The Big Shift to Remote Work

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Outline, 1

1. The big shift to remote work/WFH
2. Why the shift will stick, including:
   • How it was catalyzed by the pandemic
   • How it was amplified by policy responses to COVID-19
3. The demography & geography of WFH
4. Some benefits of the shift to WFH
5. Good or bad for productivity & innovation?
Outline, 2

6. The shift moderates wage growth
7. WFH and the surge in business startups
8. Challenges for cities and civic leaders
9. WFH and economic resilience

These slides includes additional remarks on “Data Sources and Measurement Methods” that I will not cover – except as they come up in questions.
The Big Shift to Remote Work
Percent of Full Paid Workdays Performed at Home in the United States, Workers 20-64, 1965 to October 2022

May 2020

AHTUS = American Historical Time Use Survey

ACS = American Community Survey

SWAA = Survey of Working Arrangements & Attitudes

1965-1975 uses data from the American Historical Time Use Survey.
May 2020 - October 2022 uses data from the Survey of Working Arrangements and Attitudes.
Percent of Full Paid Workdays Performed at Home in the United States, Workers 20-64, May 2020 to May 2023

WFH days are settling at about 28 percent of all paid workdays in the U.S.

Source: SWAA data from >120,000 survey responses weighted to match the US population. Pre-covid data from the American Time Use Survey. CHPS respondents weighted to match the US population aged 20 to 64 in households with incomes above $25,000. See Barrero, Bloom and Davis (2021c) and https://wfhresearch.com/

*Pre-COVID estimate taken from the 2017-2018 American Time Use Survey
*The break in the series in November 2020 reflects a change in the survey question.
Three Types of Working arrangements, U.S. Data

Front-line employees, mostly non-college, lower pay

Professionals and managers, mostly college educated, higher pay

Specialized roles - IT support, routine HR functions, call centers, etc.

Working from Home Is Now a Global Phenomenon among Well-Educated Workers

Paid Full Days Working from Home in the Survey Week, Country-Level Conditional Means

Q: “How many full paid days are you working from home this week?”

The chart reflects country dummies in OLS regressions that control for age (20-29, 30-39, 40-49, 50-59), sex, education (Secondary, Tertiary, Graduate), 18 industry sectors and survey wave, treating the raw U.S. mean as the baseline value. We fit the regression to data for 33,091 G-SWA respondents surveyed in mid 2021 and early 2022. The “Average” value is the simple mean of the country-level conditional means. The samples exclude persons who did not finish primary school. HE = sample skewed to highly educated workers in the country.

Reproduced from Aksoy et al. (2022).

Source: Hansen et al. (2023) and WFHmap.com using Lightcast data.
Yet Another Metric: Workplace Mobility Measures
US, UK and Canada Have More WFH than Europe (ex. UK)

Workplace Trips (so the drop is a measure of WFH)
Google cellphone workplace mobility in % deviation from Jan 2020

Source: Data from Google Workplace Cellphone Mobility Data
https://www.google.com/covid19/mobility/
Deviations from the Jan 3 – Feb 6 2020.
Many other pandemic-induced shifts have largely dissipated, but WFH remains at roughly 5X its pre-pandemic level (US Data).

**Share of retail spending online, %**

**Share of days worked from home, %**

WFH is more prevalent in industries with higher shares of professional and knowledge workers – US Data from the SWAA

Current WFH: all wage and salary employees by industry

<table>
<thead>
<tr>
<th>Industry</th>
<th>Days per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information (incl. part of tech)</td>
<td>2.72</td>
</tr>
<tr>
<td>Finance &amp; Insurance</td>
<td>2.18</td>
</tr>
<tr>
<td>Professional &amp; Business Services</td>
<td>1.98</td>
</tr>
<tr>
<td>Arts &amp; Entertainment</td>
<td>1.95</td>
</tr>
<tr>
<td>Real Estate</td>
<td>1.84</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>1.69</td>
</tr>
<tr>
<td>Government</td>
<td>1.53</td>
</tr>
<tr>
<td>Construction</td>
<td>1.51</td>
</tr>
<tr>
<td>Utilities</td>
<td>1.42</td>
</tr>
<tr>
<td>Health Care &amp; Social Assistance</td>
<td>1.33</td>
</tr>
<tr>
<td>Education</td>
<td>1.31</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>0.94</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>0.77</td>
</tr>
<tr>
<td>Other Personal Services</td>
<td>0.65</td>
</tr>
<tr>
<td>Hospitality &amp; Food Services</td>
<td>0.58</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Source: U.S. Survey of Working Arrangements and Attitudes at www.wfhresearch.com
Sample: N=13,662 from April to July 2022
The Prevalence of Job Postings that Offer 1+ Day Per Week of Remote Work Varies Greatly, Even among Same-Industry Firms Recruiting in the Same Occupations

Source: Hansen et al. (2023) analysis of Lightcast data. See www.WFHmap.com for more.
Managing the New Working Arrangements: A Work in Progress

What happens when employees work on business premises less often than required by company policy?

<table>
<thead>
<tr>
<th>Action</th>
<th>Senior Managers (SBU)</th>
<th>Individual Employees (SWAA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td>13</td>
<td>31</td>
</tr>
<tr>
<td>Verbal reprimand</td>
<td>17</td>
<td>25</td>
</tr>
<tr>
<td>Negative performance review</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>Reduction in pay/bonus</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Threat to terminate</td>
<td>15</td>
<td>32</td>
</tr>
<tr>
<td>Termination</td>
<td>12</td>
<td>10</td>
</tr>
</tbody>
</table>

Notes: SWAA participants asked “How has your employer responded to employees who work on business premises fewer days than requested?” over June to September 2022 re-weighted to match US working population 20 to 64. N=17,875. www.wfhresearch.com
SBU participants asked “Currently, how does your firm deal with employees who work fewer days on business premises than required by company policy?” in September 2022 reweighted to match US firms. N=335. www.atlantafed.org/SBU
Why the Shift Will Stick, Including:

How it was catalyzed by the pandemic

How it was amplified by policy responses to COVID-19
Why the Big Shift to WFH Will Stick

1. The pandemic drove mass experimentation in WFH.
2. Experimentation generated new information and shifted perceptions about the feasibility, productivity, and desirability of WFH.
3. The shift in perceptions drove a re-optimization of working arrangements, which included a large, lasting shift to much higher WFH levels.

The **pre-conditions** for the shift were also in place: Major advances during previous decades in the technologies, infrastructure, and products that support the internet, two-way video, and other forms of remote interaction.
“If you’d said three months ago that 90% of our employees will be working from home and the firm would be functioning fine, I’d say that is a test I’m not prepared to take because the downside of being wrong on that is massive.”

– James Gorman, CEO of Morgan Stanley*

Quotation from Cutter (WSJ, 2020)
Forced Experimentation: WFH productivity during the pandemic exceeded expectations. U.S. SWAA, July 2020 to March 2021

Compared to your expectations **before COVID (in 2019)** how has working from home turned out for you?

- **Hugely better -- I am 20%+ more productive than I expected**
- **Substantially better -- I am to 10% to 19% more productive than I expected**
- **Better -- I am 1% to 9% more productive than I expected**
- **About the same**
- **Worse -- I am 1% to 9% less productive than I expected**
- **Substantially worse -- I am to 10% to 19% less productive than I expected**
- **Hugely worse -- I am 20%+ less productive than I expected**

Reproduced from Barrero et al. (2021c).
Desired and planned levels of WFH after the pandemic increase with WFH productivity surprises during the pandemic

Source: Response to the questions:

**After COVID, in 2022 and later, how often would you like to have paid workdays at home?**

**After COVID, in 2022 and later, how often is your employer planning for you to work full days at home?**

**Compared to your expectations before COVID (in 2019) how has working from home turned out for you?**

Notes: This figure shows bin scatters of worker desires and employer plans for WFH after the pandemic against WFH productivity surprises during the pandemic.

Data are from 30,750 survey responses collected from July 2020 to March 2021 and reweighted to match the share of working age respondents in the 2010-2019 CPS in a given \( \text{age} \times \text{sex} \times \text{education} \times \text{earnings} \) cell. We did not ask about productivity relative to expectations in May 2020.

The Distribution of WFH Productivity Relative to Expectations 27-Country Sample, Mid 2021 and Early 2022

WFH productivity, relative to expectations

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hugely better, 20%+</td>
<td>18.6</td>
</tr>
<tr>
<td>Substantially better - 10 to 20%</td>
<td>22.0</td>
</tr>
<tr>
<td>Better - up to 10%</td>
<td>15.8</td>
</tr>
<tr>
<td>About the same</td>
<td>31.0</td>
</tr>
<tr>
<td>Worse - up to 10%</td>
<td>6.3</td>
</tr>
<tr>
<td>Substantially worse - 10 to 20%</td>
<td>3.5</td>
</tr>
<tr>
<td>Hugely worse, 20%+</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Question: Compared to your expectations before COVID (in 2019) how has working from home turned out for you?

- Hugely better – I am 20%+ more productive than I expected
- Substantially better – I am to 10% to 19% more productive than I expected
- Better – I am 1% to 9% more productive than I expected
- About the same
- Worse – I am 1% to 9% less productive than I expected
- Substantially worse – I am to 10% to 19% less productive than I expected
- Hugely worse – I am 20%+ less productive than I expected

Sample of 19,027 G-SWA respondents in mid 2021 and early 2022 who worked mainly from home at some point during the COVID-19 pandemic.

Reproduced from Aksoy et al. (2022).
WFH Productivity Surprises Are Positive, on Average, in All Countries

**Question:** “Compared to your expectations before COVID how has working from home turned out for you?”

Country-level values are conditional means. The “Average” value is the simple mean of the country-level conditional means.

Reproduced from Aksoy et al. (2022).
Planned levels of WFH after the pandemic rise with WFH productivity surprises during the pandemic

This pattern holds in all 27 countries. See appendix to Aksoy et al. (2022).

Questions:
-- Compared to your expectations before COVID, how has working from home turned out for you?
-- After COVID, in 2022 and later, how often is your employer planning for you to work full days at home?

Vertical scale: How many days per week, on average, employers plan for respondents to WFH after the pandemic ends.

N = 18,455 individual-level observations in 27 countries.
The foregoing evidence provides powerful support for a three-part explanation of how and why the pandemic catalyzed a large, lasting uptake in WFH:

1. The pandemic drove a mass, compulsory experiment in WFH.
2. Mass experimentation generated new information and shifted perceptions about the feasibility and productivity of WFH.
3. The shift in perceptions drove a re-optimization of working arrangements, which included a large, lasting shift to much higher WFH levels.

