# Round 10 Cooperative Forecast Technical Assistance

**COG Planning Directors Technical Advisory Committee**

Walker Freer, ICF
Dan Hardy, Renaissance Planning Group

**June 17, 2022**

# Agenda

- **Introduction to the ICF team**

  - Walker Freer, ICF

  - Dan Hardy, RPG

- **Study Overview**

  - Objectives

  - Economic factors + trends

- **Regional Implications**

# Objectives

- Provide informational background to underpin development of COG's Round 10 Cooperative Forecast

- Better understand the impact of the COVID-19 pandemic on utilization, density, and development of commercial office space in the region

- Summarize variables creating economic forecast uncertainties and develop long-term regional economic model forecasts

- Assess emerging trends in regional housing location and choice

- Increase understanding of future regional household size trends
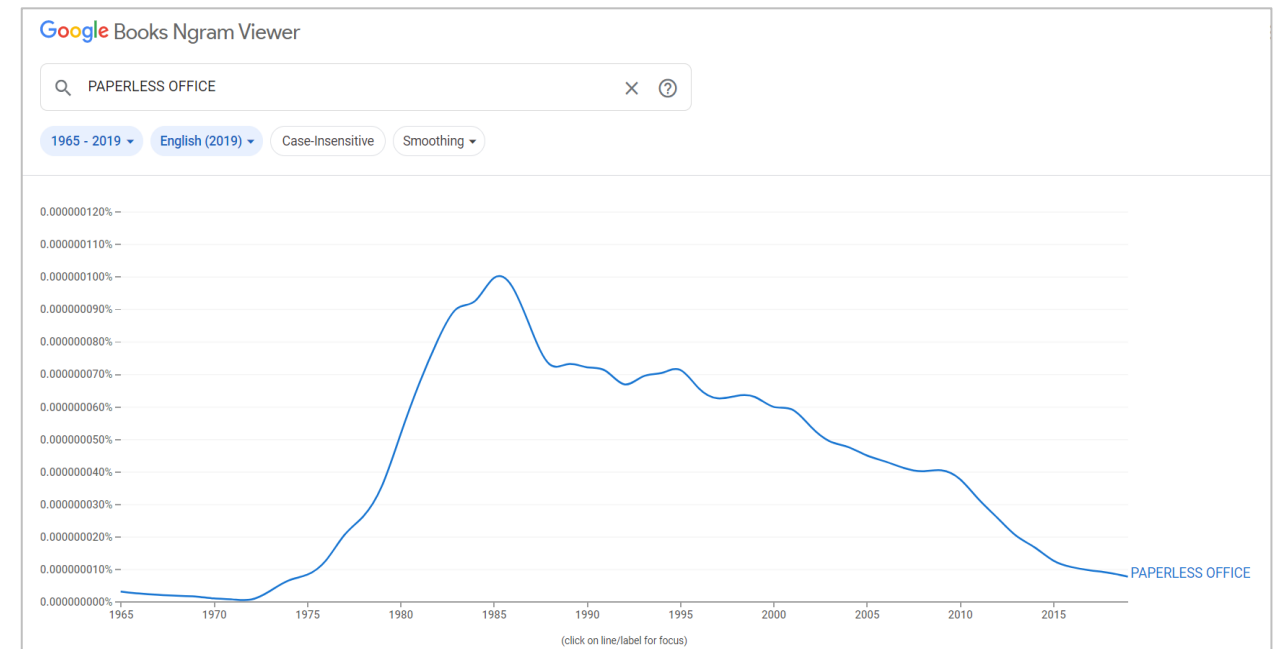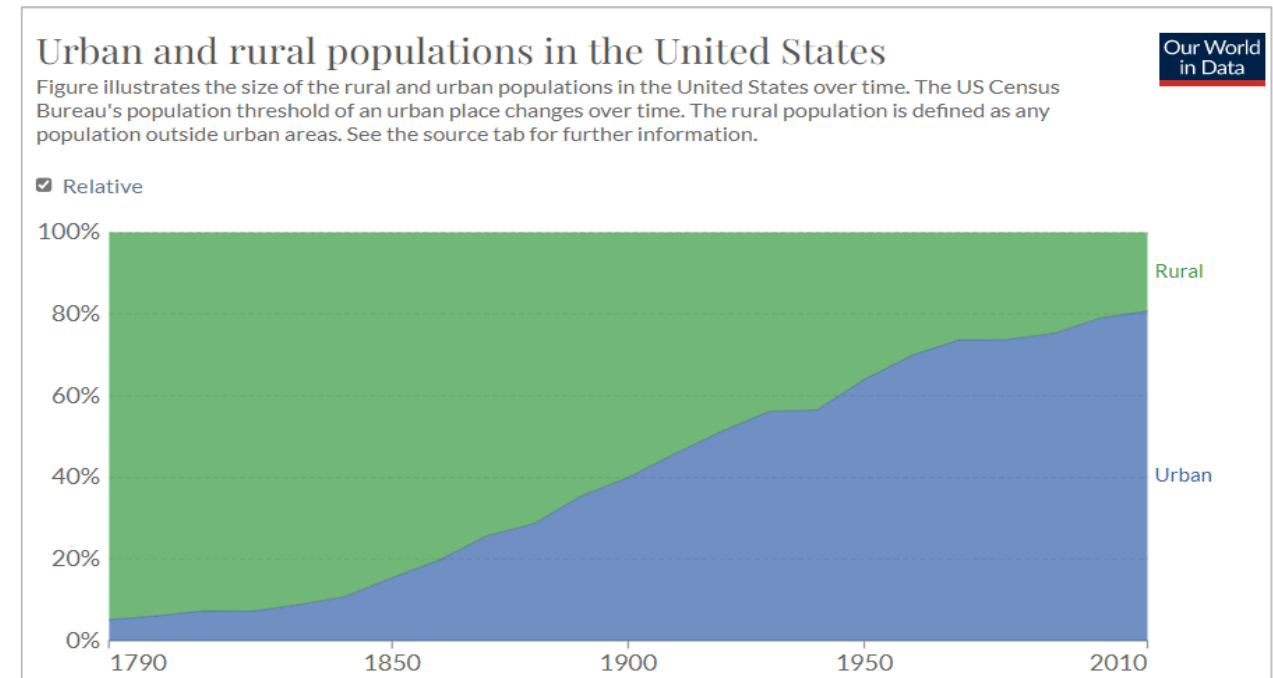
# Considering Multiple Influences

- Typical scenario planning approaches synch economic growth and social/technology influences
  - Growth = exogenous variables like birth rates
  - Social/Tech = exogenous variables such as those to the right

- A key finding is that COVID-19 appears to have limited independent effect over the long term, but is linked to accelerating trends in virtual connectivity

| Element | Acceleration of Element Would Affect MWCOG Growth: | |
| --- | --- | --- |
| | Pace | Pattern |
| Immigration (job producers) | More jobs/population, attracted from emigrant locale | No notable effect |
| Regional competitiveness: "one-company town" versus new markets (i.e., creative media) | More jobs/population associated with subject industry | Dependent on subject industry (i.e., Amazon HQ versus ecotourism) |
| Connected/Autonomous Vehicles (CAV) | None | Slight increase in sprawl |
| Virtual communications | None | Slight increase in sprawl |
| Mobility as a Service (MaaS) | None | Slight increase in compactness |
| COVID | Fewer jobs/population | Slight increase in sprawl |
| Inflation | Risk of boom/bust | Dependent on segments affected (i.e., real estate versus mobility costs) |
| Transit system unreliability | Fewer jobs/population | Slight increase in sprawl |

# Way Back-casting

There are some lessons learned from the 1918 Flu Pandemic:

- 675K deaths in US - about twice the rate of COVID (so far)

- Other societal issues:
  - The Great War
  - Birth / adolescence of zoning
  - New "travel" modes (streetcars, bikes, autos, telephones)

- Yet, urbanity continued – the key societal changes were related to "public health"

- With most upheavals, the SWOT at year zero changes by year 20+



Urban and rural populations in the United States

Figure illustrates the size of the rural and urban populations in the United States over time. The US Census Bureau's population threshold of an urban place changes over time. The rural population is defined as any population outside urban areas. See the source tab for further information.

Our World in Data



Google Books Ngram Viewer

PAPERLESS OFFICE

# Tasks

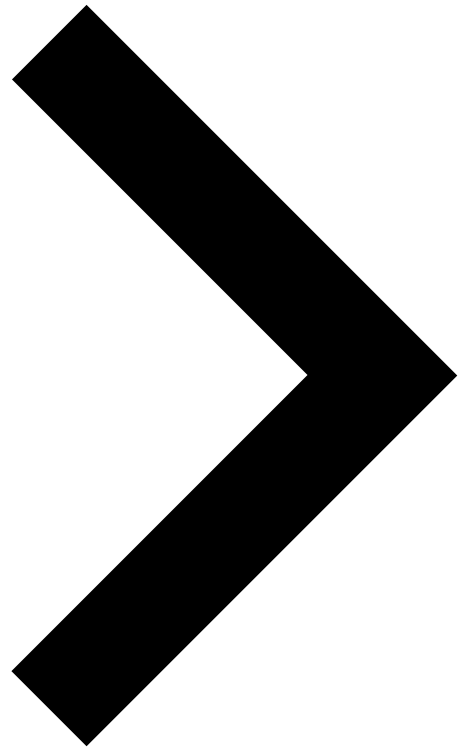**2** — Estimated changes to commercial space use

**3A** — Developed a "range" of regional economic model forecasts

**3B** — Assessed potential changes to future housing in the region

**4** — Projecting changes to future average household size

# Commercial Space Use

# Research Findings

- Office space per worker (by square footage) will continue to decline in COG's Central Jurisdictions, and will likely accelerate due to remote work trends, which will decrease demand, need, and space requirements for offices

- If remote work trends continue, economic activity could shift towards mixed-use and university-based neighborhoods, and away from central business districts, which are imperiled due to high office vacancy rates, low office activity rates, and excess capacity of Class B and Class C office space

- The COVID-19 pandemic accelerated pre-existing retail and e-commerce shifts, such as divestment in brick-and-mortar locations, increases in home delivery, and smaller retail footprints

- Investments in resilient industries such as biotechnology and life sciences centers in suburban Maryland and data centers in Northern Virginia were reinforced throughout the pandemic.

# Interview Findings

- Hybrid/remote work policies are being adopted regionwide, representing the "new normal"

- Federal agencies are focusing on employee "seats" instead of "population", to maximize office space flexibility

- Unclear when and to what degree commuters will return to Metro

- Diverse, mixed-use communities are more attractive for economic activity and office workers, while single-use neighborhoods will struggle

- Expects fewer conferences and corporate travel, resulting in a slower recovery for the hospitality industries and lower hotel occupancy rates, short-term

# Office Utilization Trends

- Broad consensus that remote/hybrid working arrangements will be a permanent change that will prompt long-term shifts in commuting and office space utilization

- Significant remote-work potential exists among the region's highly-educated work force and primary industries (scientific and technical services, FIRE)

- Knowledge industries are considering downsizing or reevaluating office space needs

- Coupled with the rise of remote work, office hoteling, and shared workspaces, square footage per worker is expected to further decrease after the COVID-19 pandemic

# Return to Office + Impact on Central Business Districts

- As of April 2022, average daily Metrorail boardings were 36% of pre-pandemic levels

- As of March 2022, regional traffic levels returned to 91% of 2019 levels

- Weekly office activity in the Washington region has only returned to 37% of pre-pandemic levels

- Office vacancy rates in downtown D.C. increased by 56% (from 11.1% to 17.5%) from 2019 to 2022; in February 2022, the DowntownDC BID reported 9.7M square feet of vacant office space

- Significant potential for office-to-residential conversions (2.3M SF being targeted as of 2021)

Weekday office activity %
(compared to 2019)

| | May 25 | June 1 | % Change |
|---|---|---|---|
| Chicago metro | 40.0% | 37.2% | 2.7% ▼ |
| Austin metro | 58.5% | 56.1% | 2.4% ▼ |
| Houston metro | 56.0% | 53.8% | 2.1% ▼ |
| San Francisco metro | 33.6% | 31.6% | 2.0% ▼ |
| Washington D.C. metro | 39.1% | 37.3% | 1.8% ▼ |
| San Jose metro | 33.9% | 32.1% | 1.8% ▼ |
| Average of 10 | 42.9% | 41.2% | 1.7% ▼ |
| Philadelphia metro | 38.1% | 36.7% | 1.4% ▼ |
| New York metro | 38.0% | 36.6% | 1.4% ▼ |
| Dallas metro | 51.3% | 50.2% | 1.1% ▼ |
| Los Angeles metro | 41.0% | 40.5% | 0.5% ▼ |

Calculated based on app, keycard, and fob usage
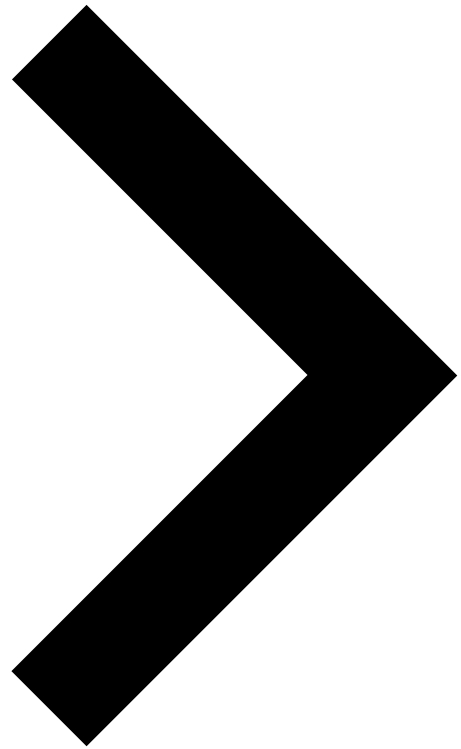
# Economic Model Forecasts

# Assessment Approach

- Literature review

- Evolution of third-party forecasts
  - S&P Global
  - MD/VA state population forecasts

- Analyses on Value of Time

- Conclusions



McKinsey Global Institute

The postpandemic economy

The future of work after COVID-19

February 2021

| Task 3A. Economic Model Forecasts |
| --- |
| Task 3B.  Regional Housing Changes |

# Conclusions/Findings

- Literature:
  - Robust on "looking backward" at the first two years of COVID
  - Rich on "looking forward" on philosophy and stated preferences (notably health and telework)
  - Sparse on quantitative forecasts

- Primary effect of COVID is "delay of growth" by two to three years of recovery

- Technology may cause a small redistribution of population from core to exurb (up to -7% in core; +1% for exurbs)

McKinsey Global Institute

The postpandemic economy

The future of work after COVID-19

February 2021
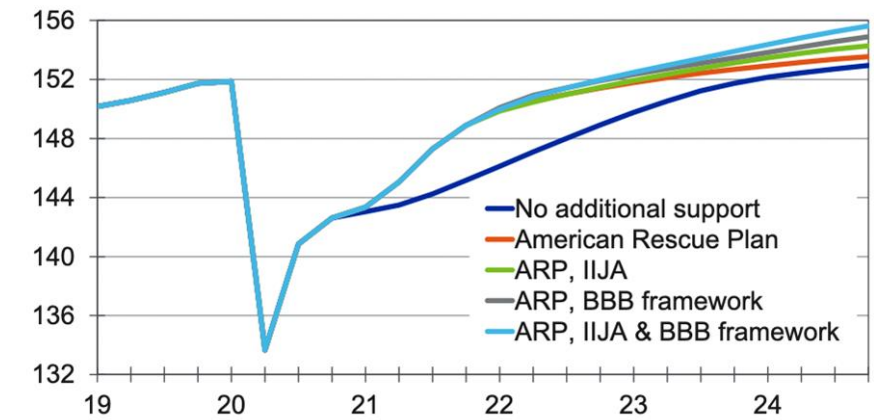
Task 3A. Economic Model Forecasts

Task 3B. Regional Housing Changes

# Literature Review: National Perspective

- In the near term (3 – 5 years) growth will rebound; we'll lose a few years of progress almost regardless of federal spending
- In the longer term, however, sustained economic growth will be affected by levels of deficit spending in the near term (Per CBO; Scenario 1 no deficit spending, Scenario 2 has deficit spending)
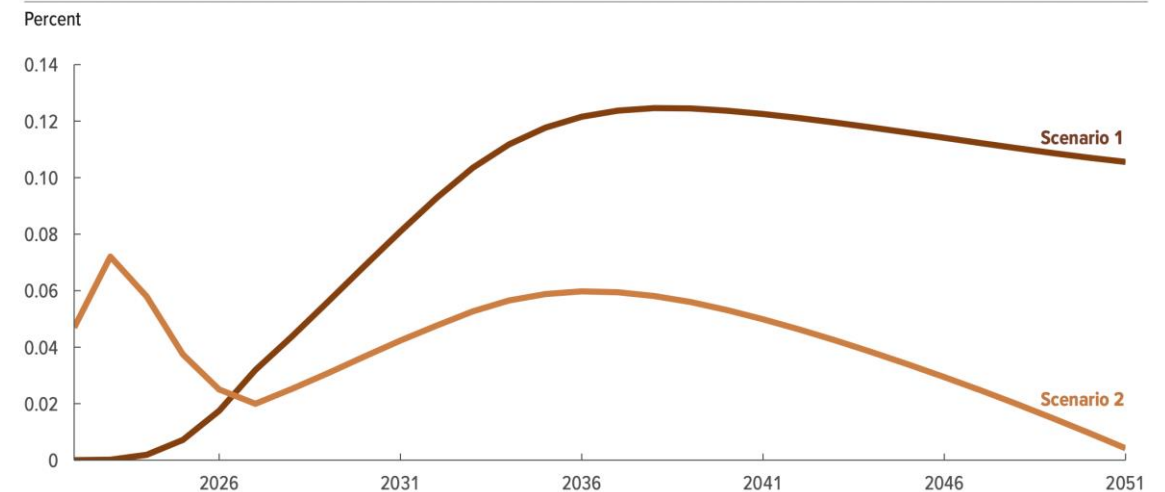
## Chart 2: Employment Gets a Boost...

Nonfarm employment under different policy scenarios, mil

— No additional support
— American Rescue Plan
— ARP, IIJA
— ARP, BBB framework
— ARP, IIJA & BBB framework

Sources: BLS, Moody's Analytics

Figure 1.

