

Discussion: The Impact of COVID on Productivity and Potential Output

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*These views expressed are those of the authors and do not necessarily reflect those of the Federal Reserve System.

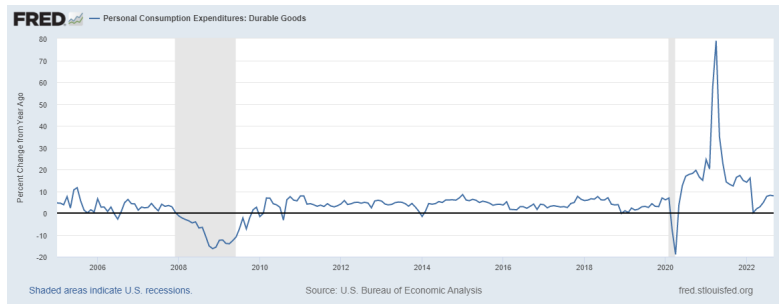
Shifts in long-run productivity growth rates

- Gordon (2016) argues that productivity growth is slowed but for periods of widespread technology adoption: electricity, internal combustion engine, internet
- Could Covid induced WFH production be that spark?
 - Hsieh and Morreti (2019) argue that spatial misallocation lowered growth by 36%
 - commuting is in some ways wasted work time (55min/day, ACS 2019)
 - Bloom and coauthors find persistence in WFH
 - Bick Blandin, Mertens (2022) finds the shift in WFH is more consistent with a one-time-adaptation than a short-term substitution
 - Kahn (2022) "Going Remote: How the Flexible Work Economy Can Improve Our Lives and Our Cities"

Shifts in long-run productivity growth rates

But shocks to:

- consumption mix/level
- nature/cost of production
- supply chains
- input costs



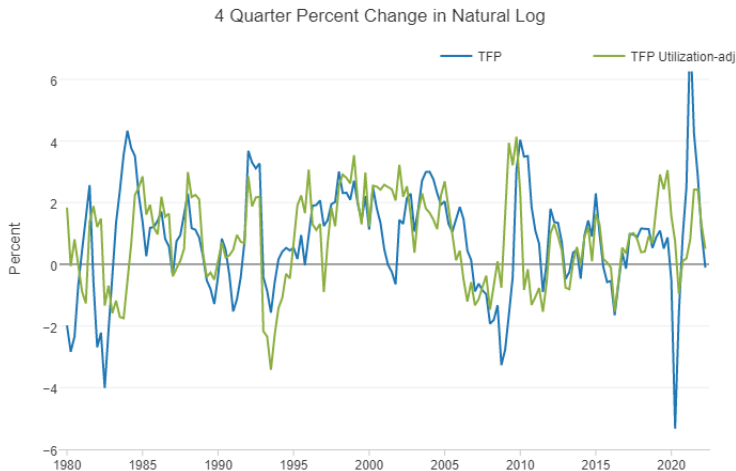
Where's the productivity?

Another Solow Paradox? "[WFH] is everywhere except for the productivity statistics."



Where's the productivity?

It depends on how you measure it



Potential output accounting

$$\Delta \ln y = \alpha \Delta \ln k + (1 - \alpha)(\Delta \ln h + \Delta \ln lc) + \Delta \ln tfp$$

- change in output y
- equals change in capital k
- hours worked h
- labor quality lc
- and the residual, tfp
- note space for dynamic capital deepening

Looking for trend breaks in productivity growth

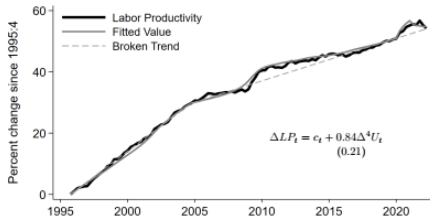
but in standard model capital/labor ratio grows at the rate of labor-augmenting technical progress

$$\Delta \ln(y) - \Delta \ln(h) = \frac{\Delta \ln(tfp)}{1 - \alpha} + \Delta \ln(lc) \quad (1)$$

