Rethinking Supply Constraints

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Overview

Recent developments have focused attention on supply constraints

- Inflation often understood in terms of aggregate demand vs supply
    - Conventional macro policy based on specific vision of supply side
    - Not the only way to think about inflation!
- Pandemic foregrounded supply constraints
    - Rapid shifts in demand
    - Supply chains, etc.
- Climate crisis framed as supply constraint
    - "Fossilflation", "greenflation"

Our proposal: Think of supply constraints in terms of speed at which economic process can adjust, rather than absolute level of output

- Better fits observable facts
- More consistent with broad Keynesian vision
- Suggests different set of policy problems

Conventional View: Potential Output

Supply constraints normally operationalized as *potential output*

- level path of aggregate output
- independent of current (demand-determined) output
- independent of composition of output
- describes long-term trend of output
- gap between actual and potential output drives policy targets — inflation, unemployment
- determined by exogenous stocks of labor, capital, productive technology (and other real resources)
- reflects productive capacity of economy
- corresponds to optimal growth path in growth models

Conventional View: Potential Output

Potential output unobservable. So constructed based on either

- Trend of output over some recent period
- Level of output at which inflation and/or unemployment are at target levels

Both are somewhat circular!

Challenges to Potential Output

1. Output fluctuations are persistent
2. Growth does not look like convergence to trend
3. Labor supply endogenous
4. Disguised unemployment
5. Production process endogenous
6. Supply constraints bind changes in composition of output

Challenges to Potential Output - 1

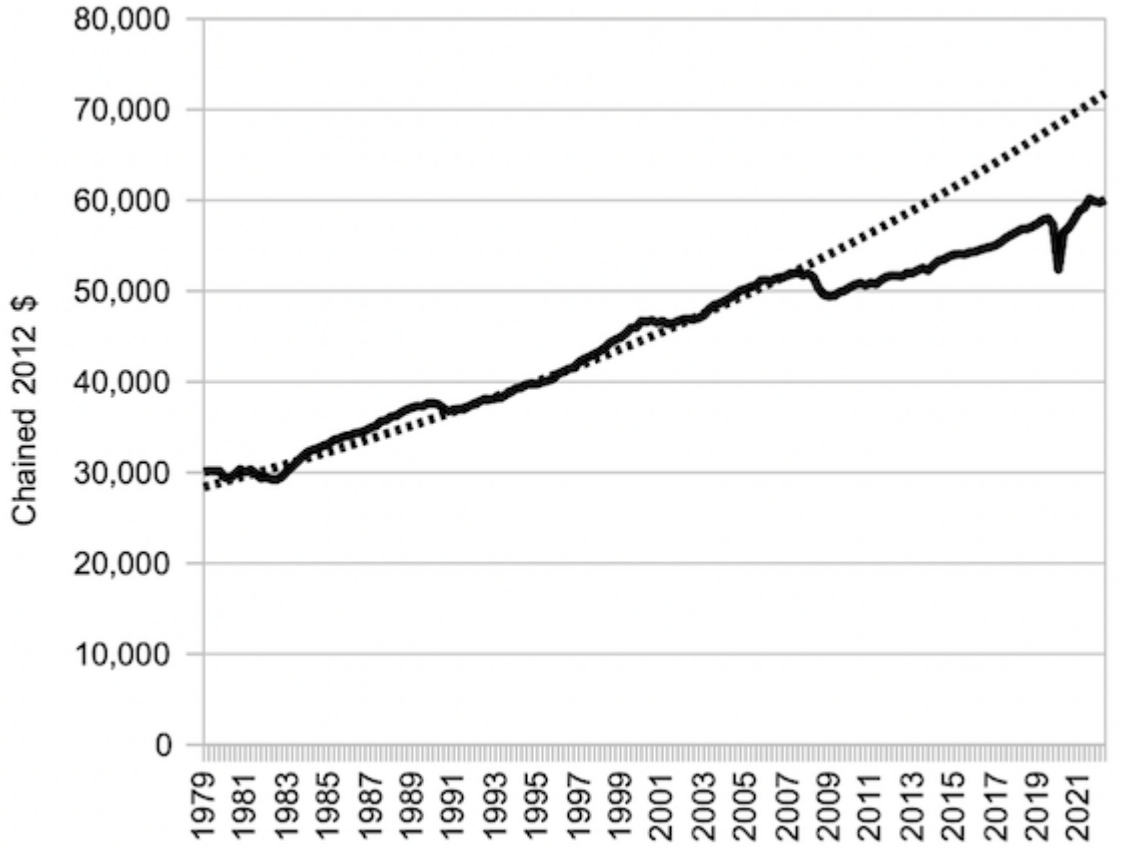
Persistent fluctuations in output

- Measured relative to either previous trend or forecasts, US GDP post-2007 showed no convergence toward earlier path
- Similar experience in most other rich countries
- Consistent with earlier research suggesting GDP fluctuations persistent

Implies either:

- Deviations in output due to supply shocks, not demand
- Shift in demand happens to coincide with shift in supply of similar magnitude
- Output remains away from potential indefinitely
- Potential adjusts toward actual output

