Hybrid Working, Commuting Time, and the Coming Long-Term Boom in Home Construction

By Jordan Rappaport

Single-family home construction has been sluggish for most of the past two decades, from the housing price collapse in the mid-2000s to the onset of the COVID-19 pandemic in early 2020. Long commuting times between peoples' homes and businesses were an important factor weighing on construction during this period. Land available for new development in the central portion of metropolitan areas and in most older suburbs is limited; although the outermost suburbs have more land for development, many workers have been hesitant to take on the long commutes associated with living in them.

However, the shift to hybrid working since the pandemic has likely altered people's preferences. Working partly at an employer's physical workplace and partly from home hugely cuts time spent commuting, making households potentially willing to live farther from employers. This increased willingness may, in turn, open large swathes of lightly settled land at the peripheries of metropolitan areas for development, thereby relaxing a long-standing constraint on single-family construction.

In this article, I estimate the statistical relationship between single-family home construction and commute duration, finding a significant

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negative correlation across the largest U.S. metropolitan areas. I then calculate how much time employees commuting from outer suburbs to central business districts (CBDs) save by working remotely two days a week. I find that across metropolitan areas with a population of at least 1 million in 2020, the time saved ranges from 130 to 406 hours per year.

Although home construction is contracting after recent increases in mortgage interest rates, my results suggest that in the long run, the time savings from fewer commutes could almost double single-family home construction in these metropolitan areas from its level just prior to the pandemic, an aggregate increase of 427,000 units per year. The largest metropolitan areas, where commutes have been longest, are likely to see an especially strong boost. For example, construction is predicted to more than triple in the New York, Los Angeles, Chicago, Philadelphia, and Boston metropolitan areas.

Section I describes the sluggish recovery of single-family home construction during the 2010s and documents that it was weakest in metropolitan areas where commutes from the outer suburbs to downtown office districts were longest. Section II calculates the commuting time saved from hybrid working—due both to fewer trips and less traffic congestion—and argues that the reduction will boost single-family home construction most in the outer suburbs of the largest metropolitan areas.

I. Weak Home Construction and Long Commutes

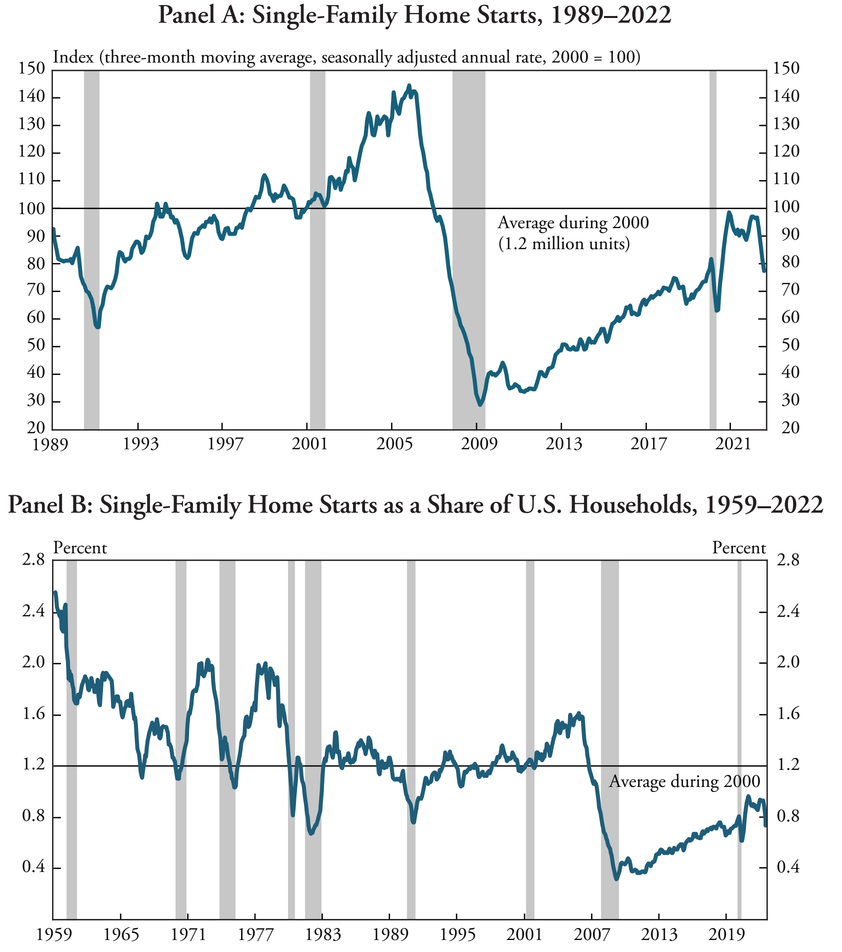
Single-family home construction was weak throughout the 2010s despite strong underlying demand for homes and vigorous growth in numerous other measures of economic activity. The negative correlation between home construction and commuting time from the outer suburbs to the CBDs of large metropolitan areas suggests that households' reluctance to move ever farther from their place of employment was an important cause.

The incomplete recovery of home construction following the Great Recession

Panel A of Chart 1 illustrates the incomplete recovery of home construction following the Great Recession with an index that plots the level of single-family starts relative to its level in 2000, which I use as a benchmark.[1] Although starts moved upward during most of the 2010s, they remained almost 20 percent below their 2000 level at the

Chart 1

Single-Family Home Starts Relative to 2000



Notes: Data are shown through August 2022. Gray bars denote National Bureau of Economic Research (NBER)-defined recessions.
Sources: U.S. Census Bureau (Haver Analytics), NBER, and author's calculations.

beginning of 2020.[2] During the pandemic, starts surged, briefly touching their benchmark level, but then swung sharply down during the first half of 2022 as mortgage interest rates rose.

Single-family home construction during the 2010s looks even more sluggish considering the increase in the U.S. population during this period. Indeed, Panel B of Chart 1 shows that the ratio of starts to households during the 2010s remained well below its level from the late 1950s until the Great Recession, excepting only lows during the 1981–82 and 1990–91 recessions.

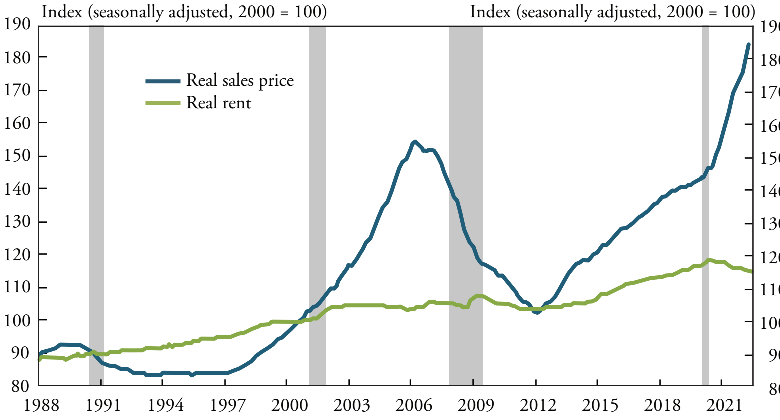
The incomplete recovery of single-family construction during the 2010s contrasted with other measures of economic activity. By the end of 2019, real GDP had risen more than 45 percent above its 2000 level, while real disposable income had risen more than 55 percent above its 2000 level. As is intuitive, the increase in income was accompanied by increases in underlying consumption demand for most goods and services, including single-family homes. However, this increase in underlying demand—the number of homes that households wish to purchase at a fixed level of prices—did not boost single-family home construction.

Instead, increased underlying demand, coupled with the weak recovery in construction, contributed to soaring home prices and subsequently dampened the *actual* number of homes demanded as prices exceeded many households' budgets. Chart 2 shows the sales and rental prices of single-family housing, adjusted for broad-based inflation, since the late 1980s. Real sales prices increased by 40 percentage points during the 2010s, while real rent increased by almost 15 percentage points, leaving both well above their levels in 2000, just prior to the start of the home construction boom and eventual house price bubble that precipitated the Great Recession.

Rising prices and rents considerably depressed the number of households who could afford to live in single-family homes. The black line in Chart 3 represents a demographic-based projection of the number of single-family homes that households would demand if home prices, home rents, incomes, and other non-demographic factors remained close to their levels in 2000.[3] The blue line represents the actual number of occupied single-family homes. During the construction boom in the early 2000s, the number of occupied single-family homes moved modestly above the projection. But beginning in 2010, the number of

Chart 2

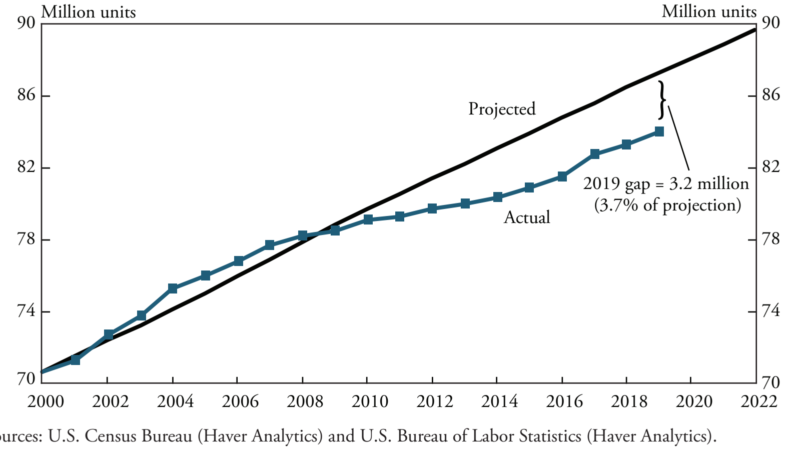
Real Price of Single-Family Housing, 1988–2022



Notes: Data shown are through June 2022. Nominal prices and rents are converted to real using the PCE price index. Gray bars denote NBER-defined recessions.
Sources: Standard and Poor's (Haver Analytics), U.S. Bureau of Labor Statistics (Haver Analytics), U.S. Bureau of Economic Analysis (Haver Analytics), NBER, and author's calculations.

