The Demise of Okun’s Law and of Procyclical Fluctuations in Conventional and Unconventional Measures of Productivity

Robert J. Gordon, Northwestern, NBER, CEPR
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Documenting and Explaining the Change in Cyclical Labor-market Behavior

- Documenting
  - A new approach to disentangling trends and cycles
    - Use of “outside information” from inflation equation to determine the unemployment rate gap
  - A new approach to data
    - Total Economy not NFPB Sector
    - Conventional vs. Unconventional Measures
  - A key finding: hours gap > output gap in 2008-09, the reverse of 1980-82

- Productivity no longer exhibits procyclical fluctuations
The “Disposable Worker” Hypothesis combines
- Increase in managerial power, linked to stock option compensation and stock market volatility
- Increasing management emphasis on maximizing shareholder value, leading to more aggressive cutting of all costs in a downturn, including not just labor but also investment
- Decline in labor power, linked to minimum wage, unions, imports, and immigration

Explains both structural shift in labor market response but also secular increase of inequality in the income distribution
The Output Identity: Simple Version and Conventional Version

\[ Y \equiv \frac{Y}{H} \cdot \frac{H}{E} \cdot \frac{E}{L} \cdot \frac{L}{N} \]

\[ Y^P \equiv \frac{Y^P}{H^P} \cdot \frac{H^P}{E^P} \cdot \frac{E^P}{E^H} \cdot \frac{E^H}{L} \cdot \frac{L}{N} \]
Introducing Unconventional Identity

- Nalewaik’s 2010 Brookings Paper:
  - GDP and GDI are conceptually identical
  - But they differ (statistical discrepancy)
  - GDI is more procyclical
  - When GDP is revised, it tends to be revised toward what GDI already shows

- Hours
  - All existing work uses hours based on payroll employment
  - There is a little-known series on hours based on the household survey

- In principle 2 numerators, 2 denominators = 4 possible productivity measures
Conventional Compared to Unconventional Identity

\[ Y^P \equiv \frac{Y^P}{H^P} \cdot \frac{H^P}{E^P} \cdot \frac{E^P}{E^H} \cdot \frac{E^H}{L} \cdot \frac{L}{N} \cdot N \]

\[ Y^I \equiv \frac{Y^I}{H^H} \cdot \frac{H^H}{E^H} \cdot \frac{E^H}{L} \cdot \frac{L}{N} \cdot N \]
Disentangling Trends and Cycles of Identity Components

- Modern macro is dominated by two detrending techniques
  - Hodrick-Prescott and Band-Pass filter
- Both are unacceptable because the trends do not reflect underlying changes in the productive capacity of the economy but exhibit major responses to the business cycle itself
- Examples for both (band-pass for 1913-1954, HP for 1954-2010)
- Superior Alternative: Kalman Trend with Cyclical Feedback
  - Where does the cyclical feedback variable come from?
The Folly of Band-Pass Filter for 1913-54
(created by G. Primiceri)

Figure 3. Annual Rates of Change of Band-Pass Filtered and Exponential-through-Benchmarks Estimates of Real GDP, 1913-54
1955-2010: H-P for Hours Oscillates Too Much

Figure 1a. Annualized Trend Growth Rate of Aggregate Hours, Alternative Methods, Conventional Identity, 1955:Q1 - 2010:Q2
1955-2010: H-P for Output Oscillates Too Much
Kalman Filter: Where to Find Outside Information on The Business Cycle?

- Fed’s capacity utilization index?
  - Too narrow
- Can’t use output gap, because you have to know the trend to calculate the gap. You get back what you put in
- Solution: inflation behavior provides extra information
- “Triangle” inflation model: inflation depends on its own lags, the unemployment gap, and specific supply shock terms
- The NAIRU and unemployment gap can be backed out of this independent information about inflation, given the lags and supply shock variables
The Unemployment Gap
Controls for the Cycle in Estimating the Kalman Trend

Figure 2. Actual Unemployment Rate, Time-Varying NAIRU, and Implied Unemployment Gap, 1955:Q1 - 2010:Q2
Special Problem Posed by 2008-10 Cycle

- Hours and employment gaps respond more than output gap.
- The Unemployment gap drives the trend adjustment.
- Estimated through 2010:Q1, the Kalman procedure thinks that output growth trend must have increased.
- We avoid making judgments on 2008-10 cycle by constraining all trends as equal to 2007:Q4 values throughout 2008-10.
Kalman Trends: Conv vs. Unconv Output & Hours

