



**CUSHMAN &  
WAKEFIELD**

Center for Real Estate  
and Urban Analysis

THE GEORGE WASHINGTON UNIVERSITY

# WORKPLACE ECOSYSTEMS OF THE FUTURE





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# INTRODUCTION:

## WHAT THE RESEARCH SAYS ABOUT THE FUTURE OF OFFICE

The previous report in Cushman & Wakefield's "[New Perspective: From Pandemic to Performance](#)" series explored the historical role the office has played in cities, the economy and for individual organizations.<sup>1</sup> In the writing of that report, Cushman & Wakefield Research and our partners from George Washington University analyzed the existing academic and industry research related to how in-office and remote work impact productivity, innovation and creativity, corporate culture and branding, employee satisfaction and retention, and location strategy related to walkable office environments.

From that report, the following key findings are important to keep in mind:

- A ***mix of in-office and remote work options*** are likely to maximize employee and organizational performance.
- Employees want ***choice and freedom*** in where they work, but few want to work outside the office exclusively.
- There are ***clear downsides*** to this pandemic-induced work-from-home (WFH) period. Office workers feel disconnected from corporate culture, personal wellbeing has suffered, and employees feel that they've had fewer opportunities to learn, especially through informal mentoring.
- Lack of in-office work has a ***disproportionately negative impact on certain workers*** (e.g., young employees and new employees).

Building on that foundational understanding, this report takes the next analytical steps in examining what the future of the office will look like in a post-COVID-19 world by exploring investor, occupier and placemaker<sup>2</sup> feedback and by analyzing historical WFH penetration rates.


One thing is clear: the purpose of the office workplace is changing. The pandemic-induced WFH experiment has altered perspectives on work, flexibility and the office. When we get to the other side of this experience and COVID-19 is no longer a lingering health concern, no one is expecting workers to come into the office to primarily answer emails—that and any other heads-down tasks can be done anywhere. So, what purpose does the office serve in the future? How will that purpose impact how occupiers think about their portfolio footprints, location strategy and office layouts? What are the implications of the changing nature of office on office owners, corporate users and civic leaders? How much WFH penetration should we expect? What are the variables that impact WFH penetration? In examining these questions, this report lays out potential outcomes of the future of office.

- **CHAPTER #1**  
**FEEDBACK FROM FOCUS GROUPS: THE PURPOSE OF THE OFFICE IS CHANGING**  
Key insights gleaned from owners, occupiers and placemakers regarding remote work, flexibility, office layouts, office usage, business outcomes and location strategy.
- **CHAPTER #2**  
**IMPLICATIONS OF THE CHANGING OFFICE ON USAGE & DEMAND**  
Critical ways organizations will adapt and tailor their strategies, processes and leadership to create the workplace ecosystems of the future that maximize company performance.
- **CHAPTER #3**  
**ESTIMATES OF WFH'S IMPACT ON OFFICE OCCUPANCY**  
Analysis of historical effect on absorption to estimate the impact of increased WFH on office absorption (utilizing data from 35 U.S. markets).

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<sup>1</sup> [Purpose of Place: History and Future of the Office.](#)

<sup>2</sup> Placemakers involved in the focus groups are all business improvement district leaders in major U.S. markets.



# 01 FEEDBACK FROM FOCUS GROUPS: THE PURPOSE OF THE OFFICE IS CHANGING

## FOCUS GROUP OVERVIEW

As part of this report process, focus groups and interviews were conducted with 32 owners, occupiers and placemakers to get a 360-degree view on the future of the workplace. This was augmented by insights from Cushman & Wakefield Total Workplace consultants directly involved across hundreds of occupier clients and with data collected as part of the Experience per SF™ consulting tool. Represented in these conversations were investors with just under \$900B in assets under management and occupiers representing \$574B in annual revenue. Additionally, the placemakers included business improvement district (BID) executive directors for submarkets in major U.S. downtowns containing over 350 million square feet (msf) of office space.

The conversations were focused on a future “post-COVID-19” world where a vaccine has become widely available and the direct pandemic health risks are low or non-existent. Focus group participants provided their perspectives on the likely future of the office and remote work models across several critical topics:

- Expected changes in remote work penetration
- Potential changes to office layouts
- Challenges and opportunities related to:
  - Productivity
  - Innovation and creativity
  - Corporate culture
  - Employee experience
- Location of office space within metropolitan areas—for example, city versus suburb and walkable versus drivable

From the feedback on those topics, six prominent themes emerged.

### KEY THEME #1: WFH PERFORMANCE BETTER THAN EXPECTED

According to the focus group participants, one of the surprises of the remote work experiment is that productivity has remained strong. Organization leaders were pleased to learn much of daily office work can be done remotely, and that technology tools are more capable than they expected to support daily tasks. This finding applies to both management and professional staff, but a “revelation” to some participants was that administrative and non-exempt workers have also been able to execute at a high level. One executive noted, “It was an ‘aha moment’ that we can actually be very productive when you put 90% of your colleagues fully remote.”

**“I really think that [the pandemic] created a big opportunity. The virus has been a catalyst to push people into a different work environment and at the same time [into] experimental management.”**

– Focus Group Participant

### KEY THEME #2: THIS ISN'T “REAL LIFE” FOR THE LONG TERM

In spite of the surprising levels of productivity, occupiers in our focus groups noted that increased remote work has created a perceived cost in long-term productivity, corporate culture, and innovation and creativity. They indicated their employees have expressed a desire to get back to the office to connect and collaborate, and that WFH fatigue is increasing. One source of that fatigue is the expanded use of video conference call technology. While the technology has sustained connectivity and the productivity of small-group meetings, it has also been the source of meeting sprawl. As one focus group participant said, “One of the byproducts of working from home is that the number of meetings I have to attend has gone up—and you just can't pop in. People have to schedule a 30-minute meeting. I'm just worn out from being in meetings on camera all day.”

**“It's just not sustainable at the levels people have been at to remain productive; it's going to be at a cost to them [office workers] personally.”**

– Focus Group Participant

Additionally, occupier participants noted that because so many people are in the same situation, employees have a certain comfort level with remote work today.

They wondered if the comfort was sustainable, however, noting it will likely feel different to remote employees once the majority of the workforce returns to the office. For example, it will be a much different experience for someone connecting virtually to a session in the future where all other participants are together in the same conference room.

From a real estate owner perspective, among the big themes articulated by participants was the belief that not only are the current dynamics temporary, but like in past recessions or other crises, most of what we do differently today will return to something closer to normalcy. Several indicated that in the long run, the need for humans to be social and connect with each other will be a strong influence on a migration back to office environments. As one owner said, “People have really short memories. So, once this is finally over and there's a vaccine, and people begin to feel safe again, I think that life is going to return to normal.” And in line with that sentiment, an owner with locations in China and Korea noted that, as of October 2020, businesses were back in the office at pre-pandemic levels, adding that they expected similar results in other markets once the virus' spread is under control.

### KEY THEME #3: CULTURE IS CONTAGIOUS FACE-TO-FACE

Our focus groups also voiced concern about the impact of remote work on corporate culture. Unsurprisingly, those concerns are in line with substantial research that indicates corporate culture is crucial to a company's success and that too much remote work can negatively impact culture. Many organizations have been able to build cultural capital over the past few years through interpersonal relationships, trust, shared history, vision buy-in and more. Organizations have leveraged this reservoir of cultural capital to help manage through change and crisis in 2020. Leaders fear, however, that capital will erode over time if people do not return to face-to-face interactions.

**“Culture trumps strategy every single time, and the challenge in this environment for talent is really making your culture stand out. You have to walk the walk and talk the talk when it comes to culture, demonstrating that it's part of your DNA.”**

– Focus Group Participant

If cultural capital is eroded post-COVID-19, real estate leaders will increasingly be asked to partner with HR to drive more solutions that create positive employee experiences through tailored events, learning and development opportunities, and flexible location strategies. As one focus group participant noted, “The focus of real estate will be on the people experience in addition to the assets.”



#### KEY THEME #4: IN-OFFICE WORKERS ARE MORE LIKELY TO INNOVATE AND CREATE

Many focus group participants agreed that innovation and creativity thrive when people are together and suffer when they're separated. Unlike operational tasks and project update meetings, the creative process is often more ephemeral, organic and less scheduled. Asking people to be innovative on a conference call doesn't always work, participants said, and the spontaneous social interaction that sparks an idea often happens in a fleeting interaction with a colleague a desk or two away. Unsurprisingly, our occupier participants reported that they look forward to having their employees back in the office to reinforce culture and spark innovation.

**“With the creative process, there’s a moment when the spark occurs...something builds on something else and that works best when we’re physically collaborating together, bouncing ideas off each other.”**

– Focus Group Participant

Beyond the walls of the building, occupiers and employees also benefit from interactions with people from neighboring companies in vibrant, active and often walkable locations. Placemakers are focused on continuing to enhance those environments because companies benefit from “the synergistic energy” that can’t be replicated with remote work.

#### KEY THEME #5: SOME CHANGES COME SLOWLY

While changes in the way companies occupy space are inevitable, occupiers in our focus groups reported they were not committing to fundamental changes just yet. This stance is reflected in 2020 leasing data where total activity is down, and short-term renewals represent an atypically high percentage of completed transactions relative to previous years.<sup>3</sup> The hesitancy of tenants to commit to longer terms underscores the uncertainty related to the pandemic and the recession. Short-term renewals provide occupiers more flexibility to manage their portfolios as they use this time to strategize, scenario plan, and gather feedback from employees and other stakeholders.

Our participants offered some consensus on the changes they do eventually expect to see.

- **The Future is Hybrid:** A majority of participants believe there will be an increase in hybrid work, wherein employees will spend part of the week working in the office and the other part working remotely, whether in their home or in a third location. Employees who want more flexibility will see this as a perk.
- **100% Remote will be Rare:** While some companies are considering allowing employees to work completely remote for as long as they would like, this model will likely be an exception. Occupiers that employ this model may increase their talent pool through positions that can be performed from anywhere, potentially attracting top talent from a broader geography. However, the challenges of managing and retaining those employees will require additional resources to ensure success.
- **Building Flexibility:** Office owners will find value in offering flexible spaces to their tenants. This may include flexible office offerings for tenants to expand space on-demand, which some owners see as an opportunity. Additionally, tenants will value more flexible, communal space, as needed.
- **Layout Changes:** Little change is happening with building layouts in the short-term beyond accommodating social distancing. However, the expectation in the long-term is for expanded communal space such as conference rooms of various sizes, huddle rooms and social areas for people to congregate—cafés, hospitality-style sitting areas, village greens and more.
- **Fear of Missing Out (FOMO) Influencing Choice:** While many surveys indicate employees want to work half or more of their time from home post-COVID-19, investor focus group participants believe this sentiment will change when more people do end up back in the office. Workers will potentially worry that their colleagues in the office are having a better experience and that they—remote workers—are “missing things and their career is suffering because of it.”

**“For fast growing companies, they need to keep accessing fresh talent. It’s almost impossible to do it remotely. They’re going to be the first ones to go back to the office.”**

– Focus Group Participant



## KEY THEME #6: THE FUTURE OF LOCATION STRATEGY

The consensus among investors, occupiers and placemakers was that location strategy was not likely to change significantly in the wake of the pandemic. Walkable submarkets—in urban and suburban settings—are going to continue to be coveted by employees. In a world where people are in the office less frequently and are looking to the office—and the surrounding neighborhood—to provide what they cannot get when working remotely, the argument could be made that these settings are more important than ever.

**“Mixed-use and high Walkable Score with proximity to amenities and people, and being close to multi-family, retail, amenities is key.”**


– Focus Group Participant

**“People are going to want to be in the middle of everything, where you can walk to your amenities, your dining, live, work, play, and be there.”**

– Focus Group Participant

Our focus groups also noted that cities that are more dependent upon public transportation may have greater challenges with the return to work process in the short-term, but this challenge will resolve itself once the vaccine becomes widely available.

<sup>3</sup> Cushman & Wakefield Research.



# 02 IMPLICATIONS OF THE CHANGING OFFICE ON USAGE & DEMAND

The complexity and change brought on by the global pandemic has required employees and organizations to adapt. Real estate professionals are not exempt as change is also going to require them to adapt to expanding roles, new considerations, new focus areas, and perhaps new priorities and responsibilities. In line with the primary themes that emerged from our focus groups, we have identified six priorities CRE executives should factor into their strategic real estate and workforce planning, and we offer some ideas on how CRE professionals might approach them.

