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The Digest

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Supply Chain Disruptions and Pandemic-Era Inflation

The COVID-19 pandemic led to major disruptions in global supply chains. In The Causal Effects of Global Supply Chain Disruptions on Macroeconomic Outcomes: Evidence and Theory (NBER Working Paper 32098), Xiwen Bai, Jesús Fernández-Villaverde, Yiliang Li, and Francesco Zanetti analyze container ship data to measure these disruptions and investigate how they affected inflation during and after the pandemic.

They find that the drop in inflation at the onset of the pandemic was due to a drop in aggregate demand due to mobility restrictions, and that the subsequent rise was mainly due to adverse shocks to supply chains. By 2022, the main driver of inflation shifted from supply chain shocks to constraints on productive capacity, likely due to reduced levels of labor supply. In late 2022, inflation began to decline as a result of weakened demand, strengthened capacity, and supply chain recovery.

Containerized seaborne trade accounts for 46 percent of all international trade. Large container ships operate on fixed itineraries, and even mild congestion can lead to substantial delays, costs, and trickle-down consequences. During the pandemic, wait times at some ports extended from only a few hours to two to three days.

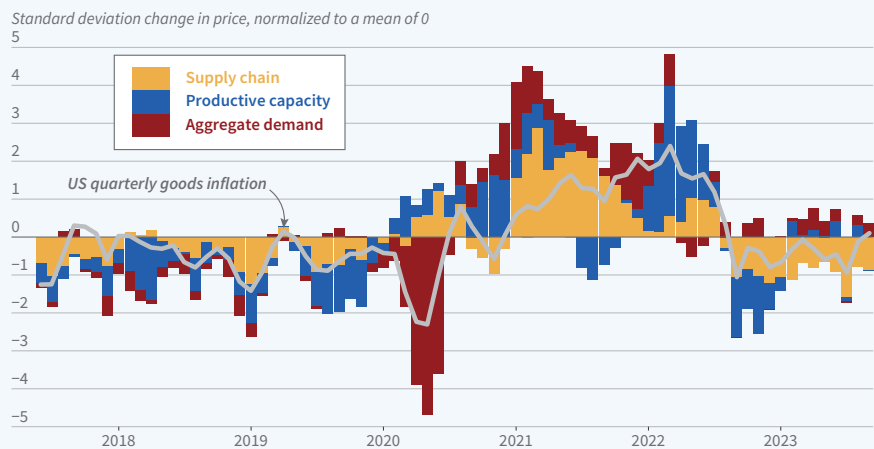Ports include both anchorages and berths. Vessels moor at berths to load and unload cargo; if a port is not congested, a vessel can moor directly at a berth upon arrival. When a port is congested, a vessel will moor first in an anchorage area; mooring patterns can be used to measure congestion. The researchers obtain data from January 2017 to September 2023 from the automatic identification system of the International Maritime Organization, which tracks all vessels larger than 300 gross tons at high frequency. They train a machine learning algorithm to identify areas with high densities of ships and then determine whether ships are at a berth or an anchorage. They define congestion as the fraction of ships that first moor at an anchorage when reaching port and compute the average congestion rate in each month, a ship-visit weighted average of congestion over the top 50 container ports worldwide.

They find that congestion was declining prior to the pandemic, and was around 25 percent from early 2019

Port congestion initially drove COVID-related inflation but was supplanted by productivity shocks later in the pandemic.

Decomposition of US Inflation, 2017–23

Standard deviation change in price, normalized to a mean of 0

Legend: Supply chain, Productive capacity, Aggregate demand; US quarterly goods inflation

The monthly series are normalized to have a mean of 0 and a standard deviation of 1 over the sample period, January 2017 to September 2023.
Source: Researchers' calculations using data from various sources.

to mid-2020. It rose to 37 percent in mid-2021 before declining again; it returned to normal levels in mid-2023.