The pre-conditions for the shift were also in place: Major advances during previous decades in the technologies, infrastructure, and products that support the internet, two-way video, and other forms of remote interaction.
Discussion, 2

This explanation and supporting evidence do not imply the big shift to WFH raised productivity. To see this point, consider a simple example:

• Before the pandemic, suppose all workers and their employers perceive WFH to be 10 percent less productive than onsite work.

• Suppose, as well, that all workers are willing to accept a 5 percent pay discount to WFH, in line with evidence presented below. No one works from home in these circumstances, because the perceived productivity loss exceeds the willingness to pay. Now consider what happens in reaction to a pandemic that forces employers and workers to WFH for weeks or months.

• Based on experiences during the pandemic, suppose half of workers (and their employers) learn that WFH is about as (un)productive as expected, while the other half learns it is $\Delta$ percent more productive than expected.
Discussion, 3

Three cases:

i. When $0 < \Delta < 5$, WFH levels return to zero after the pandemic ends. In this case, the positive productivity surprise is too small to trigger a lasting change in working arrangements.

ii. When $5 < \Delta < 10$, half of workers stick with WFH after the pandemic ends, because they now face a productivity discount of only $10 - \Delta$ percent, which is smaller than their willingness to pay to WFH.

• In this case, the productivity surprise triggers a lasting shift to WFH and a productivity fall of $\left(\frac{1}{2}\right)(10 - \Delta)$ percent.

• For example, if the pandemic leads half of workers to conclude that WFH is only 2 percent less productive than onsite work ($\Delta = 8$), then economy-wide productivity falls 1 percent.
iii. When $\Delta > 10$, the productivity surprise drives a lasting shift to WFH and a productivity rise of $\left(\frac{1}{2}\right)(\Delta - 10)$ percent.

Thus, when forced experimentation leads to a lasting shift to WFH, it can bring higher or lower productivity.

In some preliminary analysis that draws on data for the United States, Barrero et al. (2021) estimate that the lasting shift to WFH raised the economy-wide level of labor productivity by about 1 percent. The productivity effect could be larger or smaller in other countries, and it could well be negative in some countries. Indeed, it could be negative in some industries and regions within the United States, even if it’s positive on average.
Our explanation for the big shift also addresses another question: If WFH is now attractive for many employees and organizations, why did the shift not happen sooner and more gradually?

**Answer:** The full benefits of WFH went unrecognized and unrealized before the pandemic drove a sudden, huge surge in experimentation that led to major revisions in perceptions about the feasibility and productivity of WFH.

The *simultaneity* of large-scale experimentation is important in this regard. A law firm, for example, could have experimented with WFH before the pandemic. What it could not have done was experiment with WFH when the courts and other firms—including clients, rival law firms, consultants, and suppliers—also worked remotely.

Had the pandemic not occurred, our evidence suggests that the big shift to WFH would have taken place much more slowly over many years.
Why the Big Shift to WFH Sticks: Fuller Explanation

1. Mass experimentation $\rightarrow$ learning and revision of prior views $\rightarrow$ re-optimization of working arrangements
2. Investments in time, equipment, systems, processes, and management practices that enable and improve WFH
3. A surge in innovation that supports WFH
4. Attitudinal shifts: Stigma around WFH plummeted. Infection risks became more salient, raising the desire to WFH
5. Stricter, longer lockdowns during the pandemic $\rightarrow$ higher levels of planned WFH after the pandemic

The rise of the internet, emergence of the cloud, and advances in two-way video technologies before the pandemic created the conditions that made possible a big, abrupt shift to remote work.
Investments in time, equipment, systems, processes, and management practices have enabled and entrenched WFH

- The pandemic prompted firms to invest in new equipment and new technologies that support remote work (Riom and Valero, 2020, and Eberly et al., 2021)
- Barrero et al. (2021c) quantify capital investments at home in response to the pandemic and worker time devoted to learning how to WFH. They estimate the value of these pandemic-induced investments at 0.7 percent of a year’s GDP.
- Criscuolo et al. (2021) and Riom and Valero (2020) present evidence that firms adopted new managerial practices to support WFH in reaction to the pandemic.
- Bloom, Davis and Zhestkova (2021) find that, in the wake of the pandemic, new patent applications shifted toward technologies that support WFH and remote interactions more generally.
- All of these various investments in equipment, skills, technologies, and managerial practices create durable forms of capital and knowledge that improve performance in the WFH mode now and in the future.
COVID-19 Shifted Patent Applications to Technologies that Support WFH

When the market for WFH-related products and services suddenly expanded five-fold, it triggered an acceleration of new technologies that support WFH and remote interactions.

Examples: better AV, better remote collaboration tools

This surge in innovation efforts will likely lead to ongoing improvements in the relative performance of WFH and remote interactions.

Question: “Since the COVID pandemic began, how have perceptions about WFH changed among people you know?” Response options and assigned index values: Improved among almost all (95%), most (70%) or some (25%), No change (0%), and Worsened among almost all (-95%), most (-70%) or some (-25%).

The chart reports regression-adjusted conditional means. We fit the regression to data for 36,078 G-SWA respondents surveyed in mid 2021 and early 2022.

Reproduced from Aksoy et al. (2022).
Long Social Distancing: 12% of U.S. respondents say they plan no return to pre-COVID activities after the pandemic ends, and another 44% plan less than a complete return.

The sample includes respondents from the February 2022 to January 2023 SWAA waves. The SWAA samples US residents aged 20 to 64 who earned $10,000 or more in 2019 or 2021. (In January, February, and March 2022 we randomized across the two years and asked about the prior year starting with the March 2022 survey.)

N = 62,751.

Note: Long Social Distancing intentions are slowly waning, according to SWAA data, suggesting that their effects are also waning and will continue to do so. That is what we find in our analysis of labor force participation behavior.

Reproduced from Barrero et al. (2022).
**Notes:** The sample includes respondents who are employed or unemployed and who are able to work from home (as revealed by having done so during the pandemic) in the February 2022 to January 2023 waves of the SWAA. The Current Amount of Working from Home is based on responses to “Currently (this week) what is your work status?” “For each day last week, did you work a full day (6 or more hours), and if so where?” N = 36,278.

Reproduced from Barrero et al. (2022).
How have societal experiences during the pandemic (deaths, lockdowns) influenced WFH levels?
Do National Differences in Pandemic Experiences Affect Planned WFH Levels in the Post-Pandemic Economy?

• We use regression models to investigate how national (and regional) pandemic experiences affect employer plans re WFH in the post-pandemic economy and other outcomes.

• We focus on the role of pandemic severity, as measured by cumulative COVID deaths per capita, and the cumulative severity and duration of government-mandated lockdown measures.

• We measure cumulative COVID deaths per capita through the end of the month before the survey wave. Data on COVID deaths are from the Johns Hopkins Coronavirus Resource Center at https://coronavirus.jhu.edu.

• To measure cumulative lockdown stringency to date, we draw on the widely used data described in “Oxford COVID-19 Government Response Tracker.” See Hale et al. (2021) for a description of the data, which are available at www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker.
Do National Differences in Pandemic Experiences Affect Planned WFH Levels in the Post-Pandemic Economy?

• For each country (or region), we construct an index that combines the severity and duration of government restrictions on commercial and social activity, following the approach in Baker et al. (2022). We first compute the monthly Lockdown Stringency Value for country $c$ in month $t$ as:

$$LSI_{ct} = \text{Max}\{SIPO, (3/4)BCO + (1/4)SCO\}$$

where SIPO = 1 when a shelter-in-place order is in effect, 0 otherwise; BCO = 1 when a broad-based business closure order is in effect; and SCO = 1 when schools are closed. These indicator variables can take fractional values when an order is in effect part of the month or part of the country in question. Second, for any given country, we cumulate the Lockdown Stringency Values from March 2020 through the month before the survey wave.
Table 2. Current and planned levels of WFH rise with the cumulative stringency of government-mandated lockdowns

<table>
<thead>
<tr>
<th>Outcome</th>
<th>(1) Current WFH days per week</th>
<th>(2) Desired WFH days per Week</th>
<th>(3) Planned WFH days per Week</th>
<th>(4) Amenity value of option to WFH 2-3 days a week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Lockdown Stringency</td>
<td>0.204** (0.078)</td>
<td>0.085 (0.057)</td>
<td>0.136*** (0.047)</td>
<td>0.363 (0.418)</td>
</tr>
<tr>
<td>Cumulative COVID-19 deaths per capita</td>
<td>-0.005 (0.086)</td>
<td>0.044 (0.059)</td>
<td>-0.039 (0.056)</td>
<td>0.263 (0.299)</td>
</tr>
<tr>
<td>Observations</td>
<td>33091</td>
<td>36078</td>
<td>34875</td>
<td>36078</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.098</td>
<td>0.069</td>
<td>0.086</td>
<td>0.057</td>
</tr>
</tbody>
</table>

Column (3): Two standard deviation increase in CLS is associated with 0.27 more planned WFH days after the pandemic, which equals 38% of the average planned WFH days.