- allow change in the constant term
- control for labor quantity and quality
- no obvious change in trend productivity growth

3

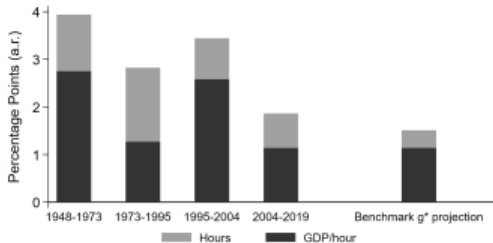
Figure 2: The procyclicality of labor productivity



Notes: Figure shows (i) the log-level of U.S. business-sector labor productivity since 1995 along with (ii) an estimated

Productivity growth regimes

Figure 3: Real GDP, hours, and productivity

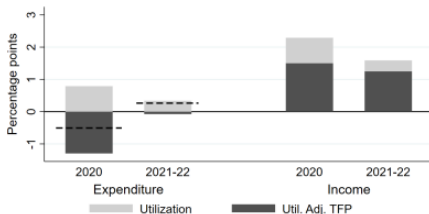


Notes: Bars show average annualized GDP growth for periods shown, decomposed into productivity (GDP per hour) and hours. GDP is the geometric average of the BEA's expenditure-side (GDP) and income-side (GDI) measures. Total economy hours are from the BLS. g* projection assumes GDP per hour grows at 2004-19 pace, and that hours grow at CBO (2022) projected 2027-32 labor-force growth (five to ten years out). Growth rates calculated as $100 \times \log$ change. Each subperiod is labeled by the first and last years of the levels data used to calculate growth rates.

Fernald (2016) regime allocation methodology

COVID Period Decomposition With Dynamic Capital Deepening

Figure 6: Utilization and utilization-adjusted TFP



Notes: Source is Fernald (2014). For each bar, the contribution of utilization and utilization-adjusted TFP sums to standard TFP growth defined implicitly in equation (1). The dashed horizontal lines show standard expenditure-side TFP growth. See also notes to Figure 4.

- 1 When you lay off a bunch of workers, the remaining workers have more capital to work with → raising productivity
- 2 if low-productive workers are more likely to be laid off, then remaining worker quality improves
- 3 The COVID era actually nests 2 periods of measures TFP
 - 1 lay off of high contact, non-essential, workers
 - 2 recovery of the those jobs

Shifting Consumption's effect on Industry Employment Share

$$\Delta \ln Y - \Delta \ln H = \sum_i w_i (\Delta \ln Y_i - \Delta \ln H_i) + \sum_i (w_i - s_i) \Delta \ln H_i.$$

COVID shifted industry employment:

- 1 low productivity industries declined, initially
- 2 high productivity industries grew, initially
- 3 this reallocation of workers obscures underlying TFP

Table 1: Decomposition of labor productivity growth by non-farm private industries

	(1) GDP	(2) Hours	(3) GDP per hour	(4) Within industry	(5) Reallocation
1. 2006 – 2019	1.74	0.88	0.86	0.98	-0.13
2. 2020 – 2022	1.27	0.18	1.10	0.91	0.18
3. 2020	-2.61	-5.13	2.52	1.33	1.19
4. 2021 – 2022	4.38	4.43	-0.04	0.58	-0.63

Notes: GDP data come from the BEA, hours data from the BLS. Units are percent changes, or percentage point contributions, at annual rates using quarterly data over the periods shown. Column (1) is the nominal-GDP-weighted average of industry real GDP growth. (2) is the hours-weighted-average of industry hours growth. (3) is the difference between columns (1) and (2). Column (4) is the nominal-GDP-weighted average of industry real GDP per hour growth. (5) is the difference between (3) and (4). Row 1 is the average from 2006Q2 (first available data) to 2019Q4; row 2 is the average from 2019Q4 to 2022Q1 (last available data); row 3 is the average from 2019Q4 to 2020Q4 (i.e., in growth rates, the four quarters of 2020); row 4 is the average from 2020Q4 to 2022Q1.