The researchers develop a macroeconomic model of congestion in which producers and retailers must match to each other to trade. A supply chain shock increases transportation costs and makes it harder to match.

Using this framework, they estimate the effects of aggregate demand, productive capacity, and supply chain shocks on GDP, personal consumption expenditure (PCE) prices, import prices, retail market tightness, unemployment, and the average congestion rate index. A negative one standard deviation supply chain shock leads to

real GDP decline and an unemployment increase of around 0.2 percent. Retail market tightness initially increases but falls in the following quarter. PCE goods prices increase by up to 0.3 percent and import prices by up to 0.5 percent.

—*Whitney Zhang*

Household Portfolio Rebalancing and Equity Market Fluctuations

How investors adjust their portfolios in response to movements in asset prices and other shocks is a key input to asset pricing models, yet data limitations mean there is relatively little evidence on these behavioral responses, particularly for high-net-worth households. In Asset Demand of US Households (NBER Working Paper 32001), Xavier Gabaix, Ralph S. J. Koijen, Federico Mainardi, Sangmin Oh, and Motohiro Yogo leverage a new dataset on households' portfolios to explore portfolio rebalancing behavior.

The data were provided by Addepar, a wealth management platform that provides investment advisors with data analytic tools. The researchers analyze data from January 2016 to
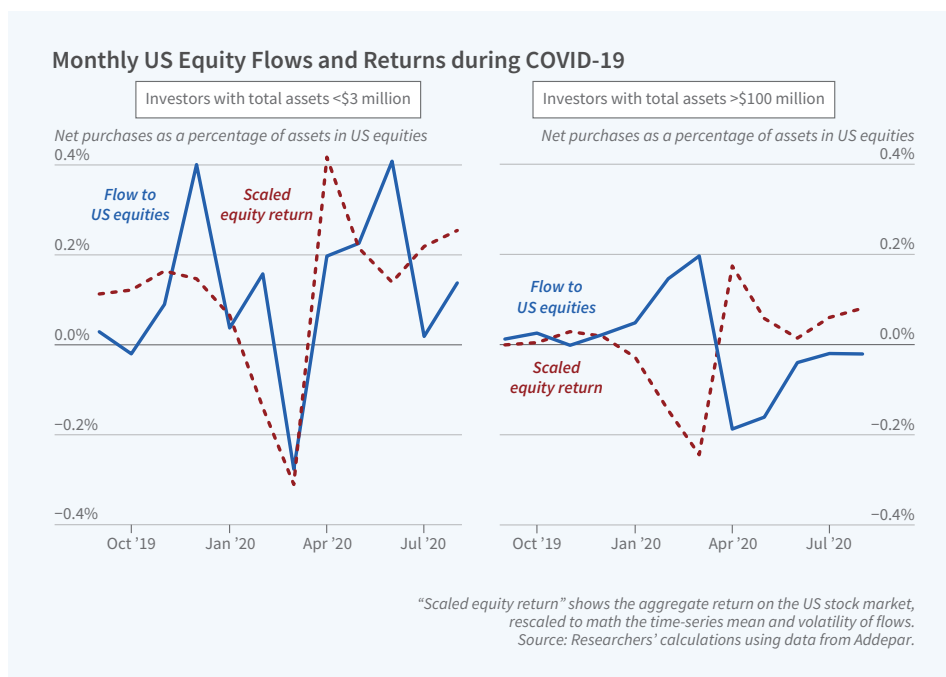

Data from the last decade show ultra-high-net-worth households bought equities during market declines, while high-net-worth households sold.

March 2023. The security-level dataset includes information on a broad set of households across the wealth distribution, including 990 ultra-high-net-worth (UHNW) households, defined as those with portfolios worth more than $100 million, and it covers a broad set of asset classes at a very high frequency. Addepar collects information on indirect holdings (e.g., through mutual funds, hedge funds, and exchange-traded funds) as well as direct holdings, and the data cover public and private asset classes. The Addepar data provide a larger sample

of high-net-worth households than US household surveys, such as the Survey of Consumer Finances, and can therefore be used to study their behavior.