Note: All regressions control for log real GDP per capita, gender, 4 age groups, 3 education groups, 18 industry sectors, and wave effects. COVID deaths and lockdown stringency measures are standardized to zero mean and unit standard deviation across countries. Errors clustered at the country level.
Table 3. Current and planned levels of WFH rise with the cumulative stringency of government-mandated lockdowns, adding controls for cumulative mask mandates

<table>
<thead>
<tr>
<th>Outcome</th>
<th>(1) Current WFH days per week</th>
<th>(2) Desired WFH days per Week</th>
<th>(3) Planned WFH days per Week</th>
<th>(4) Amenity value of option to WFH 2-3 days a week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Lockdown Stringency</td>
<td>0.174* (0.092)</td>
<td>-0.000 (0.064)</td>
<td>0.135** (0.055)</td>
<td>0.119 (0.472)</td>
</tr>
<tr>
<td>Cumulative COVID-19 deaths per capita</td>
<td>-0.002 (0.085)</td>
<td>0.052 (0.046)</td>
<td>-0.039 (0.056)</td>
<td>0.286 (0.267)</td>
</tr>
<tr>
<td>Cumulative Mask Mandates</td>
<td>0.060 (0.086)</td>
<td>0.169*** (0.054)</td>
<td>0.002 (0.046)</td>
<td>0.484* (0.251)</td>
</tr>
<tr>
<td>Observations</td>
<td>33091</td>
<td>36078</td>
<td>34875</td>
<td>36078</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.099</td>
<td>0.074</td>
<td>0.086</td>
<td>0.058</td>
</tr>
</tbody>
</table>

Note: The measure of Cumulative Mask Mandates is standardized to zero mean and unit standard deviation across countries. Specifications and samples are otherwise identical to the ones in Table 2. Errors clustered at the country level.
### Table 4. Lockdown Effects Are Stronger for the More Educated

<table>
<thead>
<tr>
<th>Outcome →</th>
<th>(1) Current WFH days per week</th>
<th>(2) Desired WFH days per Week</th>
<th>(3) Planned WFH days per Week</th>
<th>(4) Amenity value of option to WFH 2-3 days a week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Restricting the Sample to Persons with a College Degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative Lockdown</td>
<td>0.282***</td>
<td>0.092</td>
<td>0.170**</td>
<td>0.503</td>
</tr>
<tr>
<td>Stringency</td>
<td>(0.097)</td>
<td>(0.067)</td>
<td>(0.064)</td>
<td>(0.433)</td>
</tr>
<tr>
<td>Cumulative COVID-19 deaths per capita</td>
<td>-0.037</td>
<td>0.035</td>
<td>-0.059</td>
<td>0.337</td>
</tr>
<tr>
<td>Stringency</td>
<td>(0.106)</td>
<td>(0.075)</td>
<td>(0.066)</td>
<td>(0.347)</td>
</tr>
<tr>
<td>Observations</td>
<td>22210</td>
<td>24054</td>
<td>23317</td>
<td>24054</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.085</td>
<td>0.058</td>
<td>0.075</td>
<td>0.049</td>
</tr>
<tr>
<td>B. Restricting the Sample to Persons with a Graduate Degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative Lockdown</td>
<td>0.410***</td>
<td>0.144**</td>
<td>0.266***</td>
<td>0.380</td>
</tr>
<tr>
<td>Stringency</td>
<td>(0.139)</td>
<td>(0.059)</td>
<td>(0.086)</td>
<td>(0.401)</td>
</tr>
<tr>
<td>Cumulative COVID-19 deaths per capita</td>
<td>-0.113</td>
<td>-0.025</td>
<td>-0.105</td>
<td>0.180</td>
</tr>
<tr>
<td>Stringency</td>
<td>(0.118)</td>
<td>(0.055)</td>
<td>(0.075)</td>
<td>(0.335)</td>
</tr>
<tr>
<td>Observations</td>
<td>10954</td>
<td>11826</td>
<td>11468</td>
<td>11826</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.082</td>
<td>0.056</td>
<td>0.088</td>
<td>0.036</td>
</tr>
</tbody>
</table>

**Note**: This table uses the same specifications and measures as Table 2. Errors clustered at the country level.
Strategic complementarities

Strategic complementarities amplify the direct effects of all the forces discussed above. Specifically, WFH becomes more attractive relative to work in the office when a larger share of coworkers, customers, clients, etc. also works remotely. This force operates most clearly in the extreme: when no one else works in the office, there’s no point in commuting to reap the benefits of face-to-face interactions.

This type of strategic complementarity also operates at the level of organizations. As an example, it makes more sense for a law firm to allow or encourage partners, associates, and other staff to WFH when clients also work remotely.

In short, WFH makes more sense when others WFH than when everyone works on business premises.
The Demography and Geography of WFH
WFH Rates Are Similar for Men and Women

Source: Responses to the questions:
- Currently (this week) what is your work status?
- For each day last week, did you work a full day (6 or more hours), and if so where?

Notes: For each wave, we compute the percent of paid full days worked from home in the SWAA. The horizontal-axis location shows when the survey was in the field. We re-weight the sample of US residents aged 20 to 64 earning $10,000 or more in 2019 or 2021 to match CPS shares by age-sex-education-earnings cells.
N = 37,750

U.S. Data
WFH Rates Are Much Higher for College-Educated Workers than for Others

Source: Responses to the questions:
- Currently (this week) what is your work status?
- For each day last week, did you work a full day (6 or more hours), and if so where?

Notes: For each wave, we compute the percent of paid full days worked from home in the SWAA. The horizontal-axis location shows when the survey was in the field. We re-weight the sample of US residents aged 20 to 64 earning $10,000 or more in 2019 or 2021 to match CPS shares by age-sex-education-earnings cells. N = 108,597

U.S. Data
WFH Rates Are Lowest for Older Workers, Highest for Persons in Their 30s

Source: Responses to the questions:
- Currently (this week) what is your work status?
- For each day last week, did you work a full day (6 or more hours), and if so where?

Notes: For each wave, we compute the percent of paid full days worked from home in the SWAA. The horizontal-axis location shows when the survey was in the field. We re-weight the sample of US residents aged 20 to 64 earning $10,000 or more in 2019 or 2021 to match CPS shares by age-sex-education-earnings cells.
N = 108,696
WFH Rates Are Higher for Men and Women with Children Under 14

Source: Responses to the questions:
- Currently (this week) what is your work status?
- For each day last week, did you work a full day (6 or more hours), and if so where?

Notes: For each wave, we compute the percent of paid full days worked from home in the SWAA. The horizontal-axis location shows when the survey was in the field. We re-weight the sample of US residents aged 20 to 64 earning $10,000 or more in 2019 or 2021 to match CPS shares by age-sex-education-earnings cells.

N = 95,556
WFH is more prevalent in places with higher population density

Source: 66,815 SWAA responses Jan 21 to Aug 22 weighted to match the US population. Details on https://wfhresearch.com/
The Extent of WFH Opportunities Vary Greatly Across Cities

Percent of vacancy postings that explicitly say job offers hybrid or remote work

Notes: Natural Language Processing of all online jobs in the US, around 43m in 2022 from Lightcast, and obtained from www.wfhmap.com

U.S. Data

Reproduced from Hansen et al. (2023)
WFH Rates Are Higher at Younger Firms

Percent of full paid workdays performed at home by birth year of the employer’s firm

Source: Authors’ calculations using individual-level data from the U.S. Survey of Working Arrangements and Attitudes at www.wfhresearch.com.

Note: Birth year is the first calendar year in which the employer’s firm had one or more paid employees.
Some Benefits of Remote Work
When employees work from home, they save an average **65 minutes per day** by not commuting and taking less time to get ready for work. The chart shows time saved by age of youngest child.

**Source:** Data from 8,313 SWAA respondents who can work from home. Reweighted to match the US population. See [https://wfhresearch.com/](https://wfhresearch.com/).
Quantifying the Time Savings of WFH

Employer plans re WFH imply the following savings in time devoted to paid work for person \( i \) (% of pre-pandemic hours):

\[
TS_i = \frac{100(WFH_{i, Plan} - WFH_{i, Pre})(1-f_i)C_i}{H_i + C_i(Days_{i, Pre} - WFH_{i, Pre})}, \quad \text{where}
\]

- \( C_i \) = daily round-trip commute time expressed in hours
- \( f_i \) = fraction of commute time devoted to work-related activities.
- \( H_i \) = conventional measure of weekly work hours (pre-pandemic)
- \( Days_{i, Pre} \) = number of full workdays per week (pre-pandemic)

Implementing (1): 1.3% time savings on an equal-weighted basis, 1.7% on an earnings-weighted basis (\( N=31,361 \)). Accounting for savings of grooming time bumps up these values by 12-15 percent.
During the COVID-19 pandemic, while you have been working from home, how are you now spending the time you have saved by not commuting?

Please assign a percentage to each activity (the total should add to 100%).

Notes: The sample is 32,641 respondents who are able to work from home.
Table 1: Commute Time Savings and its Allocation, Country-Level Conditional Means

<table>
<thead>
<tr>
<th>Country</th>
<th>Daily Time Savings When Working from Home, Minutes</th>
<th>Percentage of Time Savings Devoted to:</th>
<th>Primary or Secondary Job</th>
<th>Leisure</th>
<th>Caregiving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>78</td>
<td>43</td>
<td>33</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Austria</td>
<td>71</td>
<td>35</td>
<td>45</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Brazil</td>
<td>82</td>
<td>40</td>
<td>32</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Canada</td>
<td>65</td>
<td>41</td>
<td>37</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>China</td>
<td>102</td>
<td>46</td>
<td>31</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>Egypt</td>
<td>73</td>
<td>44</td>
<td>29</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>France</td>
<td>62</td>
<td>44</td>
<td>26</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>Germany</td>
<td>65</td>
<td>31</td>
<td>46</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>Greece</td>
<td>58</td>
<td>33</td>
<td>33</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Hungary</td>
<td>66</td>
<td>40</td>
<td>33</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>India</td>
<td>99</td>
<td>47</td>
<td>26</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>Italy</td>
<td>61</td>
<td>34</td>
<td>39</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>Japan</td>
<td>100</td>
<td>32</td>
<td>39</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>Malaysia</td>
<td>69</td>
<td>53</td>
<td>25</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Netherlands</td>
<td>77</td>
<td>40</td>
<td>35</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Poland</td>
<td>54</td>
<td>34</td>
<td>36</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Russia</td>
<td>73</td>
<td>46</td>
<td>27</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Serbia</td>
<td>51</td>
<td>35</td>
<td>35</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>Singapore</td>
<td>94</td>
<td>53</td>
<td>27</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>South Korea</td>
<td>86</td>
<td>40</td>
<td>39</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Spain</td>
<td>63</td>
<td>31</td>
<td>41</td>
<td>12</td>
<td>12</td>
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<tr>
<td>Sweden</td>
<td>60</td>
<td>35</td>
<td>40</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Taiwan</td>
<td>69</td>
<td>53</td>
<td>28</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Turkey</td>
<td>69</td>
<td>39</td>
<td>33</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>73</td>
<td>38</td>
<td>39</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>United States</td>
<td>55</td>
<td>42</td>
<td>35</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Ukraine</td>
<td>70</td>
<td>39</td>
<td>28</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td><strong>Cross-country average</strong></td>
<td><strong>72</strong></td>
<td><strong>40</strong></td>
<td><strong>34</strong></td>
<td><strong>11</strong></td>
<td><strong>8</strong></td>
</tr>
</tbody>
</table>

Notes: The table shows coefficients on country dummies in OLS regressions that control for gender, age groups (20-29, 30-39, 40-49, 50-59), education (Secondary, Tertiary, Graduate) and a survey wave fixed effect, treating the raw U.S. mean as the baseline value. We fit the regression to data for 18,995 G-SWA respondents surveyed in mid-2021 and early 2022 who worked mainly from home at some point during the COVID-19 pandemic. The “Average” value is the simple mean of the country-level values.

