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COVID-19 Is Also a Reallocation Shock

ABSTRACT We develop several pieces of evidence about the reallocative effects of the COVID-19 shock on impact and over time. First, the shock caused three to four new hires for every ten layoffs from March 1 to mid-May 2020. Second, we project that one-third or more of the layoffs during this period are permanent in the sense that job losers won't return to their old jobs at their previous employers. Third, firm-level forecasts at a one-year horizon imply rates of expected job and sales reallocation that are two to five times larger from April to June 2020 than before the pandemic. Fourth, full days working from home will triple from 5 percent of all workdays in 2019 to more than 15 percent after the pandemic ends. We also document pandemic-induced job gains at many firms and a sharp rise in cross-firm equity return dispersion in reaction to the pandemic. After developing the evidence, we consider implications for the economic outlook and for policy. Unemployment benefit levels that exceed worker earnings, policies that subsidize employee retention irrespective of the employer's commercial outlook, and barriers to worker mobility and business formation impede reallocation responses to the COVID-19 shock.

The COVID-19 pandemic and efforts to contain the virus have exacted a staggering economic toll in countries around the world. China's economy shrank 6.8 percent in the first quarter of 2020 on a year-on-year

Conflict of Interest Disclosure: The authors did not receive financial support from any firm or person for this paper or from any firm or person with a financial or political interest in this paper. They are currently not officers, directors, or board members of any organization with an interest in this paper. No outside party had the right to review this paper before circulation. The views expressed in this paper are those of the authors, and do not necessarily reflect those of the Instituto Tecnológico Autónomo de México, Stanford University, or the University of Chicago.

basis, and eurozone economies shrank at a 14.8 percent annualized rate. In the United States, nearly 28 million persons filed new claims for unemployment benefits over the six-week period ending April 25. The US economy shrank an annualized rate of 5.0 percent in the first quarter of 2020 and 32.9 percent in the second quarter (BEA 2020). Yet, even as much of the economy shut down, many firms expanded in response to pandemic-induced demand shifts. As Bender and Dalton (2020) put it in the *Wall Street Journal*, "the coronavirus pandemic is forcing the fastest reallocation of labor since World War II, with companies and governments mobilizing an army of idled workers into new activities that are urgently needed." That is, COVID-19 is a major reallocation shock.

We develop evidence on the extent, character, and timing of the reallocative aspects of the COVID-19 shock for the US economy. We start by quantifying the near-term reallocative impact on business staffing outcomes, drawing on two special questions fielded in the April 2020 Survey of Business Uncertainty (SBU). One question asks (as of mid-April) about the coronavirus impact on own-company staffing since March 1, and another asks about the anticipated impact over the ensuing four weeks. Cumulating responses over firms and across these two questions, the data say that pandemic-related developments caused near-term layoffs equal to 12.9 percent of March 1 employment and new hires equal to 3.9 percent. In other words, the COVID-19 shock caused three new hires in the near term for every ten layoffs. Similarly, the Job Openings and Labor Turnover Survey (JOLTS) reports more than four hires for every ten layoffs in March and April. This large volume of new hires amid a tremendous employment contraction aligns well with payroll statistics reported by Cajner and others (2020), with Census Bureau statistics on gross business formation, and with anecdotal evidence of large pandemic-induced increases in labor demand at some firms.

Next, we construct projections for the permanent layoff share of recent job losses. As a first step, we draw on questions about layoff status put to employers in the SBU, to unemployment benefit claimants in California, and to households in a *Washington Post*–Ipsos survey. The first two sources indicate that about 23 percent of layoffs from March to May 2020 were seen as permanent at the time, and the rest were seen as temporary. (The *Washington Post*–Ipsos survey yields a figure of 20 percent.) Historically, many layoffs perceived as temporary when they happen do not result in recalls. Adjusting for this pattern, we project that roughly one-third or more of COVID-19-induced layoffs will be permanent in the sense that job losers don't return to their old jobs at their former employers. Because we

use historic evidence on how temporary layoffs convert to actual recalls, our adjustment could be too small or too large for the current episode. In addition, the conversion rate will surely depend on how long it takes to resolve the COVID-19 health crisis and for the economy to recover. Still, our key message in this regard is clear: many jobs lost in the wake of the COVID-19 pandemic are gone for good.