**Increases in the Level of Real GDP**
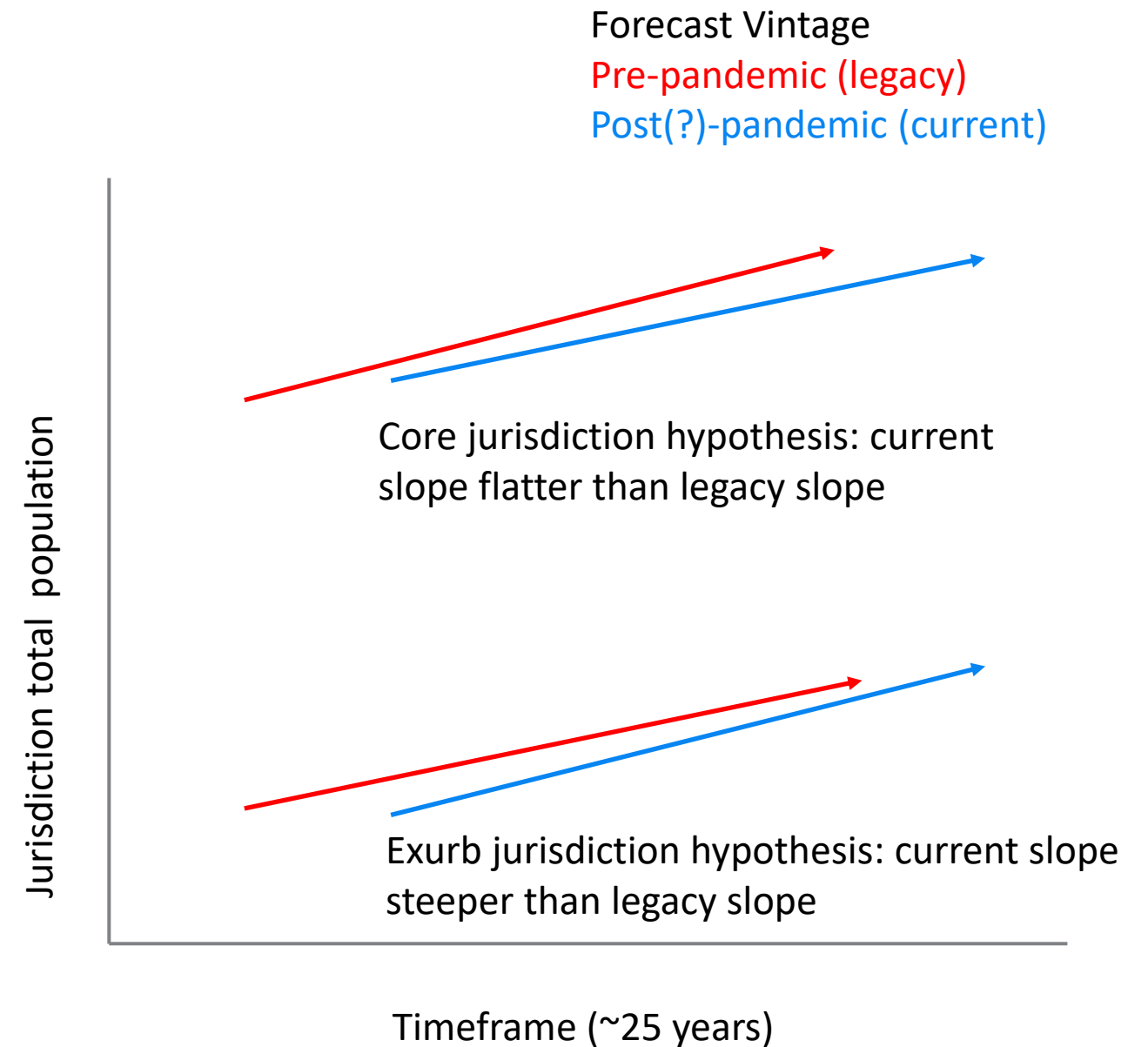
Percent

Scenario 1

Scenario 2

Source: CBO

Task 3A. Literature

Task 3B. Literature

# Third Party Forecast Evolution

- If the pandemic is believed to meaningfully affect the pace and pattern of growth, it should show up in forecasts from groups who routinely prepare them.

- Comparison of pre-pandemic and post(?)-pandemic sources:
  - S&P Global (aka IHS Markit)
  - Maryland Department of Planning (population only)
  - Virginia Weldon-Cooper Center (population only)

- None of the sources support the hypothesis that the pandemic has accelerated expectations for sprawl

Forecast Vintage
Pre-pandemic (legacy)
Post(?)-pandemic (current)

Jurisdiction total population

Core jurisdiction hypothesis: current slope flatter than legacy slope

Exurb jurisdiction hypothesis: current slope steeper than legacy slope

Timeframe (~25 years)

Task 3A. Independent Analyses

Task 3B.  Third-Party Forecasts

# Third Party Forecast Evolution

For S&P Global population and employment forecasts for the MWCOG region:

- Employment forecast growth rates are lower for all types of jurisdictions

- The core and inner suburbs are more attractive, relative to the rest of the region for both population and jobs

Average Annual Growth Rate - S&P Global

|  | Population | | | Employment | | |
|---|---|---|---|---|---|---|
|  | 2015 | 2022 | Change | 2015 | 2022 | Change |
| Core | 0.26% | 0.39% | 0.13% | 0.58% | 0.56% | -0.02% |
| Inner | 0.26% | 0.34% | 0.08% | 0.65% | 0.57% | -0.08% |
| Outer | 2.27% | 1.47% | -0.80% | 2.58% | 1.46% | -1.12% |
| Exurb | 0.94% | 0.63% | -0.31% | 1.20% | 0.70% | -0.50% |

# Third Party Forecast Evolution

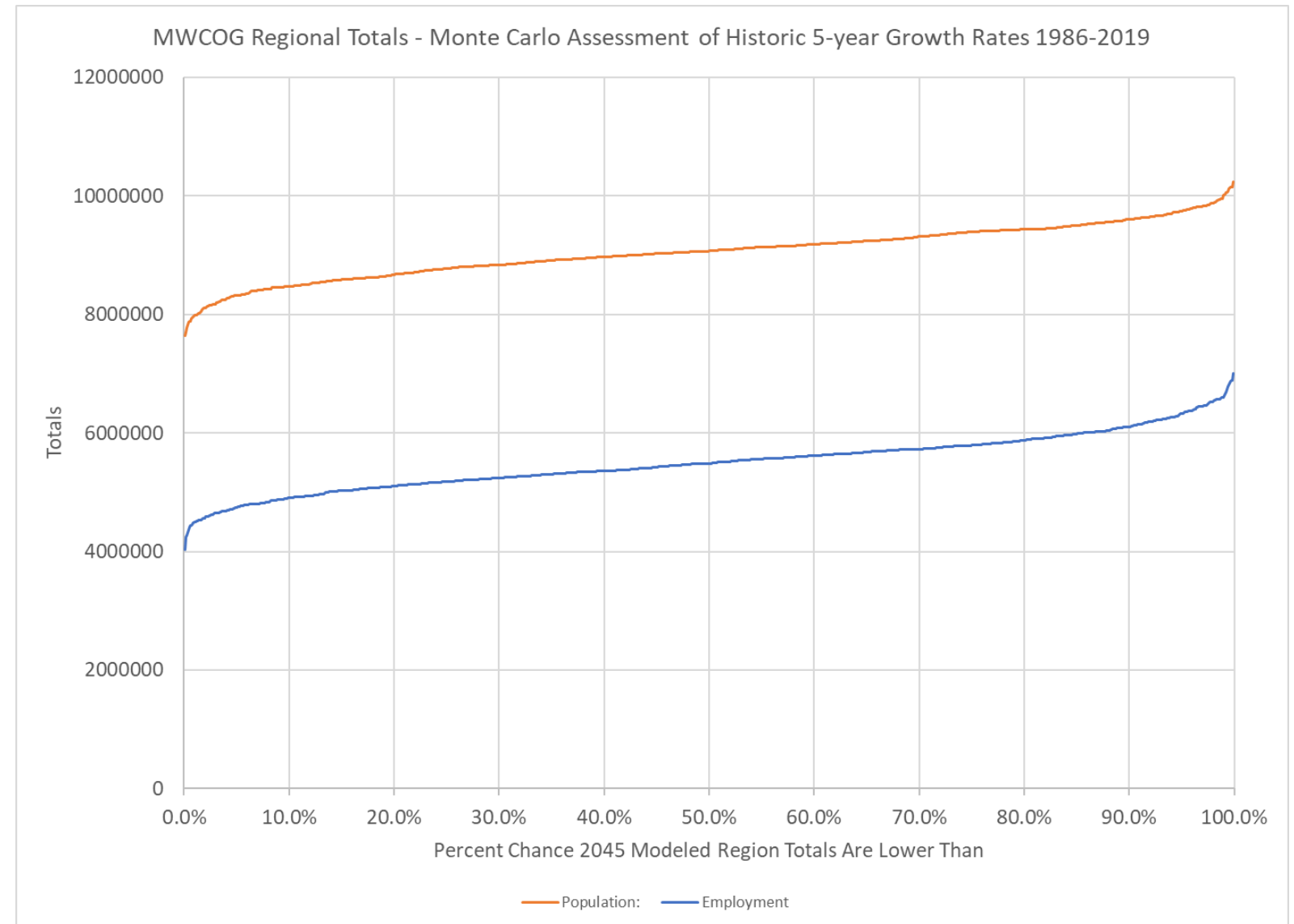For Maryland and Virginia population forecasts:

- Both states have lower AAGRs in current forecasts than in legacy forecasts

- Neither state suggests large metro counties (center or fringe) will grow faster than other, more rural locations

| County Class (CDC) | Weldon Cooper AAGR | | | MDP AAGR | | |
|---|---|---|---|---|---|---|
| | Legacy (2017) | Current (2021) | Change | Legacy (2018) | Current (2020) | Change |
| Large central metro | 0.51% | 0.42% | -0.09% | 0.15% | 0.05% | -0.10% |
| Large fringe metro | 1.17% | 1.04% | -0.13% | 0.55% | 0.52% | -0.03% |
| Medium metro | 0.43% | 0.30% | -0.14% | 0.92% | 0.78% | -0.15% |
| Micropolitan Counties | -0.45% | -0.66% | -0.20% | 0.62% | 0.47% | -0.15% |
| Noncore Counties | 0.08% | -0.08% | -0.16% | 0.74% | 0.64% | -0.10% |
| Small metro Counties | 0.86% | 0.75% | -0.11% | 0.98% | 0.80% | -0.18% |
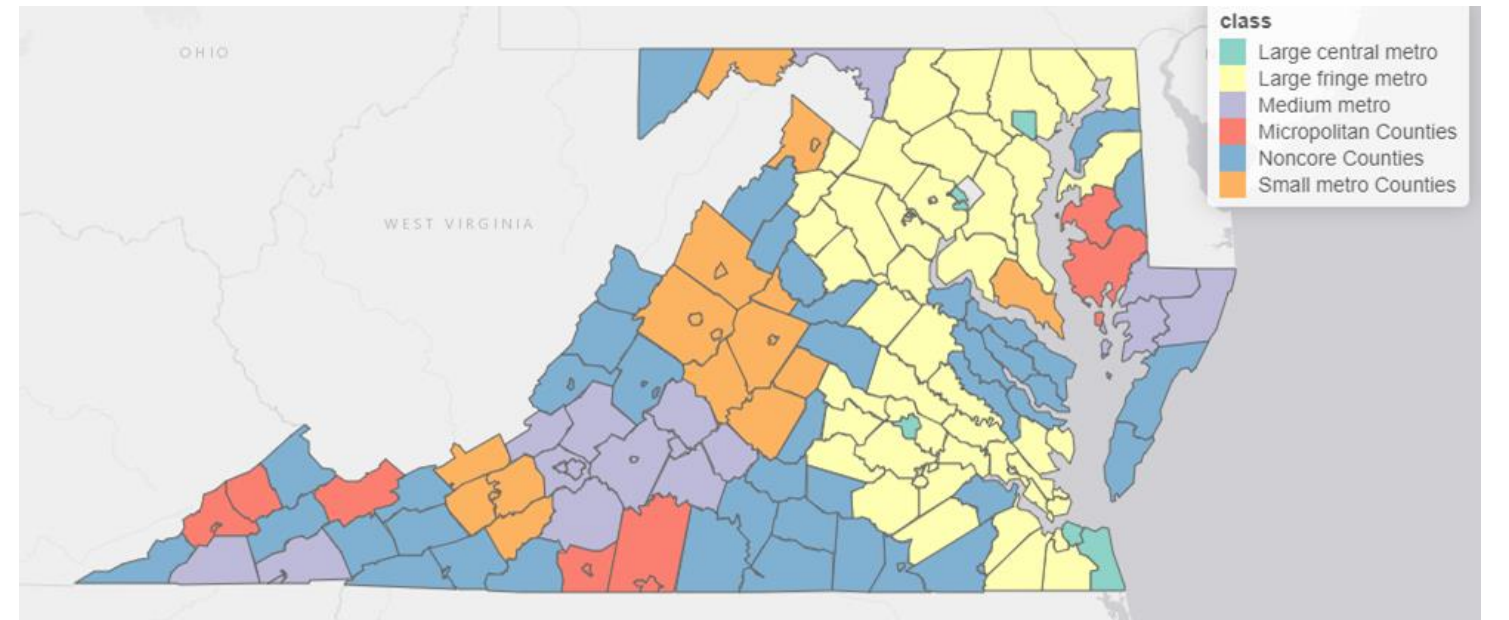
# Considering Forecast Variability

- "Monte Carlo" simulation of past growth rate variability provides insight on uncertainty

- The Round 9.1 forecasts reflect the median (i.e., "p50", or 50th percentile) forecast for 9.1M population and 5.1M jobs.

- The standard deviation (the difference between a "p15" and a "p85" forecast) is roughly 0.9M people or 0.9M jobs (about 9% above or below median)



MWCOG Regional Totals - Monte Carlo Assessment of Historic 5-year Growth Rates 1986-2019

Totals

Percent Chance 2045 Modeled Region Totals Are Lower Than

Population:    Employment

Task 3A. Independent analyses

Task 3B.  Independent analyses

# Value of Time Analyses – ICF and Delventhal/Parkhomenko Studies

Comparing independent ICF Value of Time approach with Delventhal/Parkhomenko study for same jurisdictions:
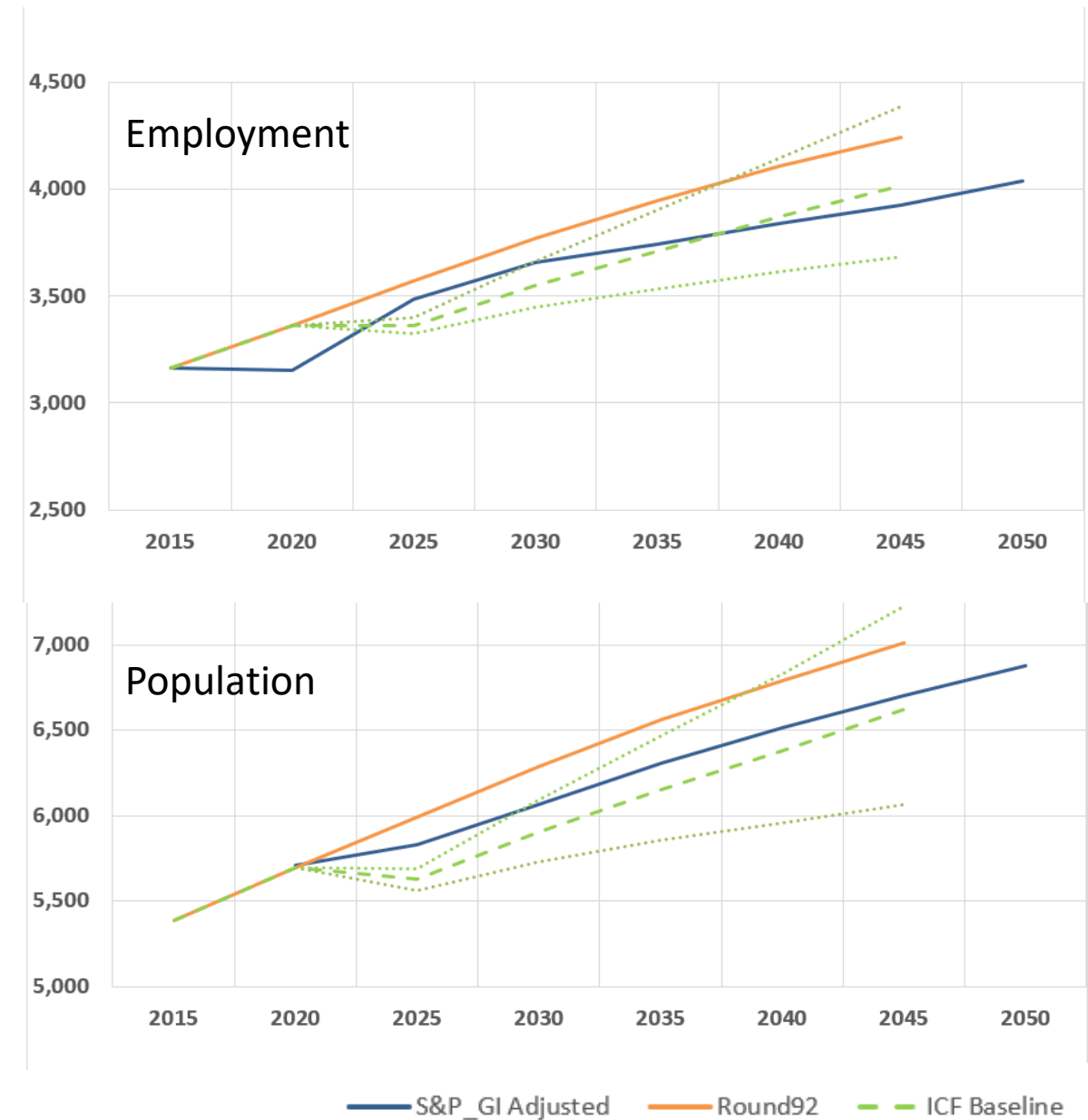
- directionality and general magnitude correlate well

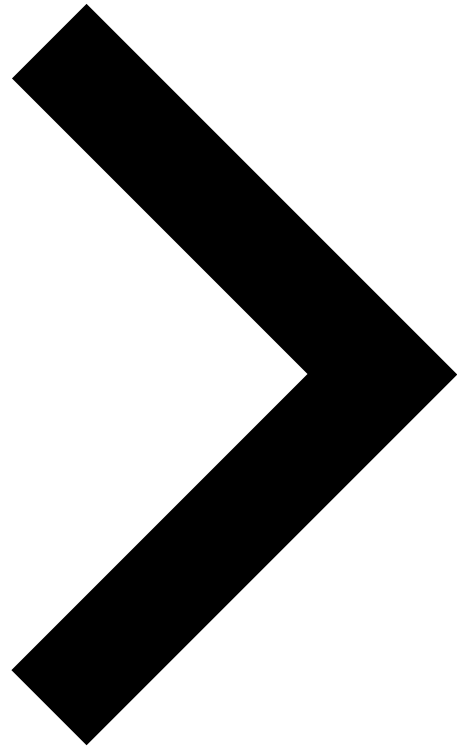- Core a bit of an outlier (partly due to regional v. national study perspectives)

| Jurisdiction | Population | Shift in population | |
| --- | --- | --- | --- |
| | | ICF Analysis | Delventhal / Parkhomenko study |
| Core | 1,133,000 | -6.9% | -0.4% |
| Inner | 3,168,000 | 0.0% | -0.6% |
| Outer (Member) | 1,217,000 | 1.2% | 0.8% |
| Outer (Model) | 1,722,000 | 1.2% | 2.5% |
| More Distant | 3,240,000 | 0.4% | 0.9% |
| TOTAL | 10,480,000 | | |

# Regional Implications

**Considering forecast variability:**

- **From Monte Carlo approach, suggested high/low totals about 9% off baseline in 2045, (indicated by thinner dashed lines)**

- **Uncertainty is inherent in each exogenous element, as well as the policy responses**

- **Focus is on sensitivity rather than precision (updated S&P_GI forecasts will be acquired for the Round 10 baseline)**



Employment

Population

S&P_GI Adjusted — Round92 — ICF Baseline

Task 3A. Independent analyses

Task 3B. Independent analyses

# Average Household Size

# Findings

- Lagging housing construction, the COVID-19 pandemic, and recent inflation will result in a short-term stabilization of the region's average household size (2.65)

- Long-term, average household size in the region will decrease due to declining birth rates, focus on multifamily development, and an aging population

- Average household size is expected to reduce throughout the region, but will slightly increase in the Outer Suburban Jurisdictions where land availability and development potential for single-family homes still exists

# Regional Factors Impacting Household Size

- **Declining birth rates:** Between 2007 and 2020, the birth rate in the U.S. declined by 20%.

- **Aging population:** The share of older adults (59+) are trending upwards in the region's suburban and exurban jurisdictions, while the growth rate in urban jurisdictions remains flat

- **Insufficient housing supply:** Regionwide, residential construction decreased 40% from 1986 to 2020; in 2020, construction of multifamily units have outpaced SFH since 2012 (+2,500 in 2020)

- **International migration:** Region buoyed by international migration, which helps offset domestic out-migration, but international in-migration rates decreased by 47% due to the COVID-19 pandemic

- **Regional household size trends:** 16% decline from 1970-2000 (2.60), uptick in 2010 and 2020 Census, which is expected to hold short-term.

