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Lifetime Earnings Differences across Black and White Individuals: Years Worked Matter

By Andrew Glover, José Mustre-del-Río, and Emily Pollard

Most research on differences in earnings between Black and white individuals has focused on differences at a point in time—for example, over the course of a month or a year. However, this approach may understate labor market inequality between Black and white individuals, especially if their lifetime employment differs. Differences in the incidence of unemployment may translate into differences in years worked over an entire career. Thus, entire lifetime earnings histories may provide a more accurate picture of labor market inequality.

Andrew Glover, José Mustre-del-Río, and Emily Pollard go beyond point-in-time measures of earnings and examine lifetime earnings differences between Black and white individuals. They find that, on average, Black individuals earn about one-third less than white individuals over the course of their lifetimes (a difference equivalent to about $550,000), though the size of this gap varies by sex and education level. In addition, they find that differences in years worked, which are not captured by point-in-time measures, contribute substantially to earnings differences between Black and white individuals.

How Much Have Record Corporate Profits Contributed to Recent Inflation?

By Andrew Glover, José Mustre-del-Río, and Alice von Ende-Becker

Inflation reached a 40-year high in 2021 and continued to climb in 2022. Record corporate profits received significant public attention as a potential explanation for high inflation. Although corporate profits and inflation do not have a direct accounting relationship, inflation is directly affected by growth in the markup, or the ratio between the price a firm charges and the firm's current marginal cost of production. Thus, the sum of the growth in the marginal cost of production and the growth in the markup is the inflation in a firm's price. Markups can change over time for many reasons, including firms' expectations for their marginal costs in the future.

Andrew Glover, José Mustre-del-Río, and Alice von Ende-Becker present evidence that markup growth was a major contributor to inflation in 2021. Specifically, markups grew by 3.4 percent over the year, whereas inflation, as measured by the price index for Personal Consumption Expenditures, was 5.8 percent, suggesting that markups could account for more than half of 2021 inflation. However, the timing and cross-industry patterns of markup growth are more consistent with firms raising prices in anticipation of future cost increases, rather than an increase in monopoly power or higher demand.

FOMC Communication Spillovers: Is There a "Call-Out" Effect?

By Karlye Dilts Stedman and Chaitri Gulati

Although the Federal Open Market Committee (FOMC) has a domestic mission, announcements from the FOMC can spill over to asset prices in foreign markets. To date, research has treated news in U.S. monetary policy announcements as a global shock that produces uniform spillovers; whether these spillovers sometimes reflect market-specific information has remained an open question. Above-average movements in foreign asset markets following the release of FOMC minutes suggest that foreign asset prices may react to FOMC communication that specifically references foreign countries, currencies, and central banks—a potential "call-out effect" of U.S. monetary policy communication.

Karlye Dilts Stedman and Chaitri Gulati present several observations that shed more systematic light on the market-specific content of international spillovers. Although they do find some evidence that mentions of specific countries in FOMC minutes can influence asset prices, these effects are modest and may reflect increased sensitivity to monetary policy shocks rather than the release of country-specific information. Thus, a "call-out effect" of U.S. monetary policy communication may be minimal.

Lifetime Earnings Differences across Black and White Individuals: Years Worked Matter

By Andrew Glover, José Mustre-del-Río, and Emily Pollard

Understanding differences in earnings between Black and white individuals is important to designing policies and programs aimed at reducing these differences. Most research on this topic has focused on differences in earnings across individuals at a point in time—for example, over the course of a month or a year. However, this approach may understate labor market inequality between Black and white individuals, especially if their lifetime employment differs. Indeed, a large body of research has shown that unemployment rates of Black and white workers differ substantially and persistently over the business cycle. Differences in the incidence of unemployment may translate into differences in years worked over an entire career. Thus, entire lifetime earnings histories may provide a more accurate picture of labor market inequality.

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In this article, we go beyond point-in-time measures of earnings and examine lifetime earnings differences between Black and white individuals. We find that, on average, Black individuals earn about one-third less than white individuals over the course of their lifetime (a difference equivalent to about $550,000), though the size of this gap varies by sex and education level. Differences in years worked are an important contributor to this average Black-white earnings gap as well as the gaps between Black and white individuals of different sexes or educational backgrounds. For example, on average, college-educated Black women have higher lifetime earnings than college-educated white women because Black women work more years over the course of their lives. In addition, Black men without a high school degree have lower lifetime earnings than similarly educated white men; fewer years worked among Black men explains the majority of this gap. Overall, these examples highlight how differences in years worked, which are not captured by point-in-time measures, contribute substantially to earnings differences between Black and white individuals.

Section I briefly describes the data and how lifetime earnings are measured. Section II documents the overall Black-white lifetime earnings gap. Section III breaks down the overall gap by sex, education, and the interaction of the two, and reveals how the gap and its drivers change depending on the characteristics of the population in question.

I. Defining and Measuring the Black-White Lifetime Earnings Gap

Earnings trajectories can differ across individuals for reasons we cannot easily measure, and these differences have consequences over a lifetime. For example, two individuals with identical demographic characteristics and with the same starting pay may experience different earnings trajectories throughout their careers. Over the course of a lifetime, these differences in earnings growth accumulate and lead to differences in lifetime earnings.

Importantly, these trajectories can differ across individuals with different demographic characteristics. For example, earnings trajectories may differ across men and women if women are more likely to leave the labor force to have or raise children. Aside from sex, earnings trajectories can also differ by education. For example, high school graduates tend to enter the

workforce earlier than college graduates and thus begin earning sooner. Finally, even after accounting for sex and education, earnings trajectories can differ by race. Focusing on average hourly earnings (that is, point-in-time measures), Daly, Hobijn, and Pedtke (2017) find that nearly half of the Black-white earnings gap cannot be explained by easily observable factors such as sex or education.

To observe individuals' entire lifetime earnings trajectories as well as demographic characteristics such as race, we use data from the U.S. Census Bureau's Survey of Income and Program Participation Synthetic Beta (SSB). These data combine the strength of survey-based and administrative data by linking individuals surveyed in the Survey of Income and Program Participation (SIPP) to earnings data based on records from the Social Security Administration (SSA) and the Internal Revenue Service (IRS). The SIPP is a nationally representative longitudinal survey that captures a host of demographic characteristics (such as race and education) that are typically not available in administrative data alone. By linking individuals in this survey to earnings data from the SSA and IRS, the SSB allows us to construct lifetime earnings histories for a large sample of individuals with little to no reporting error—a sample that we can then decompose by sex and education.

Sample selection, variable definitions, and methodology

To ensure we capture individuals' entire lifetime earnings histories, we impose some restrictions on our sample. First, we examine only individuals whom we can track for many years. Specifically, we restrict our attention to those who were age 18–25 in 1978, when our sample starts. We then follow these individuals through 2014, the last year for which data are available, when they were age 54–61.[1] We further restrict our sample to individuals with at least two years of positive earnings. We consider "positive" earnings as earnings exceeding $7,000 in a year, which roughly corresponds to working part-time (20 hours per week) at the federal minimum wage ($7.25 in 2018) over the course of 50 weeks. Because our sample is based on individuals with SSA records, most individuals have at least some earnings; thus, these restrictions do not significantly affect our main results.

The two key variables of interest in our dataset are race and lifetime earnings. In the SSB, race is coded as Black, white, or other. We exclude the "other" category from our analysis as it only comprises about 5 percent

of respondents. As we have no information on ethnicity, our "white" category includes both white Hispanic and white non-Hispanic individuals. We construct lifetime earnings by summing up annual earnings at the individual level (adjusted for inflation in 2018 constant dollars). Additional details of our variable construction appear in the appendix.

Using this sample, we measure the gaps in lifetime earnings between Black and white individuals both in dollar and percentage terms. A positive gap in dollars reflects how many fewer dollars a Black individual earns compared with their white counterparts. Similarly, a positive gap in percentage reflects how much less Black individuals earn compared with their white counterparts (calculated as white minus Black earnings divided by white earnings).

In addition to measuring the size of these gaps, we also provide a basic framework to assess what drives them. As a pure matter of accounting, lifetime earnings are the product of years worked and average earnings per year. In our analysis, we measure years worked as the number of years in which an individual has positive earnings (specifically, earnings above the $7,000 threshold discussed previously).

Because lifetime earnings are the product of years worked and average earnings per year, our accounting framework ascribes differences in lifetime earnings to three factors: differences in the number of years worked, differences in earnings per year, and the combined effects of differences in both years worked and earnings per year, which can be thought of as a residual. First, differences in the number of years worked across individuals (holding earnings per year fixed) may reflect, among other things, differences in health or family structures. For example, some individuals may temporarily leave the labor force to have or care for children, reducing their total number of years worked. Second, differences in earnings per year (holding years worked fixed) may reflect differences in individuals' skills or specific occupations. For example, neurosurgeons may work the same number of years as primary care physicians but earn more due to specialization. Third, once we allow for both years worked and earnings per year to vary, the combination of these two differences helps explain the remaining dispersion in lifetime earnings differences. For example, college graduates have higher lifetime earnings than high school graduates not only because they tend to work more years, but also because they earn additional pay over a high school graduate during

those years. Thus, this third factor captures the combined or cumulative effect of working more years at a higher pay rate.

This accounting framework clearly highlights why point-in-time (or cross-sectional) earnings measures understate earnings differences across individuals relative to lifetime earnings measures. Critically, point-in-time measures do not account for differences in years worked. Therefore, they cannot account for the first and third factors in our decomposition. Although combining point-in-time measures with some measure of employment history can help address this issue, this procedure is likely to yield imprecise estimates, as it does not account for the way individuals' earnings change over the course of their careers. Earnings tend to grow with age (or time in the labor market), and the rates of growth differ across individuals.[2] Our lifetime earnings measure, by contrast, includes earnings from all years of an individual's career, thus requiring us to make no assumptions about earnings growth.

