

INSIDE THIS ISSUE

- Could the IRS Prepopulate Income Tax Returns?
- Regulatory Costs and Delays Reduce Generic Drug Competition
- El Salvador's Experiment with Bitcoin as Legal Tender
- How Did the COVID Pandemic Affect the Number of Births?
- Pandemic-Induced Remote Work and Rising House Prices

Impacts of the European Union's Data Protection Regulations

The European Union enacted its General Data Protection Regulation (GDPR) to protect the personal data of citizens and harmonize privacy policies across member states. The regulation strengthened consumers' privacy rights and required app developers to ask customers' permission before they could use their data to, say, target online ads or conduct other revenue-producing activities. Developers also had to guarantee that customers could access, rectify, erase, and restrict the processing and portability of personal data. The law was enacted in 2016 and implemented two years later.

GDPR has made European apps less intrusive, but sharply reduced the introduction of new ones and led to many being withdrawn. In [GDPR and the Lost Generation of Innovative Apps](#) (NBER Working Paper 30028), [Rebecca Janßen](#), [Reinhold Kesler](#), [Michael E. Kummer](#), and [Joel Waldfogel](#) detail the effects of the privacy improvements by studying the set of apps that were available on Google's Play Store between July 2016 and October 2019.

The new law made app development more time-consuming and costly, according to the

researchers, who surveyed 650 German app developers for Google's Android platform. Eighty-five percent of the developers said administrative burdens to comply with the law posed a challenge, 48 percent mentioned additional costs, and 36 percent indicated

New rules made European apps less intrusive, but entry of new apps fell 47 percent and the number of new entrants that became successful fell by more than 40 percent.

a lack of knowledge about the regulation's details. One in seven reported they removed an app from the market because of the new requirements and costs, and one in 11 said they chose not to launch a developed app. These estimates may be conservative since the

survey only contacted developers who were still operating in 2019; some pre-GDPR developers may have withdrawn from the market.

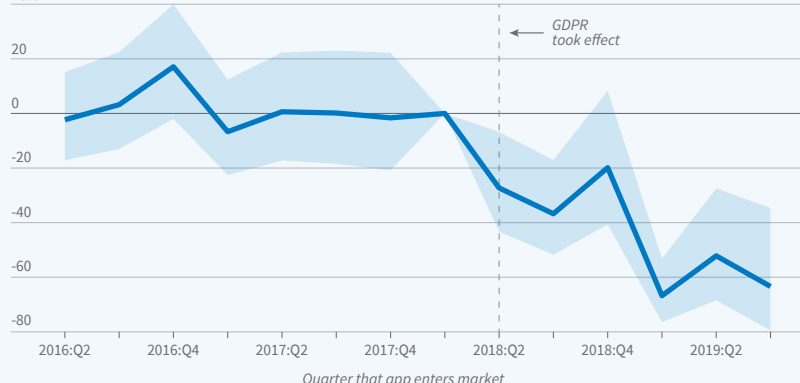
In mid-2016, 2.1 million apps were available on the Google Play Store platform.

That rose to 2.8 million near the end of 2017, then dropped by nearly 1 million by the end of 2018 — six months after GDPR went into effect. In the year before GDPR took effect, exits or disappearances of apps averaged about 100,000 per quarter. In the immediate aftermath of GDPR taking effect, that number jumped to 600,000 exits per quarter.

Apps that requested privacy-sensitive information were more likely to exit than other apps. A third of all such apps disappeared around the enactment of GDPR. The disappearances were concentrated among marginal apps: the combined market share of those that disappeared was only about 3.3 percent. The researchers find that apps that offered within-app purchases and relied

The General Data Protection Regulation and Entry of Successful Apps

Number of new apps that reach 100,000 cumulative downloads, relative to the quarter before privacy regulations took effect



Source: Researchers' calculations using data from the Google Play Store

less on intrusive data practices for revenue were less likely to disappear than those that relied on sensitive personal data.

