Observations on Recent Productivity Developments in the US, EU, and China

Robert J. Gordon, Northwestern University, NBER, and CEPR

Keynote Lecture
Seventh Macroeconomic Policy Research Workshop on Productivity, Trade and Development,
Magyar Nemzeti Bank and CEPR,
Budapest, October 31, 2008
Grateful for Invitation, Privileged to be here

- In the midst of a world economic crisis, it is a luxury for us to think about long-run economic growth issues in the US, EU, and China
- Most of this talk will discuss new research results for the US and EU
- My brief comments at the end about China are those of the educated amateur, motivated by a trip there a month ago
She Loves Me is a musical and movie with a book by Joe Masteroff, lyrics by Sheldon Harnick, and music by Jerry Bock.

The musical is the fifth adaptation of the play Parfumerie by Hungarian playwright Miklos Laszlo, following the 1940 James Stewart-Margaret Sullavan film The Shop around the Corner and the 1949 Judy Garland-Van Johnson musical version In the Good Old Summertime. It would surface yet again in 1998 as the Tom Hanks-Meg Ryan feature You've Got Mail. The plot revolves around Budapest shop employees Georg Nowack and Amalia Balash who, despite being consistently at odds with each other at work, are unaware that each is the other's secret pen pal met through lonely-hearts ads.

The original Broadway production played in 1963, and the show enjoyed a West End production and award-winning revivals on each side of the Atlantic in the 1990s.
Theme for U. S.: Slowest Potential Output Growth in History Since 1875

- Potential Output of Interest Separately from Productivity because it matters for:
  - LR government budget & Social Security
  - World balance of saving and investment
  - US as an economic engine for the world
  - LR US demand for investment, residential housing, infrastructure
The Slowest Potential Output Growth in U. S. History

- Potential Output = Trend Output = $Y^*$
- Until recently it was common for forecasters to project $Y^*$ growth at 3 to 3.5 percent, some even projected 4 percent
- Yet the facts provide an unhappy reality
  - 1997-2008 actual $Y$ growth only 2.75
  - Trend growth currently 2.5
  - (paper explains how to estimate the trend)
What is Causing Slow $Y^*$ Growth

- Commonly assumed that US $Y^*$ growth would slow due to less population growth
- But so far, population growth has not declined
- Instead, culprits are slower growth in productivity, hours/employee, and LFPR
- Much of this paper develops methods and implements them to separate cyclical movements from underlying trends
Three Goals of the Lecture for the U. S.

- #1: Project US $Y^* \text{ 2008-2028}$ and its components:
  
  $Y \equiv Y/H \times H/E \times E/L \times L/N \times N$
  
  (this is the “output identity”)

- #2: New interpretation of recent behavior of these components, esp. $Y/H$

- #3: Develop techniques for separating trends from cycles and analyzing the cyclical behavior of the components
Goals of the Second Section on Europe

- Interpret the post-1995 Turnaround of EU vs. US Labor Productivity and Hours per capita
- EU – US productivity growth turns negative
- EU – US hours per capita growth turns positive
- Why? Is there anything to the idea of a tradeoff between productivity and employment?
Thinking (briefly) about China

- Issues in discussing Chinese Q/A growth are very different
- I’m no expert but can read
- Issues from my reading
  - Measurement: Level and Growth Rate
  - Sources of Growth Decomposition
  - Explaining the Puzzles
    - Can Capital per worker grow so fast in future?
    - Why is TFP growth so much faster than in India or rest of East Asia?
General Issues Raised by Projections for the U. S.

- The need to make future projections of \( Y^* \) raises a general issue: how much of the past is relevant?
  - We project future population assuming that baby boom of 1947-64 will not happen again
  - We assume Great Depression and WWII will never happen again
  - But what is the right time horizon to look backward at productivity growth?
  - US: fast 1947-72, slow 72-95, fast 95-2004, then ???
Topical Issues Achieved with this methodology

- Separate all components of “output identity” into trend, cycle, and residual
- Were “jobless recoveries” of 1991-92 and 2001-03 unusual?
- Was fast productivity growth 2001-03 just a repeat of 1991-92?
- What has been going on in 2007-08? Does employment lead output?
To begin: History of U.S. Growth in $Y^*$

