The Big Shift to Remote Work

Steven J. Davis, based on work with Nick Bloom, Jose Maria Barrero, and Others

Hoover Institution Economic Policy Working Group

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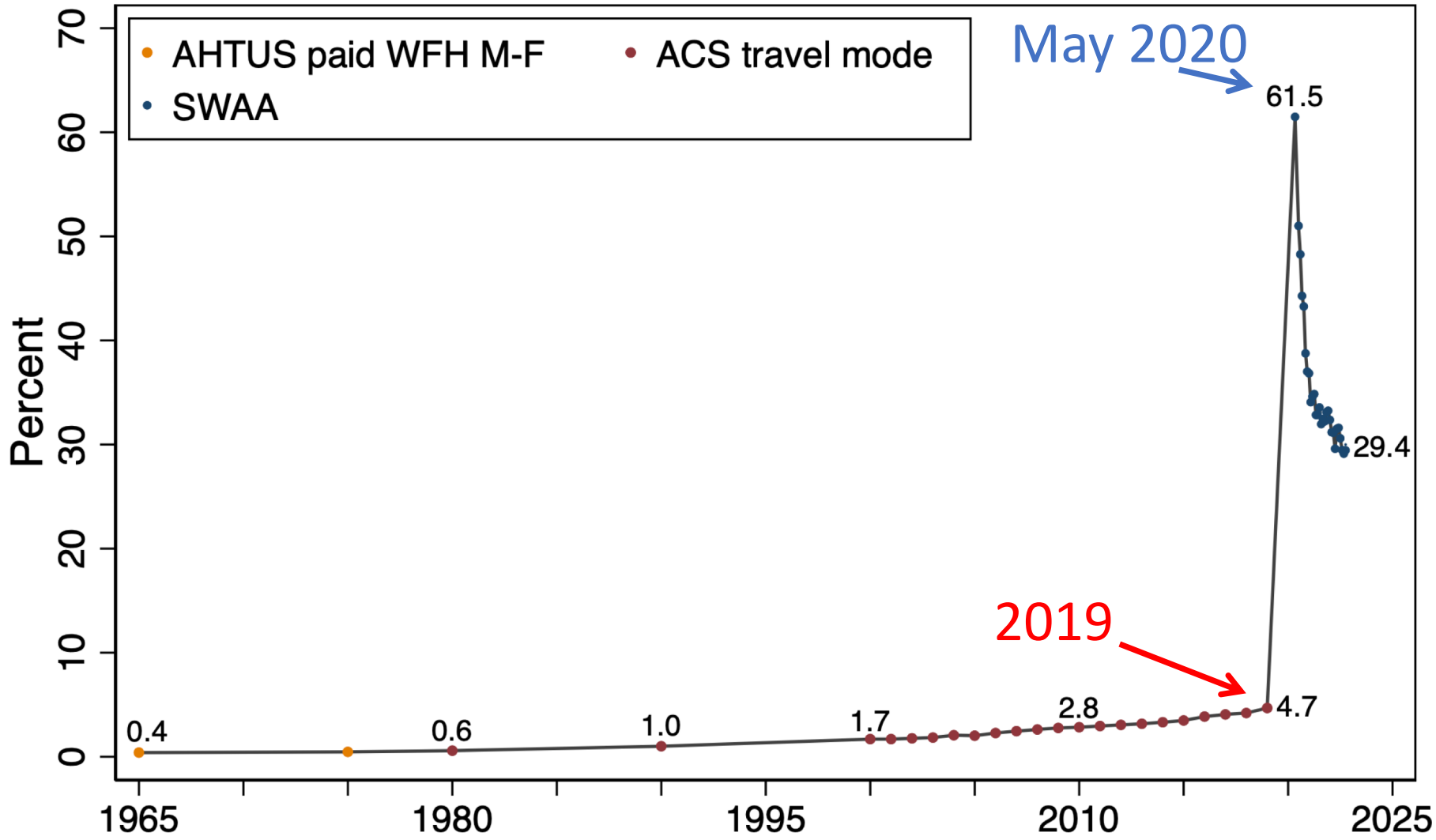
Overview

1. **The big shift to WFH/remote work**
2. ~~**Why the shift will stick**~~
   - ~~And how it was catalyzed by the pandemic~~
3. **Some benefits of the shift**
4. **The shift moderates wage growth**
5. **Good or bad for productivity & innovation?**
6. **WFH and the surge in business startups**
7. **Challenges for cities and civic leaders**

Percent of Full Paid Workdays Performed at Home in the United States, Workers 20-64, 1965 to October 2022



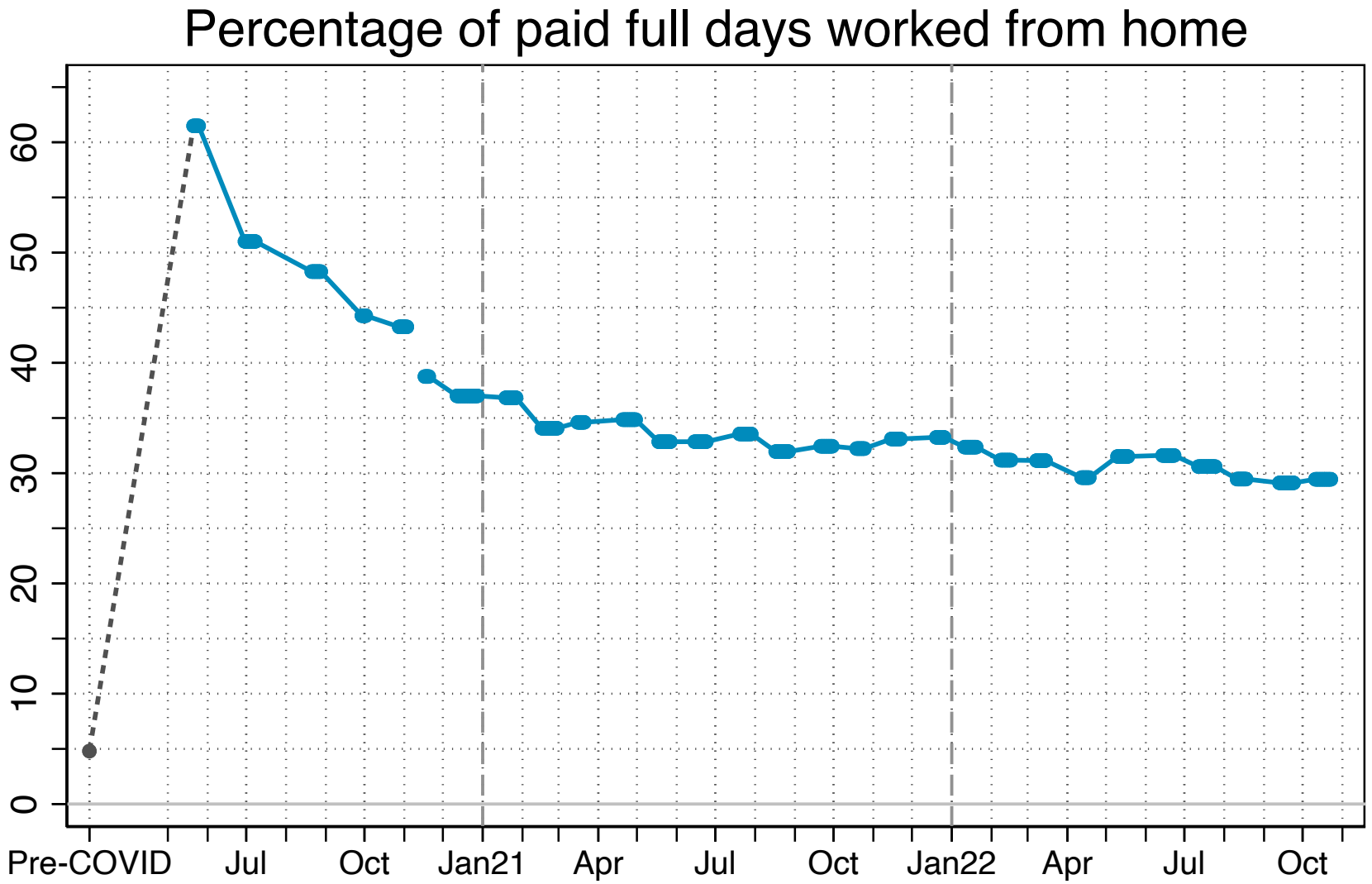
1965-1975 uses data from the American Historical Time Use Survey.
1980-2019 uses data from American Community Survey.
May 2020 - October 2022 uses data from the Survey of Working Arrangements and Attitudes.

AHTUS = American Historical Time Use Survey

ACS = American Community Survey

SWAA = Survey of Working Arrangements & Attitudes

Zooming into the period covered by the SWAA – May 2020 to October 2022



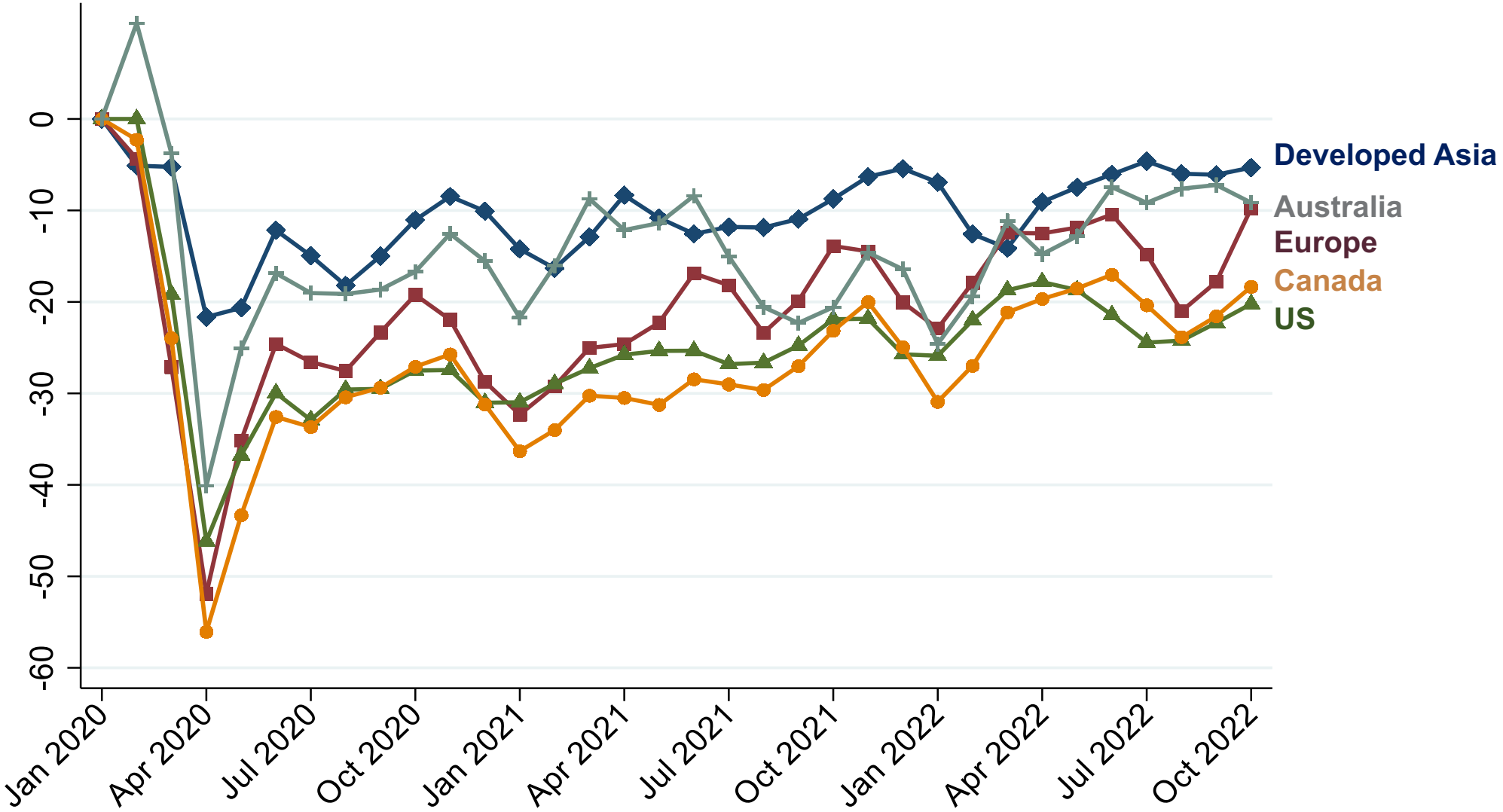
*Pre-COVID estimate taken from the 2017-2018 American Time Use Survey

*The break in the series in November 2020 reflects a change in the survey question.

