The Big Shift to Working from Home

Steven J. Davis
University of Chicago

NBER Macro Annual Session On "The Future of Work"

1 April 2022

Preview

1. **Remote work: Now, and after the pandemic**

2. **Why the big shift to WFH will stick**

3. **Some consequences of the big shift**

   a) Large benefits, mainly for well paid & highly educated

   b) Time savings = 2% of pre-pandemic work hours

   c) 1% boost in measured labor productivity + up to 0.8% more, if time savings reallocated to work are missed.

   d) WFH can raise LF participation. But Long Social Distancing cuts the other way, depressing participation by 2 ppts and lowering potential output by 1.4%.

Survey of Working Arrangements and Attitudes

- Monthly online survey since May 2020, ~100,000 observations to date.

- Target population: U.S. residents 20-64, who earned at least $10K in 2019.

- We design the survey instrument.

- It's 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 (another 12%) sharpens some results.

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

- Results and micro data are freely available at www.WFHresearch.com.
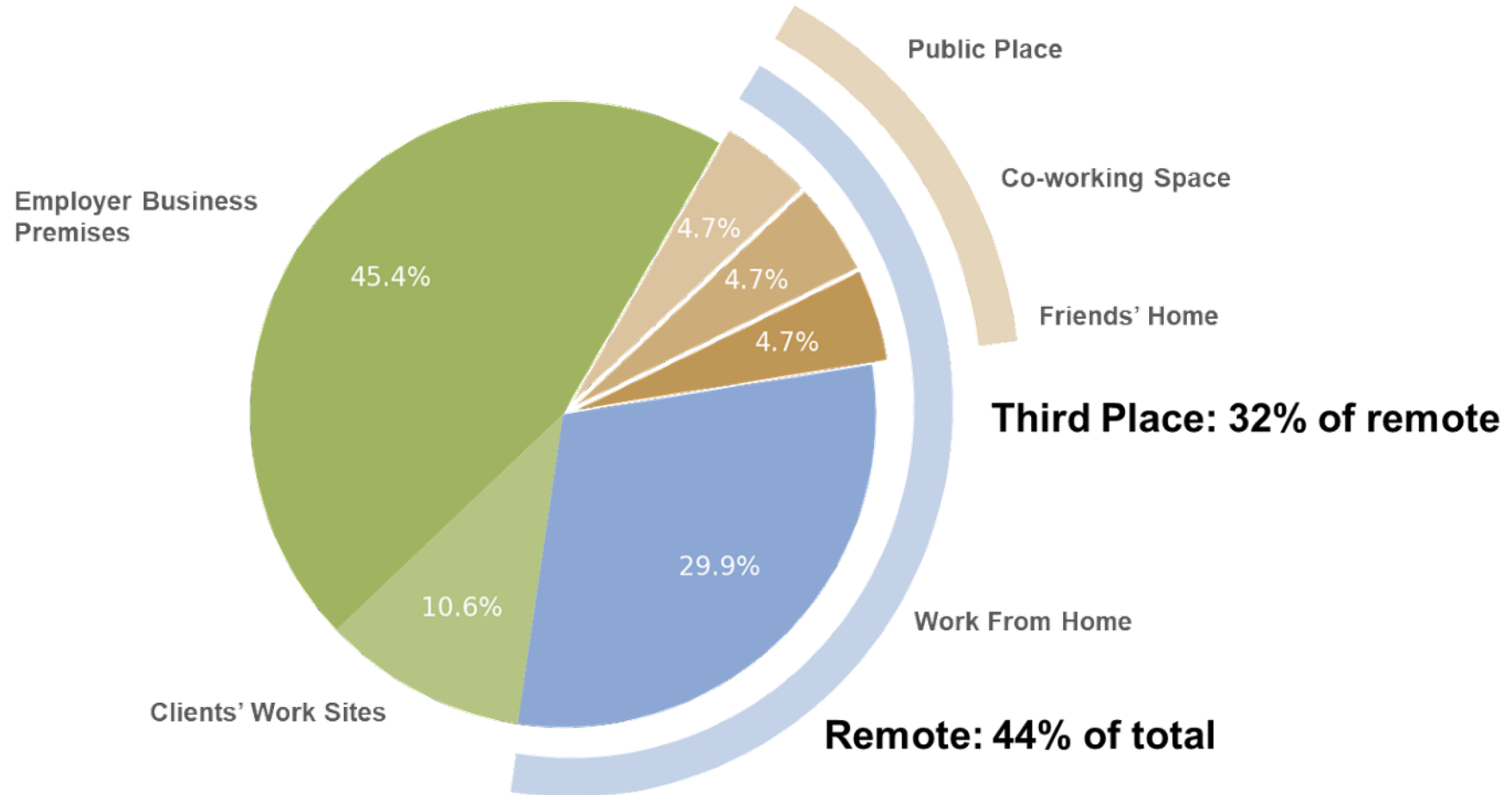
See "Why Working from Home Will Stick," by Barrero, Bloom and Davis for more information about the SWAA.

Where Work Happens Now: 30% Is WFH, 44% Is Remote

"What percentage of your <u>total working time</u> **_last week_** did you spend at the following locations?"

- Your home
- Your employer's work site
- Client or customer's work site
- Friend or family member's home
- Co-working space
- Public space (cafe, library, etc.)

Reproduced from Caros, Guo And Zhao (2022).

SWAA waves: November 2021 to February 2022. N = 17,664

Public Place

Co-working Space

Employer Business Premises

Friends' Home

Third Place: 32% of remote

45.4%

4.7%

4.7%

4.7%

29.9%

Work From Home

10.6%

Remote: 44% of total

Clients' Work Sites

Forward-Looking Survey Question (2021 version)

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

○ Never

○ About once or twice per month

○ 1 day per week

○ 2 days per week

○ 3 days per week

○ 4 days per week

○ 5+ days per week

○ My employer has not discussed this matter with me or announced a policy about it
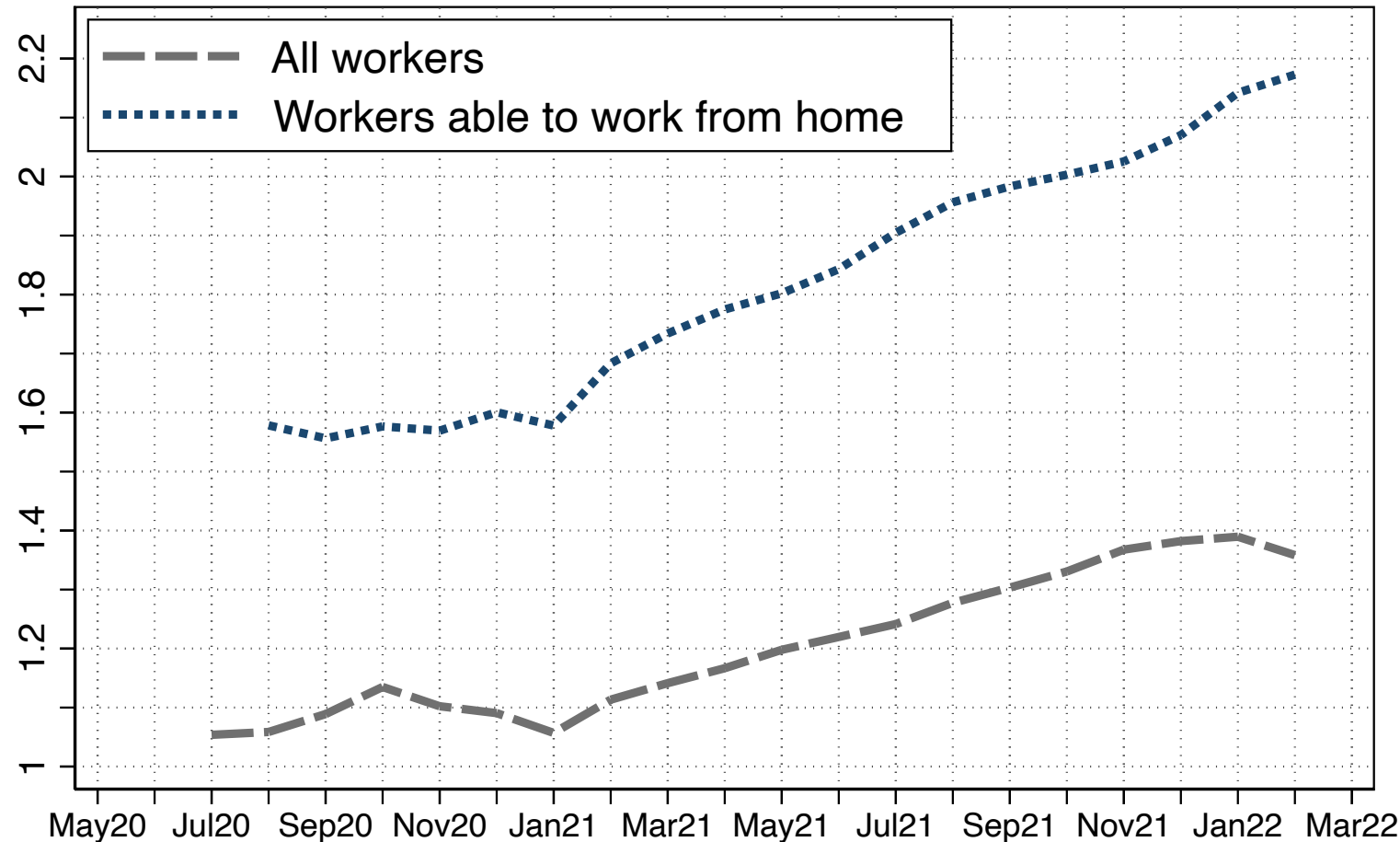
○ I have no employer

«   Auto-fill   Re-randomize   Continue

Based on what they tell workers, companies increasingly plan for employees to work from home <u>after</u> the pandemic

Average Days per Week Working From Home After the Pandemic Ends: Employer plans

- – – All workers
- ········ Workers able to work from home

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

Sample: SWAA waves from July 2020 to February 2022, excluding respondents who report having no employer. "Workers able to WFH" are those who report any WFH experience during the pandemic.
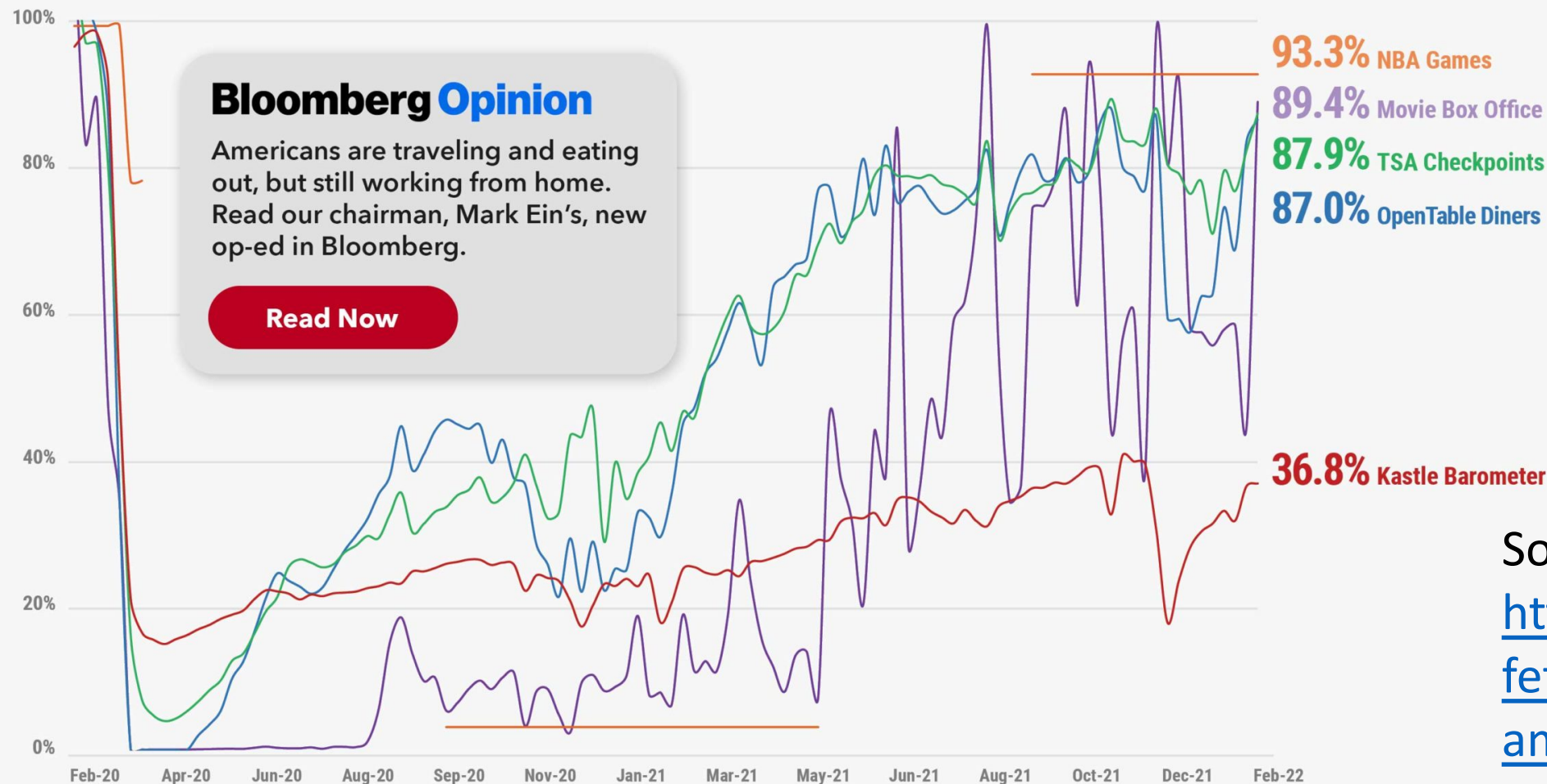**N = 66,438 (all respondents) and 46,345 (able to work from home)**

Methodological Note: If the employer has not discussed post-COVID WFH plans with the employee, we impute 0 days for plan before January 2002 wave. From January 2022 onwards, we impute: 0 days if the employee is not currently WFH; the mean value of planned WFH days in the same survey wave among workers who are currently WFH 1+ days per week, otherwise.