Chart 3

Occupied Single-Family Homes in the 2000s and 2010s, Projected and Actual



Sources: U.S. Census Bureau (Haver Analytics) and U.S. Bureau of Labor Statistics (Haver Analytics).

occupied single-family homes fell increasingly below it, with the gap eventually widening to 3.2 million units in 2019.

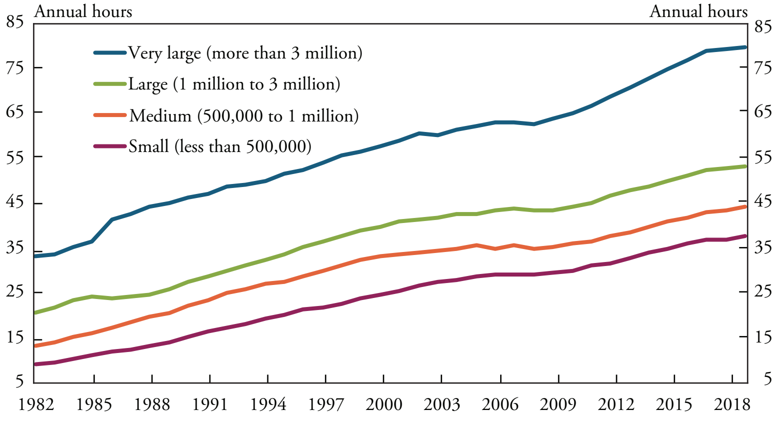
The increasing burden of commuting

Increased commuting times, reflecting worsening traffic congestion and the outward expansion of suburbs, were an important factor preventing builders in the 2010s from responding more vigorously to rising prices and rents. Commuting delays due to traffic congestion have been steadily increasing since the 1980s, especially in the largest metropolitan areas. Chart 4 shows the average annual hours of congestion-related delays experienced by commuters in metropolitan areas of four size categories (Schrank and others 2021).[4] Specifically, the chart measures the hours that traffic congestion adds to the duration of car travel above what would be required if traffic moved at its free-flow speed. The blue line shows that delays became especially punishing in metropolitan areas with a population above 3 million, where the extra time attributable to congestion more than doubled, from 37 hours per year in 1982 to 84 hours per year in 2019.

A different measure of commuting burdens, which captures both the speed of commutes as well as their distance, focuses on the longest commutes rather than average delays. It, too, is positively related to metropolitan population. Chart 5 plots the 95th-percentile commuting time per one-way trip of workers driving alone to the CBD of a metropolitan Core-Based Statistical Area (CBSA) during 2012–16 against the population of that CBSA in 2010.[5] Metropolitan CBSAs, the most commonly used delineation of metropolitan areas, are constructed as combinations of whole U.S. counties based on commuting flows. However, these delineations miss the significant share of workers employed in a CBSA who commute from residences outside it (Humann and Rappaport 2022). To account for this discrepancy, I measure commuting times based on workers driving to a CBD regardless of whether they live in its CBSA. For each CBD, the 95th-percentile commuting time is longer than 95 percent of driving commutes and shorter than 5 percent of driving commutes. As is intuitive, the 95th percentile primarily reflects the driving time of workers living in outer suburbs. Maps in the appendix illustrate the origin location of commutes to the CBDs of the five large metropolitan areas with the longest 95th-percentile commuting times (New York;

Chart 4

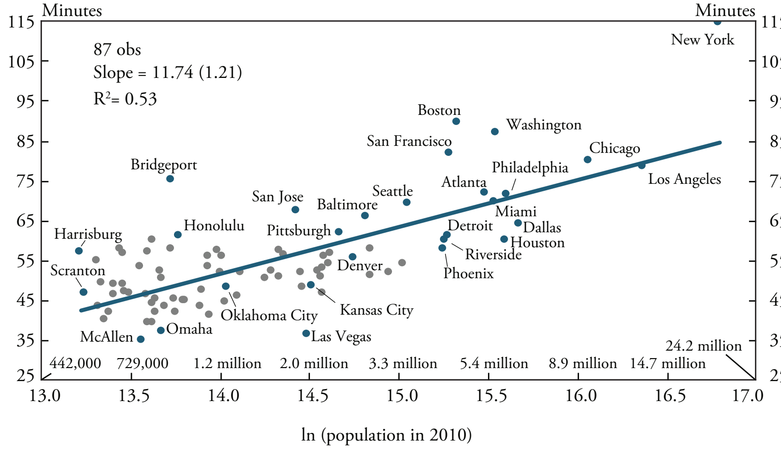
Average Delay per Commuter by Metropolitan Area Population, 1982–2019



Notes: Metropolitan areas are proxied by Urbanized Areas as delineated by the U.S. Census Bureau following the 1980, 1990, 2000, and 2010 decennial censuses. Metropolitan areas are assigned to a size category based on their population in the contemporary year.
Source: Schrank and others (2021).

Chart 5

95th-Percentile Commuting Time to CBD versus Metropolitan Population



Notes: Travel time is based on workers commuting to a census tract in the CBD, regardless of whether they live in the same CBSA. Population is for medium and large CBSAs with population of at least 500,000 in 2010.
Sources: U.S. Census Bureau and author's calculations.

Boston; Washington, DC; San Francisco; and Chicago). Maps of additional large metropolitan areas with long commuting times are available in a separate online supplement.[6]

The 95th-percentile times vary considerably across metropolitan areas. Across medium CBSAs—those with population between 500,000 and 1 million in 2010—the 95th-percentile commuting time ranged from 35 minutes (for trips to the CBD of McAllen, TX) up to 76 minutes (for trips to the CBD of Bridgeport-Stamford-Norwalk, CT). Across large metropolitan areas—those with population in 2010 above 1 million—the 95th-percentile commuting time ranged from 37 minutes (for trips to the CBD of Las Vegas) up to 115 minutes (for trips to the CBD of New York).

The negative effect of commuting time on home construction

For a large share of metropolitan residents, long commutes contribute to making the outer suburbs a less desirable place to live than places closer to the metropolitan center. Although only a moderate share of jobs may be located in or near the CBD itself, far more workers commute toward the CBD than away from it. For example, across large CBSAs in 2010, the median share of employment located within 10 miles of the CBD was 51 percent but the median share of residents located within 10 miles of the CBD was just 39 percent. Moreover, numerous civic and cultural amenities—such as museums, zoos, live performance venues, and sports teams—are located in the interior of metropolitan areas, further decreasing the desirability of living in outer suburbs. This centralization of employment and amenities constrains the extent to which metropolitan areas can expand outward.[7]

Commuting's negative effect on home construction reflects that constructing single-family homes is typically less expensive in the outer suburbs, where commuting times are longest. In other words, although developers can sell homes at more affordable prices in the outer suburbs than in locations closer to the metropolitan center, relatively few households take advantage of this opportunity due to long commuting times.

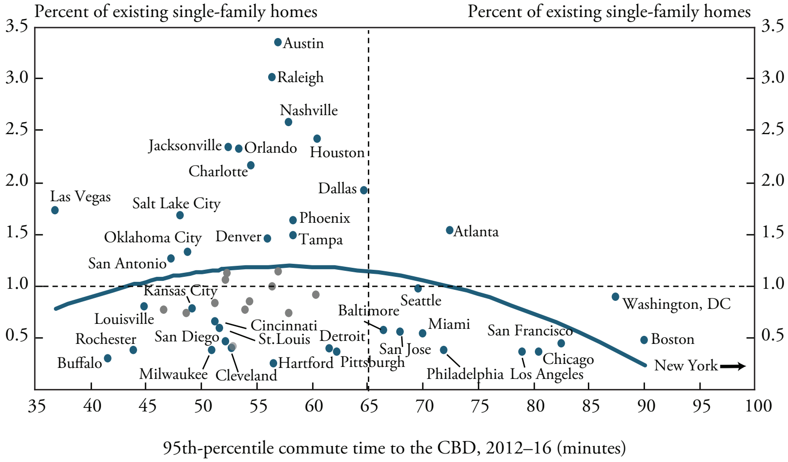
Developing homes in the outer suburbs is less costly for several reasons. First, the price of land is less expensive at the periphery of metropolitan areas. Second, zoning near the outermost suburbs is typically less restrictive than in more interior locations. Third, outer suburbs are more likely to have large tracts of open land, which lets builders develop new subdivisions that take advantage of economies of scale, constructing numerous homes in close proximity. Most metropolitan areas, including those with the largest population, have considerable peripheral land that is lightly settled. For example, in all but one of the 56 CBSAs with population above 1 million in 2020, at least half the land area has a population density below 500 persons per square mile, the threshold below which the U.S. Census Bureau classifies land as rural. Even more open land is available just outside the borders of most CBSAs.[8]

Empirically, home construction is negatively correlated with various measures of car commuting time when duration is high but positively correlated with car commuting time when duration is low. Chart 6 plots the average single-family permitting rate from 2015–19 in large metropolitan CBSAs against the 95th-percentile commuting time to their CBD during 2012–16.[9] The blue line shows the estimated statistical relationship between the two. The line has a gradual upward slope until commuting time reaches 58 minutes, indicating that construction and 95th-percentile commuting time are positively related up to this point. As commuting time exceeds 58 minutes, however, the slope of the line turns negative and steepens as the minutes increase further. In other words, the higher the 95th-percentile commuting time to a CBD grows above 58 minutes, the lower that CBSA's predicted single-family permitting rate will be. For example, the chart predicts that the Boston metropolitan area, which has a 95th-percentile commuting time of 90 minutes, will have a single-family permitting rate more than 0.8 percentage points lower than Seattle, which has a 95th-percentile commuting time of 70 minutes.