- Shifting to a Greater Emphasis on Flexibility
- Preparing for a Different Type of Space and Space Use
- Finding the Balance between Employee Preferences, Company Goals and Costs
- Preparing for an Increased Purview as a Corporate CRE Professional
- Working with Corporate Partners to Build and Sustain Culture in a Hybrid Workplace Model
- Understanding the Unique People and Location Variables to Help Customize and Optimize Space

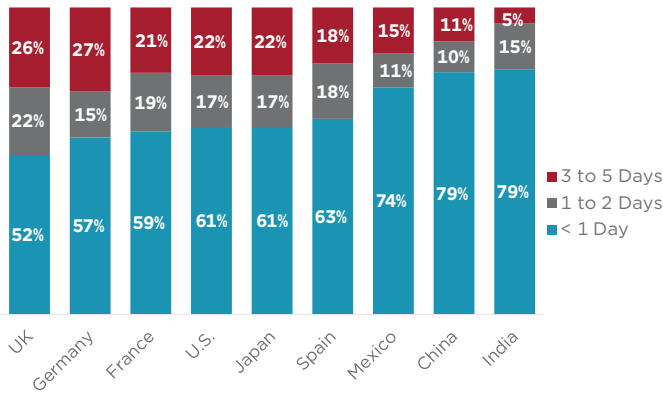


## FLEXIBILITY, FLEXIBILITY, FLEXIBILITY

Location has historically been considered the most important thing in real estate—and it remains important. However, since the workplace is going to need to iterate at the ever-increasing speed of business change, maximizing portfolio flexibility will be among the primary needs of commercial real estate executives coming out of the recession. The global economy has been rapidly evolving for decades. Now portfolio planners and strategists have to add changing preferences in where and how people work—supported by technology—to the process.

As a result, many real estate decisions can no longer be made in decades-long cycles because understanding an organization's office needs in five or seven years will become increasingly difficult. The culture of real estate decisions must change to support the business goals of today and the unknown strategies of tomorrow. This shift will require agile development in portfolio management and require organizations to build out spaces with a minimum viable product mindset and an "update culture."

## WORKFORCE WITH REMOTE WORK POTENTIAL BY NUMBER OF DAYS PER WEEK, % OF 2018 WORKFORCE<sup>4</sup>



Source: McKinsey Global Institute analysis.

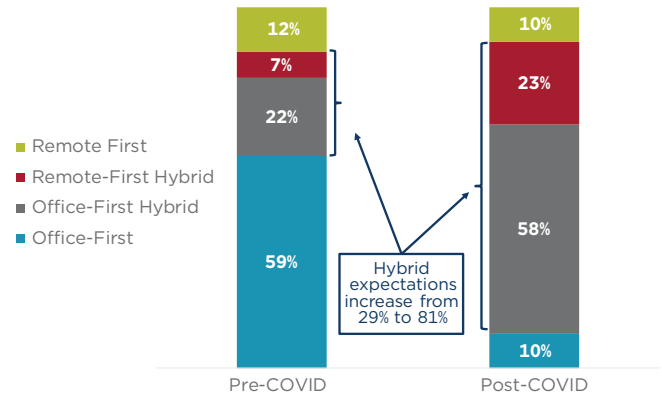
<sup>4</sup>Number of days per week of potential remote work without productivity loss (effective potential). The effective potential includes only those activities that can be done remotely without losing effectiveness. Model based on more than 2,000 activities across more than 800 occupations.

## THESE DISCUSSIONS ARE NOT BINARY

To work remotely or in the office is not a binary decision. Because people want flexibility and choice, and because organizations will need to cater to a more dynamic use of space, organizations will measure density differently. Historically, density has been associated with headcount per desk. But in a more agile work environment, there is a difference between space per person and space per work point, as occupiers shift the mix of space from predominantly individual to more collaborative and communal.

In a recent CoreNet Global-Cushman & Wakefield survey, occupiers indicated they expect to move towards less binary solutions. When asked about their company's approach to work and the workplace pre-COVID-19, the majority indicated it was "office-first," while less than a third operated in a hybrid model. In a post-pandemic future, the expectation is that "remote-first" models will be about as prevalent (approximately one-in-ten both pre- and post-pandemic), but the prevalence of hybrid models is expected to more than double.

## MOVING TOWARDS ECOSYSTEMS



Source: CoreNet Global; Cushman & Wakefield Research.

This supports the bulk of current research, which indicates that employees in general would prefer a mix of work that takes place in office and remotely. The right mix will vary by organization, department, team and the individual. However, it is reasonable to expect reaching an equilibrium where the average employee works remotely approximately two days a week.



## BALANCING EMPLOYEE PREFERENCE, COMPANY GOALS AND CORPORATE COSTS

More so than ever, employers will need to understand employee preferences to make evidence-based investment decisions on services and amenities that impact experience and provide incentive for employees to come to the workplace.

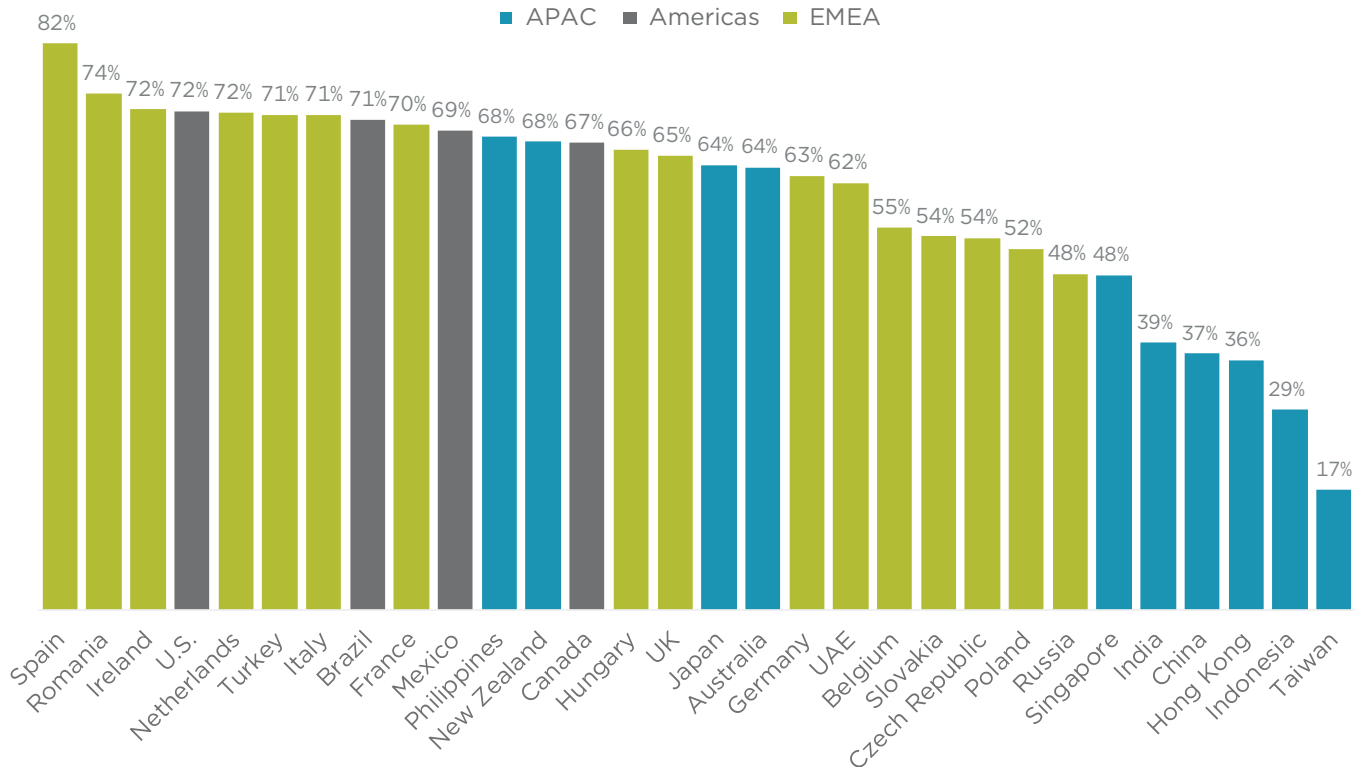
Employees' expectations for flexibility have increased. Some companies will opt for an in-office or remote work model, without a hybrid option. However, these "either or" models will likely be the minority as most employees want the best of both worlds—to be trusted with the flexibility to work from anywhere but also have the option to work in the office as needed. Two major considerations will drive an organization's ability to offer this flexibility: talent and cost.

- Talent:** Offering flexibility opens up bigger talent pools. Candidates for fully remote positions may not be limited by location. Even for organizations that expect workers to be in the office on a regular basis, flexibility is a perk that makes the job and company more attractive to candidates. Prior to COVID-19, 51% of employees said they would change jobs for one that offers them flexible work time.<sup>5</sup>

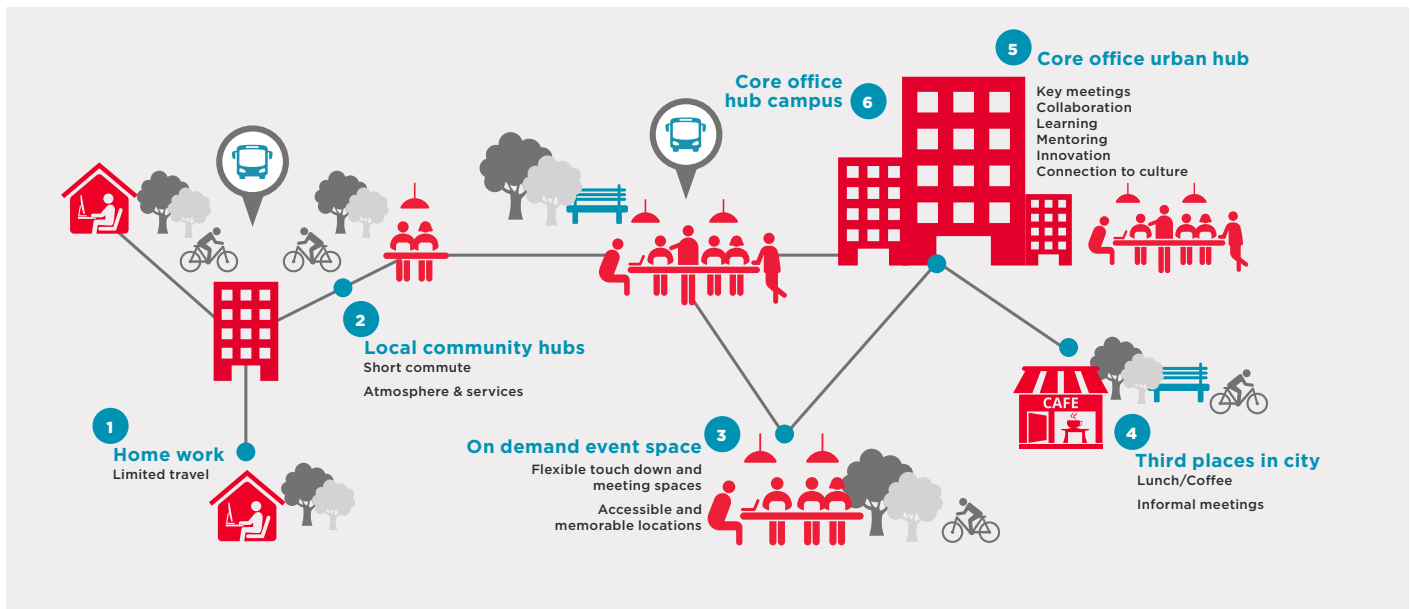
- Cost:** While work from home has the potential to reduce occupancy costs, the question remains what the real savings are. In order to implement space reductions, daily occupancies will need to be managed through communication, policies and technologies in a way that most organizations have not done historically. So while reducing space costs, organizations are likely to see increases and offsets in other areas that moderate those savings.

And who covers the increased costs related to home offices? Some companies are providing furniture stipends to help employees working from home with their home office expenses, though currently rare.<sup>6</sup> Governments throughout the world are stepping in to offer subsidies to workers who have increased costs related to working from home. For example, in Ireland, the government may cover up to 30% of broadband costs<sup>7</sup> and tax relief on a portion of utility costs<sup>8</sup> for qualifying workers. And Singapore provided a one-time utility subsidy.<sup>9</sup> It remains to be seen if these benefits remain short term or extend beyond the pandemic. And some wonder if workers should receive any benefit at all, suggesting that workers who choose to work from home should be taxed for the privilege as a way to cover the transition costs for economies that depend on office workers.<sup>10</sup>

## EMPLOYEES' EXPECTATIONS FOR INCREASED REMOTE WORK IN THE FUTURE



Source: Cushman & Wakefield Experience per Square Foot™ (XSF) 2020 Survey



## EXPANDING OF CORPORATE REAL ESTATE EXECUTIVES' PURVIEW

The concept that commercial real estate is intimately integrated with the strategy and goals of the business, rather than just a cost center, is not new. More than ever, corporate real estate functions will need to partner with human resources, business strategy, finance and technology to achieve thoughtful and impactful workspaces. Collectively, these corporate departments will need to consider a more distributed workforce and the options that give that workforce the flexibility to choose when and where to work. That may mean a network of workspaces within, and possibly across, markets. A more distributed workforce also requires policies, procedures and technology to seamlessly support productivity, connection and wellbeing.