II. A First Look at the Black-White Lifetime Earnings Gap

Using our data source, we first assess the size and drivers of the overall Black-white lifetime earnings gap. The first column of Table 1 shows that the Black-white lifetime earnings gap is about $550,000 dollars. Equivalently, Black individuals earn 34 percent less than what white individuals earn over an entire lifetime, as seen in the parentheses. To put this lifetime earnings gap in context, Wilson and Rodgers (2016) estimate a Black-white hourly wage gap of roughly 22 percent between 1979 and 2015. Our reported lifetime earnings gap is 34 percent, suggesting Black-white earnings differences at a point in time (that is, cross-sectional differences) accumulate and lead to even larger differences over an entire lifetime.

As discussed previously, this earnings gap can arise due to differences in the number of years worked, differences in earnings per year, or a combination of the two. To provide some initial insight into these potential drivers, the second and third columns in Table 1 show the size (in levels and percent) of differences in years worked and earnings per year across Black and white individuals. The second column shows that Black individuals on average work 2.3 fewer years than white individuals (or 8 percent less). Meanwhile, the third column shows that Black individuals on average earn about $16,000 fewer dollars per year

Table 1

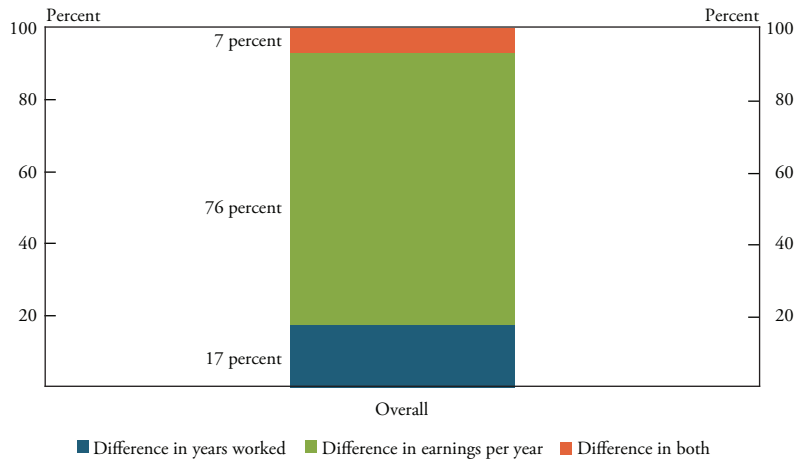
Black-White Gap in Lifetime Earnings, Years Worked, and Earnings per Year

	Lifetime earnings gap	Difference in years worked	Difference in earnings per year
	(1)	(2)	(3)
Overall Black-white gap	$550,000 (34 percent)	2.3 (8 percent)	$16,000 (28 percent)

Note: Percent figures in parentheses represent the corresponding gap in percent relative to white individuals.
Sources: SIPP Synthetic Beta and authors' calculations.

Chart 1

Contributions to Black-White Lifetime Earnings Gap



Sources: SIPP Synthetic Beta and authors' calculations.

worked (or 28 percent less) compared with white individuals. Although these differences are large, their relative importance in shaping the overall gap is not clear.

To answer that question, Chart 1 displays how differences in years worked, earnings per year, and the combination of the two contribute to the overall gap. As represented by the stacked green bar, differences in average earnings per year worked between Black and white individuals account for the majority of the gap, or roughly 76 percent. Meanwhile, differences in years worked, the blue bar, explain about 17 percent of the gap. Finally, the combination of more years worked at higher earnings per year accounts for the remaining 7 percent of the gap.

This result emphasizes that focusing only on earnings per year, and not years worked, understates the Black-white earnings gap. Specifically, ignoring differences in years worked across Black and white individuals understates the gap by 24 percent, reducing it in dollar terms from $550,000 to $417,000. Thus, lifetime earnings appear to provide a more complete measure of labor market inequality than point-in-time earnings.

III. Breaking Down the Black-White Lifetime Earnings Gap by Sex and Education

Although the overall Black-white earnings gap is large, the size of the gap as well as its drivers are likely to vary by sex and education levels. To account for potential differences, we next examine the Black-white lifetime earnings gap for men and women separately and then further decompose each group into four education groups: those with less than a high school diploma, those with a high school diploma only, those with some college (for example, an associate degree or unfinished bachelor's degree), and those with a bachelor's degree or higher.

Black-white lifetime earnings gap among women by education

Table 2 displays how lifetime earnings differ by education among Black and white women. The top row of the table shows that restricting the sample to just women reduces the Black-white lifetime earnings gap from $550,000 (or 34 percent) to $154,000 (or 14 percent). This reduction is partially due to a smaller difference in the number of years worked between Black and white women. The middle column of Table 2 shows the gap in years worked between Black and white women is only 0.3 years (or about four months), much smaller than the 2.3-year difference in years worked between Black and white workers overall.

The remaining rows of this table show that the lifetime earnings gap between Black and white women varies significantly by education level. For example, the difference in lifetime earnings between Black and white women without a high school diploma is $31,000 (or 7 percent). This gap rises to nearly $90,000 (or 8 percent) among women with some college. Most strikingly, the gap reverses sign to –$27,000 among women with a bachelor's degree or higher, suggesting Black women with a bachelor's degree or higher tend to earn more over their lifetimes than similarly educated white women. The main driver for

Table 2

Black-White Gaps in Lifetime Earnings, Years Worked, and Earnings per Year among Women by Education

Education level	Lifetime earnings gap	Difference in years worked	Difference in earnings per year
All women	$154,000 (14 percent)	0.3 (1 percent)	$5,500 (13 percent)
Less than high school	$31,000 (7 percent)	0.1 (1 percent)	$1,600 (7 percent)
High school	$83,000 (10 percent)	0.6 (2 percent)	$2,600 (8 percent)
Some college	$87,000 (8 percent)	0 (0 percent)	$3,400 (8 percent)
Bachelor's degree or higher	–$27,000 (–2 percent)	–2.5 (–9 percent)	$4,000 (7 percent)

Note: Numbers in parentheses represent the corresponding gap in percent relative to white individuals.
Sources: SIPP Synthetic Beta and authors' calculations.

this negative gap is that Black women with a bachelor's degree or higher work nearly 2.5 years more over their lifetimes than similarly educated white women despite receiving lower earnings per year. As a result, Black women earn more compared with white women over their entire lifetimes even though point-in-time data would suggest the opposite.

Although it is hard to know exactly what might be driving the greater number of years worked among Black women with a bachelor's degree, this finding is consistent with other research. For example, work by Li (2022) documents that the "child penalty" (that is, the reduction in labor market income after childbirth) is lower among Black women than white women. In particular, she finds that the smaller child penalty among high-wage Black women is because their labor force participation rate barely moves in the years following the birth of their first child, whereas the participation rate of high-wage white women declines. This observation is consistent with our finding of more years worked among Black women with a bachelor's degree than white women. More broadly, however, our result once again highlights the importance of using data on lifetime earnings rather than point-in-time measures. Point-in-time measures do not capture the higher lifetime labor supply of Black women with a bachelor's degree, which is a critical force in accounting for their higher lifetime earnings.

Black-white lifetime earnings gap among men by education

In contrast with the results for women, the top row of Table 3 shows that the lifetime earnings gap between Black and white men is much larger than the overall gap. Specifically, the lifetime earnings gap grows from $550,000 (or 34 percent) for Black and white workers overall to $917,000 (or 42 percent) for Black and white men. Again, differences in years worked appear to contribute to this gap: the gap in years worked rises from about two years for Black and white workers overall to four years for Black and white men.

Even after accounting for educational differences across Black and white men, the lifetime earnings gaps remain large, with no reversal in any of the educational categories. In percentage terms, the lifetime earnings gap never falls below 30 percent and reaches a maximum of 41 percent for Black and white men with a bachelor's degree or higher.

Although differences in lifetime earnings among men do not vary in a clear and systematic fashion with educational attainment, differences in years worked and earnings per year do. The middle column of Table 3 shows that the gap in years worked among Black and white men narrows with education: although years worked rise along with educational attainment for both Black and white men, they tend to rise more among Black men. For example, among men with less than a high school diploma, Black men work roughly 21 years, whereas white men work 26 years. For men with a bachelor's degree or higher, Black men work 30 years, whereas white men work 33 years. Accordingly, the percentage rise in years worked across these two educational categories is 43 percent for Black men and only 27 percent for white men. Because of this dynamic, differences in years worked between Black and white men fall from 21 percent (for men with less than a high school education) to 8 percent (for men with a bachelor's degree or higher).

However, in contrast to the narrowing in years worked, differences in earnings per year tend to increase with education. Indeed, although earnings per year rise along with educational attainment for both racial groups, they rise by less for Black men compared with their white counterparts. For example, among men with less than a high school diploma, Black men earn a little over $32,000 per year, whereas white men earn $39,000 per year. Among men with a bachelor's degree or higher, Black men earn slightly more than $69,000 per year, whereas

Table 3

Black-White Gaps in Lifetime Earnings, Years Worked, and Earnings per Year among Men by Education

Education level	Lifetime earnings gap	Difference in years worked	Difference in earnings per year
All men	$917,000 (42 percent)	4.1 (13 percent)	$23,300 (34 percent)
Less than high school	$358,000 (35 percent)	5.5 (21 percent)	$6,900 (18 percent)
High school	$533,000 (33 percent)	3.7 (12 percent)	$12,500 (24 percent)
Some college	$585,000 (31 percent)	3.6 (11 percent)	$13,000 (22 percent)
Bachelor's degree or higher	$1,440,000 (41 percent)	2.7 (8 percent)	$38,300 (36 percent)

Note: Numbers in parentheses represent the corresponding gap in percent relative to white individuals.
Sources: SIPP Synthetic Beta and authors' calculations.