More important than GDPR's effect on exit is its effect on new entry. When it is difficult to predict which new products will succeed, then the volume of entry has an important effect on the benefit that consumers receive: larger cohorts of entering products

include both more eventual winners (successful products) and more eventual losers. Entry of new apps fell 47 percent after GDPR took effect. Not only did entry fall overall, but the smaller post-GDPR entry cohorts included 40 percent fewer apps eventually reaching substantial success with consumers.

The law also appears to have accelerated a trend away from new intrusive apps.

Weighted by usage, the share of new apps requesting one or more pieces of privacy-sensitive data fell from 57 percent before the law to 47 percent afterwards.

The researchers conclude that evaluating privacy regulations such as GDPR requires balancing their privacy benefits against the potential cost of foregone innovation.

—*Laurent Belsie*

Could the IRS Prepopulate Income Tax Returns?

Americans spend an average of \$200 and 12.5 hours per year filing individual income tax returns. More than 40 percent of filers, particularly filers with lower incomes, could save that money and time if the IRS prefilled their tax returns, [Lucas Goodman](#), [Katherine Lim](#), [Bruce Sacerdote](#), and [Andrew Whitten](#) find in *Automatic Tax Filing: Simulating a Prepopulated Form 1040* (NBER Working Paper 30008).

Using a random, representative sample of 344,400 anonymized individual federal returns filed in 2019, the researchers prepopulate tax returns with income data reported directly to the Internal Revenue Service (IRS). This includes information on wages (Form W-2); unemployment compensation (Form 1099-G); interest, dividends, and capital gains (Forms 1099-B and 1099-DIV); non-employee compensation (Form 1099-MISC or 1099-NEC); and income from partnerships and S corporations (Forms 1065 and 1120S, Schedule K-1). The researchers then compare their prepopulated tax returns with the actual returns that taxpayers filed.

They measure the degree of agreement between the prepopulated and actual tax returns in two ways. Their first definition of

agreement is that the actual tax return does not include any nontrivial income, deductions, or credits that do not appear on the prepopulated return. This metric yields an upper bound on

Prepopulation would be most accurate for taxpayers who are single, lack dependents, have no credits or deductions, and whose only income is wages under \$100,000.

the degree of agreement. Their second definition, which yields a lower bound, requires that the tax liability on the prepopulated return fall within \$100 of that on the actual tax return. Using these two metrics, the research-

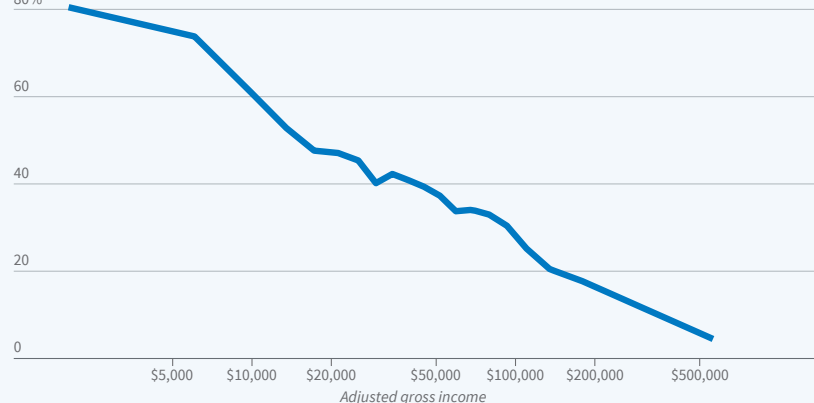
ers find that the accuracy rate for this group is between 78 and 82 percent. Accuracy rates vary with adjusted gross income (AGI). For those with AGI in the bottom 15 percent of tax filers, below about \$10,000, the two measures of accu-

accuracy are 61 and 80 percent. For those at the 65th percentile of AGI, around \$60,000, accuracy rates are between 34 and 51 percent, and for those with AGIs in the top 5 percent accuracy is lower still, between 10 and 30 percent. The decline in the accuracy rates for higher-income taxpayers is driven largely by increasing rates of itemized deductions, which cause a divergence between prepopulated and actual returns.