Figure 3a. Annualized Quarterly Growth of Output and Aggregate Hours Trends, Conventional vs. Unconventional Measures, 1955:Q1 - 2010:Q2

Figure 3b. Annualized Quarterly Growth of Labor Productivity, Conventional vs. Unconventional Measures, 1955:Q1 - 2010:Q2
Conventional (C) vs. Unconventional (U): Medium-run Growth Trends

- Major findings in Table 1
- The mysterious upsurge in LP growth 2001-07 in C data does not exist in U data
- Big differences in AAGR of LP growth
  - Conventional 96-01 2.11 01-07 2.13
  - Unconventional 96-00 2.34 01-07 1.23
Kalman Trends for Average of Conv & Unconv

Figure 4a. Annualized Trend Growth of Labor Productivity, Hours, and Output, Estimated through 2007:Q4 and then Held Constant, Average Identity, 1955:Q1 - 2010:Q2
Kalman Trends: Components of Hours

Figure 4b. Annualized Trend Growth of Hours per Employee, the Employment Rate, the Labor Force Participation Rate, and Working-Age Population, Average Identity, 1955:Q1 - 2010:Q2

- Population Growth
- Labor Force Participation Rate
- Employment Rate
- Hours per Employee
What We Learn from Cyclical Deviations from Trend (Next Slide)

- The most interesting results
  - Okun’s 2/3 hours vs. 1/3 productivity result worked perfectly in late 1960s and early 1980s but almost no other time

- Most important, the 2008-09 cycle has been bigger for hours than for output, while 1980-82 was the reverse
Gaps for C & U Average: Output, Hours, Productivity

Figure 5a. Log Percent Gaps of Actual Relative to Trend for Output, Aggregate Hours, and Labor Productivity, Average Identity, 1955:Q1 - 2010:Q2
Gaps for Three Components of Aggregate Hours

Figure 5b. Log Percent Gaps of Actual Relative to Trend for Hours per Employee, the Employment Rate, and the Labor Force Participation Rate, Average Identity, 1955:Q1 - 2010:Q2
Regression Analysis

- All variables expressed as \( \text{FIRST DIFFERENCES OF DEVIATION FROM TREND, i.e. } \Delta \log \text{ gap in } X \)
- Changes in gaps for components of output identity explained by
  - Changes in output gap (with lags for hours & leads for LP)
  - Lagged dependent variable (lags 1-4)
  - Error correction term
  - End-of-expansion dummies
    - Not 0,1 dummies. They enter in the form \(1/M, -1/N\)
    - These sum to zero
    - Productivity slows late in expansion
    - Constrained to be completely offset by faster productivity growth early in recovery ("Early Recovery Productivity Bubble")
Main Regression Results, 1955-86 vs. 1986-2010

- Hours gap lags output by roughly one quarter
- Productivity leads output by roughly two quarters
- End-of-expansion dummies (8 recessions)
  - To simplify tables, constrained to be equal within subsample
  - Significant in LP equations pre and post 1986
  - Not significant in hours equation post 1986
- Split sample: 1954-86 vs 1986-2010
  - Big change in long-run responses
  - Chow tests however do not support significance of structural change
- To simplify paper, regressions are presented only for conventional concept of hours & LP
<table>
<thead>
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<tbody>
<tr>
<td>Lagged dependent variable</td>
<td>-0.55 **</td>
<td>0.02</td>
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<tr>
<td>Output deviation from trend</td>
<td>1.18 **</td>
<td>1.18 **</td>
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<tr>
<td>Error correction term</td>
<td>-0.12</td>
<td>-0.25 **</td>
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<td>End-of-expansion (EOE) dummy variable</td>
<td>1.88 **</td>
<td>0.67</td>
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<tr>
<td>Adjusted R²</td>
<td>0.71</td>
<td>0.66</td>
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<td>Standard error of estimate</td>
<td>1.81</td>
<td>1.45</td>
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<tr>
<td>Sum of squared residuals</td>
<td>388.34</td>
<td>182.18</td>
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<td>Chow Test</td>
<td>1.50</td>
<td>0.38</td>
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<td>Mean Lag/Lead Response to Output Changes</td>
<td>0.90</td>
<td>1.40</td>
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<tr>
<td>Long Run Response to Output Changes</td>
<td>0.76</td>
<td>1.20</td>
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a. see text for details
b. c.f. implies that variable is censored