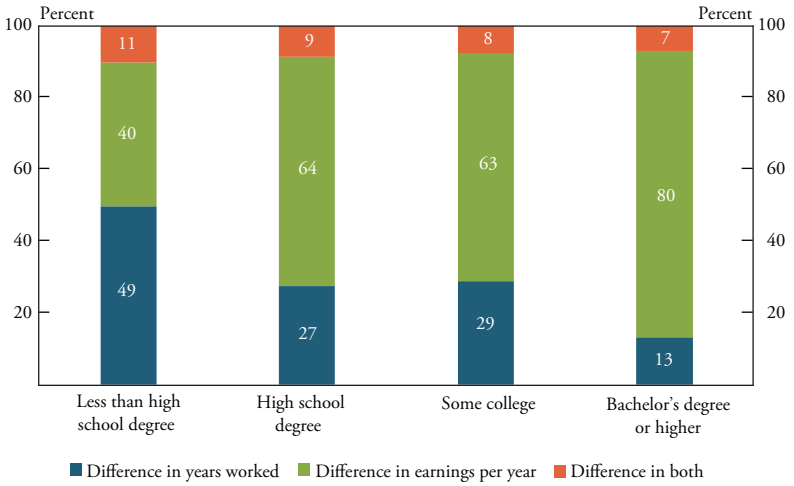
white men earn close to $108,000 per year. The according percentage increase in earnings per year across these two educational categories is 115 percent for Black men but 177 percent for white men. As a result, differences in earnings per year rise from 18 percent (for men with less than a high school diploma) to 36 percent (for men with a bachelor's degree or more).

As a consequence of these two trends, the contributors to the lifetime earnings gap for men across educational categories show some systematic patterns. The blue bars in Chart 2 show that the contribution of differences in years worked decreases with educational attainment, falling from roughly 50 percent for men with less than a high school degree to 13 percent for men with a bachelor's degree or higher. In contrast, the green bars show that the contribution of differences in earnings per year increases with educational attainment, rising from 40 percent for men with less than a high school degree to 80 percent for men with a bachelor's degree or higher.

A key implication of this decomposition is that point-in-time estimates would fail to capture a substantial portion of lifetime earnings differences across Black and white men. Indeed, the portion of the gap that is not solely due to earnings per year (that is, the sum of the blue and orange bars) ranges from 20 percent (among men with a bachelor's degree or higher) to 60 percent (among men with less than a high

Chart 2

Contributions of Black-White Lifetime Earnings Gap among Men by Education



Sources: SIPP Synthetic Beta and authors' calculations.

school diploma). This finding reiterates the usefulness of lifetime earnings measures for a more holistic understanding of earnings differences between Black and white individuals.

Our finding that Black men have fewer years with positive earnings than white men is consistent with several recent studies highlighting differences in employment outcomes between Black and white men. Using data from the American Community Survey, Bayer and Charles (2018) document that since the 1970s, Black men have become systematically more likely than white men to report that they are "not currently working."[3] Relatedly, Cajner and others (2017) document using data from the Current Population Survey that the low labor force participation rate of Black men is largely unexplained by observables. Thus, these positive earnings differences may reflect hard-to-measure factors such as school quality or pre-market skills (Neal and Johnson 1996). They may also be related to the disproportionate rise in incarceration rates of Black men (Bayer and Charles 2018; Neal and Rick 2014). Additionally, Bertrand and Mullainathan (2004) and Kline, Rose, and Walters (2022) have found large differences in callback rates for job applicants based on signals of race, suggesting discrimination in

hiring could also be driving the persistently large differences in years worked between Black and white men.

Discussion

Our results emphasize that point-in-time measures of earnings likely understate labor market inequalities, as differences in years worked play an important role in explaining the Black-white lifetime earnings gap for both men and women. Indeed, among Black women with a bachelor's degree, years worked are so important that they offset the fact that Black women earn less per year than their white counterparts. Moreover, for men, differences in years worked are so important that they account for up to 60 percent of the lifetime earnings gap between Black and white men with less than a high school diploma.

However, our data and analysis may themselves understate the quantitative importance of employment differences across Black and white individuals for two reasons. First, because our data are collected at an annual frequency, they are silent about periods of nonemployment that last only a few weeks or months. Indeed, even though Black unemployment rates are systematically much higher than white unemployment rates, spells of unemployment or nonemployment that resolve themselves within a year are not easily detectable within our data. Thus, our measure of average earnings per year worked potentially encodes high-frequency (for example, daily, weekly, or monthly) differences in nonemployment across races. A broader measure of employment or nonemployment would encompass both our measure of years worked and, for example, weeks within the year worked.

Second, our decomposition is an accounting rather than causal framework. In other words, it cannot determine whether differences in years worked affect differences in earnings per year (and vice versa) or whether a third factor is affecting both. To this point, Bayer and Charles (2018) highlight the importance of educational attainment, particularly among men, in determining their chances of being employed. According to their estimates, college-educated men are roughly 22 percentage points more likely to work than men with less than a high school degree. At the same time, several studies have documented that the labor market returns to schooling are large (Lemieux 2006; Juhn, Murphy, and Pierce 1993). Thus, education affects both years worked and earnings per year.

Conclusion

Understanding disparate labor market outcomes across racial groups is a topic of perennial interest. Much of the previous work on earnings differences by race has focused on documenting and understanding relative earnings differences at a point in time between Black and white individuals. We quantify differences over an entire lifetime and find that they are large and, in fact, larger than those implied by point-in-time measures. Black and white individuals work a different number of years across their productive lifetimes, and point-in-time measures do not capture these differences.

We also find that these differences depend heavily on sex and education. For example, Black women with a bachelor's degree or higher, on average, work nearly three more years over their lifetimes than similarly educated white women. These extra years of work lead Black women with a bachelor's degree to out-earn their white counterparts—even though they have lower earnings per year. At the other extreme, Black men with less than a high school diploma work nearly six fewer years than similarly educated white men. This vast difference in years worked accounts for up to 60 percent of the measured lifetime earnings gap between these two groups.

The importance of years worked to Black-white earnings differentials provides empirical support to Federal Reserve policy aimed at reducing the unemployment rate and keeping people employed in a context of price stability. Focusing specifically on race, Aaronson and others (2019) and Hotchkiss and Moore (2022) have shown that a hot labor market is generally associated with disproportionately large declines in the unemployment rates of Black and Hispanic women and men. Our analysis suggests declines in unemployment can have economically meaningful effects on lifetime earnings of Black workers to the extent that the declines in unemployment can be sustained.

Appendix
Dataset and Variable Creation

This data appendix provides a more detailed discussion of the dataset used in the analysis along with information on the creation of our variables.

The SIPP Synthetic Beta (SSB) version 7.0

Version 7.0 of the SSB was released in December 2018 and combines standardized variables from nine panels of the Survey of Income and Program Participation (SIPP) with administrative W-2 earnings records and benefit information.[4] This combined dataset includes the 1984, 1990, 1991, 1992, 1993, 1996, 2001, 2004, and 2008 panels and is called the SIPP Gold Standard File (GSF).

From the GSF, the Census Bureau created four entirely synthetic versions of the SSB. They also synthesized a missing data pattern for each implicate consistent with the data missing in the original dataset.[5] These four synthetic implicates were housed for public use in Cornell University's virtual Research Data Center. Our analysis code, while constructed and tested using the four synthetic implicates, was run on the GSF by the Census Bureau. The output from this code was released to us and are the results presented in the paper.

Variable definitions

While our dataset features all the earnings and demographic data we need for our analysis, we still must create our own variables that match our preferred definitions. This can mean combining variables or recoding the values in variables we already have. We construct some of our most important variables as follows:

Lifetime earnings. We follow Mustre-del-Río and Pollard (2019) in constructing annual earnings variables. Specifically, we add together total earnings from FICA-covered jobs and total earnings from non-FICA jobs for each person for each year and convert these values into real 2018 dollars using the seasonally adjusted annual CPI-U all-items series.

In our analysis, we focus on years worked and earnings per year worked. Therefore, it is particularly important to define what a year worked really means. Because we do not want to include years with minimal labor market attachment, we exclude years in which a person's

real annual earnings were $7,000 or less in real 2018 dollars when calculating their lifetime earnings. The $7,000 threshold is close to what an individual would have made if they had worked 20 hours a week at the federal minimum wage in 2018. Consequently, to generate a lifetime earnings variable, we add up all real annual earnings exceeding $7,000 over the entire sample for each person. We also create a variable for years worked by counting up the number of years in which a person's real annual earnings are greater than $7,000.

Demographic variables. Besides lifetime earnings information, our analysis also requires a range of demographic information. We use the sex, race, and education variables from the SSB. The sex variable has two values in the SSB: male and female. The race variable has three values: white, Black, and other. Finally, the education variable has five categories: less than a high school diploma, high school diploma, some college (for example, an associate degree or unfinished bachelor's degree), college degree (defined as a bachelor's degree), and graduate degree. We combine college degree and graduate degree into a single category.

Endnotes

[1]We exclude all individuals who died while in the sample.

[2]See, for example, Guvenen (2009) for evidence on differences in the growth rate of earnings across individuals.

[3]While in 1970 Black men were roughly 10 percentage points more likely to report "not currently working" compared with white men, by 2010 this measure essentially doubled.

[4]To learn more about the SSB version 7.0, please see Benedetto, Stanley, and Totty (2018).

[5]For this version of the SSB, the Census Bureau left missing values as missing in the GSF rather than imputing missing values as in previous versions. This results in one GSF and four synthetic implicates as opposed to the four GSFs and 16 synthetic implicates present in version 6.0.

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How Much Have Record Corporate Profits Contributed to Recent Inflation?