As long commutes are undesirable, the positively sloped portion of Chart 6 may seem counterintuitive. However, the statistical relationship reflects co-movement (that is, correlation) rather than causality. The undesirability of long commutes, all else equal, contributes to negative co-movement. But all else is unlikely to be equal: residents tend to be willing to endure longer commutes and pay higher house prices in metropolitan areas with more amenities or where higher productivity allows businesses to pay higher wages, both of which are likely to strengthen home construction. Essentially, desirable metropolitan characteristics contribute both to stronger single-family construction

Chart 6

Single-Family Permitting Rate versus 95th-Percentile Commuting Time



Notes: The blue line corresponds to the estimated statistical relationship between the single-family permitting rate in large metropolitan CBSAs and the 95th-percentile commute duration to their CBD. The single-family permitting rate is measured as the average annual number of construction permits for single-family houses during 2015 through 2019 divided by the average number of single-family houses during 2010 through 2014. The New York CBSA, which is excluded from the estimation, has a 95th-percentile commute duration and single-family permitting rate of 115 minutes and 0.33 percent, respectively.
Sources: U.S. Census Bureau and author's calculations.

and longer commutes, leading them to move together up to a certain threshold. In addition, the increase in population that typically accompanies strong single-family construction often worsens traffic congestion, further contributing to the positive co-movement.

Taking these factors into account, the *causal* relationship of increases in commuting time on single-family construction is likely to be negative at all durations. For example, an increase in a metropolitan area's 95th-percentile commuting time from 40 minutes to 60 minutes, all else equal, will cause single-family permitting to decrease, not increase. Moreover, the causal relationship is likely to be more strongly negative than the co-movement relationship when the co-movement relationship in Chart 6 is negative.[10] For example, an increase in 95th-percentile commuting time from 60 minutes to 90 minutes (again, all else equal) will cause single-family permitting to decrease by more than the decline implied by the co-movement relationship.

More qualitatively, Chart 6 also suggests that long commuting times impede single-family construction. The vertical dashed line separates metropolitan areas with 95th-percentile commuting times above or below 65 minutes, while the horizontal dashed line separates metropolitan areas with permitting rates above or below 1 percent. Among metropolitan areas with a commuting time above 65 minutes, only one has a single-family permitting rate above 1 percent. Among metropolitan areas that have both a 95th-percentile commuting time below 65 minutes and a single-family permitting rate below 1 percent, most have large manufacturing sectors that have been declining since the early 1980s. The low permitting in these areas likely reflects the weak population growth that accompanied industrial decline, both lowering demand for new homes and shortening commuting times. In other words, permitting was lower in these metropolitan areas notwithstanding shorter commutes.

More broadly, population growth is an important mechanism mediating the negative effect of long commutes on housing construction. Just as long 95th-percentile commuting times lower the desirability of living in outer suburbs, long commuting times from residential locations throughout a metropolitan area make living in that metropolitan area less desirable, discouraging people from moving there and so lowering demand for new homes. Consistent with this, Rappaport (2018) documents that the population growth from 2000–17 of the largest metropolitan areas was negatively correlated with their population.

II. Hybrid Working and Future Home Construction

Although long commutes appear to have constrained single-family home construction in the 2010s, the COVID-19 pandemic and associated rise in hybrid working may change this relationship going forward. Since the start of the pandemic, an increasingly large number of businesses have announced plans to permanently adopt hybrid working—that is, letting employees work some of their days in the office and some remotely. The associated time saved commuting is likely to increase workers' willingness to live farther from their workplaces, spurring single-family construction in and beyond the current outer suburbs of large metropolitan areas. Some businesses have also announced plans to let a portion of their employees work remotely full time, potentially freeing them to move anywhere and thus spurring home construction in locations throughout the United States. But if these workers must come into the office even a handful of times per year, or come into the office on short notice, they will still probably need to live no more than a few hours' drive away. In this sense, hybrid working loosens the tether between where someone lives and works but does not break it.[11]

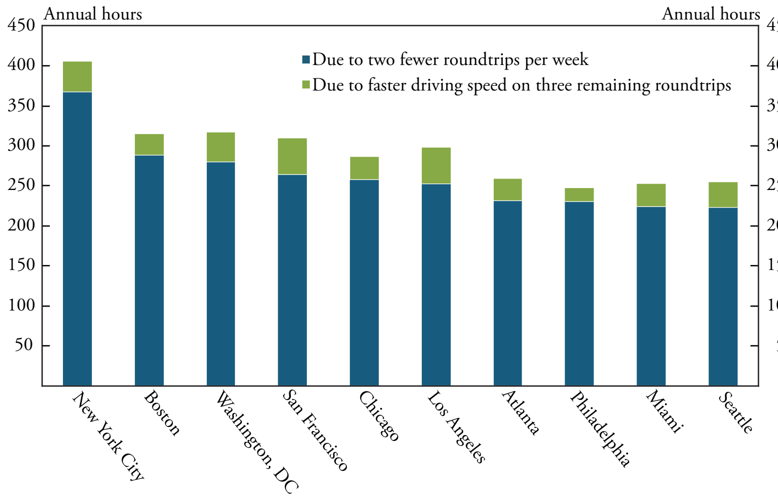
Time saved commuting

One of the largest benefits of hybrid working is reduced time spent commuting, a function of both fewer weekly trips and faster driving speed due to reduced traffic congestion. The amount of time saved will depend on the number of days worked remotely, which will likely vary considerably across employees. For illustrative purposes, Chart 7 reports predictions of the annual time saved from working remotely two days per week for a worker with a pre-pandemic commuting time equal to the 95th-percentile duration to the CBD in 2012–16. The 10 large metropolitan areas shown are those with the longest 95th-percentile durations. The predictions assume that the share of employees working remotely is about the same on each day of the workweek, causing a long-run increase in speed on trips to the CBD in each metropolitan area equal to one-half the increase in speed on all trips in the same metropolitan area from 2019 to 2020 (when the pandemic significantly reduced traffic volumes).[12] The annual commuting time saved from hybrid working ranges from 247 hours for workers driving to the Philadelphia CBD to 406 hours for workers driving to the New York CBD, with most of the time savings coming from making fewer trips rather than making trips at a faster speed.[13]

More generally, the predicted time saved is positively correlated with metropolitan population. The average predicted time saved each year is 254 hours in CBSAs with a population of at least 3 million in 2020, 180 hours in CBSAs with a population between 1 and 3 million, and 161 hours in CBSAs with a population between 500,000 and 1 million.

Three factors contribute to this positive correlation between predicted time saved and metropolitan population. First, commuting duration is positively correlated with population, implying that each skipped commute saves more time in a large metropolitan area than a small one. Second, the distance of long-duration commutes to the CBD tends to be greater in large metropolitan areas, implying that identical speed increases will save more time in large metropolitan areas than small ones.[14] Third, decreases in driving volume increase speed by

Chart 7
Commuting Time Saved Working Remotely Two Days per Week



Note: Chart shows annual time saved from working two days per week from home for a worker with pre-pandemic commuting duration equal to the 95th-percentile time to the CBD of the enumerated metropolitan area.
Source: Author's calculations.

proportionally more where congestion is worst, which tends to be in large metropolitan areas. For example, a 10 percent reduction in traffic volume on an interstate highway segment where traffic had previously slowed speed to 45 miles per hour would cut driving time by about 20 percent. The same 10 percent reduction in traffic volume on an interstate segment where traffic had previously slowed speed to 25 miles per hour would cut driving time by 40 percent.[15]

As is intuitive, the relaxed burden from commuting is likely to make workers willing to live farther from their place of employment. Consistent with this hypothesis, Delventhal and Parkhomenko (2021) estimate that the 90th-percentile distance of commutes by full-time workers increases from 23 miles for those who do not regularly work from home, to 26 miles for those who work from home one day per week, to up to 32 miles for those who work from home two days per week.[16]

The disproportionate boost to single-family home construction in large metropolitan areas

To estimate how much the predicted time savings from commuting will boost single-family home construction, I make three benchmark assumptions. First, I assume that the effect of commuting time on single-family permitting in a CBSA is equal to the magnitude of the negative correlation between permitting and the 95th-percentile commuting time to its CBD when the commute duration is 75 minutes.[17] Under this assumption, a 10-minute increase in the 95th-percentile commuting time to the CBD causes the single-family permitting rate to decline by 0.32 percentage points. This assumption is arguably conservative given the factors that offset negative co-movement of the permits rate and commuting time.

Second, I assume that the annual hours an individual saves from less frequent and faster commutes have the same effect as an equivalent decrease in the duration of their one-way commute. For example, I assume that the predicted 406 annual hours saved for workers in the New York CBSA who make two fewer roundtrip commutes per week will have the same effect on permitting as a 51-minute decrease in individuals' one-way commuting time.

Third, I assume that a significant share of employees will be allowed and will choose to work remotely two days per week. Of course, the frequency of working remotely will vary considerably across occupations, companies, and individual employees. But only a moderate share of households will need to increase their willingness to live farther from their employer for single-family construction to boom (see endnote 10).