** denotes significance at the 5% level
* denotes significance at the 10% level
Long-Run Responses, Before and After 1986

Implications of Regression Analysis

- Okun’s Law is overturned, Hours now respond by >1 to output deviations, not <1
- Productivity no longer responds procyclically to output fluctuations
  - No more Okun’s Law
  - No more SRIRL
  - No more RBC
  - No more procyclical productivity fluctuations as exogenous inputs in DSGE and other modern macro theories
The “Early Recovery Productivity Bubble”

- On average since 1970 LP has grown 1.4 percent AAGR faster than trend in first four quarters of recovery.
- 0.00 percent faster in following eight quarters.
- 2002-03 was unusual because fast growth continued in the subsequent 8 quarters.
- EOE effect explains about 2/3 of first four quarters.
- For decomposition refer to Table 7 in paper.
Figure 7a. Annual Growth Rates of Actual, Fitted, and Trend Aggregate Hours, Early and Late Coefficients, Conventional Identity.


- Actual
- Trend
- Fitted, 54-86
- Fitted, 86-10

Percent: -8, -6, -4, -2, 0, 2, 4, 6, 8
Figure 8a. Actual, Fitted, and Trend Growth Rates for Labor Productivity, Early and Late Coefficients, Conventional Identity, 1955:Q1 - 2010:Q2
Explanatory Hypothesis: The Disposable Worker

- Explains both rise in cyclical responsiveness and of income inequality
- Ingredients in increased management power: exec pay based on stock options, sensitivity to 2000-02 and 2007-09 stock market debacles
- Stock options help explain huge increase in share of top 1% 1982-2000 and fluctuating share since then
- Increased emphasis by management on maximizing shareholder value
Contributions of weak labor bargaining power the same list as the sources of increased income inequality in the bottom 90 percent

Lower real minimum wage, reduced penetration of unions in the private sector, more imports, more low-skilled immigration
Application of this Hypothesis to 2000-04

- 2001-03, large employment response and long period of employment decline (19 months after NBER trough month, Nov 2001)
  - Output recovery was so weak that output gap got worse, not better
  - Savage corporate cost cutting (intertwined nexus of executive compensation, stock market, profit collapse)
  - Why did productivity rise so fast? Delayed spillover of ICT inventions of the late 1990s

- The savage cost-cutting hypothesis has been validated by industry cross-section results of Oliner-Sichel-Stiroh (2007)
2008-09 Responses: Similarities and Differences

- **Similar:** collapse of stock market and corp. profits (bigger than 2000-02)
  - Same incentive for savage cost cutting
- **Different:** It was much much bigger
  - Output gap widened by 5x as much
  - Apocalypse Now: Fear in late 2008 and early 2009 of another Great Depression
- For every deck chair thrown off the Titanic in 2001-02, five deck chairs were tossed over in 2008-09
- Management didn’t just pick on labor costs, but also on capital investment.
  - GDPI declined at annual rate of -32% 2008:Q4-2009:Q2
Conclusions for Macro

• Changes after 1986
  – Okun’s Law is Dead
  – Procyclical productivity innovations are dead
  – RBC model and “technology shocks” are no longer relevant as core determinants of business cycles

• Conventional vs. unconventional measures of output identity
  – Big puzzle why conv. LP so high 2001-04 when ICT investment had collapsed
  – Puzzle goes away with unconventional LP
Further Conclusions

- Pitfalls of detrending with univariate filters (band-pass or HP)
  - These are always too sensitive to the actual cycle (esp. 1980-82 and 2008-10, not to mention interwar period)

- Additional dimensions of labor market dynamics in U.S.
  - End-of-expansion overhiring
  - “Early Recovery Productivity Bubble” as firms struggle to clean up from previous overhiring
Substantive Explanation of Increased Flexibility of Labor Input

- Disposable worker hypothesis
- Based on increased managerial power, diminished worker power
- Separate causes at top and bottom
- Same set of causes that has been developed previously to explain rising U.S. inequality
Caution: What About Europe?

- NL, GE, AU: Government subsidized work sharing
- In these countries productivity has been very procyclical
- Graph drop in output gap (horizontal) vs. rise in unemployment rate (vertical)
  - U. S. is an extreme outlier
- Unified explanation of “American Exceptionalism” regarding both labor-market dynamics and rising inequality