Real Per-Capita GDP and 1947-2007 Trend

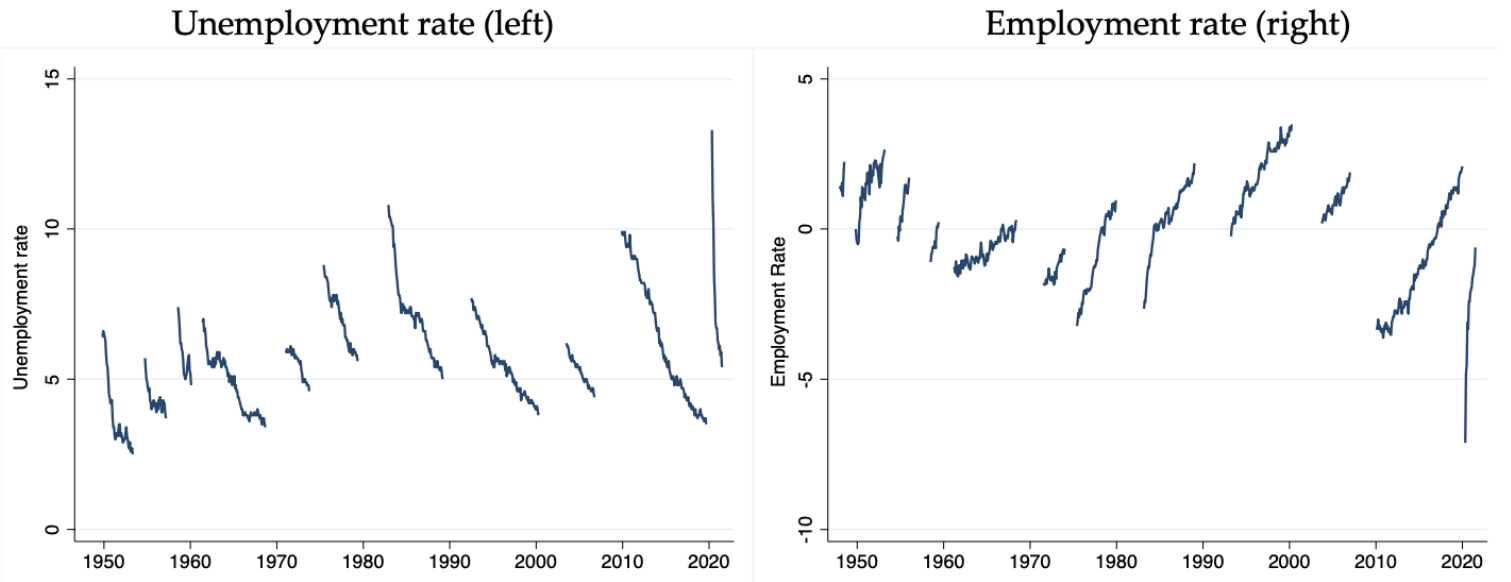


Challenges to Potential Output - 2

Steady growth in output and employment over expansions

- Convergence to trend would imply faster growth early in expansions
- In reality, employment rate rises equally fast throughout most expansions
- Suggests further growth possible in absence of recession
- If "full employment" exists, not reached in recent business cycles