Before the pandemic, WFH averaged about 0.25 days per week in ATUS data.

RETURN TO NORMAL.
BUT NOT TO THE OFFICE.

IN-PERSON ACTIVITIES AS A % OF ACTIVITIES IN 2019

FEBRUARY 2020 TO FEBRUARY 2022

Bloomberg Opinion

Americans are traveling and eating out, but still working from home. Read our chairman, Mark Ein's, new op-ed in Bloomberg.

Read Now

93.3% NBA Games
89.4% Movie Box Office
87.9% TSA Checkpoints
87.0% OpenTable Diners

36.8% Kastle Barometer

Source: Kastle.com at https://www.kastle.com/safety-wellness/getting-america-back-to-work/, accessed on 7 March 2022

Kastle Back to Work Barometer: Kastle customers are in more than 2,600 buildings in 138 cities. The Barometer reflects swipes of Kastle access controls from the top 10 cities, averaged weekly. It summarizes recent weekday building access activity among our business partners, not a national statistical sample.

Sources: Restaurant Seated Diners Database Sourced by Open Table; TSA Checkpoint travel numbers sourced by U.S. Transportation Security Administration; National Basketball Association Stadium Attendance data sourced by ESPN; Movie Theater Attendance data sourced by Box Office Mojo by IMDbPro.

6

The Big Shift Is Highly Non-Uniform Across Occupations: Evidence from Job Ads

Share of ads offering option to WFH 1+ days per week, 2019 vs. 2021
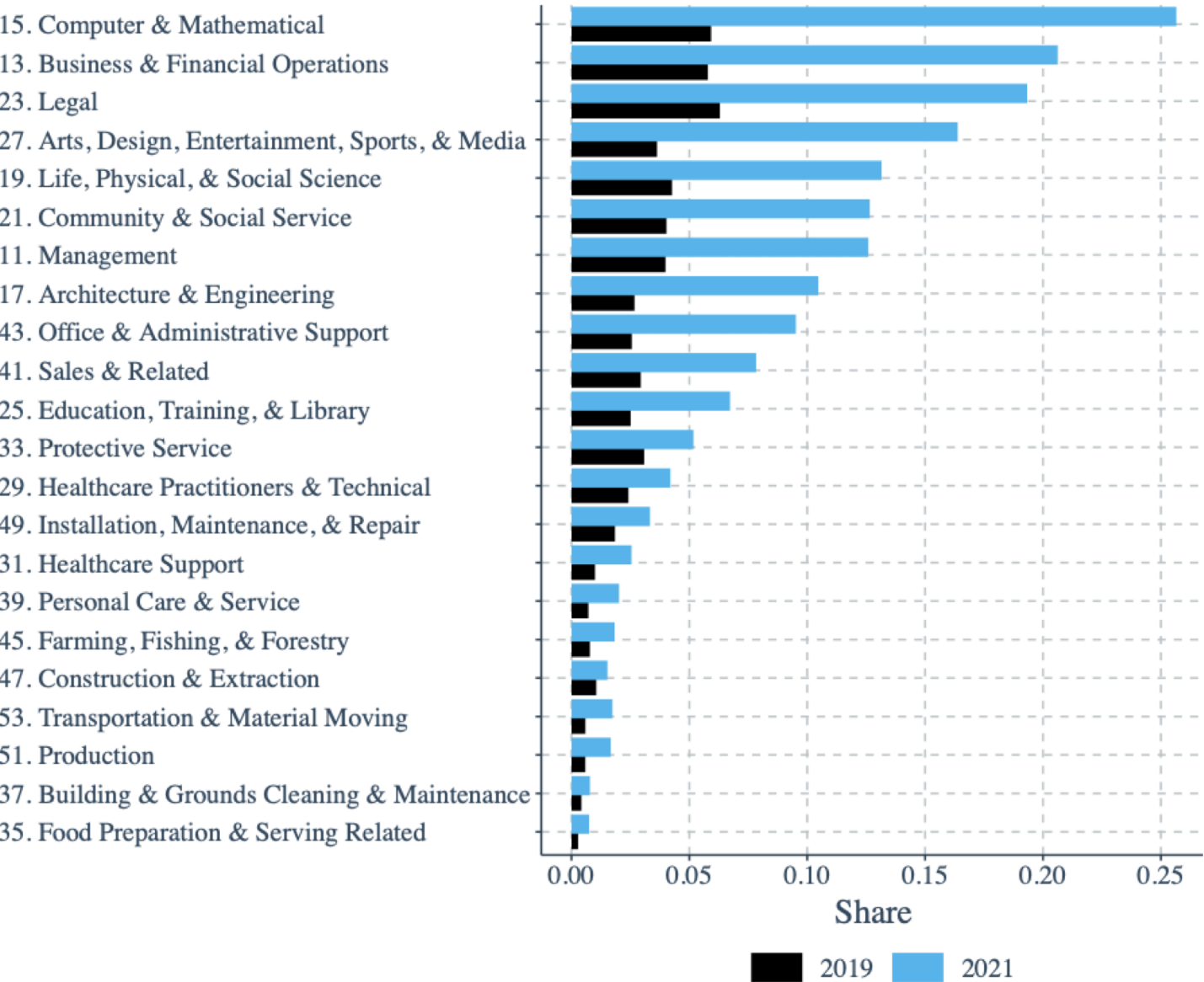

Our classifications rely on a "sequence embedding model" applied to job ads for Australia, Canada, New Zealand, UK, & USA covered by Burning Glass.

We developed the model by pre-training BERT on job ads and training it on a 60,000 human-classified text sequences. The model achieves a 98% accuracy rate, greatly out-performing dictionary methods. See Hansen et al. (2022).

The Big Shift Is Highly Non-Uniform Across Firms: Evidence from Job Ads

Share of ads offering option to WFH 1+ days per week, 2019 vs. 2021
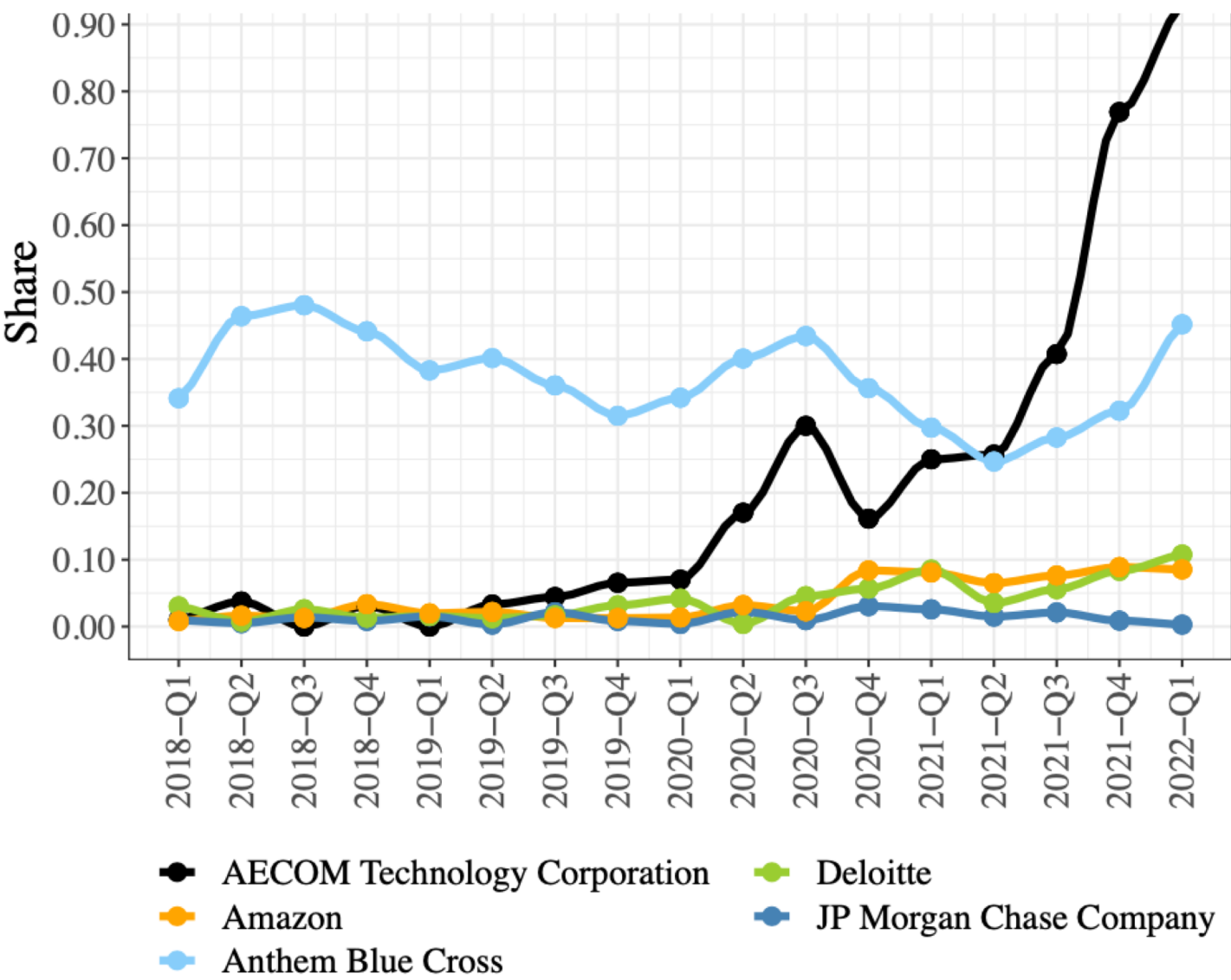
Filtering on occupations in management, business and financial, computer and mathematical, architecture and engineering.

Aecom (engineering) n = 1,210;

Amazon n = 10,316;

Anthem (insurance) n = 10,316;

Deloitte n = 12,640;

JP Morgan n = 5,131.

A 5% samle of US BG data from 2014 to 2022Q1.

8

Why the big shift to WFH will stick

1. **Mass experimentation and learning → re-optimization of working arrangements**

2. Investments (in time, equipment, systems, processes) by workers and firms that enable WFH

3. Attitudinal shifts:
   - Stigma around WFH has plummeted
   - Long-lingering fears of infection risks

4. A surge in innovation that supports WFH

5. Crumbling of managerial resistance in face of market pressures

6. Long pandemic entrenches shift to WFH

COVID-19 <u>Compelled</u> Firms and Workers to <u>Experiment at Scale</u> with Working from Home

"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."

