment Rate Higher than US, LFPR Lower?
- Minimum Wages, U Benefits
- Regulations on Hiring, Firing, Plant Closings, Plant Openings
- This is an old Story, still valid
Phelps’ Refreshing departure from Vagueness

- Too little competition, too much corporatism
- “penalties, impediments, prohibitions, mandates” that dampen “creative destruction”
- Youth in America vs. Europe, culture of “dependency”
- American teens work at McDonalds, pay part of their college expenses
- Those Italian men!
Other Big Issues

- **GDP Exaggerates U. S. GDP per Capita**
  - This has nothing to do with Competition
  - Extreme climate, lots of air conditioning, low petrol prices, huge excess energy use
  - Crime, excessive urban density impose costs

- **U. S. Medical Care Inefficiency Creates Medicare Crisis**

- **U. S. Social Security Crisis can be put off forever through open immigration**
This is not black vs. white. It reflects different values

- U. S. Low-density metro areas dependent on auto, high unmeasured cost of traffic congestion, subsidies to auto transit, starvation of public transit
- Europe high-density metro areas, unmeasured time cost of public transit, subsidies to public transit
Ian on Urban Density

- “We overspend on highways, they overspend on trains”
- “We live in suburbs and have long commutes, they live in cramped homes and are closer to work”
- “We have options: in Chicago I can live in a suburb and drive OR live in an apartment and walk to work”
- Contra Ian, many Americans lack such options
  - Inner city African Americans seeking suburban jobs
  - Many medium and small cities have virtually no public transit options, and there are few jobs where you can “walk to work”
A Solid Reason why the U. S. Welfare Level is Truly Higher

- Hedonic regressions show: people value square feet of housing and exterior land
- The average American housing unit is more than double the average European unit
- The land area is at least 4x, maybe more
- The time cost of commuting may be less when all the delays of public transit are taken into account
Summarizing Welfare Comparison

- Started with Europe/US Ratios
  Q/N 77  Q/A 93

- One-third of A/N is voluntary
  Q/N 82  Q/A 93

- One-half of remaining YPC difference disappears because U. S. GDP is overstated
  Q/N 91  Q/A 102
The New Productivity Divergence

- Focus on 1995-2003
- Growth rates of GDP per Hour Worked
  - U. S. 2.33
  - Europe 1.15
  - Difference 1.18
- Over eight years, causes Europe/US to fall back from 94 to 85 percent
The U. S. Productivity Growth “Explosion”
133 Years: Falling Behind, Catching Up, Now Falling Behind

Annual Growth Rate of GDP per Hour, EU minus US, 1870-2003
The Reversal Shown in Levels

GDP per Hour, EU as a percent of US, 1870-2003
A Closer Look at the Last Decade

Annual Growth Rate of GDP per Hour, EU and US, 1990-2003
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
Output per Hour by Industry Group, EU and US, 1990-2003

Finding the Culprit Industries
Where is the Difference?
The Van-Ark Decomposition

- 55% retail trade
- 24% wholesale trade
- 20% securities
- Rest of the economy: ZERO
- U. S. negative in telecom, backwardness of mobile phones
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
  - Central-city congestion, protection of central-city shopping precincts
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.
Let’s Walk down a street in Paris on the Left Bank

- Every few blocks, a green cross indicating a pharmacy
- To American eyes, these are antique anachronisms
  - One-by-one service at the counter, no check out stations
  - Tiny, small, don’t carry any of the obvious things that a pharmacy should carry. Walgreens.
University Funding

- Block grants for ugrad tuition subsidies
- U. S. peer reviewed grants to young professors, not young students
- NSF, NIH

- Unusual degree of downward pressure on profits
- Intangible capital became important after ICT boom
  - Productivity benefits of ICT investment could have been delayed
  - Mismeasurement of timing of productivity growth
- Outsourcing and changes in labor markets
- Are payroll employment or real GDP underestimated?
Cost Cutting and the Profit Squeeze

- Productivity growth leads output
- Income shares reveal effect of productivity cycles on profits
- NIPA says profits doubled between ’92 and ’97, then declined through ‘00
- S&P reported profits grew by 70% between ’98 and ’00
  - Shady accounting
  - Low ratio of reported to operating earnings
  - Write-offs to correct for accounting and business mistakes
Delay and Hidden Capital

- O-S requires full productivity payoff occurs at moment computer is produced
- David argues for delay
  - O-S overstates productivity post-’95 and understates ’01-’03
  - Comparison to electricity, 1880-1920
- Intangible capital complements ICT capital
Other Substantive Explanations

- **Outsourcing**
  - Reduced cost benefits
  - Some productivity benefit
    - Actual number of jobs outsourced unclear

- **Labor Market Flexibility**
  - Share of part-time and self-employed has stayed constant
  - Erosion of union membership and rise of temp agencies is nothing new
Four Reasons Why 2000-03 Productivity Growth Should not be Extrapolated

- #1 Profit Squeeze has been reversed
- #2 Intangible Capital Hypothesis; disequilibrium is being corrected
- #3 Diminishing returns: geometric growth of Moore’s law vs. limits of human brain and fingers
- #4 Jorgenson-Ho-Stiroh on Labor Quality
  - 1995-2001 0.38 percent contribution
  - 2001-2011 0.16
  - 2011-2021 0.02
- #5 What is the right time horizon for forecasting 10 years, 20 years, 75 years?