Unemployment and Employment Rate Changes over Expansions

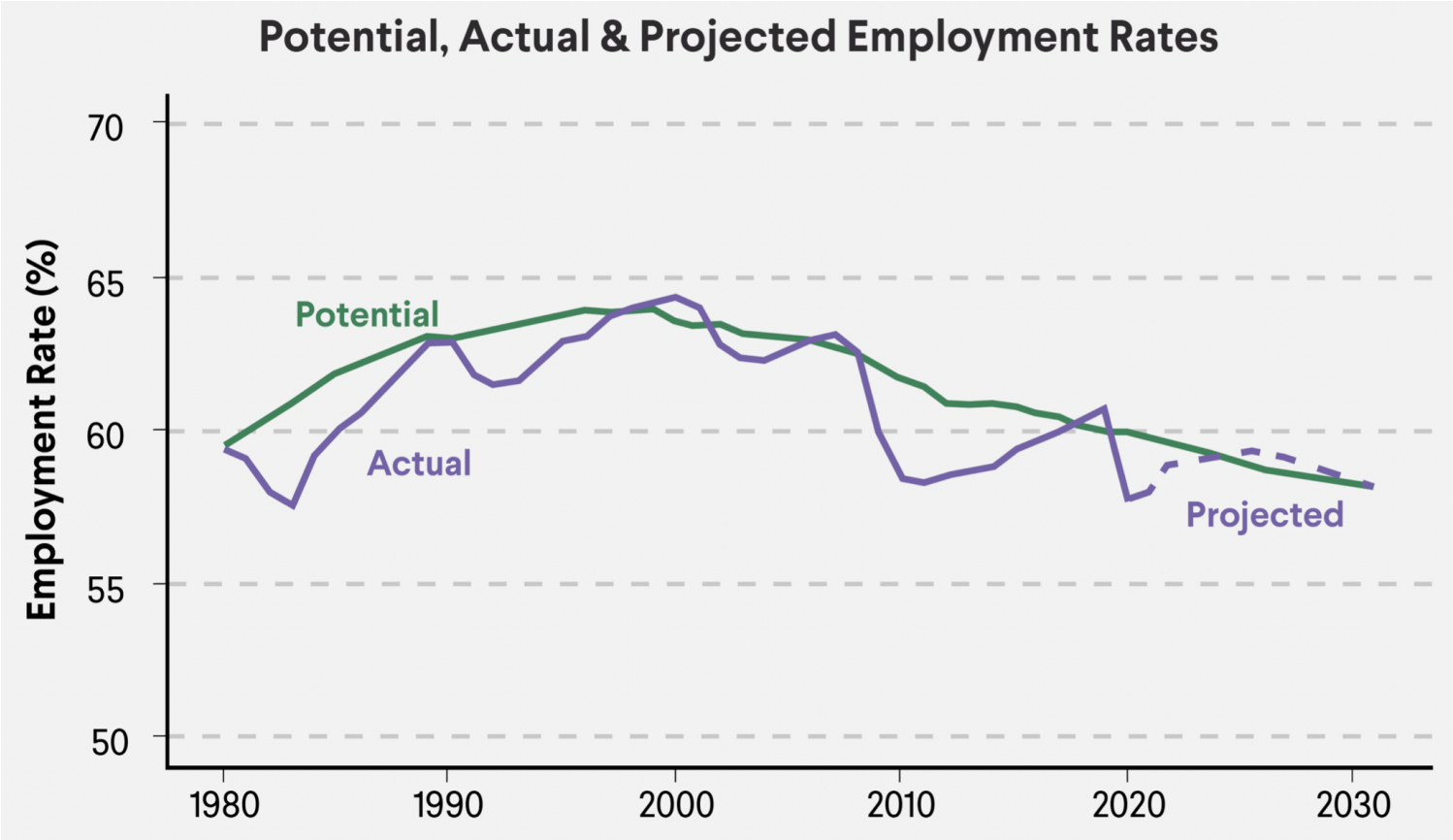


Source: Fatas 2021

Challenges to Potential Output - 3

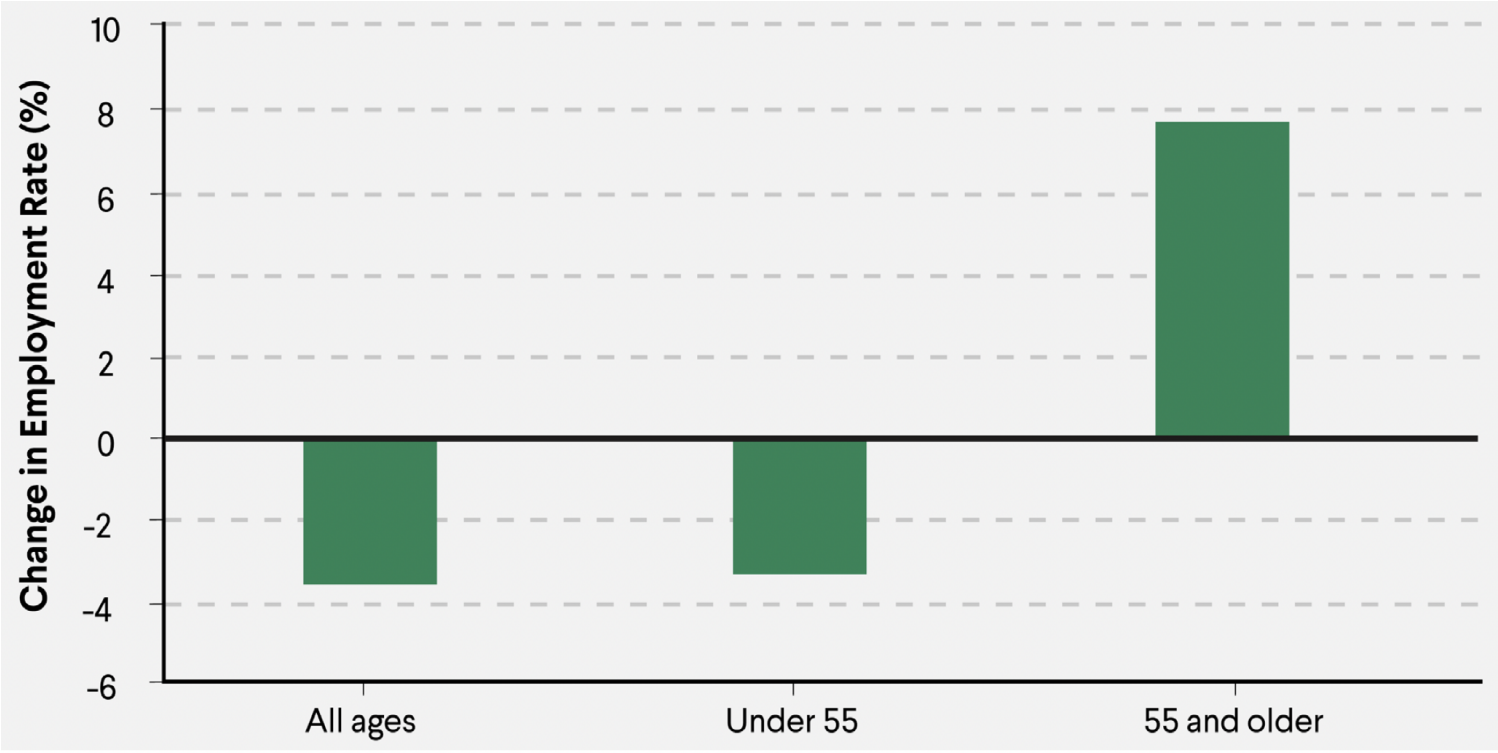
Endogenous labor supply

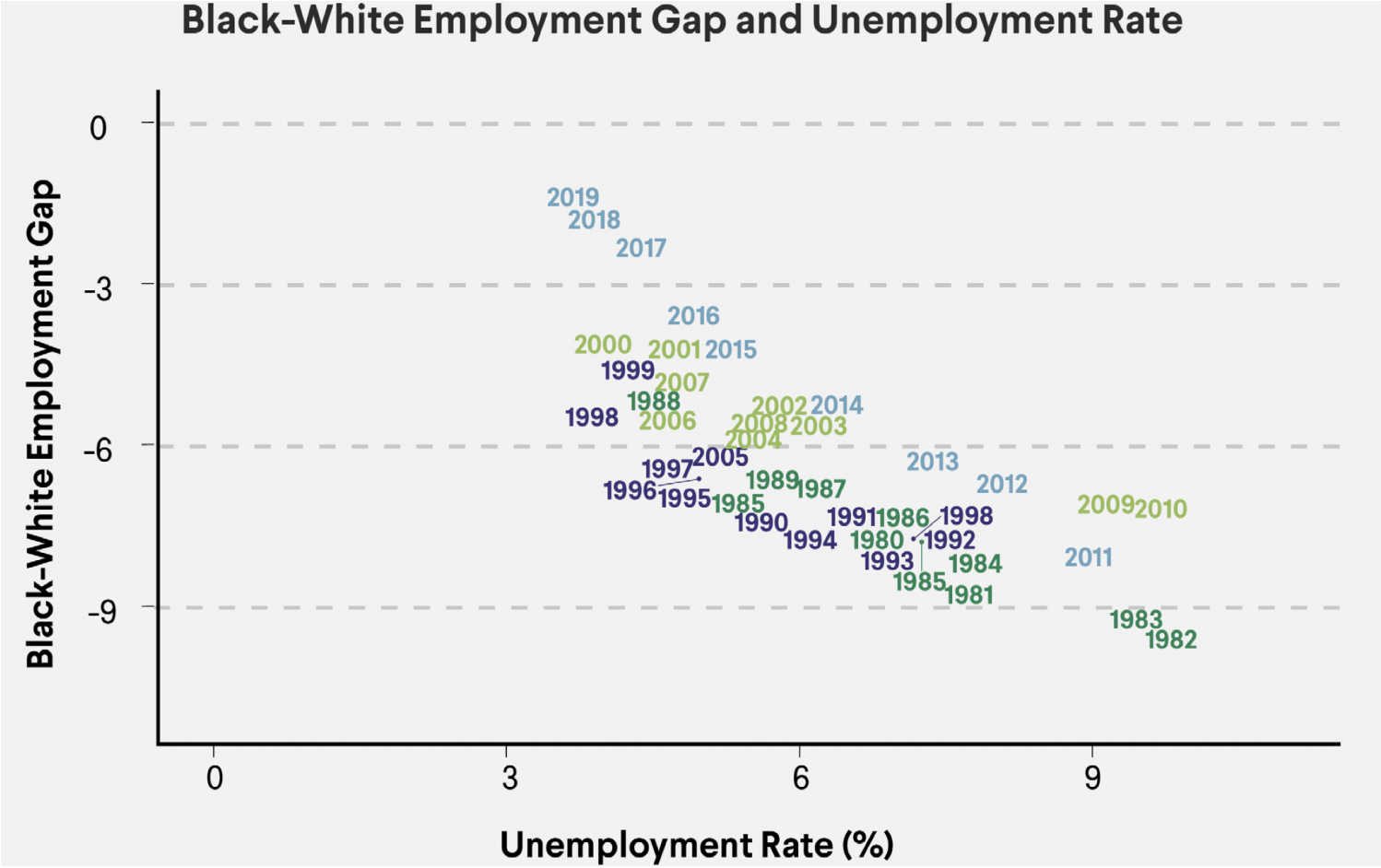
- Changes in participation rates not reducible to demographics
- Large, cyclical differences by age, sex, education, etc.
- Actual employment far short of those plausibly able, willing to work
- Micro evidence of labor-market "scarring" from recessions


