



EXECUTIVE SUMMARY

The Effect of Immigration Disruption on US Labor Markets and Post-Pandemic Inflation

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The US has endured historic and persistent rates of inflation beginning in mid-2021. The global disruptions and contortions spurred by the Covid-19 pandemic present no shortage of conditions that likely contribute to this inflationary episode, but the effect of a halt to international migration flows has been understudied and heretofore “difficult to quantify.” In this paper, we explore this possibility and — in light of remote workers’ internal migration to sunny, suburban, and southern destinations — we attempt to measure the effect of human mobility patterns more broadly on US inflation.

Using variation in the net migration flows arising from these changes at the level of metropolitan service areas, we explore the extent to which these mobility patterns relate to the recent inflationary episode that began in 2021 and has continued to date. We find that the combination of these migration patterns has led to a significant divergence in local inflationary pressures. In particular, we show that increases in total net migration flows to particular local regions are associated with increases in labor market tightness — as measured by the ratio of job openings to unemployed persons — and upward pressures on wages and home prices. Ultimately, moving from an area in the bottom quartile of migration in-flow to the top quartile corresponds to increasing the metro area inflation over 2021-2022 by almost 2.5 percentage points, which translates to annual increase of approximately \$1500 for the average US household.

Without international migrants, the internal mobility spurred by the pandemic created imbalances in regional labor and product markets. These imbalances ultimately contributed to the country’s recent episode of inflation. So, in addition to the ways that international migrants are already known to fill undesirable jobs and promote economic growth with entrepreneurship and innovation, the results highlight the role immigrants can have in helping labor markets be more responsive to local changes in demand and supply.

The Effect of Immigration Disruption on US Labor Markets and Post-Pandemic Inflation

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Introduction

The US has endured historic and persistent rates of inflation beginning in mid-2021. The global disruptions and contortions spurred by the Covid-19 pandemic present no shortage of conditions that likely contribute to this inflationary episode. In particular, economists and other observers have attributed inflation to:

- expanded unemployment benefits;¹
- excess and pent-up consumer demand owing to fiscal and monetary stimuli provided by the government in 2020 and 2021;
- disruptions in the supply chain² domestically and abroad, particularly after the February 2022 Russian invasion of Ukraine spiked the price of oil, natural gas, fertilizer, and food;
- a wave of early retirements;³ and
- subsequent labor shortages⁴ that have been linked to increased wage levels.

However, quantifying the influences of these factors on the recent inflationary pressures has proven difficult.

Moreover, the wage increases, price increases, and general labor market distortions cannot be examined independently from tremendous changes in international migration and internal mobility that are just as phenomenal. With the 2017 arrival of the Trump Administration, the level of US net international migration began dropping, but admissions grinded to a halt when

¹ Wall Street Journal Editorial Board, "Pandemic Jobless Benefits and Work," *Wall Street Journal*, Jan. 2, 2022, <https://www.wsj.com/articles/pandemic-jobless-benefits-and-work-unemployment-expansion-stimulus-covid-19-workforce-participation-omnicron-build-back-better-11641163730>.

² Gwynn Guilford, "U.S. Inflation Accelerated to 8.5% in March, Hitting Four-Decade High," *Wall Street Journal*, Apr. 12, 2022, https://www.wsj.com/articles/us-inflation-consumer-price-index-march-2022-11649725215?mod=article_inline.

³ David Harrison, "Recent Retirements Throw Wrench Into Fed's Economic Recovery Plans," *Wall Street Journal*, June 16, 2021, <https://www.wsj.com/articles/recent-retirements-throw-wrench-into-feds-economic-recovery-plans-11623879150>.

⁴ Bryan Mena, "Job Openings Near Record as Labor Market Emerges From Omicron Disruptions," *Wall Street Journal*, Mar. 9, 2022, <https://www.wsj.com/articles/job-openings-us-growth-labor-market-turnover-january-2022-11646782413>.

US borders and consulates closed with the onset of the pandemic in 2020 (see Figure 1). The closures' disruption to the labor market have been cited by the Chairman of the Federal Reserve⁵ and many of the largest US employers.⁶ In a call to combat the influence of labor shortages on inflation trends (Hanson and Slaughter 2022), a selection of researchers have supposed that international migration trends are a likely a contributor, but lament that the effect of migration trends is "difficult to quantify." In this paper, we explore this hypothesis and attempt to measure the effect of human mobility patterns on US inflation.

In 2020, while international migration was effectively halted by the eventual border shutdown and a variety of global travel restrictions brought about by the Pandemic, domestic mobility was transformed by professionals' sudden ability to work remotely. The shift in workplace dynamics spurred millions of office workers to migrate internally⁷ to destinations offering more space, better weather, and/or greater access to recreational amenities, while millions of other workers and service providers (e.g., production workers and hospital staff) — a labor supply that might otherwise migrate to meet new demand for goods and services — were less able to move. Under pre-pandemic circumstances, employers would have likely recruited international migrants or visa-holders to these booming pandemic destinations to meet the newcomers' appetite for everything from manicures to matcha lattes. But without this mobile reserve of labor supply, these countervailing domestic mobility trends generated acute imbalances in the demand and supply for labor in specific regions that are at least partially missed in national level trends.

Using variation in the net migration flows arising from these changes at the level of metropolitan service areas (MSAs), we explore the extent to which these mobility patterns relate to the recent inflationary episode that began in 2021 and has continued to date. We find that the combination of these migration patterns has led to a significant divergence in local inflationary pressures. In particular, we show that increases in total net migration flows to particular local regions are associated with increases in labor market tightness — as measured by the ratio of job openings to unemployed persons — and upward pressures on wages and home prices. Ultimately, moving from an area in the bottom quartile of migration in-flow to the top quartile corresponds to increasing the metro area inflation over 2021-2022 by almost 2.5 percentage points, which translates to annual increase of approximately \$1500 for the average US household.

⁵ Nick Timiraos, "Transcript: Fed Chairman Jerome Powell at the WSJ Future of Everything Festival," *Wall Street Journal*, May 17, 2022, <https://www.wsj.com/articles/transcript-fed-chairman-jerome-powell-at-the-wsj-future-of-everything-festival-11652821738>.

⁶ Dick Burke & Ray Walia, "America's largest employers are sounding the alarm on immigration rules. Canada's successful startup visa program shows why," *Fortune*, Aug. 19, 2022, <https://fortune.com/2022/08/19/chips-act-us-employers-tech-talent-immigration-rules-canada-startup-visa-program/>.

⁷ Riordan Frost, "Have More People Moved During the Pandemic?" Joint Center for Housing Studies of Harvard University, Nov. 19, 2021, <https://www.jchs.harvard.edu/blog/have-more-people-moved-during-pandemic>; "Fastest-Growing Cities Are Still in the West and South," U.S. Census Bureau, May 26, 2022, <https://www.census.gov/newsroom/press-releases/2022/fastest-growing-cities-population-estimates.html>.

The pandemic was a once-a-century event that required a variety of extraordinary measures. Notably, it accelerated a decline in international migration flows to the United States, which many Republican officials were already pursuing by other means. This study explores one potential effect of this policy goal. Without international migrants, the internal mobility spurred by the pandemic created imbalances in regional labor and product markets. These imbalances ultimately contributed to the country's recent episode of inflation. So, in addition to the ways that international migrants are already known to fill undesirable jobs and promote economic growth with entrepreneurship and innovation, the results highlight the role immigrants can have in helping labor markets be more responsive to local changes in demand and supply.