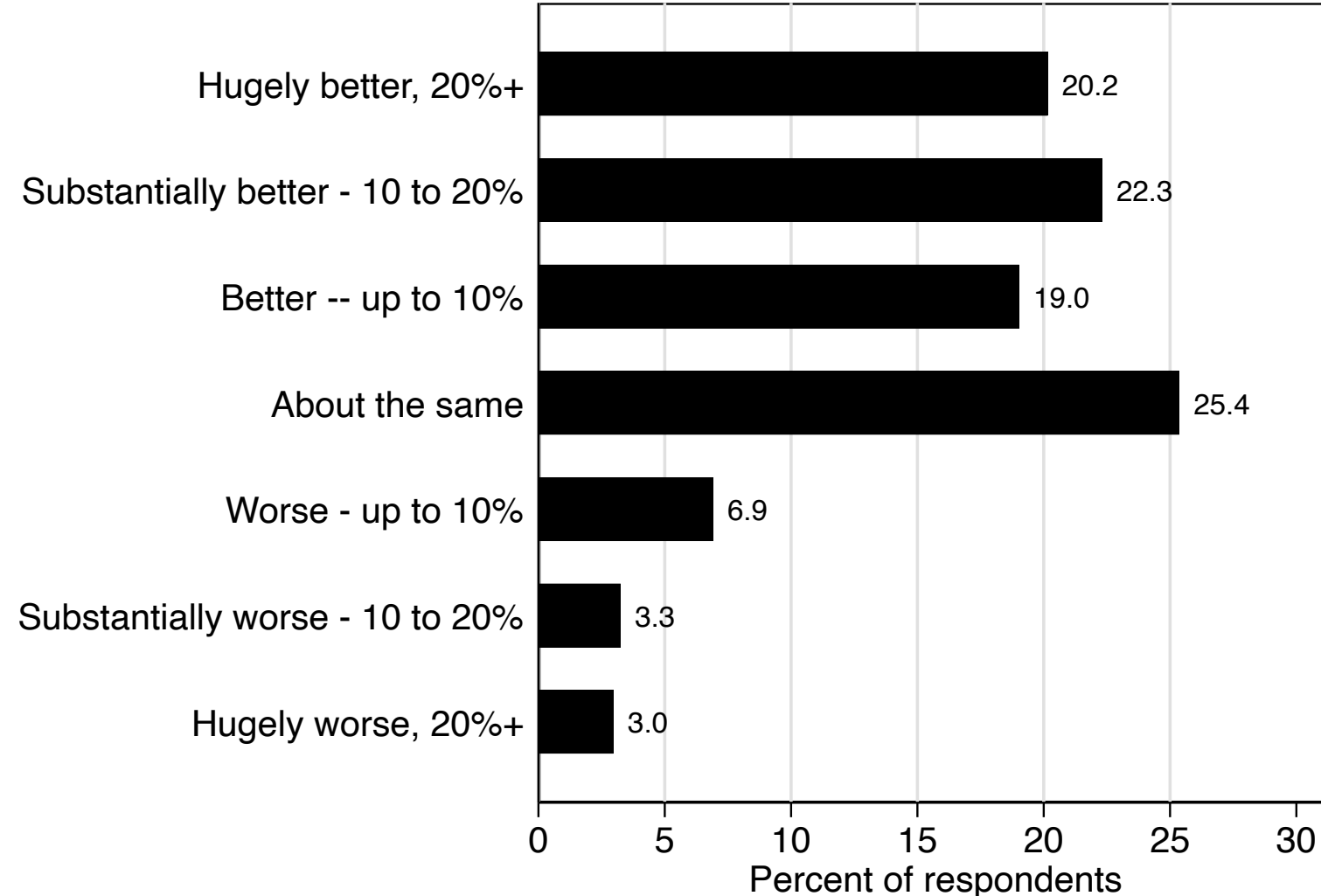– James Gorman, CEO of Morgan Stanley*

Quotation from Cutter (WSJ, 2020)

James Gorman
PHOTO: AL DRAGO/BLOOMBERG NEWS

Forced Experimentation: WFH productivity during the pandemic has exceeded expectations
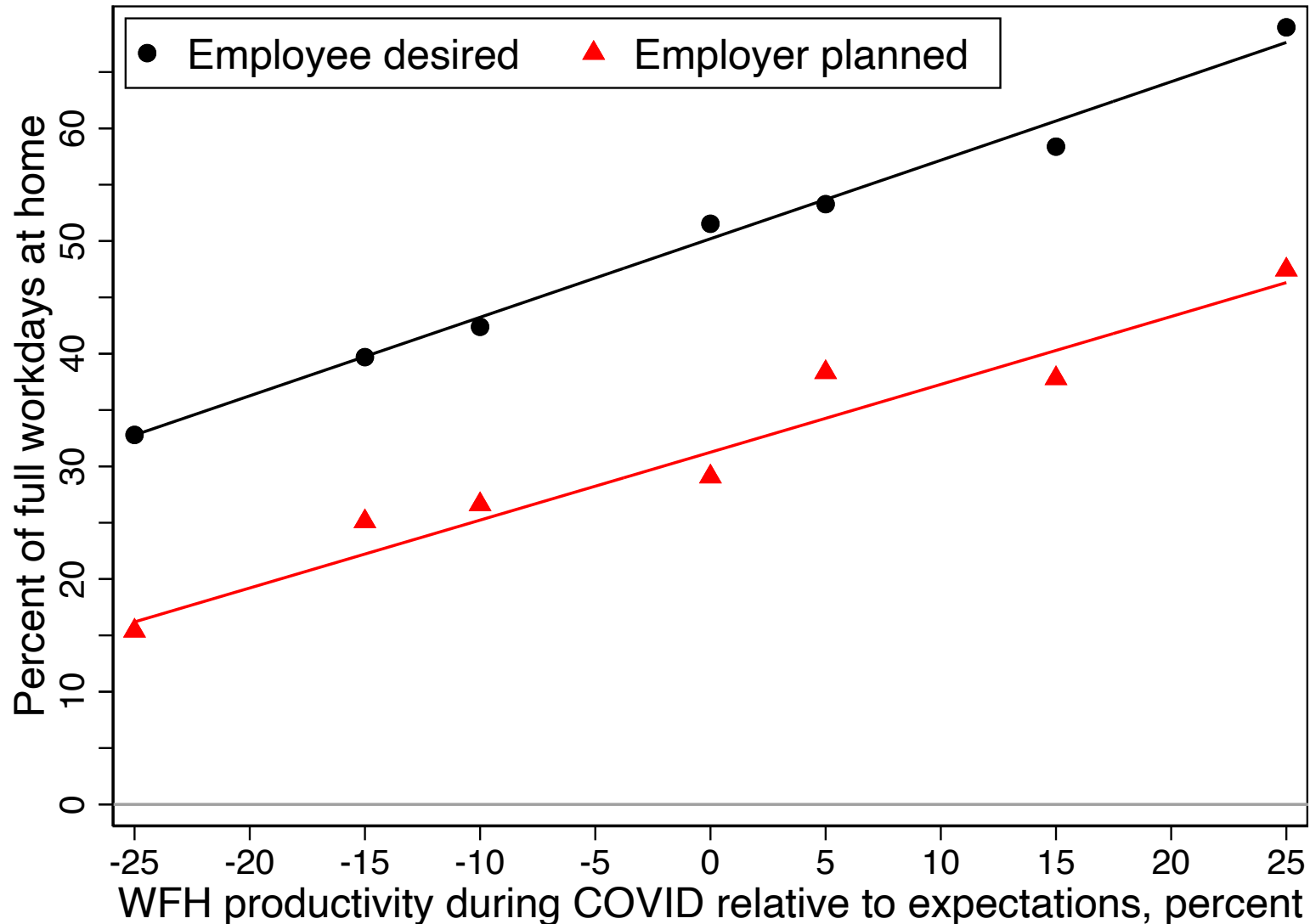
Relative to expectations, how has WFH turned out?

*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*

Desired and planned levels of WFH __after__ the pandemic increase with WFH productivity surprises __during__ the pandemic

A Similar Pattern Holds in a 27-Country Sample

Source: Global WFH Dataset, a multi-country version of the SWAA fielded across 27 countries in July-August 2021 and January-February 2022. See Barrero et al. (2022).

Most countries are in Europe, but the sample includes Australia, Brazil, China, Egypt, India, Japan, Malaysia, South Korea, Taiwan, and Turkey. The chart at left uses the pooled sample. Vertical scale: How many days per week, on average, employers plan for respondents to WFH.

This pattern holds within all 27 countries in our sample

Number of planned full workdays at home

Relative to expectations, WFH Productivity during COVID (%)

**N=18,455** observations, from 27 countries.

Consequences of the Big Shift

1. Big worker benefits, mainly for well educated & highly paid
2. Time savings = 2% of pre-pandemic work hours (earnings weighted)
3. **Direct effect** on measured labor productivity: 1% boost
   - Up to 0.8% more, if statistical agencies miss time reallocated from commuting & grooming to work.
4. WFH can raise LF participation and potential output, but one driver of WFH cuts the other way. We estimate that Long Social Distancing:
   - Cuts LF participation by 2.0 ppts (earnings weighted)
   - Reduces potential output by roughly 1.4 percent

People Place High Value on Option to Work from Home ….

Average valuation of 8% matches Mas and Pallais (2017 AER)

Value of the option to WFH 2 - 3 days/wk, % of current pay?
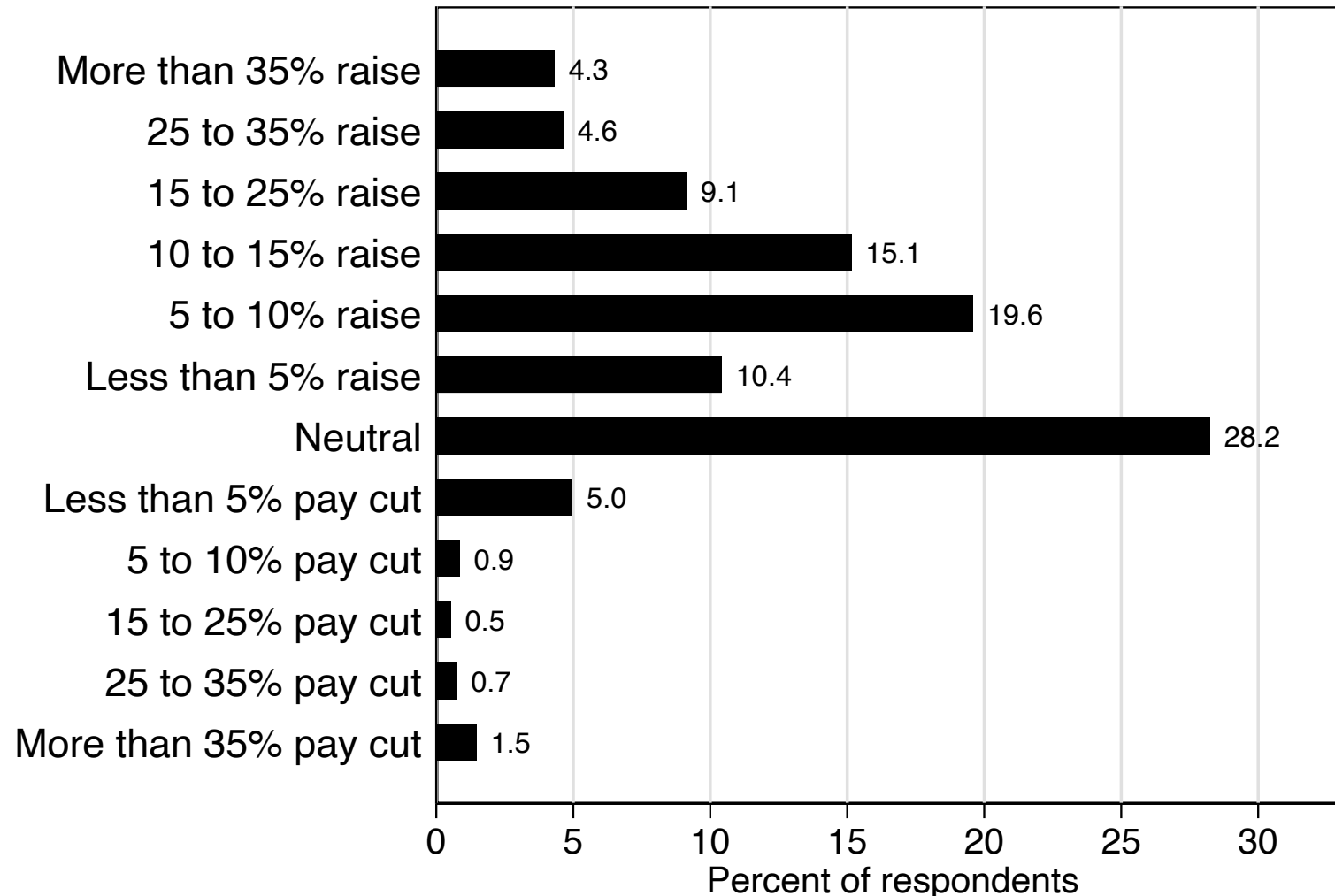
Source: Responses to a two-part question.

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 Inc-Query 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.

…. But the Benefits of WFH Will Be Realized Mainly by the Well Paid and the Highly Educated

<u>As a Percent of Earnings</u>

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

To obtain the "Value of Planned Post-COVID WFH" for a given person, we multiply "Value of Option to WFH" by ½ 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.