Potential, Actual & Projected Employment Rates
Employment Rate (%)
70
65
60
55
50
Potential
Actual
Projected
1980
1990
2000
2010
2020
2030

Contributions of Age Group Shifts and Shares to Employment Rate Change, 2000-2020

Changes in Employment Rates, 2000-2020




Black-White Employment Gap and Unemployment Rate
Black-White Employment Gap
0
-3
-6
-9
0
3
6
9
Unemployment Rate (%)
2019
2018
2017
2016
2000
2001
2015
1999
2007
1988
1998
2006
2002
2014
2008
2003
2004
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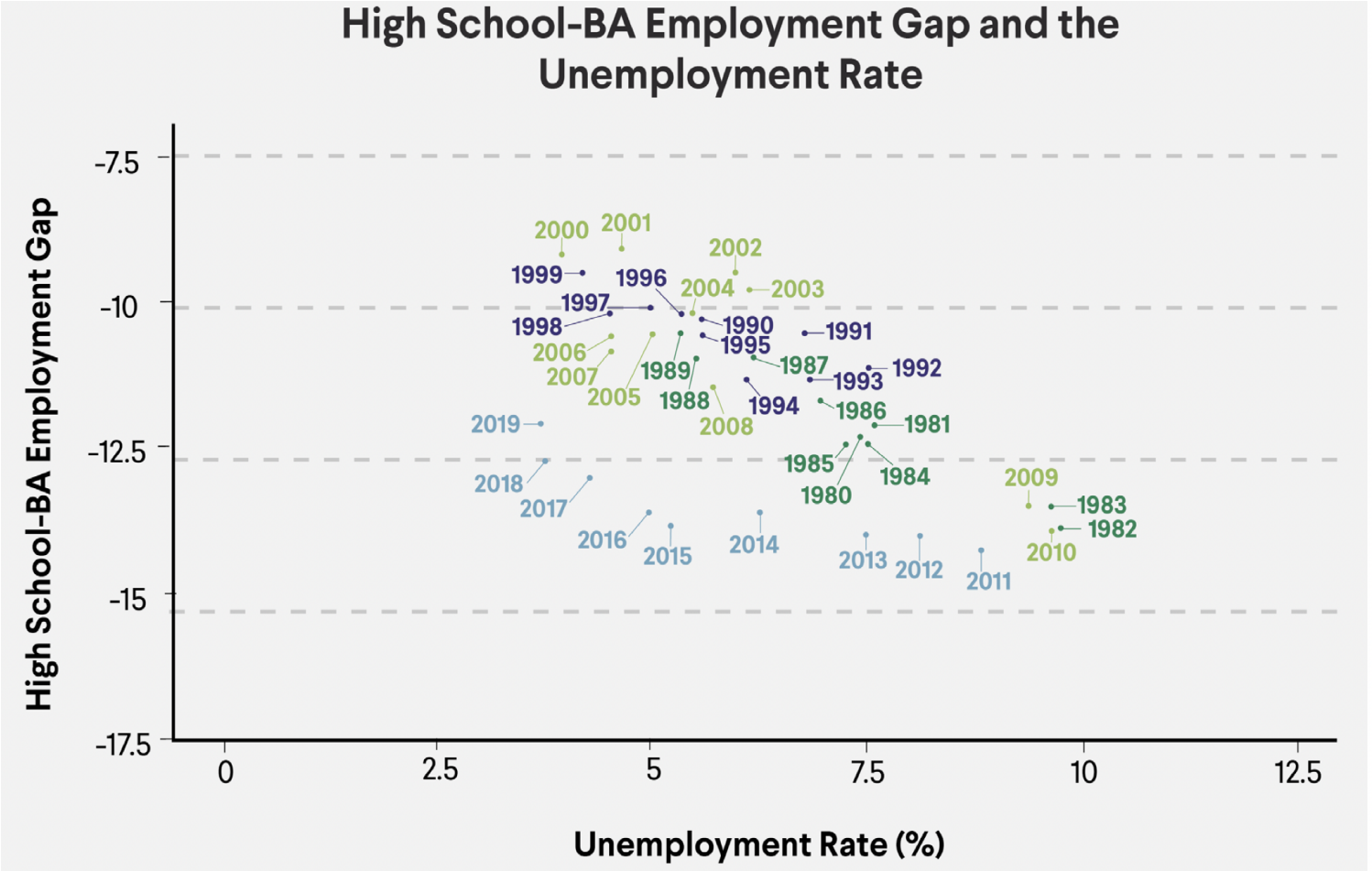
High School-BA Employment Gap and the Unemployment Rate
High School-BA Employment Gap
-7.5
-10
-12.5
-15
-17.5
0
2.5
5
7.5
10
12.5
Unemployment Rate (%)
2000
2001
2002
1999
1996
2004
2003
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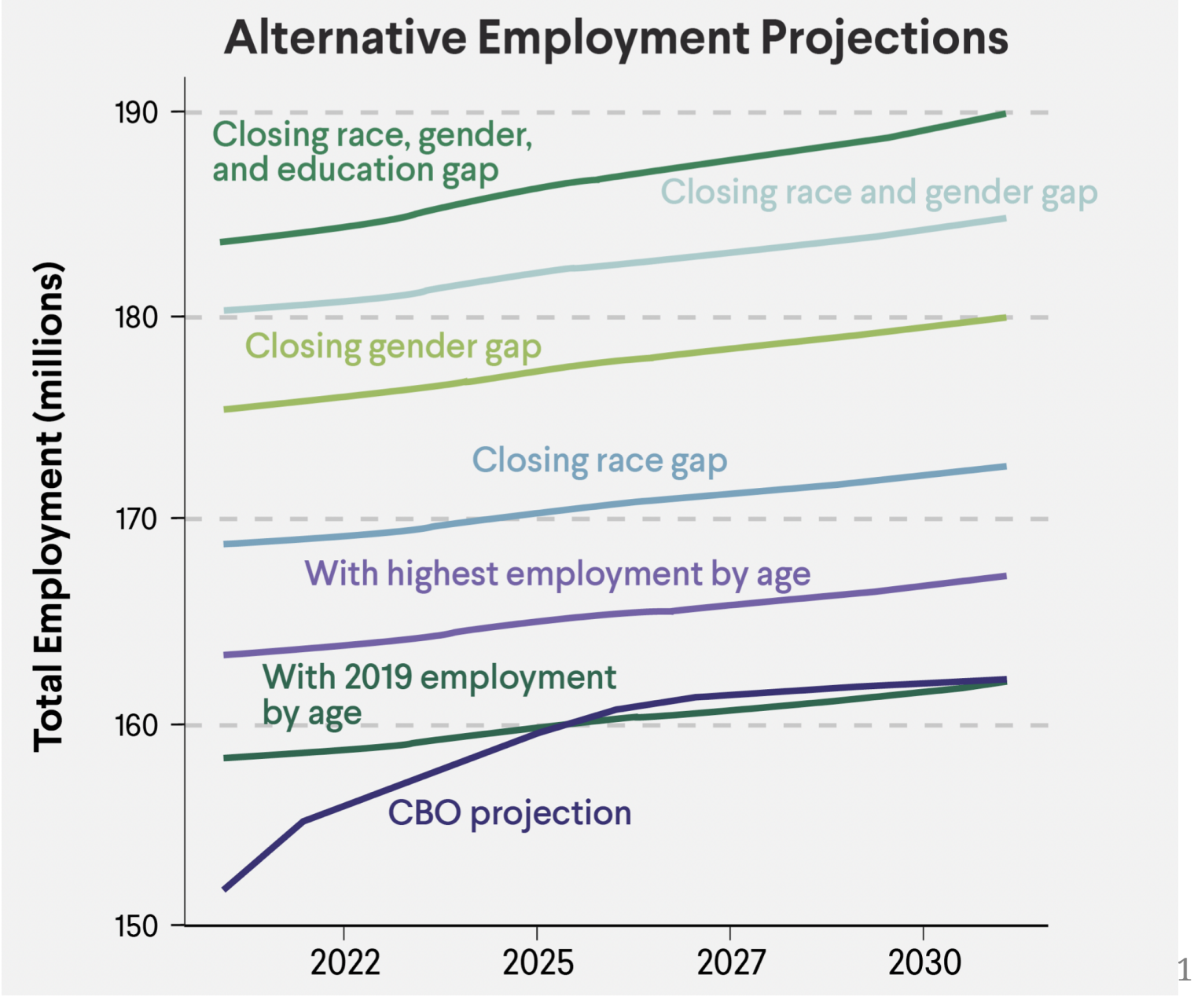