The researchers present summary information on portfolio composition and the way it varies with investor net worth. The fraction of the household portfolio held in cash varied relatively little across the wealth distribution, while the portfolio share of municipal bonds increased with portfolio size and the fraction invested in corporate bonds and global equities declined.

For most investors in the dataset, portfolio flows to risky assets are positively correlated with returns, indicating procyclical investment decisions. For the typical investor in the dataset, a 10 percent rise in equity values was associated with a shift of about 0.1 percent of household portfolios toward equities. Disaggregating the investor population, however, revealed important heterogeneity in rebalancing behavior across the wealth distribution: UHNW households are countercyclical. Given the larger value of their portfolio holdings, when rebalancing patterns are weighted by portfolio value, the net effect of a rise in equity returns is an outflow from equity, albeit a small one. The researchers conclude that it is "unlikely to be an important stabilizing force."

Monthly US Equity Flows and Returns during COVID-19

Investors with total assets <$3 million

Net purchases as a percentage of assets in US equities

Flow to US equities

Scaled equity return

Investors with total assets >$100 million

Net purchases as a percentage of assets in US equities

Flow to US equities

Scaled equity return

"Scaled equity return" shows the aggregate return on the US stock market, rescaled to math the time-series mean and volatility of flows.
Source: Researchers' calculations using data from Addepar.

The researchers attempt to explain the factors that drive changes in household asset allocation patterns. They find that three factors that provide exposure to the long-term equity risk premium (defined as the difference between expected equity returns and long-term Treasury yields), the credit premium (the yield spread between corporate bonds and Treasuries), and the municipal bond premium (the gap between the yields on taxable fixed income securities and municipal bonds) explain approximately 81 percent of the variation in rebalancing across the 13 asset classes they consider.

—Linda Gorman

When Central Bankers' Words Spoke Louder than Their Actions

When the COVID-19 outbreak depressed financial markets, the most effective central banks were those that convinced market participants that they would do whatever was necessary to restore stability.

With more than half the world's population under stay-at-home mandates by the end of March 2020, many businesses were forced to close and economic activity plunged. Stock markets fell, and some investors rushed to cash out. In response, central banks enacted expansionary policies to bolster aggregate demand and restore market stability. Between 2020 and 2021, the Federal Reserve increased its asset holdings by 22 percent of GDP; the European Central Bank increased its holdings by 33 percent. Both purchased government securities primarily, but they also bought corporate bonds and asset-backed instruments.

In Whatever-It-Takes Policymaking during the Pandemic (NBER Working Paper 32115), Kathryn M.E. Dominguez and Andrea Foschi examine how interest rates and exchange rates responded to the monetary policy announcements of 23 central banks between March 2020 and December 2021. The 23 central banks made 166 asset-purchase announcements during the study period, 28 percent of which were coded as open ended. Policy announcements that suggested a willingness to do whatever it took to restore market confidence had significantly greater impact than announcements that included an explicit limit on the scale of asset purchases.

The researchers find that on average, whatever-it-takes announcements lowered 10-year bond yields by 47 basis points more than size-limited announcements. Further, open-ended announcements had a sizable effect on the yields of longer maturities – maturities that go well beyond the time by which asset purchases would have stopped, suggesting that the announcements affected long-run expectations. When central banks made several whatever-it-takes announcements, the later ones had a smaller effect, on average, than the first one.

"[T]he real power of whatever-it-takes policy lies largely in its shock-and-awe effect when it is first announced," the researchers write. They stress that their findings are about the impact of the announcements, not subsequent purchases. The size of asset purchases often turned out to be much smaller than the markets had initially anticipated.

The relative impact of open-ended announcements was less pronounced for bonds of shorter duration, for which interest rates were already near zero in many advanced economies. Whatever-it-takes policy announcements were particularly effective at lowering rates in emerging markets, where fewer central banks had employed major asset purchase programs in previous recessions, making their announcements more of a surprise.