- Focus on Multiple Work Environments, Not Just an Office:** While the pandemic-induced experiment has mostly meant that workers were either in their homes or in the office, the workplace of the future will be an ecosystem of multiple options for workers. The first option may continue to be the core office where most learning, mentoring, team connection and collaboration occurs. For many workers, their home may now be a viable second option for working on a regular basis. And workers may have the flexibility to choose third options like local community hubs (e.g., coffee shops, the local library, etc.), on-demand event spaces, coworking spaces, retail spaces and suburban “spoke” offices. These third places may appeal to employees for a variety of reasons—for example, a spoke office might be more conveniently located than the core office and it might offer a better social outlet than home. Companies may need to help manage these options for their employees, even offer several “office pod” options, and provide the ability to book spaces on any given day.

- Need to Manage People Space Together (and Apart):** A more distributed workforce not only requires leaders and managers to trust staff to perform in a flexible office ecosystem—it puts a premium on consistent, clear communication between all levels of the organization. With more locations for employees to utilize, leaders and people managers need to more actively connect their teams, becoming very intentional about when and how they bring people together. As noted in the “Flexibility Requires Active Management” sidebar, even small amounts of flexibility (e.g., one day a week) can erode the amount of interaction teams have without some management of when people are in the office. This will require flexibility in the office space to allow for different uses for different teams daily.

Additionally, organizations will need to implement reliable technology that manages space availability, allows transparency for accessing and utilizing space, and ensures seamless connection between employees inside and outside of the office. The implementation of smart technologies to manage real-time building data and facilitate employee meetings, too, will be essential to ensure ongoing data and predictive analytics of both workplace use and employee experience.

Lastly, change management will become an essential component of any workplace project. It is imperative to not simply look at the impact on real estate and cost savings without also managing behavior and ensuring investment in new ways of managing people to facilitate employee performance, wellbeing and engagement.

## FLEXIBILITY REQUIRES ACTIVE MANAGEMENT

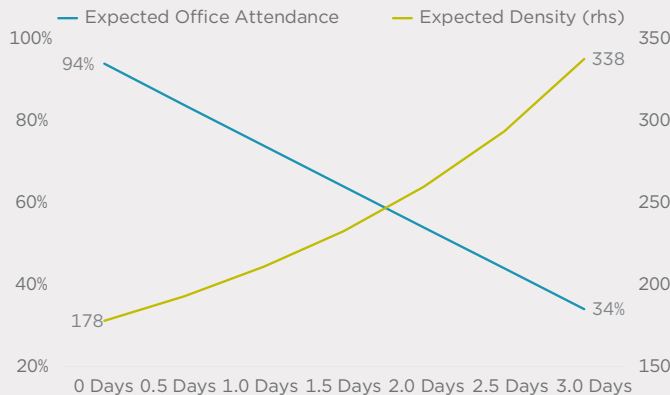
Our literature review in the previous report revealed that face-to-face interaction among team members at any organization is critical for creativity, innovation, culture and employee satisfaction. Many organizations are considering increasing remote work flexibility post-pandemic. However, if employees begin to work remotely on a random or unmanaged schedule, they are increasingly unlikely to encounter one another.

To explore this dynamic, we conducted a simulation of an anonymous company headquarters (referred to as HQX), which is a company with nearly 500 employees in a major market. This business occupies 90,000 sf of office over seven floors. With increased remote work, the company would see its expected office attendance in a given day drop with the number of remote workdays, while the square footage per employee in the office would increase (without any changes to its existing lease).

However, the chance of any two employees seeing each other on a given day drops dramatically with an increase in the organization’s remote work policy. At 2.5 days per week, a manager and an employee, for example, would only have a 19% chance of seeing one another when we account for remote work, vacation time and other leave.<sup>11</sup>

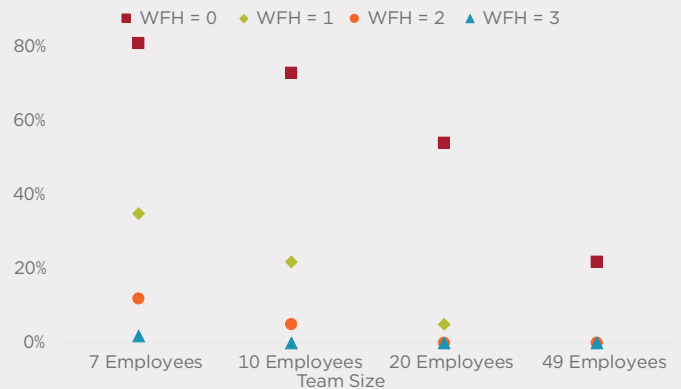
To further illustrate the impacts on teams, we focus on one floor of HQX. This floor has 119 workers who work there across seven teams. If a manager desires that at least 50% of the team be in the office on a given day, and if HQX had a remote work policy resulting in 2.0 days of remote work per week, without any management, Team 2 would only have half attendance 12% of the time. That equates to fewer than three times a month or just 30 times per year. This effect is even more dramatic with larger teams. Remote work makes it nearly impossible that the whole team, or even half of the 49-member team, is in the office on a given day.

### HQX: EXPECTED ATTENDANCE & DENSITY BY NUMBER OF REMOTE WORKDAYS



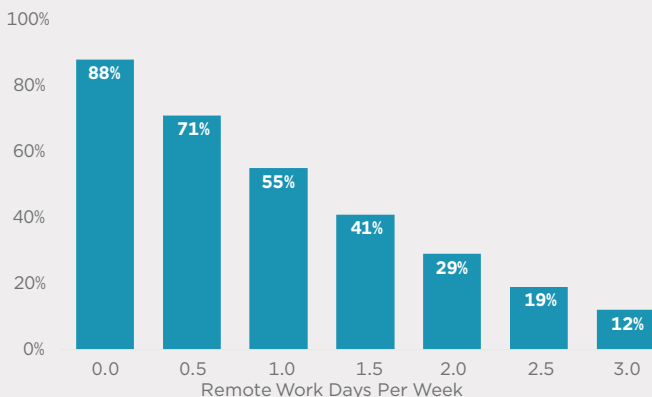
Source: George Washington University; Cushman & Wakefield Research.

### CHANCE OF 50% OF A TEAM IN THE OFFICE TOGETHER



Source: George Washington University; Cushman & Wakefield Research.

### CHANCE OF EMPLOYEE A & B BOTH BEING IN THE OFFICE



Source: George Washington University; Cushman & Wakefield Research.

### ACTIVE MANAGEMENT IS KEY

This simulation underscores a point revealed in our focus groups: **without active management remote work can decimate face-to-face interactions.** This means employees cannot both use random remote work and have expectations of seeing critical team members very often. Instead, leadership will need to plan for in-person interaction and managers may have to actively dictate in-office team meetings. This can come in many forms, from using software to manage and reserve office space, to team managers mandating in-office attendance on certain days of the week or month, or corporate executives having greater socialization events, retreats and conference-like “all hands” sessions.

Random remote work, however, is likely to result in unsatisfactory outcomes from a company’s perspective. Remote work must be managed.

## THE FUTURE OF CULTURE AND CULTURAL CAPITAL

As discussed extensively in the previous report, the connection to culture is one of the business outcomes most directly and negatively impacted by a mass WFH environment—the relationship between the organization and individual employees suffers. Further, the way employees and teams network with each other suffers as well.

There are likely two sides to the interpersonal networking coin. Large organizations may have seen an increase in communication, connection and networking between employees in different offices, cities and even continents due to an increase of video meetings and conference calls during the pandemic. But while long-distance connections may have improved, people may find it difficult to connect and develop trust with colleagues in their own office if they are never, or only very rarely, interacting in-person. New hires or people who have moved into new roles or departments during the pandemic might feel this disconnection most intensely.

Additional significant HR challenges may arise in the wake of this experience. Burnout is one concern, as employees across the globe are working 8.2% longer days (i.e., +48.5 minutes per day) during the pandemic.<sup>12</sup> Retention will be an issue for new employees who have not had a chance to connect interpersonally or to the organization's culture, values and goals. More remote work may also complicate performance management assessments and employee

growth opportunities. How much does in-office presence and face time impact career paths and professional development? While it depends upon the culture and management styles, if senior personnel are in the office post-COVID-19 then middle managers and junior employees are likely to want to be there as well, unless the organization has thought through how to balance these different concerns.

Cushman & Wakefield's XSF data consistently finds the majority of people who work from home feel they can effectively focus. However, the data also reinforces the importance of the office—as well as the need to clearly define the purpose of the physical workplace—to support culture, innovation, mentoring and employee experience.

Half of employees struggle to feel connected with their company's culture and their colleagues during the COVID-19 remote work experience. Additionally, only half of employees working remotely during COVID-19 have a strong "sense of wellbeing." Both concerns flag a significant long-term risk of cultural erosion, diminished employee wellbeing and potential burnout.

Demographics play a big role in how well people have adapted to WFH. It may be surprising, but Baby Boomers adapted more easily to remote work than younger generations. Generation Z and Millennial employees have focus challenges, often as a result of suboptimal workspaces at home. Older Millennials and Gen X office workers are often juggling other family responsibilities at home, which present a different kind of challenge.



## CRITICAL TO UNDERSTAND THE VARIATIONS ACROSS AN OCCUPIER'S PORTFOLIO

Policies related to WFH and workplace flexibility are not a one-size-fits-all discussion. The successful organizations of the future will take a holistic approach that customizes workspace options for a number of different factors. They will take the time to know their people, their markets and their culture, and they will use that understanding to implement thoughtful workplace strategies that account for differences across the organization. With a variety of choices and the change in the way we work, the workplace will be an ecosystem of different locations and experiences to support convenience, functionality and wellbeing. And the mix will vary based on local context and culture.

- **Age:** Young workers have suffered more distinctly during the mandated WFH experience for various reasons: they are less likely to have required space in their home, they have fewer established professional networks, and they benefit more from in-person mentoring.
- **Seniority:** Those at senior levels, particularly in more hierarchical cultures, will likely enjoy more flexibility than junior employees. In addition to having more flexibility, more senior employees may have the career leverage and income to accommodate a move to a “Zoom Town” (i.e., an exurban or resort location, often several hours from the closest office).
- **Department:** Departments like research and development or marketing, which have creative collaboration as part of their core processes, are struggling most with remote work. They will continue to require physical collaboration in the future. Whereas departments with more process-related tasks, such as finance, IT and operations, have in general been finding remote work to be more effective over the duration of pandemic-induced WFH.<sup>13</sup>



- **Company size:** Large global organizations are more likely to have the resources to analyze, implement and support effective workplace flexibility programs. Anecdotally, small and medium enterprises (SMEs) appear more bullish right now on returning to the office in many markets.
- **Geography:** As this report expands upon in the next chapter, WFH penetration is different across markets for various reasons, including culture, size and occupational makeup. Local cultural nuances can make a big impact and need to be taken into consideration when we redefine the office. The workplace layouts and space densities that work in one city may not be useful at all in another city.

Occupiers will need to engage in the process of defining different work personas in their organization as the requirements and mix will vary by business unit, region and tasks. These personas will be essential to inform the execution plan for the workplace, technology, services and the level of change management to ensure successful outcomes.

<sup>4</sup> McKinsey Global Institute analysis. Number of days per week of potential remote work without productivity loss (effective potential). The effective potential includes only those activities that can be done remotely without losing effectiveness. Model based on more than 2,000 activities across more than 800 occupations.

<sup>5</sup> Gallup. State of the American Workplace.

<sup>6</sup> <https://www.scmp.com/business/banking-finance/article/3110379/hsbc-let-hong-kong-employees-work-four-days-week-home>

<sup>7</sup> [https://www.citizensinformation.ie/en/money\\_and\\_tax/tax/income\\_tax\\_credits\\_and\\_reliefs/eworking\\_and\\_tax\\_relief.html#](https://www.citizensinformation.ie/en/money_and_tax/tax/income_tax_credits_and_reliefs/eworking_and_tax_relief.html#)

<sup>8</sup> <https://www.revenue.ie/en/jobs-and-pensions/eworking/index.aspx>

<sup>9</sup> <https://www.straitstimes.com/singapore/all-singaporean-households-to-get-special-100-utilities-subsidy>

<sup>10</sup> <https://www.bbc.com/news/business-54876526>

<sup>11</sup> Due to vacation sick leave, any two individuals have a less than 100% chance of being in the office together even if workers are not allowed to work remotely at all (i.e., WFH = 0 days).