# Household Size Implications

- Office to residential conversions are attractive, which could boost the region's household formation rate and reenergize CBDs

- Temporary increase in average household size in the inner and outer suburban jurisdictions is being driven by growth of Hispanic/Latino communities (multigenerational households), along with high housing costs, decreased housing construction, and uncertainty related to the pandemic and inflation

- Increased multifamily construction will result in greater household formation regionwide, but smaller average household sizes long-term

# Questions/Next Steps

- All findings and recommendations will be packaged into a technical memo

- Send additional questions or comments regarding this presentation to Greg Goodwin ([ggoodwin@mwcog.org](mailto:ggoodwin@mwcog.org)) by Friday, June 24

# Get in touch with us:

## Walker Freer, ICF

Senior Transportation Planner
(571) 842-4906
Walker.Freer@icf.com

## Dan Hardy, RPG

Principal
(703) 314-4227
dhardy@citiesthatwork.com

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linkedin.com/company/icf-international/

twitter.com/icf

https://www.facebook.com/ThisIsICF/

icf.com

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**About ICF**

ICF (NASDAQ:ICFI) is a global consulting and digital services company with over 7,000 full- and part-time employees, but we are not your typical consultants. At ICF, business analysts and policy specialists work together with digital strategists, data scientists and creatives. We combine unmatched industry expertise with cutting-edge engagement capabilities to help organizations solve their most complex challenges. Since 1969, public and private sector clients have worked with ICF to navigate change and shape the future.

# Economic Recovery Indicators

**37.3%**

Regionwide office activity rate (6/1/2022)

~99% in February 2020

**228,200**

Average daily Metrorail boardings (April 2022)

638,790 average daily Metrorail boardings in February 2020

**17.5%**

Office vacancy rate in downtown D.C. (March 2022)

11.1% in 2019

**91%**

Regional traffic levels compared to 2019 levels (March 2022)

# Process

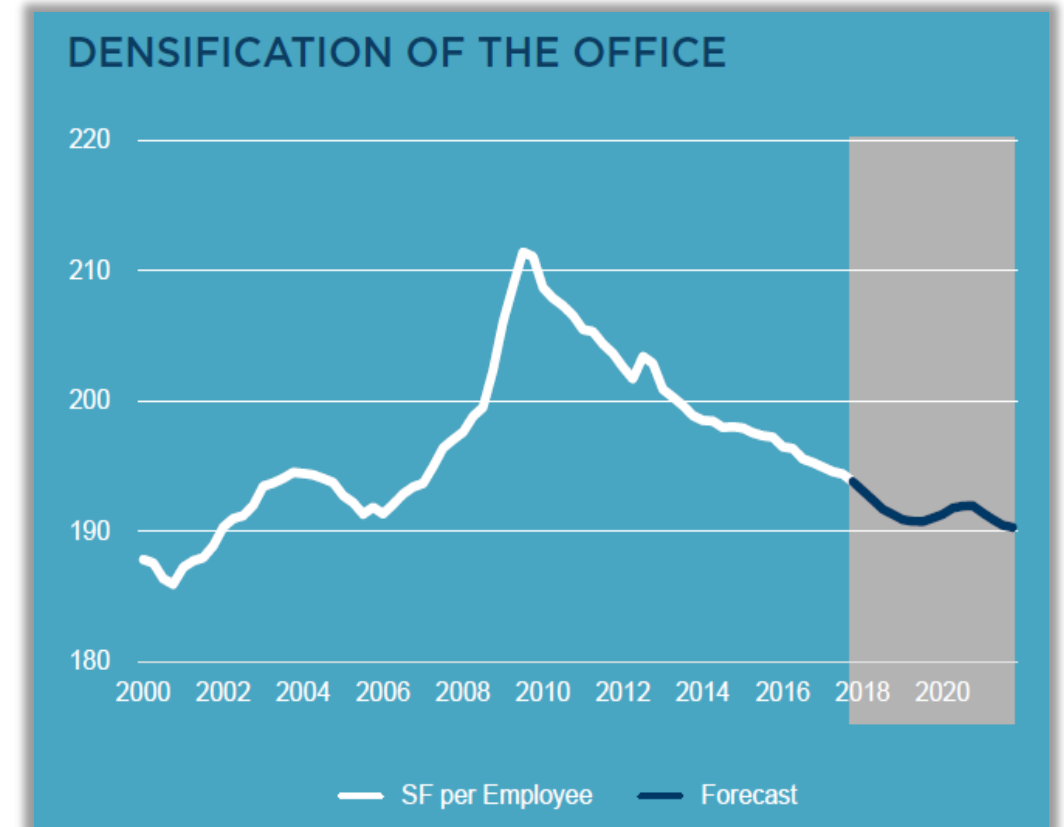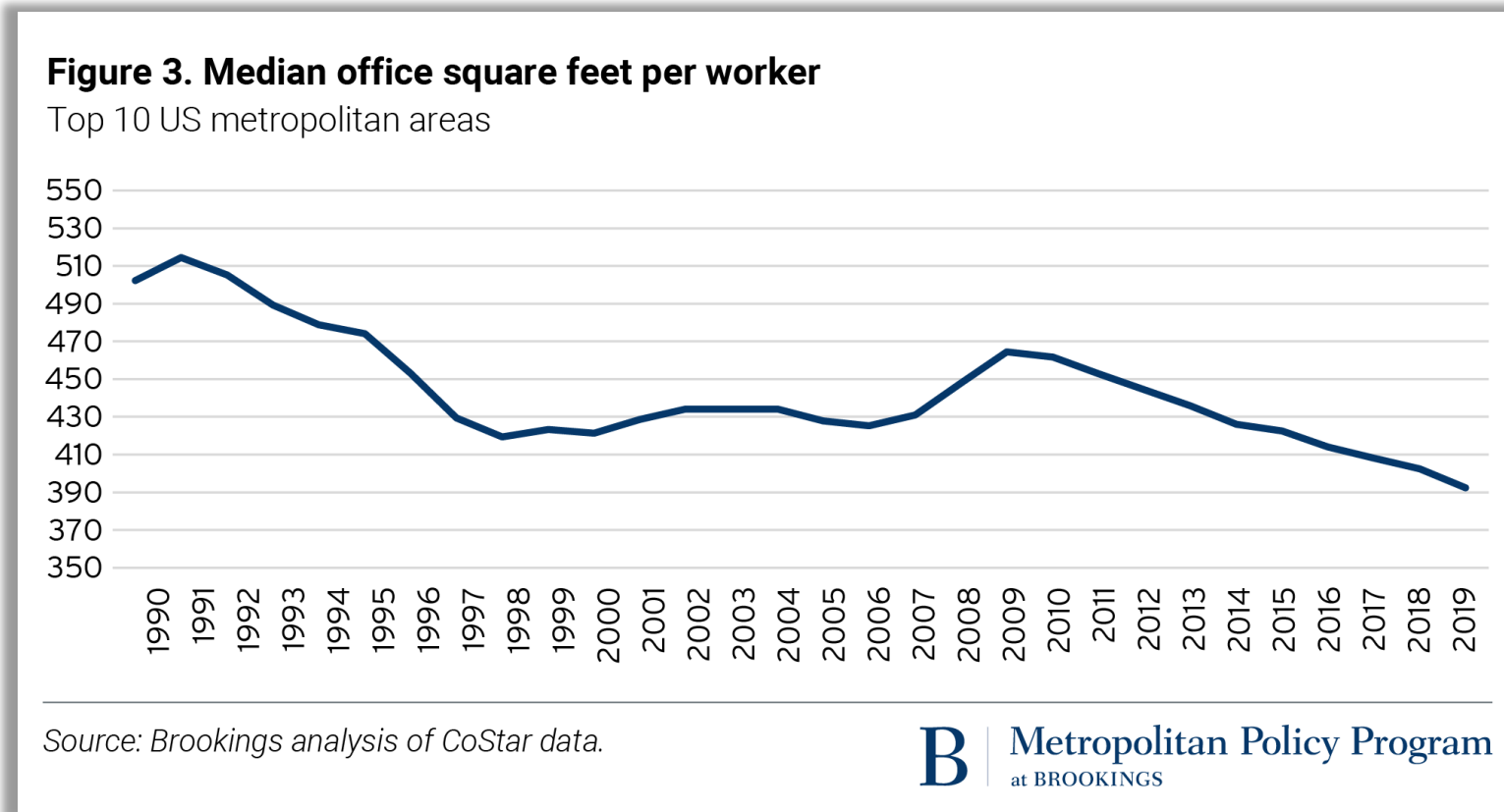| | |
|---|---|
| **Literature review + background research** | March-April 2022 |
| **Interviewed regional experts (2+4)** | April-May 2022 |
| **Independent analysis** | April-May 2022 |
| **Consolidated findings + recommendations** | May 2022 |

# Interviews with Regional Experts

- Dr. Terry Clower, George Mason University Center for Regional Analysis

- Mina Wright and Eliza Voigt, U.S. General Services Administration

- Joe McAndrew, Greater Washington Partnership

- Deborah Kerson Bilek, Urban Land Institute - Washington

# Office Space Trends

- Knowledge industries are considering downsizing or reevaluating office space needs
- Coupled with the rise of remote work, office hoteling, and shared workspaces, square footage per worker is expected to further decrease after the COVID-19 pandemic



**Figure 3. Median office square feet per worker**
Top 10 US metropolitan areas

*Source: Brookings analysis of CoStar data.*

B | Metropolitan Policy Program
at BROOKINGS



DENSIFICATION OF THE OFFICE

SF per Employee — Forecast

*Cushman & Wakefield*

Task 2. Commercial Space Use

# Return to Office
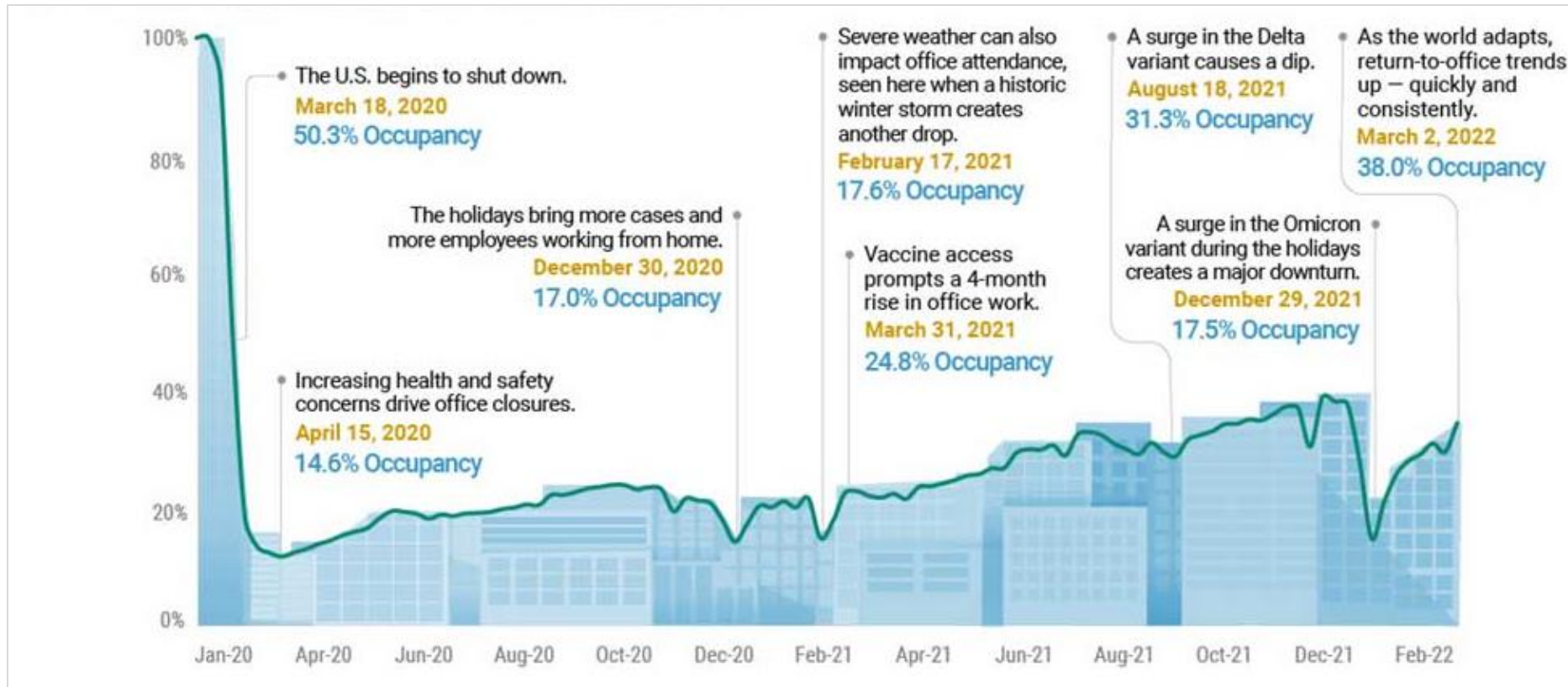


Weekday office activity/building access relative to 2019

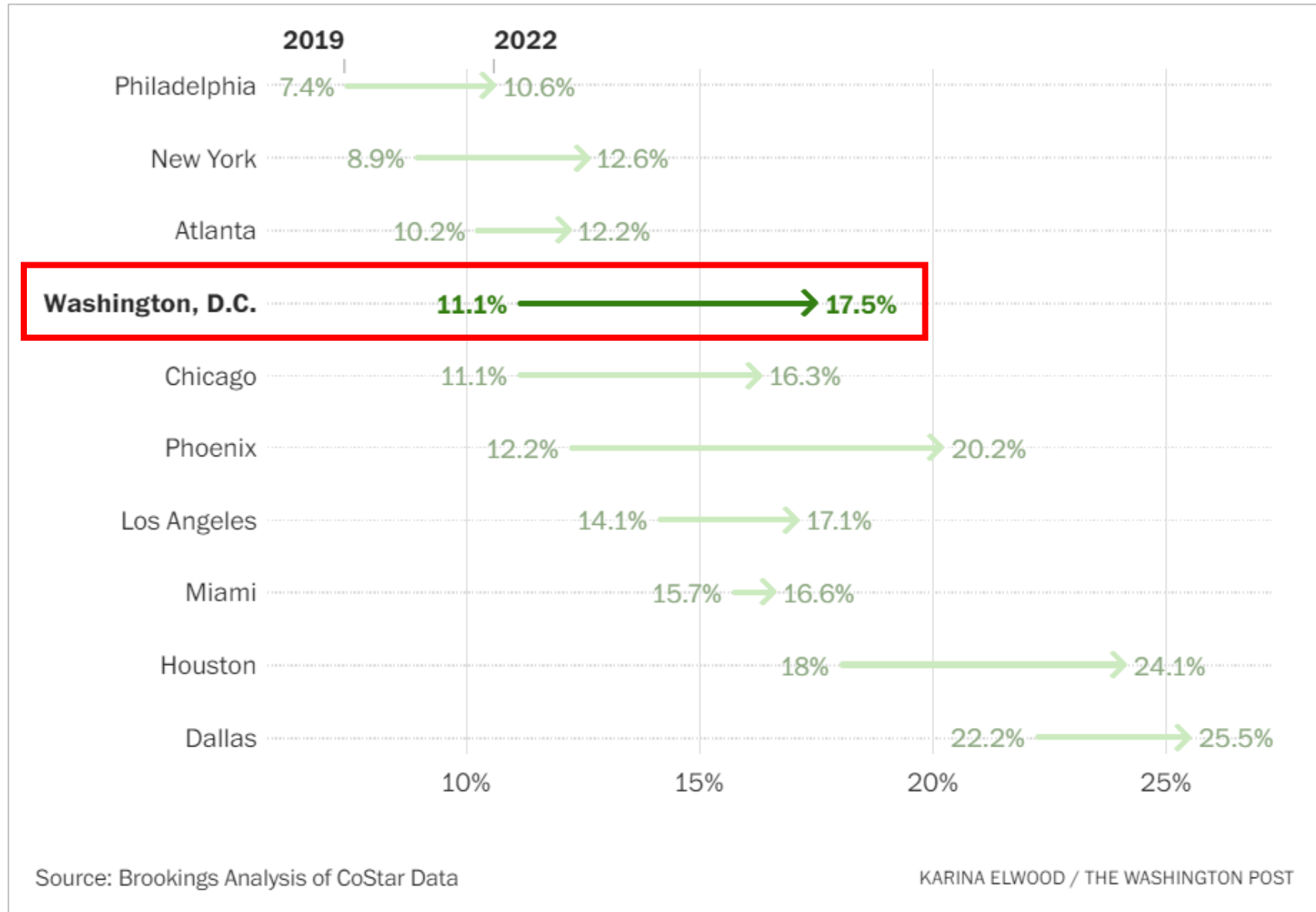| | 5/25/22 | 6/1/22 | % Change |
|---|---|---|---|
| Chicago metro | 40.0% | 37.2% | 2.7% ▼ |
| Austin metro | 58.5% | 56.1% | 2.4% ▼ |
| Houston metro | 56.0% | 53.8% | 2.1% ▼ |
| San Francisco metro | 33.6% | 31.6% | 2.0% ▼ |
| Washington D.C. metro | 39.1% | 37.3% | 1.8% ▼ |
| San Jose metro | 33.9% | 32.1% | 1.8% ▼ |
| **Average of 10** | **42.9%** | **41.2%** | **1.7% ▼** |
| Philadelphia metro | 38.1% | 36.7% | 1.4% ▼ |
| New York metro | 38.0% | 36.6% | 1.4% ▼ |
| Dallas metro | 51.3% | 50.2% | 1.1% ▼ |
| Los Angeles metro | 41.0% | 40.5% | 0.5% ▼ |

Office activity calculated based on app, keycard, and fob usage

# Impact on Central Business District



| | 2019 | 2022 |
|---|---|---|
| Philadelphia | 7.4% | 10.6% |
| New York | 8.9% | 12.6% |
| Atlanta | 10.2% | 12.2% |
| **Washington, D.C.** | **11.1%** | **17.5%** |
| Chicago | 11.1% | 16.3% |
| Phoenix | 12.2% | 20.2% |
| Los Angeles | 14.1% | 17.1% |
| Miami | 15.7% | 16.6% |
| Houston | 18% | 24.1% |
| Dallas | 22.2% | 25.5% |

Source: Brookings Analysis of CoStar Data

KARINA ELWOOD / THE WASHINGTON POST

CBD Office vacancy rates (2019-2022)

# Regional Office Space Density



Legend:
- Central Jurisdictions
- Inner Suburban Jurisdictions
- Outer Suburban Jurisdictions