Average Daily Time Savings When Working from home, Breakdown by Schooling Age of Youngest Child
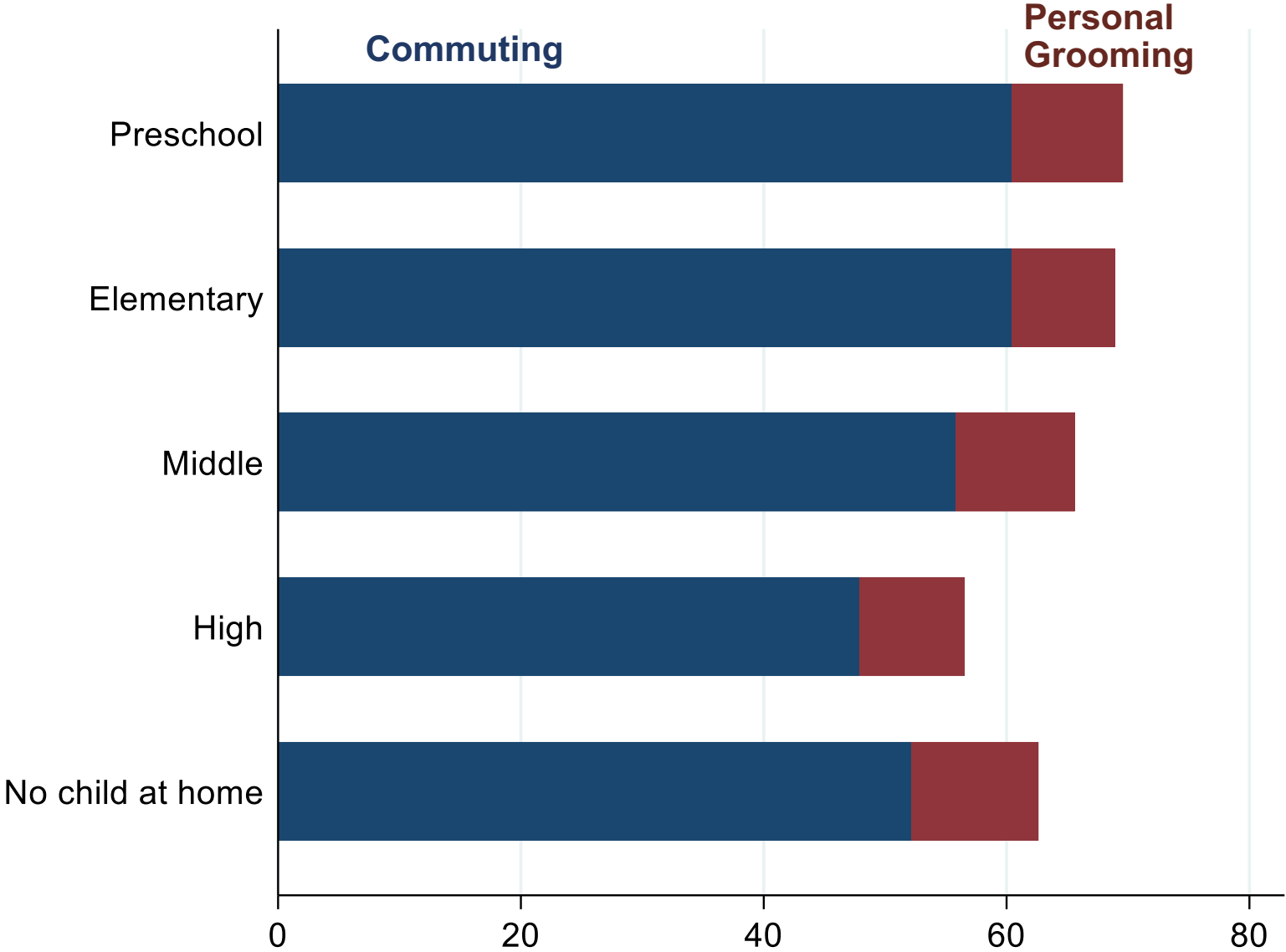
When employees work from home, they save an average **65 minutes per day** by not commuting and taking less time to get ready for work. The chart shows time saved by age of youngest child.

Source: Data from 8,313 SWAA respondents who can work from home. Reweighted to match the US population. See https://wfhresearch.com/.

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):

$$(1) \quad TS_i = \frac{100\left(WFH_i^{Plan} - WFH_i^{Pre}\right)(1 - f_i)C_i}{H_i + C_i\left(Days_i^{Pre} - WFH_i^{Pre}\right)}, \quad \text{where}$$

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 grooming time bumps up these values by 12-15 percent.

42% of workers say they are more efficient when working from home
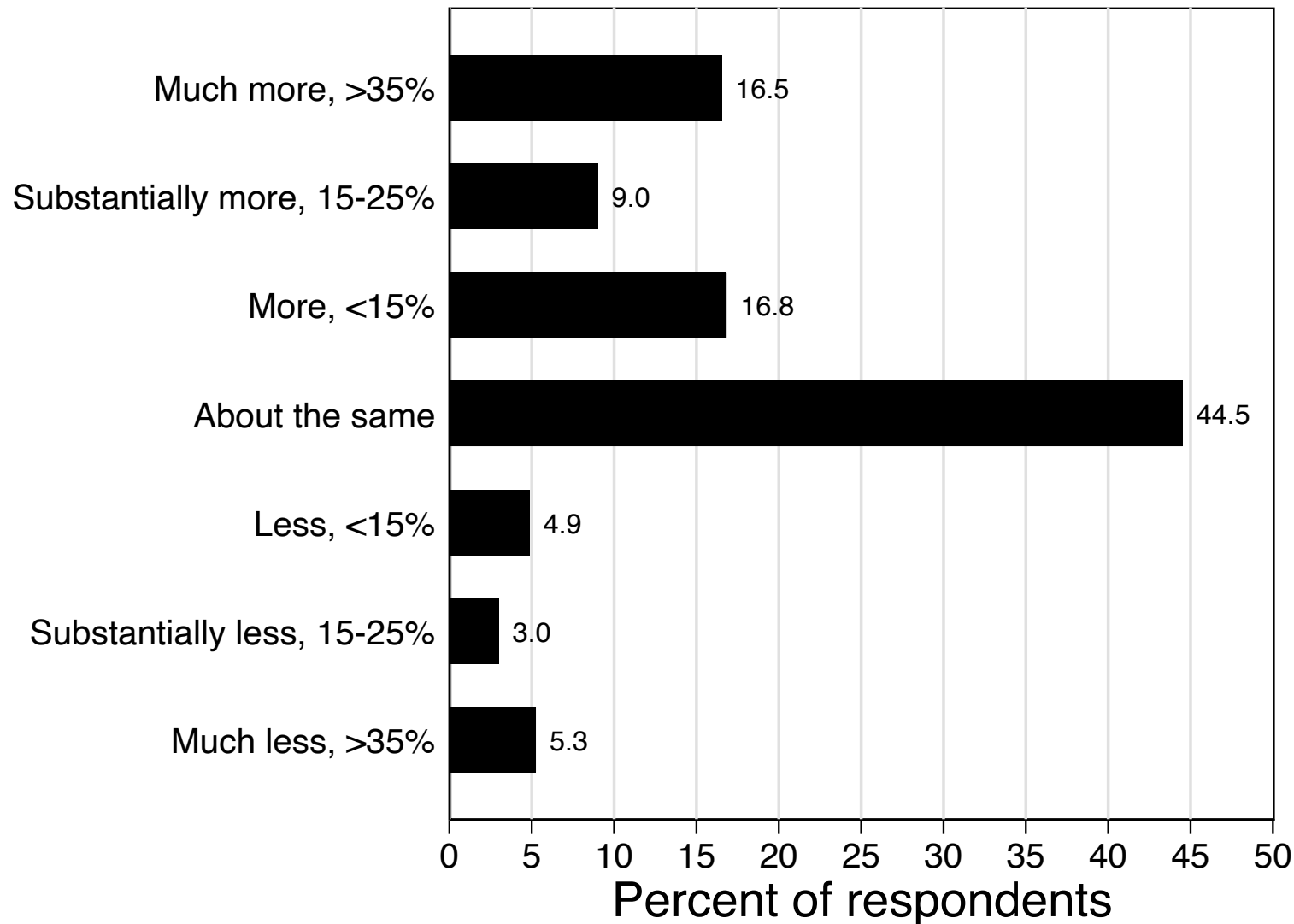
Responses to the question: *"How does your efficiency working from home **during the COVID-19 pandemic** compare to your efficiency working on business premises **before the pandemic?"***

In follow-up questions, workers attribute most of the WFH efficiency advantage to the savings in commuting time.

Notes: 49,964 SWAA responses from August 2020 to February 2022.

Quantifying WFH Effect on Measured Labor Productivity

$$(2) \quad Gain_i \ = (1 - \delta_i) PrDiff_i \left(\frac{WFH_i^{Plan} - WFH_i^{Pre}}{Days_i^{Pre}} \right),$$

$PrDiff_i$ = self-assessed relative efficiency gain when WFH.

δ_i = fraction of the self-assessed efficiency advantage of WFH that respondent attributes to reduced commuting time.

Implementing (2):

- 0.8% average boost in labor productivity (N=29,158).
- 1.0% on an earnings-weighted basis (N=29,158).

With respect to output per hour worked, this calculation presumes the shift to WFH has no effect on the extent of hours mismeasurement by statistical agencies.

How Americans Say They Use their Time Savings

How did you use the commuting time you saved by working from home, percent
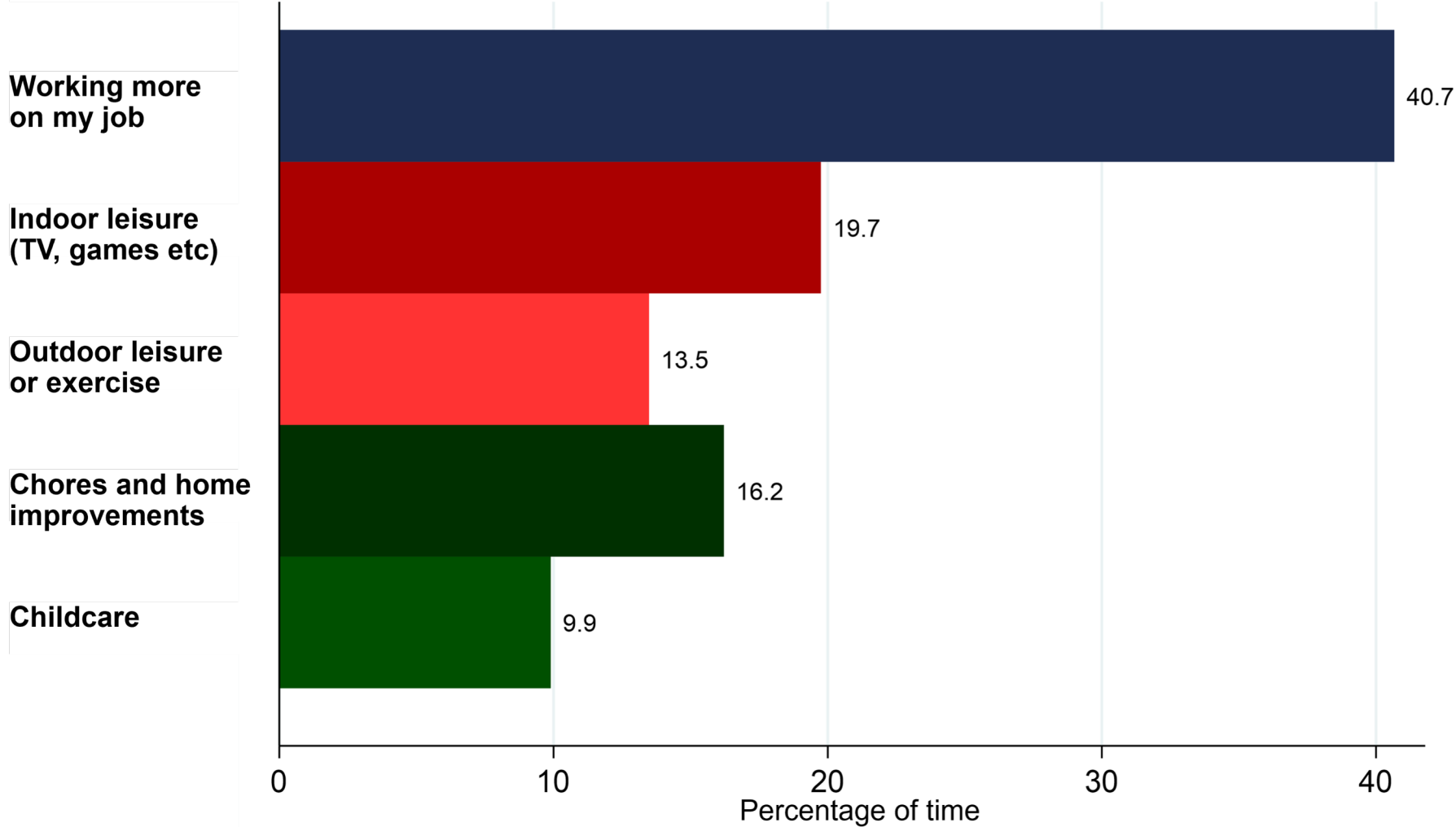
During the COVID-19 pandemic, while you have been working from home, how are you now spending the *time you have saved by not commuting?*

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.

What If Statistical Authorities Miss a Reallocation of Time from Commuting and Personal Grooming to Work Activity?

To assess the potential impact on measured productivity, suppose that all of the reallocated time goes unmeasured by the statistical agencies – e.g., suppose that a full-time worker records 8 hours per day regardless of actual work time.

1. 40% (previous slide) of the 2 percentage point time savings estimated above equals 0.8 percentage points.