Productivity by Industry Type

- 1 group industry by WFH, high contact and manufacturing
- 2 recover sector productivity at different periods of pandemic
- 3 account for factor utilization and hour mismeasurement

Table 2: GDP per hour growth for industry groups

	(1) WFH	(2) Contact	(3) Goods
1. 2006 – 2019	1.77	0.01	1.36
2. 2020 – 2022	4.06	-1.69	0.31
3. 2020	4.31	-1.60	4.15
4. 2021 – 2022	3.87	-1.76	-2.76
5. Excess pandemic growth (row 2 minus 1)	2.30	-1.70	-1.05
6. Excess growth accounted for:	1.64	0.63	0.00
7. Changing factor utilization	0.93	0.40	-0.25
8. Off-the-clock hours mismeasurement	0.71	0.23	0.25
9. Unexplained pandemic growth (5 minus 6)	0.66	-2.33	-1.04
10. Memo: 2007 – 2010	3.14	0.53	3.85
11. Dingel-Neiman teleworkable share	0.61	0.20	0.21

Notes: Industry GDP data come from the BEA, hours data from the BLS. Units are percent changes, or percentage point contributions, at annual rates using quarterly data over the periods shown. Row 10 is average growth from 2007Q4 to 2010Q4. Row 7, changing factor utilization, is calculated from the underlying industry data in Fernald (2014). Row 8, off-the-clock hours mismeasurement, is explained in the text. Group productivity growth is the difference between Tornquist indices of output and hours. Row 11 is the hours-weighted average of industry Dingel-Neiman teleworkability. "WFH" industries are "Information; management of companies and enterprises; admin and waste management services; finance, insurance, professional scientific and technical services". "Goods" consists of "Mining, utilities, construction, and manufacturing". "Contact" industries are "Wholesale trade, retail trade, accommodation and food services, arts/entertainment/recreation; transportation and warehousing; other services except government." See also notes to Table 1.

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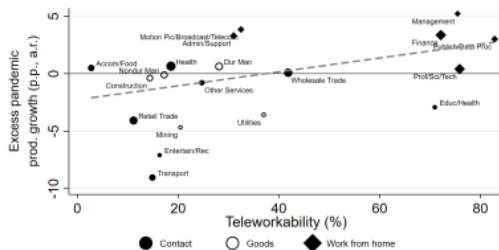
- 1 Barrero, Bloom, Davis and Meyer (2021) find increased of off-the-clock work (especially in WFH)

- 2 make level adjustment

Productivity by Industry Type

- 1 some WFH productivity can be explained by change in utilization and hours mis-measurement (Baus-Fernald-Kimball, 2014)
- 2 but contact and goods productivity looks worse when we account for this

Figure 7: Industry labor productivity growth by teleworkability



Notes: The y-axis is average annualized growth in industry real value-added per hour from 2019Q4 through 2022Q1 relative to average growth from 2006Q2 to 2019Q4. Real industry GDP data come from the BEA. All-employee hours paid come from the BLS. The x-axis is the share of employment in an industry that is teleworkable. It is an occupation-share-weighted average of the Dingel and Neiman (2020) measures of occupation teleworkability. The size of the markers represents industry nominal GDP. Industries are differentiated by groups following Gordon and Sayed (2022). The dashed line is a fitted least-squares regression line (weighted by 2019Q4 industry nominal GDP).

- how is work from home capital measured?
- "Our implicit assumption is that the utilization of home capital largely offsets having office capital idle—leaving capital in use largely consistent with what is measured"
- Total capital outlays actually look similar to forecast over time period.

- tremendous disruption in composition of employment and default measured productivity
 - location of production
 - measured hours
 - employment by industry
 - over the pandemic
- but, productivity growth *properly measured* hasn't changed much on net
- some productivity in WFH sectors, but goods and contact sectors suffering lower productivity growth