Bar chart — Square feet/Employee for Office Use:
- Alexandria
- Arlington
- Falls Church
- Fairfax
- Montgomery (Urban)
- Montgomery (Suburban)
- Gaithersburg
- Prince George's
- Prince William
- Loudoun (Urban)
- Loudoun (Suburban)
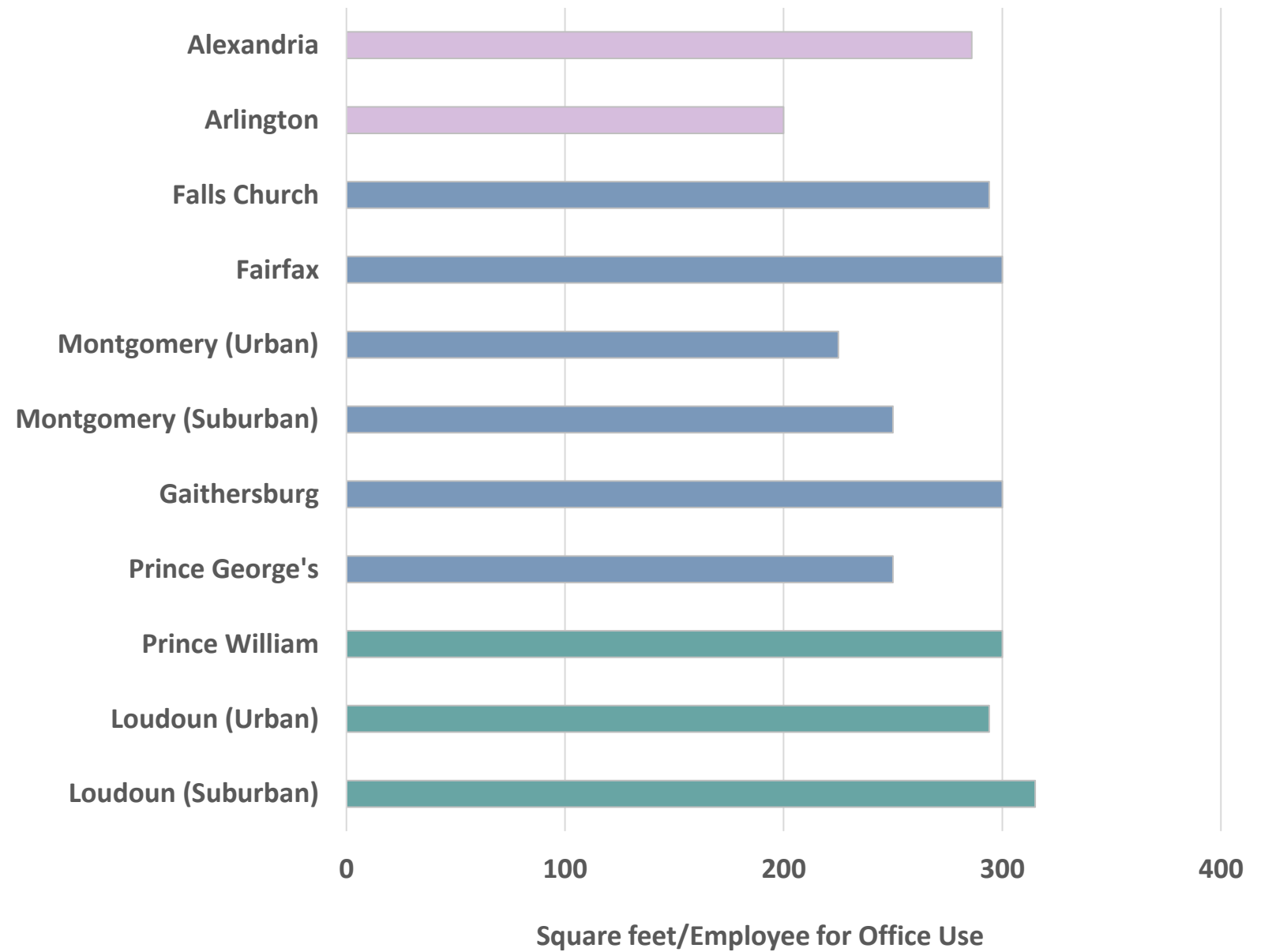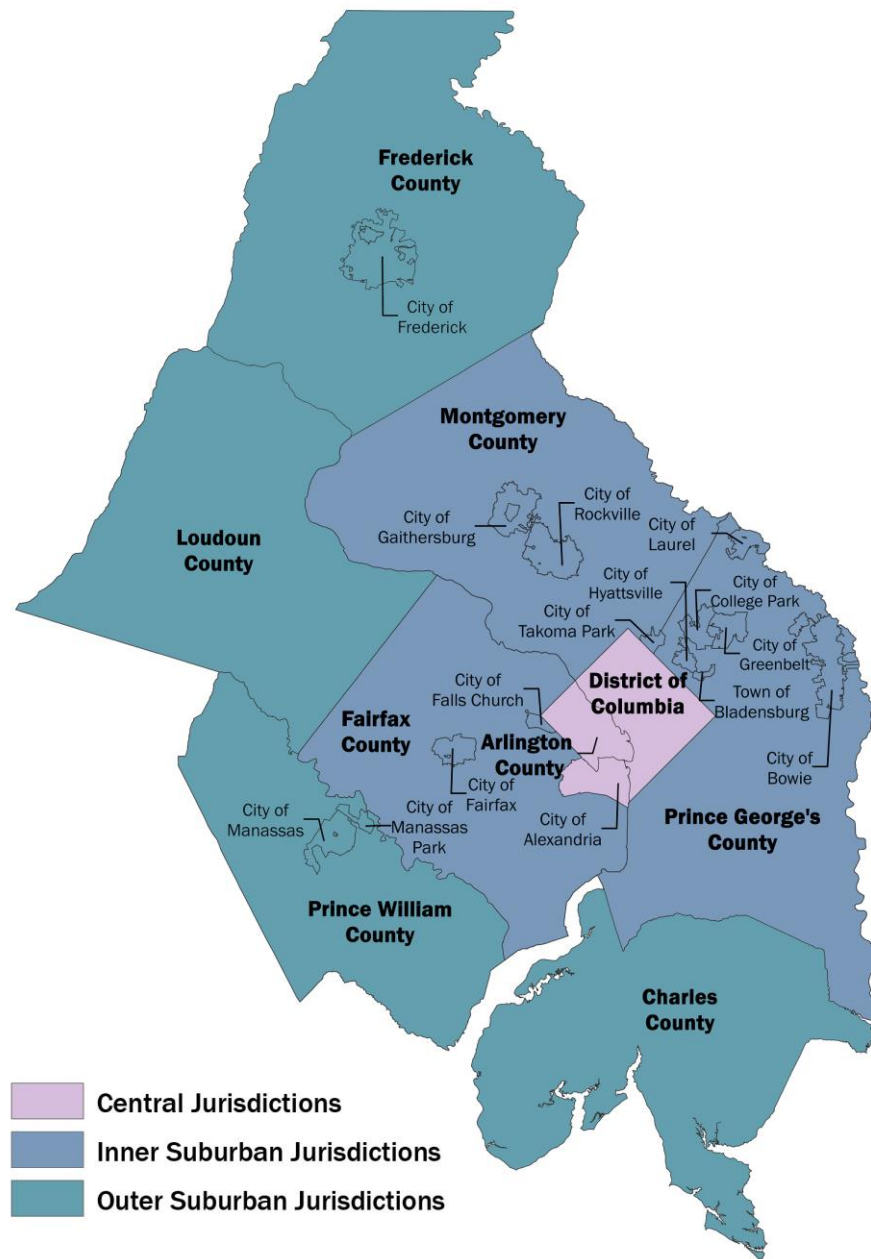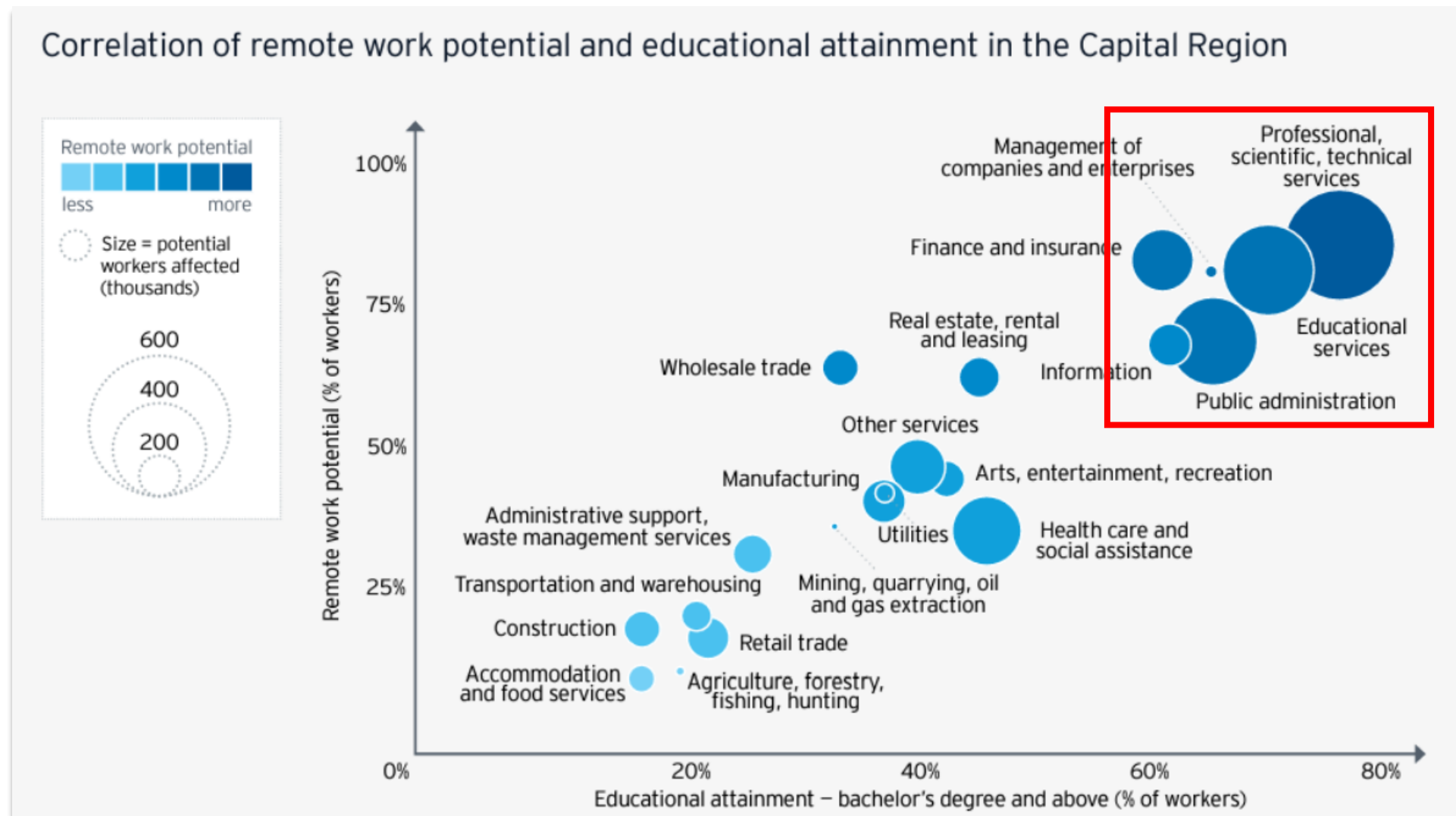
*Data and office density definitions self-reported by COG members (Round 8, 2010)*

# Remote-Work Potential

- Significant remote-work potential exists among the region's highly-educated work force and primary industries (scientific and technical services, FIRE)



Correlation of remote work potential and educational attainment in the Capital Region

Industries that have historically driven the region's economy

# Data Centers

- Northern Virginia is the largest global data center market

- Minimal job creation, significant tax revenues

- Require access to fiber optic trunk lines and sustained power delivery

- 29 data centers constructed (or planned) since 2016

- Average size of data centers in the region has doubled since 2016

- Multilevel data centers becoming more common in Loudoun County

- Data center workforce typically ranges from 20-50

- Reference total #: 36 in Loudoun, 16 in PW
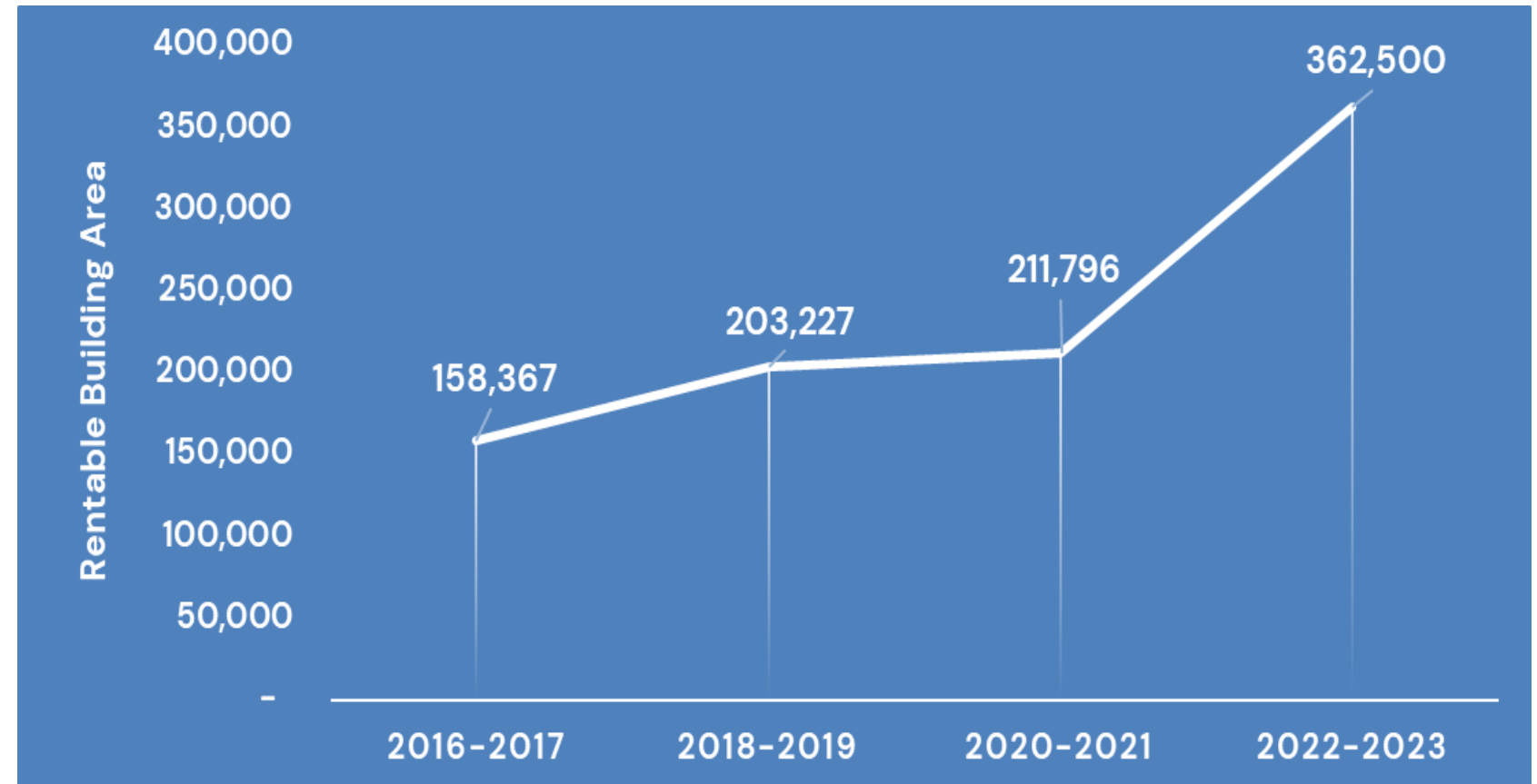
Average SF/data center constructed in the Washington region (2016-2023)

# Literature review

Three basic categories

- "Looking backward" – what changed during the pandemic?
- "Looking forward qualitatively" – what types of changes might be expected?
- "Looking forward quantitatively" – what is the direction and magnitude of change?

The first two categories are well-covered and summarized as a sort of a meta-analysis approach.

The third category is sparse: national-level assessments and two more granular studies reported on.



McKinsey Global Institute

The postpandemic economy

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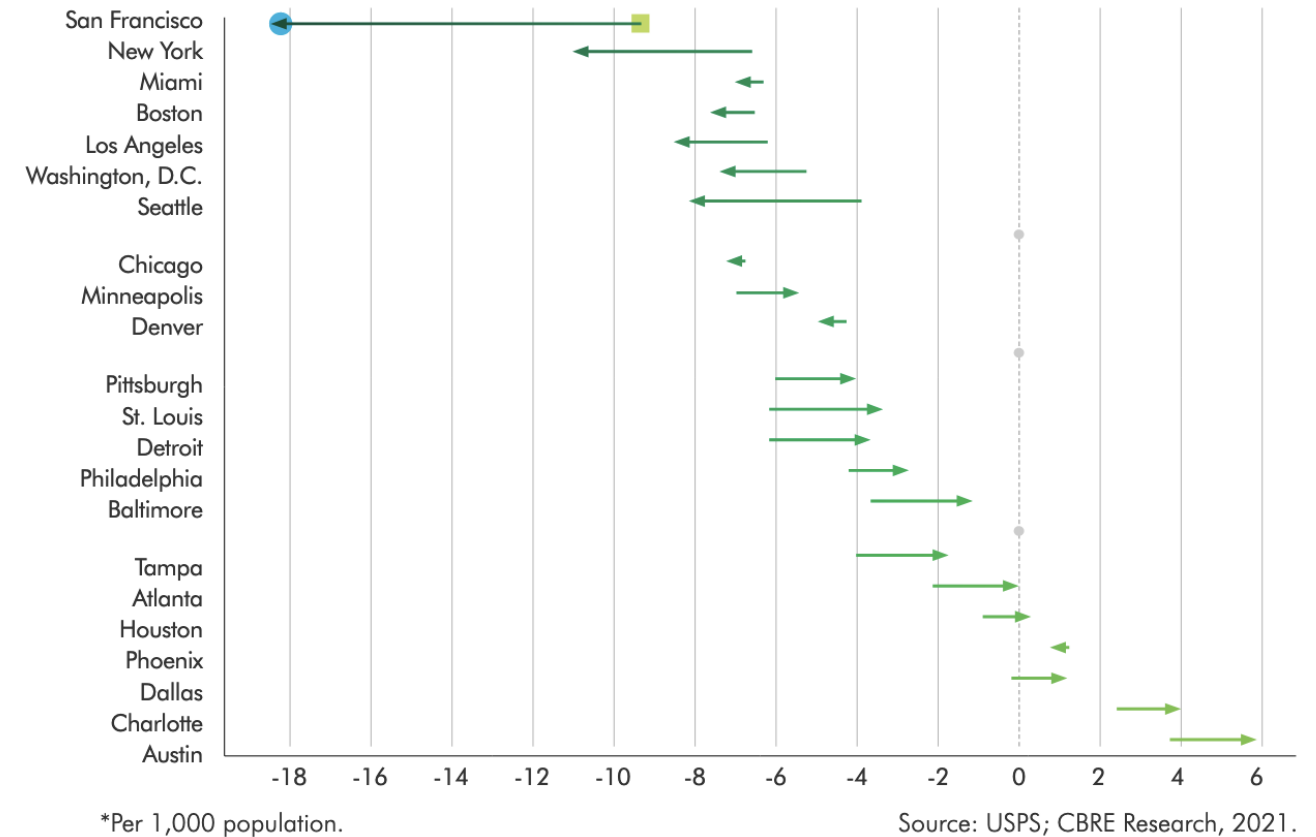| Task 3A. Literature |
| Task 3B.  Literature |

# Literature review: Category 1. Looking backward

## Looking Backward

- The pandemic was disruptive and influenced shifts in both employment and residency

- Population shifted at least temporarily from large/dense/costly metro areas to less dense places

- 2020 versus 2019 effect, though was small (CBRE example showed < 1% change in trends everywhere examined but San Francisco).



FIGURE 2 | NET MOVES, 2020 VS. 2019*

● 2020 Net Moves per 1,000 Population    ■ 2019 Net Moves per 1,000 Population

*Per 1,000 population.

Source: USPS; CBRE Research, 2021.