We also use SBU data to develop novel measures of expected reallocation activity. Specifically, we aggregate over firm-level employment forecasts to calculate the following quantity: gross expected job gains at firms that anticipate growing over the next year plus gross expected job losses at firms that anticipate shrinking over the next year minus the absolute value of the expected aggregate employment change. Dividing this quantity by aggregate employment yields our measure of the expected excess job reallocation rate at a one-year look-ahead horizon. It rises from 1.5 percent of employment in January 2020 to 5.4 percent in April. This April value is 2.4 times the pre-COVID average and is the highest value in the short history of the series. Using firm-level sales forecasts at a one-year horizon, we find a similar pattern: the expected excess reallocation rate rises from an average of just under 1 percent of sales before the pandemic to more than 5 percent from April to June 2020. These forward-looking measures reinforce the view that COVID-19 is a major reallocation shock.

Next, we draw on special questions in the May 2020 SBU to quantify the anticipated shift to working from home after the coronavirus pandemic ends, relative to the situation that prevailed before it struck. To do so, we first asked firms about the share of full workdays performed at home by their full-time employees in 2019. (Responses to this question for the prepandemic situation align well with worker responses to similar questions about working from home in the 2017–2018 American Time Use Survey.) We then asked firms what they anticipate about the share of full workdays performed at home after the pandemic ends. Comparing responses to the before and after questions, firms expect that full workdays performed at home will triple. This expected tripling will involve shifting one-tenth of all full workdays from business premises to residences—one-fifth for office workers. Since the scope for working from home rises with wages, the shift in worker spending power from business districts to locations near residences is even greater.

Finally, we consider time series evidence on the dispersion in monthly equity returns across US-listed firms. Return dispersion relates less directly to future reallocation activity, but its availability over several decades helps us put the COVID-19 episode in perspective. Whether measured by the

interquartile range or the standard deviation of returns in the value-weighted distribution, the dispersion in equity returns jumps sharply in March 2020, reaching levels last seen during the financial crisis of 2008–2009 and the dot.com bust of the early 2000s. These three episodes exhibit the highest return dispersion in our sample period, which starts in 1984.

After presenting the evidence, we consider implications for the economic outlook and for policy responses to the pandemic. As of late July 2020, it is nearly five months since the COVID-19 recession began in earnest. Even if medical advances or natural forces bring an end to the health crisis in the near future, there are sound economic reasons to think that pandemic-induced shifts in consumer spending patterns, working arrangements, and business practices will partly stick. First, millions of households have tried online shopping and delivery services in recent months. Some find they like it and will continue to value the convenience and (perceived) safety after the pandemic ends. Second, according to our survey evidence, more than half of all employees worked from home as of May 2020. This mass experiment has pushed workers and organizations to invest in becoming more effective at working from home, which is a source of persistence in the new working arrangements. Barrero, Bloom, and Davis (2020) also find that most workers have been positively surprised by their productivity at home and want to continue working from home one or more days per week after the pandemic. Third, after turning to virtual meetings out of necessity, many businesses are likely to see them as an easier, cheaper option to travel and in-person meetings in some circumstances. A persistent drop in business travel has profound implications for travel and hospitality industries. Fourth, the pandemic knocked down regulations that had stymied a shift from in-person to virtual interactions, especially in health care services. These economic forces and mechanisms suggest that much of the near-term reallocative impact of the pandemic will persist. If the COVID-19 pandemic lingers for many more months, or if new pandemic threats emerge, it will further drive and entrench recent shifts in consumer spending patterns, working arrangements, and business practices.

Historically, creation responses to major reallocation shocks lag the destruction responses by a year or more. Partly for this reason, we anticipate a drawn-out economic recovery from the COVID-19 shock, even if the pandemic is largely controlled in the next few months. Multiple forces contribute to delayed creation, as we discuss. Policy responses to major shocks and inherited features of the policy landscape can further stretch out the creation response, slowing the recovery. In this regard, we discuss five aspects of US policy that retard creation responses to the pandemic-induced

reallocation shock: unemployment benefit levels that exceed earnings for many American workers, policies that subsidize employee retention irrespective of employers' longer-term outlook, land-use restrictions that inhibit the reallocation of jobs and workers, occupational licensing restrictions the impede mobility across occupations and states, and regulations that inhibit business formation and expansion.

I. Evidence

I.A. Gross Hiring and Business Formation in the Pandemic's Immediate Wake

The top part of table 1 presents two questions about the impact of COVID-19 on staffing levels in the April 2020 SBU, fielded April 13–24. One question asks about impact on own-company staffing levels since March 1, 2020, and the other asks about the anticipated impact over the next four weeks. For each question, the survey instrument allows responses in five categories: number of permanent layoffs, with no expectation of recall; number of temporary layoffs and furloughs; hires of new employees; cuts to the number of contractors and leased workers; and additions to the number of contractors and leased workers. Cumulating the responses to these two questions and aggregating over firms yields a near-term net contraction (exclusive of quits) equal to 10.8 percent of March 1 employment. Ninety-two percent of this net contraction happened between March 1 and the mid-April survey response period, and the rest is anticipated to happen over the ensuing four weeks. Using JOLTS statistics to impute quits, we obtain a net staffing reduction equal to 14.2 percent of March 1 employment, which is similar to the fall in active employment among continuing firms that Cajner and others (2020, fig. 2, panel B) find over the same time period in tabulations of ADP payroll records.