US & Canada have seen larger WFH increases than most other countries, judging from Google workplace mobility deviations from pre-pandemic levels

Workplace Trips

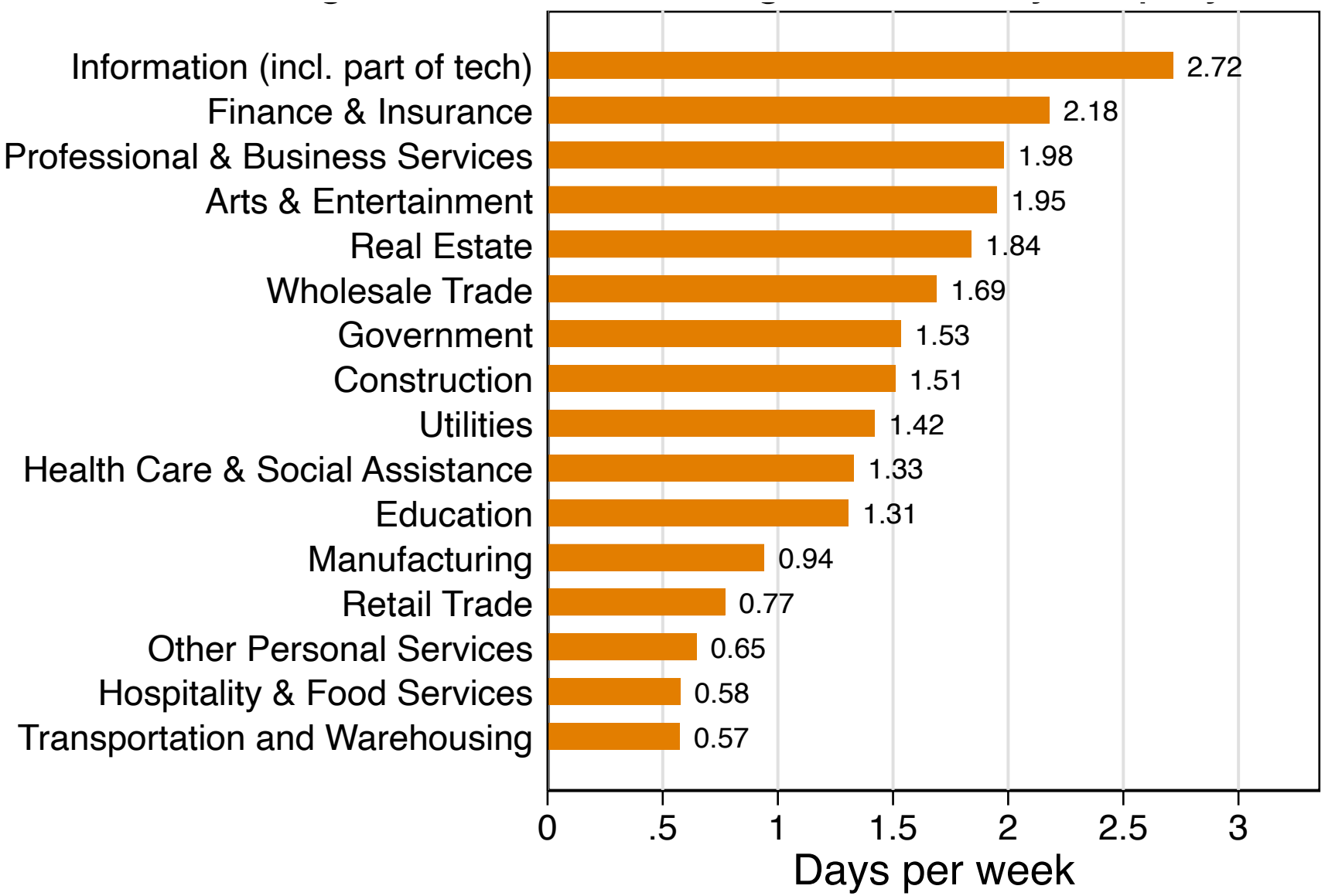
Google cellphone workplace mobility in % deviation from Jan 2020



Source: Data from Google Workplace Cellphone Mobility Data https://www.google.com/covid19/mobility/ Regions average of largest available countries: Developed Asia=KR+JP+TW+HK+SG, and Europe=GB+FR+DE+IT+ES+NL+SE+PL. Deviations from the Jan 3 – Feb 6 2020.

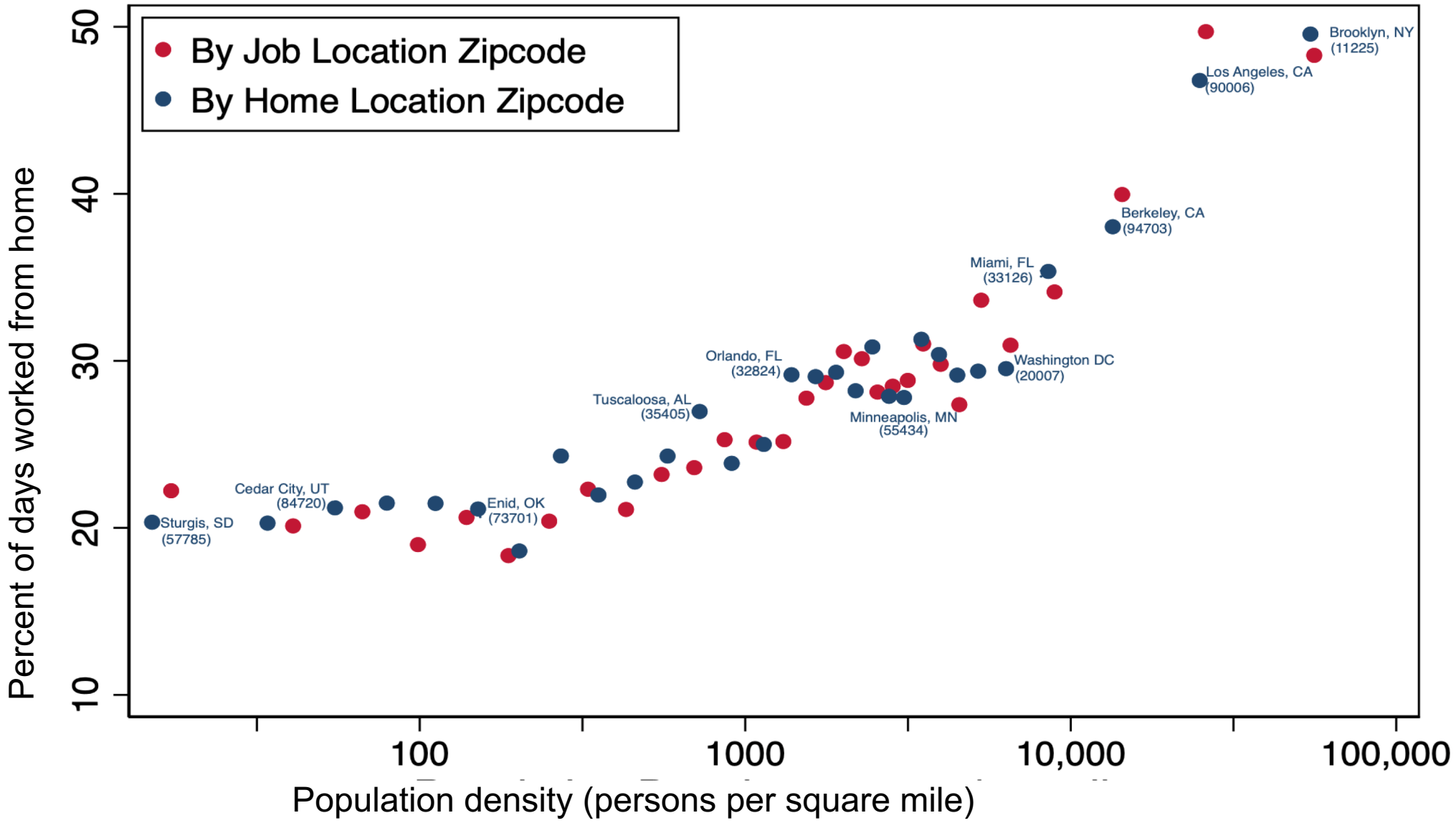
WFH is more prevalent in industries with higher shares of professional and knowledge workers – US Data from the SWAA

Current WFH: all wage and salary employees by industry



Notes: Survey of Workplace Attitudes and Arrangements www.wfhresearch.com Sample N=13,662 from April to July 2022

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/

Why the big shift to WFH will stick, and how the pandemic catalyzed a lasting shift

1. **Mass experimentation → learning and revision of prior views → re-optimization of working arrangements**
2. Investments in time, equipment, systems, processes, and management practices that enable WFH
3. Attitudinal shifts:
   - Stigma around WFH has plummeted
   - Infection risks are now greater and more salient, leading some people to prefer WFH (more so than before the pandemic)
4. **A surge in innovation that supports WFH**
5. Stricter, longer lockdowns during the pandemic → 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 an abrupt, big shift to remote work.

COVID-19 Compelled Firms and Workers to Experiment at Scale 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."

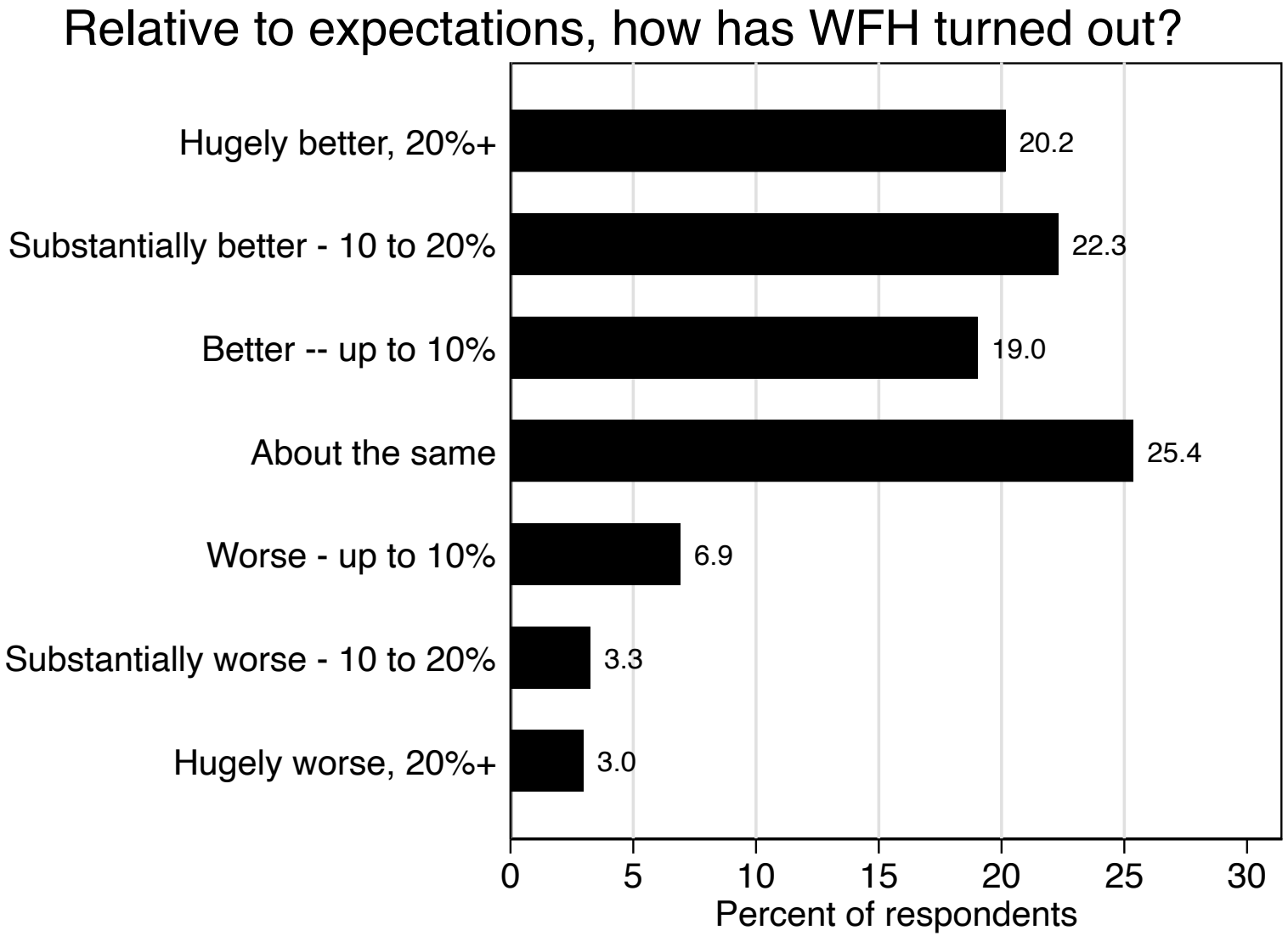
– James Gorman, CEO of Morgan Stanley*

Quotation from Cutter (WSJ, 2020)