By Andrew Glover, José Mustre-del-Río, and Alice von Ende-Becker

Inflation ended 2021 at a 40-year high and rose further in 2022. Policymakers, politicians, and pundits have considered many possible explanations for this burst of inflation, from transitory supply chain disruptions to "wage-price spirals" to mismatches between demand and supply. However, one potential explanation that has received significant public attention is "greedflation"—that is, the idea that firms are capitalizing on their market power by raising their prices higher and faster than the growth in their production costs. This idea is well captured by Robert Reich's May 17, 2022, testimony to Congress, during which he said, "When corporations are so flush with cash, why are they raising prices? They are not raising prices solely because of the increasing costs of supplies and components and of labor.... Corporations enjoying record profits in a healthy competitive economy would absorb these costs. Why? Because they *can.* And they can because they don't face meaningful competition" (p. 2).

Although higher corporate profits have received attention recently, profits and inflation do not have a direct accounting relationship. However, inflation is directly affected by growth in the *markup*—the ratio between the price a firm charges and the firm's current marginal cost of production. Inflation in a firm's prices is therefore the sum of the growth in the marginal cost of production and the growth in the markup.

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Economic theory posits many ways that markups can change over time. For example, markups could change due to a decrease in the price sensitivity of consumer demand or an increase in monopoly power that arises from reduced competition. However, markups could also rise if current marginal costs become less important for a firm's pricing, either because current firms expect higher costs to replace current inventory as it is sold or because firms expect higher marginal costs in the future and want to smooth out price increases over time rather than raise prices sharply and abruptly. In this article, we estimate the 2021 growth rate of markups and discuss likely contributors to this growth. We find evidence that markup growth was a major contributor to inflation in 2021. Specifically, markups grew by 3.4 percent over the year, whereas inflation, as measured by the price index for Personal Consumption Expenditures (PCE), was 5.8 percent, suggesting that markups could account for more than half of 2021 inflation. Such high markup growth is especially striking given that markup growth contributed almost nothing to inflation in the decade leading up to the COVID-19 pandemic.

Although our estimate suggests that markup growth was a major contributor to annual inflation in 2021, it does not tell us *why* markups grew so rapidly. We present evidence that the timing and cross-industry patterns of markup growth are more consistent with firms raising prices in anticipation of future cost increases, rather than an increase in monopoly power or higher demand. First, the timing of markup growth in 2021, as well as earlier in the pandemic, does not line up neatly with the spike in inflation during the second half of 2021. Instead, the largest growth in markups occurred in 2020 and the first quarter of 2021; in the second half of 2021, markups actually declined. Therefore, inflation cannot be explained by a persistent increase in market power after the pandemic. Second, if monopolists raising prices in the face of higher demand were driving markup growth, we would expect firms with larger increases in current demand to have accordingly larger markups. Instead, markup growth was similar across industries that experienced very different levels of demand (and inflation) in 2021. This finding suggests that an increase in markups may provide policymakers with a signal of future inflationary pressures, especially if it occurs during periods where expectations of near-term future inflation are heightened.

Section I reviews the microeconomic theory of price setting by monopolists while holding constant marginal costs and demand. Section II presents our estimates of markup growth across time and industries. Section III extends the theory of pricing to one where firms must consider future marginal costs when setting current prices and demonstrates how an increase in expected future marginal costs translates to inflation through markup growth in the present followed by negative markup growth in the future.

I. Prices, Costs, and Markups in the Model of Monopolistic Competition

Rising monopoly power among firms has been a popular explanation for the 2021 spike in inflation, buttressed by a coincident rise in corporate profits. To help illustrate the mechanisms through which monopoly power can raise markups, Figure 1 first shows how markups are determined in a standard monopolistic model of price setting holding a firm's marginal costs fixed. The solid blue line shows that consumers' maximum willingness to pay (that is, their demand for the good) declines as they purchase more of a monopolistic firm's product. The dashed blue line shows that the marginal revenue a monopolist receives from each additional sale declines as they increase output. Finally, the solid green line plots the marginal cost of producing each unit sold.[1]

A profit-maximizing monopolist chooses the price that equates marginal revenue to marginal cost, so any change in price would lead to a loss in profits. For example, in Figure 1, if the monopolist sets a unit price equal to \$4, consumers will demand (and purchase) three units. Because the monopolist's production cost is only \$1 per unit, they earn \$3 profit per unit for a total profit of \$9 and a markup equal to 4 (\$4 / \$1 = 4). This price equates marginal revenue to marginal cost and maximizes the monopolist's profit. If the monopolist decides to lower the price to \$3, they would sell four units instead of three, but their profit per unit would fall to \$2 for a total profit of \$8 instead of \$9 and a markup of 3. Similarly, if the monopolist raised the price to \$5, then they would make \$4 profit on each unit but sell only two units at that price for a total profit of \$8 and a markup of 5.

Figures 2 and 3 illustrate how markups and costs jointly determine inflation by showing how the monopolist will increase their price in

Figure 1
Price Setting by a Monopolist

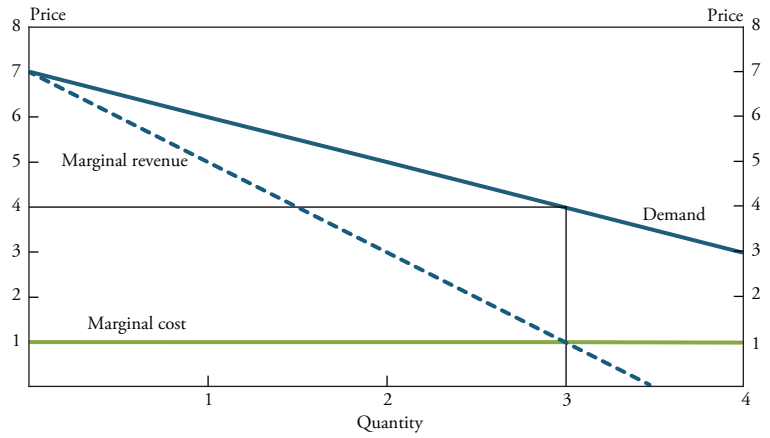
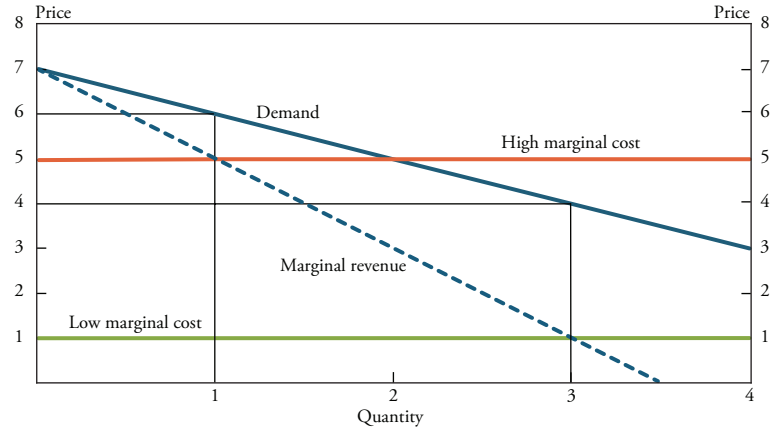
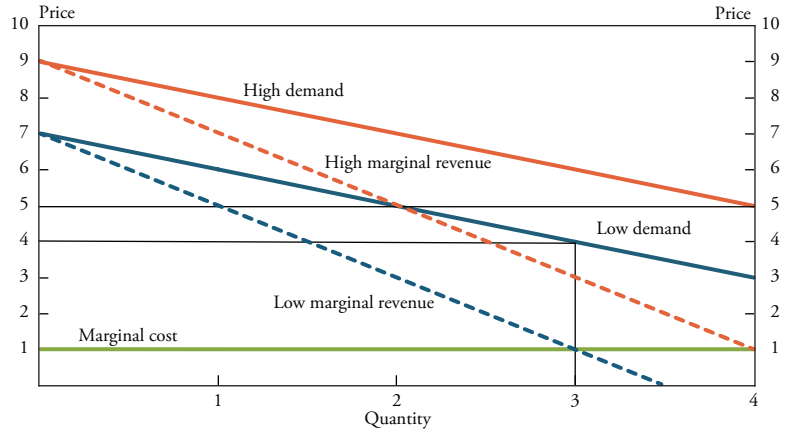


Figure 2
Effect of Higher Marginal Cost on Monopolist Pricing



response to either an increase in the marginal cost or an increase in demand. Figure 2 shows that an increase in the firm's marginal cost from \$1 to \$5—represented by the solid orange line—will raise the unit price by \$2, from \$4 to \$6. In this case, the firm's markup declines from 4 to 1.2 (\$6 / \$5 = 1.2); even though the price level increases, it is driven by the increase in marginal cost and markup growth is actually negative. In contrast, Figure 3 shows that an increase in demand—represented by the solid orange line—causes prices to grow from \$4 to \$5.

Figure 3
Effect of Higher Demand on Monopolist Pricing



In this case, the firm's markup increases from 4 to 5, so the increase in the price level in Figure 3 is entirely due to the firm's markup growing.

In summary, changes in firms' current marginal costs or demand for their products can contribute to inflation as firms adjust their prices to maximize profits. The total change in prices can always be understood as the combined effects of changes in the marginal cost of production and changes in the firm's markup. Our simple model shows that markups may or may not contribute to inflation: when a monopolist's marginal costs increase, markups decline, but when demand for a monopolist's products increases, markups rise.

II. Estimates of Average Markups

Although the figures in the previous section provide simple illustrations of firm markups, measuring the growth rate of these markups in the real economy can be challenging. First, data on a firm's marginal cost of production are not available; instead, we can only observe measures of total costs in nominal values. Second, data collected at the firm level do not report the prices that firms charge or the quantity of goods they produce, but rather their total sales.