Exchange rate responses to central bank announcements varied. Traditionally, a nation's currency depreciates when the central bank lowers interest rates. However, during times of financial turmoil, safety concerns can feature prominently in investor decisions. When some advanced economies' central banks announced asset purchases,

Response of 10-Year Yield to Asset Purchase Announcements

Change in yield, basis points

Days since announcement
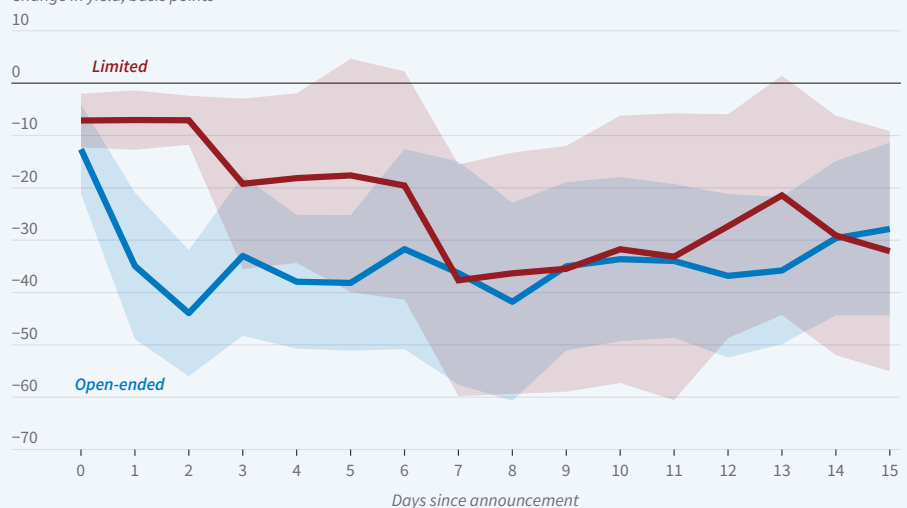
Source: Researchers' calculations using data on central bank announcements.

their currencies appreciated due to the reinforced perception of safety. In emerging economies, however, open-ended announcements resulted in significant depreciation.

"Whatever-it-takes announcements set a high bar, potentially leading to ever escalating market expectations for large-scale intervention," the researchers conclude. "It does not follow

that central banks can rely on whatever-it-takes policy in future crises."

—*Steve Maas*

Increased Immigration Enforcement and the Public Safety of Hispanics

In 2008, the US government launched the Secure Communities (SC) program, an information-sharing initiative that expanded the government's ability to identify and detain individuals in violation of immigration law who were arrested for criminal offenses. The program, which was promoted as a way to improve public safety, was implemented piecemeal across counties between October 2008 and January 2013. It doubled the number of individuals transferred to Immigration and Customs Enforcement (ICE) custody, 90 percent of whom were Hispanic.

The SC program required that the fingerprints of individuals booked in local jails, typically sent to the Federal Bureau of Investigation, also be forwarded to the Department of Homeland Security. This latter agency could then determine whether to initiate deportation proceedings. Over

Mandatory information sharing between local police and ICE led to a 30 percent decrease in reporting of crimes and a 16 percent rise in victimization among US Hispanics.