2. So if all of the reallocated time goes unmeasured, it would boost measured labor productivity by another 0.8%.

More broadly, the shift to remote work and flexible work schedules makes it harder to accurately measure labor time inputs and, hence, to accurately measure labor productivity.

Other WFH Productivity Considerations

1. (**+**) Ongoing improvements in the technology of remote work (Bloom, Davis, & Zhestkova, 2021) will raise relative efficiency of WFH over time.

2. (**+**) Ongoing managerial and organizational adaptation to remote work.

3. (**−**?) Less transmission of human capital in the workplace.

4. (**+**) Better labor market matching (by relaxing locational constraints)

5. (**−**) Many structures will remain underutilized for some time, undercutting capital productivity.

6. (**+**/**−**?) Agglomeration and congestion effects.
   - The shift to WFH may bring a loss of agglomeration benefits.
   - But do external agglomeration benefits exceed congestion costs on the margin?
   - Advances in remote work technologies expand scope for agglomeration in virtual space.

More WFH also raises the productivity payoff to improvements in residential access to reliable, high-speed internet service. See Barrero, Bloom and Davis (2021) for evidence and quantification.

LF Participation & Potential Output

WFH can raise LF participation rates and potential output by expanding employment options and improving match quality for:

- Persons with disabilities that hamper physical mobility.
- Persons who live in remote and left-behind places.

By relaxing joint location constraints (i.e., the need to live close to your job), remote work can also improve match quality more broadly.

Long Social Distancing cuts the other way.

24% of sampled persons who are neither working nor seeking work cite infection concerns as a reason

Are worries about catching COVID or other infectious diseases a factor in your decision not to seek work?
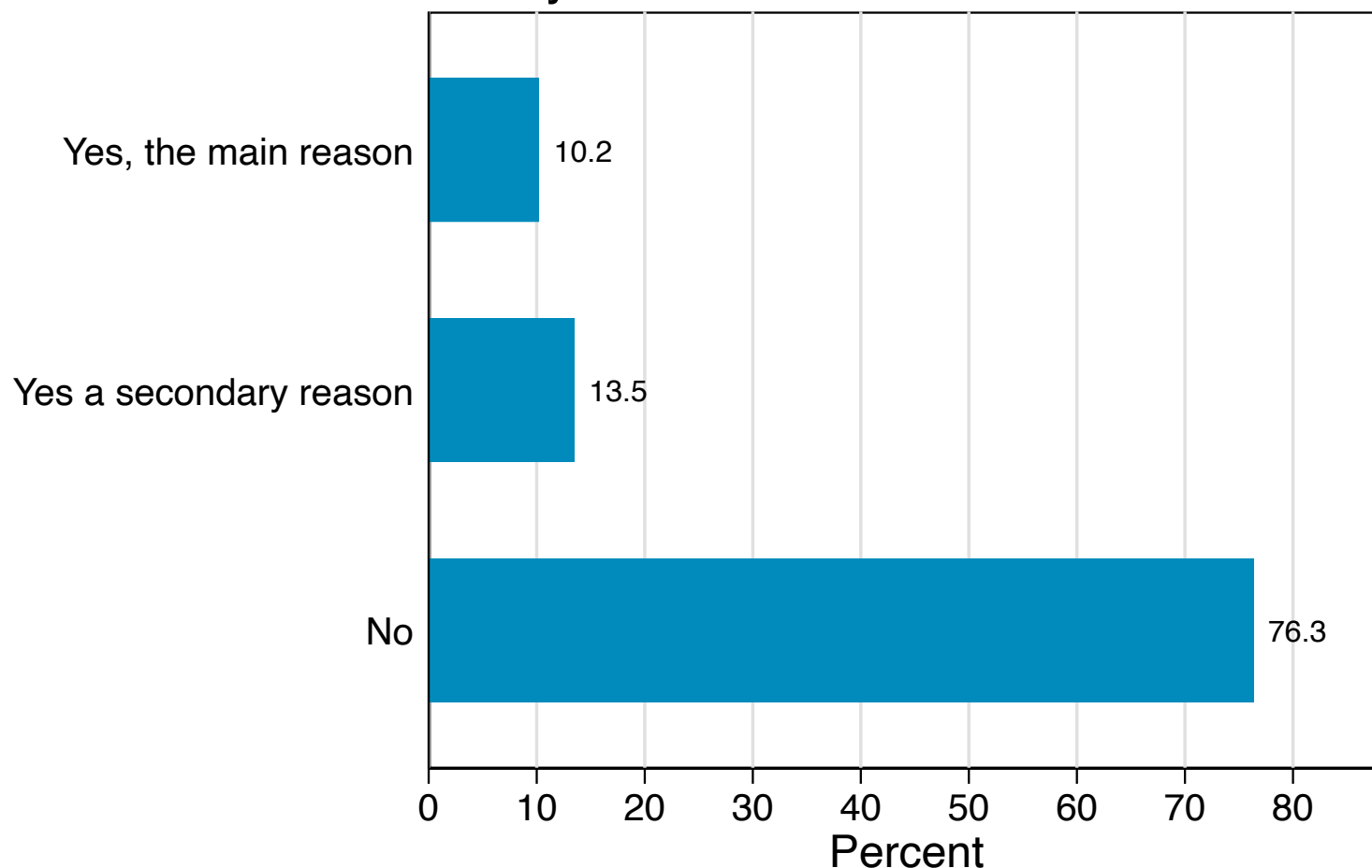
Notes: The sample includes respondents to the February and March 2022 SWAA who passed the attention check questions and indicated their working status in the week prior to the survey was "Not working, and not looking for work". The SWAA samples US residents aged 20 to 64 who earned $10,000 or more in 2019. In February and March 2022. **N = 934.**

11.1% of respondents (all of whom worked in 2019) were not working and not seeking work in the survey reference week.

Regression-Based Approach Says that Long Social Distancing Depresses LF Participation Rate by 2.5 ppts

Question: "Once the COVID-19 pandemic has ended, which of the following would best fit your views on social distancing?"

Dependent Variable: 100 x Indicator for (Not working and not looking for work in reference week)	**Coff. (s.e.)**	**% of Sample**	**Implied Drag on LF Participation Rate (ppts)**
Complete return to pre-COVID activities (baseline)	-	41.5	-
Substantial return to pre-COVID activities (e.g. avoid subway, crowded elevators)	3.1*** (0.8)	30.3	0.9
Partial return to pre-COVID activities (e.g. avoid eating out, taxi/ride-share)	4.0*** (1.0	16.0	0.6
No return to pre-COVID activities	7.7*** (1.4)	12.2	0.9
Controls: Fixed effects for survey wave, age category (20-29, 30-39,…), sex, education categories, industry of current/last job			**Total Drag: 2.5**
Observations (SWAA data from Dec 2021 to Feb 2022)	12,646		
R-squared	0.09		

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

LSD Effect on Potential Output

On an earnings-weighted basis, we estimate that LSD lowers LF participation by 2 percentage points.

Thus, using a production function with labor input elasticity of (2/3), LSD depresses potential output by roughly

$$1 - (0.98)^{2/3} = 1.4 \text{ percent}$$

This level effect on potential output will diminish if, and as, (a) desires for Long Social Distancing dissipate and (b) people find ways to accommodate their desires for social distancing, e.g., via remote work.

End of Prepared Remarks

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

Continue

The Global WFH Dataset

**A Multi-Country Version of the SWAA**

- Barrero, Bloom, Davis, Aksoy Cevat, Mathias Dolls, Pablo Zarate, European Bank for Reconstruction and Development, IFO

- Two waves fielded thus far:

     15 countries in July-August 2021

     25 countries in January-February 2022

- Roughly 500 to 1,500 respondents per country-wave – about 36,000 in total – after dropping speeders and those who fail attention checks.

- Similar selection criteria as in U.S. SWAA, but samples are clearly unrepresentative of target populations in some countries.

Big country differences in economic development, work practices, pandemic severity, government responses to pandemic, etc.

Remarks on Forced (and Coordinated) Experimentation, Learning, and Re-optimization

1. Experimentation revealed information that alters optimal working arrangements through a tail effect and a bias-removal effect.

2. Strategic complementarities across firms in the choice of working arrangements amplify the direct impact of the pandemic experience on WFH – e.g., it's easier for law firm staff to WFH when clients WFH.

3. There are also strategic complementarities across firms in experimentation with WFH and remote work.

4. COVID (permanently?) knocked down regulations that blocked virtual service delivery, especially in the healthcare sector

   - Before COVID, Medicare and Medicaid rules allowed payments for remotely supplied healthcare services only in very limited circumstances.

   - Pandemic led to relaxation of occupational licensing rules that inhibited the provision of healthcare services by out-of-state healthcare providers.

COVID-19 Shifted Patent Applications to Technologies that Support WFH

Percent of newly filed patent applications for technologies that support WFH and remote interactivity (last 3 months)

January 2020
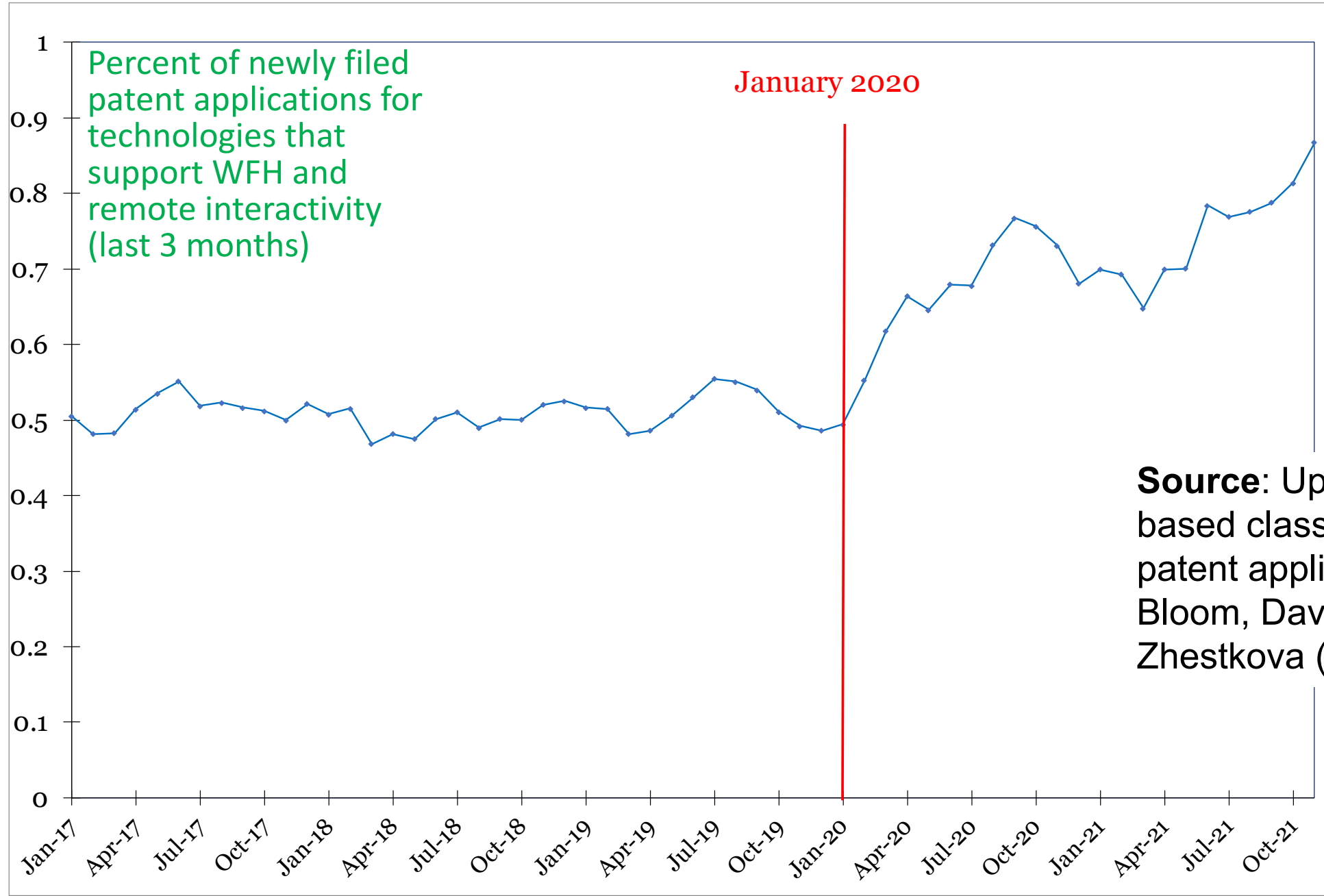
Source: Update to the text-based classification of U.S. patent applications in Bloom, Davis and Zhestkova (2021).