Given these benchmark assumptions, I predict that reduced commuting times will eventually boost aggregate single-family permits in the 56 CBSAs with a population of at least 1 million in 2020 by 427,000 per year, increasing single-family construction in these CBSAs by 92 percent above its level in 2019 and increasing national single-family construction by 49 percent above its level in 2019. Based on this benchmark, national single-family permits will eventually rise to a long-term annual rate of 1.4 million.[18] For some metropolitan areas, the boost may take place primarily outside the formally delineated CBSA.

Hybrid working is also likely to increase single-family construction for reasons only indirectly related to decreased commuting, further boosting permitting's long-term annual rate. For example, hybrid working is likely to increase demand for larger residences to accommodate home offices. Although some households may be able to accommodate this need by renovating their current home, many others will move to new homes, further driving up single-family construction.[19] In addition, many households are likely to purchase second homes, where hybrid working will allow them to spend more time than previously.

The predicted long-term increase in single-family construction is skewed toward the largest metropolitan areas. Table 1 shows that permits are predicted to increase by more than 25,000 per year in the New York, Los Angeles, and Chicago CBSAs, and by at least 9,500 per year in each of the remaining CBSAs with a population of at least 4 million in 2020. In contrast, permits are predicted to increase by no more than 3,100 per year in each of the CBSAs with a population between 1 and 1.5 million. One reason for this positive skew is that the predicted increases in the permitting rate are assumed to be proportional to time saved commuting, which is highest in the largest metropolitan areas. In essence, the switch to hybrid working boosts the desirability of living in metropolitan areas the most where one-way commuting times are longest.[20] Another reason is that for a given increase in the predicted permitting *rate*, the predicted increase in permits is directly proportional to the number of existing homes, which of course is higher in the largest metropolitan areas.

Partly offsetting the positive skew, employees who have the option of working remotely full time, without any geographic tether to their employer's office, may choose to move to smaller locations to take advantage of lower home prices there. Other employees who can work remotely full time may choose to move closer to family or to places with more amenities such as mountains and nice weather (Rappaport 2018). In these cases, full-time remote working will shift some home construction from the largest metropolitan areas to smaller locations. But these shifts are unlikely to affect the overall strength of the construction boom, reflecting that relocating workers will increase demand for new homes in the locations to which they move.

In addition, the predicted increases do not account for geographic constraints on home construction. For example, the predicted large increases in permits in the Los Angeles, San Francisco, Seattle, and Miami metropolitan areas will likely be tempered by extensive mountainous terrain and wetlands. Limited water resources may also temper home construction, especially in the West and Southwest.

More recently, the sharp increase in mortgage interest rates since the start of 2022 has pushed single-family home construction into a

Table 1

Predicted Increases in Single-Family Permits due to Less Time Spent Commuting

Population rank	Metropolitan area with population in 2020 of at least 1 million	2020 population	2015–19 annual permits	Predicted long-term increase in annual permits
1	New York-Newark-Jersey City, NY-NJ-PA	20,838,000	11,200	54,900
2	Los Angeles-Long Beach-Anaheim, CA	13,201,000	9,600	30,800
3	Chicago-Naperville-Elgin, IL-IN-WI	9,619,000	8,100	25,700
4	Dallas-Fort Worth-Arlington, TX	7,708,000	33,100	15,200
5	Houston-The Woodlands-Sugar Land, TX	7,122,000	37,700	13,200
6	Washington-Arlington-Alexandria, DC-VA-MD-WV	6,371,000	13,400	18,900
7	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	6,245,000	6,900	17,600
8	Miami-Fort Lauderdale-West Palm Beach, FL	6,138,000	7,000	12,900
9	Atlanta-Sandy Springs-Roswell, GA	6,090,000	24,200	16,200
10	Boston-Cambridge-Newton, MA-NH	4,942,000	4,900	12,700
11	Phoenix-Mesa-Scottsdale, AZ	4,846,000	20,800	10,600
12	San Francisco-Oakland-Hayward, CA	4,749,000	4,500	12,700
13	Riverside-San Bernardino-Ontario, CA	4,600,000	10,100	9,800
14	Detroit-Warren-Dearborn, MI	4,392,000	5,800	12,100
15	Seattle-Tacoma-Bellevue, WA	4,019,000	9,200	9,500
16	Minneapolis-St. Paul-Bloomington, MN-WI	3,705,000	8,400	7,600
17	San Diego-Carlsbad, CA	3,299,000	3,200	5,400
18	Tampa-St. Petersburg-Clearwater, FL	3,175,000	12,400	6,800
19	Denver-Aurora-Lakewood, CO	2,964,000	10,700	5,900
20	Baltimore-Columbia-Towson, MD	2,845,000	4,900	8,000
:				
50	Buffalo-Cheektowaga-Niagara Falls, NY	1,167,000	1,000	1,800
51	Rochester, NY	1,090,000	1,200	1,900
52	Grand Rapids-Wyoming, MI	1,083,000	2,700	1,800
53	Tucson, AZ	1,043,000	2,900	1,800
55	Tulsa, OK	1,015,000	3,100	1,700
56	Fresno, CA	1,009,000	2,200	1,300
All 56 CBSAs with population in 2020 of at least 1 million		189,976,000	435,000	427,000

Notes: Predicted increases are based on the predicted annual time savings from working from home two days per week for a worker with a pre-pandemic commute duration equal to the 95th-percentile duration of workers commuting to the CBD of the enumerated metropolitan area during 2012–16. Metropolitan areas are the CBSAs delineated by the Office of Management and Budget in 2013 with population of at least 1 million in 2020. Additional statistics for CBSAs not shown above can be found in the appendix.
Sources: U.S. Census Bureau and author's calculations.

cyclical downturn. In particular, the increase in interest rates paired with the sharp run-up in home prices over the past few years is considerably straining the affordability of monthly mortgage payments on home purchases. To the extent that mortgage interest rates remain near or above their level in mid-2022, builders may need to adjust their development strategies—for example, by shifting their product mix toward homes that are less expensive to construct or by employing new production techniques, such as modular construction, which can significantly cut costs (Bertram and others 2019). More generally, home construction has always fluctuated cyclically and is likely to continue to do so.

When single-family construction begins to rebound, supply constraints are likely to slow its climb to its predicted long-term rate. Shortages of workers, construction materials, and ready-to-build lots are all likely to constrain the growth of single-family construction in the short term. Proportionately scaling up employment to match the predicted increase in single-family construction to 1.4 million units per year would require developers to hire 1 million more construction workers than were employed in mid-2022. The production of lumber and other construction materials would also need to increase significantly. Moreover, developing new subdivisions is a drawn-out process, typically taking several years from the conception of a project to breaking ground on new homes. Ramping up will be even more challenging in many metropolitan areas. For example, annual single-family permits are predicted to more than triple in the New York, Chicago, Philadelphia, and Boston metropolitan areas.

Once single-family home construction ramps up, it is likely to remain high for many years. A widespread change in where people want to live can be accommodated only gradually. For example, the shifts in preferences toward living in suburbs and in the Sunbelt induced transitions that played out over decades (Rappaport 2004, 2007). The coming accumulation of booming home construction and the associated outward expansion of metropolitan settlement will require numerous complementary processes. Roads and utility capacity will need to be expanded, and new schools built and staffed. Similarly, growing neighborhoods at the periphery of metropolitan areas will need to attract new retailers, restaurants, and local service providers. These processes, which each take considerable time on their own, must proceed in rough concurrence. Only so much home construction can accumulate before the associated congestion dampens demand.

Conclusions

Hybrid working dramatically cuts time spent commuting and so is likely to make workers willing to live farther from their place of employment. This greater willingness, in turn, is likely to boost single-family construction, especially in the outer suburbs of the largest metropolitan areas, where the time saved from reduced commuting is highest. Based on an estimate of the relationship between commuting time and single-family home permitting and some benchmark assumptions, I predict that hybrid work and the associated reduction in commuting time will eventually boost aggregate single-family permits in large CBSAs by a total of 427,000 per year—a 92 percent increase from its aggregate level in large CBSAs in 2019 and a 49 percent increase above the national rate of single-family permitting just prior to the COVID-19 pandemic. Several additional considerations are likely to boost national single-family construction by even more, including increased demand for homes in locations just outside large CBSAs, increased demand for space to accommodate home offices, and increased demand for second homes.

The skew in the predicted home construction boom toward the largest metropolitan areas may be partly offset by a rise in full-time remote working. Households that are no longer tethered to employer offices can choose to move anywhere, boosting home construction in locations throughout the United States. Their choices are likely to depend on three considerations: the presence of family, friends, and social networks; proximity to amenities; and the affordability of homes. It may take some time before trends emerge on the specific locations that attract these newly mobile households.