Alternative Employment Projections
Total Employment (millions)
190
180
170
160
150
2022
2025
2027
2030
Closing race, gender, and education gap
Closing race and gender gap
Closing gender gap
Closing race gap
With highest employment by age
With 2019 employment by age
CBO projection

Challenges to Potential Output - 4

Mainstream view: workers have technologically-determined marginal product

Alternative view: "Disguised unemployment" (Robinson)

Weak demand means some "employment" is in very low-productivity activity

- traditional agriculture
- self-employment, family businesses, commission work, etc.

More broadly, when tight labor markets can draw workers out of

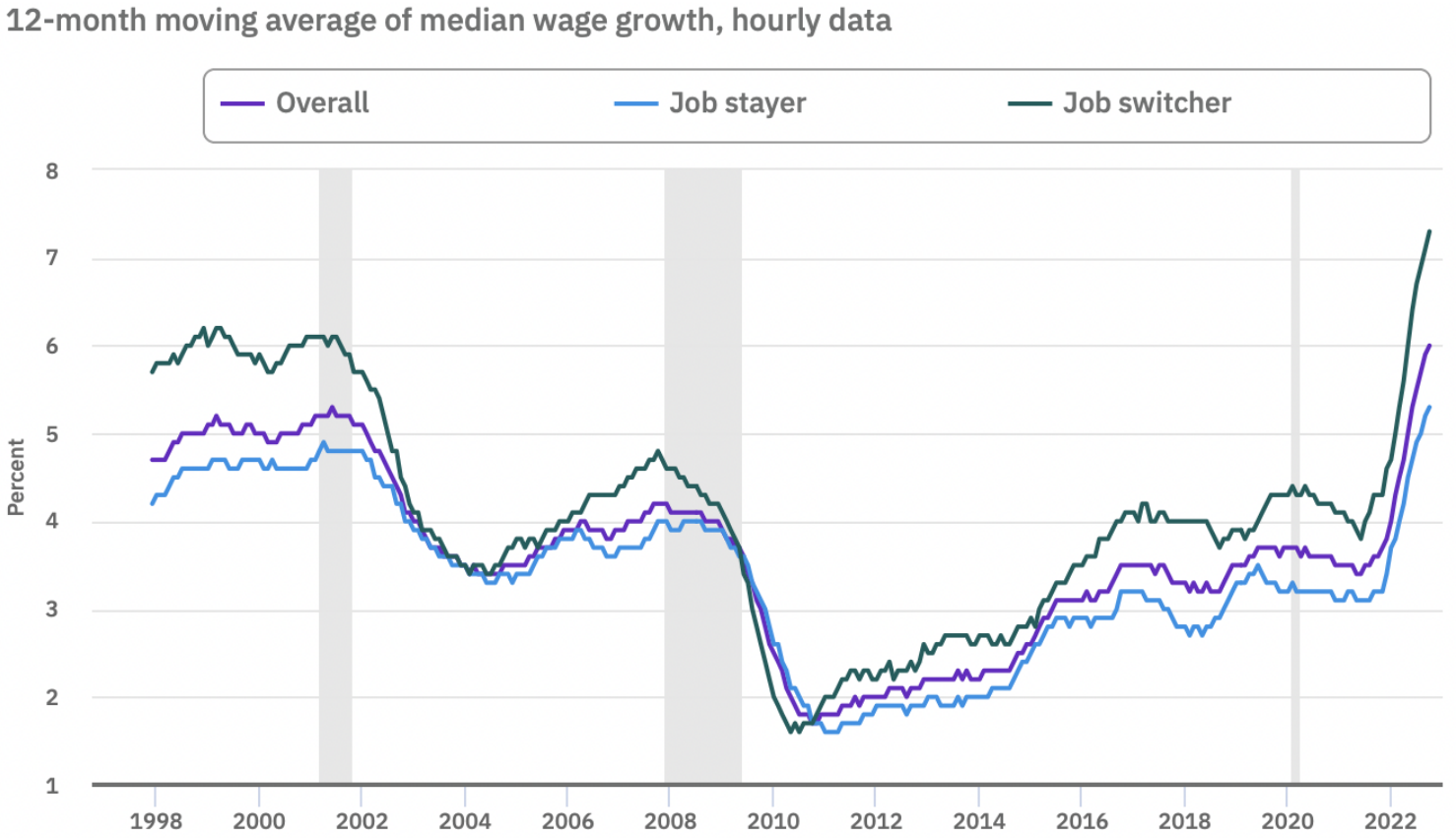
- low-wage service work
- easily mechanized jobs

Evidence?