Background

Dynamics of Inflation

Inflation has been understood to occur in two ways; foremost, when an increase in aggregate demand (overall spending) takes place absent a proportional increase in aggregate supply (overall production) — a phenomenon known as demand-pull inflation.⁸ When aggregate demand increases by more than it was previously trending, economic production usually does not (or cannot) immediately adjust to meet higher demand. To do so, producers will try to increase the quantity of goods and services they provide. Some may attempt to hire more workers by increasing wages or expanding production capacity, often at higher costs. Ultimately, these cost increases are likely to be at least partially passed on to consumers in the form of higher prices for the goods and services these firms provide, thereby creating inflation.⁹

Alternatively, inflation may also be driven by a decrease in the aggregate supply of goods and services as a result of increases in the cost of production, absent a proportional decrease in aggregate demand — a phenomenon known as cost-push inflation.¹⁰ Here, an increase in the cost of raw materials or any of the factors of production — land, capital, commodities, or labor — will result in increased production costs to meet any particular level of demand. As with demand-side disruptions, the cost increases are likely to be (at least partially) passed on to consumers through the form of higher prices.

Whether the demand-pull or cost-push variety, inflationary pressures are accentuated when the economy is at or near full employment because labor is in shorter supply, necessitating employers to increase pay in order to attract (or keep) workers. This may create a “ratchet effect,” in which wages rise and then prices rise, so wages rise again in an endless wage-price spiral.¹¹ As economists and policymakers have examined the inflation of the post-pandemic

⁸ Lynn Turgeon, “Explanations of Inflation,” in *The Advanced Capitalist System*, ed. Lynn Turgeon (Routledge, 1980), 72-85.

⁹ “What Are Some of the Factors That Contribute to a Rise in Inflation?” Federal Reserve Bank of San Francisco, October 2002, <https://www.frbsf.org/education/publications/doctor-econ/2002/october/inflation-factors-rise/>.

¹⁰ Turgeon, “Explanations of Inflation.”

¹¹ Turgeon, “Explanations of Inflation,” p. 74.

economy, many have acknowledged the effects of Covid-19 on labor because periodic surges in infection have kept many workers home and hobbled production. For example, in January 2022, the spread of the Omicron-variant virus led to about 3.6 million employee absences — more than twice as high as the pre-pandemic high.¹² The same month, 6 million individuals were unable to work because their employers closed or lost business due to Covid-19. This caused supply disruptions across a variety of sectors.¹³

The Pandemic Labor Market

Pandemic-driven shutdowns and shifts in demand led to extremely large layoffs in certain industries, such as the leisure and hospitality industry, and spikes in demand in other areas, such as consumer appliances, that could not be easily met.¹⁴ After shutdowns ended and demand began recovering, businesses found it difficult to quickly ramp up their production and recruit sufficient labor for their workforces.¹⁵

A primary contributor to the labor supply challenges experienced nationally is low labor force participation. Though the unemployment rate and level of payroll employment returned to pre-pandemic levels in 2022, the employed share of the population is still lagging, resulting in a relatively smaller labor force than before the pandemic began. The labor force participation rate was 63.4% in February 2020 before the pandemic began and fell to 60.2% in April 2020.¹⁶ It rebounded to 62.1% by January 2022 and has flatlined thereafter, dropping lower than at any point between the 1970s and the start of the pandemic.¹⁷

Macroeconomic data suggest that, if workers could be brought back into the labor force, there appears to be significant room for employment to grow. However, the likelihood of this occurring is highly uncertain because much of the decline in labor force participation was driven by retirements, typically a permanent decision by workers.¹⁸ Worse, even before the pandemic, the US Census Bureau projected that the US will experience the lowest growth in the size of the working-age population since before the Civil War.¹⁹ A possible reassurance is that while nominal wages are rising, inflation-adjusted wages are falling.²⁰ However, numerous observers

¹² "Labor Force Statistics from the Current Population Survey: Absences from Work," U.S. Bureau of Labor Statistics, 2022, <https://www.bls.gov/cps/absences.htm>.

¹³ Marc Labonte & Lida Weinstock, "Inflation in the U.S. Economy: Causes and Policy Options," Congressional Research Service, Oct. 6, 2022, 16, <https://crsreports.congress.gov/product/pdf/R/R47273/2>.

¹⁴ Labonte & Weinstock, "Inflation in the U.S. Economy," 16.

¹⁵ Wendy Edelberg, "What does current inflation tell us about the future," Brookings Institution, Nov. 16, 2021, <https://www.brookings.edu/blog/up-front/2021/11/16/what-does-current-inflation-tell-us-about-the-future/>.

¹⁶ "Labor Force Participation Rate," Federal Reserve Bank of St. Louis, 2022, <https://fred.stlouisfed.org/series/CIVPART>.

¹⁷ "Labor Force Participation Rate," 2022.

¹⁸ Labonte & Weinstock, "Inflation in the U.S. Economy," 25.

¹⁹ Bill Conerly, "Drop In U.S. Immigration Further Tightens Labor Market," *Forbes*, Apr. 28, 2022, <https://www.forbes.com/sites/billconerly/2022/04/28/immigration-very-low-despite-border-controversy-contributing-to-tight-labor-market/>.

²⁰ Labonte & Weinstock, "Inflation in the U.S. Economy," 26.

have noted the decline in labor productivity in recent years.²¹ If employers continually raise wages beyond the productivity gains of workers, it could eventually result in a wage-price spiral that could make it harder to restore price stability.

Labor Mobility and Inflation

Few have connected recent inflation to pandemic-era human mobility. But with enormous migrations of remote workers away from urban centers to suburban, Southern, and seasonal destinations with more recreational amenities, the pandemic also challenged scores of regional economies to adjust to structural shifts in labor needs.²² The net flow of people out of US urban neighborhoods averaged about 28,000 people per month in March through September from 2017 to 2019. That number about doubled — to 56,000 people per month — in 2020 after the pandemic’s onset.²³ Net out-migration was greater for metro areas that had more deaths from Covid-19 and those with more occupations capable of remote work.²⁴

To provide a benchmark for these changes, Table 1 lists the metropolitan areas with the highest domestic migration flows over the ten-year period preceding the pandemic, illustrating a pervasive shift toward Texas, the Mountain West, and the far Southeast. In contrast, Tables 2 and 3 list the metropolitan areas with the sharpest *declines* and *increases*, respectively, in domestic migration following the onset of the pandemic. As other observers have documented, the regions that experienced the most significant declines in domestic flows during the pandemic had been experiencing declines before the pandemic.²⁵ The pandemic accelerated exit from these regions and amplified domestic migration to regions that were already growing in population — all at a time when international migration flows also stopped.²⁶

²¹ “The U.S. productivity slowdown: an economy-wide and industry-level analysis,” U.S. Bureau of Labor Statistics, Apr. 2021, <https://www.bls.gov/opub/mlr/2021/article/the-us-productivity-slowdown-the-economy-wide-and-industry-level-analysis.htm>.

²² Tim Henderson, “The Pandemic Prompted People to Move, But Many Didn’t Go Far,” Pew Charitable Trust, Mar. 23, 2022, <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2022/03/23/the-pandemic-prompted-people-to-move-but-many-didnt-go-far>; Stephan Whitaker, “Did the COVID-19 Pandemic Cause an Urban Exodus?” Federal Reserve Bank of Cleveland, Feb. 5, 2021, <https://www.clevelandfed.org/newsroom-and-events/publications/cfed-district-data-briefs/cfddb-20210205-did-the-covid-19-pandemic-cause-an-urban-exodus>.