<sup>12</sup> Evan DeFilippis, Stephen Michael Impink, Madison Singell, Jeffrey T. Polzer & Raffaella Sadun. “Collaborating During Coronavirus: The Impact of COVID-19 on the Nature of Work.” <https://www.nber.org/papers/w27612>

<sup>13</sup> Cushman & Wakefield’s XSF@home Total Workplace analysis.





# 03 ESTIMATES OF WFH'S IMPACT ON OFFICE OCCUPANCY

## KEY TAKEAWAYS

1. In a post-COVID-19 world, our remote work forecasts ranged from existing remote work levels (around 1.5 days per week, on average, for office workers) to nearly three days per week on the high end. Our previous literature review as part of this series, and our focus groups, do not support the idea that remote work is likely to average levels beyond three days per week in the long-run, and workers would still require some space when they do go to the office.
2. We modeled the impact of remote work rates (as reported in the U.S. Census) against MSA-level net absorption rates for a 15-year time period. We found that there is, indeed, a negative relationship between increased remote work and office demand, but only when controlling for many factors.
3. The average impact in the markets, as revealed in our simulations, was an annual decrease in annual net absorption of about -0.28% of a market's office stock. Among markets, this impact varied from -0.18% (San Jose) to -0.40% (Austin), and is sensitive to how much remote work has accelerated in a market.
4. While our model and simulations indicate that increased remote work, within a plausible range, would decrease annual net absorption in most scenarios, net absorption tends to fluctuate widely during normal periods. The net absorption impacts in our simulations are well within what markets otherwise experience. In other words, the simulations do not indicate any dramatic fundamental change to office demand, but instead a dampening of office demand that markets can adjust to in the long run.



## OVERVIEW

The focus groups we conducted with owners, occupiers and placemakers illuminated a key point: professionals in commercial real estate, for the most part, do not expect the office to go away, but instead see remote work as an indelible part of the new work paradigm. More specifically, a consensus emerged that the median office worker is likely to work from home two or three days per week, on average.

It is now widely assumed that increased remote work will adversely impact demand for office space in the coming years. But there is much less agreement on how large this effect will be, and even less on how remote work will impact office demands for different occupations, industries and markets.

In order to separate remote work impacts from overall economic factors, we posed the following question: how would office demand have differed in 2017-2019 across the 35 top U.S. office markets if remote work had been as prevalent then as it is likely to be post-COVID-19 (according to our focus groups)?

To answer this question, we took the following steps:

1. Established a historical baseline for how remote work has varied across markets over time.
2. Using this historical data, we estimated the effect of an increase in remote work on office demand, controlling for economic variables, and then translated the overall expected increase of remote work to 2.5 days into a multiplication factor that we could then apply at the market and occupation level.
3. Analyzed how remote work varies across different occupations and markets, and then used those observations to bound maximum and minimum levels of remote work at the occupation level in each of the 35 markets.

4. Using Monte Carlo methods, we simulated different changes in remote work intensity at the occupation level for each of the 35 markets while simultaneously randomizing the size of the effect of a given increase in remote work intensity on office demand.
5. Based on these simulations, we then estimated what the effect on office demand would have been in each of the 35 markets. These demand effects can then be extrapolated forward and used as inputs into office market forecasting models.

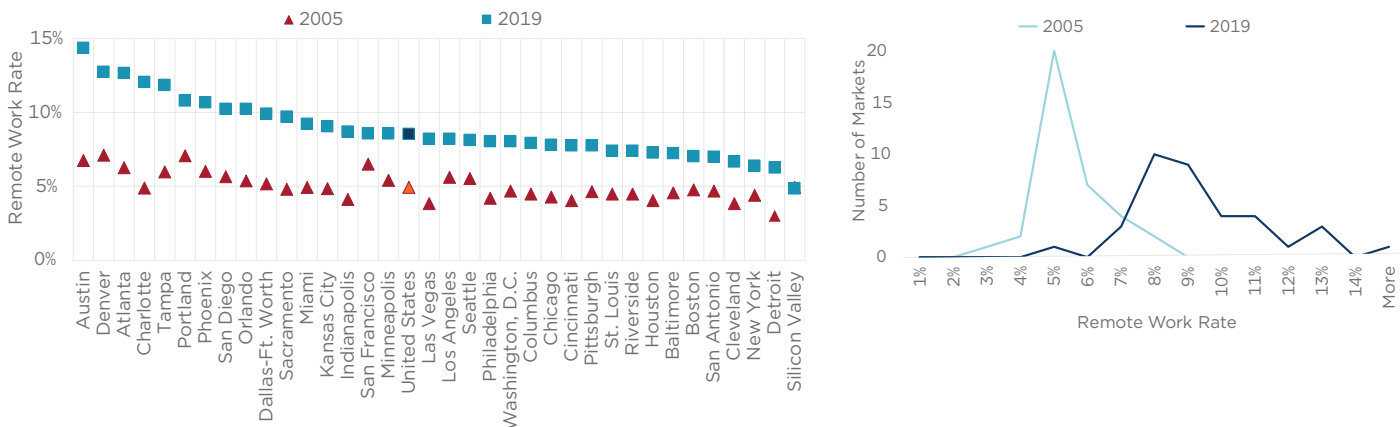
## 1. HISTORICAL EVOLUTION OF REMOTE WORK

Observing remote work as reported in the U.S. Census gives us an indication of how it has increased over time. While the Census only asks whether a person “usually” commuted via remote work in the past week,<sup>14</sup> thus mainly capturing people who remote work 2.5 to 5 days per week, the trend lines are telling. For purposes of modeling (described in the next section), we assume that these Census remote work numbers increase proportionally with time.

As you can see in Figure 8, remote working has increased across all markets from 2004-2019, although it typically waxes and wanes every year. The current leader in remote work among these markets in 2019 was Austin, Texas, with 14.4% of office workers<sup>15</sup> indicating they mostly worked from home. This compares to the U.S. national average of 8.5% for office workers within the top 35 markets.

Another outlier is the Charlotte, North Carolina market. When indexed to 2005 levels, Charlotte has seen the most dramatic change in its share of remote work by 2019, increasing nearly 2.5 times over that period, compared to the U.S. increase of about 1.7 times.

### U.S. REMOTE WORK RATE (% OF OFFICE WORKERS) BY MSA



Source: U.S. Census American Community Survey; George Washington University; Cushman & Wakefield Research.

## 2. MODELING THE RELATIONSHIP BETWEEN OFFICE DEMAND AND REMOTE WORK

Next, we estimated the relationship between office demand (net absorption) and remote work using a panel data set of the largest 35 U.S. metropolitan statistical areas (MSAs) by population, covering a time period from 2005-2019. The data set includes the following elements:

- The annual level of remote work is based on the U.S. Census American Community Survey data discussed in the previous section. We estimated these remote work rates at an occupational level within each market, focusing on employed adults who work in an office-using occupation. (See the Data on Remote Work call out box for more information on other sources of remote work data.)
- We then applied additional CRE data at the MSA level from Cushman & Wakefield. These data points included office rents, vacancy rates, net absorption, office stock, employment level and population levels.

Having constructed a novel data set, we developed a model that estimates a market's **net absorption rate** (net absorption divided by office stock) for a given year as a function of remote work in that year. We control for demand forces of employment and population, and the previous year's net absorption and stock, and applied controls for other structural factors.<sup>16</sup>

The first summary statistics in our modeling indicated something counterintuitive: remote work and net absorption rates are, in a gross sense, positively correlated, while our model reveals the more intuitive negative relationship. Many of the best performing office markets of recent years have done so despite experiencing significant increases in remote work over these periods.

This is likely because there are several forces occurring at once. Since 2005, remote work has tended to grow in markets with more advanced and maturing economies—economies further along the knowledge and experience economy—and those economies also happen to be the ones thriving and growing their office demand. Hence, one of the highest remote work rates we observe is in Austin, a market that has also been rapidly growing its office demand. On the other hand, the lowest remote work rate was in Detroit (6.3%), a market that has struggled with office demand over the last decade.

Thus, to account for confounding effects, our model used the panel time series we described and controlled for several demand factors. This revealed a negative relationship between remote work rates and net absorption shares.



### 3. VARIATION OF REMOTE WORK ACROSS OCCUPATIONS

When observing remote work rates by office-using occupations, there is considerable variation. In the 35 largest U.S. MSAs, the highest remote work rates were among advertising, art and design, and media occupations. Additionally, sales professionals had considerably higher remote work rates compared to other occupations. In fact, 18% of sales professionals in the real estate industry report mostly working from home, a statistic likely driven by residential real estate professionals.

The implications for modeling the variations are important. Some occupations like media and communications, where 22.1% report usually working from home, may be approaching a saturation point. By this we mean that different occupations are more or less suitable for predominantly working from home, and post-COVID-19, every worker, company, industry and market will be finding a new equilibrium. The “efficient frontier,” so-to-speak, of WFH had never been fully achieved, even among industries or occupations that had higher take-up rates, or utilization, of WFH pre-COVID-19.<sup>17</sup> Thus, the likely future WFH take-up rate has been expanded by the experience of 2020—there will be no going back to the prior equilibrium. But even in this new future, not all occupations will move fully,



now or ever, to their frontier. Instead, it’s likely that many will move closer than they were before. In the pre-COVID-19 data, the distribution of WFH take-up rates provide some indication of which occupations may have been closest to their most efficient long-term level. It may be hypothesized that these occupations will be impacted relatively less by the COVID-19 experience than those that suddenly had WFH thrust upon them. Across the top 35 markets, the average occupation had a maximum remote work share of about 30%, but this was sometimes as high as 80%. This suggests that even before the crisis, most occupations were well-below their theoretical ceiling on average.

At the same time, some occupations like life science, physical science, and social science technicians (for which the 2019 remote work rate equals 4.1%) are simply limited in their ability to work remotely. For other occupations like public relations, the workplace dynamics for companies hiring these individuals may have already adjusted to large remote work shares. It is possible they are approaching a plateau. For modeling purposes, we applied an upper bound to the occupation-specific remote work rates based on the past 15 years of observations across all markets.<sup>18</sup> In short, this maximum serves as a ceiling for how high a simulation’s remote work rate for an occupation in a market can be.



## REMOTE WORK RATE BY OFFICE-USING OCCUPATION, U.S. TOP 35 MSAS, 2019

OCCUPATION	REMOTE WORK RATE
Top Executives	10.2%
Advertising, Marketing, Promotions, Public Relations, and Sales Managers	14.4%
Operations Specialties Managers	6.7%
Other Management Occupations	9.2%
Business Operations Specialists	13.1%
Financial Specialists	8.6%
Computer Occupations	11.5%
Mathematical Science Occupations	8.2%
Architects, Surveyors, and Cartographers	10.5%
Engineers	5.5%
Drafters, Engineering Technicians, and Mapping Technicians	3.6%
Life Scientists	6.3%
Physical Scientists	5.3%
Social Scientists and Related Workers	7.0%
Life, Physical, and Social Science Technicians	4.1%
Occupational Health and Safety Specialists and Technicians	3.5%
Counselors, Social Workers, and Other Community and Social Service Specialists	4.6%
Lawyers, Judges, and Related Workers	8.6%
Legal Support Workers	6.2%
Art and Design Workers	17.1%
Entertainers and Performers, Sports and Related Workers	10.3%
Media and Communication Workers	22.1%
Media and Communication Equipment Workers	16.6%
Healthcare Diagnosing or Treating Practitioners	2.8%
Health Technologists and Technicians	3.4%
Other Healthcare Practitioners and Technical Occupations	15.1%
Occupational Therapy and Physical Therapist Assistants and Aides	3.2%
Other Healthcare Support Occupations	2.7%
Supervisors of Sales Workers	6.6%
Sales Representatives, Services	15.8%
Sales Representatives, Wholesale and Manufacturing	15.1%
Other Sales and Related Workers	17.6%
Supervisors of Office and Administrative Support Workers	4.1%
Communications Equipment Operators	4.6%
Financial Clerks	7.8%
Information and Record Clerks	5.3%
Secretaries and Administrative Assistants	5.3%
Other Office and Administrative Support Workers	6.3%
<b>Subtotal - Office-using Occupations</b>	<b>8.5%</b>
<b>All Other - Non-Office Using Occupations</b>	<b>3.5%</b>

Source: U.S. Census American Community Survey; Author calculations.

