An Introduction to Post-Keynesian Theories of Distribution and Growth:
Alternative Models and Empirical Findings

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Shameless advertisement and important acknowledgement

- Portions of this presentation are based on the book manuscript:

  Robert A. Blecker and Mark Setterfield, *Heterodox Macroeconomics: Models of Demand, Distribution and Growth*, Cheltenham, UK: Edward Elgar Publishing, Ltd., 2019, forthcoming.

- I also present results from the dissertation of one of my doctoral students (used with permission):

  Michael Cauvel, *Three Essays on the Empirical Estimation of Wage-led and Profit-led Demand Regimes*, unpublished PhD dissertation, American University, Washington, DC, USA, July 2018.

Distribution and growth: the big questions

- Does a society have to endure worse inequality for its economy to grow and create jobs?
  - Or can growth and employment creation be consistent with greater distributive equity?
- Historically, economists believed that distributional equity had to be sacrificed to achieve faster growth
  - Ricardo, Marx, Lewis-Ranis-Fei, Kaldor, etc.: faster growth generally requires a higher profit share or greater inequality
  - At least in the early stages of development (Kuznets curve)
    - Kuznets curve now largely debunked by Piketty
- Recent empirical studies are finding that lower inequality is often associated with more rapid or more sustainable long-run growth
  - Increased inequality is seen as contributing to secular stagnation (slow average growth) in many countries

The post-Keynesian approach: demand-led growth and functional distribution

- Post-Keynesians have emphasized that output is demand-driven in the long run as well as the short run
  - In the long run, supply (potential output) adjusts through endogenous adjustments in capital accumulation, labor force participation, and technology change (productivity growth)
  - In some views, utilization of capacity also varies in the long run (not everyone agrees)
- Income distribution affects aggregate demand -- utilization rates (in the short run, at least) and growth rates (in the long run)
  - The focus has been mainly on the "functional" distribution of income between labor ("wages") and capital ("profits")
  - More recent work has also included the personal (household) distribution of income …
  - And other dimensions of inequality: Rentiers' income (interest + dividends) vs. firms' retained profits, gender wage gaps, and wage inequality generally

Distributional effects on key components of aggregate demand (AD): Review

- **Consumption**: The marginal propensity to consume is higher out of labor income ("wages") than capital income ("profits") $\Rightarrow$ a higher wage share increases consumption

- **Investment**: The net effect of a higher wage share is theoretically ambiguous:
  - Profits (wages) probably have a positive (negative) direct effect on corporate ("business") investment (because of expectations and financial constraints)
  - But a higher wage (labor) share could boost housing ("residential") investment or induce corporate investment in labor-saving technologies
  - If there is a strong accelerator effect and consumption is strongly wage-led, then there can be an indirect positive effect of the labor share on investment

- **Net exports**: Higher unit labor costs make domestic goods less competitive internationally $\Rightarrow$ the trade balance (net exports NX) is negatively affected by a higher wage share = real wage/labor productivity

➢So it is theoretically ambiguous whether total AD is "wage-led" or "profit-led"

➢The direction of this relationship is therefore an empirical question

Two possible "demand regimes":

- **"Stagnationism" or "wage-led demand"**
  - A higher profit share (due to increased monopoly power) can depress capacity utilization and growth in a demand-driven economy by reducing consumption and investment
    - Original work of Kalecki (1954), Steindl (1952, 1979)
    - Later neo-Kaleckian models by Harris (1974), Asimakopulos (1975), Del Monte (1975), Rowthorn (1981), Dutt (1984, 1987), Taylor (1983, 1985), Amadeo (1986), many others

- **"Exhilarationism" or "profit-led demand"**
  - A higher profit share can stimulate capacity utilization and/or boost growth by increasing investment and/or net exports, even in demand-driven economies
  - As shown in a later generation of neo-Kaleckian models (Hein calls them "post-Kaleckian")
    - Bhaduri and Marglin (1990)/Marglin and Bhaduri (1990) – focused on profitability effects on investment
    - Blecker (1989) – focused on higher unit labor costs reducing net exports in an open economy

Some important caveats

- The core theoretical models do ***not*** imply that ***countries*** are uniquely and permanently either wage-led or profit-led

  - The conditions for *demand* (output) and *growth* (accumulation of capital) to be wage vs. profit-led are generally *different*

  - A country could have wage-led utilization = Y/Y_P, but profit-led growth = I/K

- Whether demand (or growth) is wage-led or profit-led is endogenous; it depend on:

  - Openness to international trade (Blecker 1989)

  - Progressivity of taxation (tax incidence) (Blecker 2002)

  - Inequality in wages or personal income (Carvalho & Rezai 2016; Palley 2017)

  - Financial payouts/rentiers' income shares (Hein 2014; Vasudevan 2017; others)

More important caveats

- Even in a wage-led economy, *realized* profits will generally be higher when demand is higher
  - Rowthorn's (1981) paradox of costs: a higher wage *share* (lower profit *share*) can result in a higher equilibrium profit *rate*
  - Similar to the fact that realized savings are higher in a higher growth equilibrium in a Robinsonian model, even if there's a paradox of thrift

- Once the wage (or profit) share is recognized to be endogenous, the meaning of wage or profit "led-ness" becomes ambiguous (or vacuous?) (Sasaki et al. 2011; Nikiforos 2017; Skott 2017)
  - I will use the terms to refer to the slope of the AD relationship (wage or profit-led *demand*)
  - Other usages include
    - The impact of an upward or downward shift in DC
    - Whether the changes in equilibrium u and ψ go in the same direction or opposite directions

A popular approach: neo-Goodwin models

- Developed by Barbosa-Filho and Taylor (2006)
  - Named after the neo-Marxian limit cycle model of Goodwin (1967)
  - The two models are not the same, but have some common features
- Output is measured by the capacity utilization rate, $u = Y/Y_P$, where Y_P is potential output
- The wage share is treated as endogenous – but it's only a function of (lags of) u
- Dynamics are based on a model of two simultaneous differential equations

$$\dot{u} = f(u, \psi) \qquad \dot{\psi} = g(u, \psi)$$

  - This assumes gradual adjustment of *both* output and distribution
- **Aggregate Demand (AD)** is the nullcline (demarcation curve): $\dot{u} = 0$
- **Distributive Curve (DC)** is the nullcline (demarcation curve): $\dot{\psi} = 0$

A log-linear version

- For simplicity, the model can be linearized in natural logarithms of the variables:
  - As is often done in empirical studies anyway

$$\hat{u} = d \ln u / dt = \upsilon_0 + \upsilon_1 \ln u + \upsilon_2 \ln \psi$$

$$\hat{\psi} = d \ln \psi / dt = \omega_0 + \omega_1 \ln u + \omega_2 \ln \psi$$

- AD and DC are given by $\hat{u} = 0$ and $\hat{\psi} = 0$

- With slopes:

$$(\partial \ln \psi / \partial \ln u)_{\hat{u}=0} = -(\upsilon_1 / \upsilon_2) \qquad \text{AD}$$

$$(\partial \ln \psi / \partial \ln u)_{\hat{\psi}=0} = -(\omega_1 / \omega_2) \qquad \text{DC}$$

Neo-Goodwin cycles (require profit-led demand)

This is an extreme case, which requires $\omega_2 > 0$ (not very credible)

- These arise under certain conditions on the slopes and parameters
  - Under other conditions we get different cycles, or no cycles!
  - So these are possible but **not** necessary outcomes