Reproduced from Aksoy et al. (2023).
A Many-Country Analysis Based on G-SWA Data, 2

<table>
<thead>
<tr>
<th></th>
<th>27-country sample</th>
<th></th>
<th>20-country sample</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td><strong>Actual, as of the survey week</strong></td>
<td>1.67</td>
<td>1.71</td>
<td>1.67</td>
<td>1.73</td>
</tr>
<tr>
<td><strong>Employer plans, postpandemic</strong></td>
<td>0.84</td>
<td>0.80</td>
<td>0.85</td>
<td>0.82</td>
</tr>
</tbody>
</table>

Panel A. Work-from-home days per week, averaging over all workers

Notes: The table reports unconditional means of WFH days per week in our sample. The first row shows the average WFH days in the survey week, based on 33,091 G-SWA respondents. The second row shows the average value of employer plans for WFH days per week after the pandemic ends, based on 34,875 G-SWA respondents.

Combining these results with the daily time savings reported on the previous slide, the G-SWA data say that WFH saved about two hours per week per worker in 2021 and 2022, and that it will save about one hour per week per worker after the pandemic ends. That’s equivalent to 2.2 percent of a 46-hour workweek, the sum of 40 paid hours and six hours of commuting.
How should we think about the value of these time savings? The after-tax wage rate offers a useful benchmark for the private value of commute time savings. This valuation is apt when the individual freely allocates time across activities, as in Becker (1965), and time spent commuting is neither more nor less (un)pleasant than time spent working.

Later research on travel time valuations, as reviewed in Jara-Díaz (2007) and Small (2012), highlights factors that lead to departures from the benchmark.

• Theory and evidence suggest that the (marginal) value of commute time rises with trip duration, because longer trips are more tiresome and because the overall time constraint binds more tightly.

• Commuters strongly dislike unpredictable travel times, and automobile drivers strongly dislike congested road conditions.
Thus, long commutes, unpredictable commute times, and congested road conditions push the private value of time savings above the after-tax wage. Conversely, short, predictable and pleasant commutes push the private value below the after-tax wage.

These observations say the private benefits of the commute time savings associated with WFH are roughly 2.2 percent of after-tax earnings when the workforce demographics are similar to that of the United States and average daily commute times are around 72 minutes. The private value of the time savings will tend to be smaller in countries with shorter commutes and a smaller share of highly educated workers (because less educated workers WFH less). For example, since the average daily commute is 55 minutes in the U.S., the implied private value of time savings associated with WFH is on the order of $(55/72)(2.2) = 1.7$ percent of after-tax earnings.
These estimates capture only the commute time savings associated with WFH. The full private value of working from home is greater for several reasons.

1. Avoided commutes bring monetary savings as well as time savings.
2. People spend less time grooming and getting ready when they WFH.
3. Working from home offers more flexibility in time use over the day and greater personal autonomy.

The upshot is that the direct private value of working from home, say, two or three days a week is greater than suggested by travel time valuations applied to commute time savings. See Barrero et al. (2021c) for a deeper analysis.
Discussion, 2

Work from home and the associated drop in commuting also affect individuals and society through many other channels

• Kahn (2022, chapters 2 and 3) considers how WFH expands personal freedom, improves life quality, brings new employment opportunities, and builds social capital in residential communities.

• More WFH also means lighter loads on transport systems and, in particular, less congestion at peak travel times. The available evidence, as reviewed in Hook et al. (2020), suggests that WFH reduces economy-wide energy consumption and pollution.

• Barrero et al. (2021a) consider how the ability to work remotely improves economic performance during pandemics and certain other disasters. See below.

• Aksoy et al. (2022) and Glaeser (2022) consider the challenges for cities presented by the big shift to work from home. See below.
When Asked Directly, People Place a High Value on the Option to Work from Home ....

Value of the option to WFH 2 - 3 days/wk, % of current pay?

Source: Responses to a two-part question.

Part 1: After COVID, in 2022 and later, how would you feel about working from home 2 or 3 days a week?
- Positive: I would view it as a benefit or extra pay
- Neutral
- Negative: I would view it as a cost or a pay cut

Part 2: How much of a pay raise [cut] (as a percent of your current pay) would you value as much as the option to work from home 2 or 3 days a week?

Data are from 20,750 survey responses collected from September 2020 to February 2021 by IncQuery and QuestionPro. We asked a similar question in earlier and subsequent waves, but we focus on the above waves, which use identical questions and response options. We re-weight raw responses to match the share of working age respondents in the 2010-2019 CPS in a given {age x sex x education x earnings} cell.
To obtain the “Value of Planned Post-COVID WFH” for a given person, we multiply “Value of Option to WFH” by $\frac{1}{2}$ if their employer plans for one WFH day per week after the pandemic, by 1 if the plan is for multiple WFH days per week, and 0 otherwise. We then average over persons in the indicated group.

### U.S. Data

<table>
<thead>
<tr>
<th></th>
<th>Value of Planned Post-COVID WFH</th>
<th>Value of Option to WFH 2-3 Days a Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ann. Earnings of $20 to $50K</td>
<td>1.5 (0.1)</td>
<td>6.8 (0.2)</td>
</tr>
<tr>
<td>Ann. Earnings of $50 to $100K</td>
<td>3.0 (0.1)</td>
<td>8.2 (0.2)</td>
</tr>
<tr>
<td>Ann. Earnings of $100 to $150K</td>
<td>4.8 (0.2)</td>
<td>9.6 (0.2)</td>
</tr>
<tr>
<td>Ann. Earnings over $150K</td>
<td>7.3 (0.2)</td>
<td>12.2 (0.3)</td>
</tr>
<tr>
<td>Goods-producing sectors</td>
<td>2.6 (0.2)</td>
<td>7.1 (0.3)</td>
</tr>
<tr>
<td>Service sectors</td>
<td>2.4 (0.1)</td>
<td>7.8 (0.1)</td>
</tr>
<tr>
<td>No children</td>
<td>1.8 (0.1)</td>
<td>6.6 (0.2)</td>
</tr>
<tr>
<td>Living with children under 18</td>
<td>3.2 (0.1)</td>
<td>8.8 (0.1)</td>
</tr>
</tbody>
</table>

**Notes:** The “value of planned WFH” is equal to the “perk value of WFH” 2 to 3 days per week scaled by how much work from home each respondent's employer is planning. The “perk value of WFH” itself comes from responses to the following two-part question: Part 1: “After COVID, in 2022 and later, how would you feel about working from home 2 or 3 days a week?” Part 2: “How much of a pay raise [cut] (as a percent of your current pay) would you value as much as the option to work from home 2 or 3 days a week?”. Data are from 20,000 survey responses collected in July, August, September, October, November, and December 2020 by Inc-Query and QuestionPro. Each wave collected 2,500 responses, except the August and December waves, which collected 5,000. We re-weight raw responses to match the share of working age respondents in the 2010-2019 CPS in each {industry x state x earnings} cell. This table excludes data from the May wave because we didn’t ask about post-COVID employer plans that month.
Responses to the question: *As the pandemic ends*, how often would you *like to* have paid workdays at home?

**Sample:** Data are from the April to June 2022 SWAA waves from [www.wfhresearch.com](http://www.wfhresearch.com). The sample includes respondents who have work-from-home experience during the pandemic and pass the attention-check questions. We re-weight the sample of US residents aged 20 to 64 earning $10,000 or more in 2019 or 2021 to match Current Population Survey on age, sex, education, and earnings. **N = 8,788** (both figures)

---

**U.S. Data**

**Desired amount of post-COVID working from home**

<table>
<thead>
<tr>
<th>Age category</th>
<th>Days per week</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 - 29</td>
<td>2.57</td>
<td></td>
</tr>
<tr>
<td>30 - 39</td>
<td>2.86</td>
<td></td>
</tr>
<tr>
<td>40 - 49</td>
<td>2.95</td>
<td></td>
</tr>
<tr>
<td>50 - 64</td>
<td>3.01</td>
<td></td>
</tr>
</tbody>
</table>

**Percent who want full-time remote work**

<table>
<thead>
<tr>
<th>Age category</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 - 29</td>
<td>24.0</td>
</tr>
<tr>
<td>30 - 39</td>
<td>29.0</td>
</tr>
<tr>
<td>40 - 49</td>
<td>33.2</td>
</tr>
<tr>
<td>50 - 64</td>
<td>40.9</td>
</tr>
</tbody>
</table>
Women More Highly Value the Option to WFH in Most Countries

The chart reports coefficients on country dummies in OLS regressions that control for age, education, industry, and survey wave, treating the raw US mean as the baseline value. We fit the regression separately for men and women.

Reproduced from Aksoy et al. (2022)
That Remains True When We Focus on Single Persons

Willingness to Pay for Option to WFH 2-3 Days Per Week, % of Pay

Panel C: Unpartnered or single persons, comparison between men and women

The chart reports coefficients on country dummies in OLS regressions that control for age, education, industry, and survey wave, treating the raw US mean as the baseline value. We fit the regression separately for men and women.
People with Children More Highly Value the Option to WFH

Willingness to Pay for Option to WFH 2-3 Days Per Week, % of Pay

Panel A: Married men, comparison between those with and without children
Married men with children

Panel B: Married women, comparison between those with and without children
Married women with children
Summarizing The Structure of Preferences Around WFH

Average willingness to pay for WFH option = 5% of pay (G-SWA)

WFH option is more highly valued by:

• Women than otherwise similar men: differential = 1% of pay
• People with children under 14: 1% of pay for both men and women
• More educated: Advanced degree holder vs. HS = 2.5% of pay
• Those with longer commutes: Differential exceeds 2% of pay for RT commute > 1 hour compared to < 20 minutes

As an illustration, compare (a) married woman with graduate degree, children under 14, and a 45-minute one-way commute to (b) single, college-educated man who lives five minutes from the office → Differential WTP for option to WFH 2-3 days per week = 5.8% of pay.

**People will sort by desired working arrangements & across employers**
What People Like about WFH

Saved time particularly important for women

What are the top 3 benefits of working from home?

Notes: The sample includes respondents to the February 2022 SWAA who passed the attention check questions and worked from home at some point since the start of the COVID-19 pandemic. The SWAA samples US residents aged 20 to 64 who earned $10,000 or more in 2019. N = 2,973.
What People Like about the Worksite

What are the top 3 benefits of working on your employer's business premises?