Among taxpayers who would have had an accurately prepopulated return, almost 45 percent used a paid preparer when filing. Even for those for whom the IRS could not fully complete a return, prepopulation could still yield

Accuracy of Tax Liability Calculations on Prepopulated Returns

Percentage of pre-populated returns with tax liability within \$100 of liability on taxpayer-filed return



Source: Researchers' estimates using data from the IRS

ers conclude that prepopulating returns would be accurate for between 62 and 73 million returns, or 41 to 48 percent of filers.

Prepopulation is particularly accurate

significant time savings. Among the 52 to 59 percent of taxpayers with inaccurately prepopulated returns, the majority would need to make only one change — such as reporting self-employment income or deductions — or complete one additional schedule.

Prepopulation would affect nonfilers, those who did not need to file a tax return, as well as those who do. Of the 46.3 million taxpayer units that did not have a filing obligation based on income in 2019, 17 percent (8 million) were entitled to a refund. These

refunds averaged \$387. On the other hand, the researchers identify 8.8 million nonfilers who had a filing obligation. Fifty-five percent of this group (4.9 million) would have owed additional taxes if they had filed a return.

—Brett M. Rhyme

Regulatory Costs and Delays Reduce Generic Drug Competition

Court cases brought against Teva Pharmaceuticals and a number of other generic drug manufacturers allege that for several years beginning in 2013, they participated in a price-fixing scheme that substantially increased the prices of many generic drugs. In [Does Entry Remedy Collusion? Evidence from the Generic Prescription Drug Cartel](#) (NBER Working Paper 29886), [Amanda Starc](#) and [Thomas G. Wollmann](#) exploit these price increases to study the factors that lead drug companies to enter new markets.

Entry rose in response to price increases. Because there are substantial and uncertain costs associated with entry, however, firms must expect substantial profits before taking this step. The researchers use the observed patterns of entry behavior, along with estimates of the demand for generic drugs during this period, to estimate the price trajectories that might have resulted if new competitors had entered promptly when prices rose.

The researchers study how drug demand and competitive entry responded to the price increases that are alleged, according to a 2019 complaint filed against the drug makers by 44 state attorneys general, to have resulted from the cartel's operation. The complaint claims that an executive hired by Teva in 2012 led a campaign to raise prices on commonly

prescribed medications, such as those for treating cancer, bacterial infections, pain, and high blood pressure. Competitors fol-

lowed suit; prices rose sharply between July 2013 and January 2015, according to the complaint. This price variation was arguably unrelated to changes in drug demand or other factors.

The researchers chart generic drug prices

fixing cartel had risen by 50 percent relative to other generic drugs.

The run-up in generic drug prices raised

Sharp drug price increases in the last decade encouraged entry into the market, but regulatory costs and delays limited entry's impact.