²³ Whitaker, “Did the COVID-19 Pandemic Cause an Urban Exodus?”

²⁴ Whitaker, “Did the COVID-19 Pandemic Cause an Urban Exodus?”

²⁵ The exceptions here are Denver, CO and Seattle, WA.

²⁶ William Frey, “New census data shows a huge spike in movement out of big metro areas during the pandemic,” Brookings Institution, April 14, 2022, <https://www.brookings.edu/blog/the-avenue/2022/04/14/new-census-data-shows-a-huge-spike-in-movement-out-of-big-metro-areas-during-the-pandemic/>.

Table 1. Metro Areas with Historically High Domestic Migration Inflows

Top 10 Largest Domestic Migration (2010-2019)			
Rank	MSA Code	MSA Title	Average
1	C1910	Dallas-Fort Worth-Arlington, TX	46061.4
2	C3806	Phoenix-Mesa-Scottsdale, AZ	40102.8
3	C1242	Austin-Round Rock, TX	29369.7
4	C4530	Tampa-St. Petersburg-Clearwater, FL	29266.5
5	C2642	Houston-The Woodlands-Sugar Land, TX	26693.7
6	C1206	Atlanta-Sandy Springs-Roswell, GA	24625.7
7	C1674	Charlotte-Concord-Gastonia, NC-SC	23270.4
8	C4170	San Antonio-New Braunfels, TX	21460.9
9	C1974	Denver-Aurora-Lakewood, CO	19670.0
10	C2982	Las Vegas-Henderson-Paradise, NV	18644.0

Source: U.S. Census Bureau population estimates

Table 2. Metro Areas with Sharpest Declines of Domestic Migration Inflows

Top 10 Largest Decline in Domestic Migration (2010-2019) with (2020-2021)					
Rank	MSA Code	MSA Title	2010-2019	2020-2021	Decline
1	C3562	New York-Newark-Jersey City, NY-NJ-PA	-146961.0	-440500.0	-293539.0
2	C3108	Los Angeles-Long Beach-Anaheim, CA	-74297.7	-237526.0	-163228.3
3	C4186	San Francisco-Oakland-Hayward, CA	-3641.1	-141865.0	-138223.9
4	C1698	Chicago-Naperville-Elgin, IL-IN-WI	-63742.6	-127799.0	-64056.4
5	C4790	Washington-Arlington-Alexandria, DC-VA-MD-D	-12596.4	-75004.0	-62407.6
6	C4194	San Jose-Sunnyvale-Santa Clara, CA	-12478.8	-60695.0	-48216.2
7	C3310	Miami-Fort Lauderdale-West Palm Beach, FL	-19219.0	-66989.0	-47770.0
8	C1446	Boston-Cambridge-Newton, MA-NH	-10197.1	-54777.0	-44579.9
9	C4266	Seattle-Tacoma-Bellevue, WA	13634.1	-29241.0	-42875.1
10	C1974	Denver-Aurora-Lakewood, CO	19670.0	-3564.0	-23234.0

Source: U.S. Census Bureau population estimates

Table 3. Metro Areas with Sharpest Increases of Domestic Migration Inflows

Top 10 Largest Increase in Domestic Migration (2010-2019) with (2020-2021)					
Rank	MSA Code	MSA Title	2010-2019	2020-2021	Increase
1	C3806	Phoenix-Mesa-Scottsdale, AZ	40102.8	87194.0	47091.2
2	C4014	Riverside-San Bernardino-Ontario, CA	10968.7	38057.0	27088.3
3	C1910	Dallas-Fort Worth-Arlington, TX	46061.4	72575.0	26513.6
4	C1242	Austin-Round Rock, TX	29369.7	52636.0	23266.3
5	C4530	Tampa-St. Petersburg-Clearwater, FL	29266.5	52367.0	23100.5
6	C2946	Lakeland-Winter Haven, FL	8936.4	29482.0	20545.6
7	C3584	North Port-Sarasota-Bradenton, FL	14343.6	34327.0	19983.4
8	C1426	Boise City, ID	8993.3	28577.0	19583.7
9	C1598	Cape Coral-Fort Myers, FL	12596.3	30368.0	17771.7
10	C2726	Jacksonville, FL	12628.5	30062.0	17433.5

Source: U.S. Census Bureau population estimates

This internal mobility created new demand for goods and services in many unprepared regional markets that needed to scramble to ramp up capacity. It is not surprising then that the four metropolitan areas with the highest regional inflation rates were among the most popular destinations for internal migrants.²⁷ An analysis by the real estate company Redfin showed that Phoenix, Atlanta, Miami, and Tampa saw double-digit inflation in the third quarter of 2022, compared to a nationwide inflation rate of 8.3 percent.²⁸ Phoenix — the sixth most popular pandemic-era boomtown among Redfin users that quarter — experienced the largest increase in the cost of goods and services as its inflation rate rose from 3 percent in 2019 to 13 percent; Phoenix shelter costs alone rose by 19 percent in August 2022. Miami, the second most popular migration destination, had a third-quarter inflation rate of 10.7 percent.

Conversely, the regions that homebuyers disproportionately left featured the lowest inflation rates in the country. Prices in San Francisco rose only 5.7 percent in the third quarter of 2022, the least among major metropolitan areas and less than half the rate of Phoenix. The Bay Area was first on the list of places Redfin users sought to leave that quarter. New York had the second-lowest inflation rate (6.4 percent) and was third on the list of regions that homebuyers sought to leave. In contrast, in 2019, Los Angeles had the second highest inflation rate in the country, but it was losing residents. The influx of buyers into markets offering more affordable space and warmer weather caused home prices to spike, but it likely also pressured local producers to meet the sharp increases in demand.

International Labor Migration

Amidst low labor market participation and low unemployment, under pre-pandemic conditions, local producers could rely on reserves of labor from international immigrants who can be recruited via seasonal or temporary work visas. Employers could also target new arrivals on other visas and the undocumented, who are often more flexible about the wages they are paid and where they reside than native-born workers. Earlier research has shown that an increase in the share of low-skilled immigrants in the labor force decreases the price of immigrant-intensive services — like childcare, gardening, housekeeping, and dry cleaning — by 2 percent, thanks to lower wages.²⁹ Though it is possible that a significant share of relocating American nationals are low-skilled, the same study shows larger wage effects for low-skilled immigrants than for low-skilled natives, implying that the two are imperfect substitutes.³⁰ The magnitude of the effect suggests that US immigration flows between 1980 and 2000 decreased the prices of