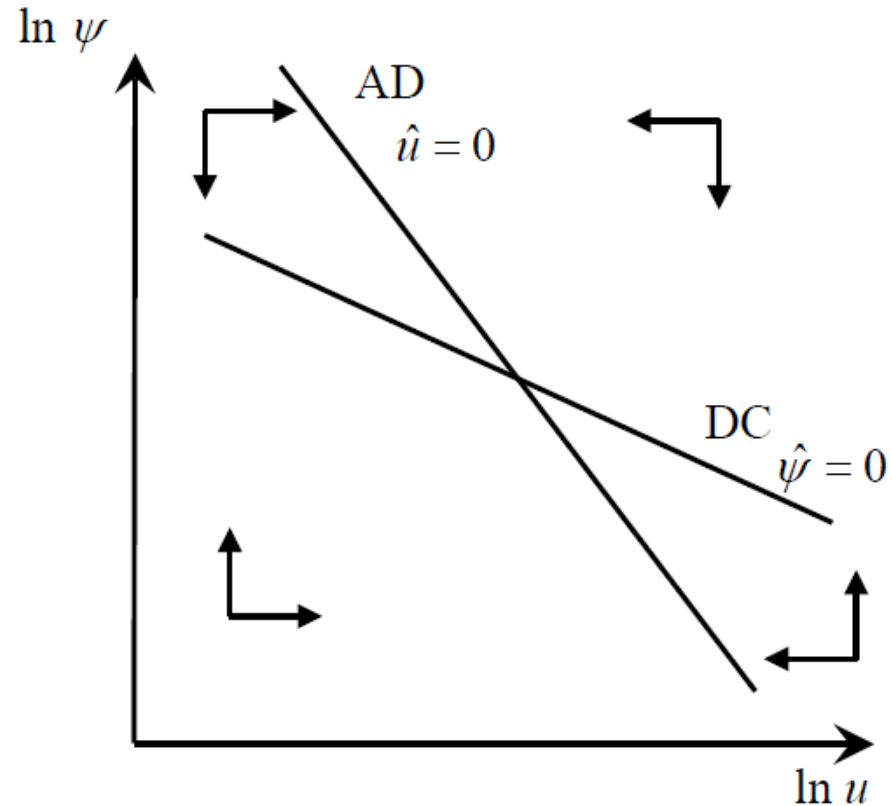- These are **not** true limit cycles except under special conditions!
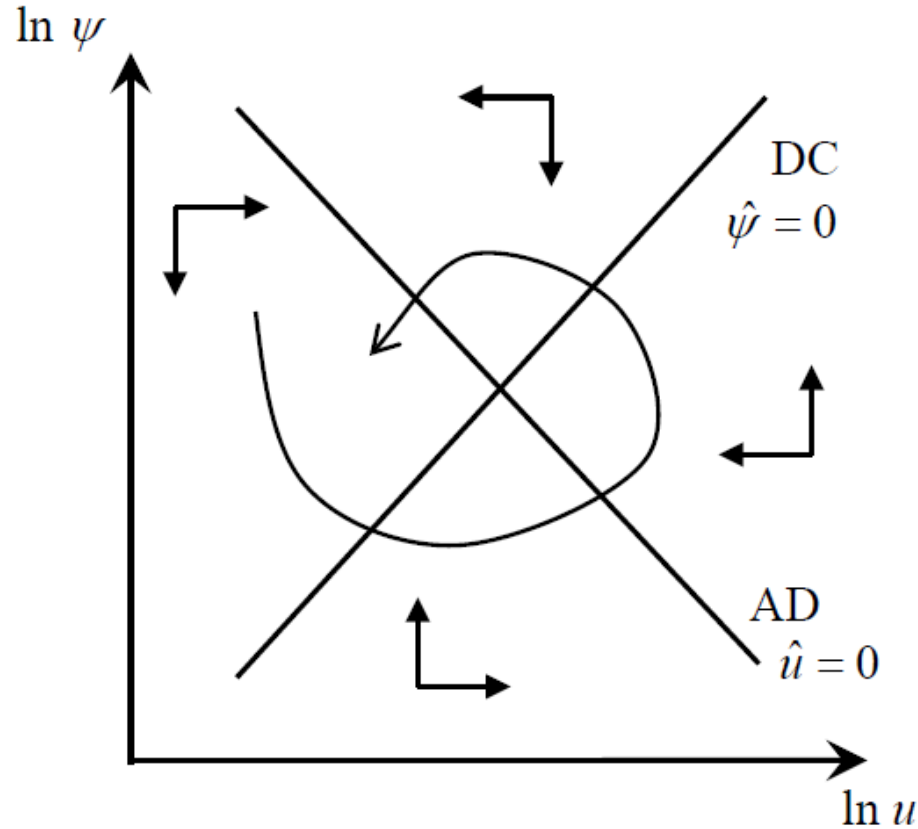
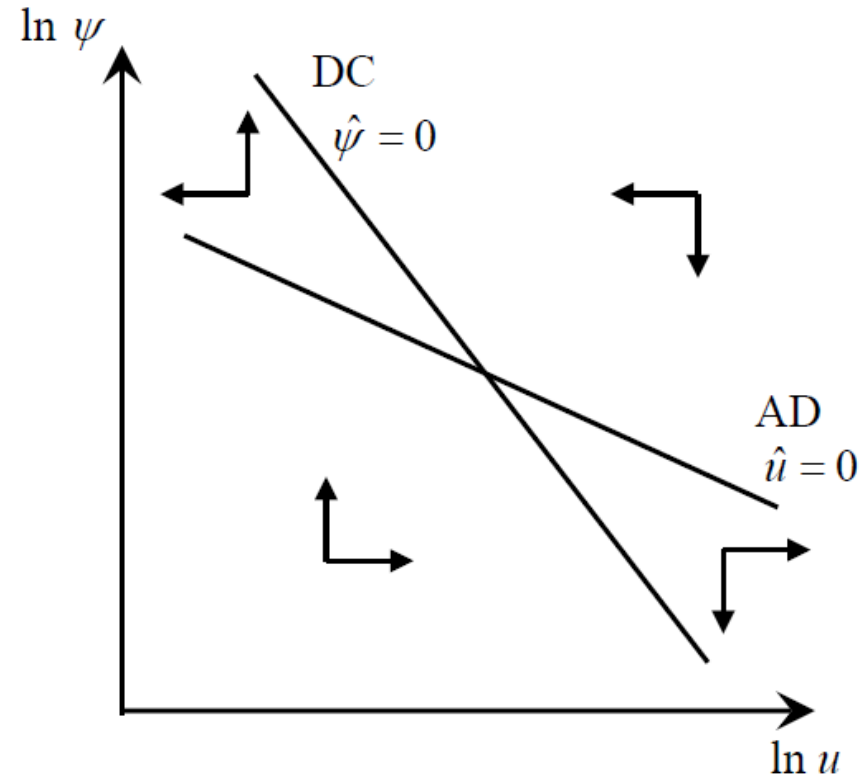(a) Stable neo-Goodwin cycles (profit-led demand, profit-squeeze)
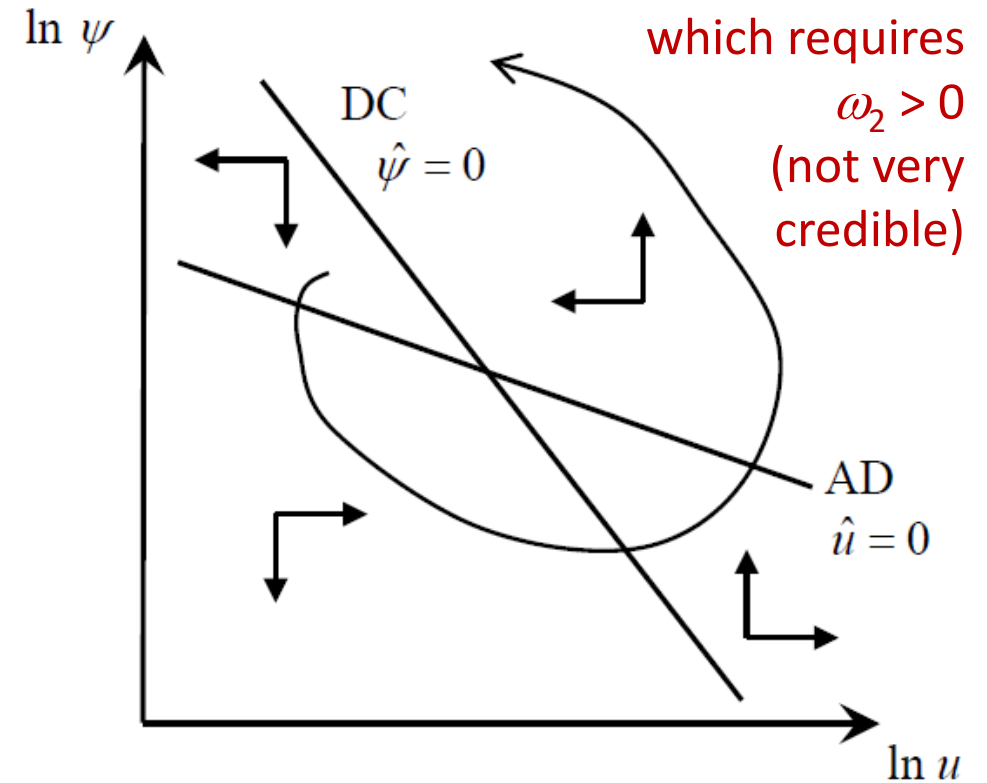
(d) Unstable neo-Goodwin cycles (profit-led demand with positive own-effect of the wage share on its rate of change)

Non-cyclical cases (also with profit-led demand)

(b) Stable node (profit-led demand, weak wage-squeeze)

(c) Saddle path instability (profit-led demand, strong wage-squeeze)

Formal stability analysis for neo-Goodwin model

- We can write the above system of differential equations as

$$\begin{bmatrix} \hat{u} \\ \hat{\psi} \end{bmatrix} = \begin{bmatrix} \upsilon_1 & \upsilon_2 \\ \omega_1 & \omega_2 \end{bmatrix} \begin{bmatrix} \ln u \\ \ln \psi \end{bmatrix} + \begin{bmatrix} \upsilon_0 \\ \omega_0 \end{bmatrix}$$

- With the Jacobian matrix of partial derivatives

$$\mathbf{J} = \begin{bmatrix} \upsilon_1 & \upsilon_2 \\ \omega_1 & \omega_2 \end{bmatrix}$$

- And equilibrium solutions

$$\ln u^* = \frac{\upsilon_2 \omega_0 - \upsilon_0 \omega_2}{\upsilon_1 \omega_2 - \upsilon_2 \omega_1} = \frac{\upsilon_2 \omega_0 - \upsilon_0 \omega_2}{\det(\mathbf{J})}$$

$$\ln \psi^* = \frac{\upsilon_0 \omega_1 - \upsilon_1 \omega_0}{\upsilon_1 \omega_2 - \upsilon_2 \omega_1} = \frac{\upsilon_0 \omega_1 - \upsilon_1 \omega_0}{\det(\mathbf{J})}$$

Stability of the equilibrium and cyclical dynamics (neo-Goodwin model)

- Trace: under standard assumptions, $\text{tr}(\mathbf{J}) = \upsilon_1 + \omega_2 < 0$
  - Negative "own-effects": Keynesian stability in goods market, convergence of the wage share
  - A necessary but not sufficient condition for stability

- Determinant: $\det(\mathbf{J}) = \upsilon_1\omega_2 - \upsilon_2\omega_1$ is ambiguous in sign
  - $\det(\mathbf{J}) > 0 \implies$ stable (in combination with a negative trace)
  - $\det(\mathbf{J}) < 0 \implies$ saddle point (unstable in this context)

- For the dynamics to be cyclical, $\mathbf{J}$ must be nondiagonizable with complex characteristic roots
  - The equilibrium is a stable focus if the real parts of the roots are negative and an unstable focus if they are positive (Klein 2002, pp. 479–84)
  - Complex roots require: $[\text{tr}(\mathbf{J})]^2 < 4 \cdot \det(\mathbf{J}) \implies (\upsilon_1 - \omega_2)^2 < -4\upsilon_2\omega_1.$
  - This means the "cross-effects" of u and ψ on each other must be relatively large in absolute value
    - These are the partials representing profit-led demand $\upsilon_2 < 0$ and the profit squeeze $\omega_1 > 0$

# Qualification: Cyclical behavior will <u>not</u> result if wages and prices are "sticky" in the short run

- If output adjusts much faster than distribution, the economy is always on the AD curve and adjusts gradually toward DC

  - Cases with wage-led demand shown for illustration:
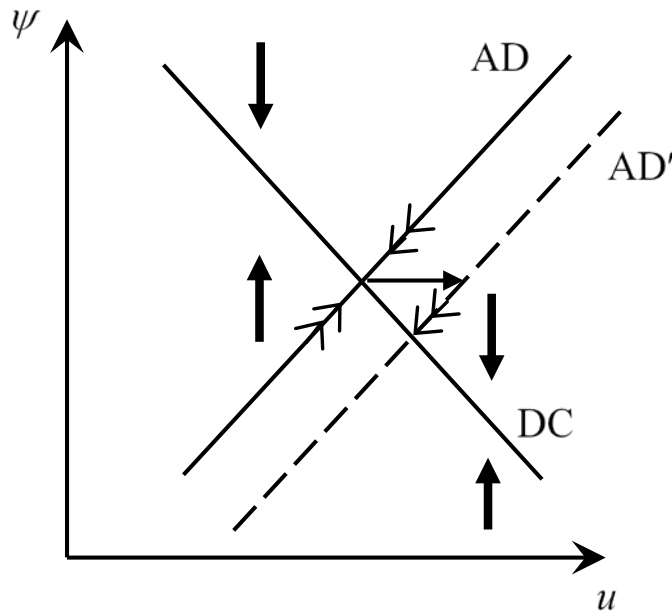
(a) Wage-led demand with a wage-squeeze (stable, overshooting)
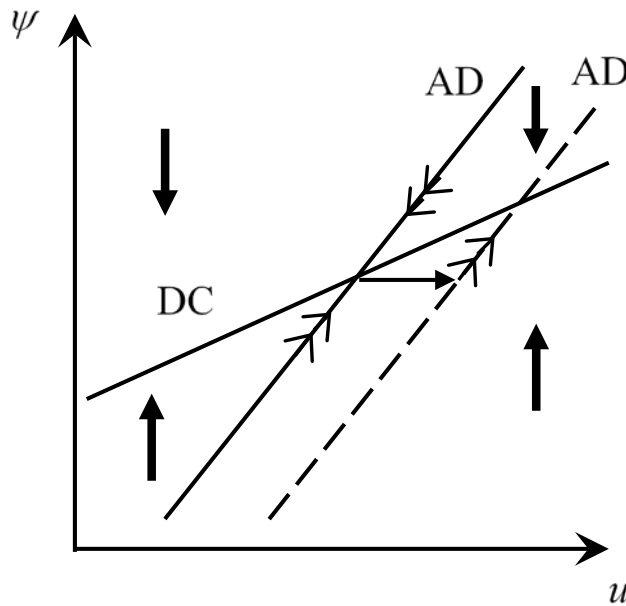
(b) Wage-led demand with a weak profit-squeeze (stable, undershooting)
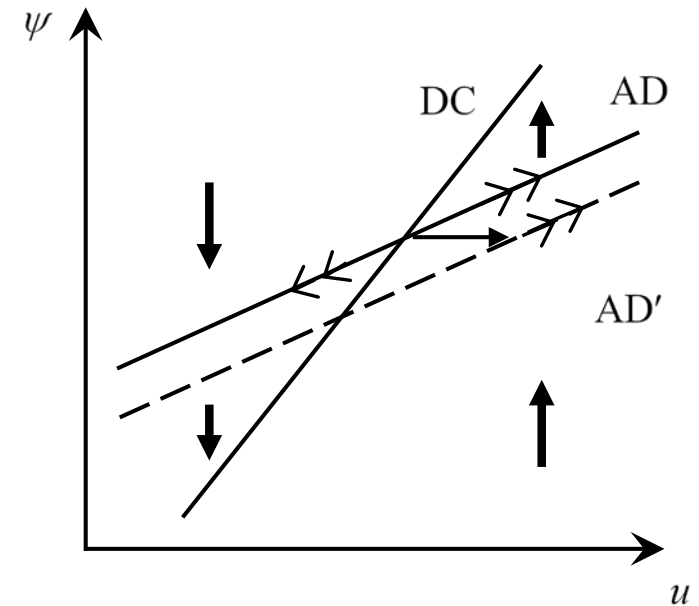
(c) Wage-led demand with a strong profit-squeeze (unstable)

Empirical studies of demand and distribution

- A large literature has estimated distributional effects on aggregate demand (slope of AD curve)
    - To see if output, utilization or the growth rate are wage-led or profit-led in various countries
- A subset of this literature has also estimated the slope of the DC curve
    - To see if there is a profit-squeeze or wage-squeeze in distribution
- Studies that find both profit-led demand and a profit-squeeze are taken to support the existence of neo-Goodwin cycles
    - But how reliable are these findings?