The Crumbling of Managerial Resistance and Organizational Inertia: Indirect Evidence

Average Days per Week Working From Home After the Pandemic Ends: Employer Plans
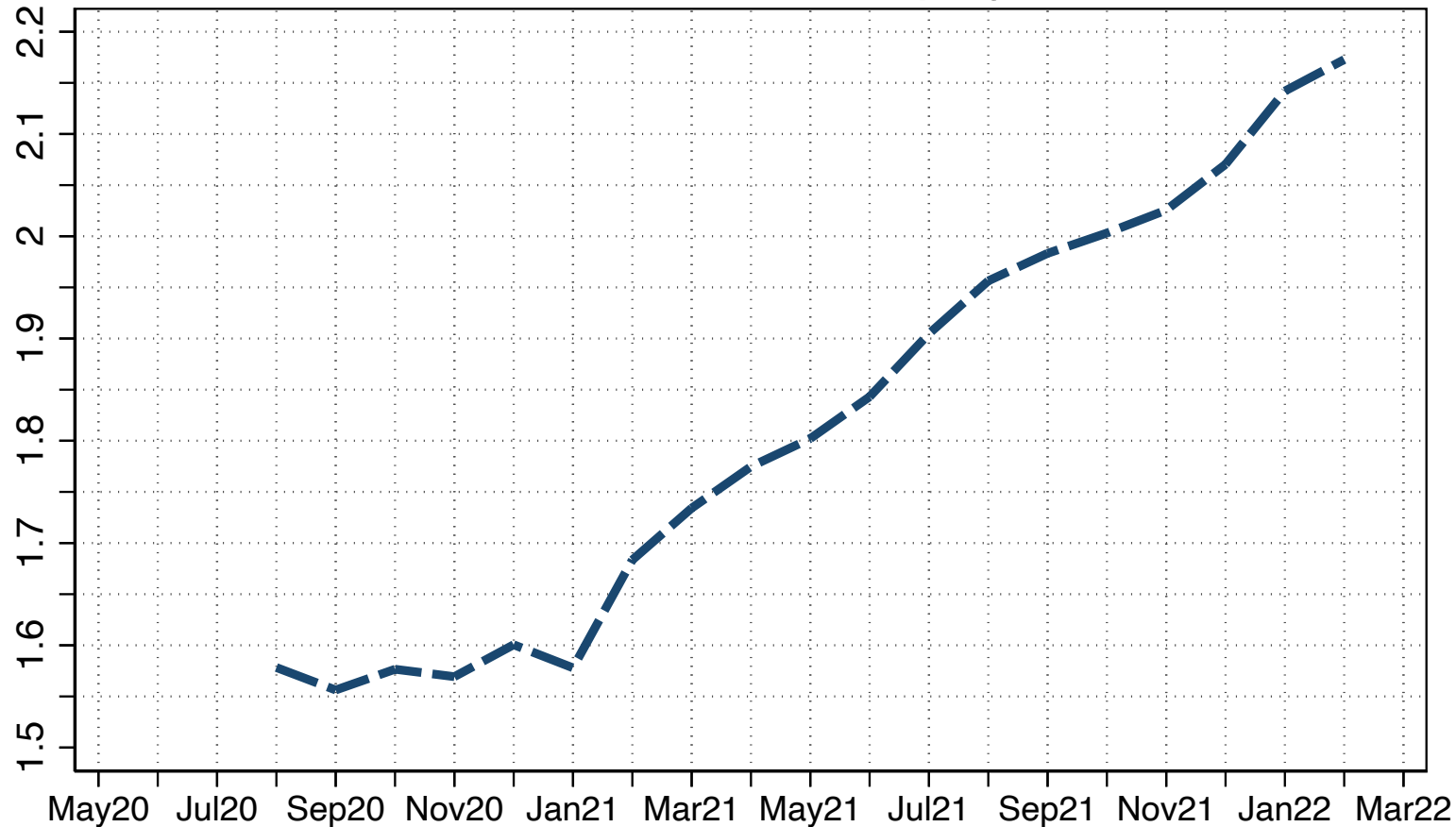
Sample: Workers able to work from home

Responses to the question:
- ***After COVID, in 2022 and later,*** *how often* **is your employer planning** *for you to work full days at home?*
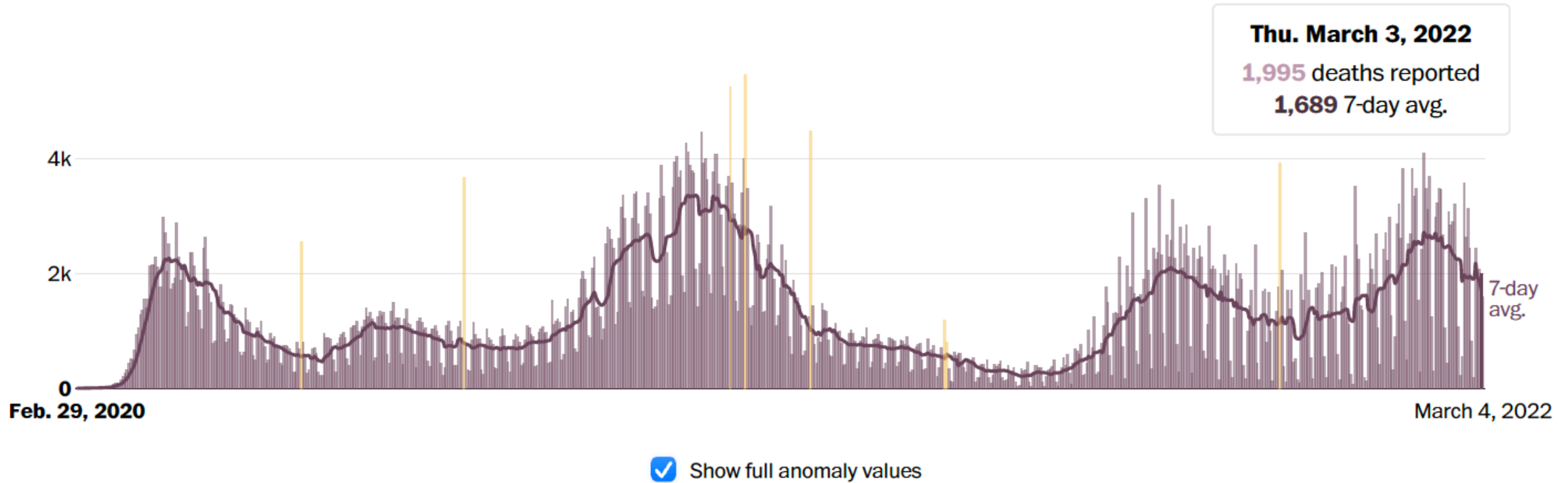
Sample: Data are from all SWAA waves, covering July 2020 to February 2022. The sample includes all respondents who reported their employer's plans for post-COVID WFH and who have work-from-home experience during the pandemic (thus able to work from home). We exclude respondents who report having no employer.

N = 46,345 (able to work from home)

The Pandemic Has Endured and May Become Endemic – Further Entrenching the Shift to Remote and Hybrid Work
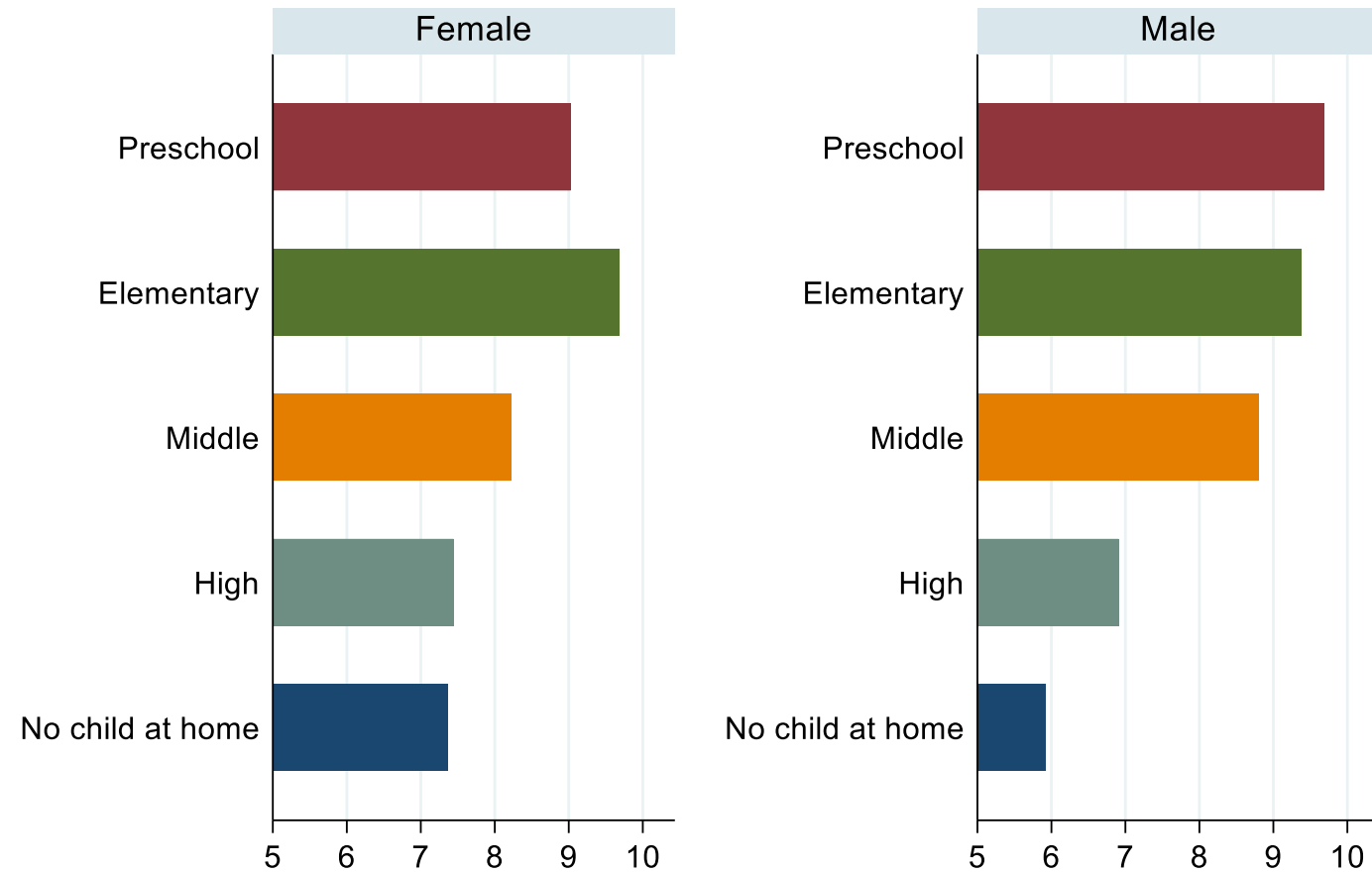

New deaths reported per day

At least 956,918 have been reported since Feb. 29, 2020.

Thu. March 3, 2022
1,995 deaths reported
1,689 7-day avg.

4k

2k

7-day avg.

0
Feb. 29, 2020   March 4, 2022

☑ Show full anomaly values

U.S. deaths attributed to COVID. Reproduced from the *Washington Post* on 4 March 2022. Anomalous data are shown on the daily chart but not included in the 7-day rolling average.