Appendix

Table A-1
Selected Statistics

Population rank	Metropolitan statistical area	Population in 2020	Driving time to CBD: 95th percentile, 2012–16 (minutes)	Time saved working remotely two days per week (hours)	Annual permits, 2015–19 (average)	Predicted annual permits	Predicted annual permit increase
1	New York-Newark-Jersey City, NY-NJ-PA	20,838,000	114.8	406	11,200	66,100	54,900
2	Los Angeles-Long Beach-Anaheim, CA	13,201,000	79.0	298	9,600	40,400	30,800
3	Chicago-Naperville-Elgin, IL-IN-WI	9,619,000	80.5	286	8,100	33,700	25,700
4	Dallas-Fort Worth-Arlington, TX	7,708,000	64.7	223	33,100	48,300	15,200
5	Houston-The Woodlands-Sugar Land, TX	7,122,000	60.5	214	37,700	50,900	13,200
6	Washington-Arlington-Alexandria, DC-VA-MD-WV	6,371,000	87.5	317	13,400	32,200	18,900
7	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	6,245,000	72.0	247	6,900	24,600	17,600
8	Miami-Fort Lauderdale-West Palm Beach, FL	6,138,000	70.0	253	7,000	19,800	12,900
9	Atlanta-Sandy Springs-Roswell, GA	6,090,000	72.5	259	24,200	40,400	16,200
10	Boston-Cambridge-Newton, MA-NH	4,942,000	90.0	315	4,900	17,600	12,700
11	Phoenix-Mesa-Scottsdale, AZ	4,846,000	58.3	209	20,800	31,400	10,600
12	San Francisco-Oakland-Hayward, CA	4,749,000	82.5	310	4,500	17,200	12,700
13	Riverside-San Bernardino-Ontario, CA	4,600,000	60.5	221	10,100	19,900	9,800
14	Detroit-Warren-Dearborn, MI	4,392,000	61.6	210	5,800	17,900	12,100
15	Seattle-Tacoma-Bellevue, WA	4,019,000	69.7	255	9,200	18,700	9,500
16	Minneapolis-St. Paul-Bloomington, MN-WI	3,705,000	54.5	190	8,400	16,000	7,600
17	San Diego-Carlsbad, CA	3,299,000	52.3	190	3,200	8,600	5,400
18	Tampa-St. Petersburg-Clearwater, FL	3,175,000	58.3	206	12,400	19,200	6,800

Table A-1 (continued)

Population rank	Metropolitan statistical area	Population in 2020	Driving time to CBD: 95th percentile, 2012–16 (minutes)	Time saved working remotely two days per week (hours)	Annual permits, 2015–19 (average)	Predicted annual permits	Predicted annual permit increase
19	Denver-Aurora-Lakewood, CO	2,964,000	56.0	203	10,700	16,600	5,900
20	Baltimore-Columbia-Towson, MD	2,845,000	66.5	237	4,900	12,900	8,000
21	St. Louis, MO-IL	2,820,000	51.7	172	5,300	11,500	6,200
22	Orlando-Kissimmee-Sanford, FL	2,673,000	53.4	188	14,400	19,100	4,600
23	Charlotte-Concord-Gastonia, NC-SC	2,638,000	54.5	192	14,900	20,100	5,200
24	San Antonio-New Braunfels, TX	2,558,000	47.3	162	7,500	11,400	3,800
25	Portland-Vancouver-Hillsboro, OR-WA	2,513,000	57.1	208	7,100	12,200	5,200
26	Sacramento-Roseville-Arden-Arcade, CA	2,397,000	56.5	198	6,300	11,400	5,000
27	Pittsburgh, PA	2,371,000	62.3	212	3,000	10,000	7,000
28	Austin-Round Rock, TX	2,283,000	57.0	205	15,400	19,100	3,700
29	Las Vegas-Henderson-Paradise, NV	2,265,000	36.8	130	9,200	12,000	2,800
30	Cincinnati, OH-KY-IN	2,234,000	51.3	176	4,100	8,600	4,500
31	Kansas City, MO-KS	2,192,000	49.2	164	5,200	9,600	4,300
32	Columbus, OH	2,139,000	48.8	166	4,200	8,000	3,800
33	Indianapolis-Carmel-Anderson, IN	2,111,000	52.3	180	6,400	10,800	4,400
34	Cleveland-Elyria, OH	2,088,000	52.8	176	2,600	7,300	4,700
35	Nashville-Davidson-Murfreesboro-Franklin, TN	2,014,000	58.0	205	13,200	17,300	4,100
36	San Jose-Sunnyvale-Santa Clara, CA	2,000,000	68.0	254	2,300	6,600	4,300
37	Virginia Beach-Norfolk-Newport News, VA-NC	1,763,000	51.3	175	4,200	7,700	3,500
38	Providence-Warwick, RI-MA	1,677,000	53.0	173	1,600	4,300	2,700
39	Jacksonville, FL	1,606,000	52.5	184	9,600	12,600	3,000
40	Milwaukee-Waukesha-West Allis, WI	1,575,000	51.0	173	1,600	4,400	2,800
41	Oklahoma City, OK	1,426,000	48.8	164	5,400	8,100	2,600

Table A-1 (continued)

Population rank	Metropolitan statistical area	Population in 2020	Driving time to CBD: 95th percentile, 2012–16 (minutes)	Time saved working remotely two days per week (hours)	Annual permits, 2015–19 (average)	Predicted annual permits	Predicted annual permit increase
42	Raleigh, NC	1,414,000	56.4	194	10,200	12,900	2,600
43	Memphis, TN-MS-AR	1,345,000	46.7	159	3,100	5,600	2,600
44	Richmond, VA	1,339,000	52.5	174	4,300	6,900	2,700
45	Louisville/Jefferson County, KY-IN	1,318,000	44.9	155	3,100	5,500	2,400
46	New Orleans-Metairie, LA	1,272,000	58.0	209	2,700	5,800	3,100
47	Salt Lake City, UT	1,258,000	48.1	165	4,600	6,400	1,800
48	Hartford-West Hartford-East Hartford, CT	1,214,000	56.6	193	800	3,300	2,500
49	Birmingham-Hoover, AL	1,181,000	54.1	186	2,700	5,400	2,700
50	Buffalo-Cheektowaga-Niagara Falls, NY	1,167,000	41.6	140	1,000	2,800	1,800
51	Rochester, NY	1,090,000	44.0	147	1,200	3,200	1,900
52	Grand Rapids-Wyoming, MI	1,083,000	45.3	150	2,700	4,500	1,800
53	Tucson, AZ	1,043,000	45.4	157	2,900	4,700	1,800
54	Urban Honolulu, HI	1,017,000	61.7	230	1,000	2,700	1,700
55	Tulsa, OK	1,015,000	42.4	140	3,100	4,800	1,700
56	Fresno, CA	1,009,000	45.8	149	2,200	3,500	1,300
57	Worcester, MA-CT	979,000	59	191	1,300	3,100	1,800
58	Omaha-Council Bluffs, NE-IA	968,000	38	131	2,900	4,300	1,400
59	Bridgeport-Stamford-Norwalk, CT	957,000	76	264	700	3,200	2,400
60	Greenville-Anderson-Mauldin, SC	928,000	45	149	4,600	6,100	1,500
61	Albuquerque, NM	917,000	44	151	2,000	3,600	1,600
62	Bakersfield, CA	909,000	43	145	2,200	3,400	1,200
63	Knoxville, TN	903,000	46	155	3,100	4,800	1,700
64	Albany-Schenectady-Troy, NY	899,000	51	167	1,200	2,800	1,600
65	McAllen-Edinburg-Mission, TX	871,000	35	117	3,000	3,800	800
66	El Paso, TX	869,000	40	130	2,300	3,300	1,000
67	New Haven-Milford, CT	865,000	53	175	400	1,900	1,500

Table A-1 (continued)