Empirical framework
(modified from Stockhammer et al., 2011)

- **Aggregate demand (AD)**

$$Y = A = C(Y, \psi, Z_C) + I(Y, \psi, Z_I) + G + NX(Y, P, Z_X, Z_M, Z_P)$$
$$+ \quad + \qquad\quad + \quad ? \qquad\qquad - \quad -$$

where

Z_j = vector of exogenous (control) variables for endogenous variable j

$$NX = X - M$$

$$X = X(P, Z_X), \ \ X_P < 0$$

$$M = M(P, Y, Z_M), \ \ \ M_P > 0, M_Y > 0$$

$$P = P(\psi, Z_P), \ \ \ P_\psi > 0$$

Demand:
$\partial A/\partial \psi > 0$ "wage-led"
$\partial A/\partial \psi < 0$ "profit-led"

- **Distributive relationship or curve (DC)**

$$\psi = \psi(Y, Z_\psi)$$

Distribution:
$\partial \psi/\partial Y > 0$ "profit-squeeze"
$\partial \psi/\partial Y < 0$ "wage-squeeze"

Three empirical approaches to estimating AD

- **"Structural" models** – estimate C, I and NX (or X and M) separately, usually taking ψ as exogenous
  - Tend to find wage-led demand *except* in smaller and more open economies (Stockhammer, Hein, Onaran, many others, very large literature)
  - Global distributional changes are found to have more wage-led effects (Onaran & Galanis)
- **"Aggregative" or "systems" models** – estimate simultaneous equations or VAR systems for $u = Y/Y_P$ (utilization rate) and ψ (wage share)
  - Tend to find profit-led demand (Barbosa-Filho & Taylor 2006, Nikiforos & Foley 2012, Kiefer & Rada 2015, Carvalho & Rezai 2016)
  - Usually find a "profit-squeeze" in distribution, implying neo-Goodwin cycles
- **"Reduced form" models** – estimate the impact of exogenous factors (Z_j) on u and ψ
  - *Don't explicitly test whether demand is wage-led or profit-led*
  - Very small literature: one study of Mexico by López et al. (2011)

The differences in empirical methodologies

- The **structural** approach estimates separate functions for C, I, and NX (or X, M, P) and then adds up the effects of changes in the wage (or profit) share:

$$\frac{\partial A}{\partial \psi} = \frac{\partial C}{\partial \psi} + \frac{\partial I}{\partial \psi} + \left(\frac{\partial X}{\partial P} - \frac{\partial M}{\partial P} \right) \frac{\partial P}{\partial \psi}$$

- **Aggregative** estimation regresses a measure of output (usually the utilization rate) on the wage (or profit) share and possibly other variables (lagged dependent variable, control variables)

$$Y = A(\psi, G, Z_C, Z_I, Z_X, Z_M, Z_P)$$

$$\text{or} \quad u = u(\psi, G, Z_C, Z_I, Z_X, Z_M, Z_P)$$

- Either of these can be a **systems** estimate if $\psi = \psi(Y, Z_\psi)$ is simultaneously estimated

- **Reduced form** estimation requires substituting $\psi = \psi(Y, Z_\psi)$ into $A(\,\cdot\,)$ so that *only* exogenous variables are included on the right-hand side:

$$Y = Y(G, Z_C, Z_I, Z_X, Z_M, Z_P, Z_\psi)$$

Table 5.1 Selected empirical studies of wage-led versus profit-led demand using alternative methodologies

Methodology	Findings	
	Wage-led demand	**Profit-led demand**
Structural estimates	Naastepad & Storm (2006–7), France, Germany, Italy, Netherlands, UK Hein & Vogel (2008), France, Germany, UK, US Stockhammer et al. (2009), euro area Onaran et al. (2011), US Stockhammer et al. (2011), Germany Onaran & Galanis (2012), euro area, Germany, France, Italy, UK, US, Japan, Turkey, South Korea Stockhammer & Wildauer (2016), panel of 18 OECD countries[b] Onaran & Obst (2016), 11 European countries[c] Cauvel (2018, Chapter 2), US (systems GMM)[d]	Naastepad & Storm (2006–7), Japan, US Hein & Vogel (2008), Austria, Netherlands Onaran and Galanis (2012), Australia, Canada, Argentina, China, India, Mexico, South Africa[a] Onaran & Obst (2016), Austria, Belgium, Denmark, Ireland

Note: Results shown here are for distributional shifts in individual countries. Onaran and Galanis (2012) and Onaran and Obst (2016) find that *some countries (Canada, Argentina, India, Mexico) switch from profit-led to wage-led if there is a simultaneous change in the labor share in all countries*

Table 5.1, Continued

Methodology	Findings	
	Wage-led demand	**Profit-led demand**
Aggregative estimates	Vargas Sánchez and Luna (2014), Mexico, long run[e] Charpe et al. (2018), US, UK, France, long run (growth)[f] Cauvel (2018, Chapter 1), US (short run, controlling for productivity)[g] Araujo and Costa Santos (2018), US (long run)[f]	Fernandez (2005), US Barbosa-Filho & Taylor (2006), US Tavani et al. (2011), US Nikiforos & Foley (2012), US Vargas Sánchez and Luna (2014), Mexico, short run Kiefer & Rada (2015), panel of 13 OECD countries[h] Carvalho & Rezai (2016), US Barrales & von Arnim (2017), US[f] Charpe et al. (2018), US, UK, France, short run (growth)[f] Silva de Jesus et al. (2018), Brazil Araujo and Costa Santos (2018), US (short run)[f]
Reduced form estimates	López et al. (2011), Mexico, short run[i]	

Note: All aggregative studies are short run unless otherwise stated.

Notes to Table 5.1 (in case of questions)

For structural studies that give separate results for domestic demand and total demand (including net exports), only the results for total demand are shown here. Studies that only cover domestic demand and do not include net exports are not included. Some studies are shown more than once if they found different results for different countries or time horizons. Long run and short run are indicated only for studies that distinguish these.

[a] Individual country results (some of these countries flip from profit-led to wage-led in response to a simultaneous redistribution of income in all countries).

[b] Marginal effects vary for individual countries; examples given are Netherlands (profit-led) and US, France, Germany, Austria (wage-led, in declining order of the magnitude of the effect). Other countries included in the panel estimates are Australia, Belgium, Canada, Switzerland, Denmark, Spain, Finland, Ireland, Italy, Japan, Norway, Sweden, UK.

[c] Finland, France, Germany, Greece, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, UK.

[d] Using systems GMM to control for endogeneity of the wage share and GDP, also including a wage share equation.

[e] There is a typographical error in the cointegrating equation printed in this article, but I have verified by email from Gustavo Vargas Sánchez (14 October, 2014) that the sign on the 'exploitation rate' (profit share) is negative indicating that output is wage-led in the long run. This is also consistent with what the authors state in the text.

[f] Uses a different methodology (wavelets) from most other studies shown.

[g] Using a cyclically adjusted measure of the wage share or treating the real wage and labour productivity as separate variables; results are sensitive to ordering in the impulse responses.

[h] Australia, Canada, Finland, France, Germany, Ireland, Italy, Japan, South Korea, Netherlands, Sweden, UK, US.

[i] Although this methodology does not directly identify whether demand is wage-led or profit-led, this study's finding that a depreciation of the peso is contractionary is consistent with the wage-led case (since a depreciation would be expected to lower the real wage). The results are referred to as 'short run' because the data are filtered and detrended.

The different methods yield very different results

- The vast majority of recent **structural studies** find wage-led demand
  - Especially for the larger countries or regions (US, EU, Germany) and in panel data for OECD countries (Onaran and Galanis 2012; Stockhammer and Wildauer, 2016)
  - But they find profit-led demand for many smaller and more open economies (Austria, China, Mexico, Canada, Ireland, etc.) where net export effects are stronger
    - As predicted by the open economy version of the neo-Kaleckian model
  - There are exceptions and conflicting results for some countries
- Most **aggregative studies** find profit-led demand and a profit-squeeze,
  - This appears to confirm neo-Goodwin cycles (Barbosa-Filho and Taylor 2006; Carvalho and Rezai 2016)
  - In the US, in international panel data (Kiefer and Rada 2015), and other countries
  - These are strictly short-run results, as we shall see
  - Some new aggregative studies are finding wage-led growth in the long run

Do the results of structural studies suffer from simultaneity bias?

- All econometric estimates are subject to various potential sources of bias
    - Omitted variables, simultaneity, measurement error, equation misspecification, etc.
    - All results can be sensitive to which measures are used for each variable

- Most **structural** studies to date could suffer from simultaneity bias (main criticism)
    - Consumption, investment, export, and import functions are usually estimated as "single equations" using OLS
        - But the wage share and output are endogenous variables, making OLS estimates potentially biased
        - Also C, I, and NX may be subject to common shocks, which makes OLS inconsistent

- Cauvel (2018, AU dissertation, Chapter 2) makes ψ and *Y* endogenous and controls for common shocks in structural models using GMM (general method of moments)
    - He finds that US aggregate demand is *more* wage-led in the GMM estimates than using OLS!
        - Hence the wage-led finding for the US case does not result from simultaneity bias
    - Results are very preliminary so should be taken with caution

Three problems with aggregative estimates

1. At best, the results only pertain to short-run business cycles (Blecker, *ROKE* 2016)
   - Many common measures of utilization or the output gap remove information about long-run trends in output – or even trends in utilization!

2. Most commonly used measures of the capacity utilization rate or output gap in the aggregative studies are based on flawed measures of business cycles (Cerra and Saxena, IMF 2017)
   - Hodrick-Prescott and other filters embody spurious dynamics and can generate spurious econometric results (Hamilton, 2017)

3. Cyclical movements in the profit or wage share are driven mostly by changes in labor productivity, not wages (Hahnel and Sherman, 1982; Lavoie, 2017)
   - Failing to control for this leads to biased estimates creating a false appearance of profit-led demand and a profit squeeze
   - This criticism is especially destructive of the neo-Goodwin cycle view

1. Demand is more likely to be more wage-led in the long run than the short run (Blecker 2016)

- **Consumption**: Liquidity constraints on workers are more binding in the long run than the short run
  - In the short run, workers can borrow to finance consumption expenditures
  - In the long run, debt constraints bind and consumption is limited by lifetime wage and salary earnings

- **Corporate investment**: profitability mainly affects the finance of desired (planned) investment
  - Retained profits (cash flow) relieve financial constraints in the short run (Minsky 1986)
  - In the long term, planned investment depends mainly on accelerator effects, i.e., output growth

- **Net exports**: negative effects of higher wages (unit labor costs) are felt mainly in the short run
  - In the long run, these can be offset by currency depreciation or other adjustments

- Thus, profit-led effects are more likely to dominate in the short run; wage-led effects are more likely to dominate in the long run
  - Caveat: This set of hypotheses was intended for the US case; effects could differ for other countries with different structural characteristics (more open, etc.)