Task 3A. Literature

Task 3B. Literature

# Literature review: Category 2. Looking forward qualitatively

Key takeaways

- Stated preference surveys indicate some trends such as market penetration for autonomous vehicles or eligibility for telework

- Many academic papers from notable authors (i.e., Ewing, Florida) outline expected dynamics and potential policy responses but do not attempt to predict results of the dynamics
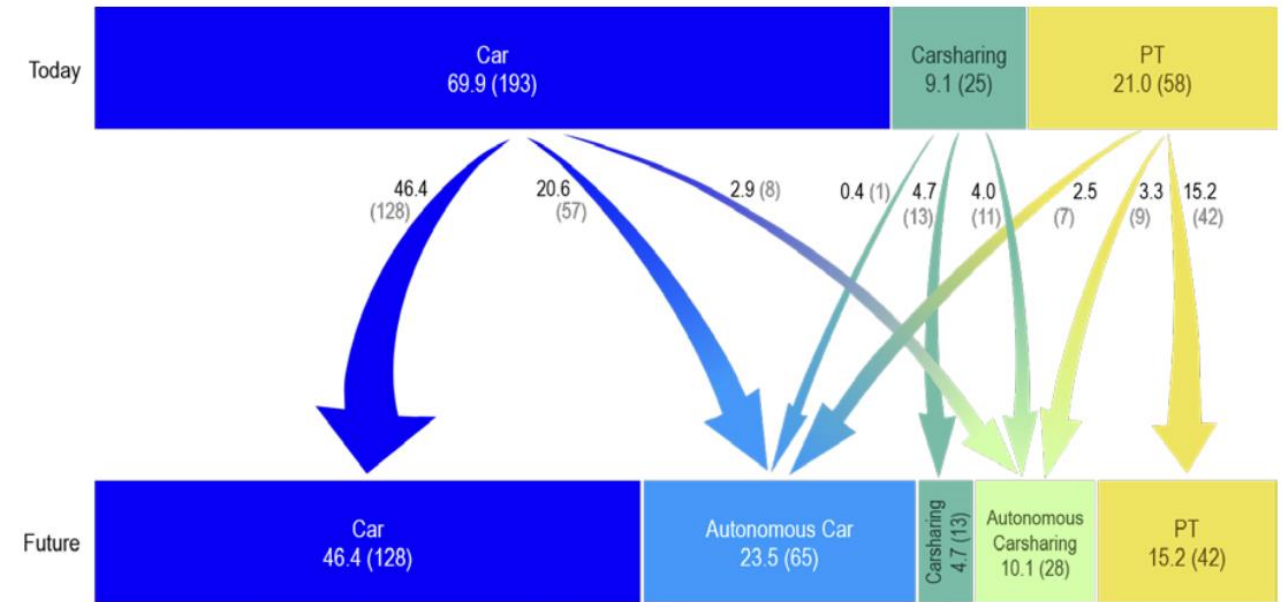


**Figure 2.** User's preference migration.

**Unintended Effects of Autonomous Driving: A Study on Mobility Preferences in the Future**

Task 3A. Literature

Task 3B. Literature

# Literature review: Category 3. Looking forward quantitatively

First of two notable studies at a more granular level:

- NBER study 2022 examines CBDs other metro counties to develop a theoretical framework of effects on prototypical metro area with a CBD, a Zone 1 in the same county as the CBD, and a Zone 2 reflecting other counties

- A fourfold increase in WFH from pre-pandemic levels a given

- Testing for location/pricing: CBD office rents down ~10%, non-CBD housing prices up

- Marginal shifts in home location (0% to 4%)

Table 6: Model Prediction for Distribution of Incomes and Population

| Row | | Pre-COVID Baseline (1) | Post-COVID Scenarios SR (2) | Post-COVID Scenarios LR (3) | Post-COVID Scenarios LR Putty-Clay (4) |
|---|---|---|---|---|---|
| | *Technology:* | | | | |
| (1) | $A_1^h/A_1^b$ | 0.365 | 0.665 | 0.666 | 0.665 |
| (2) | $A_2^h/A_2^b$ | 0.348 | 0.515 | 0.515 | 0.515 |
| (3) | $A_1^b$ | 9330 | 9254 | 9241 | 9245 |
| | *Incomes:* | | | | |
| (4) | Type 1 avg. ann. income per worker | $ 108,862 | $ 141,424 | $ 144,440 | $ 146,114 |
| (5) | Type 2 avg. ann. income per worker | $ 77,776 | $ 84,921 | $ 85,302 | $ 86,685 |
| (6) | Type 3 avg. ann. income per worker | $ 93,135 | $ 94,170 | $ 91,804 | $ 94,184 |
| (7) | Type 4 avg. ann. income per worker | $ 60,176 | $ 61,630 | $ 60,176 | $ 61,688 |
| (8) | High-skill avg. ann. income per worker | $ 103,620 | $ 125,673 | $ 126,894 | $ 128,804 |
| (9) | Low-skill avg. ann. income per worker | $ 64,486 | $ 67,334 | $ 66,329 | $ 67,810 |
| (10) | Ratio of high-skill to low-skill Income | 1.61 | 1.87 | 1.91 | 1.90 |
| | *Consumption:* | | | | |
| (11) | Type 1 avg. non-housing consumption | $ 80,664 | $ 94,557 | $ 95,170 | $ 96,721 |
| (12) | Type 2 avg. non-housing consumption | $ 48,463 | $ 50,634 | $ 50,038 | $ 51,125 |
| (13) | Type 3 avg. non-housing consumption | $ 71,074 | $ 71,925 | $ 70,010 | $ 71,902 |
| (14) | Type 4 avg. non-housing consumption | $ 37,457 | $ 38,468 | $ 37,457 | $ 38,459 |
| (15) | High-skill avg. non-housing consumption | $ 77,467 | $ 87,013 | $ 86,784 | $ 88,448 |
| (16) | Low-skill avg. non-housing consumption | $ 40,152 | $ 41,447 | $ 40,538 | $ 41,561 |
| (17) | Ratio of high-skill to low-skill avg. consumption | 1.93 | 2.10 | 2.14 | 2.13 |
| | *Population Location:* | | | | |
| (18) | Total high-skill | 51.0% | 51.0% | 51.0% | 51.0% |
| (19) | Living in Zone 1 | 35.6% | 34.0% | 32.0% | 32.0% |
| (20) | Living in Zone 2 | 64.4% | 66.0% | 68.0% | 68.0% |
| (21) | Total low-skill | 49.0% | 49.0% | 49.0% | 49.0% |
| (22) | Living in Zone 1 | 34.8% | 36.5% | 34.2% | 34.1% |
| (23) | Living in Zone 2 | 65.2% | 63.5% | 65.8% | 65.9% |

Task 3A. Literature

Task 3B. Literature

# Literature review: Category 3. Looking forward quantitatively

Second notable study at a more granular level:

- Delventhal/Parkhomenko study forecasts changes in population/jobs due to removing telework "aversion" among employees and firms

- Conclusion is nationally about 0.8 more days/week of telework (1.1 for college grads, 0.6 for others)

- PUMS-level database online

- Results generally comparable to Value of Time analysis (in next section):

  - D/P study includes job shifts; large metros attract jobs if agglomeration outpaces cost

  - D/P study considers metro overlaps



Figure I.2: Density of residents

Panel (a): absolute changes

Panel (b): relative changes

Task 3A. Literature

Task 3B. Literature
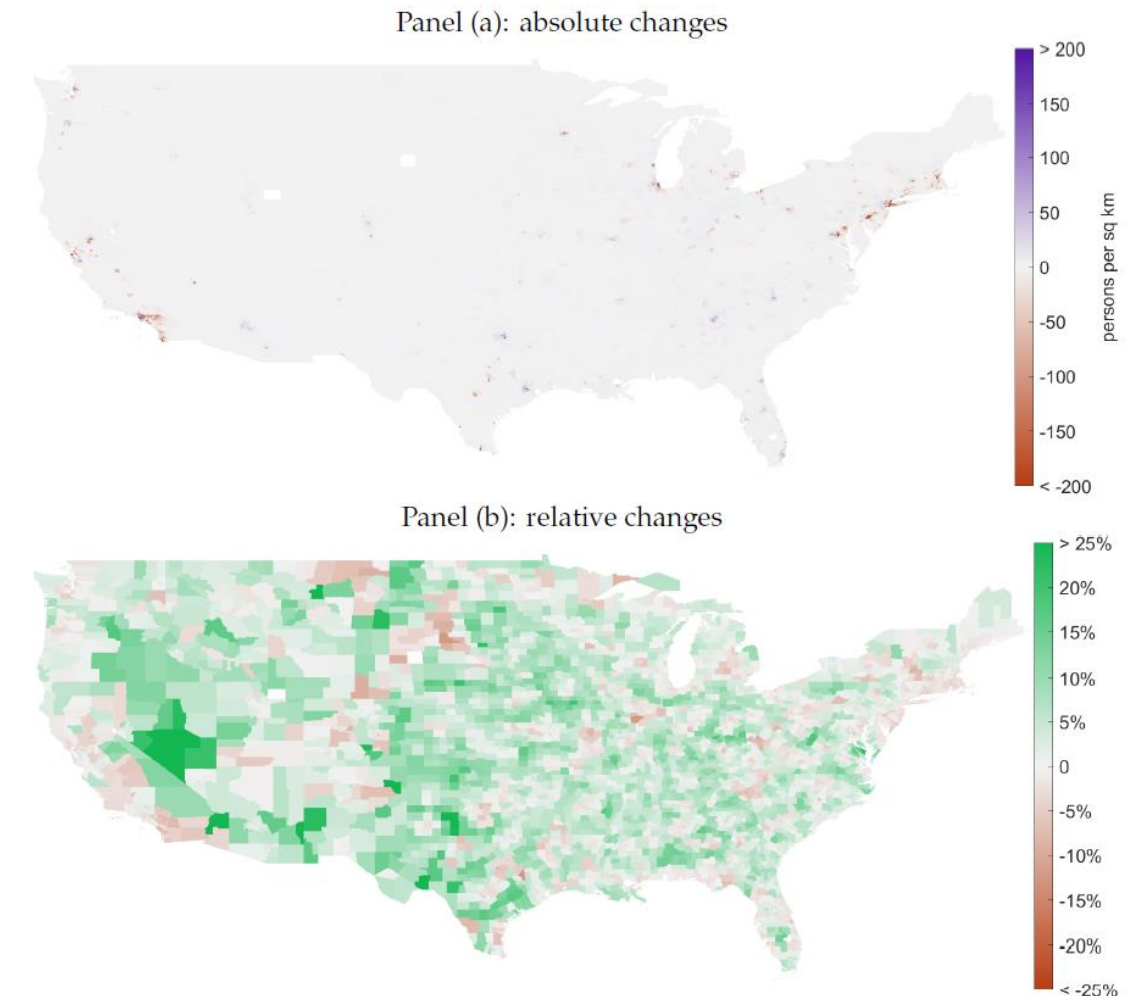
# Monte Carlo approach

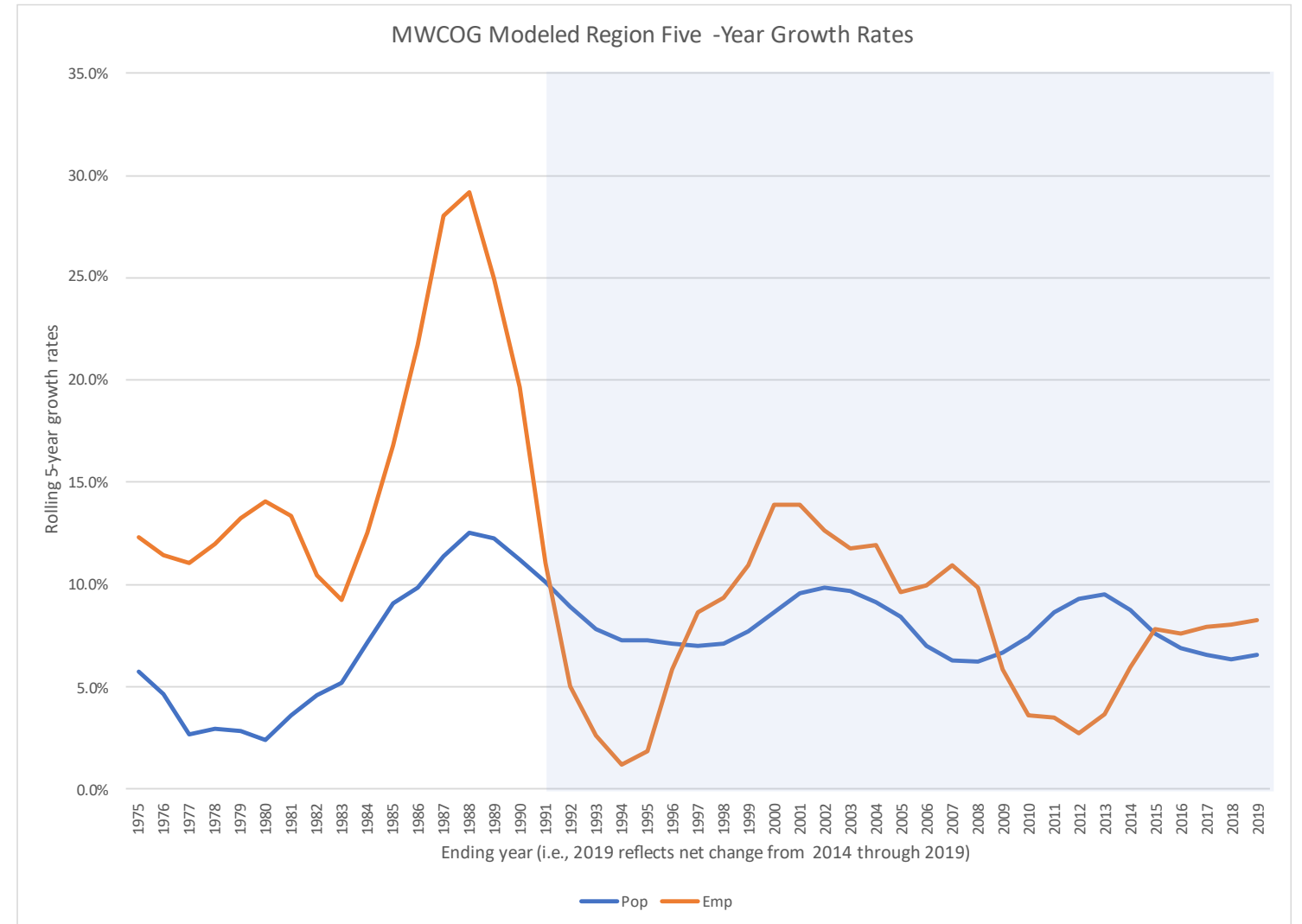- Historic growth trends show steady growth; recessions affect jobs more than population

- A Monte Carlo simulation can provide a sense of variation associated with economic uncertainty

- What if the exogenous changes affecting regional growth over the past 25 years were randomized?



MWCOG Modeled Region Historical Growth

Task 3A. Independent Analyses

Task 3B. Independent Analyses
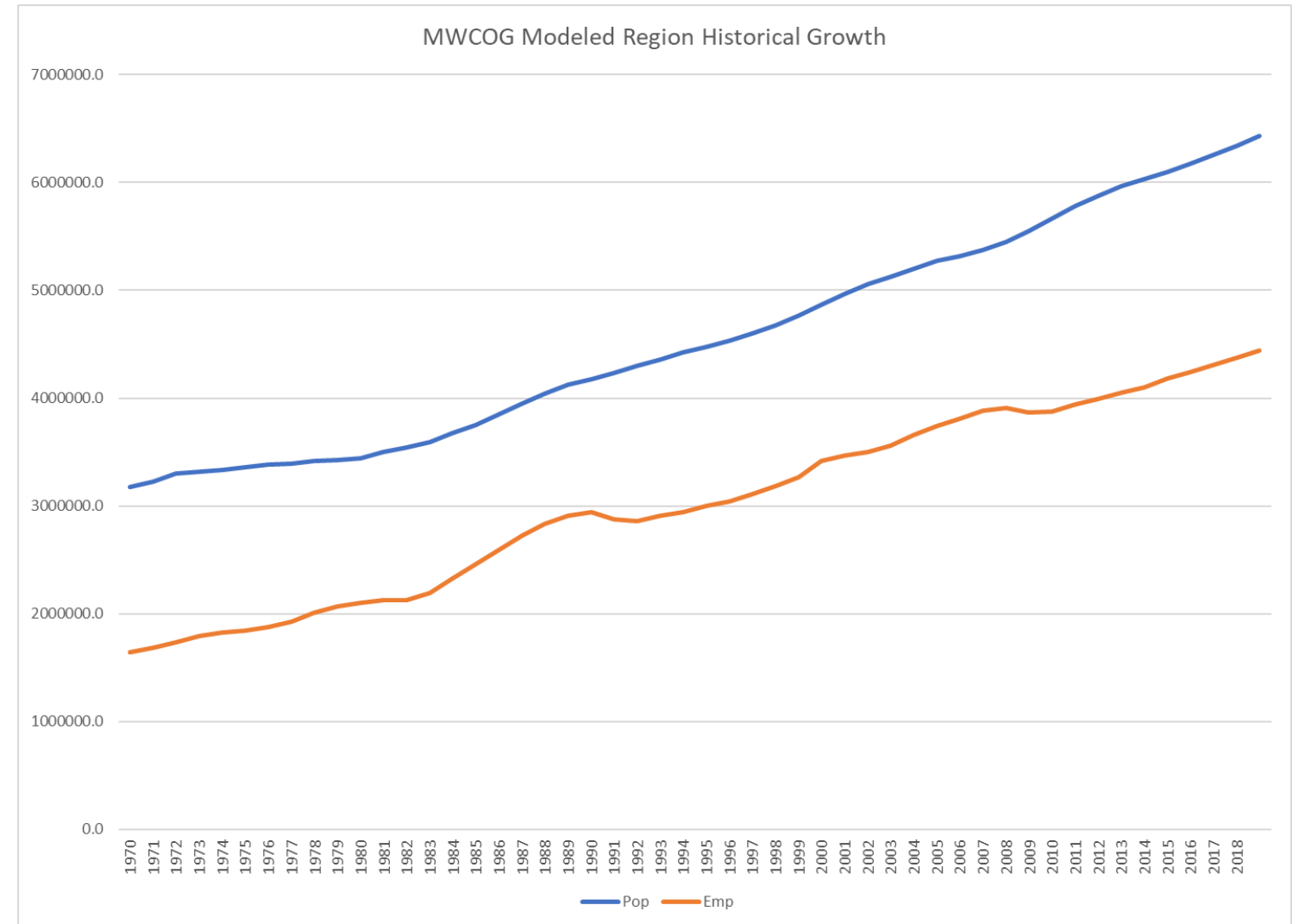
# Monte Carlo approach

- Rolling 5-year growth rates since 1986 show stabilizing patterns (compared to earlier outlier jobs growth)

- Again, job growth has greater variability than population growth



MWCOG Modeled Region Five -Year Growth Rates

Task 3A. Independent analyses

Task 3B.  Independent analyses

# Monte Carlo approach

- Re-organizing the growth from chronological to percentile facilitates Monte Carlo simulation

- For a 30-year forecast, each of six 5-year periods can be assigned a randomly selected growth rate (each line at right has a 5% chance of occurring in any period)

- The simulation was run 1,000 times to develop a range of forecasts

**MWCOG Region**
**Based on 1986-1991 onward**

| POPULATION DISTRIBUTION INPUT | | EMPLOYMENT DISTRIBUTION INPUT | |
|---|---|---|---|
| Percentile | 5-year growth | Dist | 5-year growth |
| 5% | 6.3% | 5% | 1.4% |
| 10% | 6.6% | 10% | 2.4% |
| 15% | 6.9% | 15% | 2.8% |
| 20% | 7.0% | 20% | 3.5% |
| 25% | 7.1% | 25% | 3.6% |
| 30% | 7.1% | 30% | 5.1% |
| 35% | 7.3% | 35% | 5.8% |
| 40% | 7.4% | 40% | 5.9% |
| 45% | 7.6% | 45% | 7.6% |
| 50% | 7.8% | 50% | 8.3% |
| 55% | 8.3% | 55% | 9.3% |
| 60% | 8.6% | 60% | 9.7% |
| 65% | 8.7% | 65% | 9.9% |
| 70% | 8.9% | 70% | 10.8% |
| 75% | 9.2% | 75% | 11.0% |
| 80% | 9.4% | 80% | 11.5% |
| 85% | 9.6% | 85% | 11.9% |
| 90% | 9.7% | 90% | 13.0% |
| 95% | 10.0% | 95% | 13.9% |

Task 3A. Independent Analyses

Task 3B. Independent Analyses

# Value of Time approach

How much might virtual travel replace physical travel due to technology/societal changes?

The Value of Time approach considers the tradeoff in a quick-response, three-stage process:

1. How does the ratio of transportation to housing costs by jurisdiction affect the percent working in DC?
2. How would the percent working in DC change if transportation costs dropped?
3. How much should the effect be magnified to consider the whole region?

10%

10%

A Jurisdiction

10%

40%

10%

20%

What proportion of employed residents in each jurisdiction commute to DC? How would this change if commuting got cheaper?