half of subsequent ICE arrests resulted from these local law enforcement referrals, and the program raised the number of transfers to ICE custody by 50 percent. Following this increased collaboration between local police and federal immigration authorities, law enforcement officials warned that this program would reduce trust in police among immigrant communities and reduce police effectiveness.
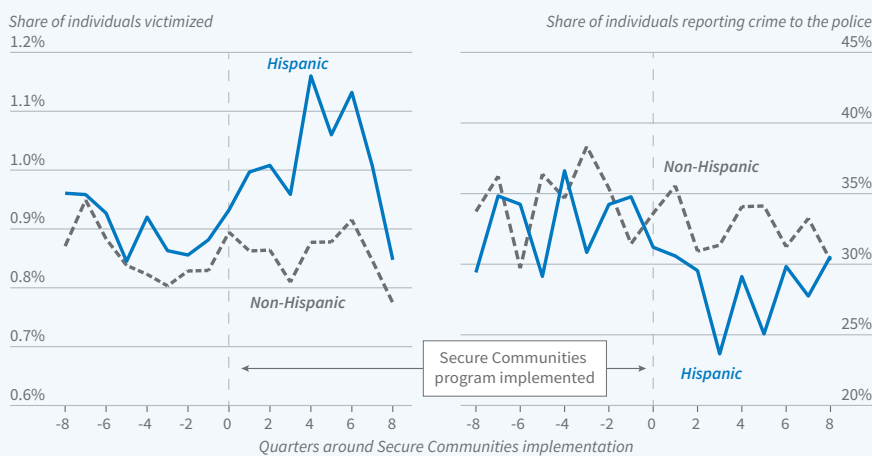
In Immigration Enforcement and Public Safety (NBER Working Paper 32109), Felipe M. Gonçalves, Elisa Jácome, and Emily K. Weisburst study the county-level introduction of the SC program and the effect of this increase in immigration enforcement on criminal victimizations and on the

likelihood of victims reporting crimes to the police. Using data from the National Crime Victimization Survey, they show that after the SC program went into effect, Hispanics were 30 percent less likely to report criminal incidents to the police.

At the same time, victimizations of Hispanics rose 16 percent, which translates to 1.3 million more crimes — mostly property crimes — with Hispanic victims in the two years following the program's implementation. The researchers did not find any change in crime reporting or victimization rates for non-Hispanics. Counties with larger declines in reporting rates experienced larger increases in victimization rates, suggesting that the decline in crime reporting among Hispanics was the key channel through which SC increased victimization.

The researchers also analyze data on 911 calls and arrests from 75 US police departments over the 2006 to 2013 period. They find that the volume of arrests post-SC did not change in either Hispanic or non-Hispanic neighborhoods, but that in predominately Hispanic neighborhoods there was a 3 percent decline in the Hispanic share of arrestees. This change in the composition of offenders is consistent with the SC program having raised the expected cost of committing a crime — by increasing the likelihood of deportation — among unauthorized immigrants. On the other hand, citizen offenders were incentivized to commit additional crimes given the lower

Immigration Enforcement and Public Safety Outcomes

Share of individuals victimized

Share of individuals reporting crime to the police

Quarters around Secure Communities implementation

Secure Communities program implemented

The 2008 Secure Communities program significantly expanded the federal government's ability to identify and detain arrested individuals who are also in violation of immigration law.
Source: Researchers' calculations using data from the National Crime Victimization Survey.

likelihood of apprehension in these neighborhoods.

The research shows that officially reported crime rates may obscure substantial changes in underlying victimization levels. Reported crime rates were unaffected by the SC program, masking the increase in Hispanic victimization and the decrease in Hispanic crime reporting. This finding highlights the crucial importance of separately measuring changes in victimization and reporting behavior to accurately detect the full impact of policies like SC on public safety.

—Leonardo Vasquez

Global Evidence on the Decline and Recovery of Rust Belt Cities

Manufacturing employment peaked in the United States and the United Kingdom in the 1970s, in France and Italy in the '80s, and in Germany and Japan in the '90s. Each of these countries experienced deindustrialization that lowered manufacturing employment. On average, between the peak manufacturing year for each country and 2010, total employment rose by 7.5 percent while manufacturing employment dropped by 7 percent.

In The World's Rust Belts: The Heterogeneous Effects of Deindustrialization on 1,993 Cities in Six Countries (NBER Working Paper 31948), Luisa Gagliardi, Enrico Moretti, and Michel Serafinelli find that cities with higher shares of college-educated workers were more likely to recover from the loss of manufacturing jobs, and that cities that depended more on manufacturing jobs were more vulnerable to deindustrialization.