People with Children, Especially Younger Children, Place Higher Value on Option to WFH
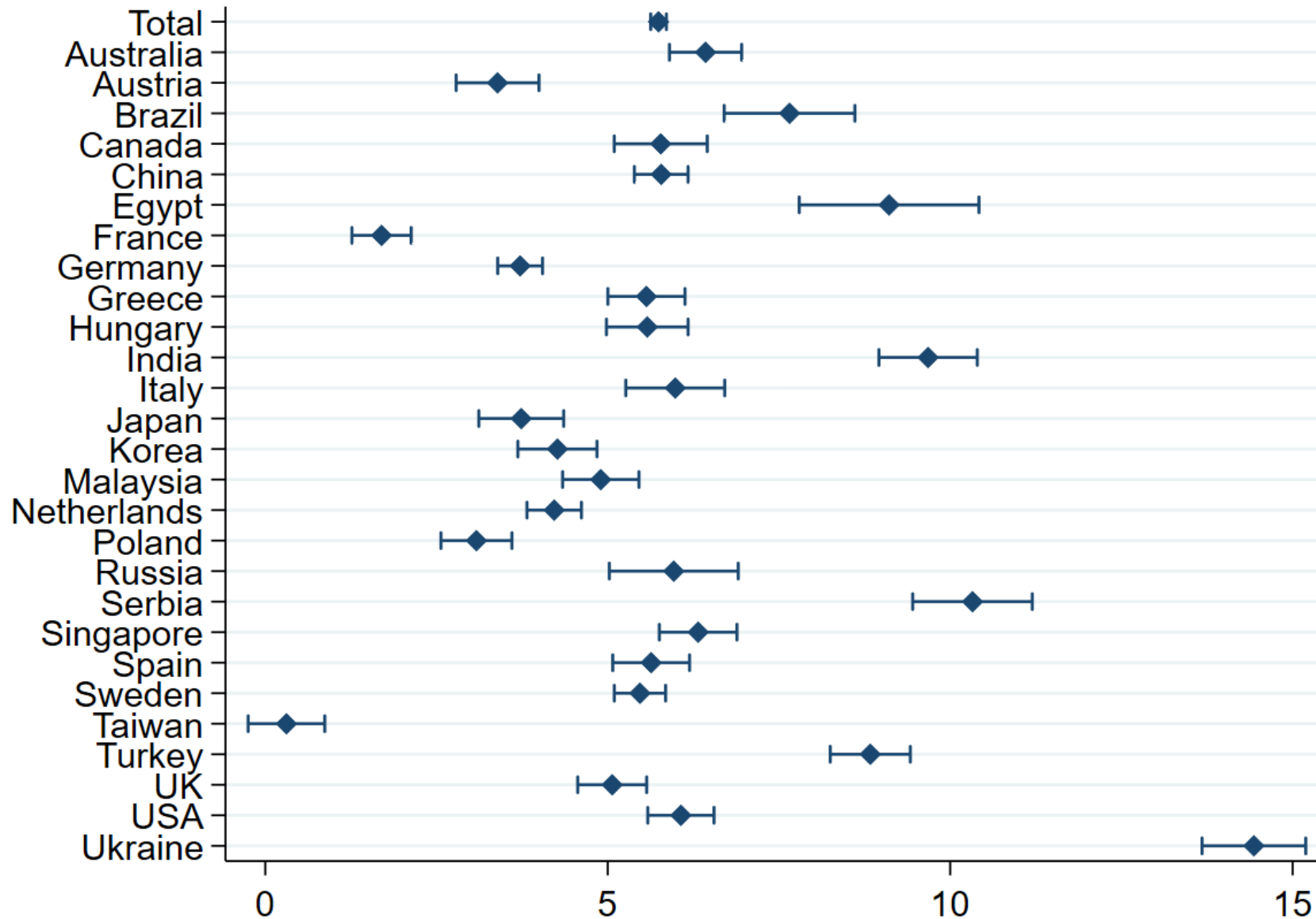
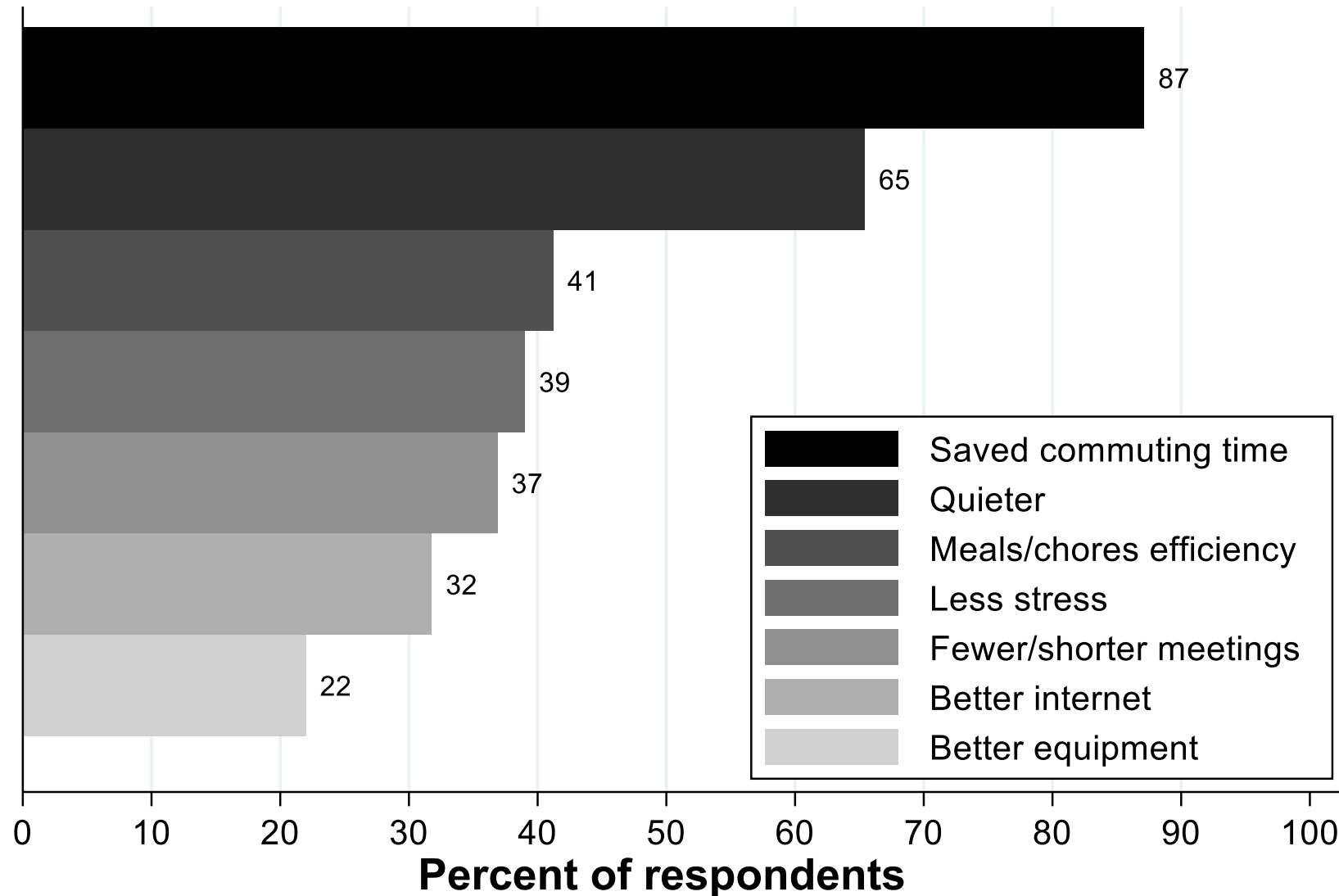Value hybrid-WFH by schooling of youngest child, as % pay

Employees highly value the option to WFH across countries

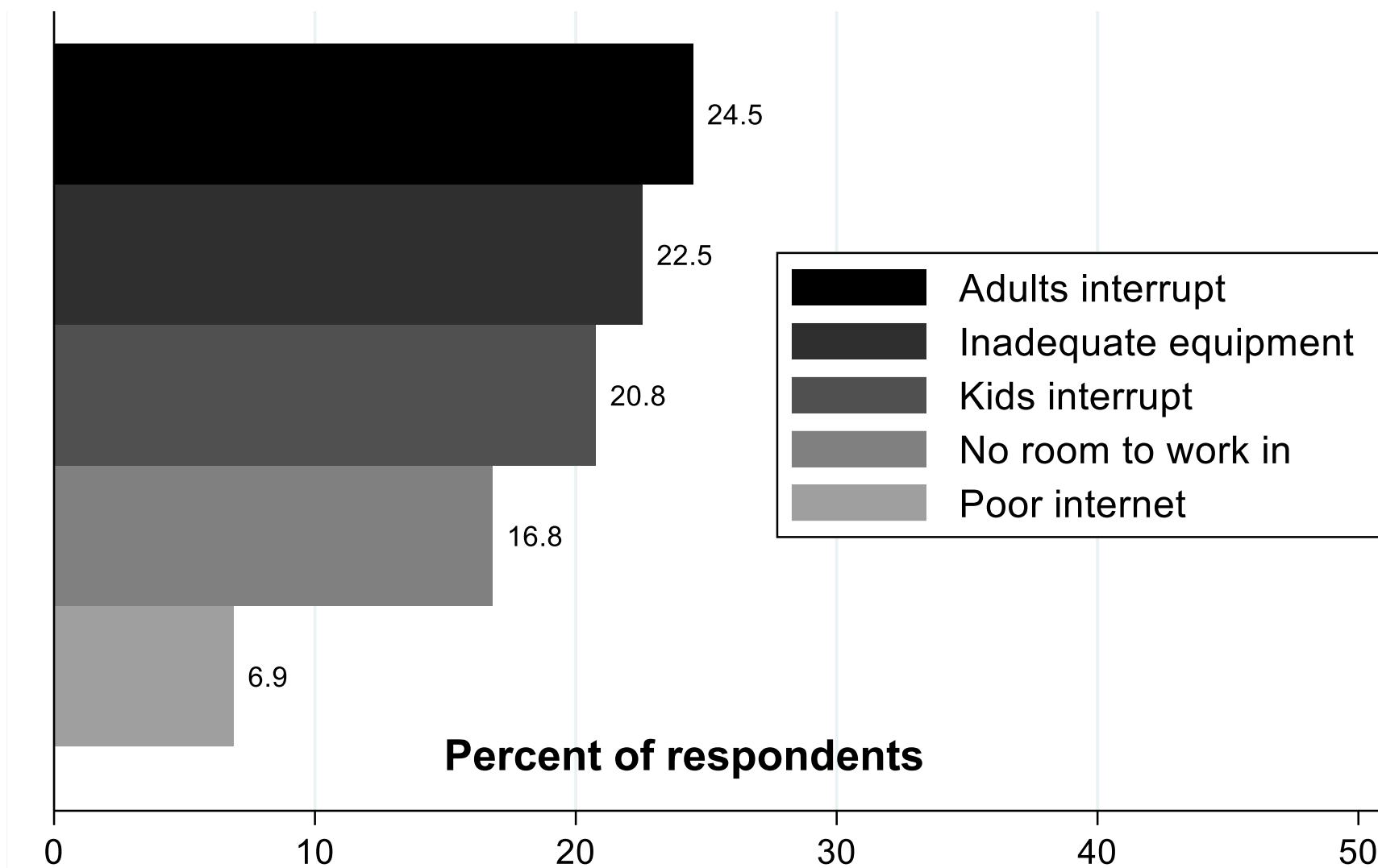**Value of WFH 2-3 days a week, % of current pay**

Source: Data from 45,349 responses across 27 countries collected in the July-August 2021 and January-February 2022 waves of the multi-country SWAA.

Why are you more efficient working from home?

Percent of respondents

Legend:
- Saved commuting time
- Quieter
- Meals/chores efficiency
- Less stress
- Fewer/shorter meetings
- Better internet
- Better equipment

Bar values: 87, 65, 41, 39, 37, 32, 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/

Why are you less efficient working from home?

Percent of respondents

Legend:
- Adults interrupt
- Inadequate equipment
- Kids interrupt
- No room to work in
- Poor internet