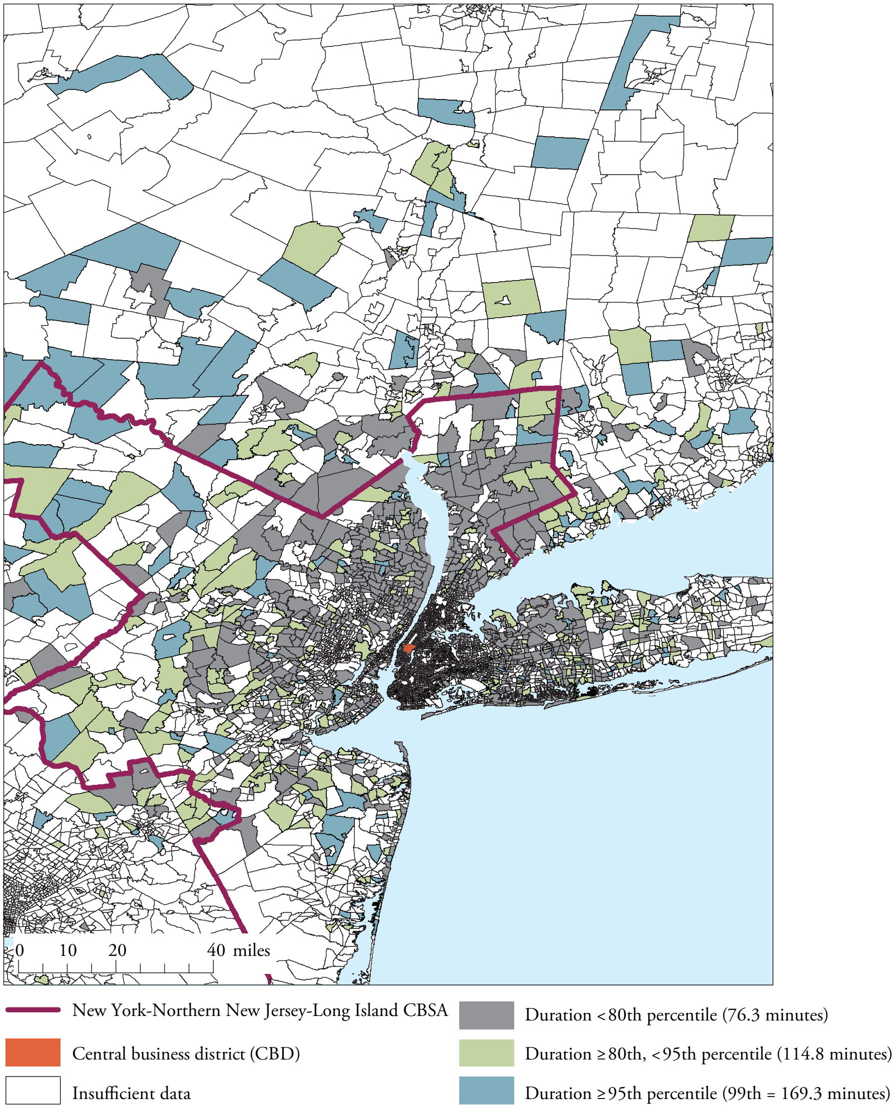
Population rank	Metropolitan statistical area	Population in 2020	Driving time to CBD: 95th percentile, 2012–16 (minutes)	Time saved working remotely two days per week (hours)	Annual permits, 2015–19 (average)	Predicted annual permits	Predicted annual permit increase
68	Allentown-Bethlehem-Easton, PA-NJ	862,000	61	202	1,000	3,100	2,100
69	Baton Rouge, LA	850,000	58	203	3,500	5,300	1,800
70	Oxnard-Thousand Oaks-Ventura, CA	844,000	40	136	700	1,900	1,100
71	North Port-Sarasota-Bradenton, FL	834,000	50	171	5,900	7,700	1,700
72	Columbia, SC	829,000	54	184	4,100	5,700	1,600
73	Dayton, OH	814,000	47	154	1,000	2,700	1,700
74	Charleston-North Charleston, SC	800,000	50	175	4,700	6,100	1,400
75	Stockton-Lodi, CA	779,000	58	195	2,200	3,700	1,400
76	Greensboro-High Point, NC	777,000	47	154	1,900	3,200	1,400
77	Boise City, ID	765,000	40	140	6,100	7,200	1,100
78	Cape Coral-Fort Myers, FL	761,000	48	166	4,800	6,400	1,500
79	Colorado Springs, CO	755,000	43	143	3,800	4,900	1,100
80	Little Rock-North Little Rock-Conway, AR	748,000	57	188	1,800	3,400	1,600
81	Lakeland-Winter Haven, FL	725,000	55	181	4,500	5,800	1,300
82	Akron, OH	702,000	48	157	900	2,400	1,500
83	Ogden-Clearfield, UT	695,000	35	116	2,600	3,300	800
84	Madison, WI	681,000	56	190	1,600	2,900	1,300
85	Winston-Salem, NC	676,000	45	150	2,600	3,800	1,200
86	Des Moines-West Des Moines, IA	672,000	42	138	3,600	4,600	1,000
87	Provo-Orem, UT	671,000	42	142	4,700	5,400	700
88	Deltona-Daytona Beach-Ormond Beach, FL	669,000	47	154	2,800	4,200	1,300
89	Syracuse, NY	662,000	47	151	600	1,700	1,200
90	Wichita, KS	655,000	41	134	1,300	2,400	1,100
91	Springfield, MA	628,000	50	164	500	1,500	1,000
92	Augusta-Richmond County, GA-SC	611,000	46	150	2,600	3,700	1,000
93	Palm Bay-Melbourne-Titusville, FL	607,000	46	151	2,100	3,300	1,100

Table A-1 (continued)

Population rank	Metropolitan statistical area	Population in 2020	Driving time to CBD: 95th percentile, 2012–16 (minutes)	Time saved working remotely two days per week (hours)	Annual permits, 2015–19 (average)	Predicted annual permits	Predicted annual permit increase
94	Toledo, OH	606,000	44	146	700	1,900	1,100
95	Spokane-Spokane Valley, WA	599,000	38	129	1,800	2,600	800
96	Harrisburg-Carlisle, PA	592,000	58	188	1,200	2,600	1,300
97	Durham-Chapel Hill, NC	589,000	54	182	3,100	4,200	1,100
98	Jackson, MS	575,000	51	169	1,500	2,600	1,100
99	Fayetteville-Springdale-Rogers, AR-MO	570,000	46	156	3,600	4,500	900
100	Scranton-Wilkes-Barre-Hazleton, PA	568,000	47	154	600	1,800	1,200
101	Chattanooga, TN-GA	563,000	49	163	1,800	2,900	1,100
102	Lancaster, PA	553,000	49	156	1,000	1,900	1,000
103	Modesto, CA	553,000	48	158	600	1,500	900
104	Portland-South Portland, ME	552,000	55	176	1,800	3,100	1,300
105	Youngstown-Warren-Boardman, OH-PA	541,000	47	154	300	1,600	1,200
106	Lexington-Fayette, KY	517,000	51	174	1,400	2,500	1,000
107	Pensacola-Ferry Pass-Brent, FL	510,000	45	153	2,400	3,300	900

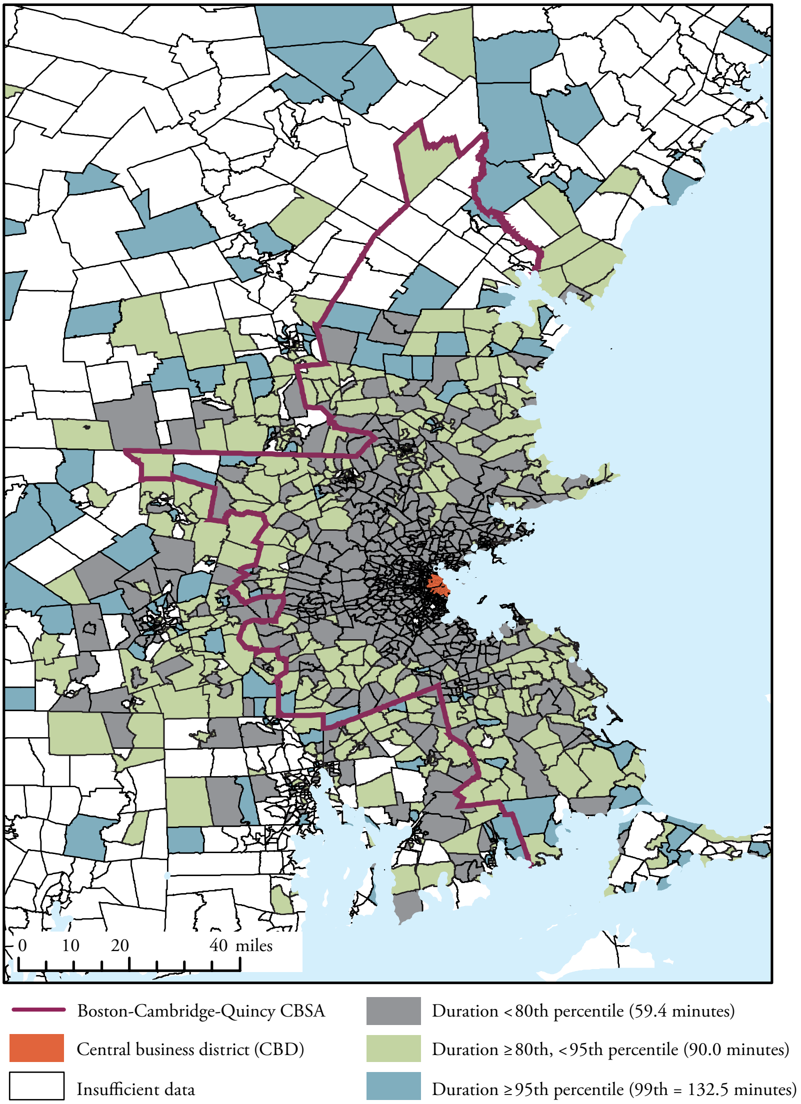
Sources: U.S. Census Bureau and author’s calculations.

Map A-1
Commuting Time to Central Business District: New York



Notes: Map shows percentile commuting times during 2012–16 of workers driving to the CBD of the New York metropolitan area. Census tracts with large land area have low population density.
Sources: U.S. Census Bureau and author's calculations.

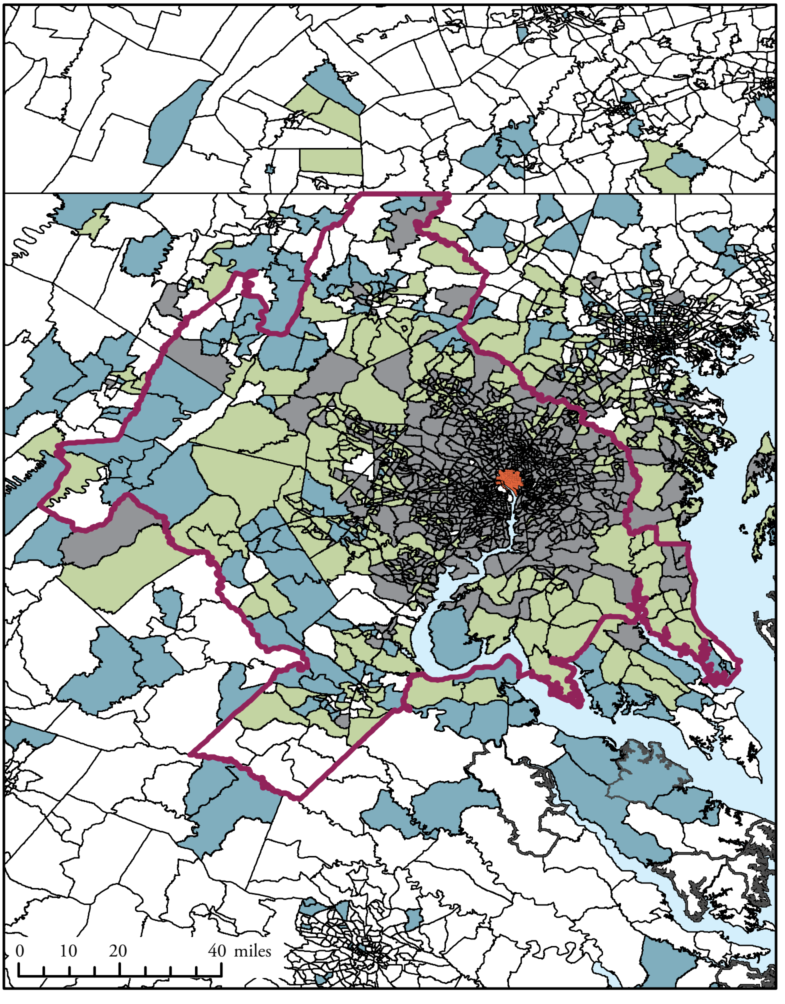
Map A-2
Commuting Time to Central Business District: Boston



Notes: Map shows percentile commuting times during 2012–16 of workers driving to the CBD of the Boston metropolitan area. Census tracts with large land area have low population density.
Sources: U.S. Census Bureau and author's calculations.