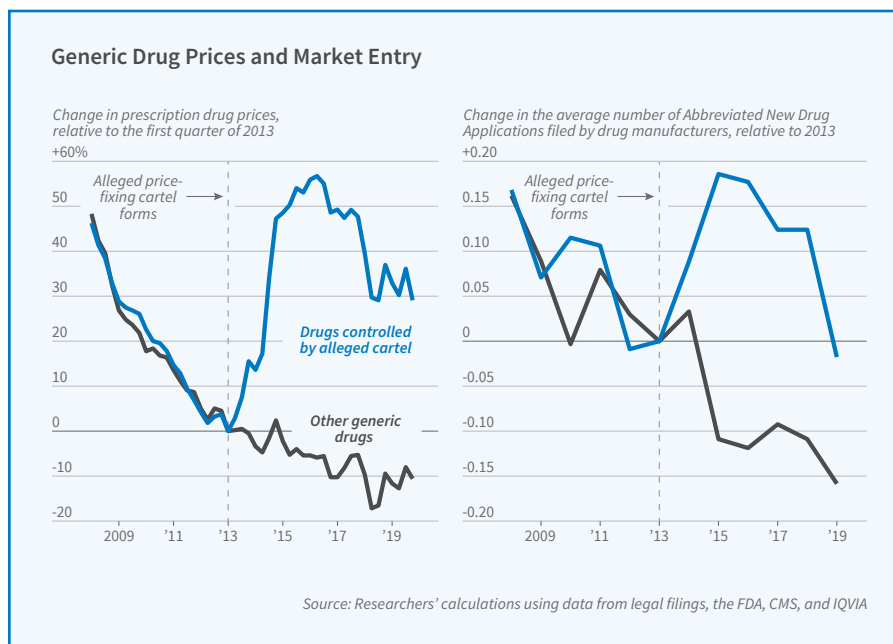
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The researchers chart generic drug prices

costs to consumers by nearly \$1 billion in 2013, \$1.9 billion in 2014, and \$2.5 billion in 2015. The price increases drew government scrutiny and also induced other pharmaceutical companies to enter the markets for specific generic drugs. Compared

with the period prior to the alleged formation of the cartel, potential competitors filed 30 to 40 percent more requests for Food and Drug Administration approval of generics.

The researchers estimate that the cost of entry averages \$3.2 million per drug, including research and development and various government fees. The approval process can take up to four years. To the extent that entry could have undermined the cartel's



between 2008 and 2019, comparing trends for those that were allegedly part of the price-fixing scheme with trends for those that were not. The prices for both groups of drugs followed similar downward trends over the 2008–13 period, but their paths diverged after 2013. By 2016, prices on many drugs that were allegedly controlled by the price-

alleged power, lower entry costs and speedier approvals could have reduced drug prices. The researchers estimate that lowering entry costs by \$800,000 per application would have saved consumers \$374 million during the period of alleged price-fixing. Reducing delays would have had a bigger payoff: a one-year reduction in time to approval would

have led to savings of \$596 million.

The researchers caution that assessing either of these policy levers is com-

plex. For example, reducing fees “may draw resources away from other oversight activities,” and speeding up approvals “may require

additional staff (or, again, result in lax enforcement).”

— Steve Maas

El Salvador’s Experiment with Bitcoin as Legal Tender

In September 2021, El Salvador became the first country to make bitcoin legal tender, requiring all businesses to accept the cryptocurrency. In an attempt to popularize and regularize its use, the government gave citizens financial incentives to download a special cryptocurrency app.

Half the nation’s households downloaded the app when the bitcoin law went into effect. Since the start of 2022, however, very few households have joined the early movers. Among early downloaders, more than 60 percent have not made a transaction after spending the free bitcoin that came with the account, and 20 percent have yet to spend the bonus. However, a small group of consumers, most of whom are banked, educated, young, and male, is very active on the app. This group was not the intended target of the bitcoin rollout. In [Are Cryptocurrencies Currencies? Bitcoin as Legal Tender in El Salvador](#) (NBER Working Paper 29968), [Fernando E. Alvarez](#), [David Argente](#), and [Diana Van Patten](#) report on a nationally representative, face-to-face survey of 1,800 Salvadoran households that explored the breadth of the digital currency’s acceptance and the reasons more Salvadorans are not taking advantage of the technology.

In theory, developing nations like El Salvador are ideal candidates for cryptocurrency adoption. More than half its citizens rely exclusively on cash, rather than credit or debit cards. Some 70 percent of households have no bank account and nearly 90 percent do not use

mobile banking. A digital payment platform could be a way to make the economy more inclusive and accessible.