Notes: The sample includes respondents to the February 2022 SWAA who passed the attention check questions and worked from home at some point since the start of the COVID-19 pandemic. The SWAA samples US residents aged 20 to 64 who earned $10,000 or more in 2019. N = 2,973.
Collecting Several Points

1. **Large direct benefits, on average, for workers and families:**
   - Savings in time and money costs of commuting and grooming
   - More flexibility in managing time and the household
   - Greater personal autonomy and more comfortable surroundings

2. Direct **benefits flow mainly to the college-educated**, who are a larger share in richer countries.

3. **Not everyone benefits:** Persons who highly value daily in-person encounters with colleagues, reside in cramped living quarters, have lousy internet connections, or who lose out on learning and networking opportunities may be worse off. Others (e.g., immobile urban poor) may be hurt by equilibrium effects on jobs and local public goods. More on this below.

4. **Obvious, but important:** **WFH is not suitable for all persons, jobs, tasks and organizations.**
Is Remote Work Good or Bad for Productivity?
Some Notes on Productivity and Remote Work

When well designed, hybrid arrangements can make for happier employees and raise productivity by expanding opportunities for undistracted work and deep thinking. Employees also put some of their time savings back into the job.
Productivity: Fully remote can lower productivity even as organized hybrid raises productivity. Heterogeneity, selection & adaptation.

**Fully Remote**

**Organized Hybrid (e.g. WFH Mon & Fri)**
Relative Efficiency of Online Meetings Tends to Fall with Number of Participants

Efficiency of online vs in-person meetings, by meeting size

- 2 people: 5.9%
- 3-4 people: 5.2%
- 5-9 people: 2.4%
- 10+ people: -1.4%

Source: Data from 2077 responses through 2021, reweighted to match the labor force survey. Details on https://voxeu.org/article/comparing-online-person-meetings
Relative Efficiency of Online Meetings Depends on Type of Person

**Figure 4a** Online meeting efficiency versus in-person, by education

<table>
<thead>
<tr>
<th>Education</th>
<th>Percentage Gain/Loss in Meeting Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 16 (GCSE)</td>
<td>0.2%</td>
</tr>
<tr>
<td>Age 18 (A-level)</td>
<td>1.2%</td>
</tr>
<tr>
<td>Bachelor degree</td>
<td>2.2%</td>
</tr>
<tr>
<td>Master degree</td>
<td>5.6%</td>
</tr>
<tr>
<td>Doctorate</td>
<td>9.4%</td>
</tr>
</tbody>
</table>

Source: Data from 2077 responses through 2021, reweighted to match the labor force survey. Details on [https://voxeu.org/article/comparing-online-person-meetings](https://voxeu.org/article/comparing-online-person-meetings)
Thoughtful coordination is essential to ensure employees benefit from in-person interactions when they are actually onsite.

Especially when employees work remotely much of the time, it becomes even more imperative to foster effective on-boarding, mentoring, on-the-job learning, and the transmission of an organization’s culture. The workplace is also a vital source of friendships and social networks for many people. Since there’s less scope for Serendipitous interactions in organizations with hybrid and mixed-mode working arrangements, there’s more need to create other ways for people to connect and form productive relationships.

Notes: The sample includes respondents to the February 2022 SWAA who passed the attention check questions and worked from home at some point since the start of the COVID-19 pandemic. The SWAA samples US residents aged 20 to 64 who earned $10,000 or more in 2019. N = 2,973.
1. Communications and engagement

- A communications style that works well in person may not translate well to remote modes. It’s harder to “read the room” on Zoom.
- When done asynchronously, remote work puts a premium on clear (but succinct) written communications.
- As a broad generalization, people see small-group meetings as more efficient in video mode. For larger meetings (10+ people), they think in-person meetings are more efficient.
- But it depends on the person and the subject matter. The well educated look more favorably on video meetings.
- Perceived engagement in video meetings improves when people keep cameras on. Most employees think so. Managers, even more so.
2. Assessments and performance reviews

- When they work onsite, it may be easy and natural to manage employees by observing their “inputs” – hours and activities.
- And the presence of coworkers helps deter shirking.
- When they work offsite, monitoring inputs may be infeasible or require intrusive, obnoxious methods.
- So, for some employees, shifting to hybrid and remote work requires major changes in performance evaluation and feedback methods – a transition from input-based to output-based assessments.
- Among professional workers, it was already common before the pandemic to be evaluated largely on the basis of outputs, rather than direct monitoring of inputs. That’s one reason the shift to WFH has been smoother and faster in many professional occupations.
A plurality of managers think work from home has little impact on their firm’s productivity, but more managers see a negative impact than a positive one.

Consider your full-time employees who currently work from home at least one day per week. On average, how do you think it would affect their productivity if they work at your business premises five days a week?

Source: Survey of Business Uncertainty, October 2022

Note: Results are weighted by firm size.
Managers think work from home has small negative productivity effects, on average. That result holds across broad industry groups and firm size categories.

Question 1: Consider your full-time employees who currently work from home at least one day per week. On average, how do you think it would affect their productivity if they work at your business premises five days a week?

Question 2 (if selected “Worse”): How much less productive would they be if working on business premises five days a week?
Question 2 (if selected “Better”): How much more productive would they be if working on business premises five days a week?

<table>
<thead>
<tr>
<th>How much less/more productive would employees who WFH 1+ days per week be if they were instead working on business premises five days a week?</th>
<th>N</th>
<th>Mean Productivity Loss, Among those who WFH 1+ Days Per Week</th>
<th>Mean Productivity Loss, Averaging over all employees by adjusting for the share who do not WFH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>282</td>
<td>3.5</td>
<td>0.9</td>
</tr>
<tr>
<td>&lt;50 employees</td>
<td>103</td>
<td>5.2</td>
<td>1.3</td>
</tr>
<tr>
<td>50-99 employees</td>
<td>46</td>
<td>3.4</td>
<td>1.8</td>
</tr>
<tr>
<td>100-249 employees</td>
<td>53</td>
<td>2.2</td>
<td>0.1</td>
</tr>
<tr>
<td>250+ employees</td>
<td>80</td>
<td>3.8</td>
<td>1.0</td>
</tr>
<tr>
<td>Construction, Real Estate, Mining and Utilities</td>
<td>37</td>
<td>5.9</td>
<td>1.4</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>46</td>
<td>2.8</td>
<td>0.3</td>
</tr>
<tr>
<td>Retail and Wholesale Trade</td>
<td>27</td>
<td>9.6</td>
<td>1.5</td>
</tr>
<tr>
<td>Business Services</td>
<td>146</td>
<td>1.4</td>
<td>0.8</td>
</tr>
<tr>
<td>Other Services</td>
<td>26</td>
<td>5.2</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Note: Using responses to Q1 and Q2 from the October 2022 Survey of Business Uncertainty, with “Not much effect” assigned an effect of 0. All means are weighted by firm size. The results in the rightmost column are adjusted for the share of the firm’s employees that works from home 1+ days per week. Those shares were calculated from special questions we asked in the October 2021 survey wave.
What Do Workers Think?

1. Using SWAA data – and accounting for whether and how much they work from home – employees perceive that WFH raises their productivity by 3 percent, on average.
   • So, there’s a gap between managerial and employee perceptions.

2. Workers attribute about 2/3 of the perceived productivity gain to a savings in commuting time. Managers are unlikely to include those time savings in their productivity assessments.

3. Disregarding worker productivity perceptions, Davis (2022) estimates that the big shift to remote work reduced the sum of paid work time and commute time by nearly 2 percent.
   • Points 2 and 3 → Netting out the role of commute time savings shrinks the gap between managerial and employee perceptions by half. The remaining difference in perceptions, about 2%, is modest.
Why are you more efficient working from home?

- Saved commuting time: 87%
- Quieter: 65%
- Meals/chores efficiency: 41%
- Less stress: 39%
- Fewer/shorter meetings: 37%
- Better internet: 32%
- Better equipment: 22%

Source: Data from 7,902 respondees who can work from home in 2021, reweighted to match the US population. Details on [https://wfhresearch.com/](https://wfhresearch.com/)
Why are you less efficient working from home?

Source: Data from 7,902 respondees who can work from home in 2021, reweighted to match the US population. Details on https://wfhresearch.com/
What about the Pace of Innovation?

Historically, many forms of invention, innovation, and entrepreneurship were highly concentrated in space. This empirical regularity gives rise to concerns that the big shift to WFH will slow the pace of innovation.

Here’s why I am less concerned in this regard than many:

1. Many highly innovative firms operate across multiple cities and countries. So, workforce dispersal *per se* is an unlikely killer of innovation and productivity growth.

2. Key developments that facilitated the big shift – e.g., the rise of the internet, better broadband, better video technologies, the emergence of the cloud – also created greater reach and higher quality in communications at a distance.
What about the Pace of Innovation?

3. The big shift is itself stimulating further advances in technologies that facilitate productive interactions at a distance, as we saw in the evidence on patent applications.

4. The rise of remote work and professional interactions at a distance during the pandemic prompted a re-think of many customs and practices that, before the pandemic, impeded the flow of ideas and prevented a fuller realization of virtual agglomeration benefits.

5. Business and managerial practices will continue to adapt to a world of remote work and better technologies for communication at a distance. Adaptation is still very much underway.
The Big Shift to Remote Work & the Surge in Business Starts
The Shift to Remote Work Is One Factor Behind the Surge in Business Startups:
-- Spatial reallocation of retail, restaurants, personal services, etc.
-- Online businesses are easier to start, and more commerce now happens online.
-- It’s now easier to source labor inputs remotely, which also facilitates startups.

Source: US Census Bureau. Business Applications (BA) that have a high-propensity of turning into businesses with payroll. The identification of high-propensity applications is based on the characteristics of applications revealed on the IRS Form SS-4 that are associated with a high rate of business formation. High-propensity applications include applications: (a) from a corporate entity, (b) that indicate they are hiring employees, purchasing a business or changing organizational type, (c) that provide a first wages-paid date (planned wages); or (d) that have a NAICS industry code in manufacturing (31-33), retail stores (44), health care (62), or restaurants/food service (72).
How the Big Shift to WFH Moderates Wage Growth
The Theoretical Argument

1. The big shift to WFH raised the amenity value of employment.
2. This amenity-value shock came as a surprise. Initially, at given wages, workers reaped the full benefit of the amenity-value shock.
3. As compensation adjusts over time to share the amenity-value gains with employers, wage-growth pressures moderate.
   • This result is immediate in a generalized Nash bargaining model, for example.
   • It holds in a competitive model, too, though for different reasons:
     • ↑ amenity value of work → LS shifts out → wage falls
     • Holds even with inelastic LS, because employees devote part of their WFH-related time savings to their jobs
     • If shift to WFH lowers productivity per unit time, LD curve shifts inward, which also lowers the wage. But evidence above says near-term productivity effects are small, perhaps even positive.