The "new" commuters are assumed to be relocated residents
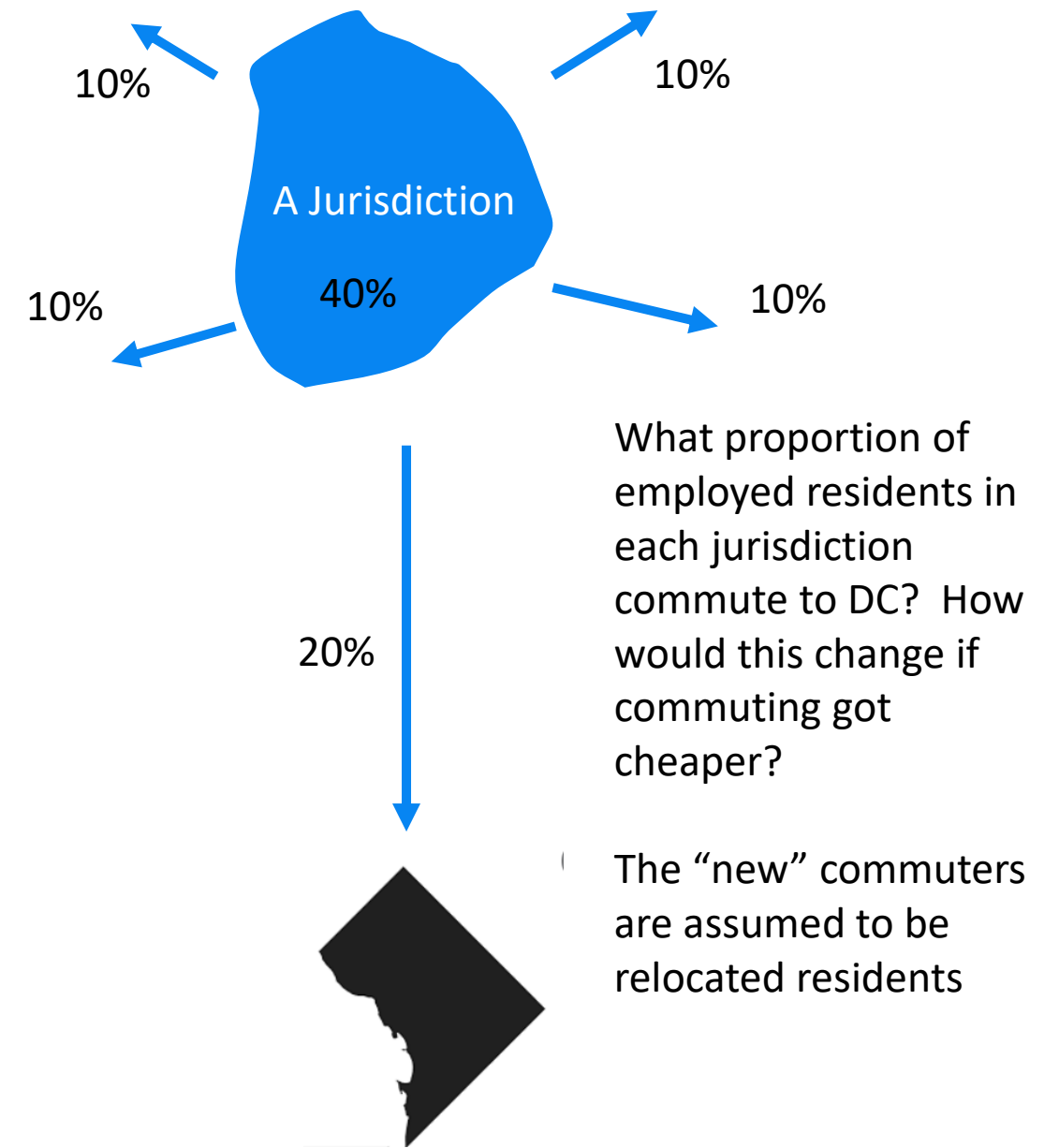
# Value of Time approach

First stage:

- The percentage of employed residents in any jurisdiction that commute to DC is a function of the ratio of transportation costs ($t) to housing costs ($h)
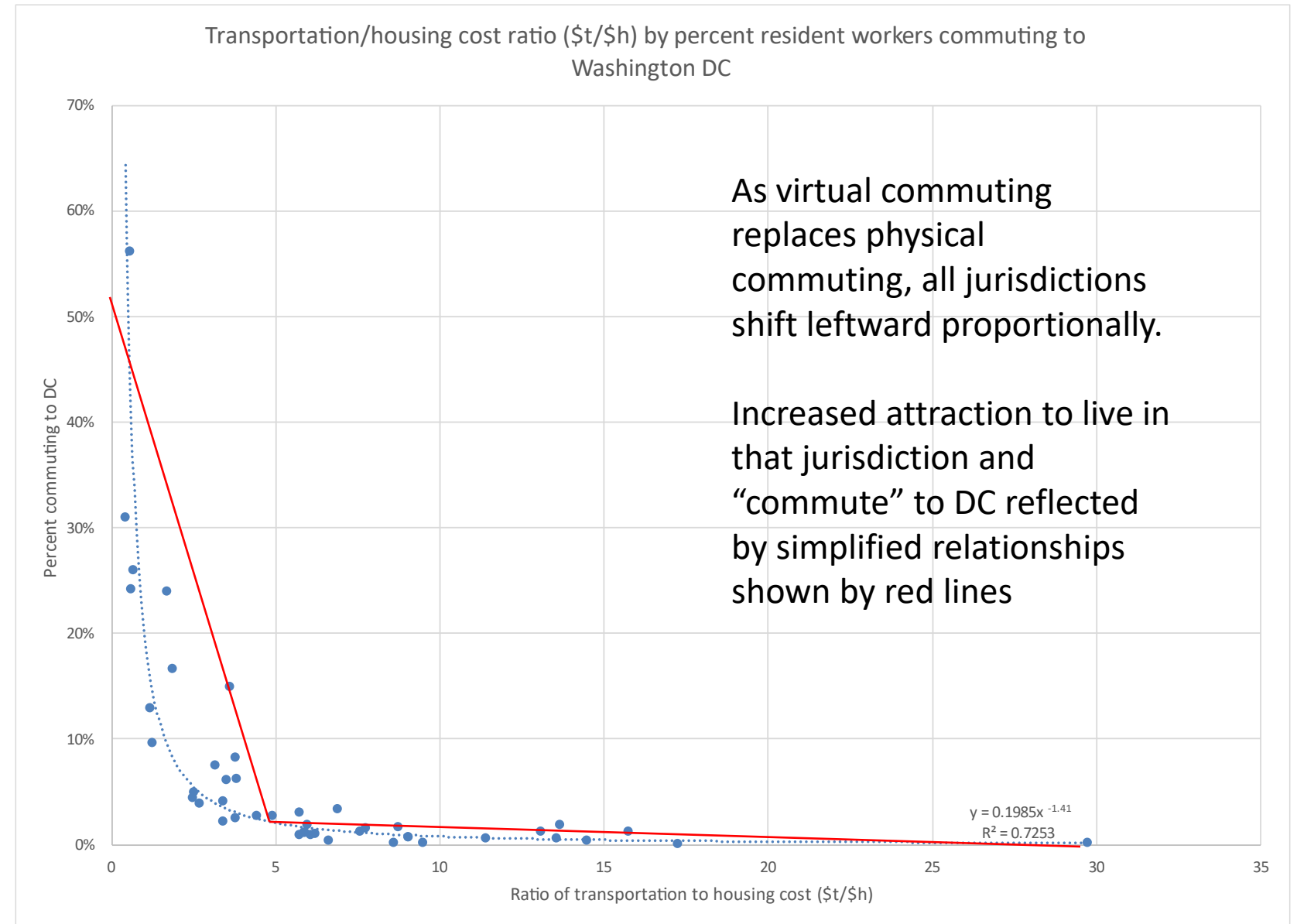
- Note that transportation costs used VOT=$12.50 per hour; the fact that VMT has rebounded to 97% pre-pandemic levels suggests operating costs (often not consciously priced anyway) can be decoupled from the investment in time

Transportation/housing cost ratio ($t/$h) by percent resident workers commuting to Washington DC

$$y = 0.1985x^{-1.41}$$
$$R^2 = 0.7253$$

Percent commuting to DC

Ratio of transportation to housing cost ($t/$h)
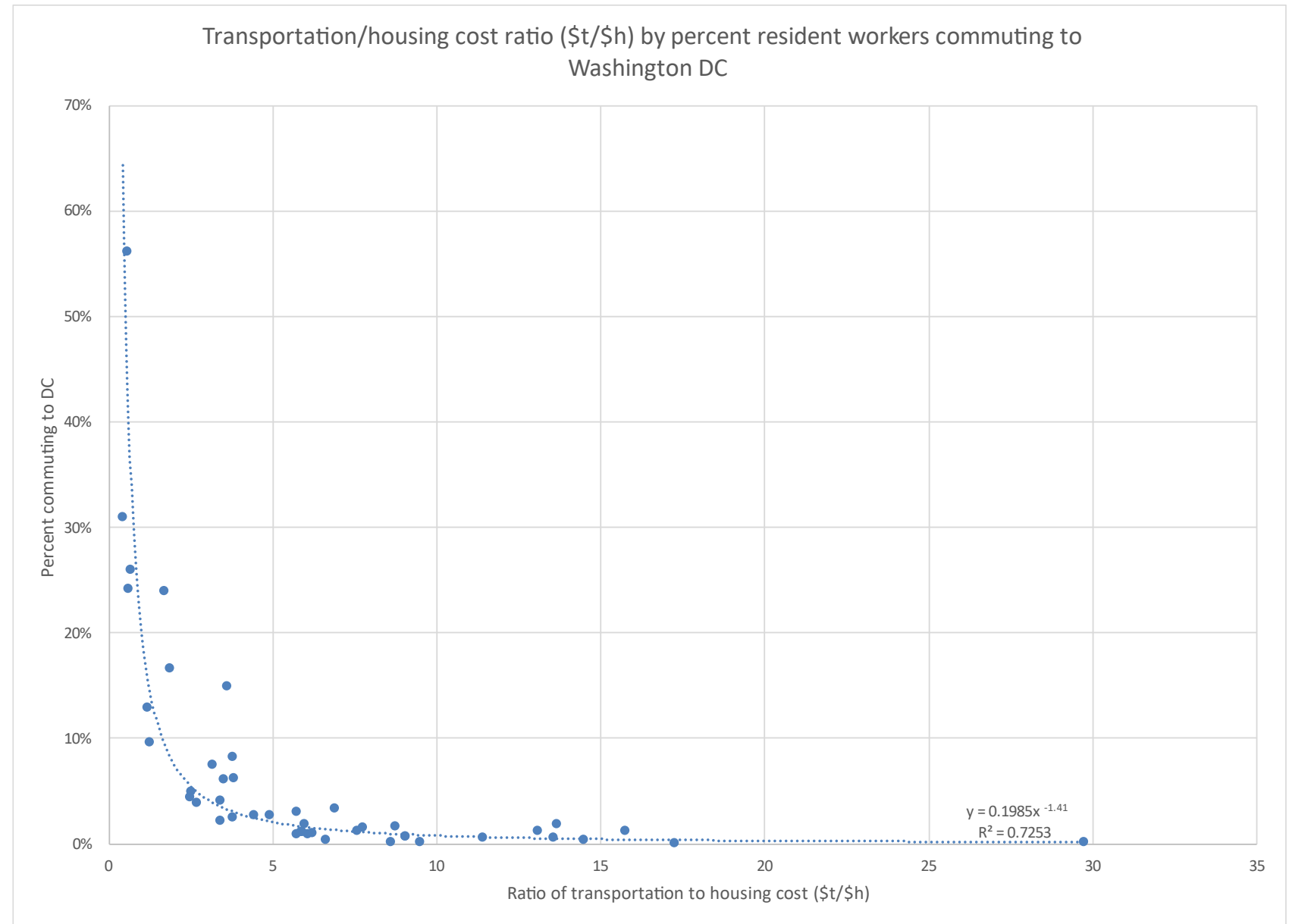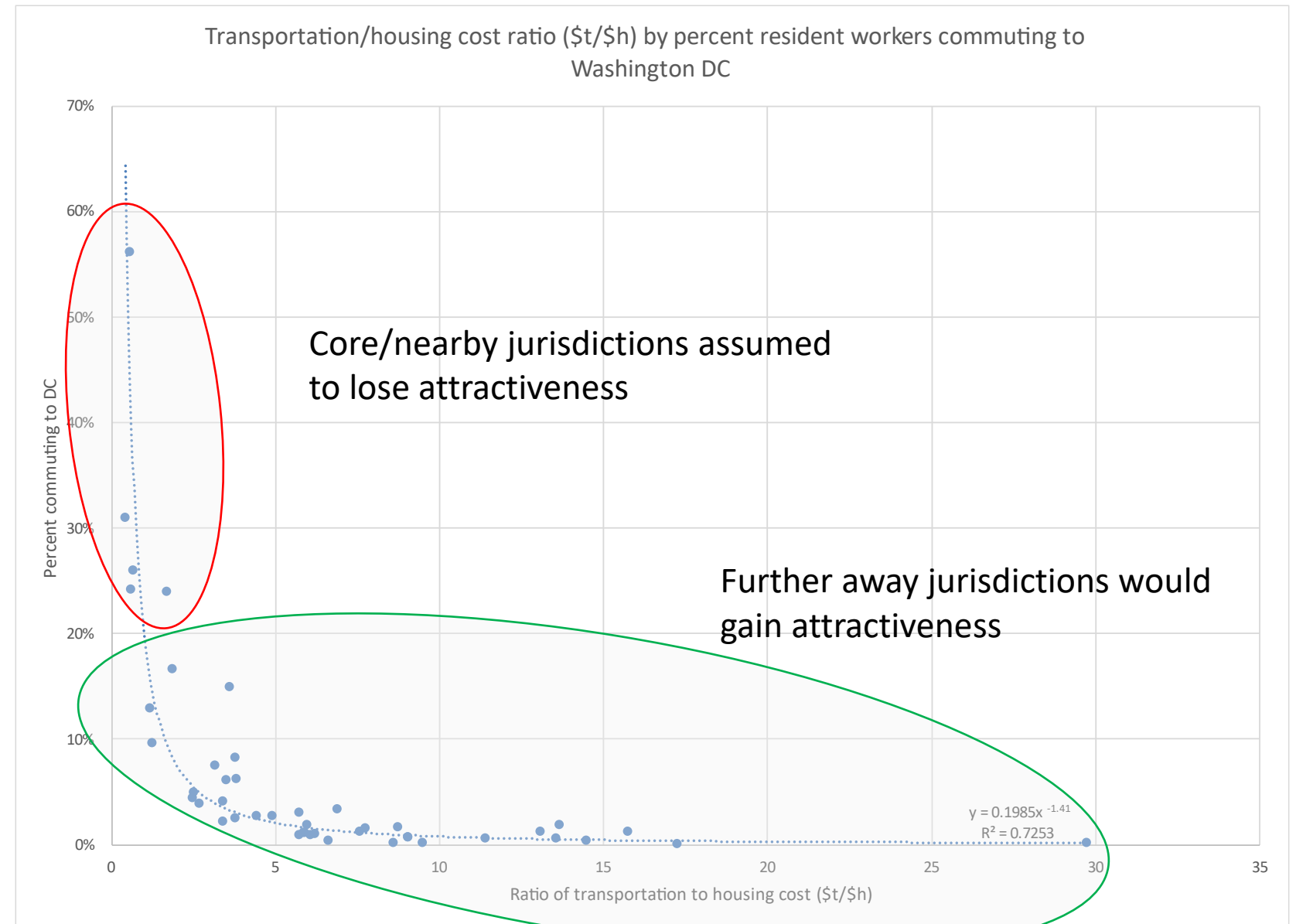
# Value of Time approach

Second stage:

- As the percentage of days commuting drops towards zero, the ratio of transportation to housing cost drops (for all jurisdictions, even DC)

- Dots would all move toward the left as commuting costs drop

- A greater percentage of residents would take a more distant job if commuting time were reduced.

### Transportation/housing cost ratio ($t/$h) by percent resident workers commuting to Washington DC

As virtual commuting replaces physical commuting, all jurisdictions shift leftward proportionally.

Increased attraction to live in that jurisdiction and "commute" to DC reflected by simplified relationships shown by red lines

$y = 0.1985x^{-1.41}$
$R^2 = 0.7253$

Percent commuting to DC

Ratio of transportation to housing cost ($t/$h)

# Value of Time approach

Second stage:

- The effect is assumed to increase resident workforce attraction to DC for jurisdictions with less than the typical "21.6% of residents currently commute to DC"

### Transportation/housing cost ratio ($t/$h) by percent resident workers commuting to Washington DC

Core/nearby jurisdictions assumed to lose attractiveness

Further away jurisdictions would gain attractiveness

$y = 0.1985x^{-1.41}$
$R^2 = 0.7253$

Percent commuting to DC

Ratio of transportation to housing cost ($t/$h)

# Value of Time approach

Second stage:

- For considering commuting to DC only, the maximum effect on population is roughly a 4% loss in core jurisdiction population and ~1% gain in more distant jurisdiction population.  This equates to ~80% telework; we assume there is always some physical connection (i.e., key meetings/events) to the workplace

Stage 2.  Assemble effect on population by geography using DC as destination

| Jurisdiction | Population | Median Housing Price | Commute Time to DC (minutes) | Max Population Shift | Shift as percent of 2020 Population |
|---|---|---|---|---|---|
| Core | 1,133,000 | $ 639,000 | 15 | -39100 | -3.5% |
| Inner | 3,168,000 | $ 473,000 | 30 | 200 | 0.0% |
| Outer (Member) | 1,217,000 | $ 429,000 | 56 | 7000 | 0.6% |
| Outer (Model) | 1,722,000 | $ 378,000 | 50 | 10600 | 0.6% |
| More Distant | 3,240,000 | $ 254,000 | 76 | 6800 | 0.2% |
| TOTAL | 10,480,000 | $ 403,000 | 28 | -14400 | -0.1% |

# Value of Time approach

Third stage:

- The effect for DC overlaps with similar effects for other activity centers

- Based on a rough sense (dated, but still relevant) of employment in activity centers and a judgment on value of time for commuting to the core versus other jurisdictions, we suggest that the effect for the region as a whole might be roughly twice that for DC alone