To overcome these challenges, we estimate the growth rate in markups by assuming that firms equate their marginal cost to a constant proportion of the production costs that they can control—specifically,

variable costs, which include things like labor and utilities, rather than fixed costs, such as depreciation on previously installed capital. This assumption allows us to proxy a firm's markup growth using the growth in its ratio of sales to variable costs. We estimate markup growth using Compustat data, which consist of quarterly data at the firm level for publicly traded corporations in the United States. These data have been used widely to estimate markups (as in De Loecker, Eeckhout, and Unger 2020) and have two main benefits. First, they allow us to estimate markups at the firm level and then calculate averages at different sectoral levels of aggregation. Second, they include a direct estimate of total variable costs, "cost of goods sold," which is our basis for estimating markups.[2]

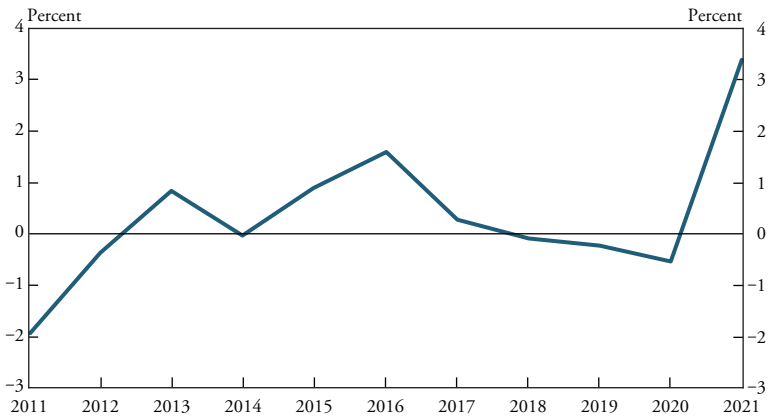
The blue line in Chart 1 plots average markup growth across all firms from 2011 through 2021, weighted by share of total sales. The chart shows that after remaining roughly flat in the decade preceding the pandemic and falling by 0.5 percent in 2020, markups grew by about 3.4 percent in 2021. This is more than half of the 5.8 percent PCE inflation rate, suggesting markup growth played a major role for inflation in 2021.[3] Furthermore, the burst in markup growth seen in 2021 stands in marked contrast to the decade before the pandemic, when marginal cost growth drove inflation and markup growth averaged only 0.42 percent (less than one-third of average PCE inflation over that period).

Looking at the timing of markup growth tells a more nuanced story. Chart 2 shows quarterly markup growth plotted against quarterly PCE inflation. We estimate that quarterly markup growth was highest in 2021:Q1, when it neared 16 percent (annualized), while quarterly inflation was only 4.6 percent. Furthermore, markups fell in the second half of 2021, while inflation accelerated. This suggests that the source of high markup growth in recent years was not a steady increase in monopoly power.

As shown in the previous section, changes in demand can also drive markup growth, even if monopoly power is unchanged. However, if high-frequency changes in demand were generating fluctuations in markup growth, then we would expect industries with higher demand to have both higher inflation and higher markup growth than those with less demand.

Chart 1

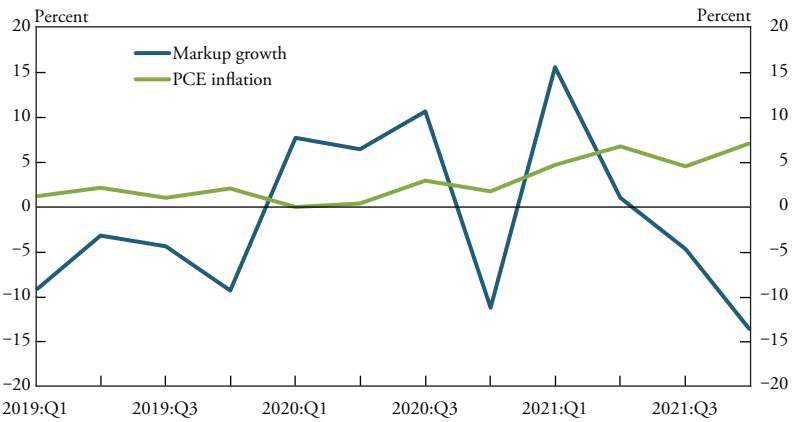
Growth Rate in Markup Estimates



Sources: Compustat and authors' calculations.

Chart 2

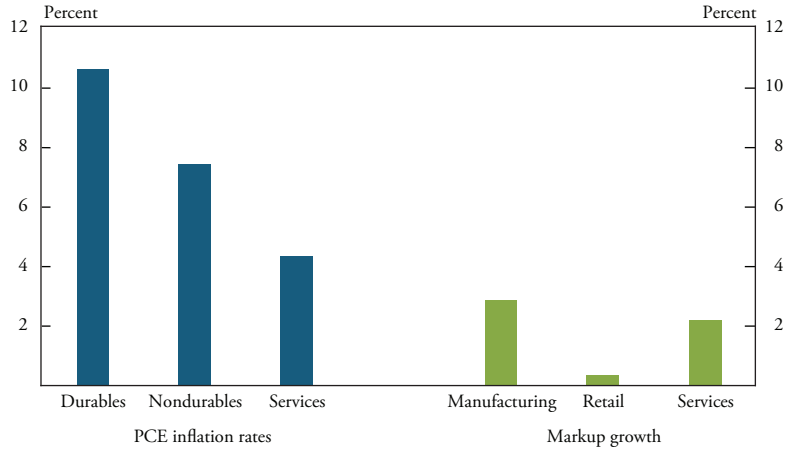
Quarterly Aggregate Markups and PCE Inflation



Sources: Bureau of Economic Analysis (BEA), Compustat, and authors' calculations.

We check for this pattern using the industrial detail of our Compustat markup measure. Goods and services experienced different rates of inflation in 2020 and 2021, as shown in the first three bars in Chart 3. Durable goods inflation spiked sharply to nearly 11 percent, nondurable goods inflation grew by 7.4 percent, and services inflation remained relatively low at 4.3 percent. These differences likely reflect shifts in relative demand in the face of ongoing COVID-19 risk in 2021, as spending on durable goods has a relatively low risk of infection compared with spending

Chart 3
Sectoral Inflation and Markup Estimates



Sources: BEA, Compustat, and authors' calculations.

on services. However, the green bars in Chart 3 show that the pattern for markup growth in roughly comparable industries was much more similar. Markups grew only slightly more in manufacturing (2.90 percent) than in services (2.20 percent), and retail saw the smallest growth in markups (0.33 percent). The similarity of markup growth despite large differences in inflation speaks against a simple demand-based explanation in which markups drove inflation most for industries that experienced the strongest increase in relative demand due to the pandemic.

III. Higher Future Marginal Costs Increase Markups When Pricing Is Dynamic

Although markup growth was high in 2021, the evidence from the previous section casts doubt on the simple explanation of "greedflation," understood as either an increase in monopoly power or firms using existing power to take advantage of high demand. Instead, this evidence may be consistent with an alternative explanation: that firms are raising markups in the present to smooth price increases they expect in the future. Indeed, both the hump shape of aggregate markup growth and similarity in markup growth across industries arise naturally in standard macroeconomic models where firms adjust their prices slowly over time and expect high marginal costs in the near-term future.

To understand how markups can rise in response to an increase in firms' expectations of higher marginal costs in the future, we extend our theory of price setting to one with multiple periods of production and sales as well as "sticky" prices. We consider a firm that has a marginal cost of $1 at the beginning of the year (as in Figure 1) but expects their marginal cost to rise to $5 in the next year (as in Figure 2). However, we assume that this firm will only set its price once for both years, either because it is costly to adjust prices or because consumers dislike frequent price changes. Of course, this illustrative model cannot also generate inflation after markups have fallen, as we see in the data, but we extend it to a longer horizon below.

Figure 4 demonstrates profits as the firm considers prices between $4 (which maximizes profits given a constant marginal cost of $1) and $6 (which maximizes profits given a constant marginal cost of $5). Using either price of $4 or $6 for both periods generates a total profit of $6. However, if the firm sets a price of $5, then profits rise to $8. Effectively, this balances the average of the marginal cost between the two years to the marginal revenue, thereby maximizing total profit. Markups are therefore higher initially—when the marginal cost is $1, firms set a price of $5, leading to a first-year markup of 5 rather than 4. However, markups fall in the second year—when marginal costs rise to $5 and the price remains at $5, then the markup is equal to 1. In other words, the firm just breaks even on the last unit sold in the second year.