Note: Remote work rate refers to the share of workers reporting to the U.S. Census that they mostly commuted via telework in the last week



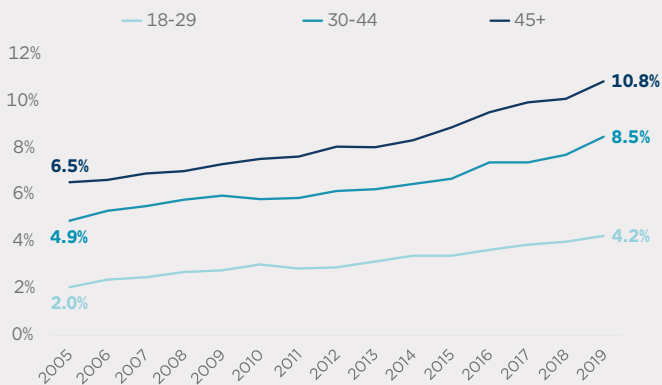
## REMOTE WORK AND AGE

Although we did not incorporate age cohorts into our model, demographics are worth noting as focus groups and prior Cushman & Wakefield studies show differing remote work experiences for different age groups. Statistics indicate that remote work has been adopted more heavily by older employees in the past. For instance, 10.8% of employees aged 45 and older reported working remotely in 2019. This is consistent with the fact that many existing remote work policies have incorporated a permission model, lending to more senior employees typically able and willing to engage in remote work. Younger employees, on the other hand,

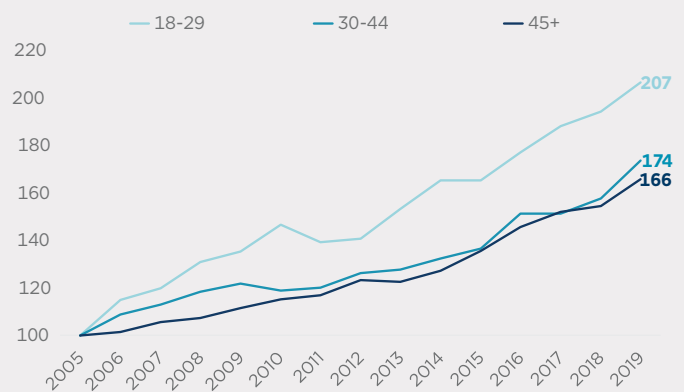
are less likely to be able to work from home or accept the option when offered—only 4.2% of employees aged 18 to 29 reported working remotely in the same year.

Nonetheless, younger employees have increased their adoption of remote work at a quicker pace than other demographic groups. Compared to 2005 levels, workers aged 18 to 29 have more than doubled the rate at which they work remotely, compared to a 74% increase among workers aged 45 and older. Even with these trends, it would take decades for these remote work shares to equalize, indicating that remote work will likely continue to be utilized more heavily by older employees.

### U.S. REMOTE WORK RATE (%) BY AGE GROUP



### U.S. REMOTE WORK RATE BY AGE GROUP, INDEX (2005=100)



Source: U.S. Census American Community Survey; George Washington University; Cushman & Wakefield Research.

## 4. SIMULATING OFFICE DEMAND

With our inputs collected, we set out to identify how increased remote work would have impacted office demand from 2017-2019. In other words, if we look back and hypothetically move the remote work dial around, what impact does our model have on office demand over this period?

To solve for this, our computer model ran 100,000 simulations in each market using a Monte Carlo methodology.<sup>19</sup> This means that instead of using a simple scenario analysis of “low” and “high,” we can instead consider a distribution of the unknown future remote work rate. For this purpose, we use the Project Management Risk and Critical Path Analysis (PERT) distribution, which is used in operations research when a forecast is unknown but there are educated estimates of the variable’s bounds.<sup>20</sup>

Using three inputs, this method creates a full distribution from which we can randomly pick generated remote work factors for each simulation. To create this distribution, we used the following parameters of the remote work rate across all simulations:

1. The “low” forecast for the future level of remote work is equal to existing levels of remote work, or a factor of 1.0. A PwC study indicated that pre-COVID-19 levels of remote work averaged about **1.5 days per week** for office workers.<sup>21</sup>
2. The “most-likely” level of remote work is indicated from our focus groups, which averaged between 2 to 3 days per week. We applied an estimate of about **2.25 days per week**, or a factor of 1.49 above baseline.

### DATA ON REMOTE WORK

There are multiple data sources for remote work statistics. For this study, historical MSA-level time series data on those who worked remotely was needed. The U.S. Census Bureau’s American Community Survey (ACS) microdata provides this information via a question on how a worker predominantly commuted to work. Since this data are available by detailed (3-digit) occupational categories, it is possible to construct estimates of office worker remote work rates. In 2019, 8.2% of workers with office occupations reported working remotely in the U.S.: in the largest 35 MSAs studied, this figure was 8.5%, and it was 7.6% outside of the top 35 MSAs. Importantly, the inference is that if one mainly commuted to work via remote work, that this includes individuals predominantly working from home 2.5 to 5 days per week.

However, there are other sources of data on remote work. For example, the U.S. Bureau of Labor Statistics released such data in its Job Flexibilities and Work Schedule Summary (based on the Time Use Survey’s Leave Module). This survey specifically denotes the number

of days worked exclusively from home, and how many days per week workers do this. Additionally, it provides this data by occupational<sup>22</sup> and industry groups. The latest data (for 2017-2018) show that just over 5% of financial and professional/business service *industry workers*<sup>23</sup> worked remotely five days per week, or full-time. Approximately 30% to 32% of such workers worked remotely (for a full day) at least some of the time. About 9.5% of such workers worked remotely 3-5 days per week (the approximate comparison to the ACS question). Because this module is not conducted regularly, it is not possible to construct a historical times-series dataset.

The first report in the *From Pandemic to Performance* series, Cushman & Wakefield’s Global Office Impact Study & Recovery Timing, leveraged multiple sources of data, including the BLS data described here. The model looked at pre-COVID-19 national remote work rates and made assumptions about how those would change over the coming decade, with the only distinction being between full-time remote work and partial remote work. Future remote work rates were determined using a

combination of the Dingel & Neiman methodology (using industries)<sup>24</sup> and corroborating that with surveys of both workers and executives. Our findings were that, given the stated assumptions, national office demand would be 15.8% lower from 2022-2030 than it otherwise would be without higher rates of remote work. This represents a 0.19% drag on the national absorption rate.

That study’s findings are consistent with those in this report, which approaches the question of how to model the impact of remote work on office demand in a fundamentally different way. This report finds that across the top 35 largest MSAs, an increase in the average number of days remotely worked by office workers would have most likely led to a decline in office demand of 20.4% from 2017-2019, representing a 0.28% drag on the average absorption rate. That this magnitude is greater than the prior report’s may be a result of only including the largest MSAs. A BLS article<sup>25</sup> shows that larger MSAs tend to have higher remote work rates.

Both reports’ findings are within the normal boundaries of absorption volatility.

3. The “high” forecast of remote work is **2.9 days per week**, or a factor of 1.92 above baseline levels. This is from a PwC survey of office workers’ desire for remote work in the post-COVID-19 environment. It is also supported by the range indicated in our expert focus groups.

In addition to randomly selecting a remote work factor, we also randomly selected a remote work “effect” using our model’s confidence interval. Finally, we applied the impact against the actual net absorption rate in a given market.<sup>26</sup>

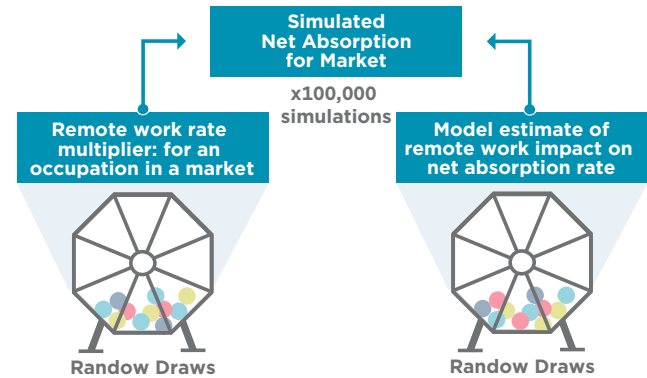
## 5. SIMULATION RESULTS

Using our model that translates remote work rates and net absorption rates, and our previously discussed assumptions about what post-COVID-19 remote work rates are likely to be, we conducted 100,000 simulations for each market to identify demand. We simulated the impacts on the top 35 markets as they were from 2017-2019 and adjusted the remote work shares. The final impact on each market varies, but our simulations indicate that the most-likely outcome is that remote work would have decreased office demand (net absorption) in every one of the 35 markets. But it’s important to note that the decrease in demand is within the order of magnitude of what markets would typically observe in year-to-year fluctuations.

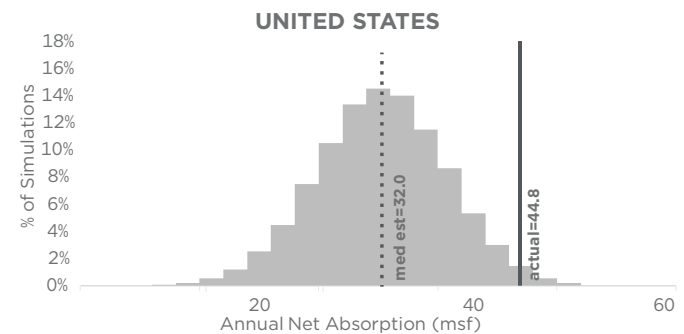
On average, across the 35 markets we observed a “most-likely” impact equal to a decrease of -0.28% in net absorption as a share of total office stock. The average market impact is a 601,000 sf loss in annual net absorption, or 20.4%, compared to the baseline of what actually occurred.<sup>27</sup> Given a range of forecasts of remote work rates, **the median simulation indicates an annual net absorption of about -0.28% of a market’s office stock. From there, we see a 50% confidence interval (from the 25th to 75th percentiles) that this decline would be as low as -0.37% to -0.20% of the U.S. aggregate office stock for these top 35 markets.**

These estimates are based on figures from 2017-2019, but the purpose is to understand how increased remote work would impact demand going forward. To do so, readers should consider our estimate that our simulated remote work increases would be a consistent drag of about -0.3% of a market’s office stock on net absorption per year for the top 35 U.S. markets. Further, we believe this downward force would exist in the near-to-medium term, which is what we have simulated. In the longer-term, however, markets are likely to return to a new equilibrium as price, supply, vacancy, and occupier behavior all adjust to the initial shock.

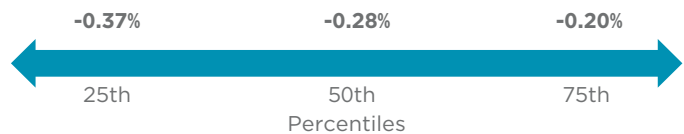
## DIAGRAM OF MONTE CARLO SIMULATIONS



## HISTOGRAM OF SIMULATED ANNUAL NET ABSORPTION (MSF), 2017 - 2019



## RANGE OF SIMULATIONS OF NET ABSORPTION FROM INCREASED REMOTE WORK SIMULATIONS, BY PERCENTILE (ANNUAL NET ABSORPTION AS SHARE OF OFFICE STOCK)



Note: Average simulation percentile across top 35 markets.

## MODEL RESULTS

### ACTUAL NET ABSORPTION VS. MODEL PREDICTED NET ABSORPTION, ANNUAL AVG., 2017-2019

MARKET / MSA	ACTUAL NET ABSORPTION (MSF)	MODEL "MOST-LIKELY" NET ABSORPTION (MSF)	SHIFT (MSF) (MOST-LIKELY - ACTUAL)	SHIFT AS % OF STOCK
ATLANTA	2.3	1.8	-0.5	-0.4%
AUSTIN	1.2	1.0	-0.2	-0.4%
BALTIMORE	1.2	1.0	-0.2	-0.2%
BOSTON	2.3	1.9	-0.4	-0.2%
CHARLOTTE	1.7	1.3	-0.3	-0.4%
CHICAGO	0.9	0.3	-0.6	-0.3%
CINCINNATI	(0.1)	(0.2)	-0.1	-0.3%
CLEVELAND	0.6	0.2	-0.3	-0.2%
COLUMBUS	0.3	0.2	-0.1	-0.3%
DALLAS-FT. WORTH	1.4	0.7	-0.7	-0.3%
DENVER	1.5	1.1	-0.4	-0.4%
DETROIT	0.7	0.5	-0.2	-0.2%
HOUSTON	(0.6)	(1.0)	-0.5	-0.2%
INDIANAPOLIS	0.2	0.1	-0.1	-0.3%
KANSAS CITY	0.7	0.6	-0.1	-0.3%
LAS VEGAS	0.7	0.5	-0.1	-0.2%
LOS ANGELES	2.8	2.0	-0.8	-0.3%
MIAMI	1.5	1.3	-0.3	-0.3%
MINNEAPOLIS/ST. PAUL	0.6	0.4	-0.2	-0.3%
NEW YORK	8.1	6.7	-1.4	-0.2%
ORLANDO	0.3	0.2	-0.1	-0.3%
PHILADELPHIA	(0.4)	(0.8)	-0.3	-0.3%
PHOENIX	2.3	2.0	-0.4	-0.3%
PITTSBURGH	(0.3)	(0.5)	-0.2	-0.3%
PORTLAND	0.3	0.1	-0.2	-0.3%
RIVERSIDE	0.3	0.2	-0.1	-0.3%
SACRAMENTO	0.8	0.6	-0.3	-0.3%
SAN DIEGO	1.1	0.9	-0.3	-0.3%
SAN FRANCISCO	3.2	2.5	-0.7	-0.3%
SAN JOSE	2.5	2.1	-0.4	-0.2%
SEATTLE	3.1	2.8	-0.3	-0.3%
ST. LOUIS	0.6	0.5	-0.1	-0.2%
TAMPA	0.6	0.4	-0.1	-0.3%
WASHINGTON, D.C.	2.6	1.8	-0.8	-0.3%

Source: Author calculations.