Stage 3. Estimate expansion effect associated with all activity centers

Note: From 2002 report, rough sense of activity center employment (Round 6.2)
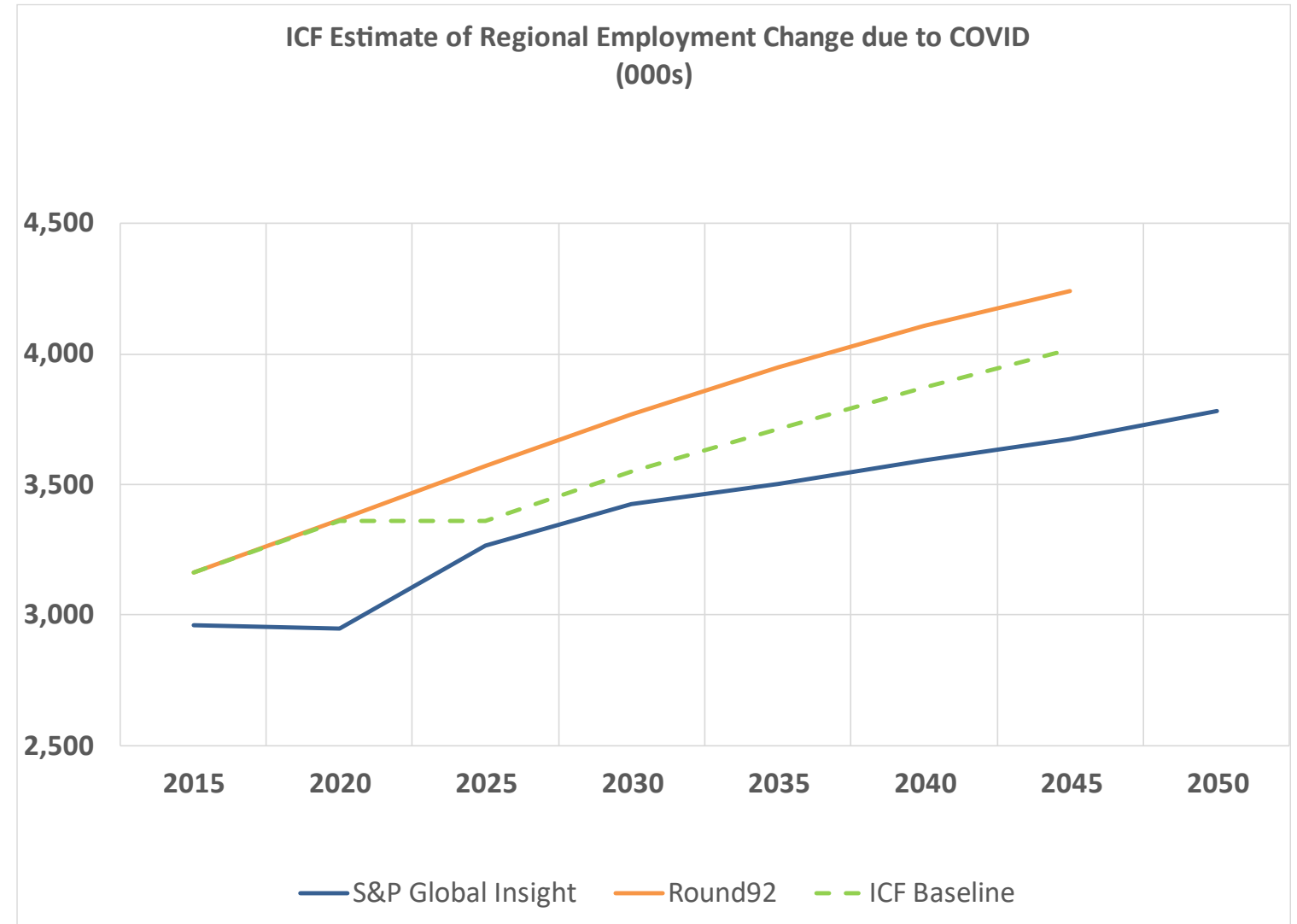Regional_Activity_Centers_Report.pdf

| Location | 2000 Jobs | 2025 Projected Jobs | 2025 Employment | Relative Weight Based on Value of Time (judgment) | Multiplier |
|---|---|---|---|---|---|
| DC Core | 493,700 | 605,600 | 100% | 100% | 1.00 |
| Mixed-Use Centers | 316,900 | 440,200 | 73% | 50% | 0.36 |
| Employment Centers | 282,200 | 383,000 | 63% | 50% | 0.32 |
| Suburban Employment Centers | 312,000 | 485,000 | 80% | 25% | 0.20 |
| Emerging Employment Centers | 87,400 | 182,900 | 30% | 25% | 0.08 |
| TOTAL | 1,492,200 | 2,096,700 | | | 1.96 |

# Regional summaries

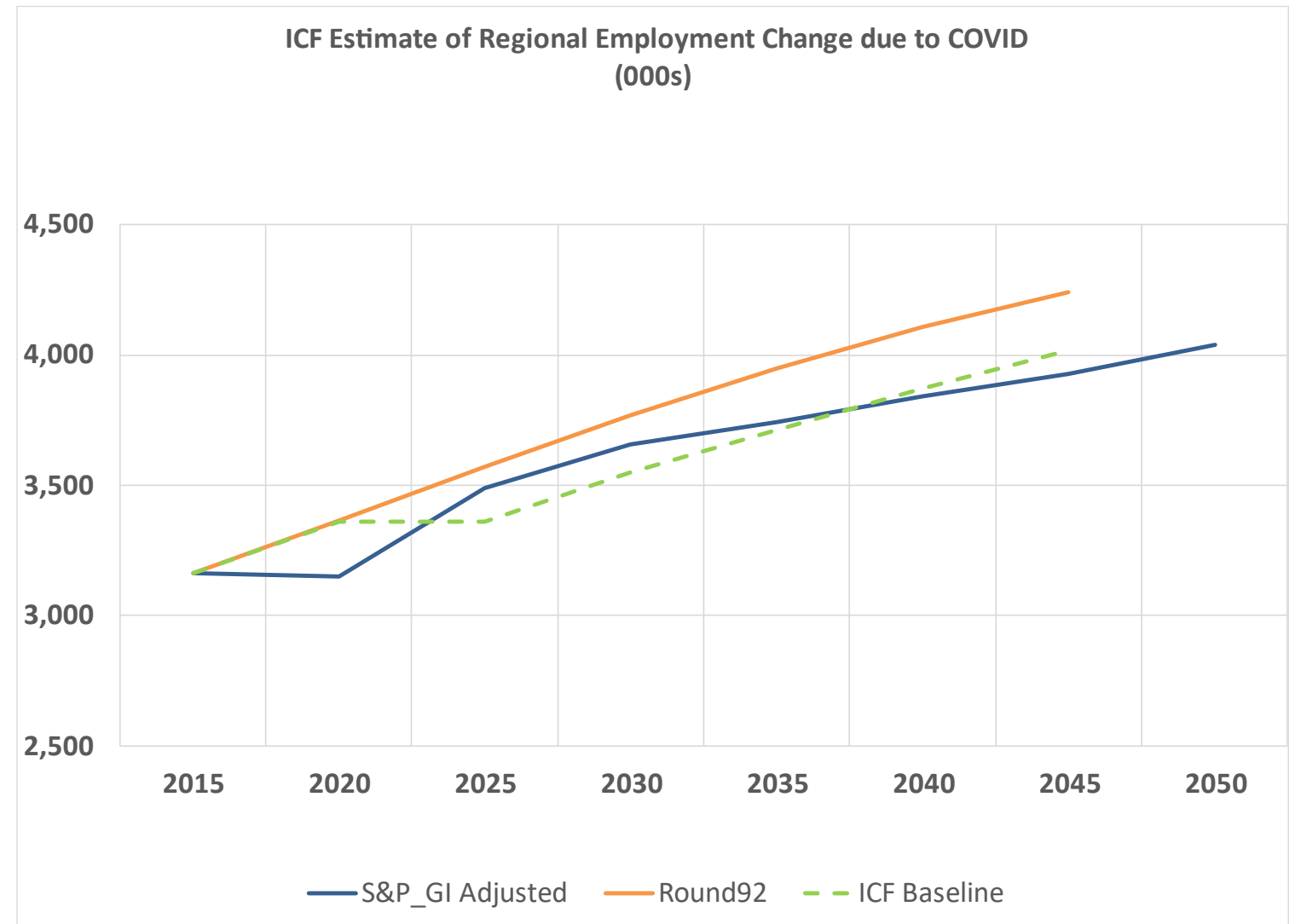**Looking at the full MWCOG region in 5-year increments:**

- **COVID effects are non-negligible, but in the same ballpark as other effects:**
  - **Round 9.2 is pre-COVID (2018)**
  - **S&P Global Insight is from February 2022**
- **Employment will take until 2025 to rebound but will regain momentum (at least as far as COVID is concerned)**



ICF Estimate of Regional Employment Change due to COVID (000s)

Task 3A. Independent analyses

Task 3B. Independent analyses

# Regional summaries

Looking at the full MWCOG region in 5-year increments:
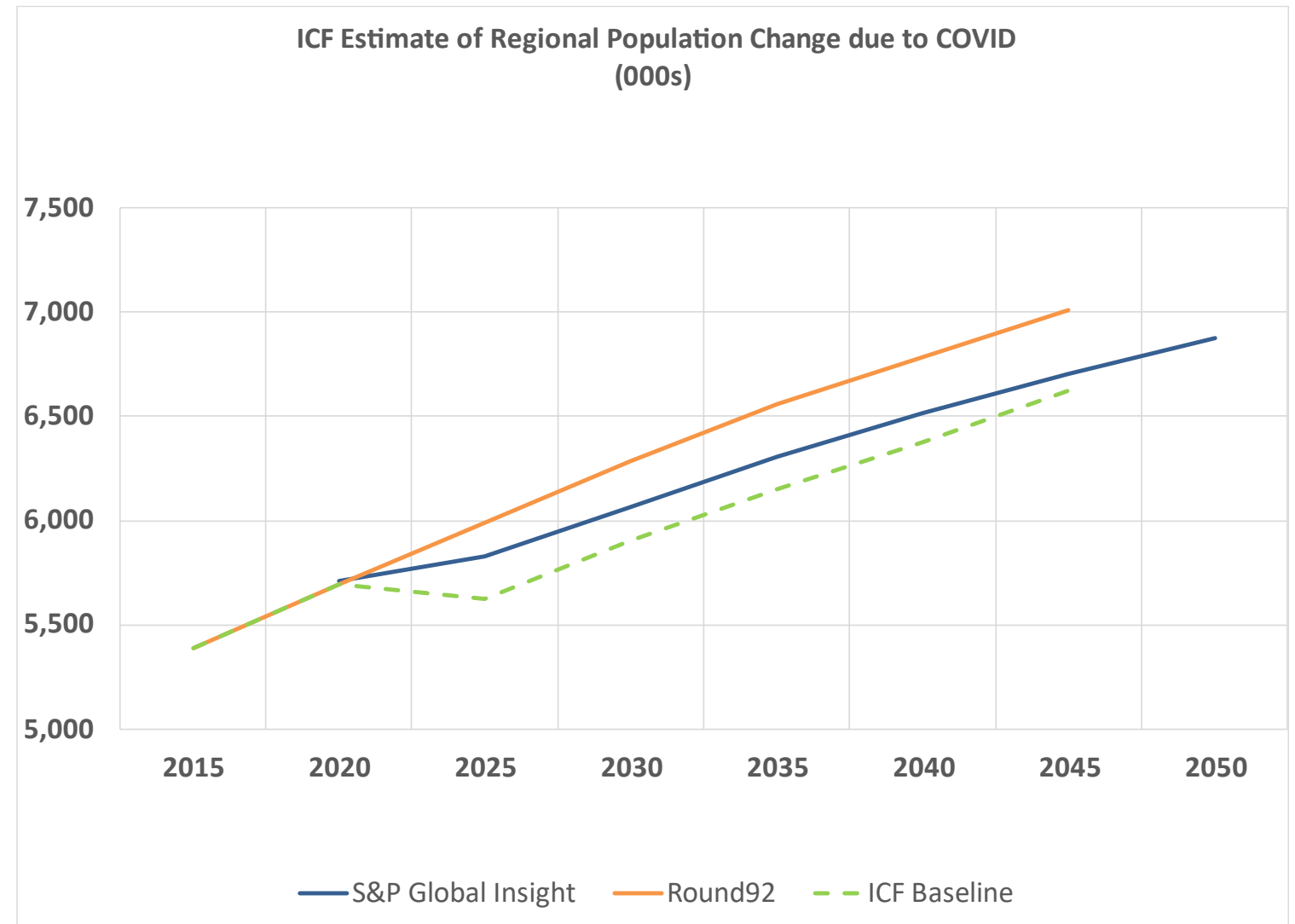
- COVID effects are non-negligible, but in the same ballpark as other effects:
  - Round 9.2 is pre-COVID (2018)
  - S&P Global Insight is from February 2022

- **Adjusting S&P Global Insight to match Round 9.2 baseline shows a relatively consistent expectation for all horizon years**



ICF Estimate of Regional Employment Change due to COVID (000s)

Legend: S&P_GI Adjusted — Round92 — — ICF Baseline

Task 3A. Independent analyses

Task 3B. Independent analyses

# Regional summaries

Looking at the full MWCOG region in 5-year increments:

- COVID effects are non-negligible, but in the same ballpark as other effects:
  - Round 9.2 is pre-COVID (2018)
  - S&P Global Insight is from February 2022
- **Population effects tend to lag slightly behind employment**
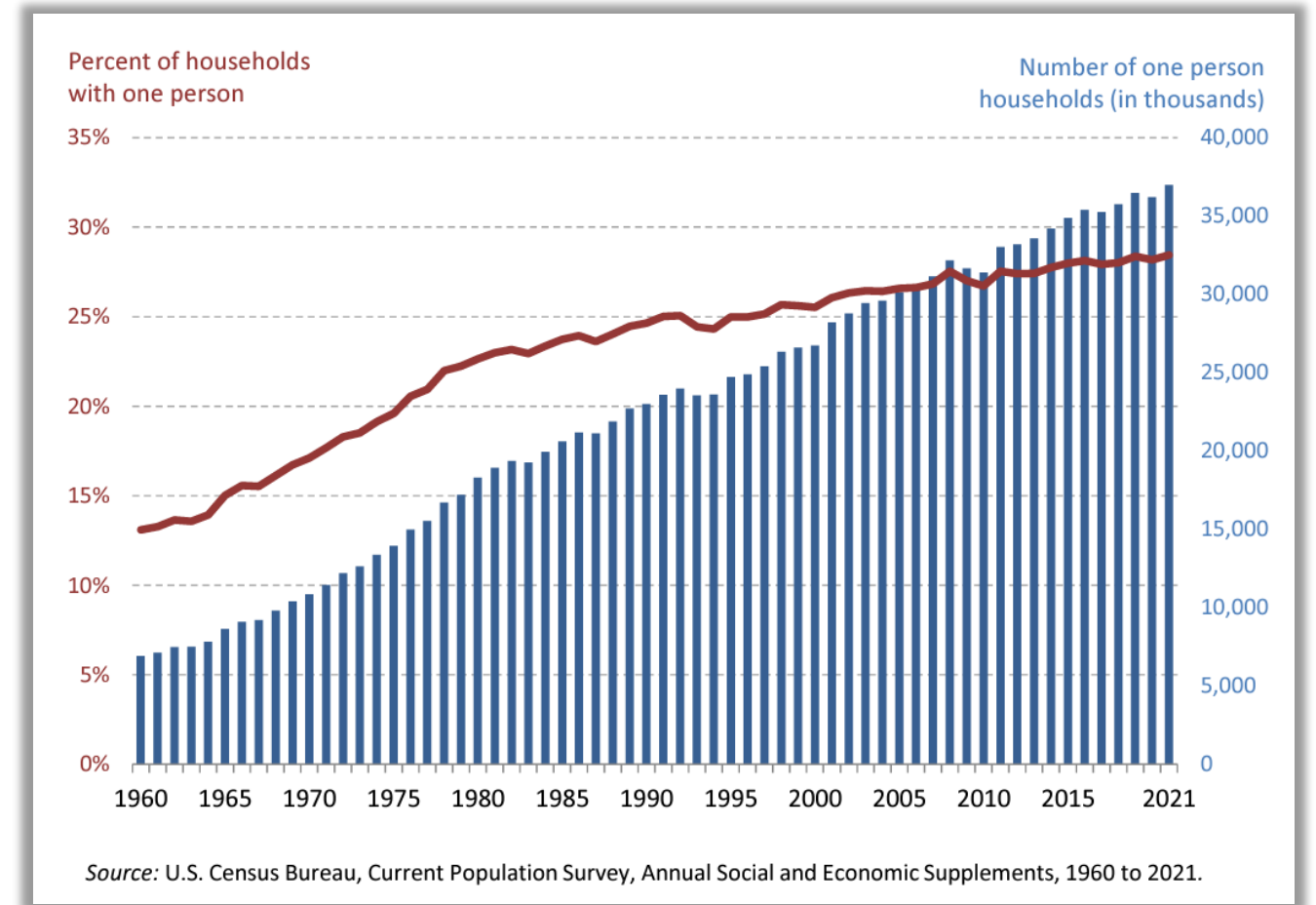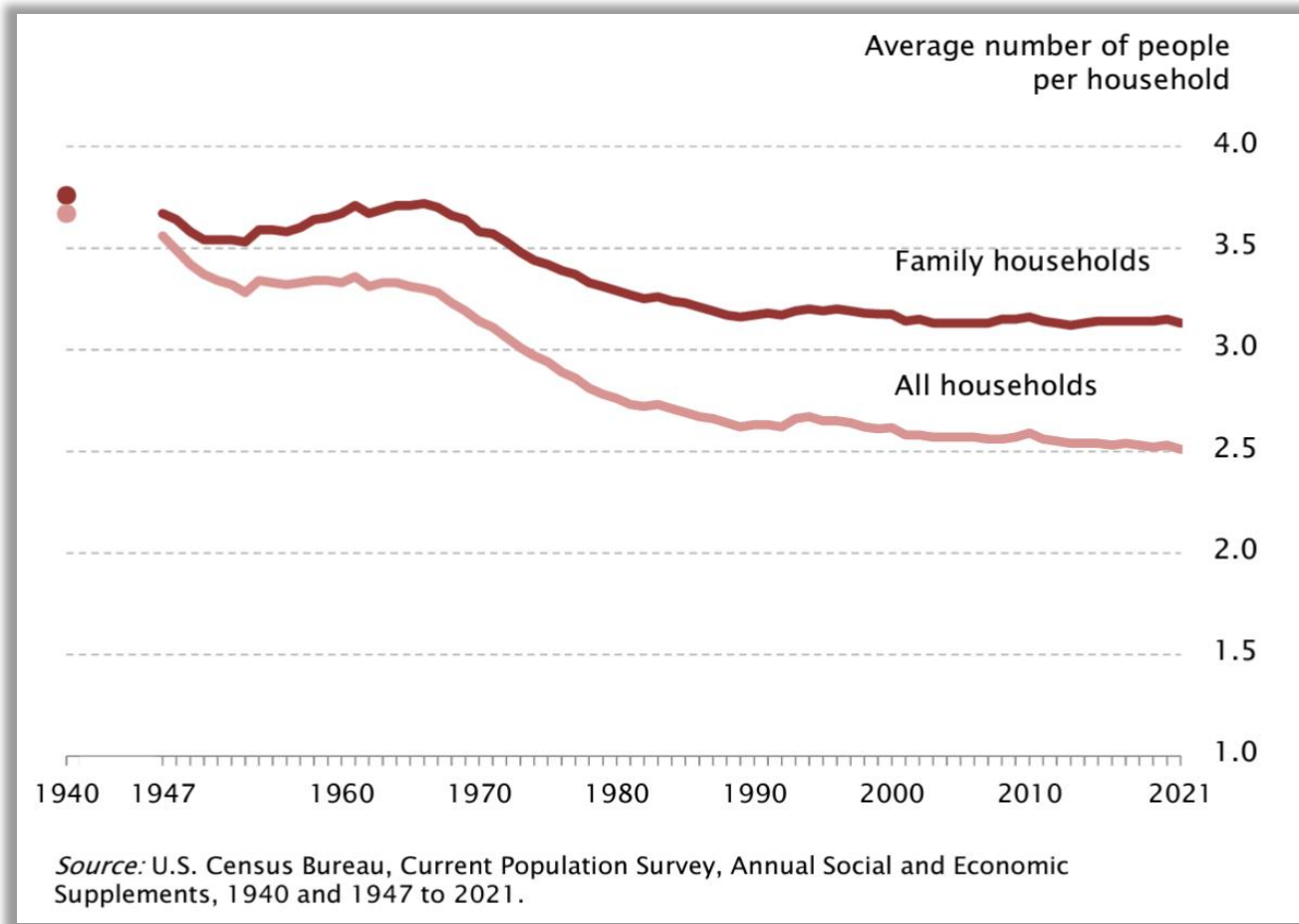- **Population within MWCOG region drops slightly with effects of COVID**