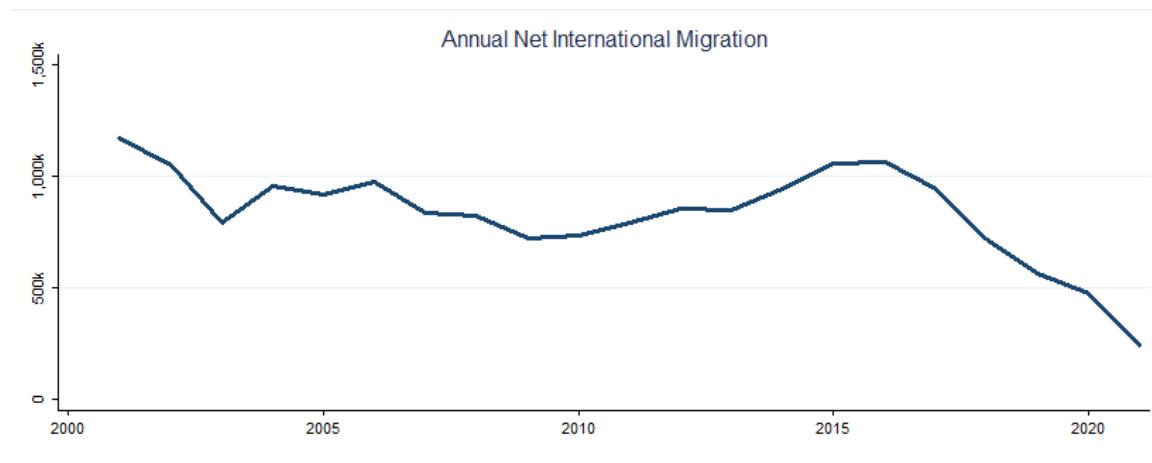
²⁷ Lily Katz & Taylor Marr, “Pandemic Boomtowns Phoenix and Miami Have Among the Highest Inflation Rates in the U.S.,” Redfin, Nov. 10, 2022, <https://www.redfin.com/news/migration-inflation-q3-2022/>.

²⁸ Katz & Marr, “Pandemic Boomtowns.”

²⁹ Patricia Cortes, “The Effect of Low-Skilled Immigration on U.S. Prices: Evidence from CPI Data,” *Journal of Political Economy* 116, no. 33 (2008): 381-422, p. 381.

³⁰ It has also been hypothesized that newly arrived immigrants are more price sensitive than the native population, possibly because of their lower income and lack of brand and store loyalties. Saul Lach, “Immigration and Prices,” *Journal of Political Economy* 115, no. 4 (2007): 548-587, p. 550. Retailers then have an incentive to lower their markups in order to attract these new high-elasticity consumers, especially when brand and store attachments are initially weak and develop over time. Mark Bils, “Pricing in a Customer Market,” *Q.J.E.* 104 (November 1989): 699–718.

Figure 1. Annual Net International Migration



Source: U.S. Census Bureau population estimates

immigrant-intensive services by at least a city average of 9 to 11 percent and increased the purchasing power of high-skilled workers living in the 30 largest US cities by an average of 0.32 percent.³¹

However, as Figure 1 exhibits, the annual net flow of foreigners to the United States has been declining since the 2016 election of President Donald Trump, who signed dozens of executive actions designed to mitigate the number of newcomers admitted and then effectively halted immigration with the pandemic's onset.³² Only 247,000 migrants were admitted to the United States between 2020 and 2021 after the US admitted 477,000 between 2019 and 2020 and 1,049,000 between 2015 and 2016.³³ Economists estimate that these policies prevented 1.15

³¹ Patricia Cortes, "The Effect of Low-Skilled Immigration on U.S. Prices: Evidence from CPI Data," 413-414. The author also finds the low-skilled immigration also decreased the purchasing power of the native high school dropouts by a maximum of 1 percent and of Hispanic low-skilled natives by 4.2 percent.

³² Julia Gelatt and Muzaffar Chishti, "COVID-19's Effects on U.S. Immigration and Immigrant Communities, Two Years On," Migration Policy Institute, June 2022, https://www.migrationpolicy.org/sites/default/files/publications/mpi-covid-us-immigration-lookback_final.pdf.

³³ Jason Schachter, Pete Borsella & Anthony Knapp, "New Population Estimates Show COVID-19 Pandemic Significantly Disrupted Migration Across Borders," U.S. Census Bureau, Dec. 21, 2021, <https://www.census.gov/library/stories/2021/12/net-international-migration-at-lowest-levels-in-decades.html>. See also J. Passel & D. Cohn, "Legal U.S. immigration rebounds somewhat after plunging with COVID pandemic," Pew Research Center, April 4, 2022, <https://www.pewresearch.org/fact-tank/2022/04/04/legal-immigration-to-the-u-s-partially-rebounds-as-national-and-global-borders-reopen/>.

Table 4. Metro Areas with Historically High International Migration Inflows

Top 10 Largest International Migration (2010-2019)			
Rank	MSA Code	MSA Title	Average
1	C3562	New York-Newark-Jersey City, NY-NJ-PA	84789.8
2	C3310	Miami-Fort Lauderdale-West Palm Beach, F	61049.9
3	C3108	Los Angeles-Long Beach-Anaheim, CA	34903.5
4	C4790	Washington-Arlington-Alexandria, DC-VA-MD	34209.9
5	C2642	Houston-The Woodlands-Sugar Land, TX	33272.9
6	C1446	Boston-Cambridge-Newton, MA-NH	28918.7
7	C1910	Dallas-Fort Worth-Arlington, TX	23996.4
8	C4186	San Francisco-Oakland-Hayward, CA	22241.7
9	C4266	Seattle-Tacoma-Bellevue, WA	19978.0
10	C1698	Chicago-Naperville-Elgin, IL-IN-WI	19211.8

Source: U.S. Census Bureau population estimates

million additional immigrants from entering the United States in 2021 alone; from 2016 to 2021, 3.4 million additional immigrants might have entered, many of whom would have joined the labor force.³⁴ According to the State Department, the number of non-immigrant work visas issued fell from a peak of 5.5 million in 2015 to a low of 1.45 million in 2021.³⁵ Combined with increasing exits of foreign workers from the US, net international immigration into the United States had dropped almost in half by 2019 from 2017 levels.³⁶

Table 4 lists the ten MSAs with the greatest number of international migrant flows during the ten-year period from 2010 to 2019, and then displays their average annual net flows. Unsurprisingly, these MSAs are the largest cities in the US. In any given year, cities like New York or Miami might experience a population increase of near 70,000 people from international migration alone.³⁷ Table 5 lists the ten MSAs with the sharpest declines in international migration flows, as measured by the change in the average annual flows from 2010-2019 to 2020-2021. Unsurprisingly again, areas traditionally heavily reliant on international migration have seen the sharpest declines; indeed, the top ten metropolitan international migrant destinations are precisely those which experienced the greatest declines. This underscores the pandemic's universal elimination of international migration everywhere.

³⁴ Elior Cohen & Samantha Shampine, "Immigration Shortfall May Be a Headwind for Labor Supply," Federal Reserve Bank of Kansas City, May 11, 2022, <https://www.kansascityfed.org/research/economic-bulletin/immigration-shortfall-may-be-a-headwind-for-labor-supply/>.

³⁵ Cohen & Shampine, "Immigration Shortfall."

³⁶ Schachter, Borsella & Knapp, "New Population Estimates."

³⁷ In per capita terms, the top 10 MSAs change a bit, reflecting the dominant role international students can have on a smaller university towns (e.g., like University of Illinois in Champaign-Urbana, IL and Purdue University in Lafayette-West Lafayette, IN).