El Salvador introduced the Chivo Wallet in September 2021 along with incen-

Despite free bitcoin and discounted gasoline for those downloading and using the cryptocurrency app, downloads have stalled and use in daily life is not widespread.

tives to get households to download and use it. These included \$30 in free bitcoin with each download, which is nearly 1 percent of average annual per capita income, and large discounts on gasoline paid for in bitcoin. Residents didn’t need a bank account

conversions from bitcoin to dollars, and withdrawals at Chivo ATMs incur no fee.

Almost 78 percent of those who were aware of the app tried to download it. The most common motivator was the \$30 bonus,

although respondents also pointed to the contactless payment technology at a time when the COVID-19 pandemic was in full swing, and the potential to receive remittances. Among the one in five Salvadorans who knew about Chivo but did not download it, the top reason

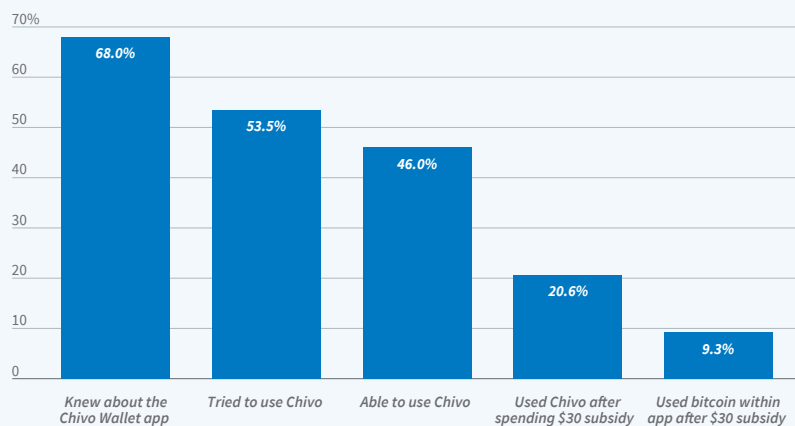
was a preference for using cash. Others said they did not trust the system or bitcoin, they did not own a phone with internet, or the technology was complicated.

Even among active users who reported using the app after spending the bonus, more than half have not withdrawn cash from a Chivo ATM. But the mean number of ATM withdrawals is 2.59, which suggests that a small group of users is very active on the system.

Although the law requires all firms to accept bitcoin, in reality only 20 percent do so. Roughly 5 percent of all sales have been paid in bitcoin through Chivo Wallet, and just as most households using Chivo prefer to keep their money in cash rather than in bitcoin, 88 percent of firms convert their bitcoin into dollars.

— Laurent Belsie

Measures of Bitcoin Use



Source: Researchers’ calculations using data from a national survey in El Salvador

or a credit card to make transactions, only a mobile phone with internet access, something two-thirds of residents had.

Yet another perk was fee-free transactions. Outside Chivo, bitcoin transactions can involve large fees. Using a bitcoin ATM can run up charges of up to 20 percent of the transaction amount. But with Chivo, transactions,

How Did the COVID Pandemic Affect the Number of Births?

The COVID-19 pandemic has had important effects not just in hospital intensive care units, but in maternity wards as well.

In [The US COVID-19 Baby Bust and Rebound](#) (NBER Working Paper 30000), [Melissa Schettini Kearney](#) and [Phillip B. Levine](#) document a large drop in births associated with conceptions during the first several months of the pandemic.

In [The Missing Baby Bust: The Consequences of the COVID-19 Pandemic for Contraceptive Use, Pregnancy, and Childbirth among Low-Income Women](#) (NBER Working Paper 29722), [Martha J. Bailey](#), [Lea J. Bart](#), and [Vanessa Wanner Lang](#) suggest that reduced access to reproductive health services likely resulted in more births among disadvantaged women than would have been expected given the economic slowdown.

Kearney and Levine study monthly births from October 2016 through December 2021 and calculate the gap between actual births during the pandemic and the number that would have been expected based on pre-pandemic trends. They date all births to the likely month of conception.