James Gorman

PHOTO: AL DRAGO/BLOOMBERG NEWS

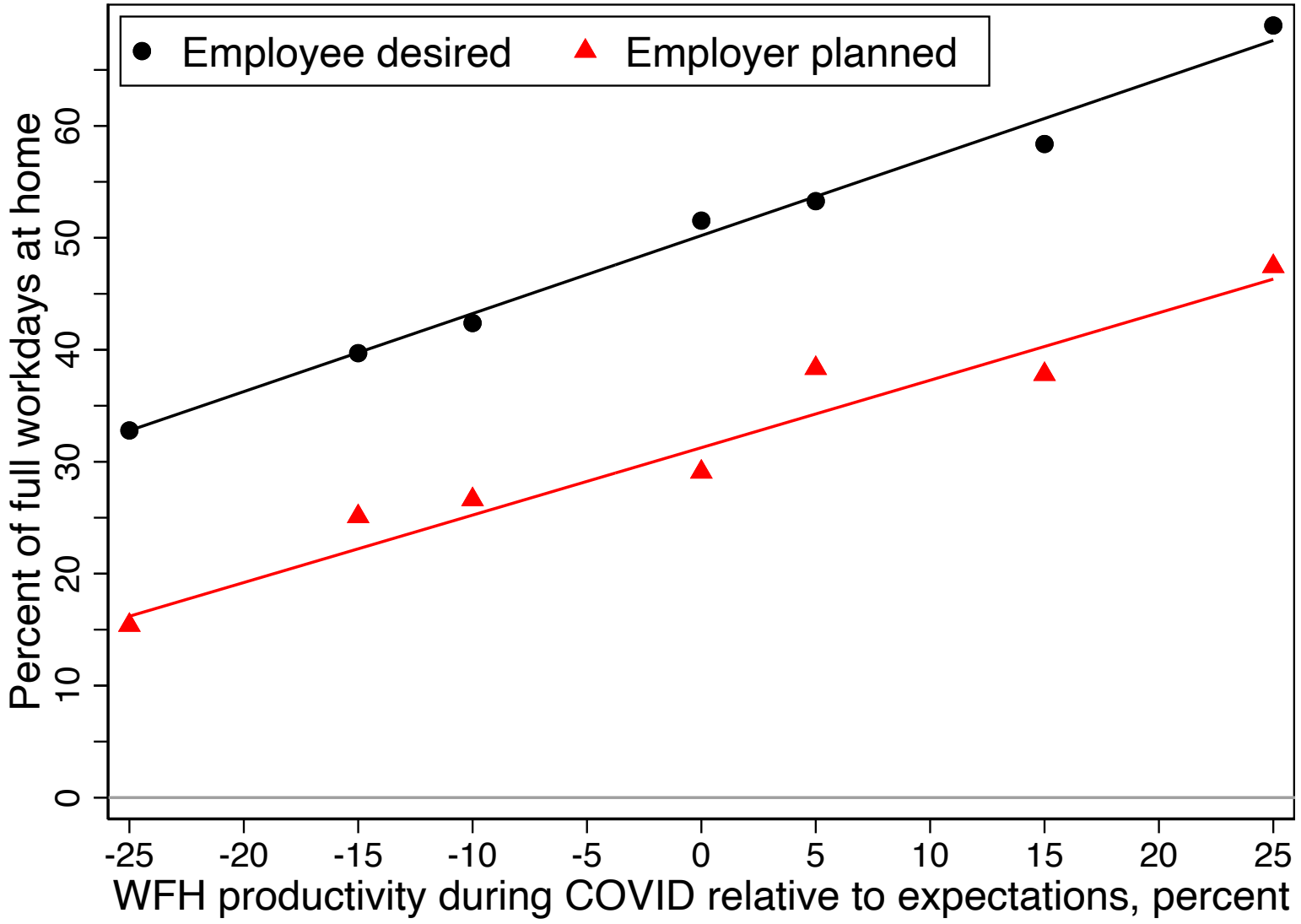
Forced Experimentation: WFH productivity during the pandemic exceeded expectations



*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



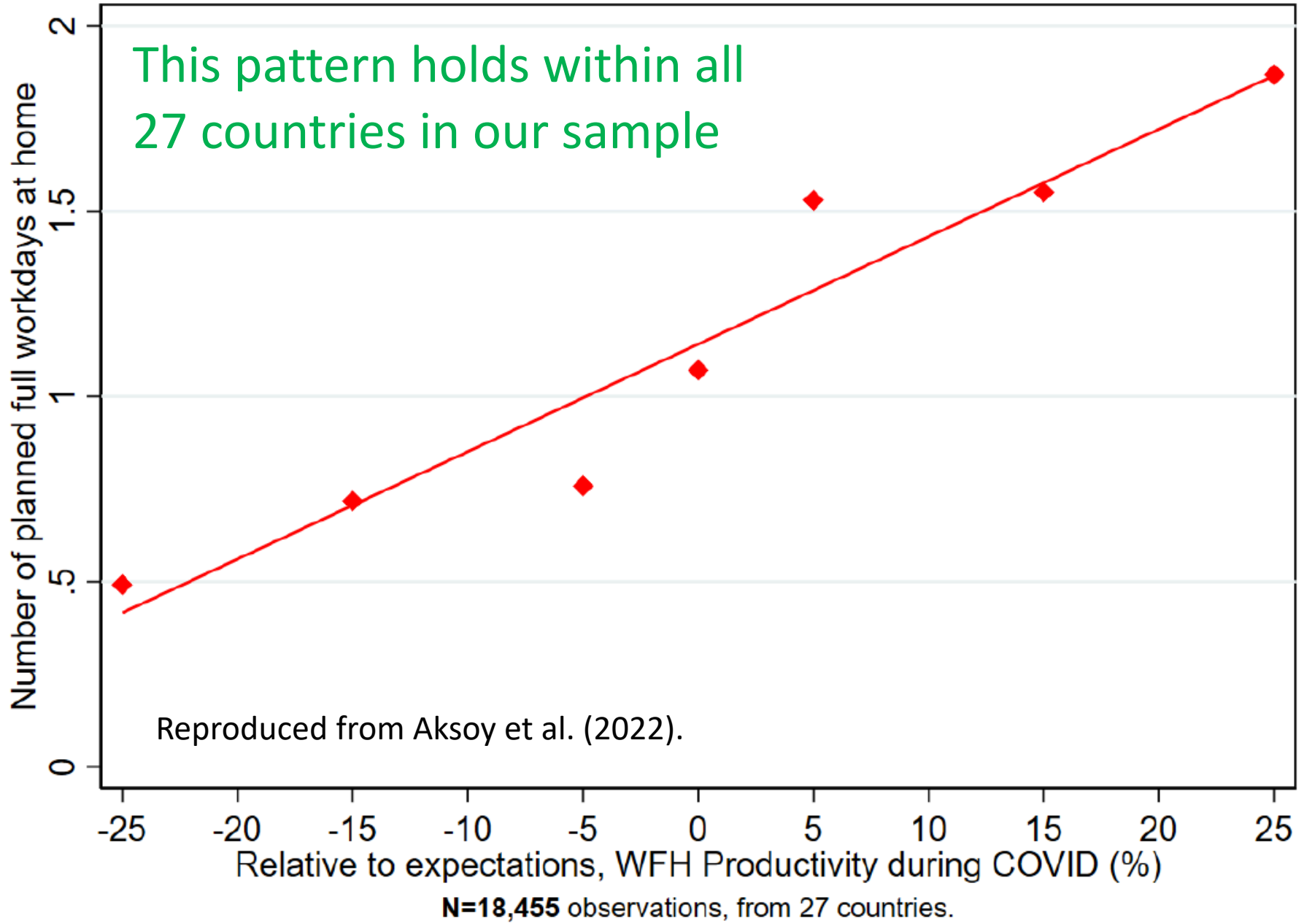
Source: Response to the questions:

> ***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 {age x sex x education x earnings} cell. We did not ask about productivity relative to expectations in May 2020.

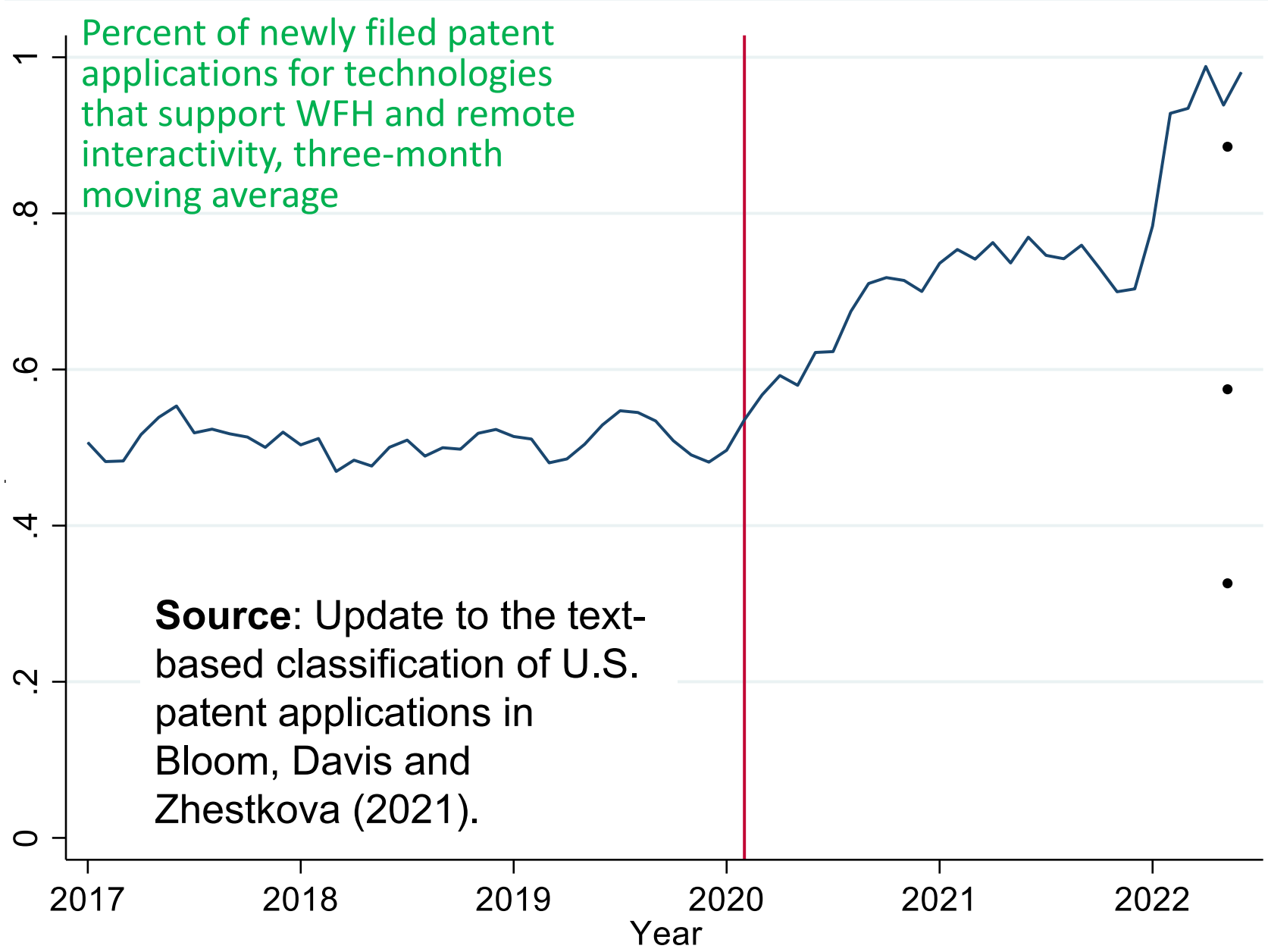
A Similar Pattern Holds in a 27-Country Sample