Large, pro-cyclical wage gains to job switchers

- Tight labor markets move people from lower-to higher-paying jobs

Median annual wage growth, job switchers and non-switchers



Source: Atlanta Fed

Challenges to Potential Output - 5

Production technology is not prior to actual production

- technology embodied in concrete, specialized capital goods
- … and concrete, specialized enterprises.
- Learning by doing and increasing returns pervasive in real economies

Historical episodes of rapid growth see big increases in spending *and* qualitative transformations of production

- Industrialization
- War mobilization
- The 1990s boom in US?

Should not exclude these from our stories!

Path-dependent patterns of international specialization

Lessons from decarbonization

- rapid fall in cost of renewable energy *after* policies to encourage adoption

Challenges to Potential Output - 6

Supply constraints also limit rapid changes in *composition* of output

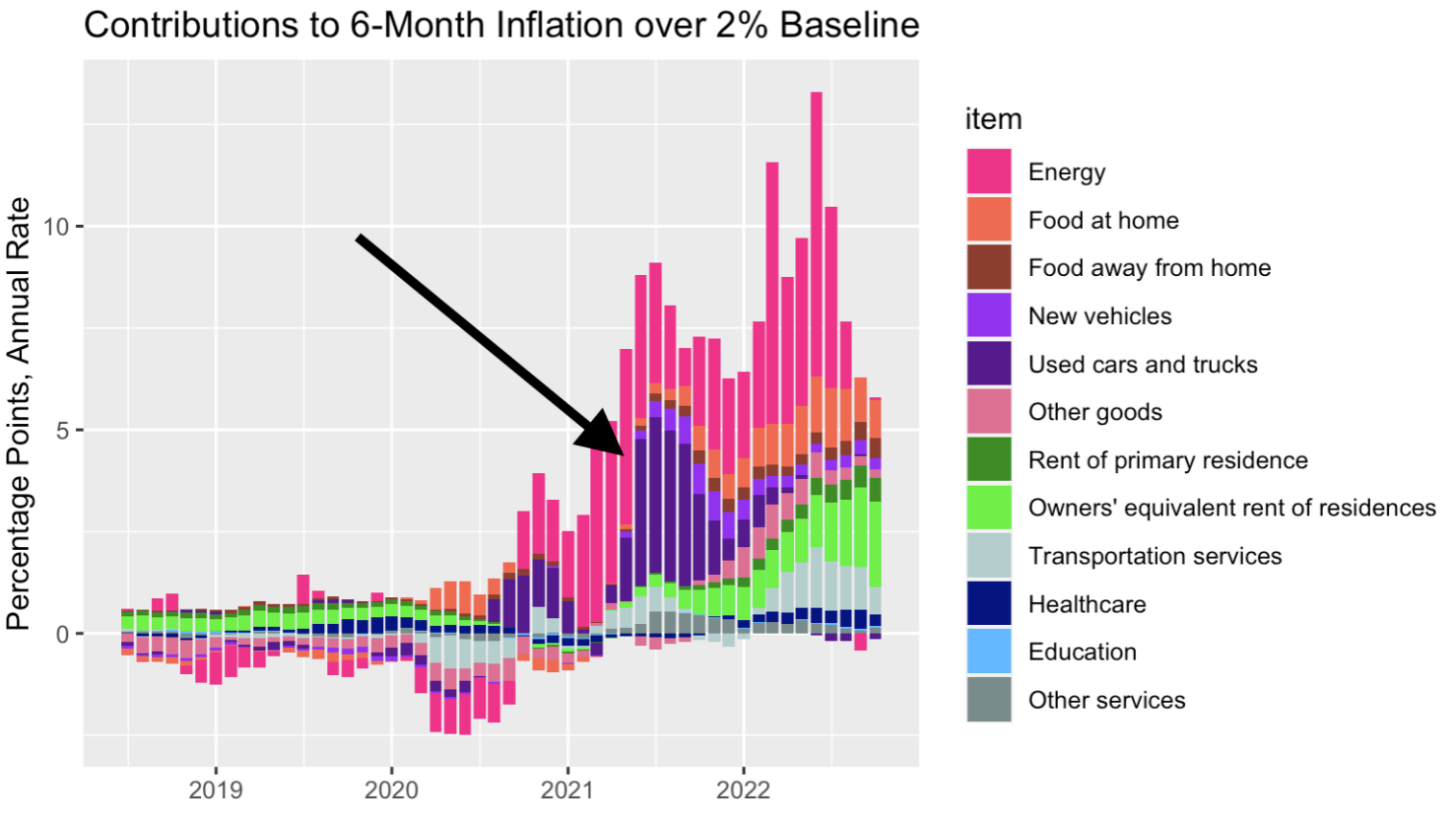
The pandemic experience:

- shift in demand from in-person services to goods
- interruption in supply of key inputs (energy, shipping)