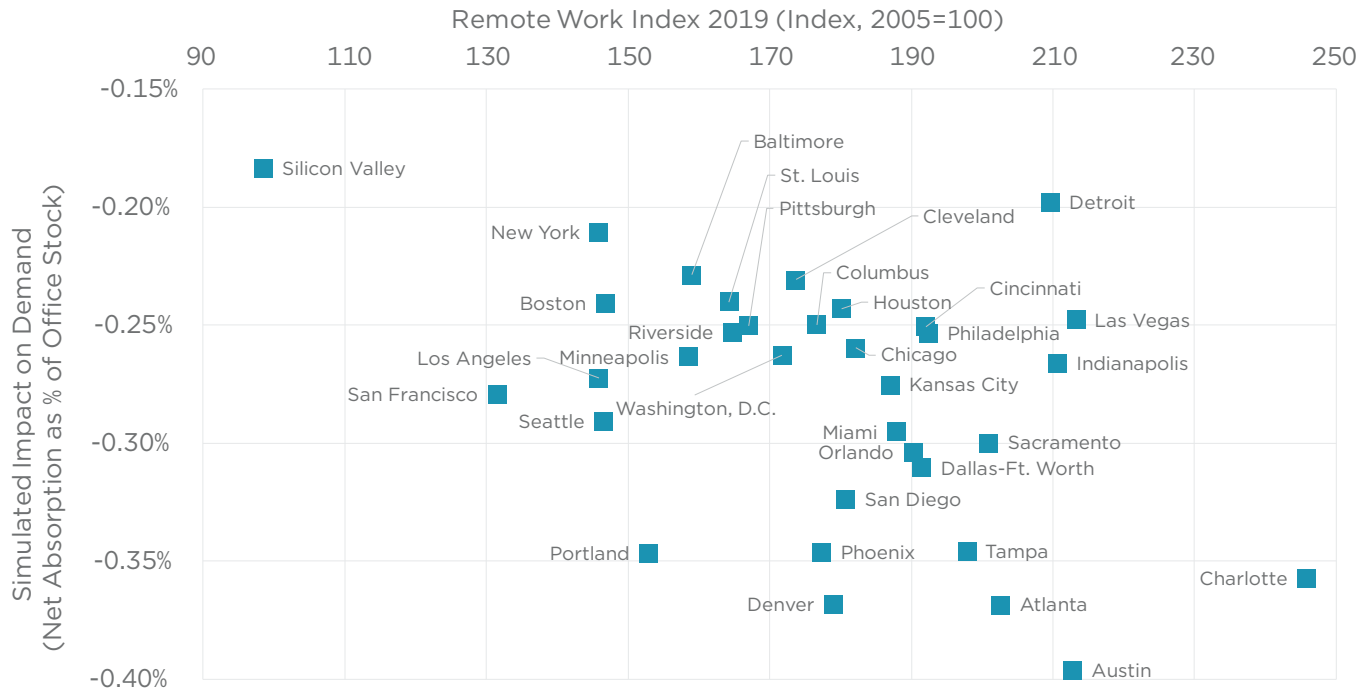
Note: San Antonio MSA excluded due to data availability.



Finally, an important trend is that markets with accelerating remote work adoption rates were the markets that our simulations predicted would see greater impacts on office demand. For example, Charlotte's remote work share in 2019 was nearly 2.5

times that of 2005; Austin, likewise, grew about 2.1 times its 2005 share. For those markets, our simulations saw greater impacts compared to a market like San Jose, for example, which had nearly the same remote work share in 2019 than it did in 2005.

## SIMULATION IMPACT TO NET ABSORPTION VS 2005-2019 INCREASE IN REMOTE WORK SHARE



Source: George Washington University; Cushman & Wakefield Research.

<sup>14</sup> The Census question asks: "How did this person usually get to work last week? Mark (X) ONE box for the method of transportation used for most of the distance." We consider remote work those who answered the option "Worked at home."

<sup>15</sup> Defined as those in traditional office-using occupations. This study uses microdata from ACS to calculate these rates for each market.

<sup>16</sup> Schnuck, R. (2013). Within and between estimates in random-effects models: Advantages and drawbacks of correlated random effects and hybrid models. *The Stata Journal* 13(1): 65-76. <https://journals.sagepub.com/doi/pdf/10.1177/1536867X1301300105>

<sup>17</sup> Take-up rates are dependent upon several factors including the ability of an occupation to be done remotely, a firm's willingness to let it be done remotely and an employee's desire to work remotely given the option.

<sup>18</sup> We derived an upper bound for each occupation's remote work rate using the 15 years of data across the top 35 markets. We use the maximum observed remote work rate in that panel set, across all markets, as an upper bound for the occupation's remote work rate. We applied a Monte Carlo method and PERT distribution to this bound ranging from a factor of 1.0 to a factor of 1.33, centered on a factor of 1.2 times the maximum observation in the data set.

<sup>19</sup> Dizikes, P. (May 2010). Explained: Monte Carlo Simulations. *MIT News*. <https://news.mit.edu/2010/exp-monte-carlo-0517>

<sup>20</sup> Clark, C.E. (1962). The PERT model for the distribution of an activity time. *Operations Research* 10: 405-406.

<sup>21</sup> PwC (June 2020). When everyone can work from home, what's the office for? PwC's US Remote Work Survey. <https://www.pwc.com/us/en/library/covid-19/us-remote-work-survey.html>

<sup>22</sup> By 2-digit NAICS in ATUS data.

<sup>23</sup> Data on the information industry (NAICS 51), which is traditionally included in office-using industries, does not meet the data disclosure requirements for these statistics.

<sup>24</sup> Dingel, Jonathan, and Brent Neiman. University of Chicago Booth School of Business, 2020, How Many Jobs Can Be Done at Home?

<sup>25</sup> Dey, M., Frazis, H., Lowenstein, M.A., and Sun, H. (June 2020). Ability to work from home: evidence from two surveys and implications for the labor market in the Covid-19 pandemic. *Monthly Labor Review* Jun. 2020. U.S. Bureau of Labor Statistics. <https://www.bls.gov/opub/mlr/2020/article/ability-to-work-from-home.htm>

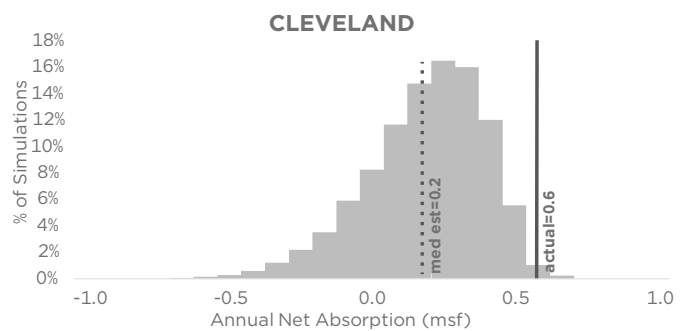
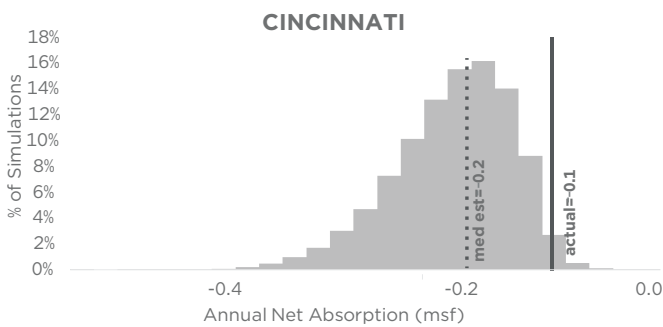
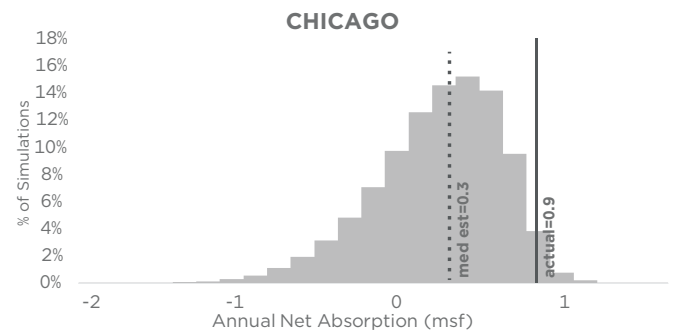
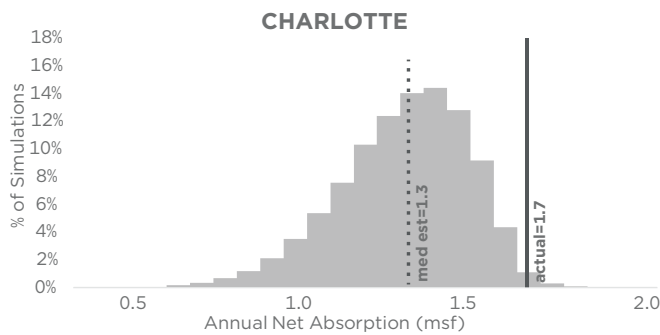
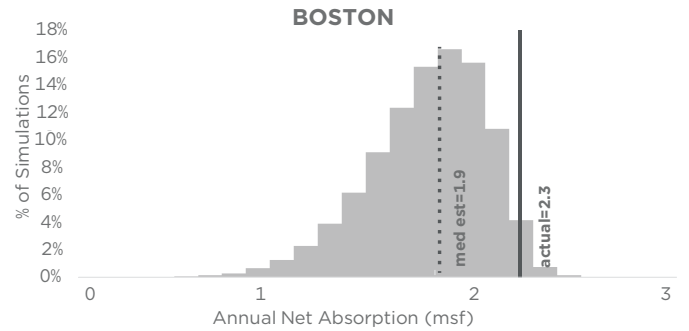
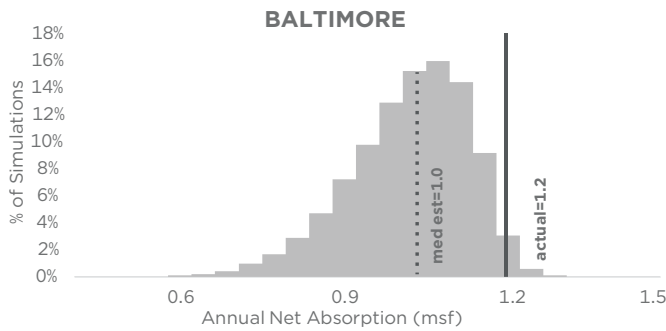
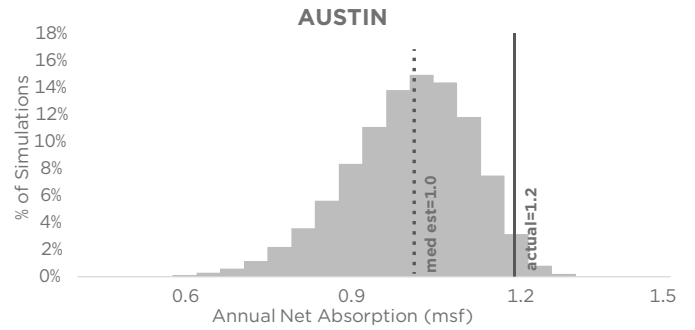
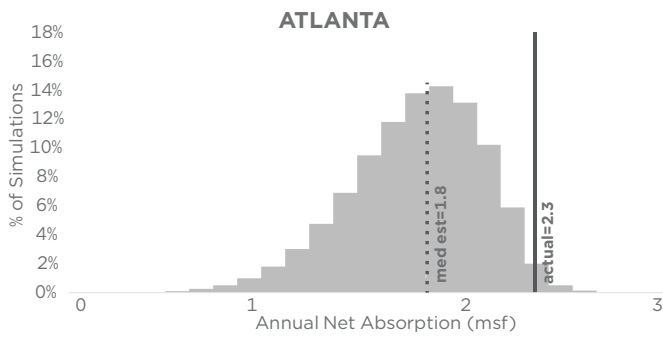
<sup>26</sup> We used a three-year average of 2017-2019.