This is a one-time transition phenomenon (not a steady-state effect) but spread out over 1-2 years or more, because wage agreements and employment relationships take time to adjust.
Many Firms See WFH as a Way to Moderate Wage Growth

Over the next 12 months, will your firm let employees work from home (or other remote location) at least one day per week to restrain wage-growth pressures?

Reproduced from Barrero et al. (2022b), based on special questions fielded to hundreds of U.S. firms in the April and May 2022 waves of the Survey of Business Uncertainty.
Over the past 12 months, has your firm expanded the opportunities to work from home (or other remote location) as a way to keep employees happy and to moderate wage-growth pressures?

<table>
<thead>
<tr>
<th>Category</th>
<th>Share of &quot;Yes&quot; responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall (N=547)</td>
<td>38.0</td>
</tr>
<tr>
<td>Large, 250+ employees (N=84)</td>
<td>52.4</td>
</tr>
<tr>
<td>Small, &lt;250 employees (N=462)</td>
<td>35.3</td>
</tr>
<tr>
<td>Goods producers (N=147)</td>
<td>23.1</td>
</tr>
<tr>
<td>Retail and wholesale trade, Transportation and warehousing, Leisure and hospitality (N=101)</td>
<td>24.8</td>
</tr>
<tr>
<td>Educational services, Health care and social assist., Other services (N=31)</td>
<td>45.2</td>
</tr>
<tr>
<td>Finance and insurance, Real estate and rental and leasing, Professional and business services, Information (N=268)</td>
<td>50.4</td>
</tr>
</tbody>
</table>
### Wage-Growth Moderation Due to the Rise of Remote Work Over the Two-Year Period Centered on April/May 2022 (Percentage points)

<table>
<thead>
<tr>
<th></th>
<th>Mean Cumulative Wage-Growth Moderation Over Two Years</th>
<th>Unweighted</th>
<th>Weighted by Firm Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td></td>
<td>2.2</td>
<td>2.0</td>
</tr>
<tr>
<td>Small Firms (fewer than 250 employees)</td>
<td></td>
<td>2.2</td>
<td>2.0</td>
</tr>
<tr>
<td>Large Firms (250 or more employees)</td>
<td></td>
<td>2.1</td>
<td>2.0</td>
</tr>
<tr>
<td>Goods Producers</td>
<td></td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Retail and Wholesale Trade, Transportation and Warehousing, Leisure and Hospitality</td>
<td></td>
<td>1.4</td>
<td>1.8</td>
</tr>
<tr>
<td>Education, Healthcare, Social Assistance, Other services</td>
<td></td>
<td>2.7</td>
<td>3.8</td>
</tr>
<tr>
<td>FIRE, Professional and Business Services, Information</td>
<td></td>
<td>3.0</td>
<td>2.3</td>
</tr>
</tbody>
</table>

This table reports size-weighted means tabulated from special SBU questions fielded from 11-22 April and 9-20 May 2022.

**Source:** Barrero et al. (2022b), who draw on the responses to special questions in the April and May 2022 waves the SBU. Survey of Business Uncertainty conducted by the Federal Reserve Bank of Atlanta, Stanford University, and the University of Chicago Booth School of Business.
Other Workforce Changes Associated with the Shift to Remote Work

Has this increase in remote work brought other changes at your firm? Please answer for each of the following:

- **Part-time employees**: 26.4% more, -2.5% less
- **Independent contractors**: 22.8% more, -
- **Leased workers**: 11.3% more, -2.1%
- **Domestic outsourcing**: 8.8% more, -1.5%
- **Offshoring**: 7.8% more, -
- **Employment of the physically-challenged**: 5.4% more, -
Results for a recent RCT on 1612 engineers, marketing and finance professionals found WFH reduced quit rates 35% 

> Nick Bloom @I_Am_NickBloom · Jul 25
> New RCT on 1612 employees, finding hybrid #WFH
> 1) Reduced quit rates by 1/3
> 2) Shifted hours from WFH days to office days & weekends
> 3) Increased messaging and video calls (even in the office)
> 4) Generated a small productivity increase
> Paper: bit.ly/3J4rL5l

See Davis, Macaluso and Waddell (2022) for survey evidence that employers offer remote work as a way to recruit and retain employees.

Source: Davis, Macaluso and Waddell (2022)
Source: Attribution rates for 1612 engineers, marketing and finance professionals of Trip.com who were randomized between September 2021 and February 2022 by even and odd birthdays into control (5-days a week in the office) and treatment (Mon, Tue and Thur in the office; Weds and Fri working from home). Difference statistically significant at the 5% level. Details in Bloom, Han and Liang (2022) “How Hybrid Work from Home Works Out”.

![Bar chart showing hybrid WFH lowered employee quit rates by 35%](https://bit.ly/3J4rL5l)
A Force for Wage Compression

Autor and Dube (2022) estimate that real hourly wages rose 6 percent or more in the lower quartile of the earnings distribution from January-March 2020 to January-March 2022. They also show that real wages fell in the upper half of the distribution over the same period, with larger declines at higher deciles. Remarkably, the 90-10 wage differential shrank by about 10 percentage points over this two-year period.

According to our estimates above, the amenity value of the big shift to WFH is 1.5 percent of earnings for workers who earn 20-50 thousand dollars per year and 7.3 percent for those who earn 150 thousand or more. The implied high-low differential is 5.8 percent. If, for example, employers ultimately get half of the amenity-value gains, the effect is to shrink the high-low earnings differential by 2.9 percentage points.
More Evidence Related to City-Level Variation in Remote Work
Working From Home is More Common in Major U.S. Cities than in Smaller Cities and Towns

Source: Responses to the questions:
- Currently (this week) what is your work status?
- For each day last week, did you work a full day (6 or more hours), and if so where?

Notes: The chart plots 6-month moving averages where available and 3-month moving averages prior to November 2020. For each wave, we compute the percent of paid full days worked from home and plot it on the vertical axis, after sorting respondents into cities (i.e., Combined Statistical Areas) by the location of their current job’s business premises. Before November 2020, we asked the first question above. Since November 2021, we have asked the second question. From November 2020 to October 2021, we back-cast responses to the current question using a regression model that relates the current-question responses to the responses to another question (not shown). We re-weight the sample of US residents aged 20 to 64 earning $10,000 or more in 2019 or 2021 to match CPS shares by age-sex-education-earnings cells.

N = 91,751
Remote-Work Posting Shares Vary Greatly Across U.S. Cities

Source: Hansen et al. (2023) using Lightcast data.
Figure 7: The Share of Vacancy Postings that Explicitly Offer Hybrid or Fully Remote Work Grew at Different Rates across Cities since the Pandemic

Reproduced from Hansen et al. (2023)
Large US Cities Face Estimated Spending Reductions of $2000 to $5000 per Worker per Year Due to the Shift to WFH

Reduction of person days on business premises (percent)
by MSA of Current Job

<table>
<thead>
<tr>
<th>City</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington, DC</td>
<td>37.0</td>
</tr>
<tr>
<td>Atlanta, GA</td>
<td>34.9</td>
</tr>
<tr>
<td>Phoenix, AZ</td>
<td>34.1</td>
</tr>
<tr>
<td>Los Angeles, CA</td>
<td>32.9</td>
</tr>
<tr>
<td>New York, NY</td>
<td>32.9</td>
</tr>
<tr>
<td>San Francisco, CA</td>
<td>31.2</td>
</tr>
<tr>
<td>Boston, MA</td>
<td>31.2</td>
</tr>
<tr>
<td>Miami, FL</td>
<td>30.6</td>
</tr>
<tr>
<td>Chicago, IL</td>
<td>26.8</td>
</tr>
<tr>
<td>Dallas, TX</td>
<td>26.6</td>
</tr>
<tr>
<td>Philadelphia, PA</td>
<td>25.7</td>
</tr>
<tr>
<td>Houston, TX</td>
<td>24.1</td>
</tr>
</tbody>
</table>

Reduction in spending ($ per person per year)
by MSA of Current Job

<table>
<thead>
<tr>
<th>City</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York, NY</td>
<td>4,661</td>
</tr>
<tr>
<td>Los Angeles, CA</td>
<td>4,200</td>
</tr>
<tr>
<td>Washington, DC</td>
<td>4,051</td>
</tr>
<tr>
<td>Atlanta, GA</td>
<td>3,938</td>
</tr>
<tr>
<td>Miami, FL</td>
<td>3,323</td>
</tr>
<tr>
<td>San Francisco, CA</td>
<td>3,040</td>
</tr>
<tr>
<td>Dallas, TX</td>
<td>2,869</td>
</tr>
<tr>
<td>Phoenix, AZ</td>
<td>2,757</td>
</tr>
<tr>
<td>Boston, MA</td>
<td>2,539</td>
</tr>
<tr>
<td>Chicago, IL</td>
<td>2,387</td>
</tr>
<tr>
<td>Houston, TX</td>
<td>2,167</td>
</tr>
<tr>
<td>Philadelphia, PA</td>
<td>2,161</td>
</tr>
</tbody>
</table>

Notes: We obtain current working from home rates from the June to November 2022 SWAA waves and weekly expenditure near work from questions that asked about meals, entertainment and shopping near work in 2019, asked from July 2020 to January 2021. For each of 12 top metropolitan statistical areas (MSAs) we compute the average amount of post-COVID work-from-home days in the June to November period of 2022. We also compute the average weekly expenditure near work in 2019 for each MSA. We estimate the reduction in person days on business premises as WFH rates (as % of full paid working days) – 5 (%, based on our estimates of pre-COVID working from home from the American Time Use Survey). Finally, we estimate the annual loss in spending ($ per worker per year) for each city as:

\[(\text{weekly expenditure near work} \times 50) \times (\% \text{ reduction in expenditure}) \times (1.115, \text{ cumulative PCE inflation from 2020Q1}).\]

N = 28,824 (WFH Plans reported in 2022Q1) N = 14,527 (weekly spending near work pre-pandemic)
Questions about 2019 spending near work used in the previous two slides. (Asked July 2020 to January 2021)

**In 2019,** when you worked at your employer's business premises, roughly how much money did you spend during a **typical day** on food and drinks (e.g., lunch, coffee, snacks, etc.)?