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

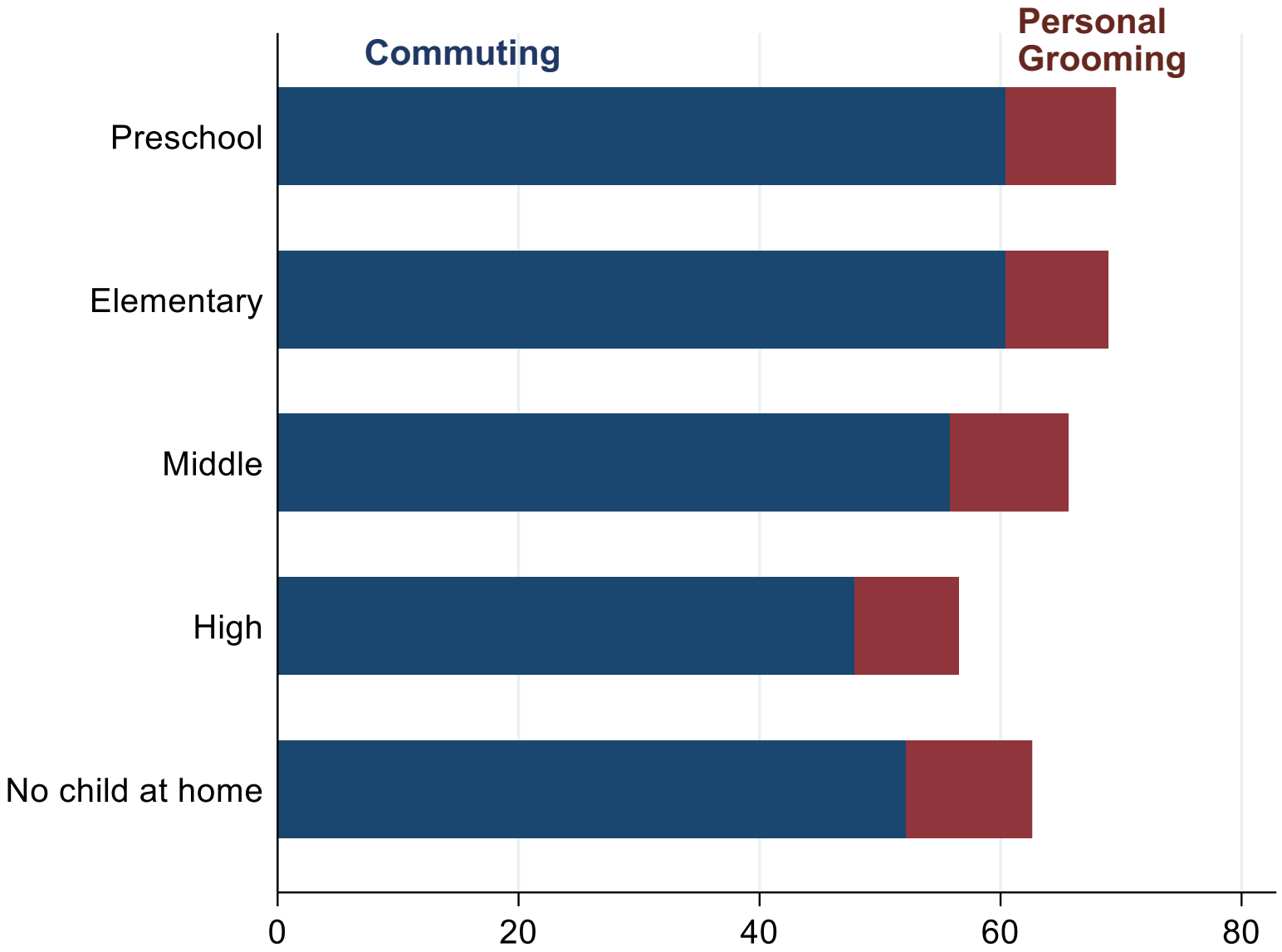
COVID-19 Shifted Patent Applications to Technologies that Support WFH



- New WFH technologies are being rapidly developed as the market for WFH products has increased 5x
- For example: better AV, more and better remote collaboration tools, scheduling software
- Will likely lead to continuing improvements in the relative performance of WFH and remote work interactions more broadly.

Some Benefits of Remote Work

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):

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

C_i = daily round-trip commute time expressed in hours

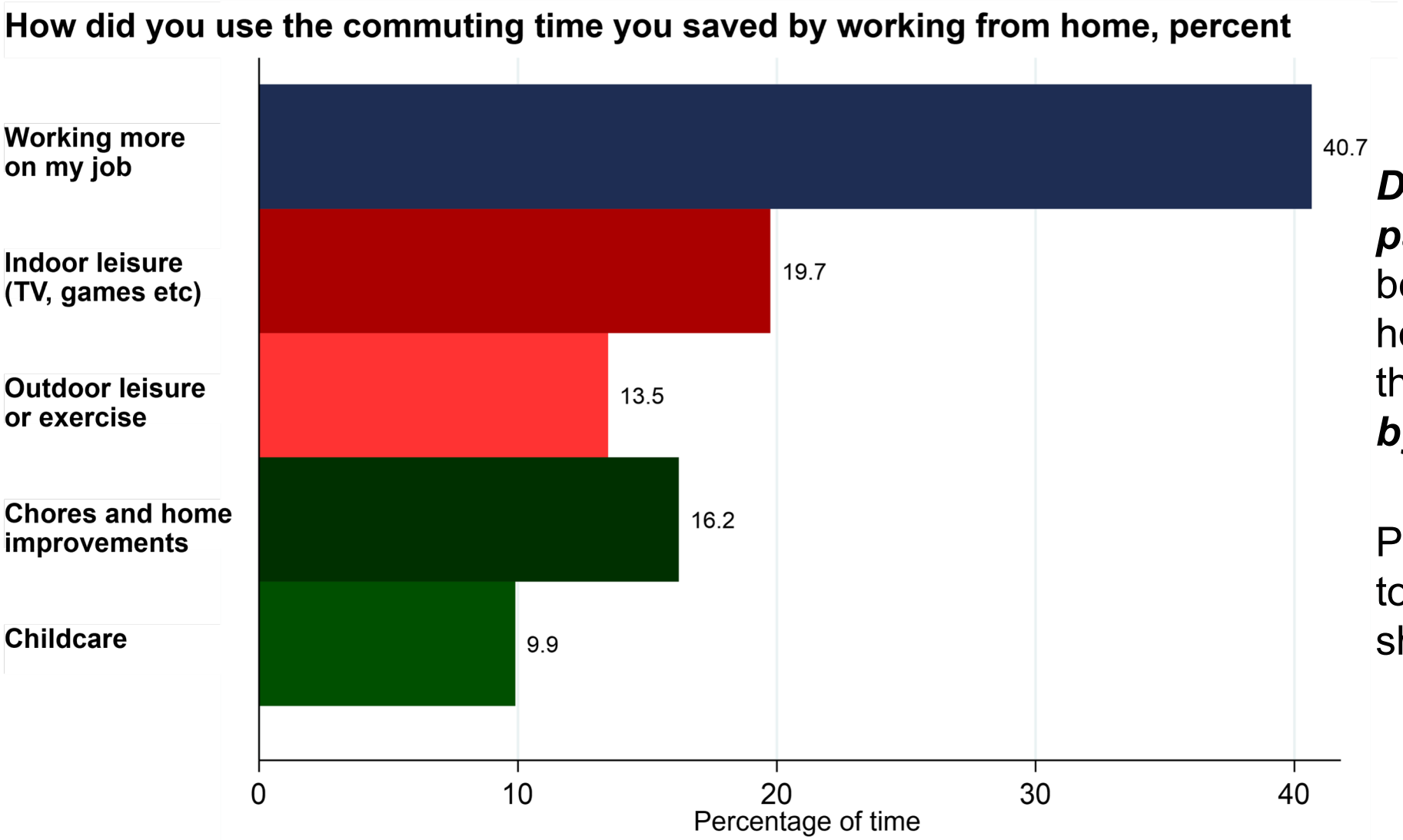
f_i = fraction of commute time devoted to work-related activities.

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.

How Americans Say They Use their Time Savings



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.

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:

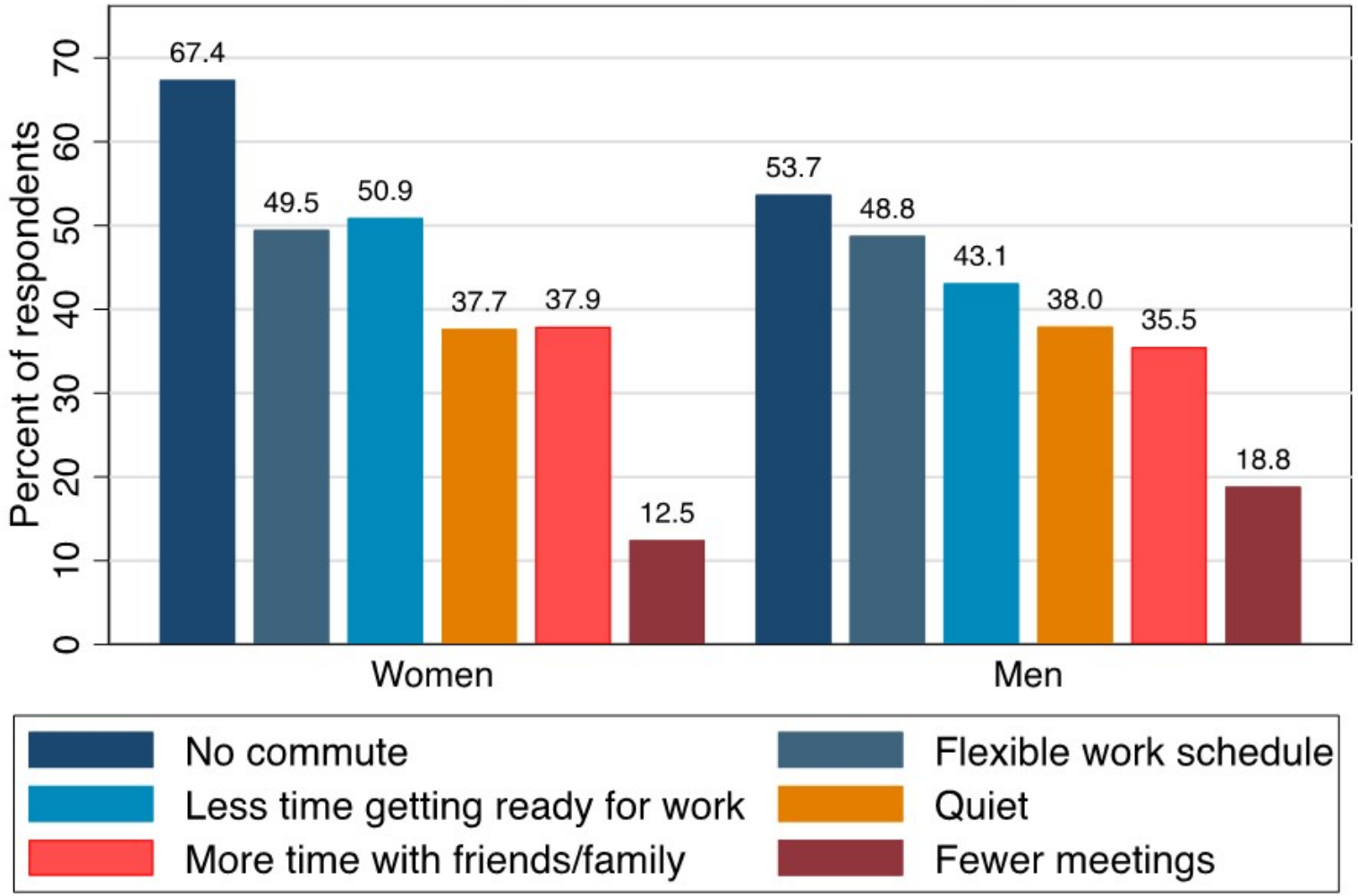
- Women than otherwise similar men: differential = 1% of pay
- People with children under 14: 1% of pay for both men and women
- More educated: Advanced degree holder vs. HS = 2.5% of pay
- Those with longer commutes: Differential exceeds 2% of pay for RT commute > 1 hour compared to < 20 minutes