The researchers stratify cities into terciles based on their manufacturing employment share in the year of their country's manufacturing peak. In the two decades preceding that peak, the average employment growth rates for cities in all terciles were similar to the aggregate employment growth rates in their respective countries. However, growth diverged in the post-peak decades. The tercile of cities labeled "former manufacturing hubs" experienced falling employment, while cities in the other terciles experienced growth. A 1 standard deviation increase in a city's initial manufacturing share, 16.1 percentage points, was associated with a 2.7 percent per decade decrease in total employment growth after the manufacturing peak.

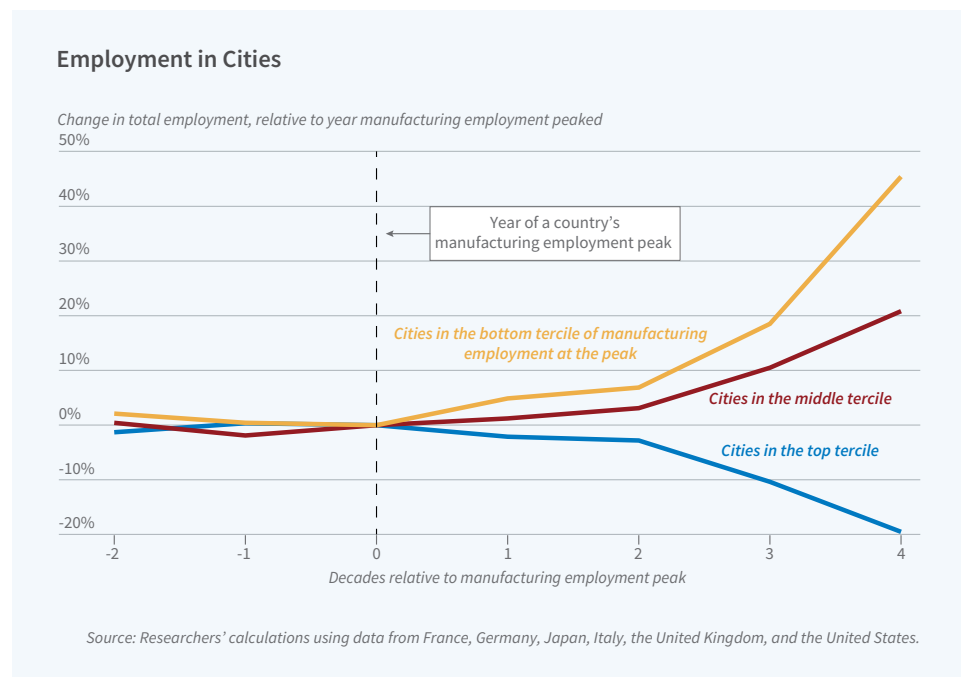While a majority of former manufacturing hubs lost employment relative to

> *Former manufacturing hubs with higher shares of college-educated workers were more likely to recover from employment losses related to deindustrialization.*

national benchmarks during deindustrialization, 34 percent of these cities either maintained or accelerated their employment relative to other cities in the same country. There are substantial differences in this experience across countries. For example, nearly half of German hubs successfully recovered to their prior employment levels, compared with only 17 percent of US hubs. The researchers suggest that US Rust Belt communities were hit harder than their international counterparts in part because of their relatively less educated workforces. The gap in the college-educated share of the workforce in hubs and non-hubs, 1.7 percentage points in the US, was larger than in other countries.

The researchers provide further evidence on the role of education by segmenting cities into quartiles based on the share of their residents with a college degree in the year of their country's manufacturing peak. In the pre-peak decades, cities with and without better-educated workforces experienced similar rates of employment growth. During deindustrialization, however, cities in the top quartile by educational attainment experienced employment growth while those in the other quartiles experienced progressively greater total employment declines. A 1 percentage point increase in the share of college-educated workers correlated with a 3 percentage point increase in employment growth per decade.