Although this simple example illustrates how higher future marginal costs can increase inflation in the present via markups, it is much simpler than the dynamic equilibrium models used by policymakers, which allow firms to engage in many periods of price setting, households to make consumption and labor supply decisions (which determine firms' demand and wage costs), and monetary policy to change interest rates in response to inflation (which affects household spending). Figure 5 demonstrates inflation (blue line) and markup growth (green line) from such a model in which prices, output, and interest rates are all determined jointly in equilibrium following a monetary policy rule that leads the central bank to raise interest rates when inflation rises. In this simulation, firms realize that marginal costs will rise by 10 percent in a year and then shrink slowly, returning to normal after two years. In anticipation, they begin raising prices immediately,

Figure 4

Monopolist Profit from Fixed Price over Two Years

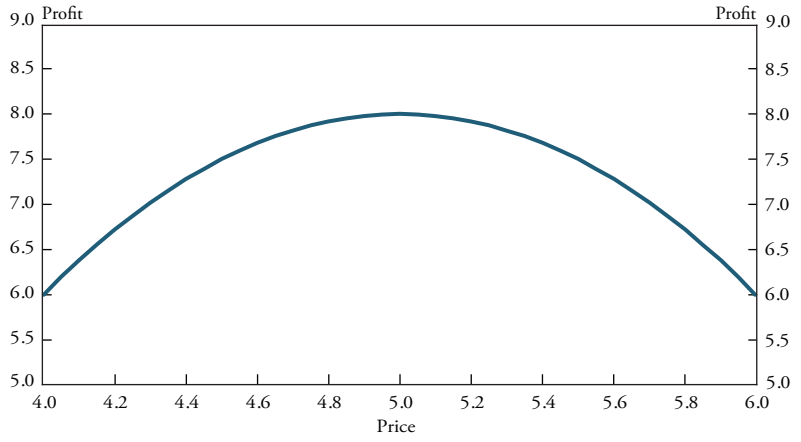
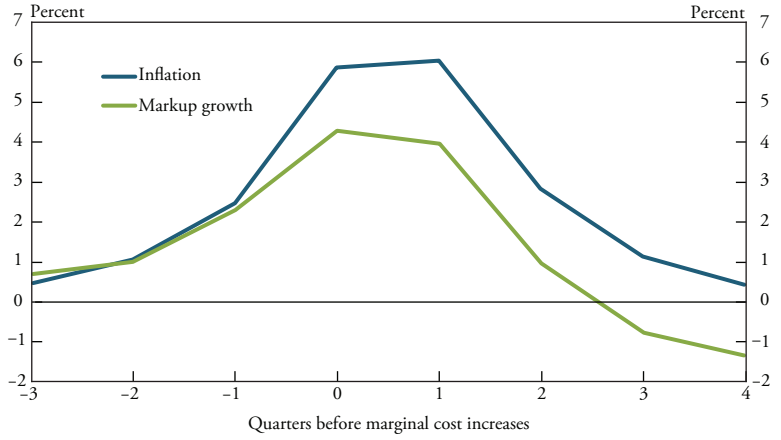


Figure 5

Inflation and Markup Growth from Dynamic Equilibrium Model



which translates into markup growth and inflation. Furthermore, in the model, the increase in inflation elicits an increase in interest rates by the central bank, which in turn lowers employment and reduces marginal costs (through lower real wages). The result is that markup growth initially accounts for more than 100 percent of inflation, which is why the green line is initially above the blue line. Once marginal costs rise, however, inflation is higher than markup growth, and eventually markups begin to shrink. The qualitative pattern of markup

growth's contribution to inflation is remarkably similar to the quarterly pattern of inflation and markup growth in 2021. Furthermore, the initial markup-driven increase in inflation foreshadows the later increase in marginal costs and signals a persistent rise in inflation. Overall, this example's accordance with the quarterly data from 2021 suggests that the large contribution of markups to inflation in 2021 may have been a harbinger of the continued inflation observed in 2022.

Conclusion

As inflation has remained stubbornly high, economists and policymakers have sought to better understand the contribution to price gains from direct increases in marginal costs versus increases in firms' markups. We show that markup growth likely contributed more than 50 percent to inflation in 2021, a substantially higher contribution than during the preceding decade. However, the markup itself is determined by a host of unobservable factors, including changes in demand but also changes in firms' expectations of future marginal costs. The decline in markups during the first half of 2022—even as inflation remained high—is consistent with firms having raised markups during 2021 in anticipation of future cost pressures. Furthermore, the growth in markups was similar across industries with very different relative demand and inflation rates in 2021, which is also consistent with an aggregate increase in expected future marginal costs. We conclude that an increase in markups likely provides a signal that price setters expect persistent increases in their future costs of production.

Endnotes

[1]We use a constant marginal cost for simplicity, but it is not required for our empirical work.

[2]Cost of goods sold is defined by the Internal Revenue Service as "the costs incurred by the corporation in producing the goods or providing the services that generated the corporation's business receipts." While it may sound straightforward that this measure proxies well for variable cost, Traina (2018) argues that one should include other expenses, such as marketing and management costs, as well. We have done our analysis with Traina's alternative measures of variable costs and found similar results for 2020–21.

[3]We say that our estimates suggest that markup growth made a large contribution to PCE inflation because our average markups use different weights than PCE. Specifically, we calculate the average markup in Compustat using each firm's markup weighted by its share of total sales, while the PCE price index weights prices using consumption expenditures.

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FOMC Communication Spillovers: Is There a "Call-Out" Effect?

By Karlye Dilts Stedman and Chaitri Gulati

The Federal Open Market Committee (FOMC) has a clear domestic mandate: achieving both stable prices and maximum sustainable employment. However, the FOMC's actions appear to lead to substantial spillover effects for foreign economies. Announcements from the FOMC can spill over to asset prices in foreign markets by altering market participants' expectations for global growth or the future decisions of their own central banks. To date, research has treated news in U.S. monetary policy announcements as a global shock that produces uniform spillovers. Whether these spillovers sometimes reflect market-specific information has remained an open question.

In an example of a potential market-specific spillover, on the day the November 2010 FOMC meeting minutes—which extensively reference countries in the euro area—were released, the euro area MSCI total return index fell 3.6 percent, and the euro depreciated against the dollar by 2.0 percent. This movement is significant considering that the 2007–21 average daily change of the MSCI and exchange rate in either direction is 1.0 percent and 0.4 percent, respectively. The above-average movements in foreign asset markets following the release of FOMC minutes in this example and others suggest that foreign asset prices may react to FOMC communication that specifically references foreign

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countries, currencies, and central banks—a potential "call-out effect" of U.S. monetary policy communication.

In this article, we present several observations, or stylized facts, that shed more systematic light on the market-specific content of international spillovers. Although we do find some evidence for the importance of country-specific mentions, these effects are modest and may reflect increased sensitivity to monetary policy shocks rather than the release of country-specific information. In other words, a "call-out effect," per se, of U.S. monetary policy communication may be minimal.

Section I motivates our analysis and provides some background on spillovers from central bank communication. Section II describes our data and methods. Section III outlines stylized facts. Section IV discusses caveats to the interpretation of the results and further analysis, suggesting future avenues for research in this area.

I. Background on Spillovers from U.S. Monetary Policy

A large body of research has documented how global markets respond to the FOMC's monetary policy announcements. Early work has emphasized the effects that changes to U.S. monetary policy have on trade balances, either through exchange rates and exchange rate management, or through the effects of U.S. demand on trading partner economies' goods and services (see, for example, Kim 2001 and Obstfeld and Rogoff 1995). More recent work has highlighted the implications of U.S. monetary policy for global financial conditions. In its most basic formulation, easing monetary policy lowers longer-term yields in the United States and, through portfolio balance effects among financially interconnected economies, leads to capital flows abroad that lower yields in foreign economies (Fratzscher and others 2018; Neely 2015). These easier financial conditions boost domestic spending and thus GDP in foreign countries.

U.S. monetary policy can also influence global financial flows through risk premiums and investor sentiment. Because the U.S. dollar serves as the world's reserve currency and the United States plays a singularly important role in the global financial system, the Federal Reserve's monetary policy influences the balance sheets of firms and individuals that lend funds abroad. By affecting these balance sheets, U.S. monetary policy alters not only the availability of foreign credit

broadly but also the risk-taking behavior of these firms and individuals, with implications for financial stability (see, for example, Bruno and Shin 2015, Borio and Zhu 2012, and Miranda-Agrippino and Rey 2020). In this framework, contractionary Federal Reserve policy leads to a deleveraging of global financial intermediaries, reduced international capital flows, declines in the provision of domestic credit around the world, and tighter foreign financial conditions.

In addition to "pure" monetary policy shocks, central bank communication also generates what is often referred to as the "central bank information effect" (see, for example, Romer and Romer 2000 and Nakamura and Steinsson 2018). Although central banks release information purposefully through forward guidance, policy actions also contain information regarding policymakers' level of confidence in economic fundamentals. In communicating its policy decision, which generates a monetary policy shock, the FOMC also communicates its assessment of the economic outlook to justify its decision, which generates a news shock—the central bank information effect. Although both types of information carry implications for the global economy, they have distinct outcomes. For example, an expansionary monetary policy decision conveys information regarding the path of policy, be it a decrease in the federal funds rate, an increase in asset purchases, forward guidance, or some combination thereof. We would expect this decision to raise asset prices and lower yields, loosening financial conditions and causing a depreciation of the domestic currency. The decision may also convey a previously unknown degree of pessimism in economic conditions on the part of the central bank that warrants a loosening of policy. In the face of this negative economic news, we would expect asset prices to fall, yields to rise, and financial conditions to tighten.

Whereas research studies on pure monetary policy shocks emanating from the FOMC's announcement of policy decisions are many and varied, research on the international spillovers of central bank information—specifically, the macroeconomic news content of the communications—is sparse. The few studies in this area tend to treat the information effect as a global phenomenon; that is, information released by the FOMC either reveals information about economic conditions that are global in scope, or the United States plays such an important role in the global economy that its domestic news has global effects.

Global growth news can refer to common conditions (including those emanating from the United States) that market participants expect to affect the home economy in a similar fashion. This type of news could induce foreign yields to co-move with yields in the United States by generating the expectation that the foreign central bank will move policy in the same direction as the Federal Reserve or directly ease credit conditions (as in a pure monetary policy shock). Alternatively, this type of news could induce asset price changes in the opposite direction, such as the central bank information shocks documented domestically. Empirical evidence suggests that expansionary Fed information shocks increase global investors' risk appetite, easing financial conditions on net (Pinchetti and Szczepaniak 2021; Franz 2020). Thus, we see evidence to suggest that FOMC communication could generate spillovers to foreign economies both through the channels of monetary policy and by revealing information about global economic conditions.