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

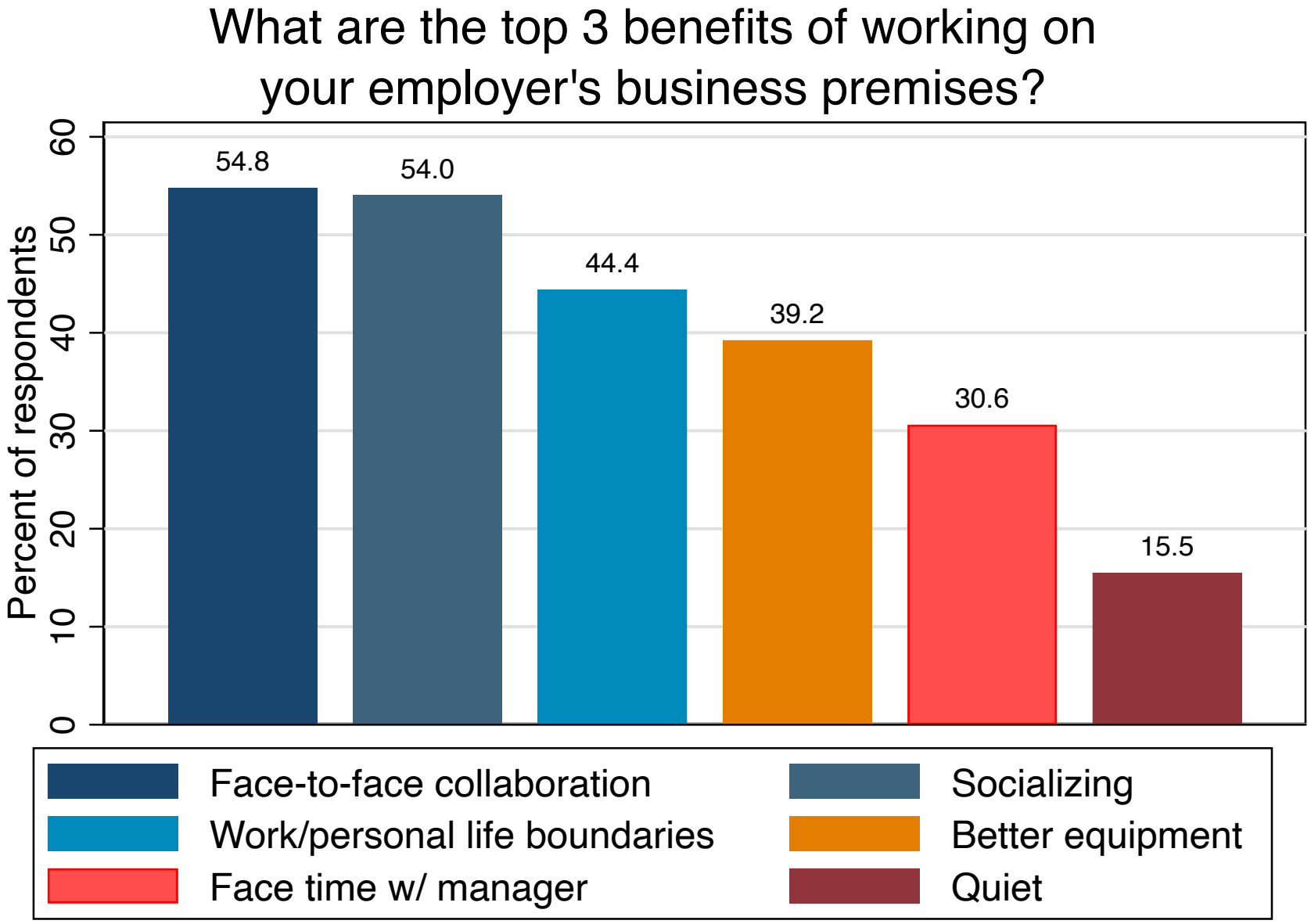
Saved time particularly important for women



WFH RESEARCH

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



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

	As a Percent of Earnings			
	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.

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.

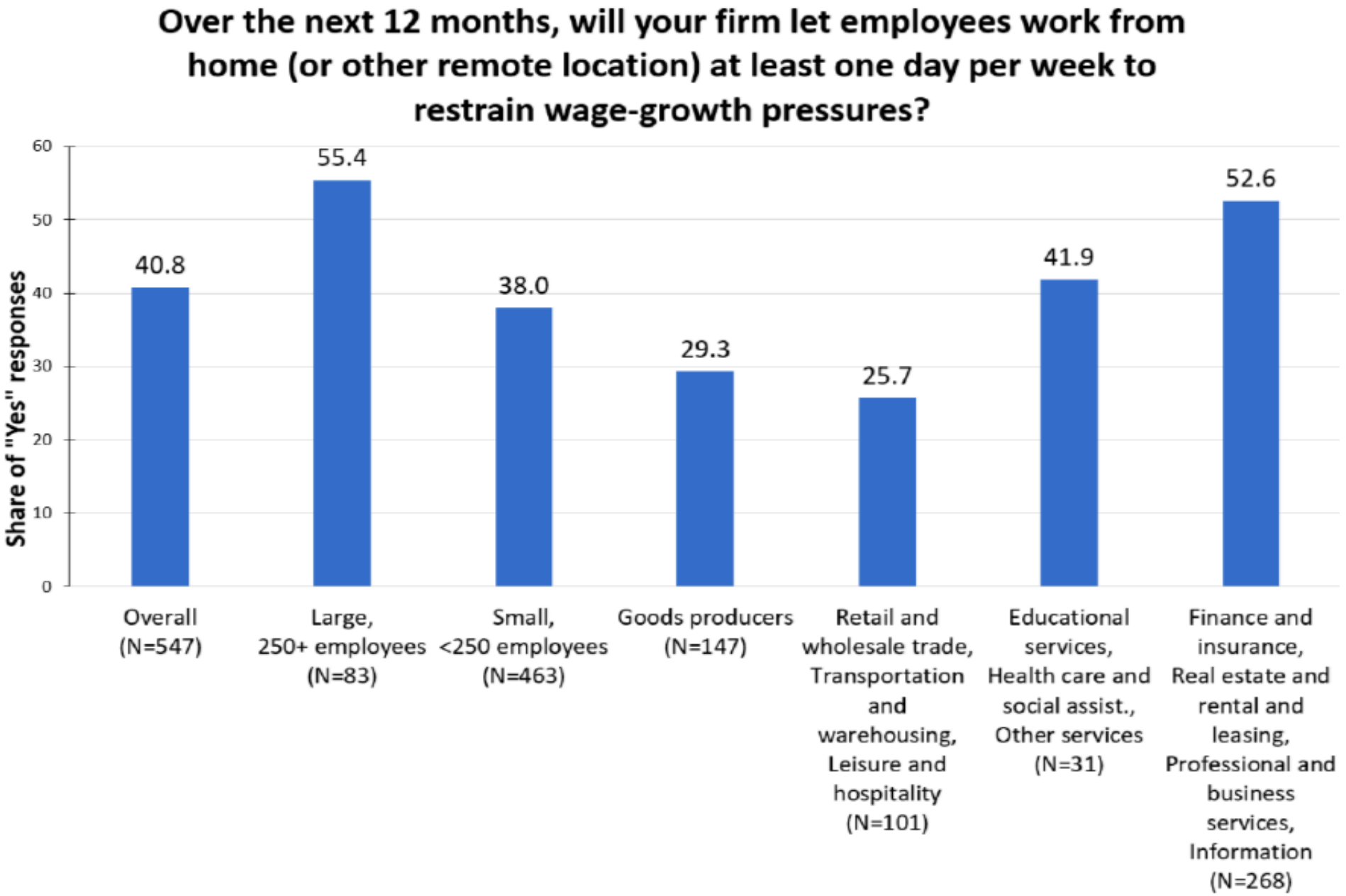
How the Big Shift to WFH Moderates Wage Growth

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 Nash-type bargaining model.
   - 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.

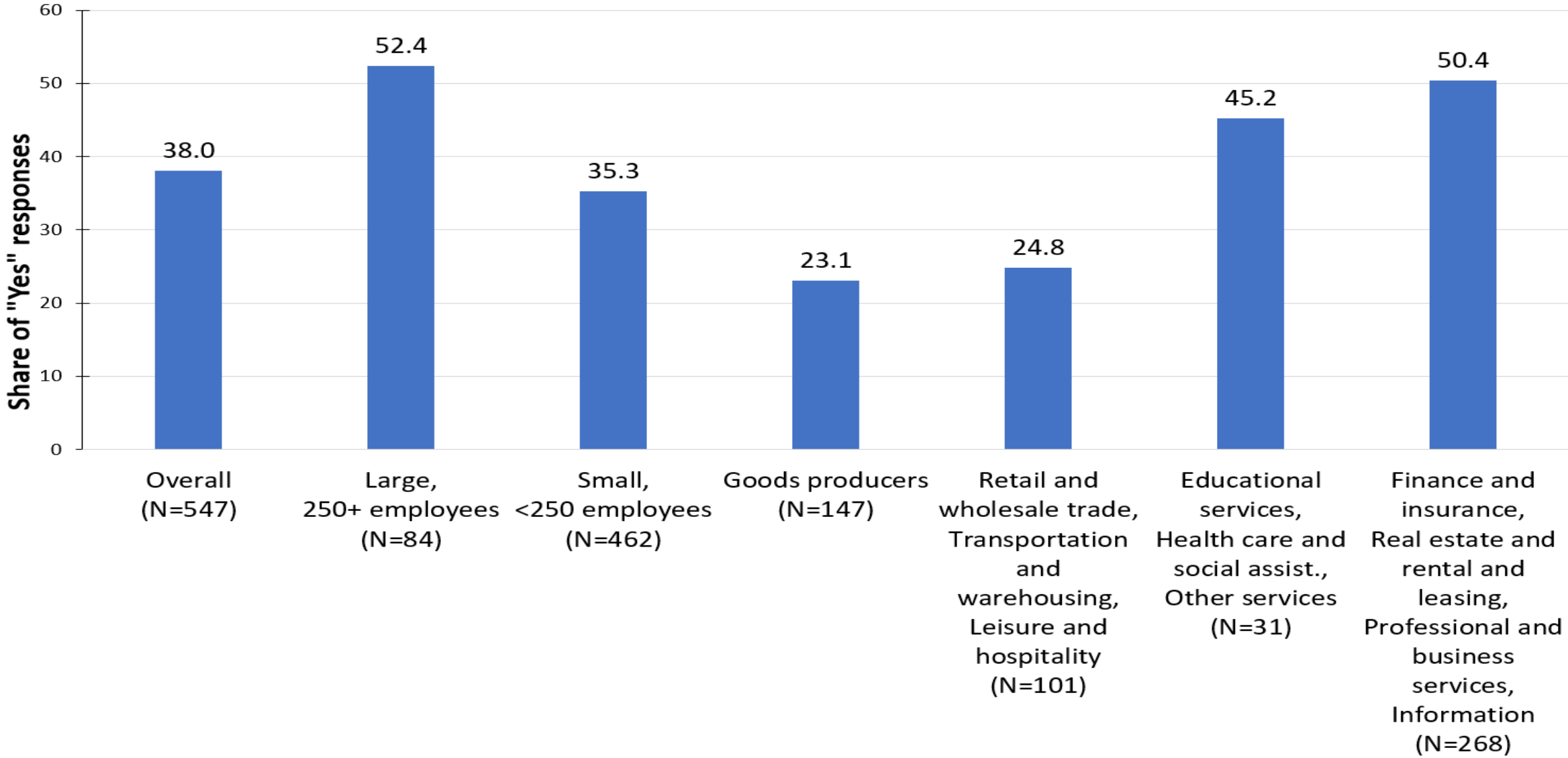
This is a one-time transition phenomenon (not a steady-state effect) but spread out over 1-2 years or more, because wage agreements and employment relationships take time to adjust.

Many Firms See WFH as a Way to Moderate Wage Growth



Reproduced from Altig et al. (2022), 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?