<table>
<thead>
<tr>
<th>Number</th>
<th>Required</th>
<th>Min: 0</th>
<th>Max: 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ _____</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**In 2019,** when you worked at your employer's business premises, roughly how much money did you spend during a **typical week** on shopping near work (e.g., gifts or clothes shopping during your lunch break or after work)?

<table>
<thead>
<tr>
<th>Number</th>
<th>Required</th>
<th>Min: 0</th>
<th>Max: 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ _____</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**In 2019,** when you worked at your employer's business premises, roughly how much money did you spend during a **typical week** in bars, restaurants, and other **entertainment** venues that are near to your workplace?

<table>
<thead>
<tr>
<th>Number</th>
<th>Required</th>
<th>Min: 0</th>
<th>Max: 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ _____</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Public transit journeys are stabilizing 35% below pre-pandemic, consistent with one third of days now remote

Notes: US Passenger trips in the National Transit Database, covering around 800,000 passenger trips per month in February 2020. Data de-seasonalized and on a 3-month moving average (except from 2020/2-2020/9 due to the rapid impact of the pandemic). https://www.transit.dot.gov/ntd
WFH has led to a movement out of some city centers

Cumulative net flows (moves in – moves out) from Feb 2020-Sept 2022 as a % of the zipcode population

Inflation Adjusted House Prices Fell about 5% in City Centers after the Pandemic, but Rose 20% in the Suburbs

See Gupta et al. (2022) for evidence and analysis that points to even steeper price drops for commercial real estate in U.S. city centers.

Challenges for Cities and Civic Leaders

My remarks here are tailored to the U.S. context. The issues are somewhat different in developing economies and in rich countries with smaller roles for local governments and local tax revenues.

1. The big shift to WFH presents acute challenges for urban centers that, before the pandemic, organized themselves to support high-volume inward commuting and a high spatial concentration of commercial activity.

2. The big shift eroded their local tax bases: (a) Fewer inward commuters → a drop in sales tax and transit revenues; (b) in some cities, an outflow of residents drove a further drop in sales tax revenues; (c) commercial property values fell; and (d) less business travel means smaller lodging and sales taxes.
Challenges for Cities, 2

4. The big shift has increased the elasticity of the city-level tax base with respect to governance quality – more so in cities like San Francisco where many well-paying jobs are amenable to remote work.

5. This increase in the tax base elasticity creates sharper incentives for sensible, efficient local governance.

6. But it also creates more scope for a downward spiral in city fortunes, whereby poor governance drives outmigration and a loss of commuters and businesses, eroding the local tax base and undercutting the fiscal capacity to supply local public goods, which leads to more outmigration and less inward commuting, and so on.
Challenges for Cities, 3

• Cities that fail to control crime, offer good schools, and levy taxes commensurate with services are now more exposed to residential outmigration, drops in inward commuting, and a business exodus. They face greater risks of a downward spiral in local tax revenues, local public services, and other urban amenities.

• By similar logic, attracting “good jobs” will do less to boost urban fortunes when employees work remotely much of the time.

• The flip side of these observations is that cities that offer good schools, low crime, and pleasant places to live, work and play will are even more attractive now than before the pandemic.

Thus, we can anticipate much diversity in city-level fortunes in the coming years, including the possibility of major failures.
WFH and Economic Resilience

How much did WFH mute the U.S. economic contraction caused by the pandemic?

How much would U.S. GDP increase if all workers had high-quality home internet access (universal access)?
Figure 4: “How much would your efficiency working from home increase if you had perfect high-speed internet?”

A. All Respondents with WFH Experience

B. Only Those with Imperfect Reliability

Note: Efficiency gain imputed to ‘None’ if the respondent reports perfect internet quality. Some respondents with <100% reliable internet report zero potential gains.

Source: Responses to the following questions in the Survey of Working Arrangements and Attitudes:

“How reliable is your internet connection?”

“How much would your efficiency working from home increase if you had perfect high-speed internet?”
How We Project the Productivity Effects of Universal Access

1. Combine individual-level data on the planned extent of WFH in the post-pandemic economy with individual-level estimates for the productivity effect of moving to reliable, high-speed home internet.

2. Two approaches to individual-level productivity effects:
   a) Ask workers how reliable, high-speed home internet access would affect their productivity (if at all) when WFH
   b) Fit regression models that relate the productivity of WFH to internet access quality in the cross section.

3. Aggregate over workers in an earnings-weighted manner to get aggregate labor productivity effect.
Table 3: Earnings-weighted productivity effects of internet access quality

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Productivity Shortfall During COVID</td>
<td>(2) Using employer plans for WFH</td>
</tr>
<tr>
<td>Regression-imputed (simple)</td>
<td>-0.8</td>
<td>0.4</td>
</tr>
<tr>
<td>Regression-imputed (controls)</td>
<td>-0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Self-assessed causal effect</td>
<td>-3.0</td>
<td>1.1</td>
</tr>
</tbody>
</table>
Implied Effects on Aggregate Output

1. Posit aggregate production function with CRS and output elasticity with respect to labor services = 2/3.

2. For fixed non-labor inputs, 1.1% labor productivity gain implies output gain of $0.73\% = (1.011)^{2/3} - 1$ per period in the post-pandemic economy.
   • Flow GDP gains of roughly $160$ billion per year.
   • PV GDP gain of about $4$ trillion when capitalizing flow gains at 4% annual discount rate

3. Flow gains are nearly 3X as large in COVID-like disasters, underscoring the high economic resilience value of moving to universal access.
Economic Resilience

• U.S. real GDP per capita was about 11% below its pre-pandemic trend in the second quarter of 2020 and about 4.5% below trend in the third quarter (Davis, Liu, Sheng).

• Our 2% estimated output gain from universal access during the pandemic recession would have materially moderated the U.S. output shortfall.

• Similarly, flow payoffs to universal access are larger in other disaster scenarios (e.g., another pandemic) that inhibit travel and in-person interactions but do not cut off the internet itself.
Potential Sources of Bias in Our Projections

1. Post-pandemic WFH level could be more/less than we project.

2. Pandemic-related stress and presence of kids at home (due to school closures) may have pulled down the relative productivity of WFH during the pandemic, which would cause us to understate the productivity of WFH after the pandemic.

3. We lack data on WFH efficiency for respondents with no WFH experience during the pandemic (about 1/3 of earnings-weighted respondents). Implicitly, we treat them as having the same productivity response to universal access as average respondent with WFH experience. If excluded persons hold jobs that are ill suited for WFH, which seems likely, it will lead us to overstate productivity and output gains from universal access.

4. Advances in complementary technologies are likely to improve the extent and efficiency of remote work over time.
Remote Work and Internet Access as Sources of Economic and Social Resilience

1. By raising output in the face of pandemics, biological attacks, and other disasters that require distancing, universal access to high-quality home internet service would strengthen economic resilience.
   • The capacity to quickly switch between production modes of roughly equal productivity is a valuable option that pays off especially in bad states of the world.
   • Firm-level examples: contamination events, flood damage, explosions, and fires that sideline the business premises as a place of work.
   • At the macro level, our analysis says that the output payoff to universal access during pandemic-like disasters is 3X as large as during normal times.
Remote Work and Internet Access as Sources of Economic and Social Resilience

2. Universal access provides a ready means of engagement and socializing when circumstances compel physical distancing.

3. Better internet service improves household access to online shopping and home delivery services during pandemic-like disasters.

4. Compliance with stay-at-home orders during the COVID-19 pandemic rose with access to high-speed internet service, even after controlling for household income (Chiou and Tucker, 2020) → Universal access can help contain a pandemic.

5. Better internet access promotes student engagement in remote-learning settings, the value of which is greater when a pandemic or other disaster leads to school closures.

Internet access is not a general-purpose source of resilience in the face of all disasters.
SARS-CoV-2 Forever?
There are sound reasons to fear that the SARS-CoV-2 virus “will ping pong back and forth across the globe for years to come,” triggering recurrent outbreaks of COVID-19 (Brilliant et al. 2021).

More Pandemics to Come?
Jones et al. (2008) document the emergence of 335 new infectious diseases in human populations from 1940 to 2004, with a rising incidence over time even after efforts to control for reporting bias. Urbanization, long-distance travel, and cross-border commuting create the potential for new disease outbreaks to spread rapidly and become global pandemics.
Several other recent studies stress the economic resilience value of WFH during a pandemic and its role in slowing the spread of the SARS-CoV-2 virus. See Alipour, Fadinger, and Schymik (2021), Bai and others (2021), Berniell and others (2021), and Eberly, Haskel, and Mizen (2021).
Data Sources and Measurement Methods
The Survey of Working Arrangements and Attitudes

• Monthly online survey since May 2020. Currently, about 10,000 individual respondents per month; > 100,000 since inception.

• We (Barrero, Bloom and Davis) design the survey instrument.

• **Target population**: U.S. residents, 20-64, who meet a prior-year earnings requirement.

• The SWAA is fielded by market research firms that rely on wholesale aggregators (e.g., Lucid) for lists of potential survey participants.

• After dropping “speeders” (~16% of sample), we re-weight to match 2010-2019 CPS worker shares in age-sex-education-earnings cells. Dropping those who fail attention checks (roughly another 12%) sharpens some results.

• Median response time: 7 to 12 minutes, after dropping speeders.

• Results, micro data, survey instruments, and more are freely available at [www.WFHresearch.com](http://www.WFHresearch.com).
Representativeness

• By design, we focus on persons who exhibit some attachment to the workforce, as evidenced by prior earnings.

• No respondents are recruited based on an interest in our topics.

• Since respondents take the survey using a computer, smartphone, iPad or like device, we miss people who never use such devices.

• Before re-weighting, the SWAA under samples the less educated, particularly those who did not finish high school.

• Even after re-weighting, we may over sample those who are more tech and internet savvy, especially among the least educated.
Attention check question #1

In how many big cities with more than 500,000 inhabitants have you lived?

Please note that **this question only serves the purpose to check your attention.**

Irrespective of your answer, please insert the number 33.

Continue
Attention check question #2

What color is grass?

The fresh, uncut grass, not leaves or hay. Make sure that you select purple as an answer so we know you are paying attention.