Table 5. Metro Areas with Sharpest Declines of International Migration Inflows

Top 10 Largest Decline in International Migration (2010-2019) with (2020-2021)					
Rank	MSA Code	MSA Title	2010-2019	2020-2021	Decline
1	C3562	New York-Newark-Jersey City, NY-NJ-PA	84789.8	25093.0	-59696.8
2	C3310	Miami-Fort Lauderdale-West Palm Beach, F	61049.9	24029.0	-37020.9
3	C3108	Los Angeles-Long Beach-Anaheim, CA	34903.5	4708.0	-30195.5
4	C4790	Washington-Arlington-Alexandria, DC-VA-N	34209.9	13525.0	-20684.9
5	C2642	Houston-The Woodlands-Sugar Land, TX	33272.9	12997.0	-20275.9
6	C1446	Boston-Cambridge-Newton, MA-NH	28918.7	11316.0	-17602.7
7	C4186	San Francisco-Oakland-Hayward, CA	22241.7	5263.0	-16978.7
8	C1698	Chicago-Naperville-Elgin, IL-IN-WI	19211.8	4342.0	-14869.8
9	C1910	Dallas-Fort Worth-Arlington, TX	23996.4	9196.0	-14800.4
10	C4266	Seattle-Tacoma-Bellevue, WA	19978.0	7743.0	-12235.0

Source: U.S. Census Bureau population estimates

When pandemic lockdowns began, labor markets tightened across 36 states nationwide and by greater than 50 percent of pre-pandemic levels in 10 states,³⁸ but there was little inflow of foreign workers. Problematically, the regions with reserves of recent arrivals were those markets that saw drops in population and therefore consumption — a mismatch of labor supply and demand. According to the US Chamber of Commerce's Worker Shortage Index, Alaska, Georgia, Minnesota, Montana, New Hampshire, North Dakota, Utah, Vermont, Virginia, Wyoming all reported at least an average of 40 unemployed workers for every 100 open jobs in 2022. Similarly, the greatest increases in job openings from 2019 to 2022 were in Alaska, Colorado, Georgia, Kentucky, Montana, Texas, and Utah — nearly all of which were pandemic destinations.³⁹ Between 2018 and 2022, rural states like Idaho and Montana experienced 12.2 percent and 7.7 percent population growth, respectively, while New York, Illinois, and California saw gradual declines of 1.1, 2.2, and 1.1 percent, respectively.⁴⁰ Correspondingly, residents of the Mountain West region—Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming — experienced the highest monthly inflation rates in the US with over \$500 in added household costs in January 2022.⁴¹ By June 2022, prices in this region were about 15 percent higher over an 18-month span.⁴² Conversely, those in the East South Central region — Kentucky, Tennessee, Mississippi, and Alabama, states that attracted fewer remote workers — experienced the lowest monthly inflation costs.

³⁸ Johannes Matschke & Sai Sattiraju, "Labor Markets Are Tight, but Conditions Vary across States," Federal Reserve Bank of Kansas City, Dec. 22, 2021, <https://www.kansascityfed.org/research/economic-bulletin/labor-markets-are-tight-but-conditions-vary-across-states/>.

³⁹ L. Cates, "Understanding America's Labor Shortage: The Most Impacted States," U.S. Chamber of Commerce, Oct. 31, 2022, <https://www.uschamber.com/workforce/the-states-suffering-most-from-the-labor-shortage>.

⁴⁰ Ethan Chernofsky, "Domestic Migration Trends: June 2022," Association for International Real Estate Investors, Oct. 6, 2022, <https://www.afire.org/summit/migrationtrends/>.

⁴¹ "How Much is Inflation Costing You? It Depends on Where You Live," United States Congress Joint Economic Committee, Mar. 2, 2022, <https://www.jec.senate.gov/public/index.cfm/republicans/2022/3/how-much-is-inflation-costing-you-it-depends-on-where-you-live>.

⁴² Jackie Benson, Kevin Cornith, & Kole Nichols, "State Inflation Tracker: June 2022," United States Congress Joint Economic Committee, July 13, 2022, <https://www.jec.senate.gov/public/index.cfm/republicans/2022/7/state-inflation-tracker-june-2022>.

In this analysis, we quantify the extent to which much of the 2021-2023 inflation is attributable to regional “mismatches” of labor supply and demand. It is not enough, we argue, to understand these dynamics as a matter of internal population shifts of remote employees and space-seekers that may be resolved with a redistribution of workers over time. The mismatch takes place when local suppliers are *unable* to ramp up their capacity by recruiting commensurate numbers of US or foreign workers. In October 2022, the nationwide labor market had 10.1 million job openings but only 5.8 million workers available to fill them⁴³ — a shortfall we estimate is acutely felt in regions that experienced rapid consumer growth. No redistribution of the current US labor force will fully address this. But to what extent does this mismatch of labor supply and demand drive inflation?

Data

Given changes to supply and demand for different segments of the economy brought upon by demographic change, what was the effect of these dramatic disruptions to international and domestic flows on regional — and therefore national — inflation? Addressing this question, we estimate a series of regressions that attempts to isolate the effect of the recent swings in total net migration to metropolitan areas on recent inflation. More specifically, we explore the extent to which these migration patterns have contributed to increases in the headline Consumer Price Index (CPI), but also on several of the underlying components including home prices, and wages in specific sectors as well as our measure of labor market tightness (the ratio of job openings to unemployment).

In each case we estimate the effect using a regression model that is given by the following equation:

$$\Delta y_{it} = \beta_0 + \beta_1 \text{Net Total Migration}_{it} + \varepsilon_{it}$$

where Δy_{it} is the percent change in some measure or price (e.g., CPI, wages, or home prices) from 2020—2022 in a particular metropolitan area i in period t , Net Total Migration is the net increase in the number of persons who have arrived in area i during the 2020—2021 period, and ε_{it} is the regression model error term.⁴⁴ In the case of CPI, we run this regression on the 21 largest MSAs for which timely CPI data is available. For the wage measures, we can estimate this regression at the MSA level for as many as 300 MSAs located across the US. In the case of the job posting-to-unemployed ratio, we are restricted to only being able to run this regression at the state-level. Finally, in all cases, our measure of net total migration is measured as the net inflow of individuals per 1,000 residents as of 2019.

⁴³ Ben Winck & Jason Lalljee, “The Trump and COVID eras tanked immigration to the US. Reversing that could help ease a recession risk, sky-high inflation, and a labor crisis,” Business Insider, Oct. 18, 2022, <https://www.businessinsider.com/trump-covid-immigration-makes-inflation-worse-recession-outlook-jobs-supply-2022-10>.

⁴⁴ In all cases we report the heteroskedasticity robust standard errors of the regression coefficients. For the state-level regression, we weight observations by their total population in 2019.

The changing scope of our analysis is attributable to available data sources. We gather net migration flows at the county level from the US Census Bureau. These data provide estimates of county level population changes that arise not only from natural changes (i.e., births and deaths) but also US internal and international migration flows. This serves as our primary variable of interest and how changes in these flows over the course of the most recent period have translated into metropolitan labor market tightness and ultimately into upward pressure on wages and prices.

Next, we gather measures of inflation—as measured by the Consumer Price Index (CPI) — at the MSA level from the Bureau of Labor Statistics. The CPI measures, though less comprehensive in geographical coverage (e.g., the Bureau of Economic Analysis implicit regional price deflators), has the advantage of being much timelier, and it captures the inflationary experience of these MSAs during the entirety of 2022.

To further highlight the inflationary pressures driven by migration patterns, we also gather several alternative measures of pricing pressures that reflect underlying components of CPI. In particular, we gather home price data from Zillow at the MSA level. Additionally, we gather measures of the average annual wages by county (and industry) from the Quarterly Census of Employment and Wages.