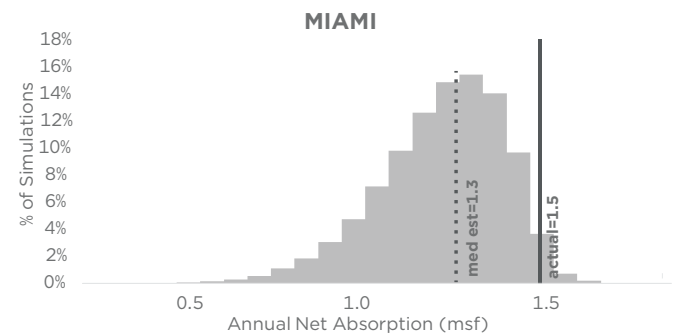
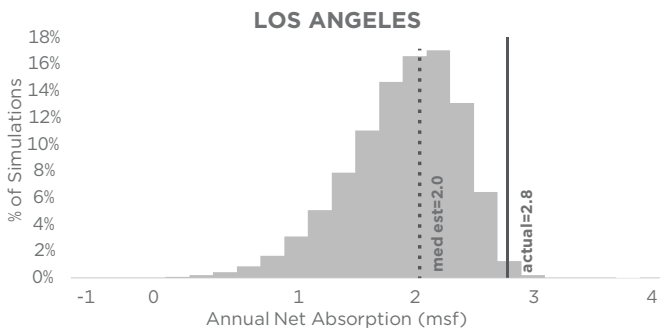
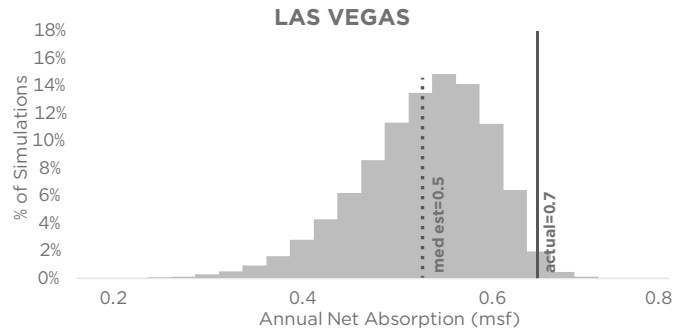
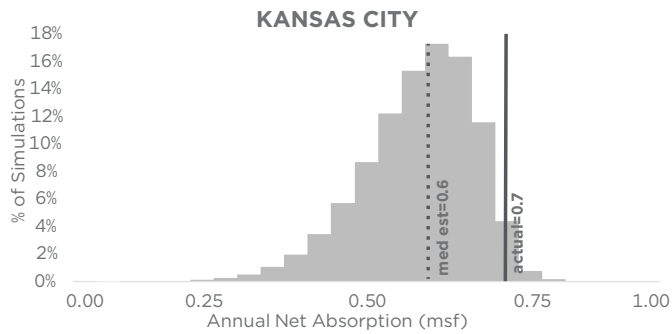
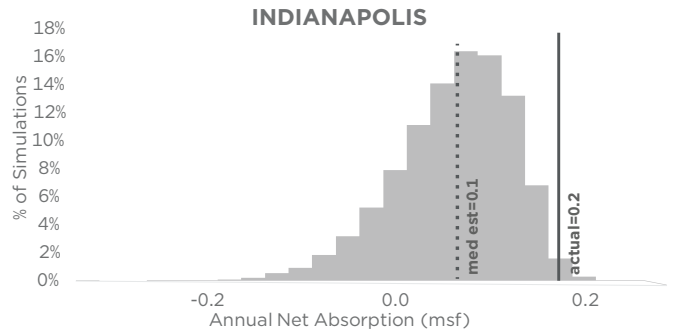
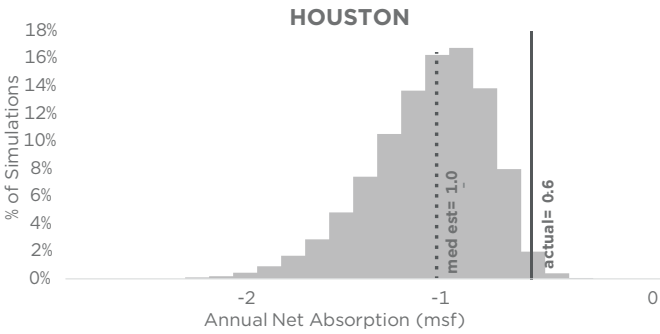
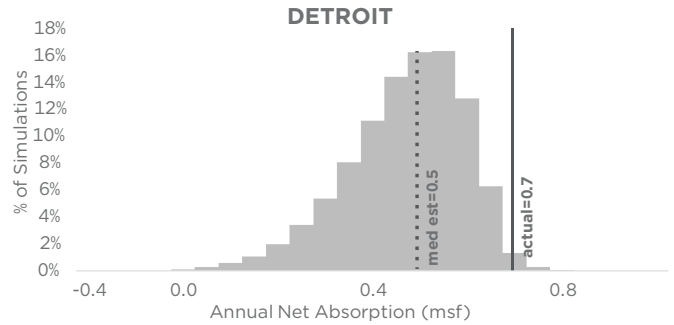
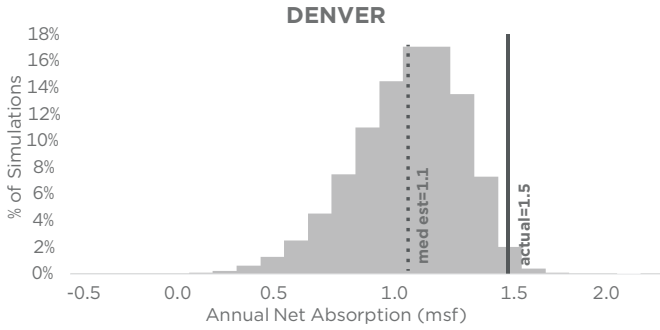
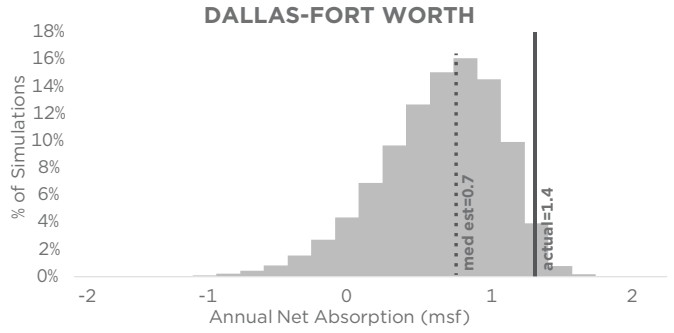
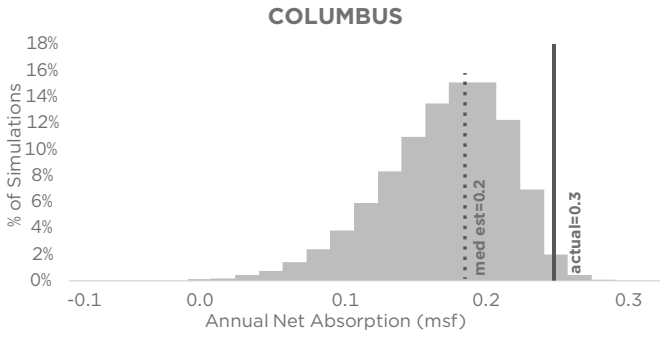
<sup>27</sup> All averages weighted for 35 MSAs by 2017-2019 net absorption (msf).

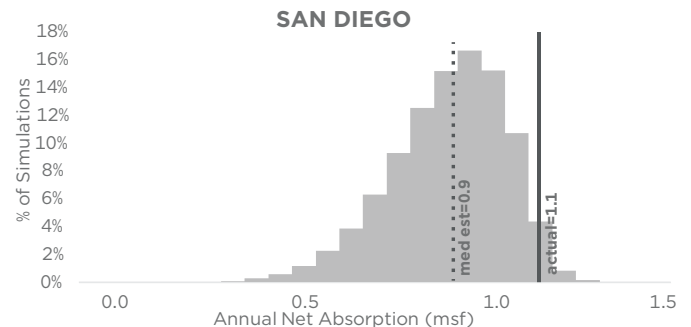
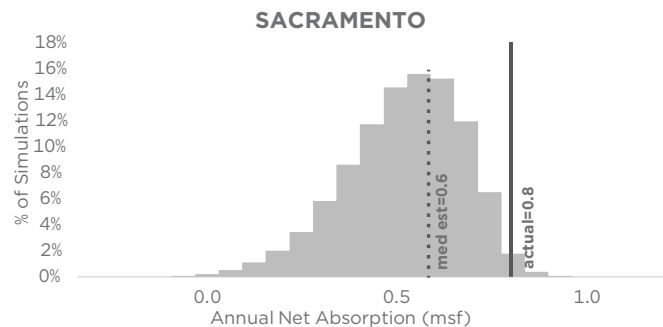
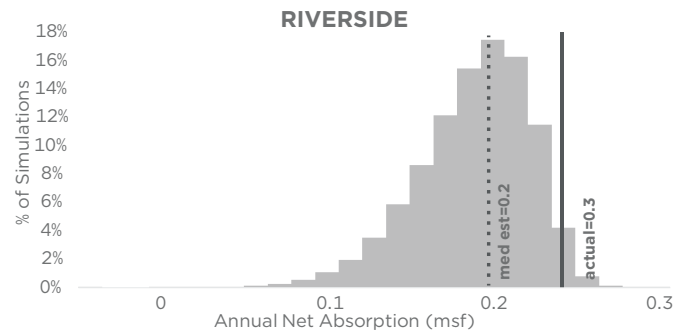
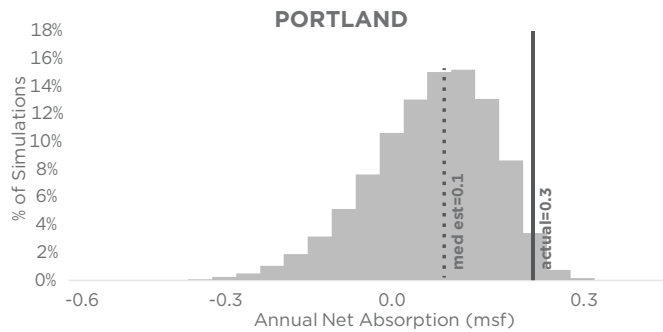
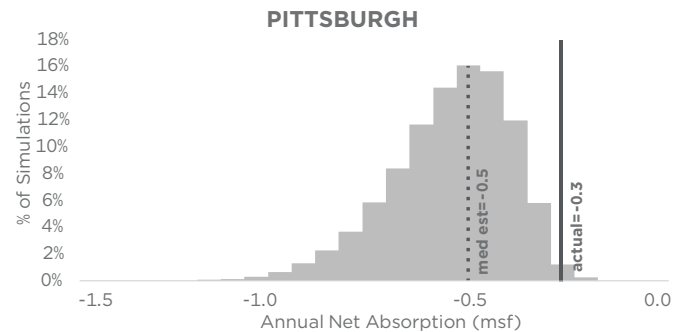
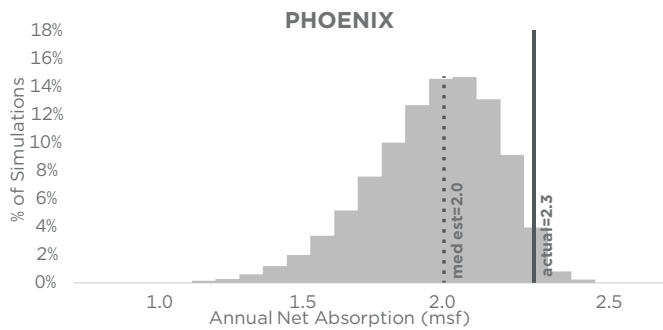
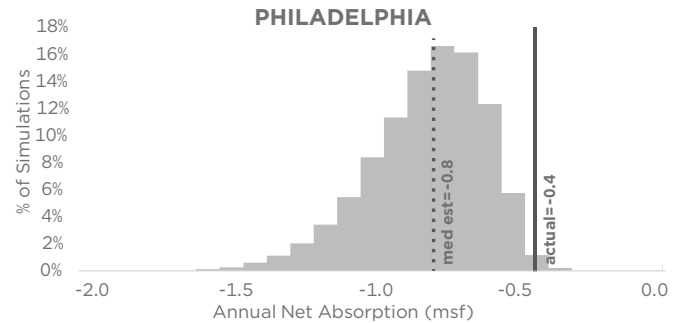
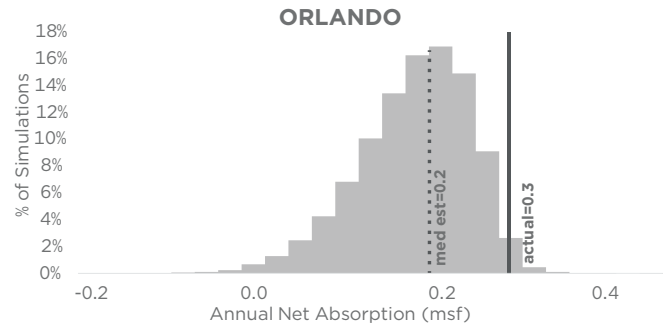
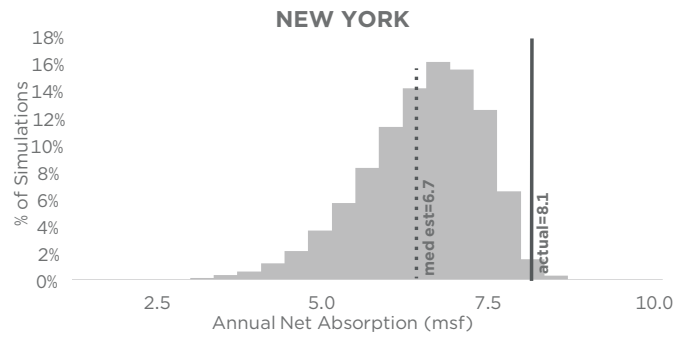
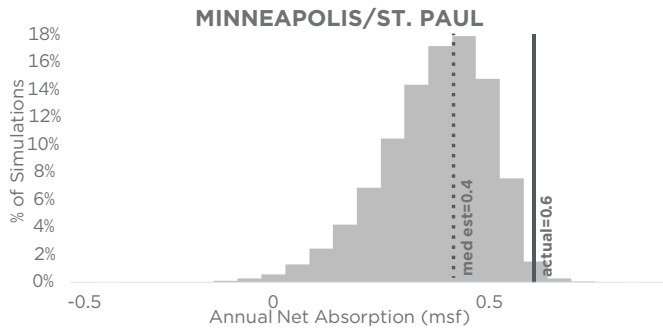
# APPENDIX A