They estimate a “birth gap” of 62,000 conceptions during the early months of the pandemic. The low point was April 2020. Conceptions leading to live births rebounded from June to December 2020; there were 51,000 more births than projected.

Several factors might explain these patterns. The jobless rate jumped from 3.5 percent at the start of 2020 to 14.7 percent in April 2020; it dropped to 6.9 percent in October 2020. Federal stimulus payments to households, and the public health crisis itself, may have altered families’ childbearing plans.

The researchers use state-level data to analyze how these factors contributed to the ini-

tial baby bust and subsequent rebound. During the initial bust period, states with larger drops in household spending, and stronger COVID outbreaks, experienced larger declines in con-

Conceptions leading to live births decreased during the pandemic recession, then rebounded. Birth rates were likely affected by low-income women’s reduced access to contraception.

ceptions leading to live births. The drop was greatest in New York, the epicenter of the early pandemic in the US.

In the rebound period, the strengthening labor market played an important role. In states where the unemployment rate fell most and household spending recovered most, conceptions leading to live births rose most. The COVID case rate had a smaller relationship to birth rates during the rebound period than earlier.

States where births fell most at the onset

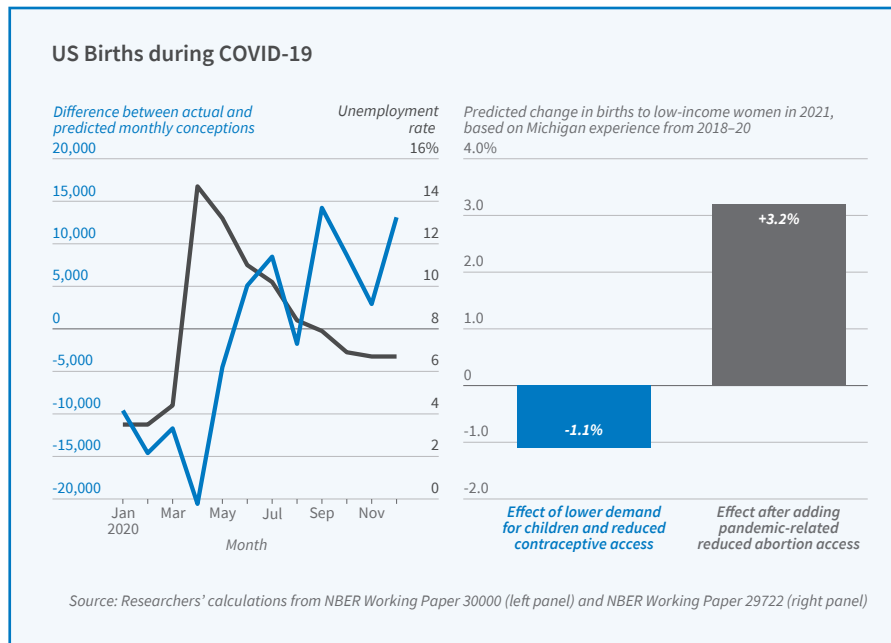
birth rates. To gauge the impact of such closures, they draw on a pre-pandemic study in Michigan that analyzed how the use of contraception by low-income, uninsured women

changed before and after a visit to a Title X health clinic. Title X is a federal program subsidizing reproductive health care. The Michigan study found that a typical subsidized visit to a health center affected the practice of contraception and resulted in eight fewer pregnancies per 100 patients.

To compare the potential importance of clinic closures and the pandemic-related economic downturn, the researchers apply Kearney and Levine’s method of analyzing historical birth patterns. They estimate that births among low-income women would have fallen by 8 percent during the 2020 recession had there been no change in their access to contraception. Allowing for the impact of anxiety about COVID raises this estimate to more than 9 percent: 16,250 fewer births nationwide. To account for the impact of clinic closures during the pandemic, which reduced access to contraception, they extrapolate the Michigan experience to the nation’s Title X pop-

ulation. Accounting for variations in demographics, they estimate that cutbacks in reproductive care could have raised the number of births among low-income women by 14,350. On balance, they predict a net decline from the pandemic recession as well as reduced contraception access of fewer than 2,000 births, or 1.1 percent, in the low-income population.