Finally, we gather information on the number of job openings at the state level from the Job Openings and Labor Turnover Survey (JOLTS) available at the state level and combine that with the number of unemployed persons also at the state level to create the vacancy-to-unemployed — or V/U — ratio which represents a common measure to characterize the degree of labor market tightness. For instance, values much above one indicates periods of time where there are more available and unfilled job openings than there are people who are not working and looking for a job. Alternatively, when this value is less than one, there are more people who are not working and looking for a job than there are currently available positions that prospective workers can fill.

Empirical Results

Table 6 summarizes the regression results across our range of different measures of upward pricing pressures. In the first column, we report the coefficient estimates for the state-level regression involving job posting to unemployed ratio — the most direct measure of the degree of labor market tightness (see also Figure 2). In this specification, we find a strong positive association between the total net migration flows to a state and the corresponding number of unfilled positions relative the number of people in the state currently looking for work. While labor market shortages the since the pandemic are a national trend (all state values of the V/U ratio are above 1), the regression estimates indicate that moving from the bottom to the top

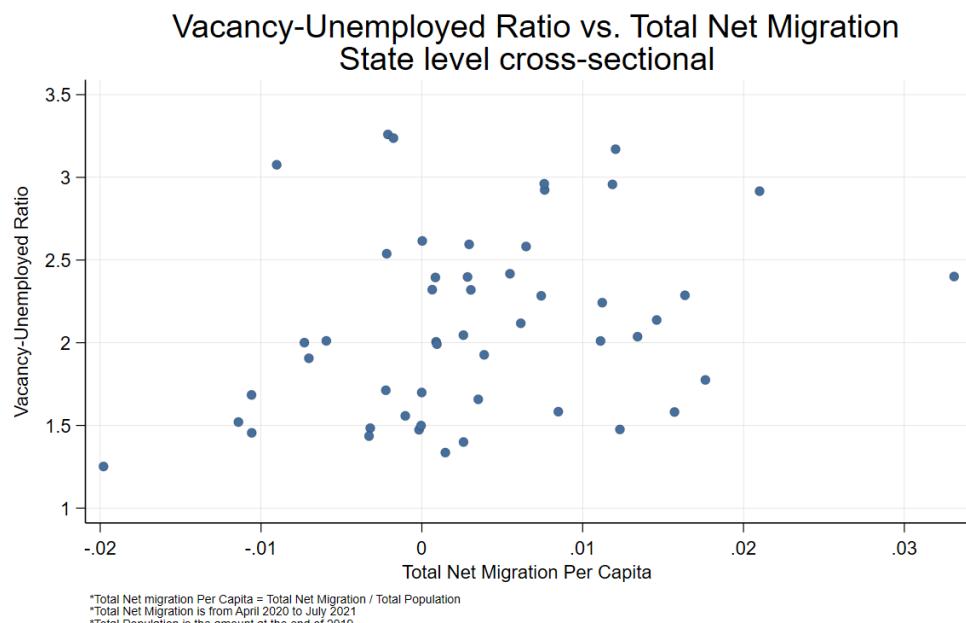
Table 6. Net Migration Flows Strongly Associated with Upward Pricing Pressures

	V/U	CPI	Zillow-Home Prices	Wages	Leisure Wages	Construction wages
Net Migration per capita	0.023 (0.005)	0.164 (0.015)	0.498 (0.037)	0.040 (0.011)	0.017 (0.016)	0.040 (0.010)
Constant	1.874 (0.072)	13.721 (0.292)	31.430 (0.416)	4.724 (0.134)	10.331 (0.174)	3.785 (0.253)
Observations	50	21	886	380	372	342

Source: Bureau of Labor Statistics, Census Bureau, Zillow, Quarterly Census of Employment and Wages, and authors' calculations. Heteroskedasticity robust standard errors reported in parenthesis.

*net migration per capita is number of net inflow residents per thousand existing population (2019)

Figure 2. Vacancy to Unemployed Ratio and Total Net Migration



Source: Bureau of Labor Statistics and U.S. Census Bureau population estimates

decile of total net migration flows corresponds to moving from a job openings to unemployed ratio of 1.61 to 2.19, which constitutes a 31 percent increase in labor market tightness off the average.⁴⁵ These results are largely consistent and expand upon those of Duzhak (2023).

The second column reports the regression estimates most directly associated with overall inflation pressures. More specifically, the second column reports the coefficient estimates from a regression involving the largest 21 metro areas and how total net migration flows are associated with the most recent episode of inflation as measured by the Consumer Price Index (CPI). As displayed in Figures 3 and 4, the relationship between migration and inflation at the metro area level is strongly positive. The regression estimates indicate that moving from the bottom to the top quartile of total migration corresponds to increasing the metro area inflation over 2021-2022 by almost 2.5 percentage points.

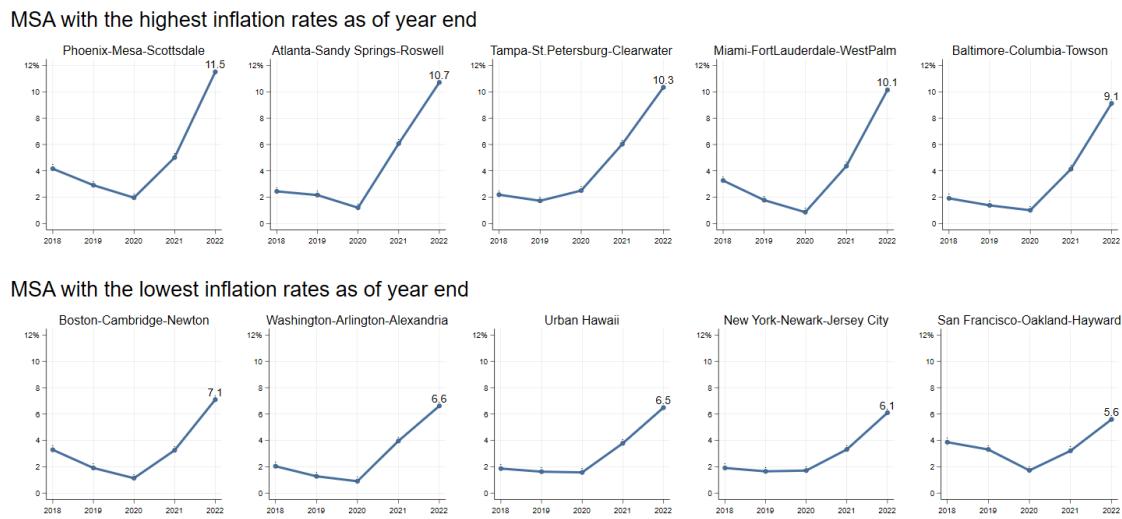
Next, we decompose some of the primary contributors of that inflationary pressure. In the third column, we report the regression estimates associated with the largest component of CPI — housing. More specifically, the third column reports the coefficient estimates from a regression involving nearly all the metropolitan areas and how total net migration flows are associated with home price appreciation, as measured by Zillow. As Figure 5 shows, the relationship between migration and home price appreciation at the metropolitan area level is strongly positive. The regression estimates indicate that moving from the bottom to the top quartile of total net migration flows corresponds to increasing local home price appreciation over 2021-2022 by almost 6.7 percentage points

The labor market results suggests that the migration patterns we document should also impact wages. In the fourth column, we report the regression estimates associated with wages. More specifically, the fourth column reports the coefficient estimates from a regression involving nearly all the metro areas and how total net migration flows are associated with (nominal) wage inflation. As displayed in Figure 6, the relationship between migration and wage inflation at the metropolitan area level is more modest but still significantly positive. The regression estimates indicate that moving from the bottom to the top quartile of total net migration flows corresponds to increasing metropolitan areas' wage inflation over 2021-2022 by just over one half of a percentage point.