- Can’t Use Statistical Trends like H-P
  - Distortion in Great Depression and WWII
  - Standard HP quarterly parameter of 1600 implies that $Y^*$ growth declines from +3% in 1929 to *minus 7% per year* in 1933


- Post-1954 trends taken from research reported later

- See Table 1 in your handout
Trend Real GDP Growth between Benchmark Years
Questions about This History

- The most dramatic episodes are slow growth 1913-28 and fast growth 1928-50
  - Contradicts real business cycle theory about Great Depression
  - Raises puzzle about 1913-28, a dynamic period when electricity was applied in manufacturing

- Otherwise stable growth 1975-1913 and 1950-72, then steady slowing down
Using the “Output Identity” to Link Income per Capita to Productivity

(1) \( Y = \frac{Y}{H} \times \frac{H}{E} \times \frac{E}{L} \times \frac{L}{N} \times N \)

Four of five of these exhibit procyclical behavior (not population 16+)

BUT concept of productivity usually discussed in U.S. is for NFPB sector

This equation works as long as our data are for total economy productivity and total economy hours per employee.
The Output Identity Allows us to . . .

- Estimate trends in any of the variables, call $x$ the log of a variable and $x^*$ its trend
- $\Delta x$ is the growth rate of the actual value and $\Delta x^*$ is the growth rate of the trend
- $\Delta (x-x^*)$ is the growth rate of the ratio of actual to trend for any variable
- We estimate regressions with $\Delta (x-x^*)$ as the dependent variable for four components of the output identity (excluding population)
Simplest Method to Measure Trends: TTB Method

- TTB is log-linear Trends through Benchmark quarters
- Quarters are those when unemployment roughly equal to the natural rate (down, not up)
- Turn to Table 2, shows 7 periods
- This is our first introduction to the question – why doesn’t growth in Y/N equal historical growth in Y/H?
Some of What We Learn from Table 2

- Real GDP growth slowed down as in Table 1 and the chart.
- The five components must add up to real GDP growth by definition.
- Productivity growth soared after 1995 but real GDP continued to slow down.
- Hours per employee were strongly negative in 2 periods, moderately negative in 2 periods, near zero otherwise.
- Employment rate barely moves, by assumption.
More About Table 2

- LFPR rose strongly 1964-87, not since then (this pulls down growth in $Y/N$ relative to $Y/H$ since 1987)
- Working-age Population growth peaked before 1977 but held up relatively well 1997-2007
Simplify by Combining Terms

- Turn to table 3
- Now compare annual growth rates in $Y/N$ and $Y/H$ for the same time intervals
- By definition any discrepancies must be equal to three labor market variables
- Labor-market variables explain changing relationship between growth in $Y/N$ and $Y/H$
- Next slide presents the numbers of Table 3
How Y/N Grows Differently than Y/H

<table>
<thead>
<tr>
<th>Benchmark Period</th>
<th>Percent per Year</th>
<th>Labor Market Variables</th>
<th>Output Per Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>1954:1-1964:3</td>
<td>2.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1964:3-1972:1</td>
<td>1.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1972:1-1977:3</td>
<td>1.41</td>
<td>1.58</td>
<td></td>
</tr>
<tr>
<td>1977:3-1987:3</td>
<td>1.58</td>
<td>1.87</td>
<td></td>
</tr>
<tr>
<td>1987:3-1997:2</td>
<td></td>
<td></td>
<td>1.58</td>
</tr>
<tr>
<td>1997:2-2007:2</td>
<td></td>
<td></td>
<td>1.87</td>
</tr>
<tr>
<td>2007:2-2008:2</td>
<td></td>
<td></td>
<td>1.21</td>
</tr>
</tbody>
</table>

Real GDP per capita
Next we turn to results of statistical trends

- **Hodrick-Prescott filter**
  - Bends too much at standard parameter of 1600
  - We use parameter of 6400, even that bends too much

- **Kalman filter**
  - Allows feedback from other variables, we allow feedback from GDP $\Delta (x-x^*)$
TE Productivity Trends: TTB vs. Kalman
Kalman Trend vs. Actual 8-Quarter Changes
Actual/Trend Total Economy Productivity Raises Questions