Recent studies of long-run vs. short-run effects

- **Halter et al. (2014)**: Lower personal inequality (Gini) has a positive effect on growth in the long run but not the short run
  - Data for 106 countries in 1965-2005, eight 5-year periods, usual controls
  - The effect of higher inequality is positive in next 5-year period, but negative after that **and** the long-run impact is negative

- **Vargas Sánchez and Luna (2014)**: Found that Mexican output (real GDP) is profit-led in the short run and wage-led in the long run

- **Kiefer and Rada (2015)**: Demand (output gap) is profit-led in the short run in a sample of 13 OECD countries (panel data), **but** there is a long-term decrease in *equilibrium* levels of u^* and ψ^*
  - These variables have a positive long-run relationship, but the causality is not clear

- **Charpe et al. (2018)**: Using time frequency (wavelet) analysis, the labor share leads the growth rate negatively over shorter cycles (2–4 and 4–8 years), but positively over longer cycles (16–32 and 32+ years)
  - In very long-term data for the US (1898–2010), UK (1856–2010) and France (1896–2010)
  - Similar results for the US are found by Araujo and Costa Santos (2018), but Barrales and von Arnim (2017) found profit-led cycles up to the medium run (inconclusive results for the long run)

2. Spurious measures of potential output and capacity utilization (output gaps)

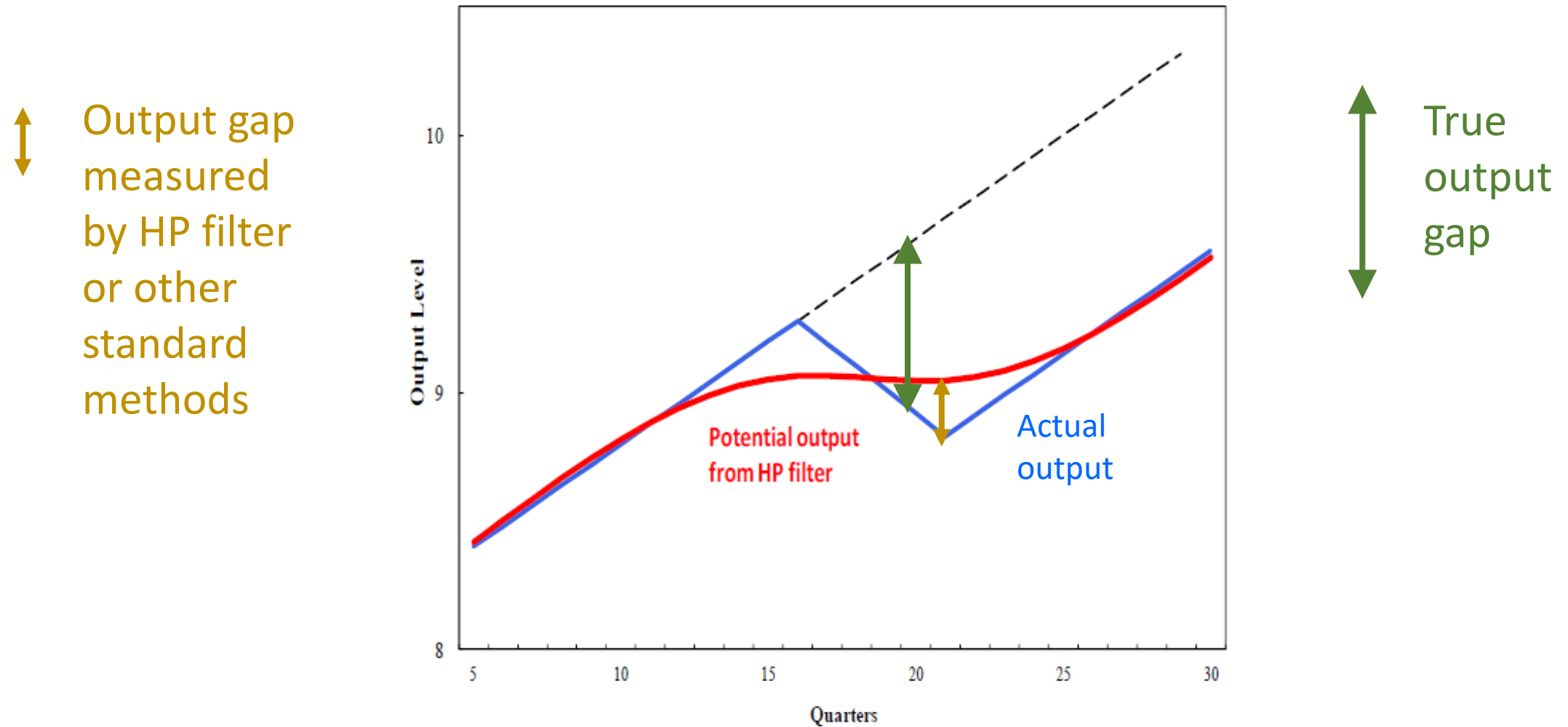**Figure 3. Concepts of the Business Cycle**
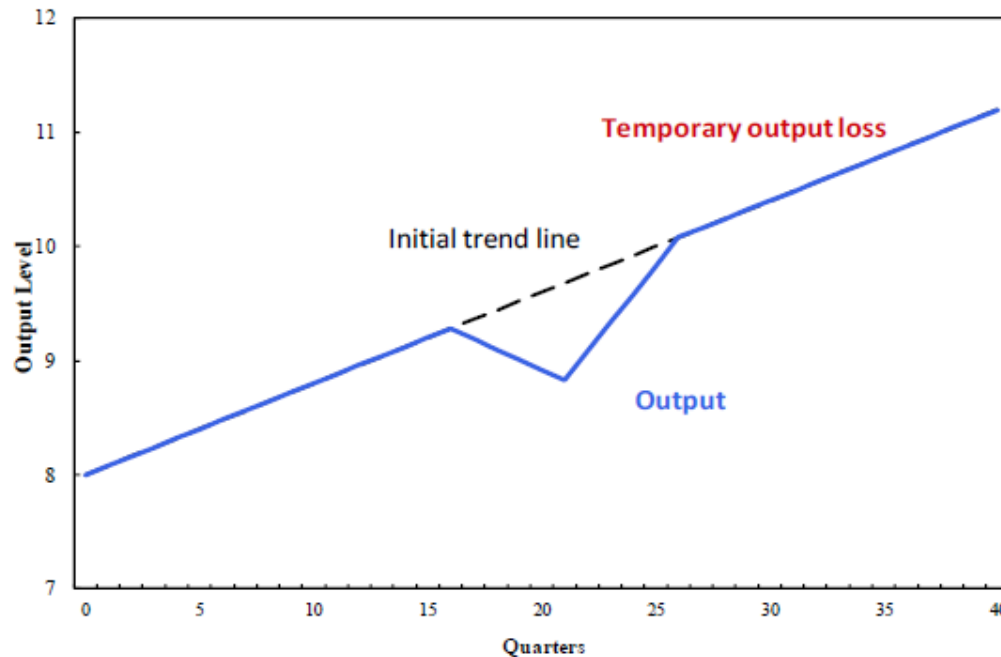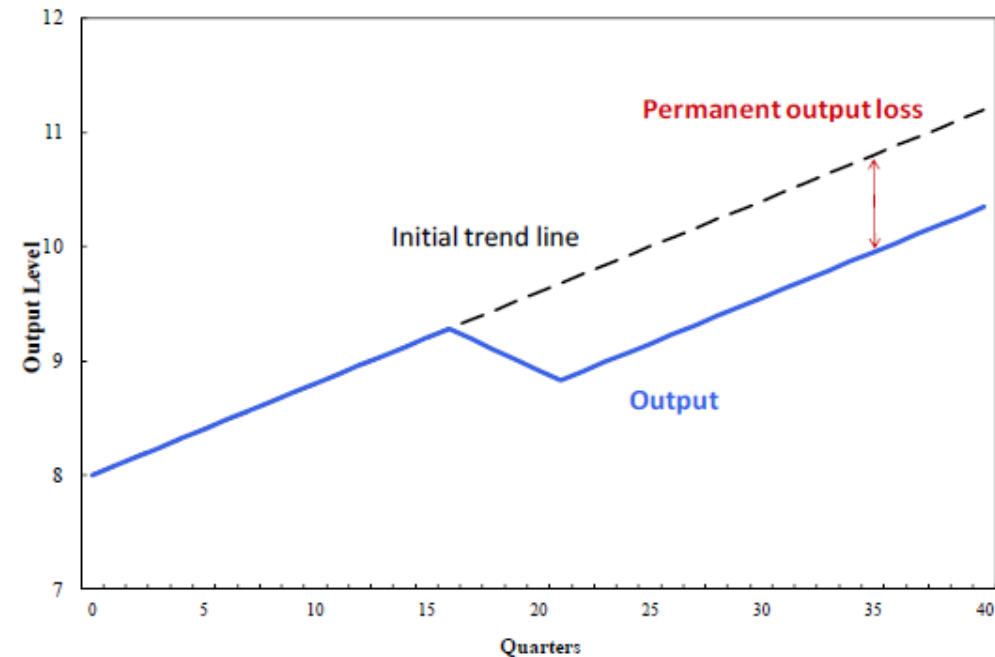
Traditional view | Alternative view

From Cerra & Saxena (IMF, 2017), "Booms, Crises, and Recoveries: A New Paradigm of the Business Cycle and Its Policy Implications"

# Figure 5. Filters Create Spurious Output Gaps

Output gap measured by HP filter or other standard methods

True output gap

Potential output from HP filter

Actual output

Source: Cerra and Saxena (2017).

Do other measures of potential output solve this problem?