— Steve Maas



Pandemic-Induced Remote Work and Rising House Prices

From December 2019 to November 2021, US house prices grew by 23.8 percent, the fastest rate on record. At the same time, the COVID-19 pandemic reshaped where and how Americans work. In November 2021, 42.8 percent of employees worked from home either part- or full-time. Some reports suggest that a significant fraction of pandemic-induced remote work may become permanent.

In *Housing Demand and Remote Work* (NBER Working Paper 30041), John A. Mondragon and Johannes Wieland find that the shift to remote work induced by COVID-19 caused a large increase in housing demand and accounted for at least half of recent aggregate house price growth. They offer a fundamentals-based explanation for the record increase in house prices and suggest that the future trajectory of remote work may be a key determinant of housing demand and house prices in the future.

The researchers estimate the effect of remote work on housing demand and house prices using variation in the propensity for remote work across core-based statistical areas. They find that areas where remote workers accounted for a larger share of employment prior to the pandemic also experienced larger increases in remote work during the pandemic.

This finding is not affected by adding controls for local economic characteristics, such as population density or labor market outcomes before and during the pandemic.

Areas in which more people worked remotely before COVID-19 experienced higher house price growth over the course of the pandemic.

The researchers show that areas with more exposure to remote work saw significantly higher house price growth. One additional percentage point of workers engaged in remote work during the pandemic implies an additional 0.93 percent increase in house prices from December 2019 to November 2021 after controlling for the effect of net migration on house prices. This cross-sectional estimate, combined with the aggregate shift to remote

work, implies that remote work raised aggregate US house prices by 15.1 percent. They validate this aggregation using a general equilibrium model of housing demand, migration,

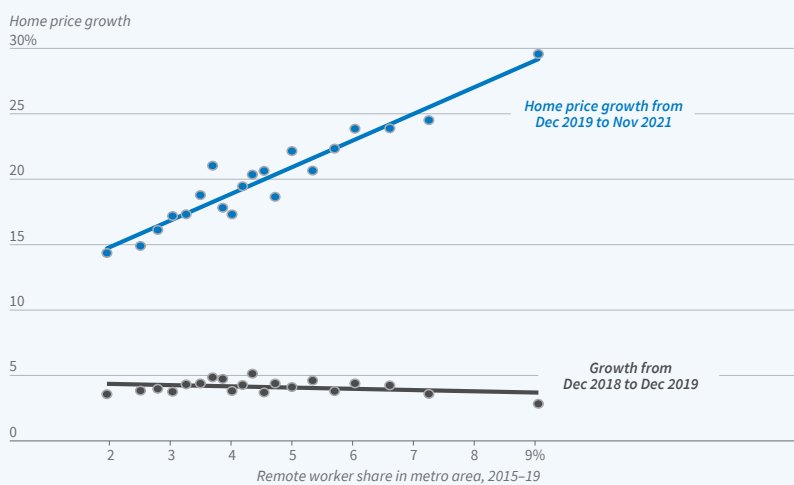
and remote work choice.

The researchers note that if the shift to remote work raised housing demand, it should also have resulted in increased rents. They find effects of remote work on rental price growth that are almost identical to those on house price growth. They also show, in a more limited sample of locations, that greater exposure to remote work predicts a decline in commercial rents, consistent with reduced demand for office space. Local inflation excluding shelter is only weakly associated with exposure to remote work, consistent with an increase in the demand for housing relative to other goods. Remote work is also positively associated with an increase in issuance of building permits.

The researchers conclude that house price growth during the pandemic largely reflected a change in fundamentals rather than a speculative bubble.

—Lauri Scherer

Housing Prices and Remote Work



Source: Researchers' calculations using data from Zillow and the ACS

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