—Leonardo Vasquez

Employment in Cities

Change in total employment, relative to year manufacturing employment peaked

Source: Researchers' calculations using data from France, Germany, Japan, Italy, the United Kingdom, and the United States.

Deadline Effects on Productivity: Evidence from the Patent Office

Some organizations reward employees who meet production quotas by pre-set deadlines. Such structures allow employees to manage their time between deadlines, but may also result in procrastination or rushed efforts near the deadline. In Deadlines versus Continuous Incentives: Evidence from the Patent Office (NBER Working Paper 32066), Michael D. Frakes and Melissa F. Wasserman explore whether shifting from a discrete quota structure to a continuous one reduces the bunching of work effort before deadlines. They also assess changes in outcome quality. Their analysis draws on more than 7 million patent applications filed between March 2001 and June 2022 with the US Patent and Trademark Office (USPTO).

The researchers study a 2011 reform of performance incentives for patent examiners that was designed to reduce the disproportionate share of task completions at the end of quota periods. The reform modified the USPTO's biweekly quota system by adding incentives tied to examiners' average time from patent application review to completion. They exploit differences in the ability of patent examiners with different degrees of seniority to control the timing of their review completion to analyze the impact of these incentives.

The researchers find that completion of patent application reviews on the last day of a quota period fell by roughly 50 percent following the USPTO reform. They also find a decrease in average examination pendency — a measure of the timeliness of reviews — and an increase in the day-to-day consistency of examiners' approval rates. In the pre-reform period, examiners were more likely to issue easily reversed first-round rejections as the quota deadline approached than on other days. Because these rejections could be reversed in later reviews, they might not affect the ultimate disposition of the applications, but they would prolong the overall application process. This differential spike in first-round rejections fell to almost zero following the reform.

To assess whether the change in the timing of reviews affected their quality, the researchers analyze applications that were submitted to both the USPTO and the European Patent Office (EPO). The EPO maintains similar patentability standards as the USPTO, so its decisions can provide a comparison group for the USPTO outcomes. There was no change in the concordance between USPTO and EPO decisions around the time the USPTO added the continuous incentive system. This suggests that the reforms led to a reduction in application processing time without any diminution of examination quality.

—*Lauri Scherer*

First-Round Reviews Completed by GS-14 Patent Examiners

Frequency of first-round review completion

Date of first-round review completion
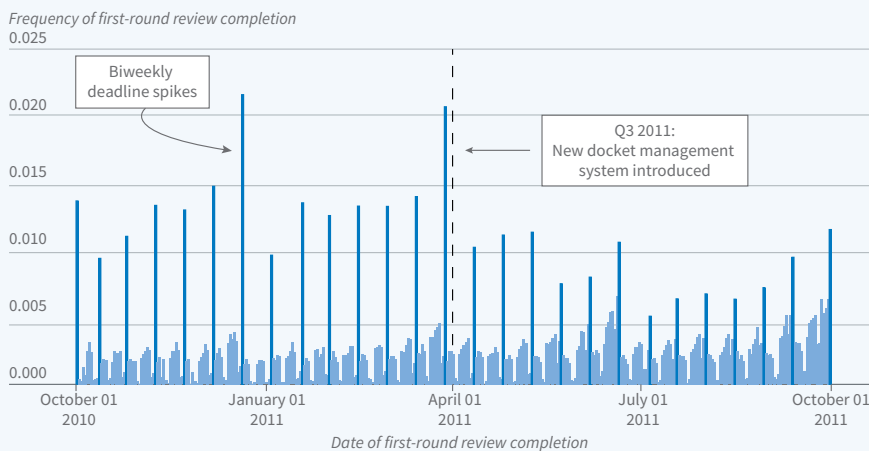
The new docket management system expanded the biweekly quota system by adding new incentives tied to average review-completion times.
Source: Researchers' calculations using the USPTO's Patent Application Information Retrieval database.