- No, not in general
- Neoclassical measures of potential output use an aggregate production function of the type

$$Y_P = AF(K, H, L)$$

- But capital accumulation, labor force participation, human capital, and productivity growth can all be affected by demand-side shocks
  - In a major crisis or deep recession, investment falls, people leave the labor force or drop out of college, skills of unemployed workers atrophy, and A is a residual anyway
  - Many studies have shown persistent effects of the Great Recession on potential output or its underlying determinants
- The only things that might help would be using real-time data on potential output estimated *before* a given time period
  - In the US, the Fed's capacity utilization series is more reliable but has some limitations

Changing CBO estimates of US potential GDP and actual GDP for 2007 to 2017 (annual)
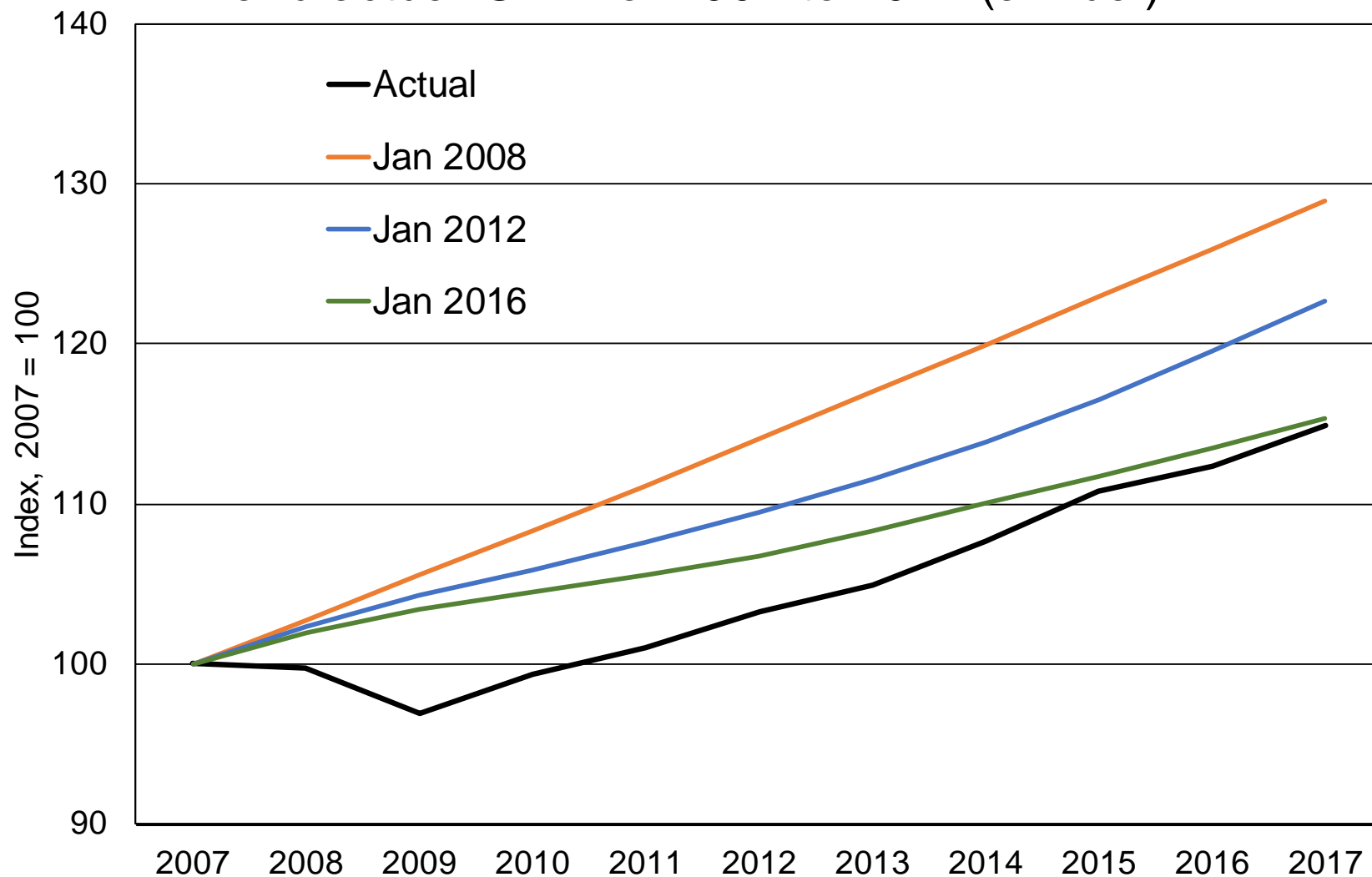
Sources: CBO estimates from *The Budget and Economic Outlook*, various January issues; BEA, GDP release of March 28, 2018 (actual GDP); and author's calculations. Similar diagrams using earlier forecasts can be found in the work of Ball, Cerra & Saxena, and others.

"Why you should never use the Hodrick-Prescott filter" (J. Hamilton, *REStat,* online 2017)

- Hodrick-Prescott (HP) and other filters bring future information into the measure of potential output and the utilization rate or output gap at any time *t*, which could not have been known at that time
  - "HP introduces spurious dynamic relations that have no basis in the underlying data-generating process"
  - "Filtered values at the end of the sample are very different from those in the middle, and are also characterized by spurious dynamics"
- This confirms earlier critiques
  - The HP filter can generate spurious cycles where no cycles exist in the underlying data (Cogley and Nason 1995; Canova 1998)
  - It puts too much of the cycle into the trend (Comin and Gertler 2006; Gordon and Krenn 2010)

➢Except we may use HP for purposes of comparison with earlier studies

Hamilton's alternative measure of cycles

- Based on a regression of the form

$$y_{t+h} = \beta_0 + \beta_1 y_t + \beta_2 y_{t-1} + \beta_3 y_{t-2} + \beta_4 y_{t-3} + v_{t+h}$$

  - Using quarterly data, $h = 8$ (so all information is lagged 2+ years)

- The estimated residual $\hat{v}_{t+h}$ is the cycle series
  - If $y = \ln$ GDP, then this is the logarithmic output gap or utilization rate
    - The cyclical component is the deviation of the series from a forecast based on four quarters of realizations of the variable starting eight quarters earlier
  - The trend (fitted value) will not bend down before a recession as in HP
    - But it will slow down about two years after a severe recession if output does not return to its previous trend

Hodrick-Prescott trend, Hamilton fitted values, and actual U.S. real GDP, log scale, quarterly, 2000Q1 to 2017Q4

Actual — HP trend — Hamilton Fitted
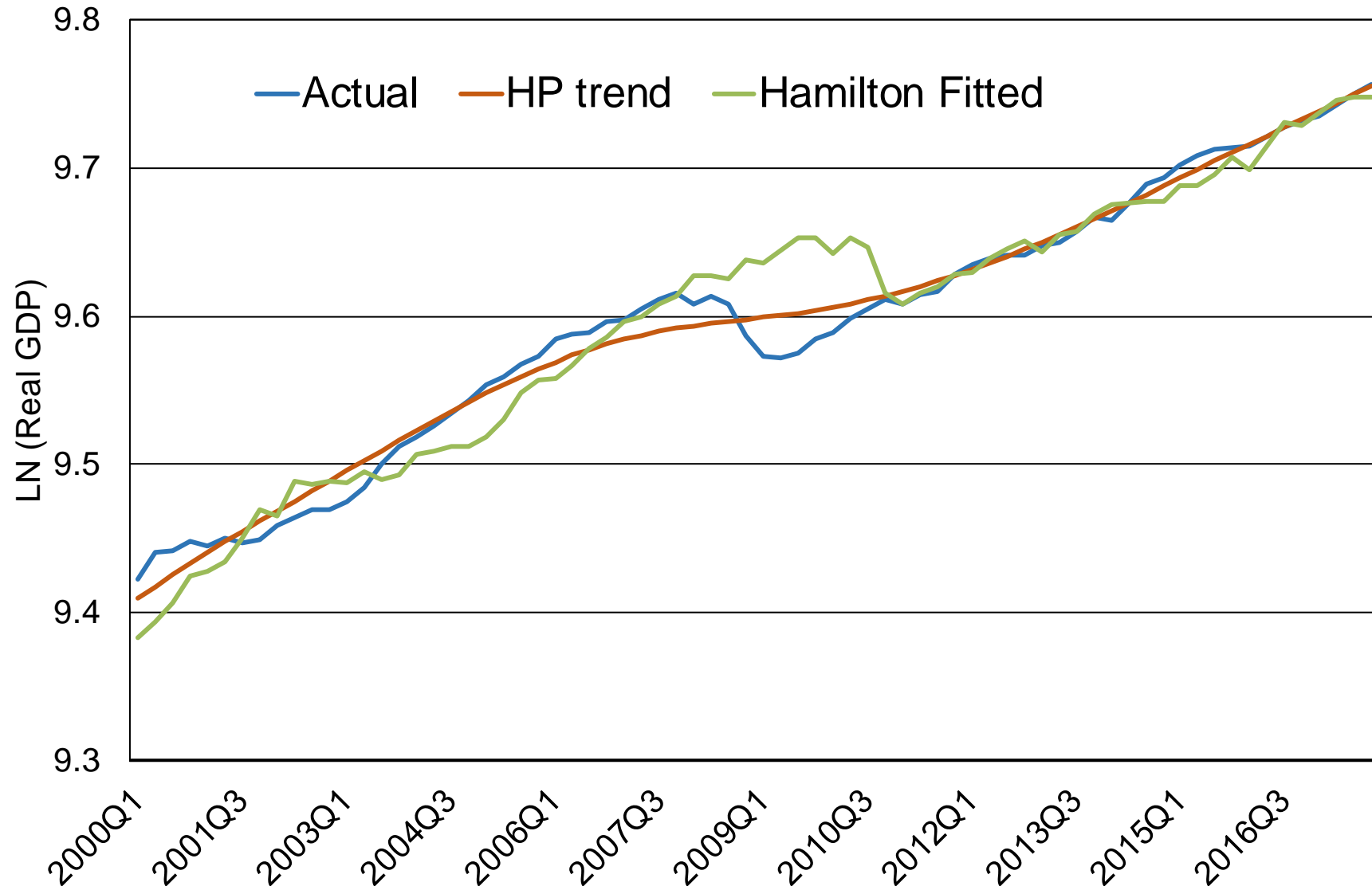
LN (Real GDP)

Source: BEA and author's calculations. Note: The trends were calculated using data for 1960Q1 to 2017Q4.

Comparing the Hamilton and Hodrick-Prescott measures of the output gap (U.S. real GDP, quarterly, 1960-2017)
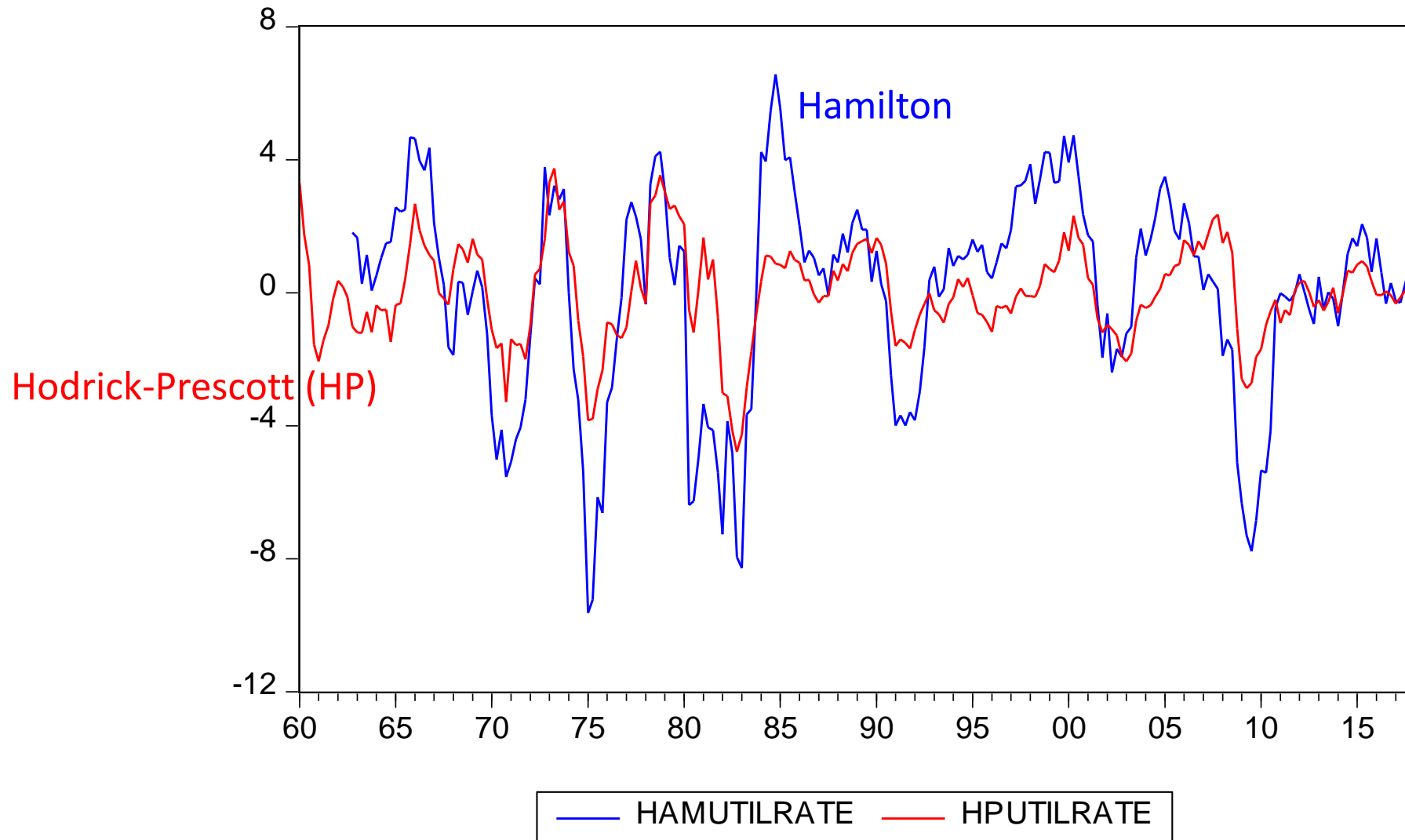
3. Short-run endogeneity of labor productivity and the wage share (emphasized by Lavoie 2017 & earlier)