![Graph showing productivity raises percent per year from 1955 to 2005. The x-axis represents the years, and the y-axis represents the percentage per year. The graph shows fluctuations in productivity raises over time.](image-url)
The Mysterious Behavior of Trend TE Hours/Employee

- The graph shows the percentage change per year from 1955 to 2005.
- The blue line represents the actual data, while the red line represents the Kalman estimation.
- The y-axis indicates the percent per year, ranging from -2.5 to 1.5.
- The x-axis represents the years, numbered from 1955 to 2005.
Trend for LFPR: The Women Entered but Now?
Population Growth: No Business Cycles but it Matters in Future Forecasts
Adding Components for Real GDP
Conclusion About Real GDP Trend

- Slowdown from 4.4 in early 1960s to 2.5 now
- Viewed over decades, productivity growth is negatively correlated with labor force growth
- Hours per Employee and LFPR
- Population Growth Decline has barely started
How do Components React to Changes in Output Gap? (revisiting Okun’s Law)

- First method in Table 4, look at cyclical deviations in quarters that have peak and trough deviations for Q
- Then Tables 5 and 6, regressions of components of output identity
Specification of Regressions

- Dependent variables are first differences of ratios of actual to trend

\[ \Delta x'_t = \Delta (x_t - x^*_t) \]
- Table 5: H/E, E/L, L/N
- Table 6: Aggregate H, Y/H

- Specification:

\[
\Delta x'_t = \sum \alpha_i \Delta x'_{t-1} + \sum \beta_j \Delta y'_{t-j} + \phi x'_{t-1} + \sum \gamma_k D_k + \varepsilon_t
\]
Shown are sums of coefficients

** indicates significance at 1 percent, * indicates significance at 5 percent

Note significance of EOE dummy variables

Bottom of table shows EOE coefficients when they are all forced to be equal

Column 2: dependent variable is productivity rather than aggregate hours

Table 7 summarizes responses
“Early Recovery Productivity Bubble”

- Table 8
  - Top panel shows change in productivity relative to trend in first four quarters of recovery
  - Bottom panel the next eight quarters (i.e., quarters 5 through 12)
- On average 1.59 points vs. -0.11 points
- Largely explained by equation, relying on response to output change and to EOE effect
- Unusual about 2001-04, growth stayed above trend in next eight quarters
Cumulative Equation Errors, 1985-2008

- Productivity equation with 2000-03 EOE effect
- Hours equation with EOE effect
- Productivity equation without 2000-03 EOE effect
Now the Explanations of Changes in Productivity Trend

- 1995-2000 productivity growth revival, consensus that it was driven by production and use of ICT equipment
- 2001-2003 further increase in trend growth
  - Savage corporate cost cutting
  - Intangible capital hypothesis
Explaining the Two Hypotheses

- **Cost Cutting in 2001-03**
  - Employment declined until mid-2003 while output increased
  - Result: unusual upsurge of productivity
  - Profits had been propped up by accounting scandals, then collapsed
  - More of manager pay relied on stock options than 10 years earlier
  - Great pressure to revive profits and stock prices by cutting costs, leading to massive layoffs

- **Oliner-Sichel-Stiroh (2007 BPEA) support:** cross-industry positive correlation profit decline and employment decline
Benefits of late 1990s ICT investment was delayed

“Learning lag” in how to use ICT investment, development of software

Many of benefits of 1995-2000 ICT investment occurred with a lag in 2001-03

Explains how output could grow with employment declining
Why Productivity Trend Growth Slowdown 2004-07?

- Profits revived, reducing pressure for cost cutting. Employment grew again.
- ICT investment did not revive; returned to pre-1995 values as share of GDP.
Why Did Productivity Grow Faster than Trend 2007-08?