We go a step further and consider whether FOMC communication might generate uneven spillovers across countries rather than uniform spillovers, as prior research has assumed. Can the Federal Reserve generate news spillovers specific to the markets they discuss? Are spillovers amplified by the presence of specific information? Market-specific news might, for example, highlight the conditions of a foreign country or include information on policy coordination with the Federal Reserve, such as swap lines.[1] These specific mentions have the potential to amplify spillovers by generating a "call-out" effect—heightening awareness of conditions abroad or increasing their perceived importance by virtue of the FOMC's attention.

II. Measuring Spillovers Using FOMC Meeting Minutes

To shed some light on the potential for a call-out effect from market-specific news, we examine the minutes of 119 FOMC meetings from 2007 to 2021, which are available on the Federal Reserve Board's website and released three weeks after the date of the policy decision.[2] We focus on the minutes' releases rather than the FOMC decision announcements because the minutes contain more detailed information on the context in which the policy decision was reached; the FOMC announcement transcripts rarely address international developments in any detail.

To spot market-specific news, we use a predetermined list of words to find both implicit and explicit mentions of six countries with strong financial and trade ties to the United States: the UK, Switzerland, Japan, Canada, Mexico, and the euro area.[3] To find references to economic conditions in these countries, we screen the text for the country's name, currency, central bank, and references to swap lines and sovereign bonds. Table 1 summarizes the number of meeting minutes (out of 119) that contain references to each of our sample countries as well as the total number of mentions for each country in our sample from 2007 to 2021. Unique in our sample, the euro area is mentioned in every set of meeting minutes—either as a region or in reference to one of its key member states—constituting a total of 817 references. Switzerland is mentioned the fewest times, with a total of 39 mention days aggregating to 74 references.

To measure spillovers, we gather daily data for several key asset prices for each of these six countries. To assess the spillover effects on equity markets, we use the country-specific MSCI total return indices from Refinitiv (formerly Thomson Reuters Datastream). To assess the spillovers to sovereign bond markets and currency markets, we use the corresponding zero-coupon bond yields and nominal exchange rates vis-à-vis the U.S. dollar from Bloomberg, respectively, for each country. Using daily data helps us isolate the foreign effects of the Federal Reserve's policy actions. Up to the day of a central bank announcement, financial markets will have already included in their price what investors expect the central bank to do, including any attendant international effects. If markets that are closely linked to monetary policy decisions change immediately after a monetary policy announcement (either upward or downward), we can credibly assume that asset prices changed because of monetary policy itself. Extending this assumption to some international contexts requires an adjustment, however. While Canada and Mexico have the same trading hours as the United States, trading closes in European and Asian countries before the time of the minutes' release. Thus, for those markets, we examine the reaction of asset prices to the minutes the day after they are released.[4]

Table 1
Country-Specific Mentions in FOMC Minutes, 2007–21

Countries	Minutes referencing the country	Total references
Switzerland	39	74
Mexico	85	162
Canada	102	225
Japan	103	283
UK	107	212
Euro area	119	817

Sources: Board of Governors of the Federal Reserve System and authors' calculations.

III. Stylized Facts: Evaluating Country-Specific Spillovers

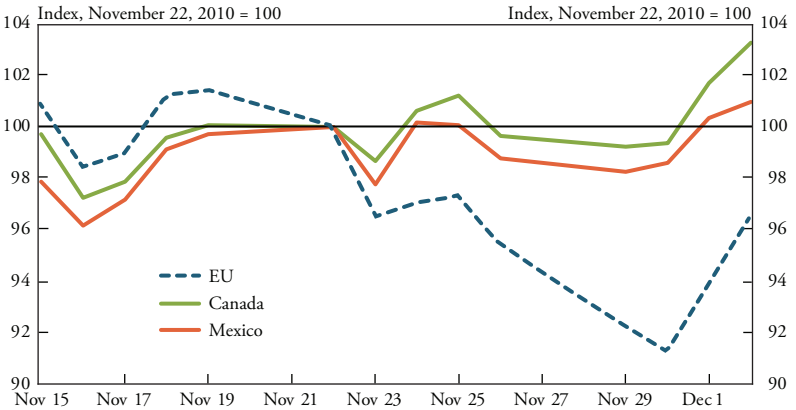
To look for evidence of monetary policy announcements affecting foreign asset prices, we analyze a subset of dates where a few countries are mentioned at a time and collect the largest absolute value changes in asset prices on those dates. Our opening example from November 23, 2010, for instance, contains meaningful references only to euro area countries.[5] At the time, deteriorating financial conditions in Europe, particularly in peripheral countries, loomed large. For example, "the German economy continued to perform strongly, while recent data showed weakness in the peripheral euro-area countries… Spreads relative to German bunds on the 10-year sovereign bonds of most peripheral euro-area countries either declined or were little changed over the period, but Irish sovereign spreads moved higher on concerns over the fiscal burdens associated with losses in the Irish banking sector." The text of the minutes also intones that the ECB's contemporary policy response did not line up with financial market expectations.[6] For example, "Benchmark 10-year sovereign yields generally declined in the major advanced foreign economies, but the overnight rate in the euro area increased as the European Central Bank continued to allow the amount of liquidity provided to the banking system to decline."

Chart 1 suggests that the release of the minutes coincided with a discernable change in European asset prices. The chart shows the path of the MSCI total return index and the exchange rate (in local currency to U.S. dollars) in the euro area (dotted line) and in two countries with no reference in the minutes, Canada and Mexico. In each case, the series are normalized into an index to equal 100 on the day before the

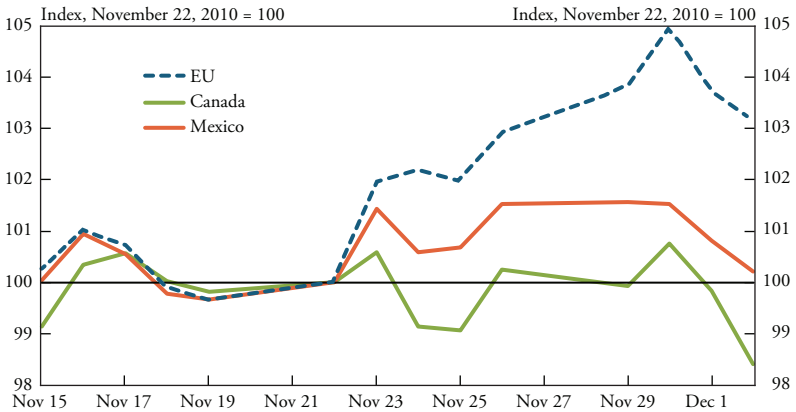
Chart 1

Release of November 23, 2010, FOMC Meeting Minutes Coincides with Change in European Asset Prices

Panel A: MSCI Total Return Index Falls Furthest for the EU after Mention



Panel B: Euro Weakens Noticeably against the U.S. Dollar after Mention



Notes: Dashed line indicates country-specific mention. Solid lines indicate no mention.
Sources: Refinitiv, Bloomberg, and authors' calculations.

minutes were released (November 22, 2010) and are shown from 10 business days before the release until 10 days after. From the close of trading on November 22 until the close of trading on November 23, the euro area MSCI total return index fell 3.6 percent, and the euro depreciated against the dollar by 2.0 percent. For context, the average change of the MSCI and exchange rate in either direction over the sample is 1.0 percent and 0.4 percent, respectively, with standard deviations of 1.10 percent and 0.39 percent. Thus, the changes observed on this date were 2.4 and 4.1 standard deviations above the mean, respectively. In addition to the one-day change, the MSCI continues to trend down and the currency continues to depreciate in the days following the release. In contrast, the MSCI and exchange rates of Mexico and Canada show a comparatively flat trend, moving somewhat on the date of the minutes release, but returning to their pre-release values thereafter.

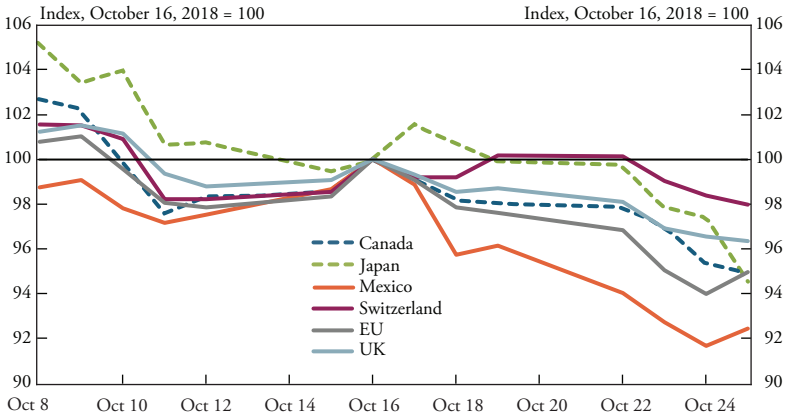
Although each of the minutes contains at least one reference to one of our sample countries, asset prices also occasionally react to minutes in which their corresponding markets receive no mention, consistent with the release of global news. For example, despite the overall positive tone of the minutes on October 17, 2018, any reference to foreign economies contained in the minutes is decidedly downbeat. In line with such pessimism over the global outlook, Chart 2 shows that MSCI total returns fell and currencies depreciated in nearly all the markets under consideration, regardless of whether they were referenced (shown in dotted and solid lines, respectively). Examples such as these illustrate that global news, absent any particular country-specific aspect, generate uniform spillovers whereby foreign asset markets react to global growth news alone.