In the fifth and sixth columns of Table 6, we explore the extent to which this association of migration and wages differs across industrial sectors. More specifically, we report the coefficient estimates associated with wage inflation in the leisure and hospitality sector, and we report the coefficient estimates associated with the wage inflation in the construction sector. Comparing the coefficient estimates, we find that the association of total net migration flows on wage inflation in the construction sector is almost two times the association in the leisure and hospitality sector. (Also see Figures 7 and 8.)

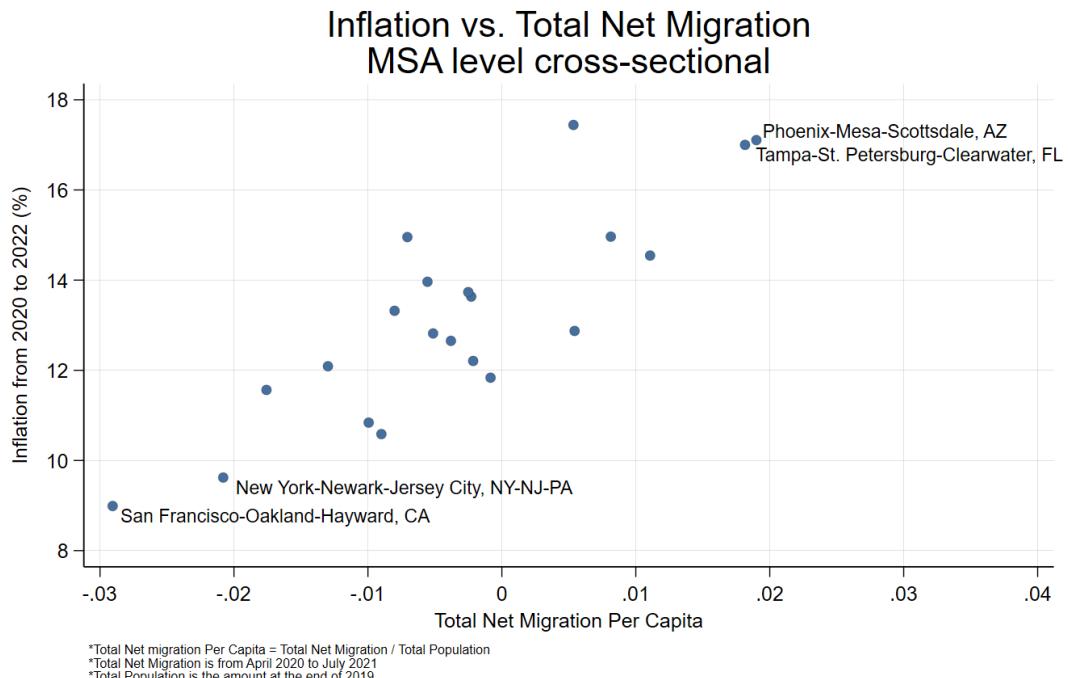
⁴⁵ Total migration flows account for 21 percent of the variation in state-level job openings to unemployed ratios.

Figure 3. Inflation in Several Large Metropolitan Areas



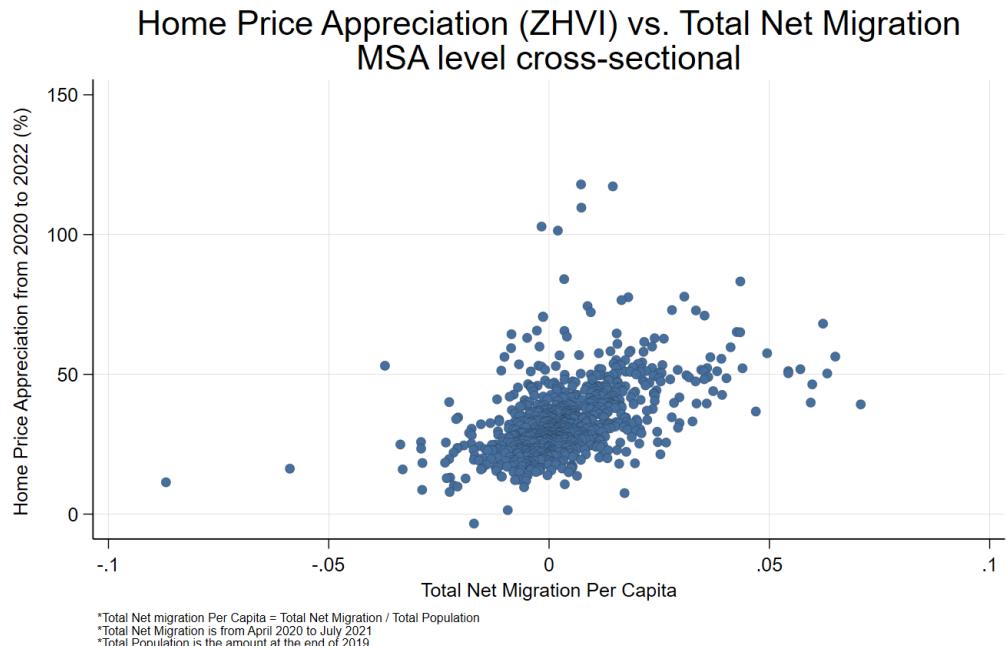
Source: Bureau of Labor Statistics

Figure 4. CPI Inflation and Total Net Migration



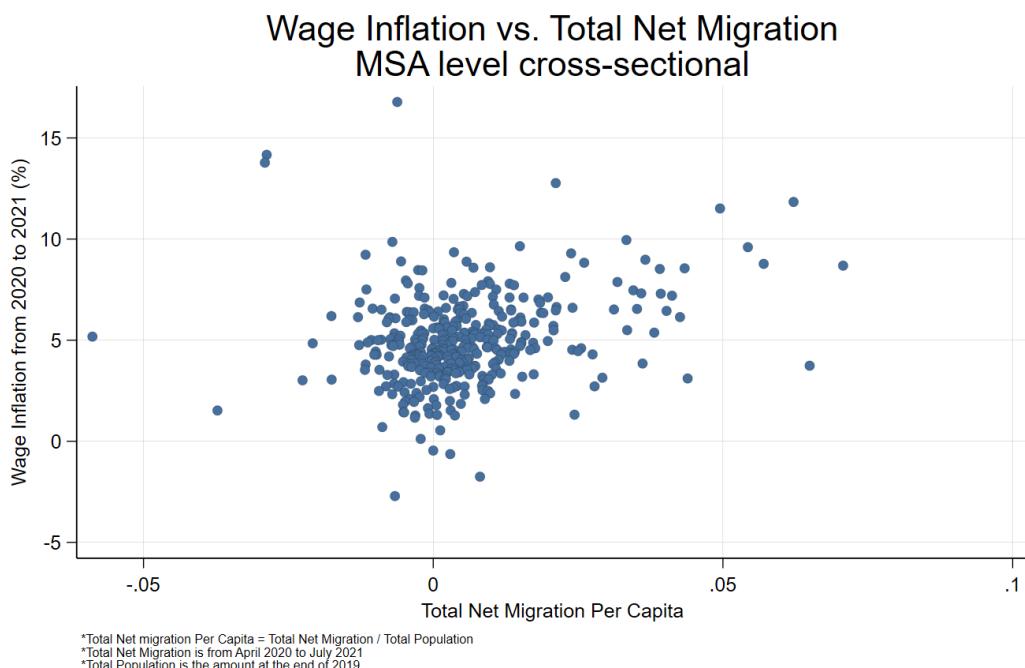
Source: Bureau of Labor Statistics and U.S. Census Bureau—Population Division