- Employment declined slowly and steadily January, 2008 until now
- Real GDP grew in first half 2008, news yesterday of -0.3 percent real GDP 08:Q3
- Strong productivity growth, but temporary
  - GDP growth in early 2008 represents shift to exports
  - Capital intensive, high productivity
  - Composition effect, exports of commodities use little labor
Back to Original Topic: Future Growth in Potential Output

- Key assumptions: population growth, productivity, hours per employee
- No assumed change in employment rate or LFPR
- Assumed TE Productivity growth 1.6 vs. 1.7 for last 21 years
- Result: 2.40, the slowest in American history
## End Result: Projections over 2008-2028

Table 10. Actual and Predicted Annual Growth Rates of Components of Real GDP, 1987-2008 and 2008-2028

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Real GDP</td>
<td>2.86</td>
<td>2.40</td>
</tr>
<tr>
<td>Aggregate Hours</td>
<td>1.16</td>
<td>0.80</td>
</tr>
<tr>
<td>Household Employment</td>
<td>1.26</td>
<td>0.85</td>
</tr>
<tr>
<td>Labor Force</td>
<td>1.21</td>
<td>0.85</td>
</tr>
<tr>
<td>Working-Age Population</td>
<td>1.15</td>
<td>0.85</td>
</tr>
</tbody>
</table>
Turning to Europe: The Employment – Productivity Tradeoff (CEPR DP 6722 2/08)

- EU labor productivity catches up to US level up to 1995 then falls back
- Hours worked moves in the opposite direction
  - Did one cause the other?
- Major increase in heterogeneity
- Understanding these issues will help us understand the effects of changes in policies and institutions
Main Contribution is to the Policy Debate

- For 20 years, Europe had low employment and hours, high unemployment
- Post-1995 Turnaround: Slower growth productivity and faster E/N
- EU wants to change it all with reforms – some to raise employment, others to raise productivity
- You Can’t Have It Both Ways
Trend TE Productivity Growth: US vs. EU-15

The graph shows the productivity growth trend for the United States and the EU-15 from 1970 to 2006. The United States started with a higher productivity growth rate, but it declined over the years. In contrast, the EU-15 had a lower productivity growth rate initially but saw some fluctuations with a slight increase towards the end of the period.
Trend Growth in Hours per Capita, US vs. EU-15

The chart illustrates the trend growth in hours per capita for the United States and the EU-15 countries from 1970 to 2006. The percent changes are depicted on the y-axis, while the years are marked on the x-axis. The United States and EU-15 data are represented by blue and red lines, respectively. Notable trends include fluctuations in growth rates over time, with both regions experiencing periods of increase and decrease in working hours per capita.
Output per Capita (Y/N)
Growth: Almost the Same

Year

Percent
0 0.5 1 1.5 2 2.5 3 3.5 4

EU-15
United States
The Employment-Productivity Tradeoff

- Take any CRS production $F(K,L)$
  \[
  \frac{Y}{L} = f(K/L)
  \]
- As long as capital is fixed, an increase in employment lowers labor productivity
- We don’t know how fast capital adjusts; the tradeoff may be quantitatively small
- A major goal of this research is to quantify the tradeoff
Turnarounds in Hours and Output

- Turnarounds are 1995-2006 minus 1980-1995 growth
- The relative turnarounds (EU minus US) cancel each other out
  \[ \frac{Y}{H} + \frac{H}{N} = \frac{Y}{N} \]
  
  \[-2.20 \quad 1.99 \quad -0.21\]
- 1980-2006 Y/N growth is identical
- But the EU is not catching up in level of Y/N relative to US
Regressions for E/N

- Cover 1980-2003 EU-15, N=320, population weighted, all variables first differences

- **Explanatory Variables:**
  - Output Gap
  - Average Replacement Rate (ARR)
  - Employment Protection Legislation (EPL)
  - Product Market Regulation (PMR)
  - Union Density
  - Tax wedge
  - Various dummies

- Which explain pre-1995 decline and post-1995 turnaround?
E/N Change Regression

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Gap</td>
<td>0.52 ***</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Product Market Regulation</td>
<td>-0.44</td>
<td>(0.55)</td>
</tr>
<tr>
<td>Union Density</td>
<td>-0.46 ***</td>
<td>(0.10)</td>
</tr>
<tr>
<td>Employment Protection Legislation</td>
<td>0.86</td>
<td>(0.79)</td>
</tr>
<tr>
<td>Unemployment Benefits (ARR)</td>
<td>-0.18 ***</td>
<td>(0.05)</td>
</tr>
<tr>
<td>High Corporatism Dummy</td>
<td>-2.04 **</td>
<td>(0.98)</td>
</tr>
<tr>
<td>Tax Wedge</td>
<td>-0.28 ***</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Post-1995 Dummy</td>
<td>0.94 ***</td>
<td>(0.15)</td>
</tr>
</tbody>
</table>