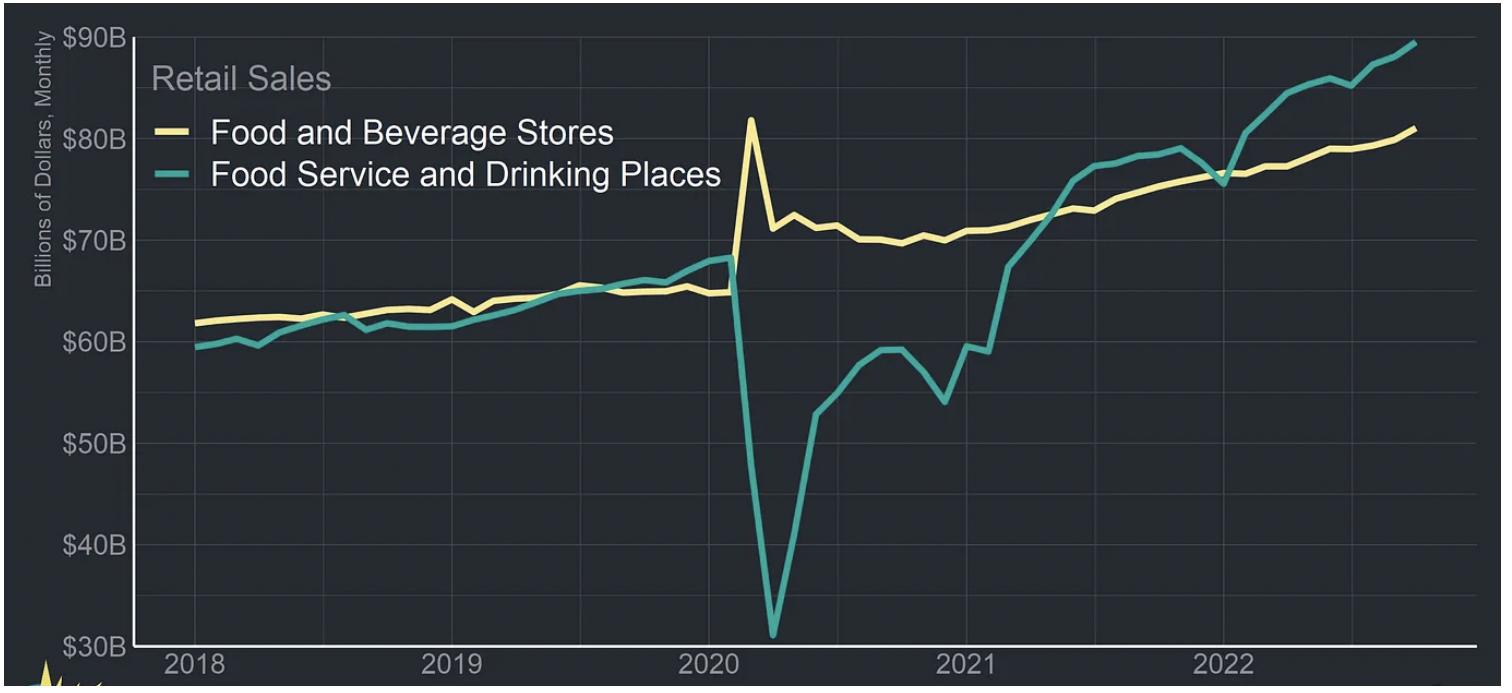
Led to disruptions to production and rise in overall price level, rather than smooth reallocation

- "micro" vs "macro" stories of inflation

Mid-2001 rise in inflation was mostly auto prices

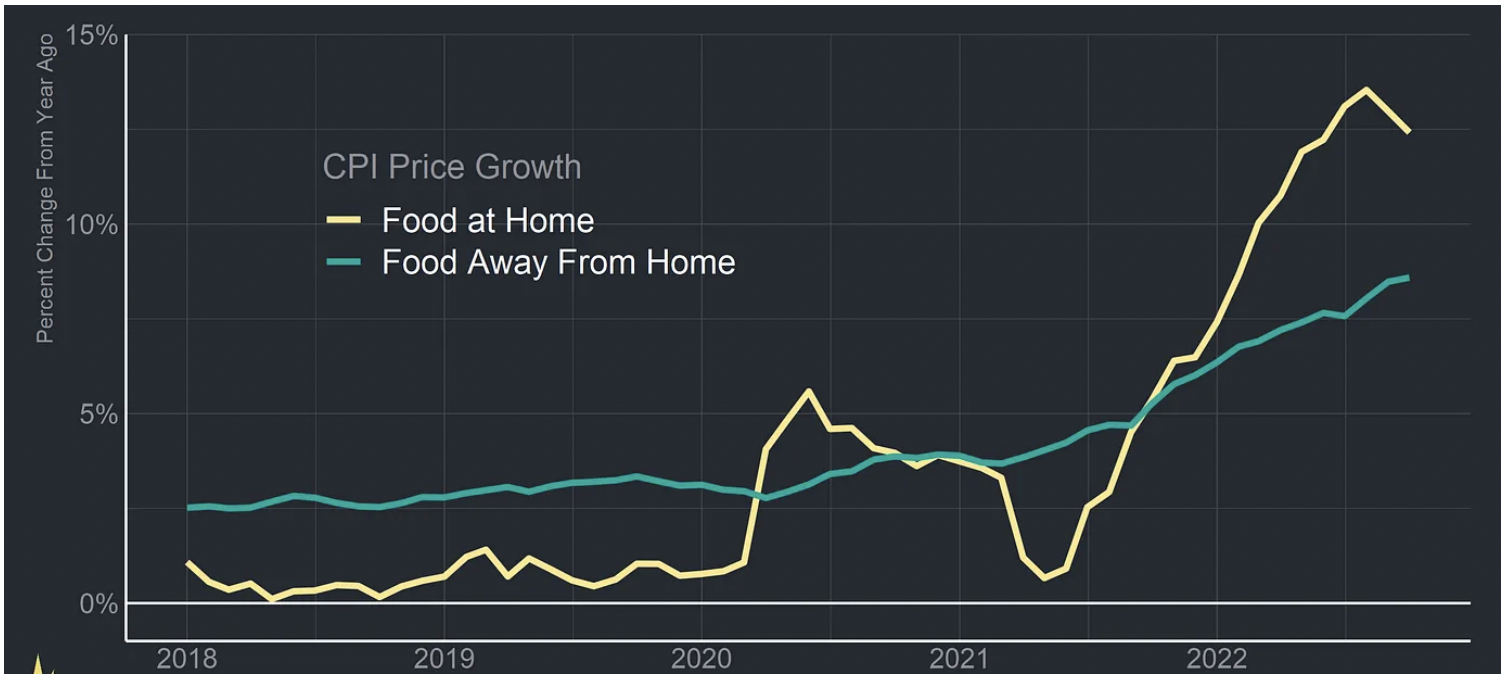


During pandemic, when spending on food away from home fell and on food at home rose...



Source: Apricitas Economics

… prices of food at home rose sharply but prices of food away from home did not fall



Source: Apricitas Economics

Does "Supply Side" Even Exist?