- The fixed cost of overhead labor was included in Kalecki's original models
  - Also Harris (1974), Asimakopulos (1975), Rowthorn (1981), Lavoie (1992, 1995, 2014)
  - Hahnel and Sherman (1982), Sherman and Evans (1984) cited this in criticizing profit-squeeze studies of the 1970s (e.g. Weisskopf 1979) [Forerunners of neo-Goodwin]

- Appendix 4.1 in Blecker-Setterfield, chapter 4, covers the original Harris-Asimakopulos versions (which were very similar):

- Total employment is $L = L_0 + L_1$, where L_0 is production workers and L_1 is overhead employees (managers etc.)

- Production workers' labor is proportional to output ($L_0 = a_0 Y$) but overhead employment L_1 is exogenously given in the short run

Short-run endogeneity of the wage share *continued*

- National income is given by the identity: $PY = \Pi + WL$

- The price level P is determined by a markup pricing: $P = (1 + \tau)Wa_0$

- Then the profit share is

$$\pi = \frac{\Pi}{PY} = \frac{\tau - (L_1/a_0 Y)}{1 + \tau}$$

- A positive demand shock that raises Y will also increase π

- Hence the wage share $\psi = 1 - \pi$ will be negatively related to Y and to utilization, $u = Y/Y_P$ in the short run when potential output Y_P is given

- Estimates that don't take this countercyclicality of ψ ($\uparrow Y$ or $u \rightarrow \downarrow \psi$) into account could be picking up reverse causality

  - They could spuriously find "profit-led demand" ($\downarrow \psi \rightarrow \uparrow Y$ or u)

The relation to labor productivity

- Labor productivity (output per hour of all employees) is $$\frac{Y}{L} = \frac{Y}{a_0 Y + L_1}$$
  - where $\partial(Y/L)/\partial Y > 0$ as long as $L_1 > 0 \implies$ productivity varies procyclically
  - This is also true in relation to the utilization rate:
    - Multiplying the right-hand side by $1 = (1/Y_P)/(1/Y_P)$ and using the definition $u = Y/Y_P$, we can also see that $Y/L = u/(a_0 u + L_1/Y_P)$ and, holding Y_P constant and assuming $L_1 > 0$, $\partial(Y/L)/\partial u > 0$

- Thus the cyclical behaviour of the wage share can be driven by demand shocks to productivity, since by definition $$\psi = \frac{W/P}{Y/L}$$

- When the real wage is deflated by a consumer price index (P_C), this is a little more complicated
  - You have to control for relative consumer prices $$\psi = \frac{(W/P_C)(P_C/P)}{Y/L}$$

US wage share (broadest measure: total labor compensation/GDP), annual, 1960-2016

Table 1.11. Percentage Shares of Gross Domestic Income

[Percent]
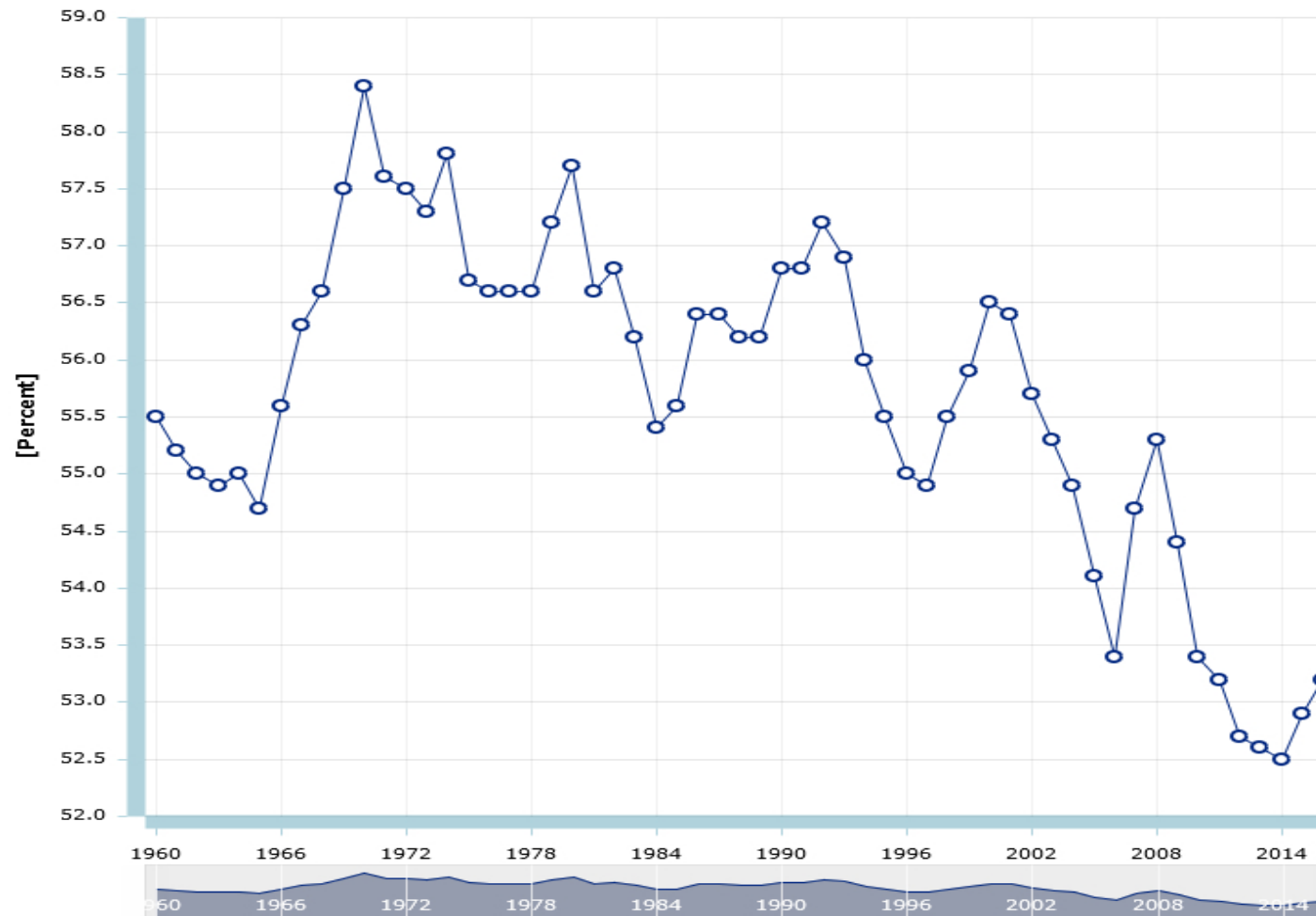
Source: U.S. Bureau of Economic Analysis

Compensation of employees, paid

Source: FRED.

We do see a cyclical pattern in the US wage (labor) share.

But we will see that this is caused by demand shocks to labor product-ivity, not by demand effects on the real wage (not profit-squeeze)

Whereas, the long-term decline is driven by the real wage growing more slowly than labor productivity

Note: Some alternative measures show the US wage share declining secularly only after 2000

VAR estimates from Michael Cauvel (2018, Chapter 1)
AU dissertation, cited with author's permission

- Comparing results with HP filter and Hamilton measures of the utilization rate, using quarterly US data, 1947Q4 – 2016Q4
  - Using a vector autoregression (VAR) model with Cholesky decomposition
  - The ordering imposes restrictions on which variables have contemporaneous effects

- Baseline model (to replicate previous studies): **two variables, wage share (WS) and utilization (UTIL), ordering WS, UTIL**
  - Finds usual result of profit-led demand, profit-squeeze in distribution
    - The latter is insignificant using Hamilton

- Then he controls for productivity in one of two ways (**three-variable models**):
  - **Real wage (compensation per hour, COMP), productivity (PROD), utilization (UTIL)**
    - Preferred ordering: COMP, UTIL, PROD to capture the Lavoie critique (some results are sensitive)
  - **Cyclical components of productivity (PRODCYCLE), wage share adjusted to remove cyclical component of productivity (COMP_ADJ), utilization (UTIL)**

Baseline impulse responses, using HP filter (replication of earlier studies)

Response to Cholesky One S.D. Innovations ± 2 S.E.

Response of LNUTIL to DLNWS
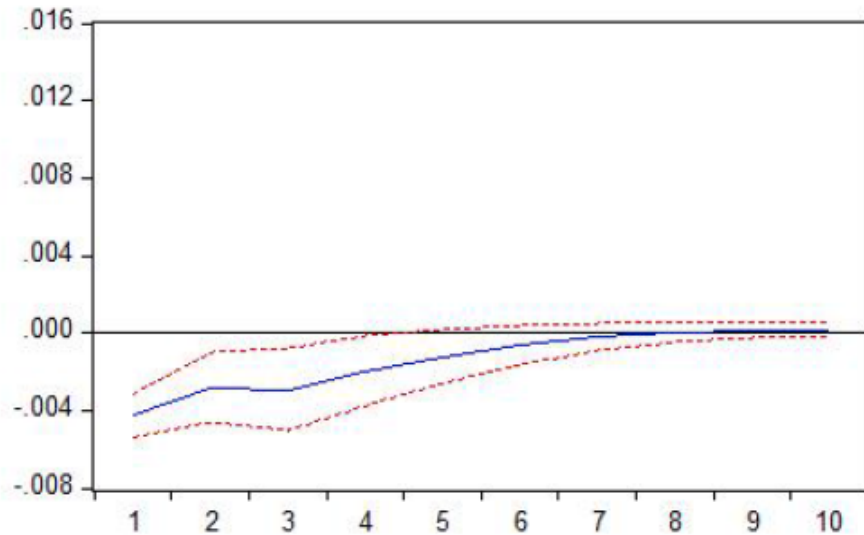
Demand (capacity utilization) is **profit-led**, up to 4 quarters

Response to Cholesky One S.D. Innovations ± 2 S.E.