Wage-Growth Moderation Due to the Rise of Remote Work Over the Two-Year Period Centered on April/May 2022 (Percentage points)

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

This table reports size-weighted means tabulated from special SBU questions fielded from 11-22 April and 9-20 May 2022.
Source: Altig et al. (2022, 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

A Force for Wage Compression

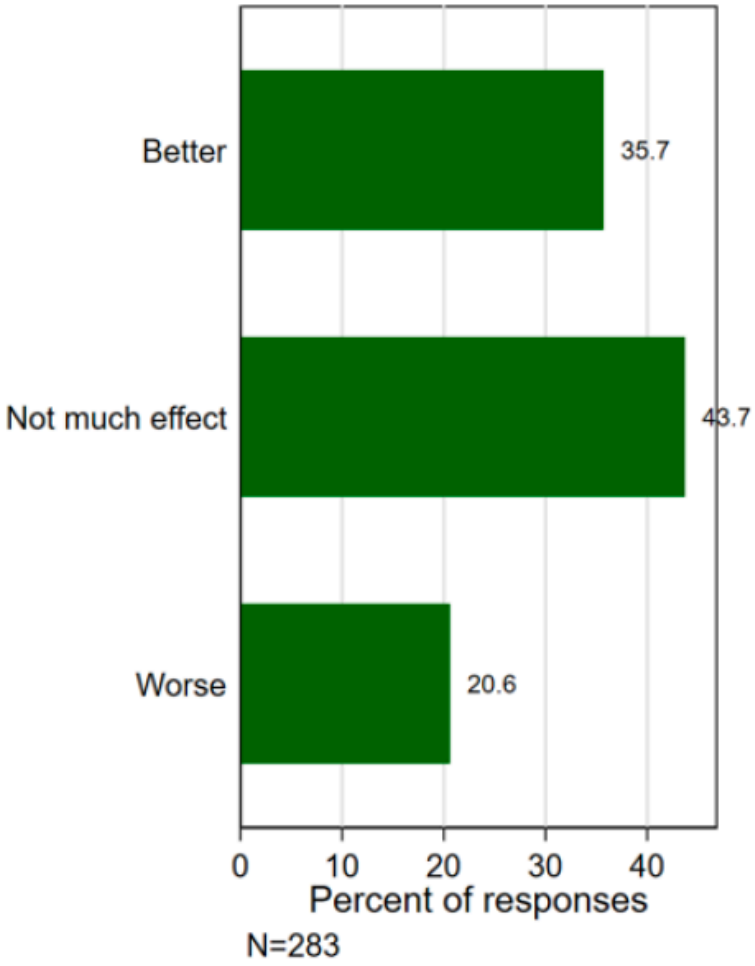
Autor and Dube (2022) estimate that real hourly wages rose 6 percent or more in the lower quartile of the earnings distribution from January-March 2020 to January-March 2022. They also show that real wages fell in the upper half of the distribution over the same period, with larger declines at higher 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.

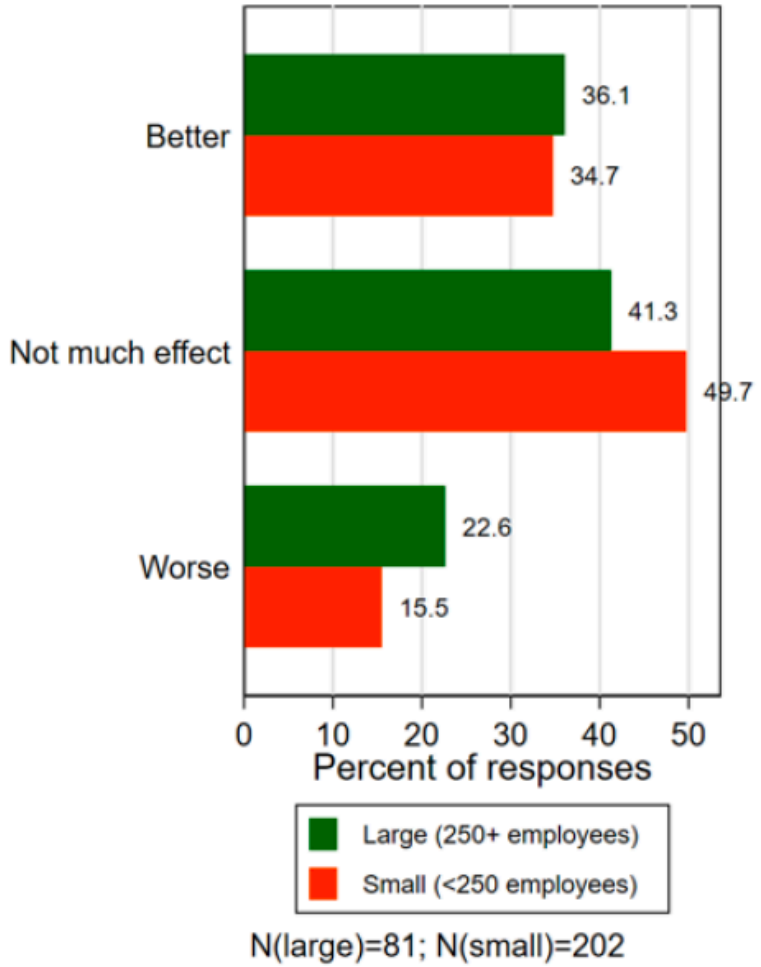
Is Remote Work Good or Bad for Productivity?

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?



N=283



N(large)=81; N(small)=202

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?
a. Better b. Not much effect c. Worse
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?

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?	N	Mean Productivity Loss, Among those who WFH 1+ Days Per Wek	Mean Productivity Loss, Averaging over all employees by adjusting for the share who do not WFH
Total	**282**	**3.5**	**0.9**
<50 employees	103	5.2	1.3
50-99 employees	46	3.4	1.8
100-249 employees	53	2.2	0.1
250+ employees	80	3.8	1.0
Construction, Real Estate, Mining and Utilities	37	5.9	1.4
Manufacturing	46	2.8	0.3
Retail and Wholesale Trade	27	9.6	1.5
Business Services	146	1.4	0.8
Other Services	26	5.2	0.9

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.

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:

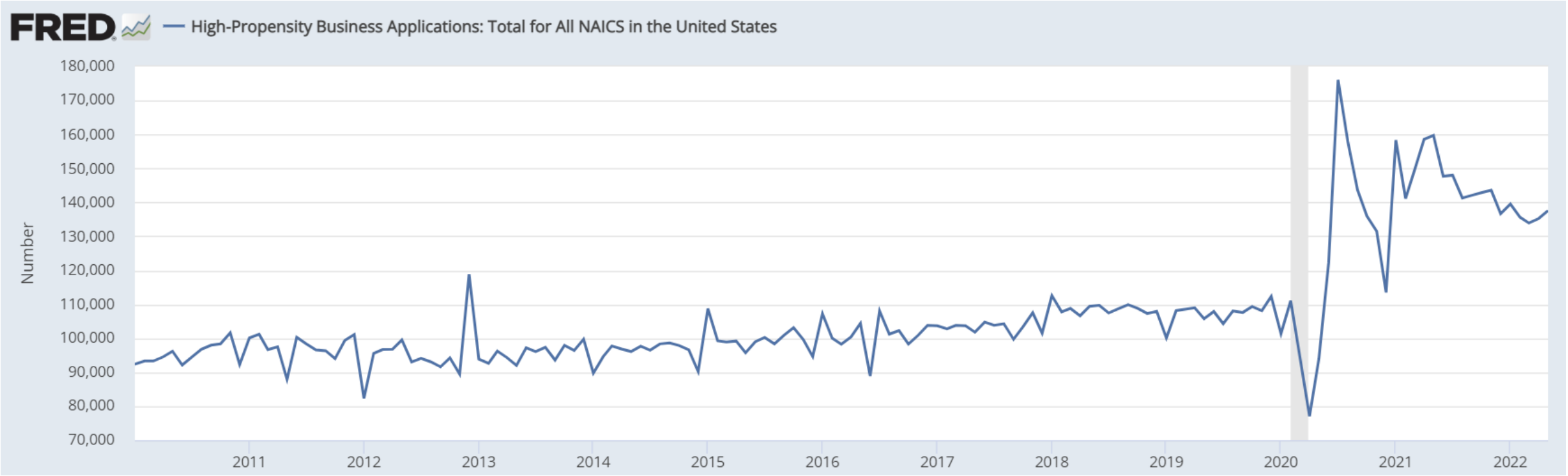
1. Many highly innovative firms operate across multiple cities and countries. So, workforce dispersal *per se* is an unlikely killer of innovation and productivity growth.
2. Key developments that facilitated the big shift – e.g., the rise of the internet, better broadband, better video technologies, 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 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.

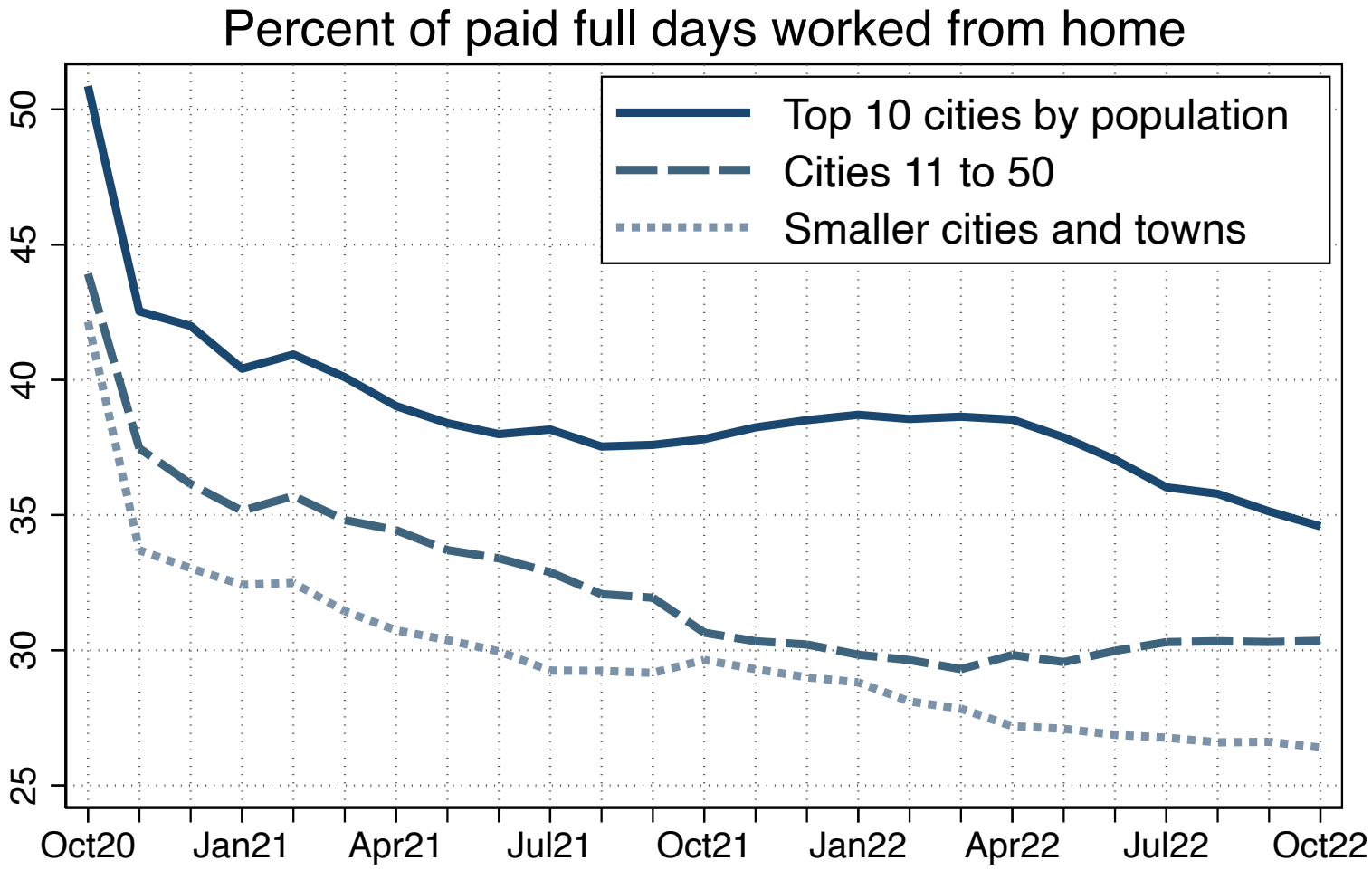


Source: US Census Bureau. Business Applications (BA) that have a high-propensity of turning into businesses with payroll. The identification of high-propensity applications is based on the characteristics of applications revealed on the IRS Form SS-4 that are associated with a high rate of business formation. 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).

https://fred.stlouisfed.org/series/BAHBATOTALSAUS

City-Level Variation in Remote Work

Working From Home is More Common in Major U.S. Cities than in Smaller Cities and Towns



*We define cities using Combined Statistical Areas and use the location of the respondent's current job.