Map A-3

Commuting Time to Central Business District: Washington, DC



Washington-Arlington-Alexandria CBSA

Central business district (CBD)

Insufficient data

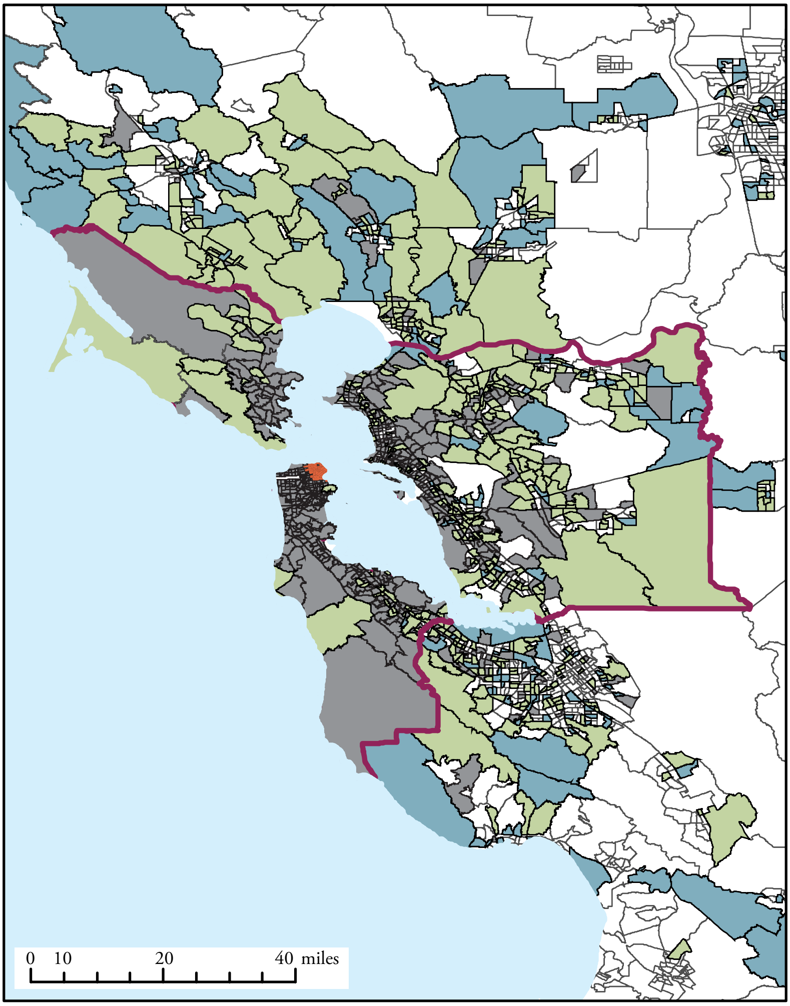
Duration < 80th percentile (56.3 minutes)

Duration ≥ 80th, < 95th percentile (87.5 minutes)

Duration ≥ 95th percentile (99th = 128.3 minutes)

Notes: Map shows percentile commuting times during 2012–16 of workers driving to the CBD of the Washington, DC metropolitan area. Census tracts with large land area have low population density.
Sources: U.S. Census Bureau and author's calculations.

Map A-4
Commuting Time to Central Business District: San Francisco

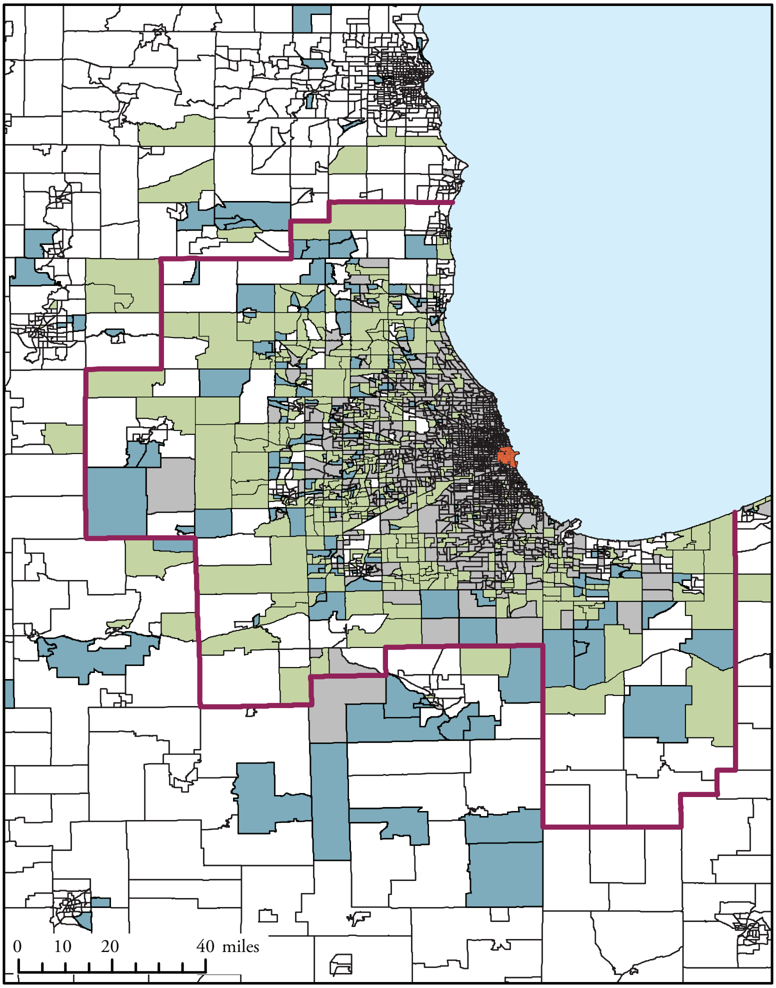


San Francisco-Oakland-Fremont CBSA
Central business district (CBD)
Insufficient data
Duration < 80th percentile (51.0 minutes)
Duration ≥ 80th, < 95th percentile (82.5 minutes)
Duration ≥ 95th percentile (99th = 125.0 minutes)

Notes: Map shows percentile commuting times during 2012–16 of workers driving to the CBD of the San Francisco metropolitan area. Census tracts with large land area have low population density.
Sources: U.S. Census Bureau and author's calculations.

Map A-5

Commuting Time to Central Business District: Chicago



Chicago-Naperville-Joliet CBSA
Central business district (CBD)
Insufficient data
Duration < 80th percentile (53.0 minutes)
Duration ≥ 80th, < 95th percentile (80.5 minutes)
Duration ≥ 95th percentile (99th = 122.5 minutes)

Notes: Map shows percentile commuting times during 2012–16 of workers driving to the CBD of the Chicago metropolitan area. Census tracts with large land area have low population density.
Sources: U.S. Census Bureau and author's calculations.

Endnotes

[1]My choice to use 2000 as a benchmark primarily reflects that it was a year just prior to a recession and subsequent boom in home construction, which proved unsustainable. In addition, single-family home starts stayed near their level in 2000 for an extended period. Measured as a 12-month moving average, single family starts remained continuously within 10 percentage points of their 2000 benchmark from May 1998 to November 2002. And as illustrated in Panel B of Chart 1, the ratio of single-family home starts to the number of U.S. households stayed near its level in 2000 throughout most of the 1980s and 1990s.

[2]Although an overhang of unsold, newly constructed homes contributed to the crash in construction that started in 2006, this excess inventory had been more than worked off by the end of 2009, at which point the inventory of unsold new homes dropped to its lowest level since 1971.

[3]The projection uses the share of each five-year age range—20–24, 25–29, …, 85–89, 90 and older—that lived in a single-family home in 2000 to calculate the number of occupied single-family homes there would be if individuals in the same age range made the same housing choices in subsequent years as the individuals in that age range made in 2000 (Rappaport 2013). For example, 13.5 percent of women age 25–29 in 2000 lived with one other person in a single-family home in 2000. Thus, the projection assumes that this 2000 trend continued for women age 25–29 in subsequent years. As described in the main text, the projection also assumes that the relative price of single-family housing services remained at its 2000 level in subsequent years. Another critical assumption is that the relative purchasing power of a household's disposable income remained at its 2000 level. Additional assumptions include that people's preferences remained unchanged and that the stock of single-family homes in any year had similar characteristics, including the commuting time associated with location, as in 2000.

[4]Schrank and others (2021) report delays for Urbanized Areas (UAs), which are the densely settled core of metropolitan Core-Based Statistical Areas (CBSAs), a more commonly used delineation of metropolitan areas. I classify the size of each UA in each year by its population in that year. A similar chart in Schrank and others (2021) classifies UAs in all years by their population in 2020.