Response of DLNWS to LNUTIL

Profit squeeze in distribution (3-6 quarters)

(a) Response of ln utilization to a positive shock in Δ ln wage share

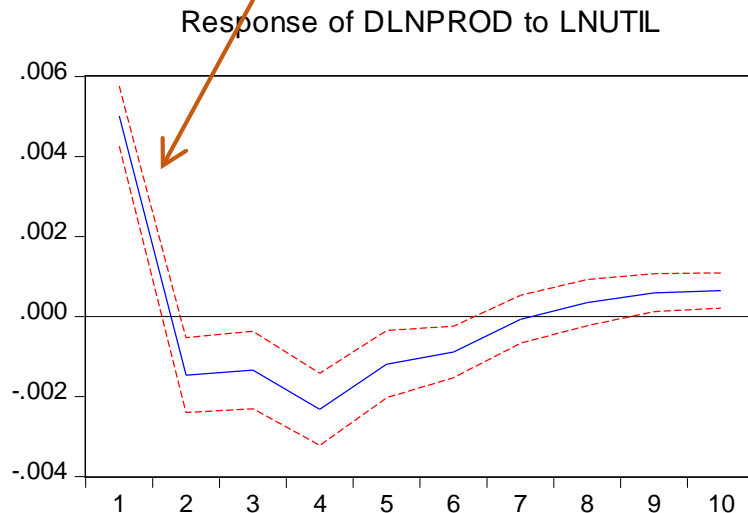(b) Response of Δ ln wage share to a positive shock in ln utilization

Ordering: Δ ln WS, ln UTIL (2 lags + time trend);
Utilization is measured by deviations from an HP-filtered trend

Demand still appears profit-led using Hamilton (*but the profit-squeeze becomes insignificant*)

Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.

Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.

Response of HAMILTONUTIL to DLNWS

Response of DLNWS to HAMILTONUTIL

Demand (capacity utilization) seems **profit-led**, up to 8 quarters
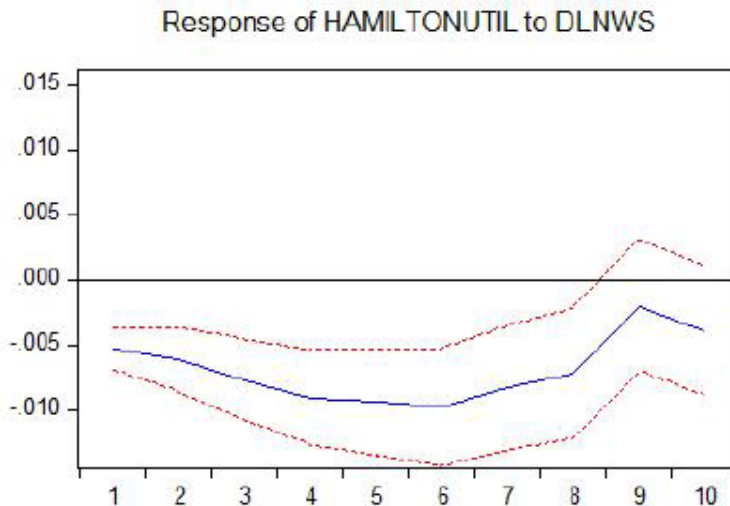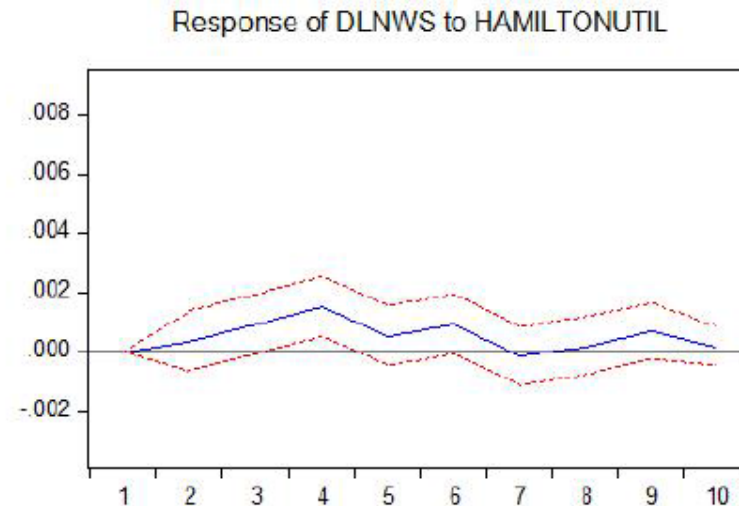
Profit squeeze becomes mostly insignificant

(a) Response of Hamilton utilization to a positive shock in Δ ln wage share

(b) Response of Δ ln wage share to a positive shock in Hamilton utilization

Ordering: Δ ln WS, ln HAMILTONUTIL (9 lags + constant);*
Utilization is measured by residuals from Hamilton regression
*Note: results using 2 lags are more similar to HP

Decomposing the wage share into the real wage (hourly compensa-tion) and labor productivity: demand becomes wage-led (using HP)

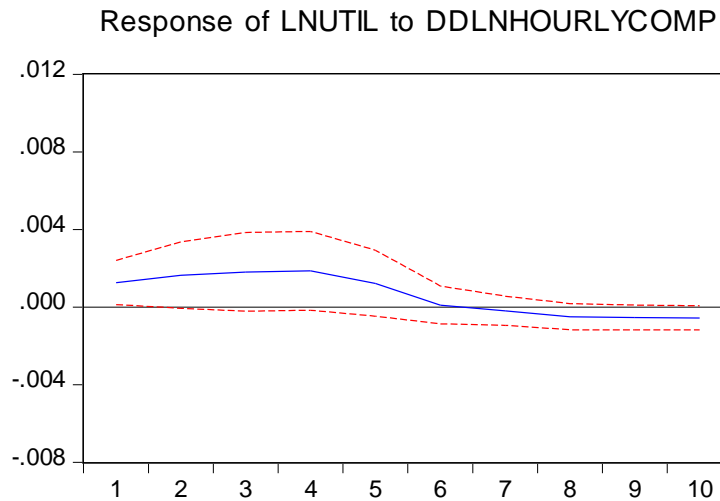Short-run positive impact of utilization (demand) shocks on productivity

Positive effects of real hourly compensation shocks on utilization (*only borderline significant*)

No evidence of a significant profit-squeeze effect

Response to Cholesky One S.D. Innovations ± 2 S.E.　　Response to Cholesky One S.D. Innovations ± 2 S.E.　　Response to Cholesky One S.D. Innovations ± 2 S.E.

Response of DLNPROD to LNUTIL

Response of LNUTIL to DDLNHOURLYCOMP

Response of DDLNHOURLYCOMP to LNUTIL

Response of Δ ln productivity to a positive shock in ln HP utilization

Response of ln HP utilization to a positive shock in ΔΔ ln real hourly compensation

Response of ΔΔ ln real hourly compensation to a positive shock in ln HP utilization
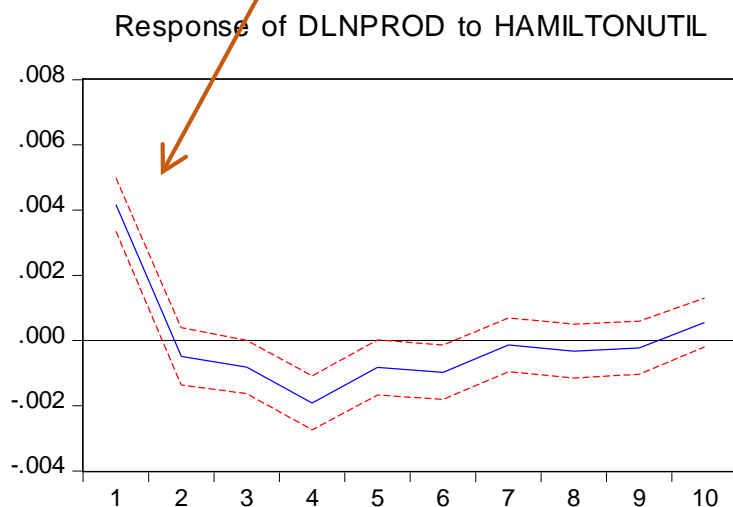
Ordering: ΔΔ ln real hourly compensation, ln HP utilization, Δ ln productivity; 4 lags + constant; sample period 1948Q3 – 2016Q4.
Some of these results are ordering-dependent. Shocks to utilization also have no significant effects on Δ ln hourly compensation.

Similar results are obtained using Hamilton: demand again becomes wage-led (but with marginal significance)

Short-run positive impact of utilization (demand) shocks on productivity

Positive effects of real hourly compensation shocks on utilization (*only borderline significant*)

No evidence of a significant profit-squeeze effect

Response to Cholesky One S.D. Innovations ± 2 S.E.

Response to Cholesky One S.D. Innovations ± 2 S.E.

Response to Cholesky One S.D. Innovations ± 2 S.E.

Response of ∆ ln productivity to a positive shock in ln Hamilton utilization
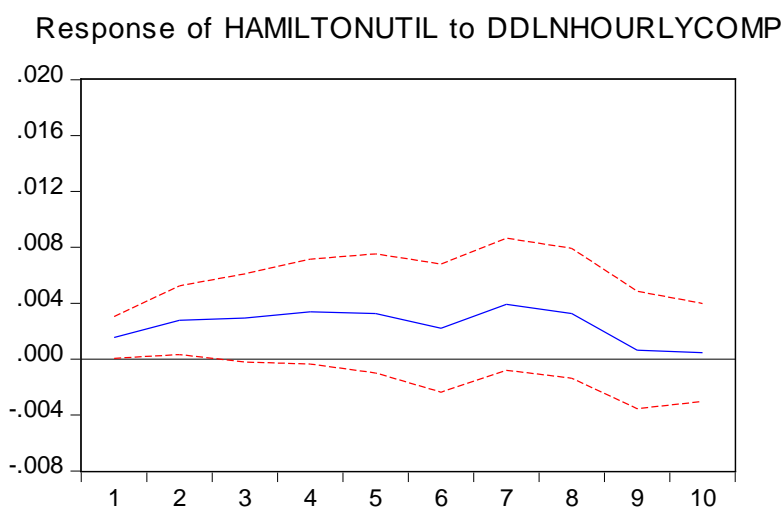
Response of ln Hamilton utilization to a positive shock in ∆∆ ln real hourly compensation

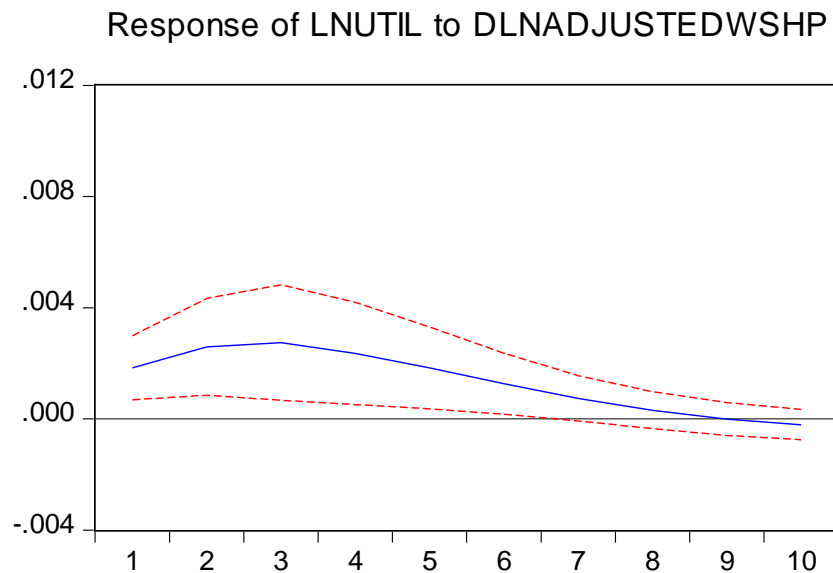Response of ∆∆ ln real hourly compensation to a positive shock in ln Hamilton utilization

Ordering: ∆∆ ln real hourly compensation, ln Hamilton utilization, ∆ ln productivity; 9 lags + constant; sample period 1952Q1 – 2016Q4.
Some of these results are ordering-dependent. Shocks to utilization also have no significant effects on ∆ ln hourly compensation.