- Our tax wedge coefficient is consistent with what others have found.
- EPL and PMR seem to have no effects.
- Everything else has the correct sign – regulations and taxes reduce employment.
- The post-1995 dummy is substantial.
  - Growth in the employment rate rose by 1% after ‘95.
Employment Regression Results

- Need to untangle effects of policy variables from time effect and output gap
- We plot predicted values with policy fixed at its 1995 level
- Predictions of first-difference equation are cumulated into levels
- The output gap and dummies are still allowed to vary over time
Female Employment

Effect of the Policy variables (1.75%)

Effect of the post-95 dummy (2.38%)
Male Employment

Effect of the post-95 dummy (6.32%)

Effect of the Policy variables (1.47%)
Productivity Regressions

- Suppose we are in a Cobb-Douglas world. What coefficient would we expect on employment?
  \[ y = 0.33k + 0.67h \]
  \[ (y-h) = 0.33(k/h) \]
- If capital is fixed, the coefficient will be minus 0.33
- If capital adjusts it will be smaller
- If labor is not homogenous it could be larger
  (The last people to enter the labor force are likely the least experienced)
Productivity Regressions

Identification with IV
Must deal with simultaneity between employment and productivity.
We want variables that affect employment but not productivity
- The tax wedge is our best candidate
- We also consider using the post-1995 dummy and union density
**Productivity Regressions**

- Tax wedge is the only instrument in this version
- Coefficient on employment is twice what we would expect
- EPL and ARR have independent positive effects on productivity
- We can drive the SE on employment down to 0.10, but the result remains the same
- Not dependent on Med.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment Rate</td>
<td>-0.64 ***</td>
<td>0.20</td>
<td>(0.20)</td>
</tr>
<tr>
<td>Output Gap</td>
<td>0.68 ***</td>
<td>0.11</td>
<td>(0.11)</td>
</tr>
<tr>
<td>Product Market Regulation</td>
<td>0.56</td>
<td>(0.45)</td>
<td></td>
</tr>
<tr>
<td>Union Density</td>
<td>0.03</td>
<td>0.12</td>
<td>(0.12)</td>
</tr>
<tr>
<td>Employment Protection Legislation</td>
<td>1.66 ***</td>
<td>0.65</td>
<td>(0.65)</td>
</tr>
<tr>
<td>Unemployment Benefits (ARR)</td>
<td>0.14 ***</td>
<td>0.05</td>
<td>(0.05)</td>
</tr>
<tr>
<td>High Corpratism Dummy</td>
<td>-0.49</td>
<td>0.94</td>
<td>(0.94)</td>
</tr>
<tr>
<td>Post-1995 Dummy</td>
<td>-0.14</td>
<td>0.24</td>
<td>(0.24)</td>
</tr>
<tr>
<td>R2</td>
<td>0.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RMSE</td>
<td>0.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>320</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Policy Effect
- Lowered growth by .25\% per year
- cumulates to 2.5\% decline in the level
- 1/3 of the total shortfall
### Effects of Policy/Institutions

<table>
<thead>
<tr>
<th></th>
<th>Shock Size</th>
<th>Employment</th>
<th>Productivity</th>
<th>Output Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product Market Regulation</strong></td>
<td>0.9</td>
<td>-0.14</td>
<td>0.35</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>(0.24)</td>
<td>(0.25)</td>
<td>(0.22)</td>
<td></td>
</tr>
<tr>
<td><strong>Union Density</strong></td>
<td>23.32</td>
<td>-7.93</td>
<td>5.07</td>
<td>-2.85</td>
</tr>
<tr>
<td></td>
<td>(1.17)</td>
<td>(1.23)</td>
<td>(1.07)</td>
<td></td>
</tr>
<tr>
<td><strong>Unemployment Benefits (ARR)</strong></td>
<td>11.31</td>
<td>-0.90</td>
<td>1.37</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>(0.34)</td>
<td>(0.31)</td>
<td>(0.25)</td>
<td></td>
</tr>
<tr>
<td><strong>Employment Protection Legislation</strong></td>
<td>0.87</td>
<td>0.74</td>
<td>0.23</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>(0.36)</td>
<td>(0.37)</td>
<td>(0.31)</td>
<td></td>
</tr>
<tr>
<td><strong>High Corpratism Dummy</strong></td>
<td>1</td>
<td>-1.02</td>
<td>0.65</td>
<td>-0.37</td>
</tr>
<tr>
<td></td>
<td>(0.48)</td>
<td>(0.33)</td>
<td>(0.21)</td>
<td></td>
</tr>
<tr>
<td><strong>Tax Wedge</strong></td>
<td>9.21</td>
<td>-2.67</td>
<td>1.71</td>
<td>-0.96</td>
</tr>
<tr>
<td></td>
<td>(0.64)</td>
<td>(0.53)</td>
<td>(0.4)</td>
<td></td>
</tr>
</tbody>
</table>