[5]Except for New York, I designate a tract as belonging to the CBD of a metropolitan area if it is located within two miles of the tract with the highest employment density in a metropolitan CBSA, using the CBSA delineations promulgated in Office of Management and Budget (2013) and employment reported in the Longitudinal Employer-Household Dynamics Origin-Destination Employment Statistics (LODES) for 2012. For the New York metropolitan area, the LODES data locates most employees of the New York City public school system in the tract of its Brooklyn headquarters, falsely making that tract appear to have the highest employment density in the metropolitan area. Instead, I anchor the

New York CBD by Grand Central Station and consider all tracts within two miles of it to belong to the CBD. I calculate the distribution of commuting times using the number of drivers and mean driving time for each origin-destination pair of tracts with a destination place of employment in the CBD and an origin place of residence within 150 miles of it, excluding trips with passengers. The number of drivers and mean travel time for each pairwise flow are for 2012–16 as reported in the Census Transportation Planning Product for those years.

[6]To access supplemental maps, visit https://doi.org/10.18651/ER/v107n-4Rappaport.

[7]Humann and Rappaport (2022) find that the elasticity of settled metropolitan land area with respect to metropolitan population is increasingly below as metropolitan population rises, suggesting centripetal forces limit metropolitan expansion. These centripetal forces would likely weaken if employment could expand outward in proportion to population expanding outward. One reason employers choose not to move outward is the need to attract workers from throughout a metropolitan area. Another reason is that businesses in some industries and occupations are more productive in proximity to each other, discouraging individual companies from moving away from an existing cluster. Consistent with this, employment in some occupations—including law, finance, information technology, science, and media—is considerably more centralized than employment in other occupations (Brown and others 2017). In addition, urban amenities—such as restaurants, cafés, live performance venues, and pedestrian retail districts—are a key force pulling young college graduates to live near metropolitan centers, incentivizing employers to locate nearby (Smart Growth America 2015; Couture and Handbury 2020).

[8]To be sure, in some metropolitan areas, a considerable portion of lightly settled land may be unsuitable for development—for example, due to mountainous terrain and wetlands (Saiz 2010). And especially in the West and Southwest limited water resources may preclude developing land.

[9]I henceforth measure single-family construction by permits rather than starts, as only data on the former are available for metropolitan areas. The statistical relationship is estimated by a fitted regression of the single-family permitting rate on linear and quadratic terms for the 95th-percentile commuting time to the CBD. I exclude the New York City metropolitan area from the regression because its 95th-percentile commuting time, 115 minutes, is considerably above the next highest duration, 90 minutes, causing New York to have disproportionate leverage in estimating coefficients.

[10]Consistent with this causal relationship being more steeply negative, economic theory suggests that the causal relationship is likely to curve downward (that is, to become more steeply negative as commuting time increases). Increasingly long commutes leave increasingly less time for household responsibilities and leisure. For this reason, a reduction in commuting time by a few minutes is likely to be valued more by households with a long commute than those with al-

ready short commutes. Rappaport (2016) shows that workers' marginal valuation of time saved commuting increases with the duration of their commute if they are not able to choose their weekly hours (for example, if they are required to work 40 hours per week). Under a baseline calibration, the marginal valuation of a minute saved commuting approximately doubles as one-way commuting time rises from 20 to 40 minutes and then approximately doubles again as one-way commuting time rises from 40 to 60 minutes.

[11]An ongoing monthly survey finds that 28 percent of full-time paid employees worked remotely one to four days per week in July 2022 and 14 percent worked five days per week remotely (Barrero, Bloom, and Davis 2021). These shares of hybrid and full-time remote work are likely to change over time as businesses and workers experiment with different setups. But even if the extent of remote working settles at shares well below the survey results, the number of households able to move farther from on-site workplaces is likely to be sufficient to drive a long-term boom in single-family home construction. For example, each increase of 0.1 percentage point in the share of existing households in 2022 moving into a new single-family home would require 128,000 newly constructed units. Correspondingly, hybrid working would only need to spur an additional 0.4 percent of households per year to move into a newly constructed home to exceed my baseline prediction of the single-family construction boom.

[12]The annual values are based on working 48 weeks per year. Schrank and others (2021) report annual travel time indices (TTIs) for several hundred metropolitan areas, which are calculated as the ratio of the actual duration of all vehicle miles driven in a metropolitan area during a calendar year to the duration for the same vehicle miles if they had been driven at free-flow speed. As a benchmark for time saved due to faster speed, I use the ratio of a metropolitan area's TTI in 2020 to its TTI in 2019. This ratio is likely to considerably understate the time savings in 2020 due to remote working's effect on speed for commutes to and from the CBD during rush hours. One reason is that the TTI for 2020 includes the 10 weeks prior to the mid-March lockdown, during which speeds were similar to those in 2019. A second reason is that the ratio of TTIs captures speed improvements averaged over all vehicle miles driven in a metropolitan area, which are likely to have been considerably smaller than the speed improvements experienced by workers commuting to the CBD during rush hour. CBDs are disproportionately occupied by large office buildings, which in turn are disproportionately occupied by workers in occupations that can be done from home (Dingel and Neiman 2020). Consistent with this, traffic volume near CBDs during 2020 fell by far more than total metropolitan traffic volume. For example, according to Kastle Systems, daily attendance at large office buildings remained extremely low through the end of 2020: average attendance in 10 large metropolitan areas initially fell 85 percent and remained 75 percent below its pre-pandemic level at the end of the year. The total volume of traffic in large metropolitan areas in 2020 fell by considerably less, dropping 40 percent initially and remaining 20 percent below its pre-pandemic level throughout the second half of the year (Schrank and others 2021). In addition, even if the percentage decrease in volume had been the same throughout

a metropolitan area, the percentage reduction in travel time would have been greater near CBDs to the extent that pre-pandemic traffic congestion there was worse (Small and Verhoef 2007). Of course, the eventual reduction in rush-hour driving time on routes to the CBD may be less than the reduction in travel time on all trips within a metropolitan area during 2020. For this reason, I assume that the long-term reduction in travel time on trips to the CBD in each metropolitan area will be one-half of the reduction in travel time on all trips in the same metropolitan area in 2020 compared with 2019. For example, the travel time on trips in the New York metropolitan area decreased by an average of 14 percent in 2020 relative to 2019. I assume that hybrid working will cause travel time on trips to the New York CBD to decrease by 7 percent from their duration in 2019. One source of uncertainty on time saved is that some workers may switch from taking public transit to driving, thereby offsetting some of the decrease in driving volume from making fewer commutes.

[13]In addition to saving time, hybrid working cuts commuting expenses considerably. The 95th-percentile distances for the 10 metropolitan areas shown in Chart 7 range from 24.6 miles for workers driving to the Miami CBD to 51.7 miles for workers driving to the New York CBD. Using the Internal Revenue Service's 2019 reimbursement rate for business driving, $0.58 per mile, the corresponding annual savings from making two fewer round trips per week for each of 48 weeks per year ranges from $2,740 to $5,760.

[14]Across the 51 CBSAs with population of at least 1 million in 2010, regressing the mean distance of flows with long commuting times—those with commuting times to the CBD between the 90th and 95th percentiles—on population gives an R-squared value of 0.12. The associated coefficient implies that a doubling of a CBSA's population is associated with an increase of 1.5 miles in the distance of long commutes. Regressing the 95th-percentile distance of commute to the CBD, regardless of their duration, on population gives an R-squared value of 0.22; the associated coefficient implies that a doubling of a CBSA's population is associated with an increase of 2.6 miles in the 95th-percentile commuting distance to the CBD.

[15]I calculate the increase in driving speed and associated reduction in travel time using the updated Bureau of Public Roads function and recommended parameters for freeways reported in Small and Verhoef (2007). An additional factor that may contribute to saving more time in large metropolitan areas is that commuting time there tends to be less reliable than in smaller metropolitan areas, in the sense that travel time can vary considerably day to day. The flexibility made possible by hybrid working may allow employees to strategically choose to work remotely on days when congestion is especially high (Kahn 2022).

[16]Also consistent with an increased willingness to live farther from work, Ramani and Bloom (2021) document that population inflows and home price growth during 2020 and 2021 were greatest in the low-density suburbs of the largest metropolitan areas, which they term a "donut effect."

[17]In other words, I assume the causal relationship is linear with a slope equal-to that of a line that is tangent to the co-movement curve in Chart 7 at a 95th percentile duration of 75 minutes. As described in the main text, the causal relationship of commuting duration on permitting is likely to be negative at all durations with a steeper negative slope than the co-movement relationship when the latter is negative. Allowing for the likely concavity of the causal relationship implies that the difference in the increase in permits in metropolitan areas with long commutes compared with the increase in metropolitan areas with short commutes will be greater than the benchmark prediction, reinforcing the conclusion that hybrid working will disproportionately boost home construction in large metropolitan areas.

[18]I calculate the 1.4 million long-term average by summing the benchmark 427,000 per-year boost in single-family permits in CBSAs with population above 1 million in 2020, a corresponding 66,000 per-year boost in single-family permits in smaller CBSAs, and the 957,000 average annual rate of national single-family permitting during December 2019 through February 2020.

[19]The need for home office space is also likely to increase apartment construction. Although many households currently living in apartments may seek to move into single-family homes, many others are likely to seek to move into larger apartments. In addition, many individuals living with roommates or family members are likely to choose to move out on their own, and renting an apartment is typically the most affordable option.

[20]Commuting and home prices are two key congestion mechanisms equating the utility of living in different metropolitan areas. In a quantitative framework, lowering the frequency of commutes increases the population of metropolitan areas with high productivity and amenities relative to those with low productivity and amenities (Rappaport 2016).

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