Figure 5. Home Price Appreciation and Total Net Migration



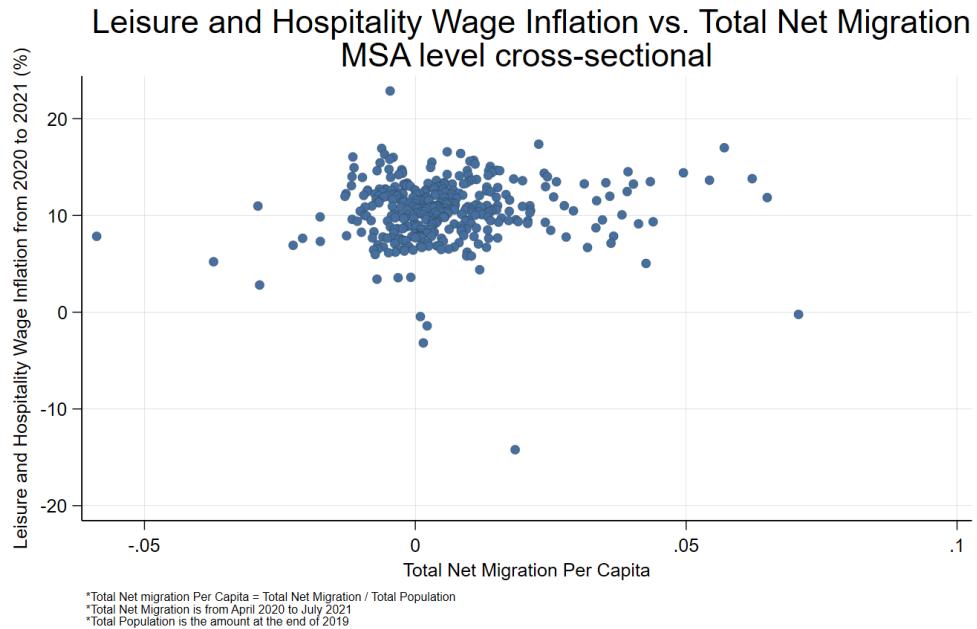
Source: Zillow and U.S. Census Bureau—Population Division.

Figure 6. Wage Inflation and Total Net Migration



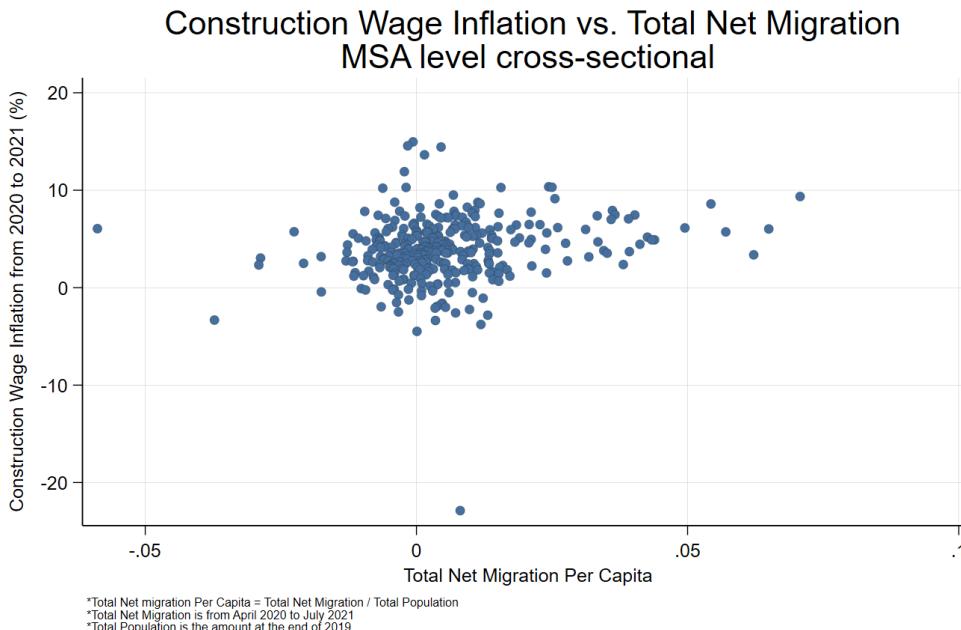
Source: Quarterly Census of Employment and Wages (QCEW) and U.S. Census Bureau—Population Division.

Figure 7. Leisure and Hospitality Wage Inflation and Total Net Migration



Source: Quarterly Census of Employment and Wages (QCEW) and U.S. Census Bureau—Population Division.

Figure 8. Construction Wage Inflation and Total Net Migration



Source: Quarterly Census of Employment and Wages (QCEW) and U.S. Census Bureau—Population Division.

These results corroborate those involving the overall wage and home appreciation. In particular, the pandemic-induced domestic migration led to a stronger increase in the demand for housing construction than services (such as restaurant dining) which coincided with the abrupt restriction of international migrants who otherwise conventionally support both services. In the face of these shifts, a natural response is nominal wage increases in the construction sector relative to the leisure and hospitality sector.

Conclusion

We find strong evidence that the acceleration of both the downward trend in international migration together with the dramatic shifts in domestic migration have created a substantial divergence in the net migration flows across regions in the United States. Some metropolitan areas experienced substantial spikes in population growth, while other metropolitan areas experienced population loss — all without the versatility normally provided by a workforce of highly mobile, foreign-born workers.

The effects on the labor market and, consequentially, inflationary pressures have been profound. In particular, we find using a combination of MSA level variation in a variety of different measures of inflationary pressure that the net effect of the shutdown of international migration and the reorientation of internal national migration has been a primary factor contributing to this most recent inflationary period.

The results highlight that future research should explore the extent to which domestic mobility patterns are likely to reflect permanent shifts in residence — or if they might end up being transitory responses to the pandemic-induced changes in daily activities still occurring into 2023. For now, it is reasonable to expect employers to continue offering higher wages and raising prices — which could lead to a medium-run, wage-price spiral.⁴⁶ To achieve higher real wages while reducing inflation and encouraging employment, the US must either increase labor force participation and expand training⁴⁷ or increase the pool of workers available through the admission of foreign workers. The only other remedy is for a recession to cool demand and reduce the pressure to hire — a resolution few will favor.

⁴⁶ Lida Weisenstock, “The Post-Pandemic Labor Market and Rising Inflation,” Congressional Research Service, Nov. 22, 2021, <https://crsreports.congress.gov/product/pdf/IN/IN11711>.

⁴⁷ Harry Holzer, “Tight labor markets and wage growth in the current economy,” Brookings Institution, April 13, 2022, <https://www.brookings.edu/research/tight-labor-markets-and-wage-growth-in-the-current-economy/>.

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