- Tax wedge and union density lower Y/N
- ARR and EPL have *positive* effects
  - Driven by their direct effects on productivity
Conclusions about Europe

- A good deal of the changes in employment and productivity are unexplained.
- There is a strong tradeoff between LP and employment.
- A 1% increase in employment raises output by 0.36% in the short-run.
- The effects of policy are ambiguous. Some regulations may increase output.
Outsider’s Perspective on China

- Measurement Issues (Maddison-Wu)
- Debate Maddison vs. OECD
  - In 2005 Chinese total (PPP) GDP was 82 percent of the US (OECD 43 percent)
  - Implies GDP per capita 17 percent of US (OECD 10 percent)
- Key difference according to Maddison: OECD uses PPP prices disproportionately based on high-end items in urban areas, not representative of all China
Growth Rate of Real GDP

- Maddison-Wu (2008) revise growth with many detailed adjustments
- For 1978-2003 their growth rate of total GDP is 7.9, not the official rate of 9.6
- Classroom exercise with M-W numbers
  - 2005 Q ratio 82, Q/N 17
  - Future growth China Q 7.9, Q/N 7.3
  - Future growth US Q 2.4, Q/N 1.6
- Catch-up dates?
  - Total PPP GDP, February 1, 2009!
  - GDP per capita, year 2036
Growth Accounting Raises Issues, Doesn’t Provide Answers

- Growth accounting decomposition for total economy, China vs. India vs. East Asia
- Measurement disagreements, Bosworth-Collins vs. Maddison-Wu vs. He-Kuijs
Comparison of China, India, East Asia, 1978-2004

[Bar chart showing comparisons of Output, Employment, Q per Wkr, Phys Cap., Education, and TFP for China, India, and East Asia.]
The Big Questions

- Why did China have so much saving and investment to achieve such fast growth in capital-labor ratio?
- What are underlying causes of rapid TFP growth?
- Will this continue?
- Let me just tackle the TFP question
Thinking about TFP as the Martian Observer

- 10 days in India 2005, 3 days in Beijing 2008
- Sources of differential TFP growth
  - Reallocation effect: agriculture to industry (this happens everywhere)
  - Reallocation effect, state-owned enterprises to private firms
  - Reallocation effect, domestic-owned firms to foreign-owned firms with frontier technology
More Sources of High Chinese TFP Growth

- “Foreign buyer effect”: Wal-Mart meets talented Chinese manufacturers
  - Brings standard specifications
  - Allows production at large scale
  - Another type of reallocation effect

- The critical role of infrastructure and urban housing
  - Beijing vs. Mumbai
  - Highways, electricity, airports
  - Airports: Hangzhou 2008 vs. Bangalore 2005
  - Infrastructure leads growth (China) instead of being a barrier to growth (India)

- Hidden topic: Chinese culture. Overseas Chinese have traditionally been entrepreneurs (Malaysia, Philippines, Singapore, Hong Kong)
Can the Growth Rocket continue to soar?

- Reasons for skepticism
  - Can’t continue to raise S and I shares forever
  - Diminishing returns to investment
  - Growing gap between coastal provinces and interior leaves room for interior catchup
  - Reallocation effects will diminish in importance
Conclude by Answering my Own Skepticism

- How could China ever have a higher standard of living than US with the enormous difference in quality of housing?

- Answer: Western Europe also has apartment-type housing but exceeds US in many dimensions
  - Welfare system, pensions, medical care, longevity, absence of child poverty