Yes

- rise in flow of money payments does not necessarily call forth proportionate rise in production
- independent measures of utilization broadly move with changes in output
    - unemployment
    - quits, job vacancies, etc.
    - capacity utilization
    - residential and office vacancies
- tight labor markets associated with accelerating wages and greater worker power
- rapid growth leads to rise in relative price of goods in inelastic supply
- business reports of shortages, longer delivery times, etc.
- governments pursuing rapid industrialization, war mobilization, etc. worry about physical resources, not just financial and external

Alternative View: Adjustment Costs

Supply constraints should be thought of as costs of *changing* existing organization of production

Fundamentally, reflects that

- employment and other economic relations are embedded in larger social arrangements
- production technology is embodied in long-lived, specialized capital goods and organizations
- large-scale changes in activity pose coordination problems
- real-world markets characterized by limited information and pervasive frictions

Hysteresis and Adjustment Costs

Existence of hysteresis implies potential output should be thought of as constraint on adjustment

Common formalization:

$$Y^*_{t+1} = (1+g)(Y^*_t + \alpha(Y_t - Y^*_t))$$

α is fraction of output gap carried into potential output

Orthodox case: $\alpha = 0$

Pure adjustment constraint: $\alpha = 1$

For any $\alpha > 0$:

- *Permanent* shift in level of demand leads to *transitory* output gap as output shifts to new higher or lower path
- Permanent shift in *growth* of demand Δg leads to permanent but finite output gap converging to $\frac{\Delta g}{\alpha}$

Adjustment Costs and Labor Supply

Instead of given laborforce, think of gradient of distances from employment

- short-term unemployed
- longer-term unemployed
- discouraged workers
- people who don't expect to be in paid employment
- people systematically disfavored by employers
  - non-white
  - less educated
  - criminal record
  - disabled
- immigrants

(and perhaps over longer run population growth)

No sharp line between in and out of laborforce

Tight labor markets/high wages needed to overcome frictions and bring new people into labor market

Moves in and out are persistent -- *not* a labor supply curve

Adjustment Costs and Composition Changes

Production carried out by specialized firms

Firms invest in capacity to meet normal or expected level of demand

Within normal range of utilization, constant costs

Above normal range, costs rise rapidly

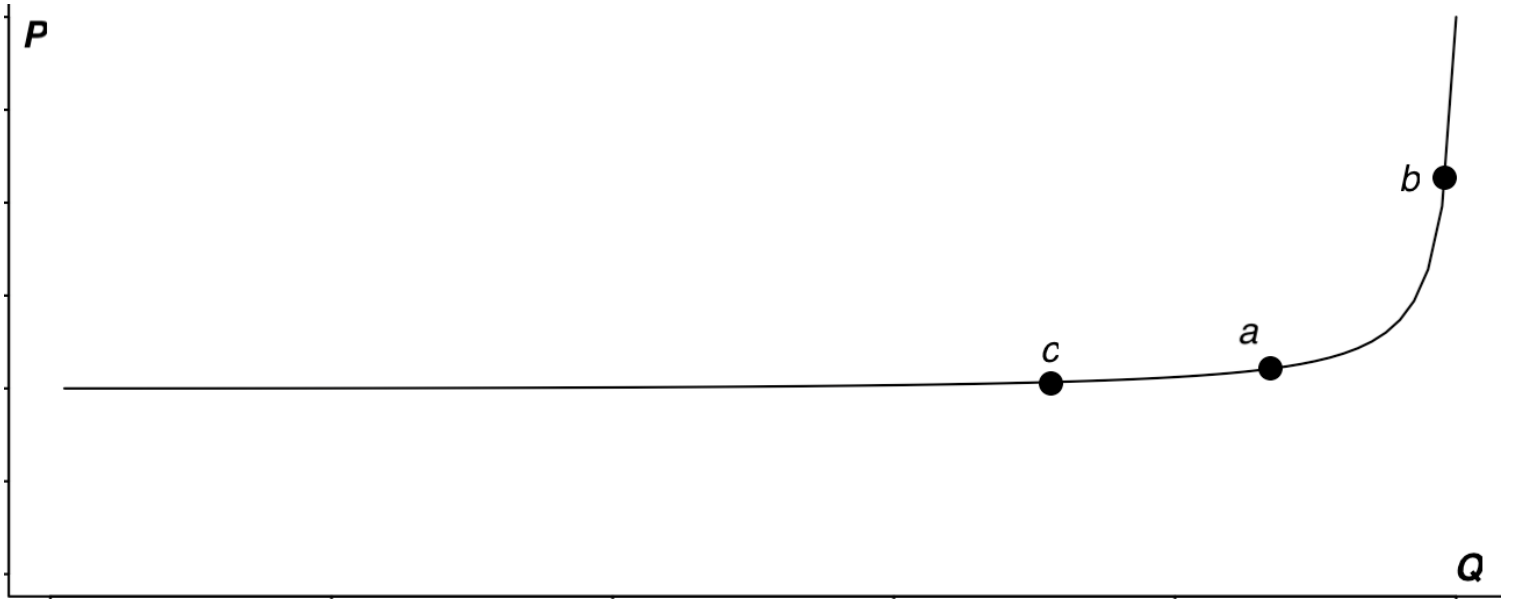
When demand falls, firms reduce Q

- with constant costs, no reason for prices to fall

When demand rises (above some threshold), firms increase P

- costly or impossible to rapidly increase production

Schematic cost curve



When demand rises, move from a to b

When demand falls, move from a to c

Adjustment Costs and Composition Changes

Sometimes claimed that changing composition leads to net rise in prices because of price inflexibility - prices and wages downwardly rigid

This is backwards.

- Labor relatively unspecialized, so no reason for wages to fall
    - noted by Sraffa (1922)
- Problem is inflexibility of *production process*
- Prices adjust much faster than real activity can
- Because output can't rise quickly in short run, shifts in demand lead to large price increases
- Rapid changes in relative prices and incomes are economically (and politically) disruptive
    - big part of what we perceive as "supply constraints"

Solution is not more flexible prices, but *limiting* large price moves in period before new capacity can come online

Implications - Observational/Empirical

- Shifts in demand have lasting effects on output and employment
    - Permanent shift in *level* of demand --> transitory output gap as potential converges to new path
    - Permanent change in *growth* of demand --> persistent constant (or convergent) output gap
- After period of positive or negative output gap, restoring target inflation and unemployment requires return to earlier *growth rate*, not earlier *trend*
- Labor force and productivity growth are positive functions of output gap (or demand growth)
- Inflation (and other signs of binding supply constraints) will also appear in response to rapid changes in composition of output
- Sectors seeing positive demand shifts will have much higher costs/prices in short run but lower in long run
- Binding supply constraints associated with large changes in relative prices and incomes

Implications - Conceptual

- Conventional picture of supply reasonable only as description of *local* adjustment
    - Current pattern of production part of historical data as much as labor, capital and technology
- Should not identify level of output that generates rising prices in short run with long-run trend or absolute resource constraint
    - Short run price moves not informative about longer run production possibilities
    - Maximum output given "real" resources not meaningful
    - Economic growth open-ended and path-dependent
    - Throw out those Solow models!
- Problem is limits to (market) coordination
    - Big changes in demand generate large price and income changes before output can adjust
    - Need to limit disruptive price changes in the short run
    - Faster growth (or reallocation) will require more extensive non-market coordination