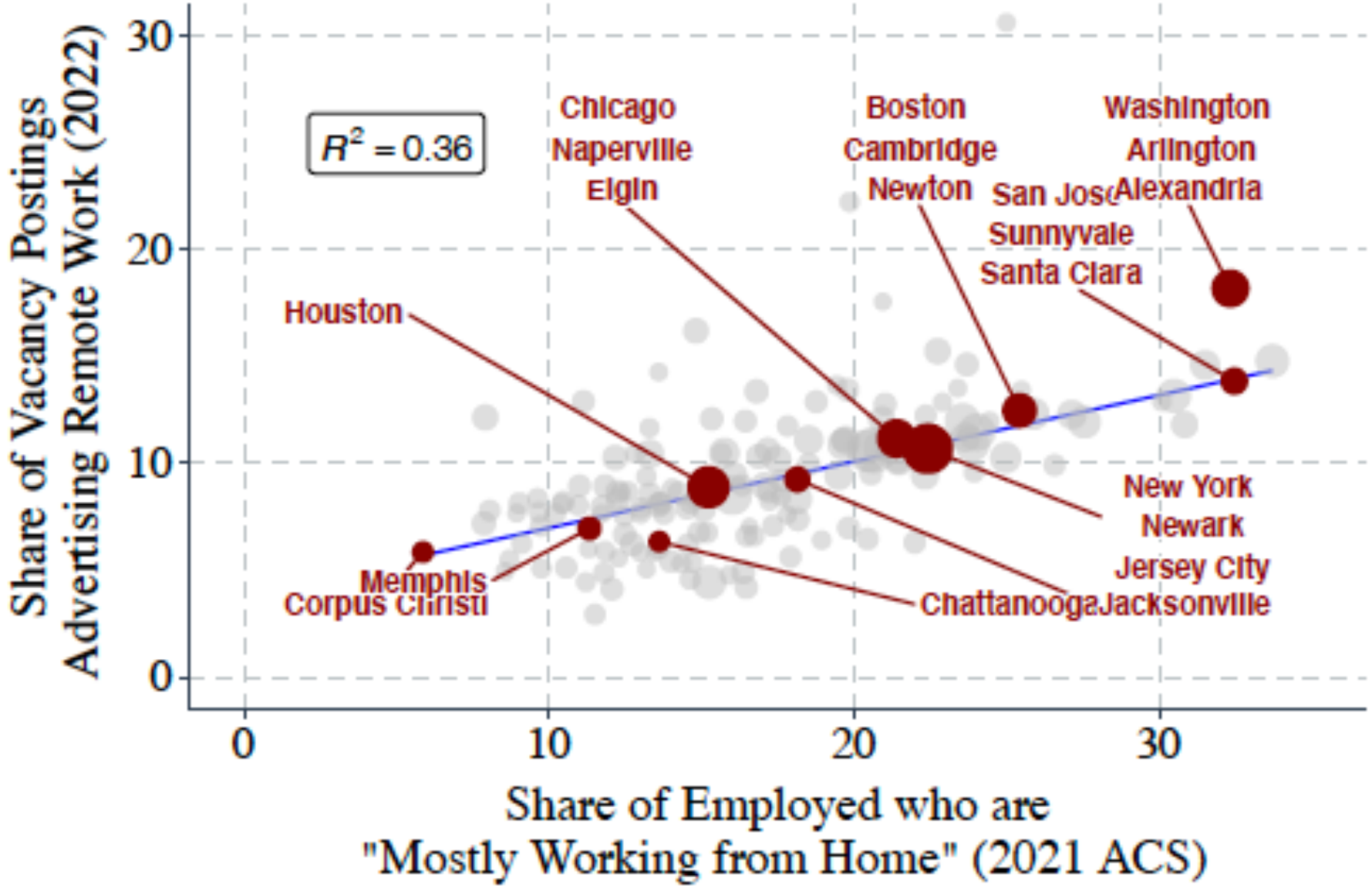
Source: Responses to the questions:

- **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 busines spremises. 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.

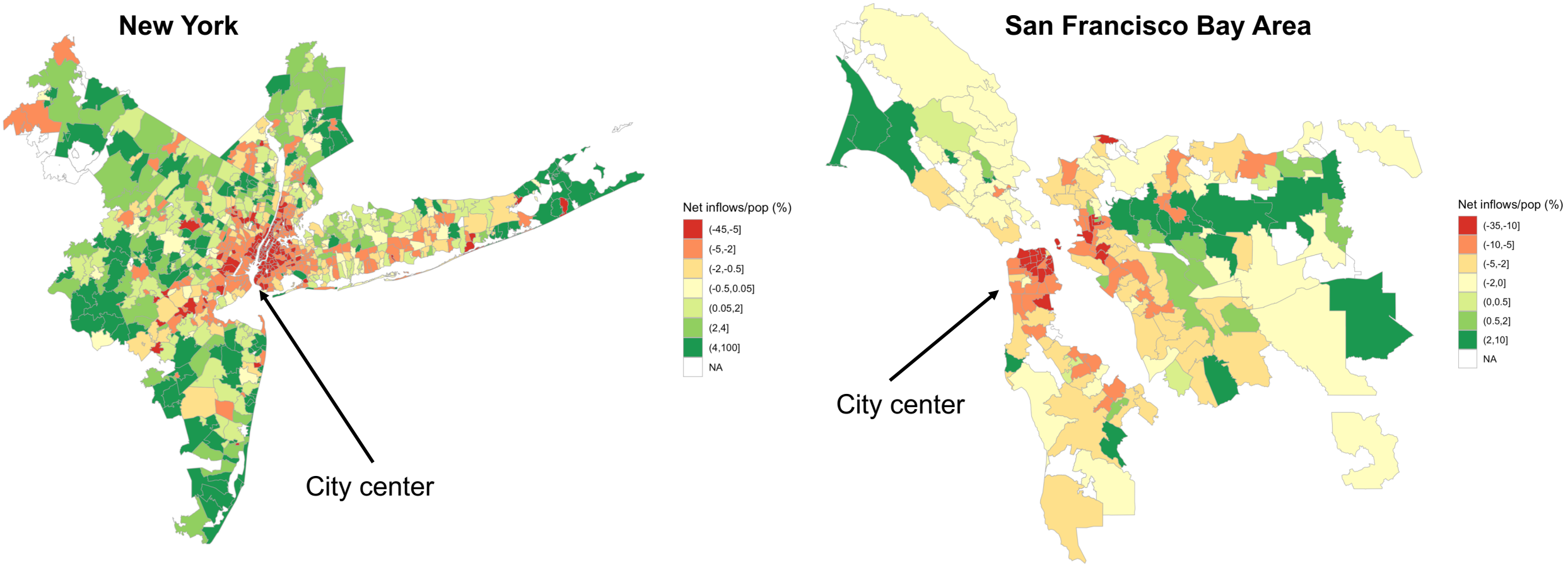
N = 91,751

Remote Work Vacancy Posting Share Compared to Percent of Full Paid Days Worked from Home in American Community Survey



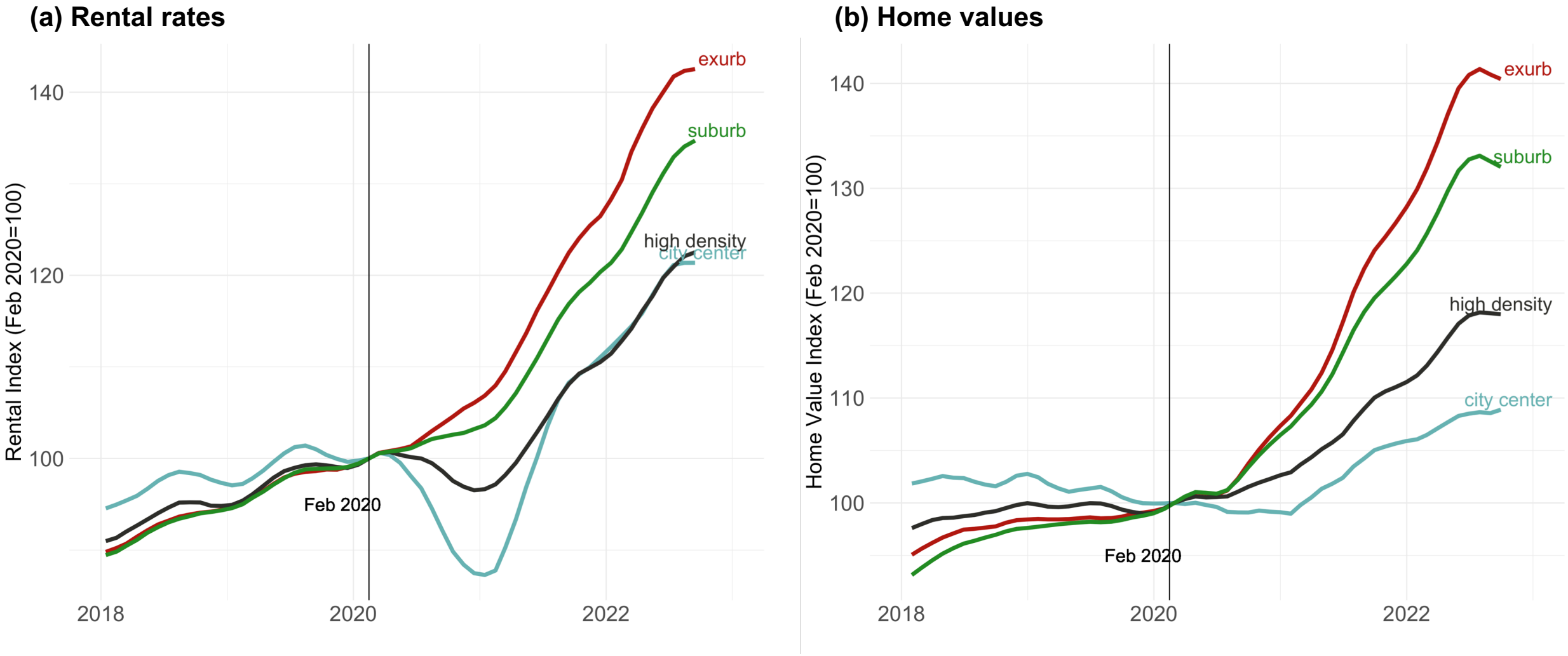
WFH has led to a movement out of some city centers

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



Source: Arjun Ramani and Nicholas Bloom "The Donut Effect", NBER Working Paper 2021 using US Postal Service Change of Address Data
https://nbloom.people.stanford.edu/sites/g/files/sbiybj4746/f/w28876.pdf

Figure X: WFH has pushed up rents and house prices in city suburbs



Notes: Zillow's rental index (left) and home value index (right) in the 12 largest US metro areas (New York, Los Angeles, Chicago, Dallas, Houston, Miami, Philadelphia, Washington DC, Atlanta, Boston, San Francisco, and Phoenix – ordered by population).

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.

End of Presentation Materials

Notes on Key Sources + More Evidence

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.