- Magenta
- Green
- Purple
- Brown
- Black
- White
- Blue
SWAA Aligns with the American Community Survey, Google Mobility, and Household Pulse Survey Measures of Working from Home

- The American Community Survey measures the share of employees who work fully from home.
- On a comparable sample – employees aged 20-64 earning at least $10,000 – the ACS finds 18.39% of employees are fully remote while SWAA finds 19.97%

- Google Workplace Mobility data measures the reduction in commuting days to workplaces across all cellphone users.
- Google records a 24.4% reduction in daily trips to workplaces, which when added to an ATUS-based estimate of 5% of days WFH pre-pandemic (see Barrero et al, 2021), yields a 29.4% share of WFH days. The corresponding SWAA estimate is 28.2%.

- The U.S. Census Bureau’s Household Pulse Survey measures the amount of working from home 1-2, 3-4, or 5+ days in the previous week at the individual level. For an aligned sample by age and income from June 2022 to December they estimate 30.2% of days WFH a week compared to 29.3% of days for SWAA

- On all three measures our SWWA data aligns extremely closely and levels and time series, giving us confidence in the accuracy of the analysis using this.
Google Workplace Mobility Measures Daily Trips

• Using data from location tracker on cellphones Google calculates changes in trip frequency and posts this on https://www.google.com/covid19/mobility/

• We use their change from the January 2020 based for “Workplace trips” on weekdays until October 2022 when Google stopped producing the data

• To convert this to a measure of days worked from home we add this reduction in workplace trips to the baseline 5% level of working from home from ATUS measured in the US pre-pandemic in 2018
Monthly SWAA aligns with US Google workplace mobility data

The Percent of Workdays Performed at Home: Two Indicators

Source: Google Workplace Cellphone Mobility Data from https://www.google.com/covid19/mobility/ measured as the daily deviation of workplace trips from the January 3 to February 6, 2020 average. Reported here as a monthly average of weekdays, baselined at 5% in January 2020 to match pre-pandemic values from ATUS. SWAA is the amount of full paid working days done from home from home based on the the Survey of Working Arrangements and Attitudes from www.wfhresearch.com minus the pre-pandemic estimate based on the American Time Use Survey as reported in Barrero, Bloom, and Davis (2021).
Global Survey of Working Arrangements (G-SWA)

**Target Population:** Full-time employees, aged 20-59, who finished primary school in 27 countries around the world.

**Survey Design:** We design the G-SWA instrument, adapting many questions from the US-focused SWAA developed by Barrero, Bloom and Davis (2021).

**Implementation:** Respondi, a professional survey firm, fields the G-SWA as an online survey in cooperation with its external partners. Two waves:

- Wave 1: July-August 2021, 15 countries, N= 12,229 (after drops)
- Wave 2: January-February 2022, 25 countries, N=23,849 (after drops)

**Quality Control:** We drop “speeders,” defined as the bottom 5% of the completion-time distribution in each country. In addition, we drop the roughly 15% of respondents who fail an attention-check question.
More on the G-SWA and How We Use It

Median Response Times: 7.3 to 9.5 minutes, after drops.

Representativeness: (1) Respondents take the survey on a computer, smart-phone, iPad or like device, so we miss persons who don’t use such devices. (2) Our samples have too few less-educated persons, more so in less-developed economies. We do not try to create representative samples by country. Instead, we estimate conditional mean outcomes at the country level in making our …

Cross-Country Comparisons: We use coefficients on country-level dummies in OLS regressions, treating the raw U.S. mean as the baseline. These regressions control for age (20-29, 30-39, 40-49, 50-59), sex, education (Secondary, Tertiary, Graduate), 18 industry sectors, and survey wave (or time period).
About the Survey

The Survey of Business Uncertainty (SBU) is fielded by the Federal Reserve Bank of Atlanta. It was designed, tested, and refined in cooperation with Nick Bloom of Stanford University and Steven Davis of the Chicago Booth School of Business and the Hoover Institution. Bloom and Davis received research support from the Sloan Foundation and the U.S. National Science Foundation. Davis also received research support from Chicago Booth.

Our monthly Survey of Business Uncertainty (SBU) goes to about 1500 panel members (as of August 2022), who occupy senior finance and managerial positions at U.S. firms. We contact panel members each month by email, and they respond via a web-based instrument.

Survey questions pertain to current, past, and future outcomes at the respondent’s firm. Our primary objective is to elicit the respondent’s subjective forecast distributions over own-firm future sales growth rates and employment levels. We also ask special questions on many timely topics, including work from home.

For more information on survey design and methodology, please refer to the resources on the SBU page and “Surveying Business Uncertainty,” published in the Journal of Econometrics and also available as NBER Working Paper 25956.
Measuring Remote Work In Job Vacancy Adverts

• In Hansen et al. (2023), we examine more than 250 million job vacancy postings across five English-speaking countries. Our measurements rely on a state-of-the-art language-processing framework that we fit, test, and refine using 30,000 human classifications. We achieve 99% accuracy in flagging postings that advertise hybrid or fully remote work, greatly outperforming dictionary methods and also outperforming other machine-learning methods.

• The combination of scale, rich text data, and automation lets us characterize the shift to remote work in a highly granular manner. We track its evolution at a monthly frequency in hundreds of occupations, thousands of cities, tens-of-thousands of employers, and in city-by-occupation and employer-by-occupation cells. See https://wfhmap.com for data and more information.
These examples are based on actual postings in our dataset and the dictionary used in an OECD study.

<table>
<thead>
<tr>
<th>False-Positive Examples:</th>
<th>False-Negative Examples:</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are looking for a Deputy Home Manager with domiciliary care experience to join our company. You will <strong>work from home</strong> care facilities with a strong track record of quality service.</td>
<td>We encourage our people to explore new ways of working - including part-time, job-share or working from different kinds of locations, including their home. Everyone can ask about it.</td>
</tr>
<tr>
<td><strong>Schedule:</strong></td>
<td>With a hybrid mix of time at home as well as our corporate office, this role will suit an analytical, process orientated and people focused payroll professional who thrives in a fast-paced environment.</td>
</tr>
<tr>
<td>* 10 Hour Shift</td>
<td>We see the value in work-life balance, so whether you like to get a surf in before work, like to head home in time to pick up the kids or you just like working from the comfort of your own home now and then, we want to support you.</td>
</tr>
<tr>
<td>* 8 Hour Shift</td>
<td>The interviews for this role are likely to be conducted remotely using Microsoft Teams or Zoom. It is also expected that relevant work within these roles may be done remotely, within the UK.</td>
</tr>
<tr>
<td><strong>Work remotely:</strong></td>
<td></td>
</tr>
<tr>
<td>* No</td>
<td></td>
</tr>
<tr>
<td>Applicants must also have:</td>
<td></td>
</tr>
<tr>
<td>* Ability to work as part of a team, in a fast paced environment</td>
<td></td>
</tr>
<tr>
<td>* Experience in a 4 or 5 star hotel</td>
<td></td>
</tr>
<tr>
<td>* Previous experience working in <strong>remote</strong> locations</td>
<td></td>
</tr>
<tr>
<td>You may work on renovation projects, store reorganizations, new store openings, and store closings. May respond to managerial or <strong>Home Office</strong> requests for special reports, information, or for help on special projects.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Audit Sample</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>Error Rate</td>
</tr>
<tr>
<td>All Zero</td>
<td>.28</td>
</tr>
<tr>
<td>Dictionary</td>
<td>.16</td>
</tr>
<tr>
<td>Dictionary w/ Negation</td>
<td>.12</td>
</tr>
<tr>
<td>Logistic Regression</td>
<td>.11</td>
</tr>
<tr>
<td>Logistic Regression w/ Negation</td>
<td>.08</td>
</tr>
<tr>
<td>GPT-3</td>
<td>.06</td>
</tr>
<tr>
<td>WHAM (Generic English)</td>
<td>.03</td>
</tr>
<tr>
<td>WHAM (Baseline)</td>
<td>.02</td>
</tr>
</tbody>
</table>

**Note:** This table reports classification performance metrics, which we calculate using a hold-out sample of human-classified text sequences. "Error Rate" is the overall rate of misclassifications (relative to humans). "Precision" is the ratio of true-positive classifications to the sum of true positives and false positives. "F1 score" is the harmonic mean of Precision and "Recall", where Recall is the fraction of true positives divided by the sum of true positives and false negatives – i.e., the denominator is the true number of positives, according to human classifications. Columns (1)-(3) uses a 40% random subset of our audit sample, and Columns (4)-(6) uses a sample that approximates a random sample of our full universe of postings. See Appendix B for details, including a description of each algorithm.
Figure 1: WHAM and Dictionary Methods Applied to U.S. Vacancy Postings

Postings Classified as Job Allows Hybrid or Fully Remote Work

Note: This figure shows the percent of postings that say the job allows one or more remote workdays per week, as classified by WHAM (blue) and a dictionary-based approach (black) using the keywords in Adrijan et al. (2021). For both methods, we reweight the data to match the U.S. occupational distribution of vacancies in 2019 at the six-digit SOC level.
Identify if the text offers the possibility of remote work at least one day per week:

Text: "We are looking for a Deputy Home Manager with domiciliary care experience to join our company. You will work from home care facilities with a strong track record of quality service."

Remote work: No

Note: To compare our WHAM model to recent advances in generative AI, we analysed our audit sample of text sequences drawn from job vacancy postings using GPT-3. The above is an illustration of the prompt we used. We report the performance of this approach to classification in Table 4 which compares this measurement algorithm to WHAM. The example shown above highlights that, unlike some other widely used methods, this technology is similar to WHAM in its ability to process context.
Gusto Data and Measurement Methods

- Monthly payroll data from Gusto, a payroll and HR services platform

- Data from 200,000+ small and medium-sized businesses
  - 1 million+ employees per month
  - Covers all 50 states + DC and all major industries

- We use distance from employee residence to worksite location:
  - For single-unit firms, worksite location = company address.
  - For multi-unit firms, the company assigns each employee to a single worksite location for tax-filing purposes.
  - If the company designates the employee as (fully) “remote,” we assign the employee to the tax-filing address of the company headquarters.


Altig, David, Jose Maria Barrero, Nicholas Bloom, Brent Meyer and Nicholas Parker, 2022 “Surveying Business Uncertainty,” Journal of Econometrics, November.


Barrero, Jose Maria, Nicholas Bloom, Shelby Buckman and Steven J. Davis, 2023c. “Working from Home Demographics,” March.


References, 2


Davis, Steven J., 2022. “The Big Shift to Working from Home,” slides to accompany NBER Macro Annual presentation, April