Values: 24.5, 22.5, 20.8, 16.8, 6.9

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

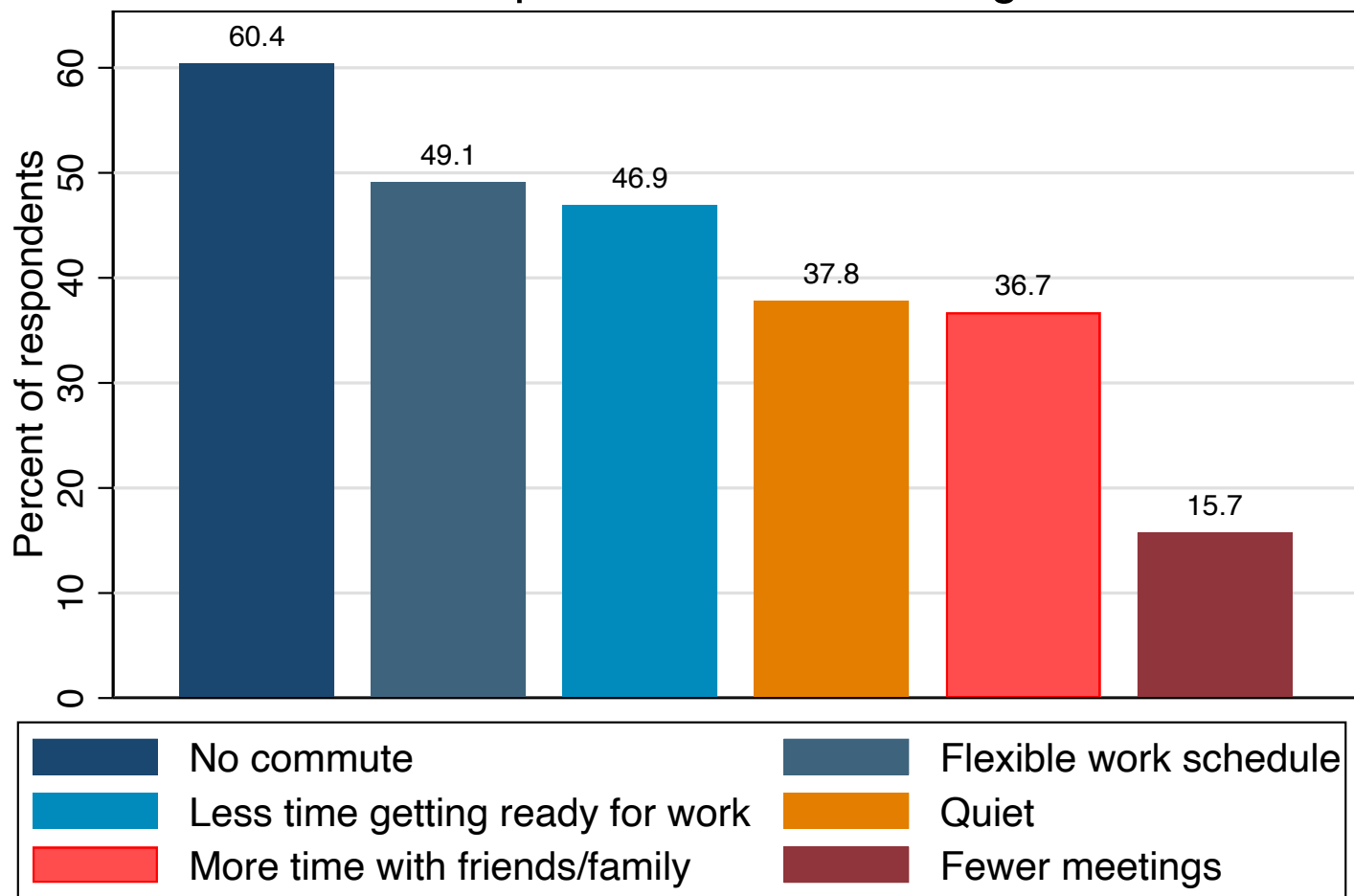# Commuting, flexibility, and less time getting ready for work are most often among the top 3 benefits of working from home
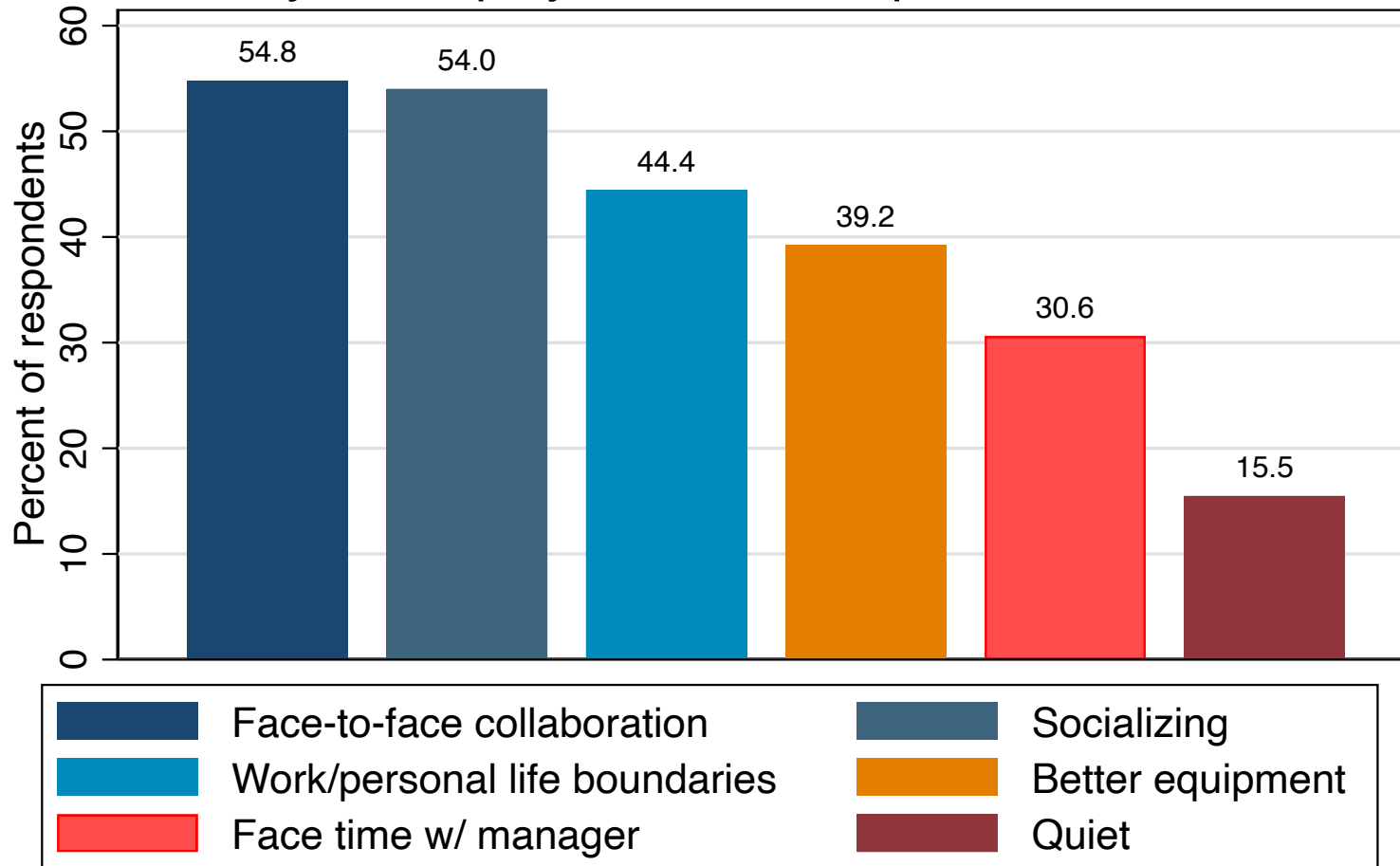
What are the top 3 benefits of working from home?

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.**

Collaboration and socializing are most often among the top 3 benefits of going to employers' 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.**

The Self-Assessed Relative Efficiency of WFH Has Been Rising

Efficiency of Working From Home
Relative to Working on Business Premises (%)

Linear trend coef (SE) = .3 (.02). N = 42240
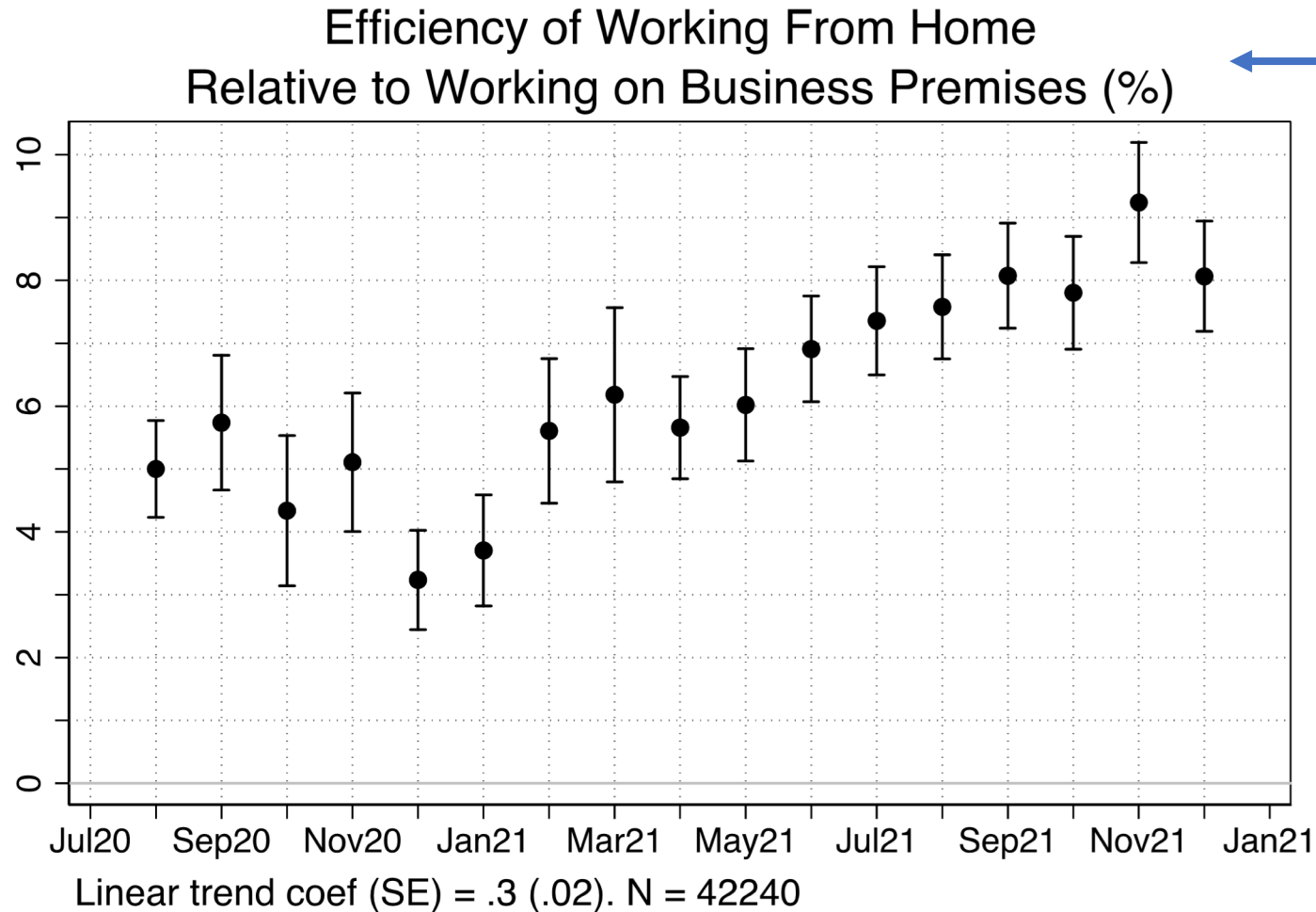
Average value of the $PrDiff_i$ term in the $Gain$ expression.

The average value of $WFH_i^{Plan} - WFH_i^{Pre}$ has also drifted up since January 2021. Both forces contribute to a rise over time in our projected productivity boost from the shift to WFH.

Remote and Hybrid Working Arrangements Are Complementary to a Broader Geographic Search for Talent

Are you offering remote or hybrid working arrangements as a way to recruit new full-time employees?

Source: A small-scale survey of employers in the Fifth District of the Federal Reserve System. The survey results are discussed more fully in Davis, Macaluso and Waddell (2022).

- Did Not Expand Recruiting Area
- Expanded Recruiting Area

Not Offering WFH to Recruit New Employees   Offering WFH to Recruit New Employees

Quantifying the Effect of Long Social Distancing on LF Participation

(1) Regress 100 X LF non-participation status (not working and not looking for work = 1) on responses to the question about social distancing plans after the pandemic ends. Control for age, sex, education, and industry of the current/last job.

(2) <u>Counterfactual</u>: Use the regression coefficients on substantial, partial and no return to pre-COVID activities and the shares in each response category for social distancing plans to compute the implied drag on LF non-participation relative to a world with no long social distancing (i.e., everyone fully returns to pre-COVID activities). This counterfactual implies that long social distancing lowers the LF participation rate by 2.5 ppts as of early 2022.

(3) This estimate is not very sensitive to controls. For example, dropping all controls and repeating, yields a 2.4 ppt effect. It is lower on an earnings-weighted basis – 2.0 ppts.

(4) In results not shown, the long social distancing drag on LF participation shows no signs of abating over time. In fact, it's been drifting up since late 2020.

(5) Finally, note that the self-diagnosed reasons for non-participation (slide 24) also imply that long social distancing imparts a similarly-size drag on LF participation.

References

Barrero, Jose Maria, Nicholas Bloom, and Steven J. Davis. 2020. "60 Million Fewer Commuting Hours per Day: How Americans Use Time Saved by Working from Home," University of Chicago, Becker Friedman Institute for Economics Working Paper No. 2020-132.

Barrero, Jose Maria, Nicholas Bloom, and Steven J. Davis. 2021. "Internet Access and its Implications for Productivity, Inequality, and Resilience." In *Rebuilding the Post-Pandemic Economy*, ed. Melissa S. Kearney and Amy Ganz (Washington D.C.: Aspen Institute Press.

Barrero, Jose Maria, Nicholas Bloom, and Steven J. Davis. 2021. "Why Working from Home Will Stick." National Bureau of Economic Research Working Paper 28731.

Barrero, Jose Maria, Nicholas Bloom, and Steven J. Davis. 2022. "Long Social Distancing," March.

Barrero, Jose Maria, Nicholas Bloom, Aksoy Cevat, Steven J. Davis, Matthias Dolls, and Pablo Danial Zarate, 2022. "Working from Home Around the World," March.

Bloom, Nicholas, Steven J. Davis, and Yulia Zhestkova. 2021. "COVID-19 Shifted Patent Applications toward Technologies that Support Working from Home." *AEA Papers & Proceedings,* May.

Caros, N.S., Guo, X., and Zhao, J. (2022). The emerging spectrum of flexible work locations: implications for travel demand and carbon emissions.f https://arxiv.org/abs/2201.01281

Davis, Steven J., Claudia Macaluso and Sonya Ravindranath Waddell, 2022. "Are Firms Using Remote Work to Recruit and Retain Workers?" *Economic Brief,* Federal Reserve Bank of Richmond, 23 February 2022.

Hansen, Stephen, Peter Lambert, Nicholas Bloom, Steven J. Davis, Raffaella Sadun and Bledi Taska, 2022. "Remote Work across Jobs, Companies, and Countries."

Mas, Alexandre and Amanda Pallais, 2017. "Valuing Alternative Work Arrangements," *American Economic Review,* 107, no. 12 (December), 3722-59.