Removing the cyclical component of productivity from the wage share also makes demand wage-led (significantly)

Using the HP utilization rate and HP filtered productivity

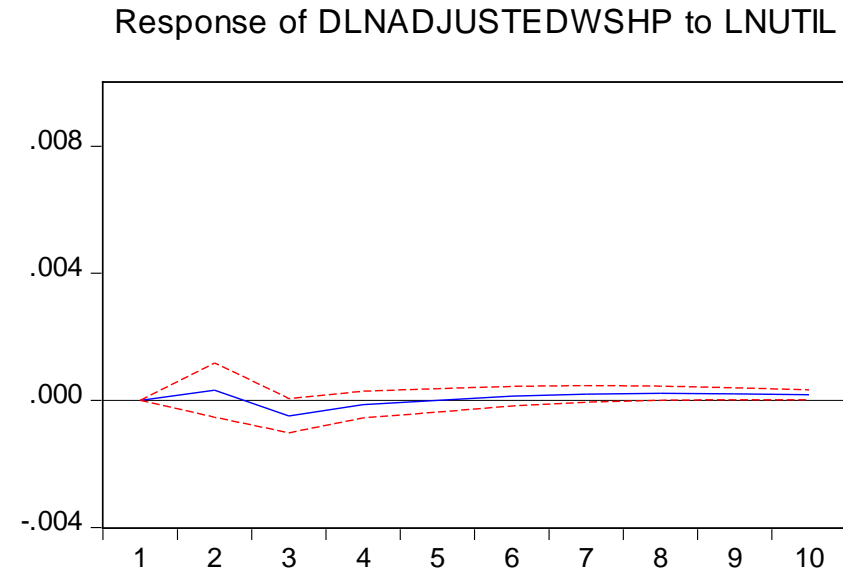Utilization responds positively to shocks to the adjusted wage share

And there is no evidence of a profit-squeeze

Response to Cholesky One S.D. Innovations ± 2 S.E.

Response to Cholesky One S.D. Innovations ± 2 S.E.

Response of LNUTIL to DLNADJUSTEDWSHP

Response of DLNADJUSTEDWSHP to LNUTIL

(a) Response of HP utilization to a positive shock in Δ ln HP-adjusted wage share

(b) Response of Δ ln HP-adjusted wage share to a positive shock in ln HP utilization

Sample period: 1947 Q4 - 2016 Q4; Model specification: 2 lags and constant term
Variable ordering: Δ ln HP-adjusted wage share, ln HP utilization, HP cyclical component of productivity
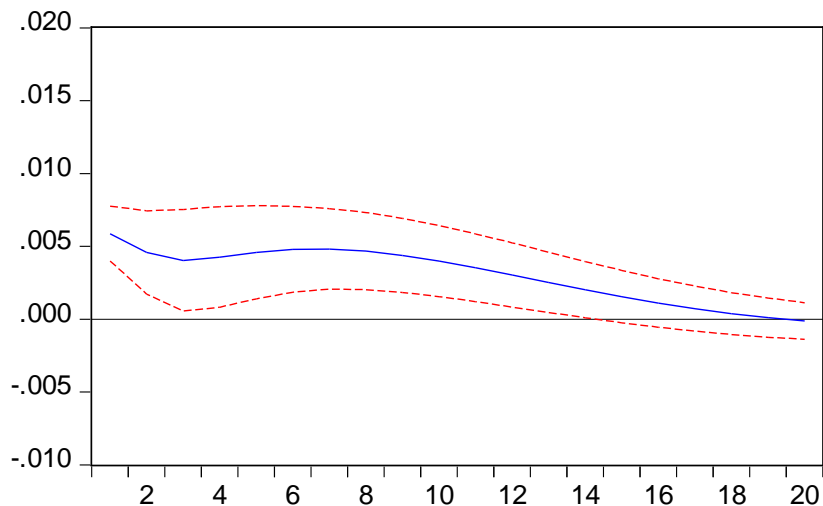
Qualitatively similar results are obtained using Hamilton instead of Hodrick-Prescott

Using the Hamilton utilization rate and Hamilton filtered productivity

Again demand is wage-led

Response to Cholesky One S.D. Innovations ± 2 S.E.
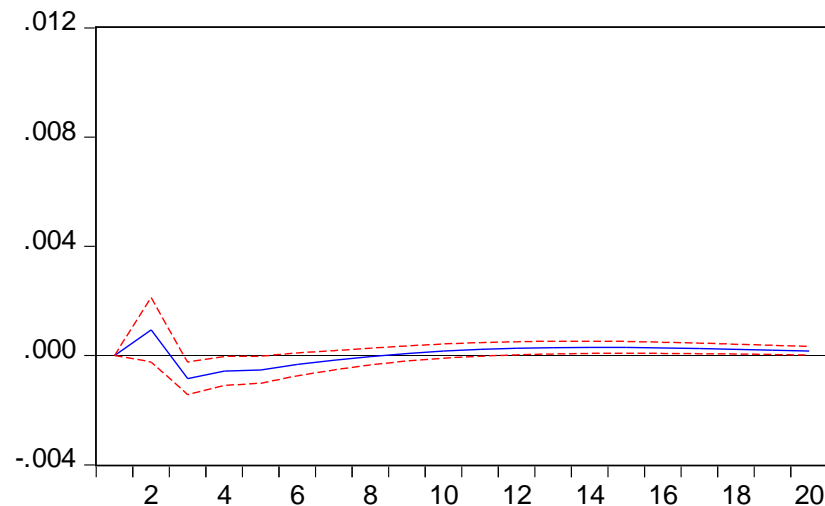
Response of HAMILTONUTIL to DLNADJUSTEDWSHAM

(a) Response of Hamilton utilization to a positive shock in Δ ln Hamilton-adjusted wage share

And there is no profit-squeeze

Response to Cholesky One S.D. Innovations ± 2 S.E.

Response of DLNADJUSTEDWSHAM to HAMILTONUTIL

(b) Response of Δ ln Hamilton adjusted wage share to a positive shock in Hamilton utilization

Sample period: 1950 Q3 - 2016 Q4; Model specification: 9 lags and constant term
Variable ordering: Δ ln Hamilton-adjusted wage share, Hamilton utilization, Hamilton cyclical component of productivity

Two alternative stories for the countercyclical rotation
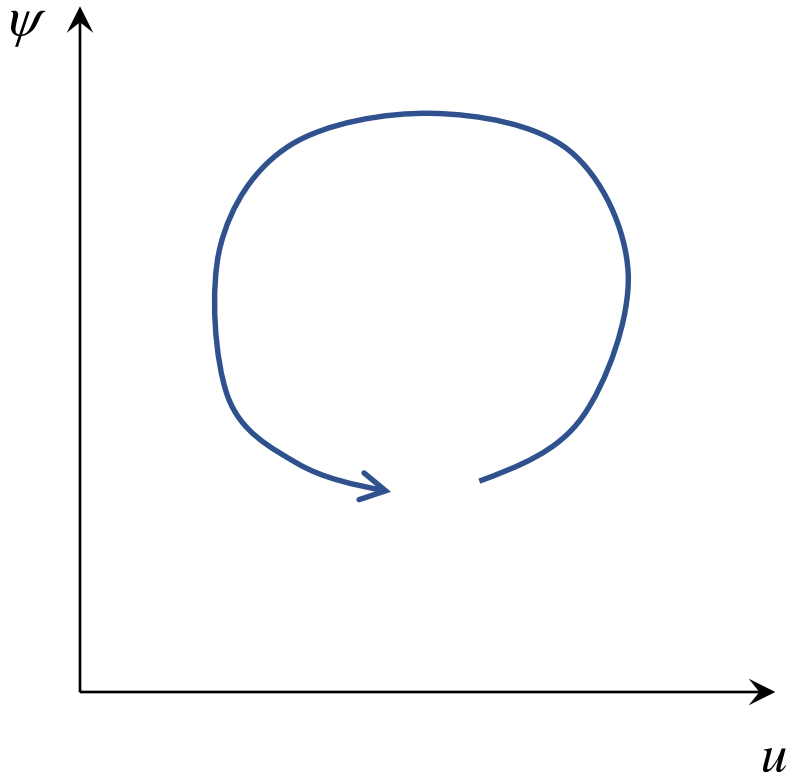
- Neo-Goodwinian profit-led/profit-squeeze:
  - In a boom, rising output and employment cause wages to rise, thus squeezing profits, which (after some lags) reduces investment and AD and causes a recession
  - In the recovery, wages are depressed, so profitability recovers, and this sparks a revival of investment and growth
  - Distributional changes (wages vs. profits) *drive* the cycles

- Alternative post-Keynesian view (Lavoie & others):
  - Demand-side shocks (financial crises, monetary policies, fiscal austerity, Harrodian instability) cause a recession; since productivity falls, the wage share rises endogenously
  - The recovery begins for other reasons (monetary or fiscal stimulus, balance sheet repair or debt relief, inventory cycles, etc.); as productivity recovers, the wage share falls
  - **The movements in the wage share are *effects* rather than causes of the cycles in utilization (as Cauvel's results show)**

Implications for future research

- The real wage (hourly compensation) is sticky in the short run
  - It does not respond to short-run demand shocks or variations as assumed in the "profit-squeeze" theory.
- We should *stop* putting so much emphasis on the wage (or profit) *share* in empirical work
  - The wage share needs to be decomposed into wages, prices, and productivity
    - Their determinants and dynamics need to be studied separately
  - What matters for investment are profit rates or cash flow, not the profit share
- Causes of distributional shifts need to be identified
  - Different causes of distributional changes may have different effects on output (utilization or growth)
    - For example, a rise/fall in markups vs. a rise/fall in labor's bargaining power

Implications for future research – *continued*

- Short-run cycles are **not** driven by changes in wages "squeezing" profits
  - Short-run variations in the wage share are due mainly to the impact of demand shocks on labor productivity
  - To explain cycles in output or utilization we need to look at monetary and fiscal policies, financial dynamics, Harrodian instability mechanisms, etc.
- *Nevertheless, falling wage shares and rising inequality may be linked to **long-term** stagnation trends*
  - *Persistent long-term stagnation can also follow a major financial crisis (Latin America 1980s; Japan 1990s, US and EU since 2008, etc.)*
  - *Long-run causality may go both ways: wages may respond to demand conditions more in the long run than they do in the short run*

Qualifications to the conclusions

- Cauvel's empirical results are preliminary and limited to the US case
  - More econometric research is needed to test the Lavoie argument more broadly
  - But *if* his results prove to be robust, then the neo-Goodwin model would be discredited
- The structural models seem to be more reliable, ***but*** they ***don't*** imply that ***all*** countries have wage-led demand in the short run
  - Smaller and more open economies (e.g. China, Mexico, Austria, Canada) may have profit-led demand in the short run because of strong net export effects
  - Although such economies could also have more wage-led demand in the long run or in response to simultaneous (global) distributional shifts

Qualifications to the conclusions

- At best, an AD relationship linked to income distribution is only one part of a complete macro model
  - Distribution is clearly endogenous – and multifaceted
- It's time to branch out beyond the current generation of distribution-and-demand studies
  - More complete models need to incorporate labor markets, firms' pricing behavior, financial dynamics, fiscal and monetary policies, exchange rates and balance of payments, household sector, etc.
- We have much more work to do, both in theory and especially in empirics and policy!