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

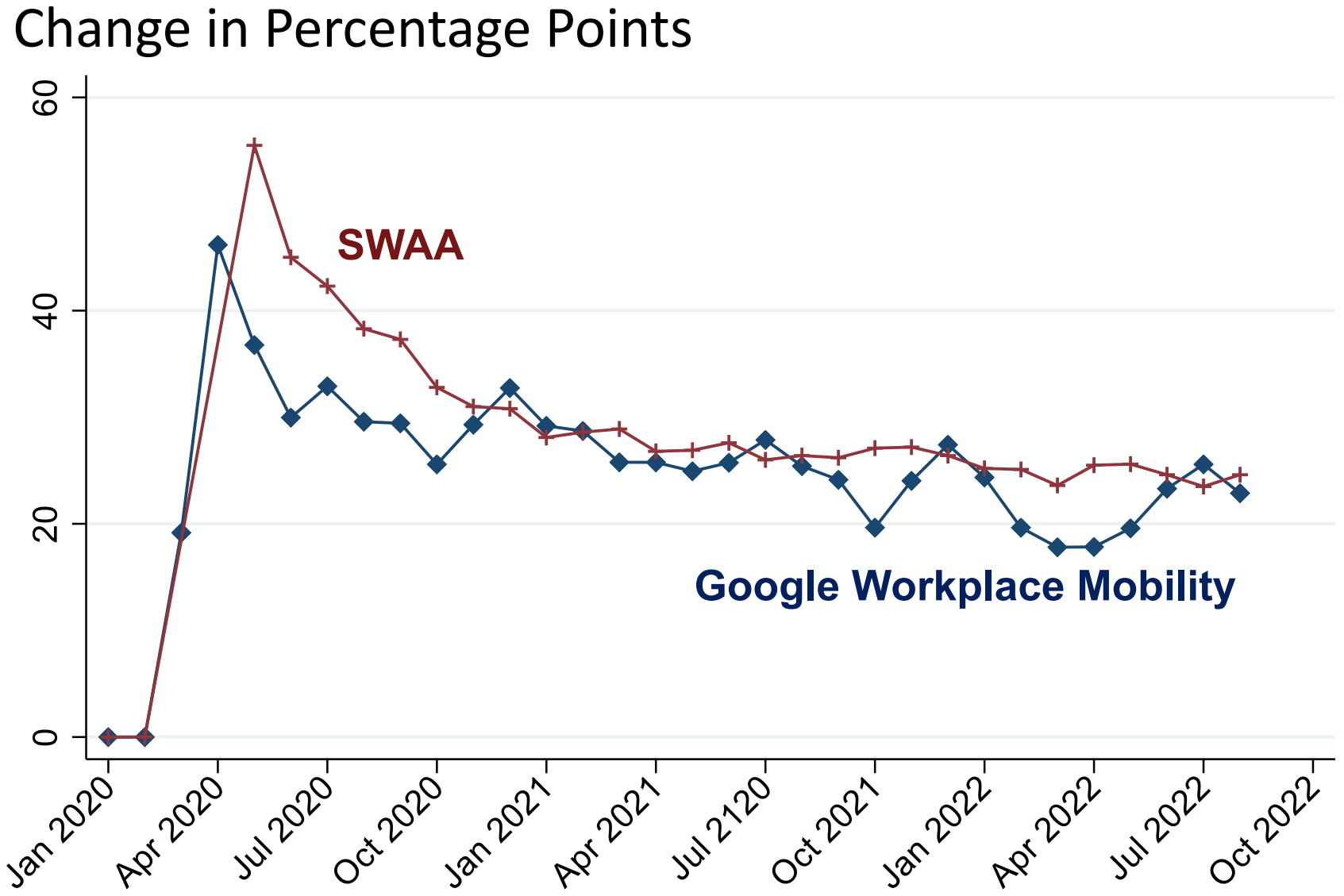
What color is grass?

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

Continue

Change in Full Paid WFH Days Since Pandemic's Onset Compared to Google Workplace Mobility Drop

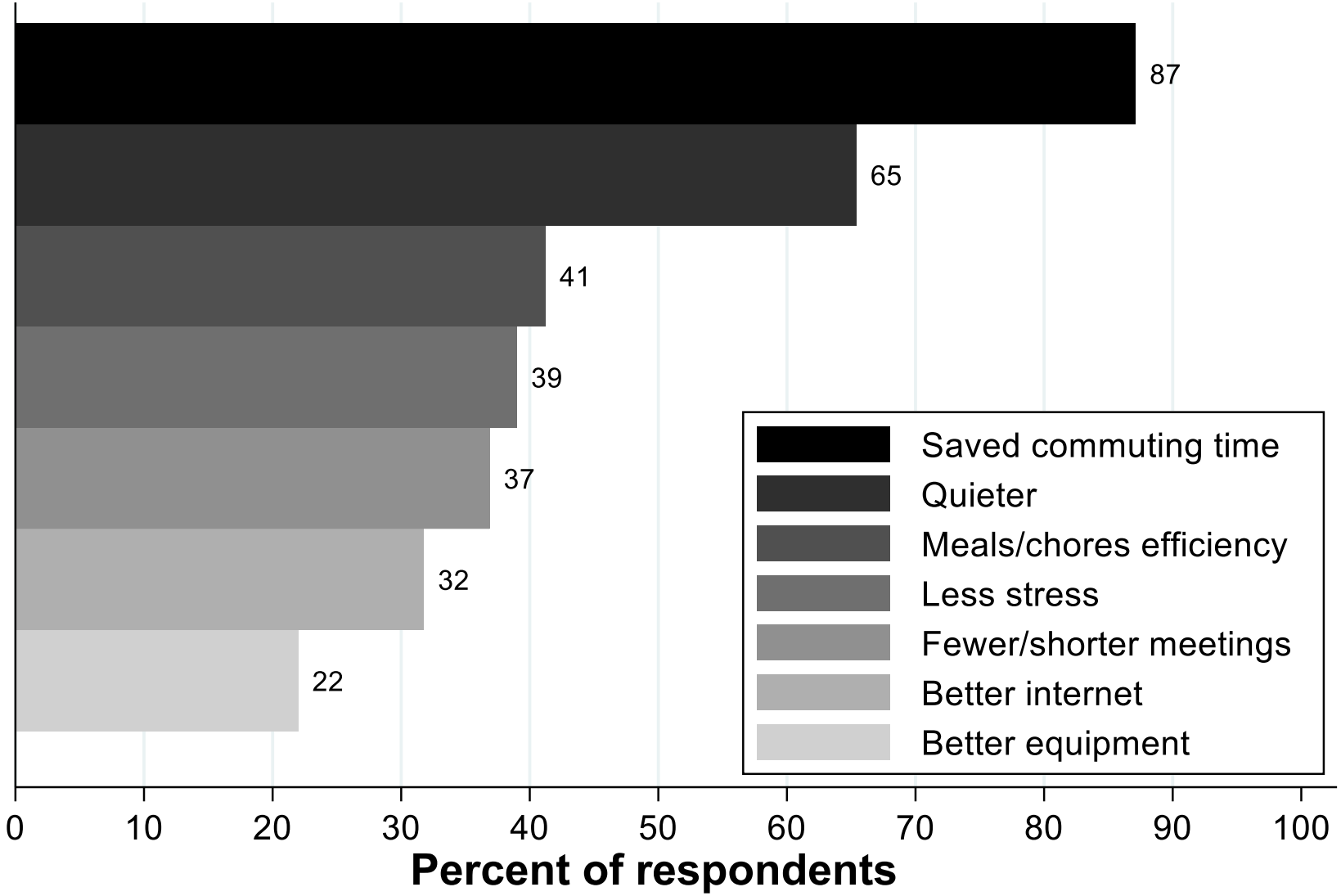


Red = Change in WFH Share computed as SWAA measure of WFH Days as percent of all workdays minus 5 ppts

Blue = Percentage point drop in Google Workplace Mobility Index from before the pandemic

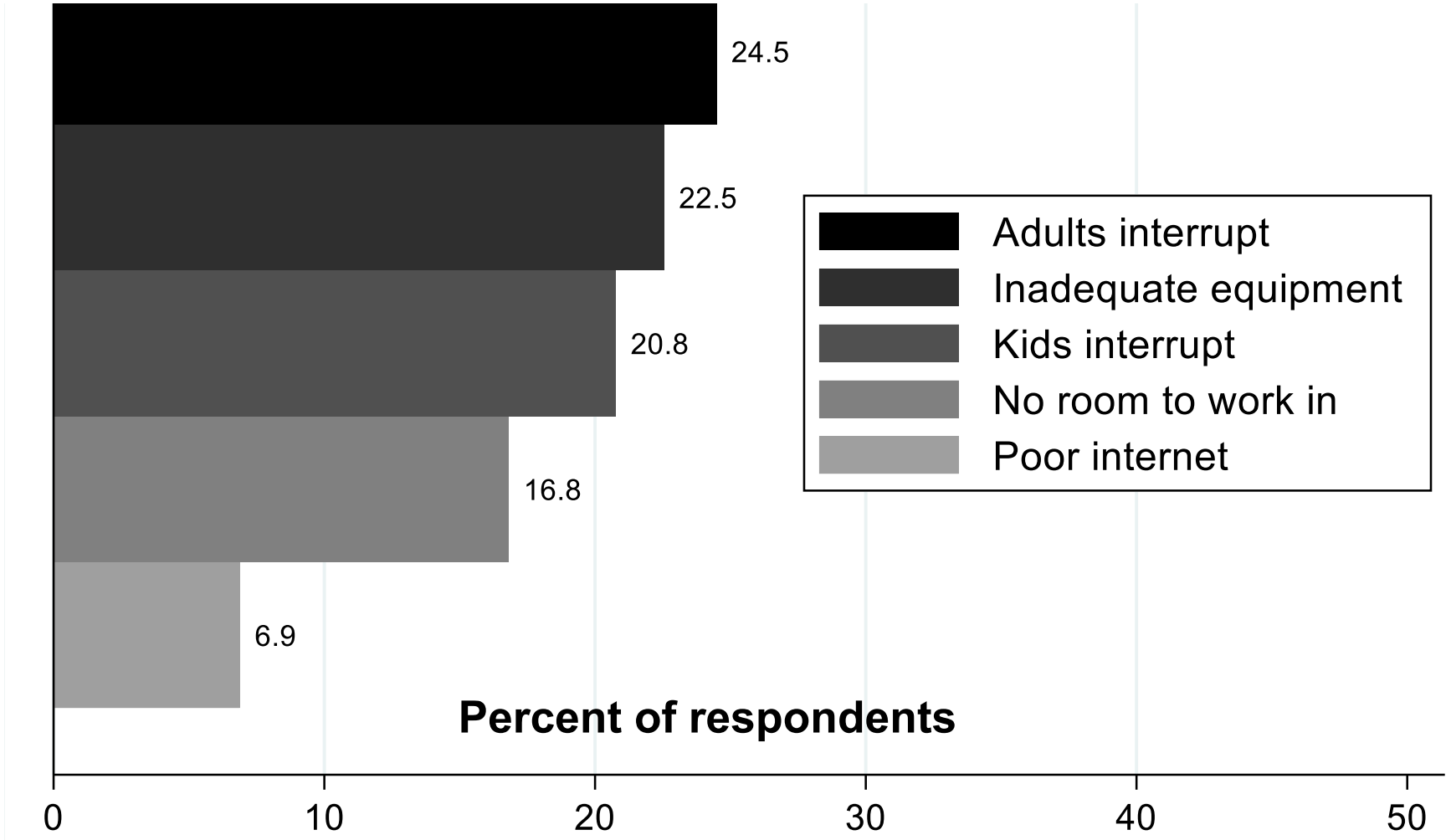
From revision to "Why Working from Home Will Stick" by Barrero, Bloom and Davis.

Why are you more 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/

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/

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).

SBU Survey of Business Uncertainty

FEDERAL RESERVE BANK of ATLANTA | CHICAGO BOOTH The University of Chicago Booth School of Business | Stanford University

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. (2022), we use a state-of-the-art NLP approach to classify job vacancy adverts as to whether the job does or does not allow 1+ days per week of remote work. We start from a “DistilBERT” model (Sanh et al., 2020), pre-train it on a portion of the Lightcase/Burning Glass corpus, then train it on human-classified text sequences extracted from 60,000 job adverts. We audit the model-based classifications to check performance and refine the model.
- We apply our model to 350+ million job vacancy adverts posted online and collected from 2014 to the present.
- Currently, our dataset covers the United States, United Kingdom, Canada, Australia, and New Zealand. We plan to extend our measurement and analysis to other countries as well.

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.

This slide and the next two summarize key points developed in "Internet Access and Its Implications for Productivity, Inequality, and Resilience," by Barrero, Bloom and Davis, 2021.

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.

References (Incomplete)

Altig, David, Jose Maria Barrero, Nicholas Bloom, Steven J. Davis, Brent Meyer and Emil Mihaylov, 2022. "The Shift to Remote Work Lessens Wage-Growth Pressures," NBER working paper 30197, June.

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

Autor, David and A Dube, 2022. "The Unexpected Compression: Employment and Wage Trends Before and After the Pandemic," presentation to the CBO Advisory Board Meeting, June.

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. "Why Working from Home Will Stick." National Bureau of Economic Research Working Paper 28731.

Barrero, Jose Maria, Nicholas Bloom, and Steven J. Davis, 2021. "Don't Force People to Come Back to the Office Full Time," *Harvard Business Review.*.

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, 2021).

Barrero, J M, N Bloom and S J Davis (2022), "Long Social Distancing," NBER Working Paper 30568.

Barrero, Jose Maria, Nicholas Bloom, Aksoy Cevat, Steven J. Davis, Matthias Dolls, and Pablo Danial Zarate, 2022. "Working from Home Around the World," *Brookings Papers on Economic Activity,* forthcoming.

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.

Bloom, Han and Liang, 2022. "How Hybrid Work from Home Works Out." NBER Working Paper 30292

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

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.

Dingel, Jonathan and Brent Neiman, 2020. "How Many Jobs Can Be Done at Home?" *Journal of Public Economics,* 189.

Gupta, Arpit, Vrinda Mittal and Stijn Van Nieuwerburgh, 2022. "Work from Home and Office Real Estate Apocalypse," November.

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

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