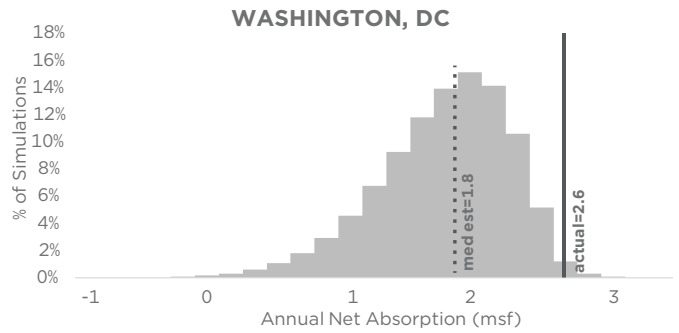
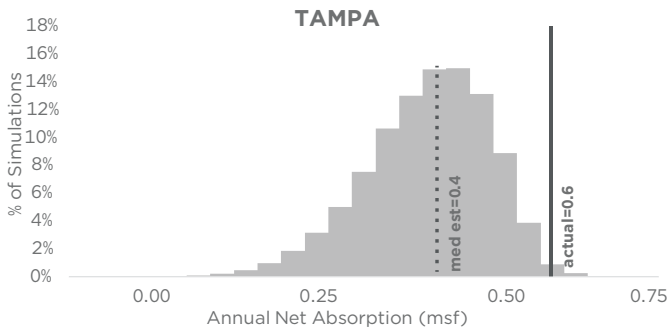
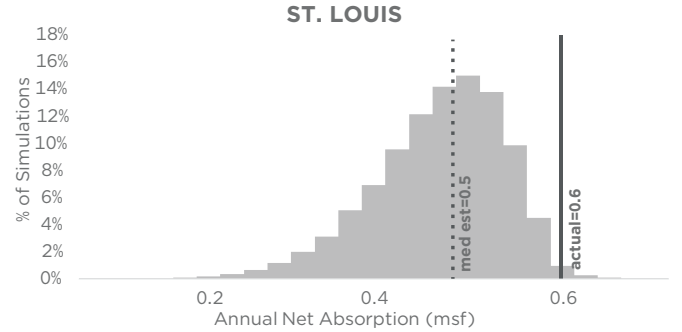
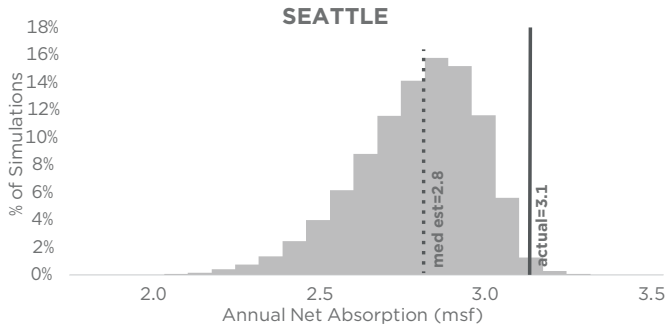
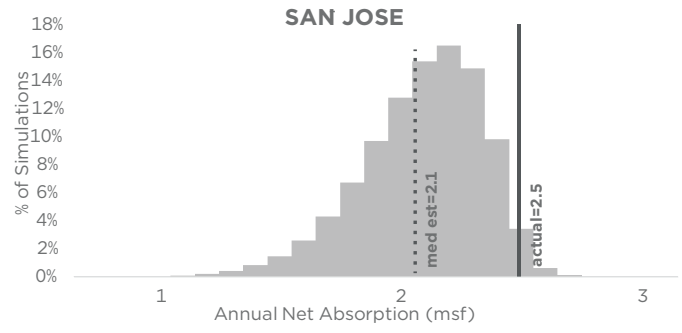
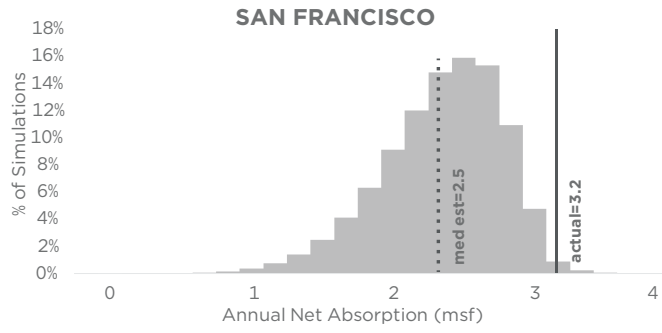
## SIMULATION RESULTS

### HISTOGRAM OF SIMULATED ANNUAL NET ABSORPTION (MSF). (Y-AXIS = % OF SIMULATIONS), 2017 - 2019







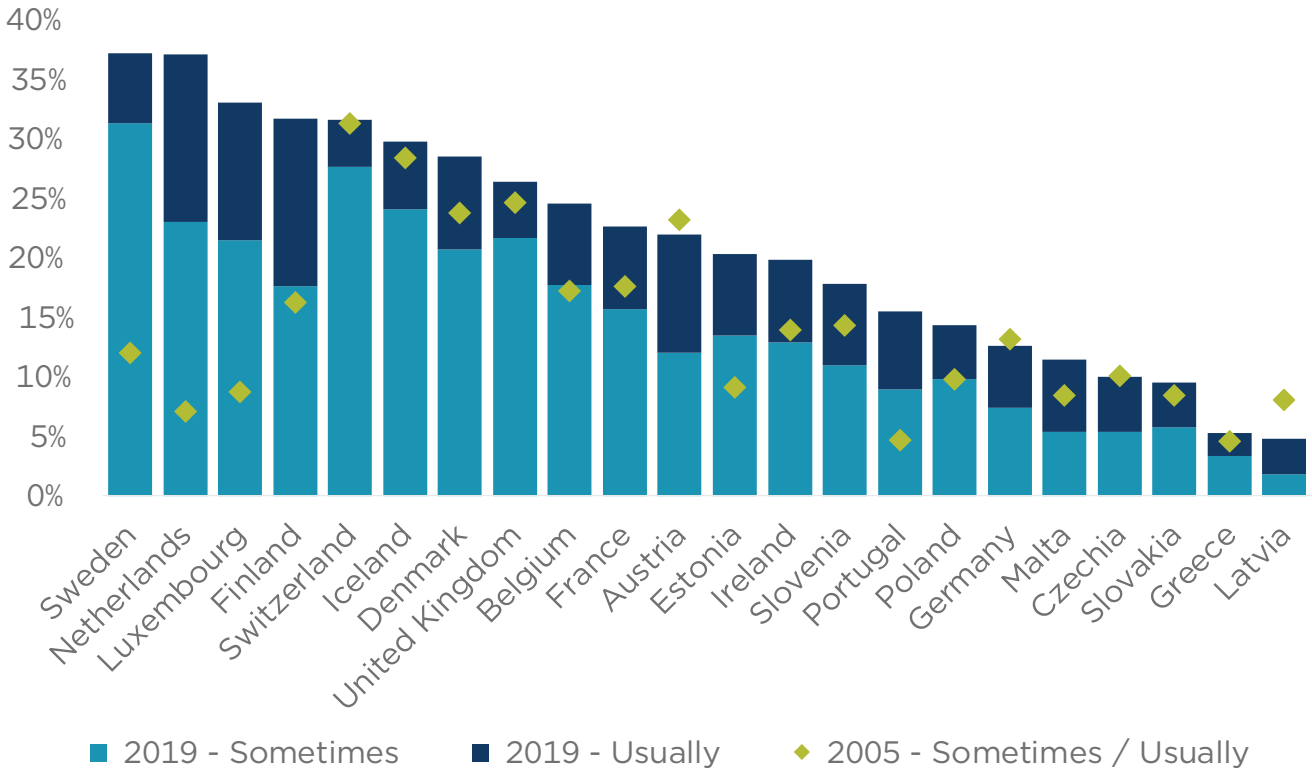


## APPENDIX B

### EUROPEAN WORK FROM HOME (2019)

GEOGRAPHY	SOMETIMES	USUALLY	SOMETIMES / USUALLY
Belgium	17.7%	6.9%	24.6%
Bulgaria	0.6%	0.5%	1.1%
Czechia	5.4%	4.6%	10.0%
Denmark	20.7%	7.8%	28.5%
Germany	7.4%	5.2%	12.6%
Estonia	13.5%	6.8%	20.3%
Ireland	12.9%	7.0%	19.9%
Greece	3.4%	1.9%	5.3%
Spain	3.5%	4.8%	8.3%
France	15.7%	7.0%	22.7%
Croatia	5.0%	1.9%	6.9%
Italy	1.1%	3.6%	4.7%
Cyprus	1.2%	1.3%	2.5%
Latvia	1.8%	3.0%	4.8%
Lithuania	2.1%	2.4%	4.5%
Luxembourg	21.5%	11.6%	33.1%
Hungary	3.4%	1.2%	4.6%
Malta	5.4%	6.1%	11.5%
Netherlands	23.0%	14.1%	37.1%
Austria	12.1%	9.9%	22.0%
Poland	9.8%	4.6%	14.4%
Portugal	9.0%	6.5%	15.5%
Romania	0.6%	0.8%	1.4%
Slovenia	11.0%	6.8%	17.8%
Slovakia	5.8%	3.7%	9.5%
Finland	17.6%	14.1%	31.7%
Sweden	31.3%	5.9%	37.2%
United Kingdom	21.7%	4.7%	26.4%
Iceland	24.1%	5.7%	29.8%
Norway	5.2%	5.0%	10.2%
Switzerland	27.7%	3.9%	31.6%
Montenegro	1.4%	5.8%	7.2%
North Macedonia	1.4%	1.6%	3.0%
Serbia	2.5%	4.9%	7.4%
Turkey	1.0%	2.1%	3.1%

**EUROPEAN WORK FROM HOME (2005 VS. 2019), SELECT GEOGRAPHIES**



Source: Eurostat

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The Center for Real Estate and Urban Analysis is a national thought-leader on real estate and policy at The George Washington University School of Business. Our primary goals are to develop and teach the real estate curriculum for graduate and undergraduate students, conduct influential real estate research, create networking opportunities for students and alumni, and facilitate career opportunities for students and alumni.

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