### ICF Estimate of Regional Population Change due to COVID (000s)



Legend: —— S&P Global Insight  —— Round92  - - - ICF Baseline

Task 3A. Independent analyses

Task 3B. Independent analyses

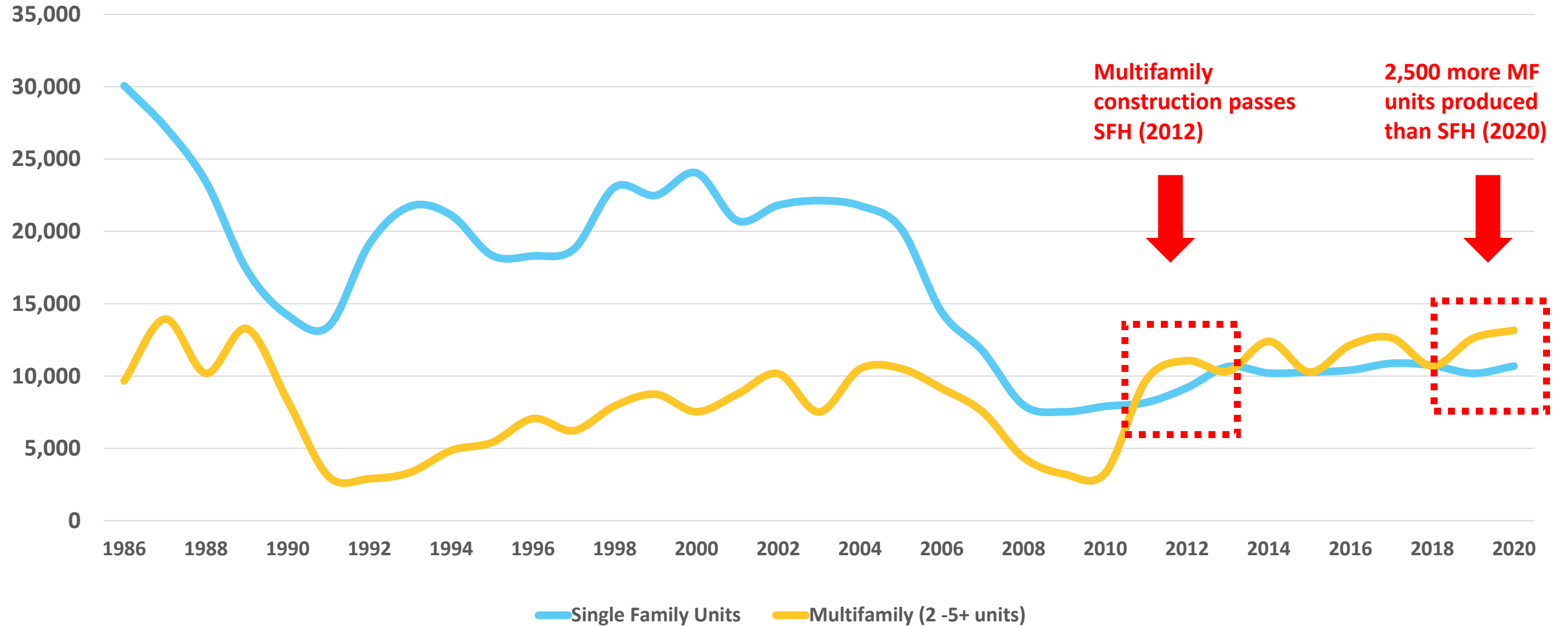# Interviews with Regional Experts

- Qian Cai, Weldon Cooper Center (UVA)

- Alfred Sundara, Maryland State Data Center

- Joy Phillips, DC Office of Planning

- Jenny Schuetz, Brookings Metro

- Peter Tatian, Urban Institute

# Household Size Declines

- Consistent decline in household size dating back to mid-20<sup>th</sup> Century
- Single-person households now represent one-third of all households



Average number of people per household

Family households

All households

Source: U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplements, 1940 and 1947 to 2021.



Percent of households with one person

Number of one person households (in thousands)

Source: U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplements, 1960 to 2021.
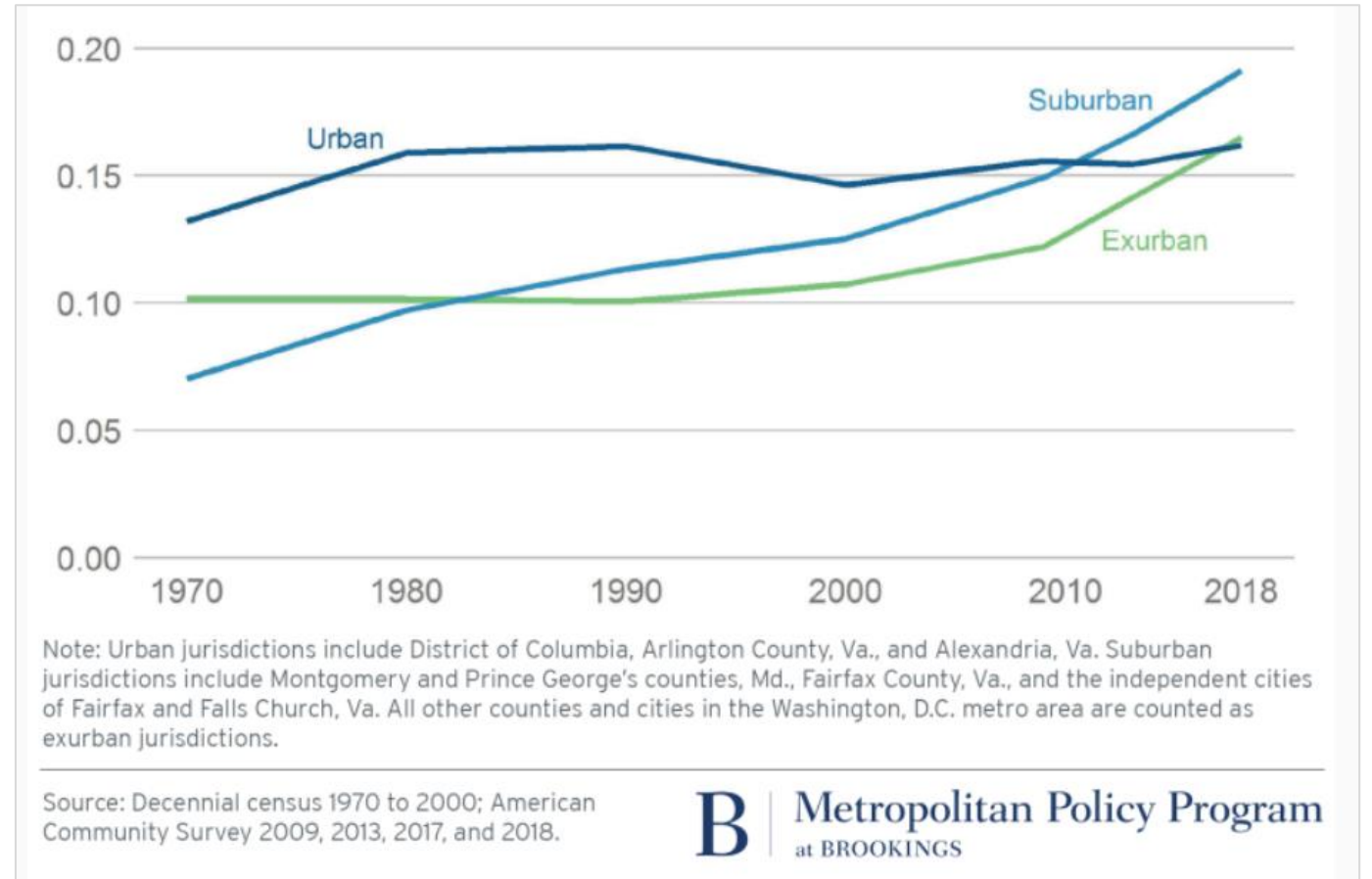
# Lagging Housing Construction



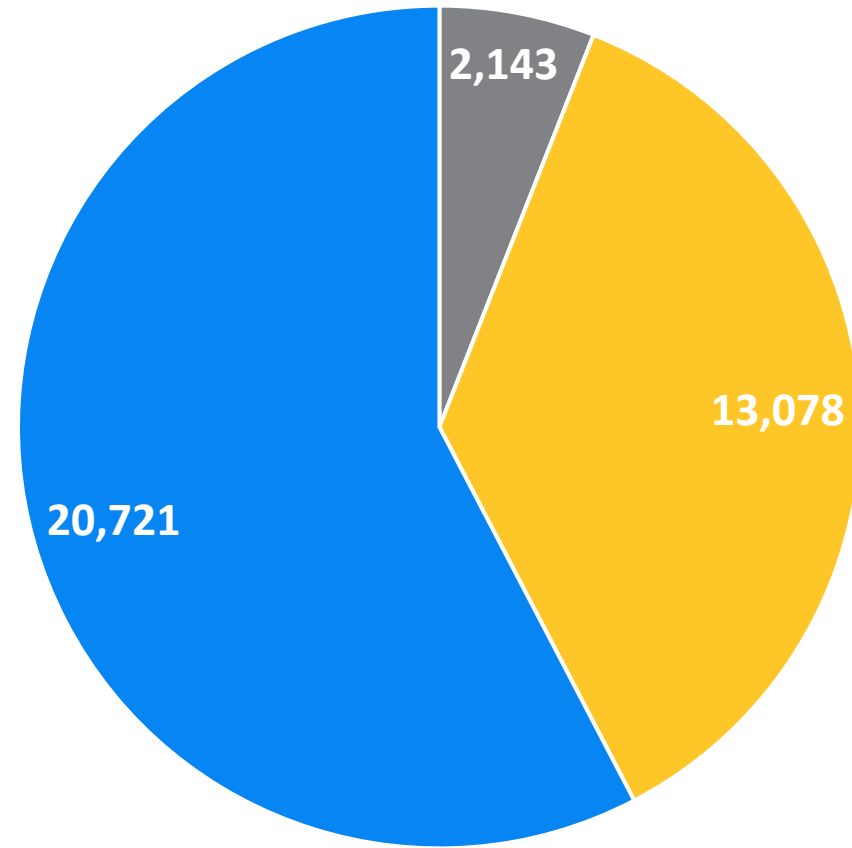Housing Construction in COG Region (1986-2020)

# Aging Population

- Populations in suburban jurisdictions are aging at a faster rate than urban jurisdictions

- Average household sizes are historically smaller for older adults, with higher rates of solo households



Note: Urban jurisdictions include District of Columbia, Arlington County, Va., and Alexandria, Va. Suburban jurisdictions include Montgomery and Prince George's counties, Md., Fairfax County, Va., and the independent cities of Fairfax and Falls Church, Va. All other counties and cities in the Washington, D.C. metro area are counted as exurban jurisdictions.

Source: Decennial census 1970 to 2000; American Community Survey 2009, 2013, 2017, and 2018.

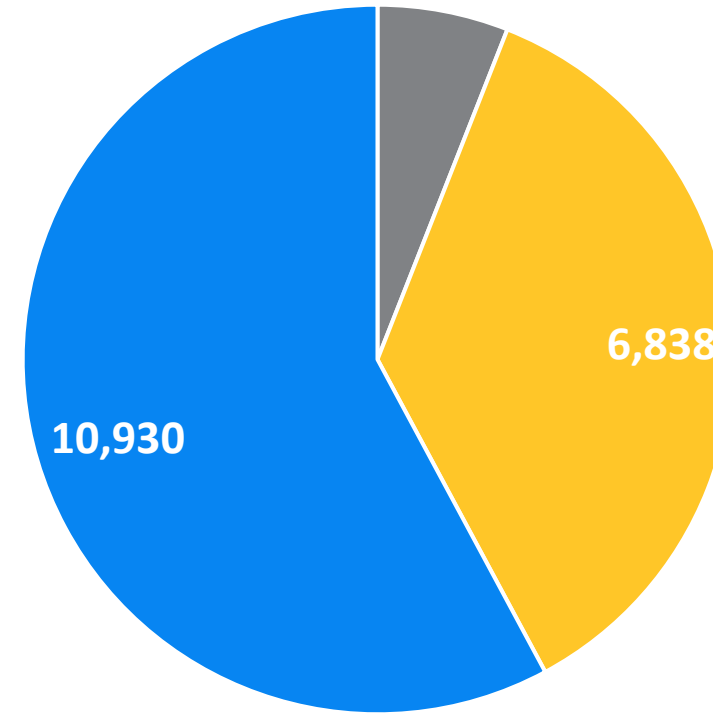B | Metropolitan Policy Program at BROOKINGS

Share of population over age 59 (1970-2018)

# International In-Migration



July 2019-June 2020

July 2020-June 2021

■ Washington, D.C. ■ Maryland ■ Virginia

# International Migration



Migration in the metro area by county, 2020

| County | Net migration |
|---|---|
| Loudoun County, VA | 4,568 |
| Frederick County, MD | 3,582 |
| Stafford County, VA | 2,140 |
| District of Columbia, D.C | 1,485 |
| Calvert County, MD | 357 |
| Charles County, MD | 151 |
| Arlington County, VA | 80 |
| Falls Church City, VA | 11 |
| Fauquier County, VA | -56 |
| Fairfax City, VA | -123 |
| Manassas Park City, VA | -184 |
| Prince William County, VA | -252 |
| Manassas City, VA | -479 |
| Alexandria City, VA | -1,986 |
| Prince George's County, MD | -5,955 |
| Fairfax County, VA | -8,825 |

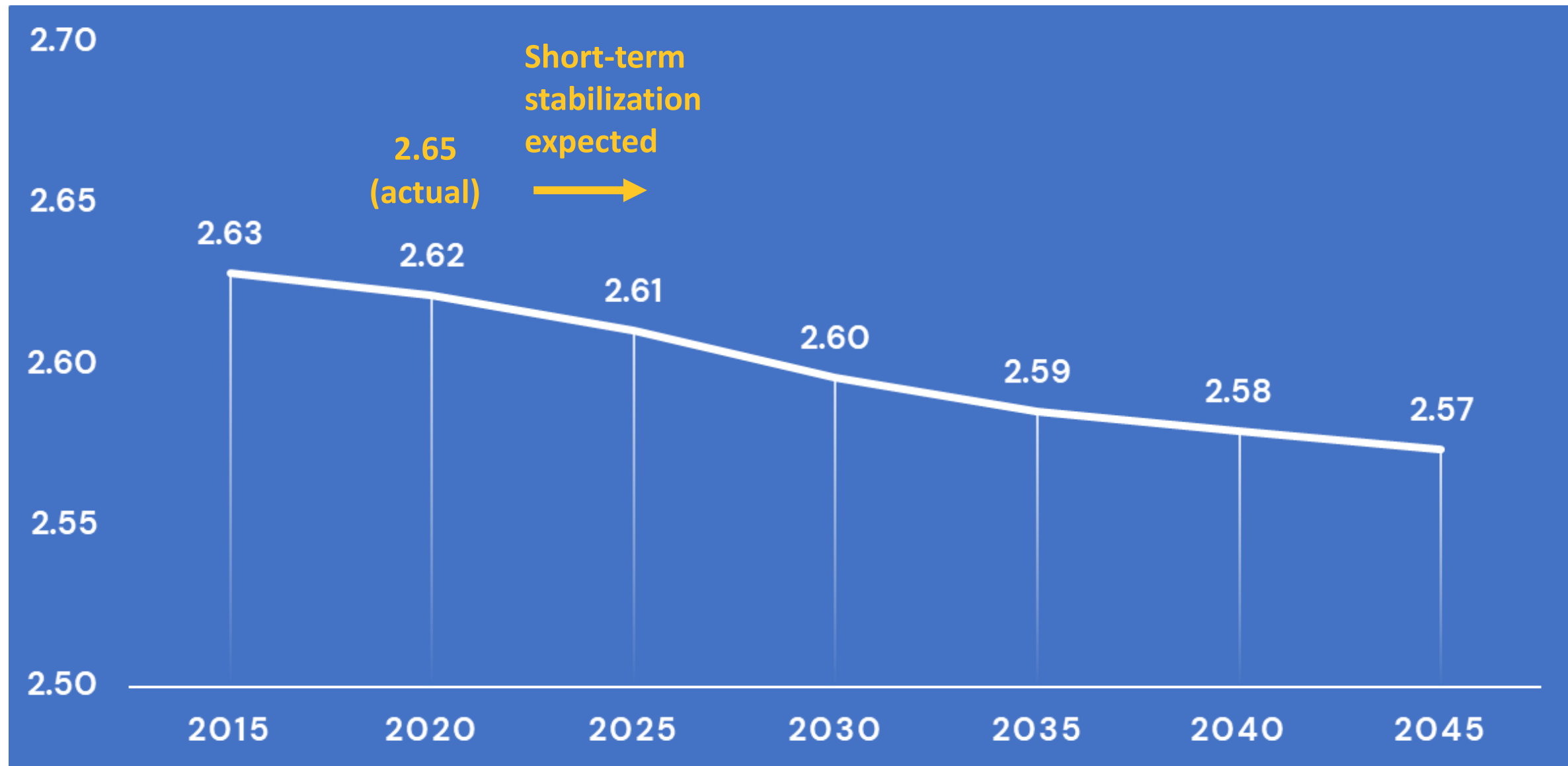Legend: Domestic Migration · International migration · Net migration

Source: U.S. Census Bureau 2020 Estimates, via D.C. Policy Center

# Historic Regional Average Household Size
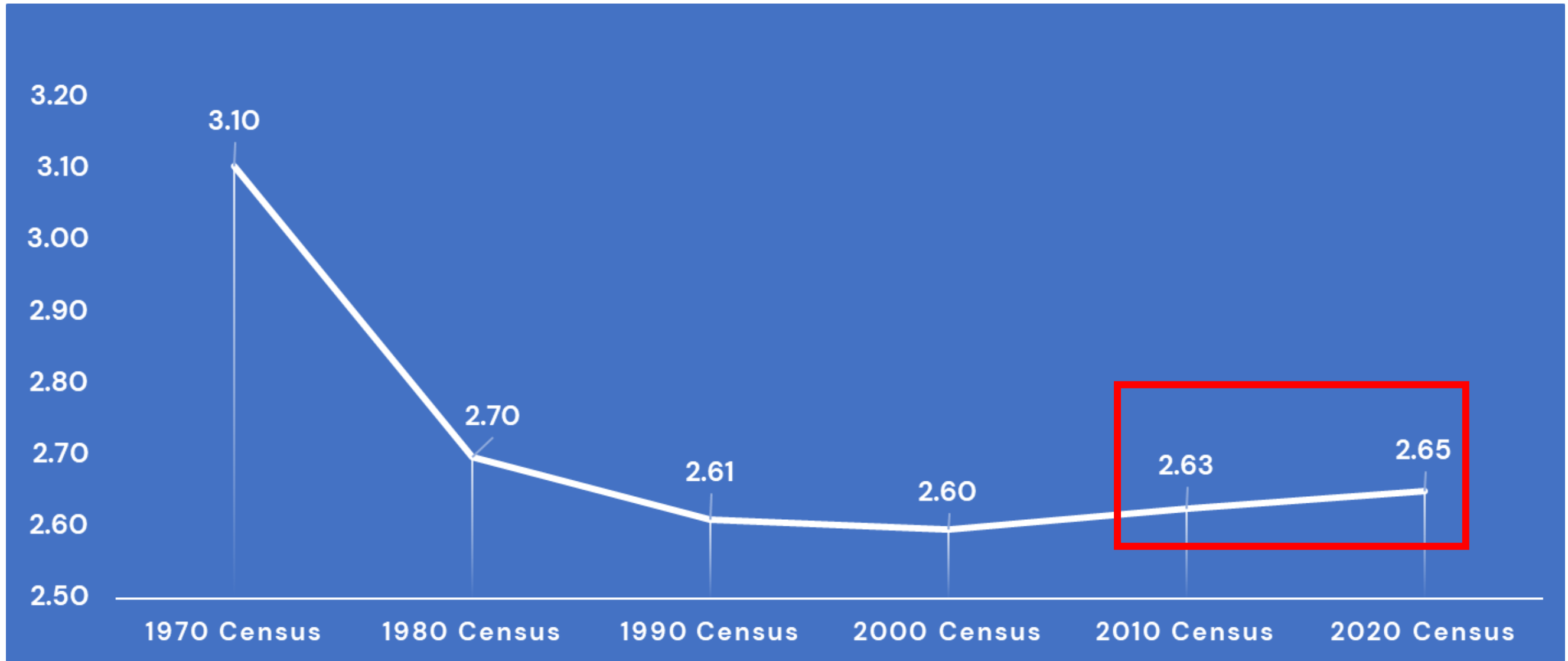


COG Region Average Household Size (1970-2020)

# Forecasted Regional Average Household Size



Source: COG Round 9.2 Forecast (2021)