To take a more systematic look at reactions to the minutes we compare them across time. We first classify dates as containing a country-specific reference in the minutes, making no reference in the minutes, or as having neither an FOMC meeting statement nor minutes released. Table 2 shows the average in absolute value of the change in yields, the growth of the MSCI total return index, and the growth of the exchange rate (in local currency to U.S. dollars) on each of these date types. The fourth column of the table shows the ratio of minutes containing a mention to minutes that make no mention, on average; positive values indicate that days with a mention see more movement

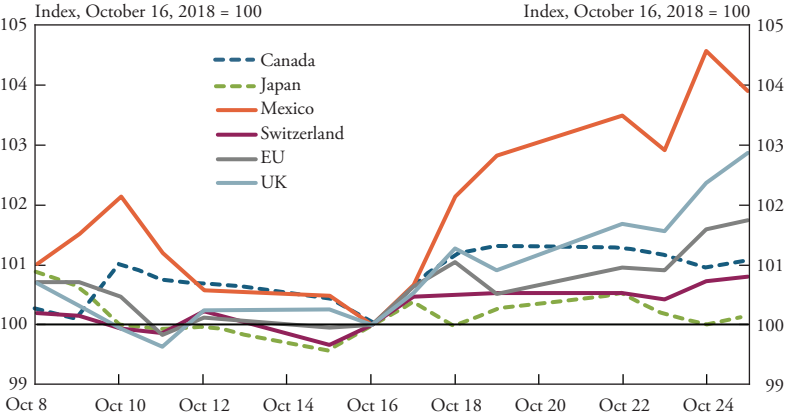
Chart 2

Asset Prices React to Release of Global News

Panel A: MSCI Total Return Indices Fell across All Countries Driven by Pessimistic Global Growth Outlook



Panel B: Currencies Largely Depreciated against the U.S. Dollar Irrespective of Mentions



Notes: Dashed lines indicate country-specific mention. Solid lines indicate no mention.
Sources: Refinitiv, Bloomberg, and authors' calculations.

Table 2
Asset Prices Broadly Move More on Mention Days

Country	Mention (1)	No mention (2)	Non-FOMC (3)	Mention / no mention (percent) (4)
Exchange rate growth (local currency / USD)				
Canada	0.423 (0.369)	0.316 (0.209)	0.421 (0.402)	33.9
Mexico	0.642 (0.65)	0.611 (0.525)	0.565 (0.579)	5.1
EU	0.417 (0.337)	0.369 (0.064)	0.416 (0.389)	13.0
UK	0.413 (0.369)	0.480 (0.382)	0.426 (0.418)	–14.0
Switzerland	0.526 (0.435)	0.405 (0.385)	0.432 (0.512)	29.9
Japan	0.587 (0.494)	0.311 (0.251)	0.421 (0.437)	88.7
MSCI total return growth				
Canada	0.944 (0.982)	0.821 (0.624)	0.915 (1.112)	15.0
Mexico	1.142 (1.135)	0.958 (0.736)	1.135 (1.2)	19.2
EU	1.114 (1.036)	0.738 (0.651)	1.029 (1.147)	50.9
UK	0.944 (1.04)	1.303 (0.613)	0.939 (1.087)	–27.6
Switzerland	0.905 (0.9)	0.854 (0.801)	0.791 (0.845)	6.0
Japan	1.058 (1.013)	0.692 (0.624)	0.916 (0.922)	52.9
Yields: average change of one-, five-, and 10-year bonds				
Canada	0.025 (0.017)	0.030 (0.02)	0.028 (0.025)	–16.7
Mexico	0.063 (0.144)	0.086 (0.219)	0.100 (0.217)	–26.7
EU	0.028 (0.024)	0.017 (0.021)	0.024 (0.023)	64.7
UK	0.034 (0.028)	0.032 (0.019)	0.032 (0.028)	6.3
Switzerland	0.022 (0.032)	0.018 (0.012)	0.018 (0.016)	22.2
Japan	0.012 (0.012)	0.005 (0.003)	0.010 (0.01)	14.0

Sources: Board of Governors of the Federal Reserve System, Refinitiv, Bloomberg, and authors' calculations.

than those without, while negative values indicate the reverse. We use the absolute value of changes as we do not account for the tone of the minutes—the minutes can contain "good" news or "bad" news—which allows us to comment on the existence of an effect without taking a stand on its direction.

Ultimately, we find limited systematic evidence for the importance of specific mentions in the minutes. Although most countries in the sample (those with positive values in column 4) see their included asset prices move more on mention days than on the dates of minutes releases in which they are not referenced, these differences are modest. For example, the top row of numbers in Table 2 shows the average change in the Canadian exchange rate on the dates of mentions (0.423), those of minutes with no mention of Canadian developments (0.316), and dates with no FOMC activity (0.421). The fourth column shows that the average exchange rate growth on mention days is 33.9 percent larger than that observed on non-mention days (0.423 / 0.316 – 1 = 0.338). Thus, the effect of a release on the Canadian exchange rate is 33.9 percent larger when Canada is mentioned in the minutes in some form, whereas the difference in the average exchange rate of Canada on mention days versus days with no FOMC activity is only 0.48 percent.

In each category, Japanese asset prices move the most in response to country-specific references relative to dates with no reference (111 percent more on average), while Mexican asset prices react the least (6 percent less). Comparing mention dates to those with no FOMC activity yields similar counts, though the difference in the average between those dates is less dramatic still. Among asset classes, bond yields move the most on mention days relative to other minutes releases (32 percent more), while MSCI total returns move the least (19 percent more).

IV. Caveats and Further Analysis

We consult the minutes for our analysis because they present more context than the FOMC announcements, but this methodological decision requires some caveats. The principal drawback of examining the minutes for market-specific mentions is that they comprise, in large part, background information compiled by the Federal Reserve's staff economists reviewing economic conditions at the time of the meeting. Only the latter section of the minutes discusses the deliberation of the

committee. This second section of the minutes is thus more likely to contain a monetary policy shock because it emanates from policymakers. Because we do not distinguish between the two elements of the minutes in our analysis, the mentions we identify are not the same across the text in terms of informational content. Moreover, the minutes are released with a substantial lag, which lowers the likelihood that mentions contain current macroeconomic news. Mentions also arise when economic conditions are less certain. The minutes may only have an effect when the reference pertains to an ongoing situation. For example, references to countries with ongoing exposure to the European debt crisis may experience an "aftershock" when they are mentioned in the minutes.

To check the robustness of our findings, we repeat the analysis described in Section III using transcripts of the Chair of the Federal Reserve Board's post-FOMC press conferences from 2011 onward.[7] Although these dates contain the monetary policy shock of the FOMC announcement, the shock could have differential effects for "called-out" countries. Even using this sample of announcement-day mentions by the Chair, however, we find only small differences in asset prices on days with a country-specific mentions relative to those without. The patterns observed, as with the minutes, may instead reflect susceptibility to monetary policy spillovers: countries whose asset markets are more sensitive to U.S. monetary policy shocks by virtue of close financial ties are more likely to be mentioned. Thus, we might not be observing a causal market-specific effect for those countries. A more rigorous statistical treatment is needed to separate these effects.

Controlling for contemporaneous real and financial news presents an easy improvement to the analysis. However, in unreported results, we find that including control variables related to contemporaneous announcements does not much alter the picture. It appears that identifying the news content pertaining to specific non-U.S. markets requires a still more sophisticated approach. Identifying a domestic central bank information effect is straightforward—when monetary policy loosens (tightens), market participants may infer that the domestic growth outlook is more vulnerable (robust). The same logic translates to global news generated by the FOMC. However, the potential for market-specific information likely relies on context in that the mention may often

differ in tone from the overall communication. Thus, the exact context and tone of the reference would determine whether the sentiment it generates amplifies or ameliorates the overall spillover from monetary policy or information shocks. We suggest that any future exploration of a call-out effect would benefit from considering this angle.

Conclusion

International spillovers of U.S. monetary policy decisions have broad implications for foreign economies and market participants. During periods of high volatility in international asset markets, mentions of foreign countries in FOMC minutes may explain some of the movements of foreign asset prices. In sovereign debt markets, spillovers provide informational content on the term structure of interest rate yields. Large banks with portfolio exposure to global financial markets and investors holding foreign assets benefit from information about the co-movement of asset prices around the world. For U.S. policymakers, assessing potential "spillback" effects to the U.S. economy as global economies become more interconnected could be of great importance.

U.S. monetary policy decisions produce spillovers in foreign asset markets as FOMC communications alter market participants' perceptions of global growth and their expectations for central bank responses abroad. Since the onset of the 2007–09 global financial crisis, monetary policy spillovers have increased in response to policy actions by the Federal Reserve. We evaluate whether international spillovers vary when the triggering information is market-specific by assessing the effect on foreign asset prices on mention versus non-mention days. Although we find limited evidence for a call-out effect of U.S. monetary policy communication, a more rigorous treatment is needed to cleanly identify shocks of this type.

Endnotes

[1]A currency swap line is an arrangement between central banks to exchange currencies with the intended goal to meet foreign currency liquidity needs for domestic institutions—especially beneficial in times of market stress.

[2]We exclude minutes released on October 7, 2008, as both statements and minutes were released on this day, making it difficult to distinguish the source driving any observed effects.

[3]Within the euro area, we only search for the following member states: Germany, France, Spain, Ireland, Italy, Portugal, and Greece. These euro area member countries are the most referenced in the minutes, and their sovereign yields are the most traded.

[4]This adjustment does not apply to currencies as foreign exchange trades throughout the day.

[5]The minutes contain only a glancing mention to the Nikkei (Tokyo Stock Exchange) and FTSE (London Stock Exchange) equity indices: "Major equity indexes in the euro area and in the United Kingdom increased moderately, whereas the Nikkei index declined."

[6]The ECB had not yet committed to doing "whatever it takes" to prevent the dissolution of the euro. Mario Draghi, then-president of the ECB, gave a speech on July 26, 2012, stating that "the ECB is ready to do whatever it takes to preserve the euro" (Draghi 2012). The speech was perceived as an implicit commitment from the ECB to provide unlimited support to the euro area at a time of severe deterioration in economic and financial conditions.

[7]Post-meeting press conferences only became a regular occurrence beginning in April 2011.

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