Despite the huge negative employment impact of the pandemic and lockdown, the coronavirus shock caused sizable gross staffing gains over the span of two and a half months: new hires equal to 3.9 percent of March 1 employment and new contractors and leased workers equal to 0.2 percent. SBU data also say the COVID-19 shock caused gross staffing reductions equal to 14.9 percent of March 1 employment (18.3 percent inclusive of quits), mostly due to temporary layoffs and furloughs. The undersampling of young firms in the SBU, the omission of new firms from the sample frame, and lower survey response rates of highly stressed firms are reasons to think our estimates of gross staffing changes are downwardly biased.

Table 1. Gross Staffing Changes in Reaction to the COVID-19 Pandemic

Survey questions: We would also like to ask how developments related to the coronavirus are affecting staffing levels at your firm:
—Since March 1, we made the following staffing changes in response to developments related to the coronavirus (response options as indicated below).
—Over the next four weeks, we expect to make the following staffing changes in response to developments related to the coronavirus (response options as indicated below).
Survey response period: April 13–24, 2020.

	From March 1 to mid-April	*Over next four weeks*	*Cumulative*
Net staffing change, exclusive of quits	−10.0	−0.9	−10.8
	(1.18)	(2.02)	(2.63)
Net staffing change, with imputed quits	−12.5	−1.9	−14.2
Gross staffing reductions, exclusive of quits	10.9	4.0	14.9
	(1.16)	(0.69)	(1.62)
Gross staffing reductions, with imputed quits	13.4	5.0	18.3
Permanent layoffs	0.9	0.7	1.5
	(0.18)	(0.23)	(0.34)
Temporary layoffs and furloughs	8.5	2.9	11.4
	(0.95)	(0.49)	(1.28)
Cuts in contractors and leased workers	1.6	0.5	2.0
	(0.63)	(0.36)	(0.85)
Imputed quits	2.5	0.9	3.4
Gross staffing increases	0.9	3.1	4.1
	(0.16)	(1.88)	(2.05)
Hires of new employees	0.8	3.0	3.9
	(0.16)	(1.88)	(2.04)
Additions to contractors and leased workers	0.1	0.1	0.2
	(0.03)	(0.05)	(0.06)
Number of survey responses	368	341	335

Source: Authors' calculations using data from the April 2020 Survey of Business Uncertainty.
Notes: Entries are activity-weighted means, expressed as a percent of employment on March 1. Standard errors in parentheses. According to data from the Job Opening and Labor Turnover Survey, there were 0.2314 quits per layoff in March 2020 and 0.2191 in April. We multiply these fractions by the SBU layoff rates in the table to obtain imputed quits.

We can restate our results about gross staffing gains and losses in terms that are less sensitive to these sources of bias. In particular, table 1 implies that coronavirus-related developments caused about three new hires for every ten layoffs. If we include contractors and leased workers, the ratio is about 2.7 gross staffing gains for every ten gross staffing reductions. JOLTS data for March and April show 4.6 hires for every ten layoffs. Similarly, Cajner and others (2020) find a high incidence of new hires in ADP data for April and May 2020. While it might seem surprising to find so many hires amid the sharpest employment contraction since records

began, simultaneous large-scale hiring and separations are a ubiquitous feature of US labor markets.[1]

JOLTS data on job openings also point to large-scale hiring plans in the immediate wake of the COVID-19 pandemic. There were about 6.2 million job openings in the US private sector on the last (business) days of January and February 2020, 5.3 million on the last day of March, and 4.3 million on the last day of April. In other words, job openings after the pandemic struck were about 69 to 85 percent as large as before it struck. In this regard, it's important to note that the JOLTS concept of job openings excludes positions open only to internal transfers, positions to be filled by recalls from temporary layoffs, and positions that are not available to start within thirty days. According to JOLTS data, actual hires in April 2020 were 70 percent of actual hires in February. Thus, JOLTS statistics confirm that large-scale hiring activity, actual and planned, continued during the pandemic recession, though at a much-reduced pace. This statistical evidence aligns well with anecdotal evidence of large pandemic-induced labor demand increases at some firms, detailed in online appendix C.

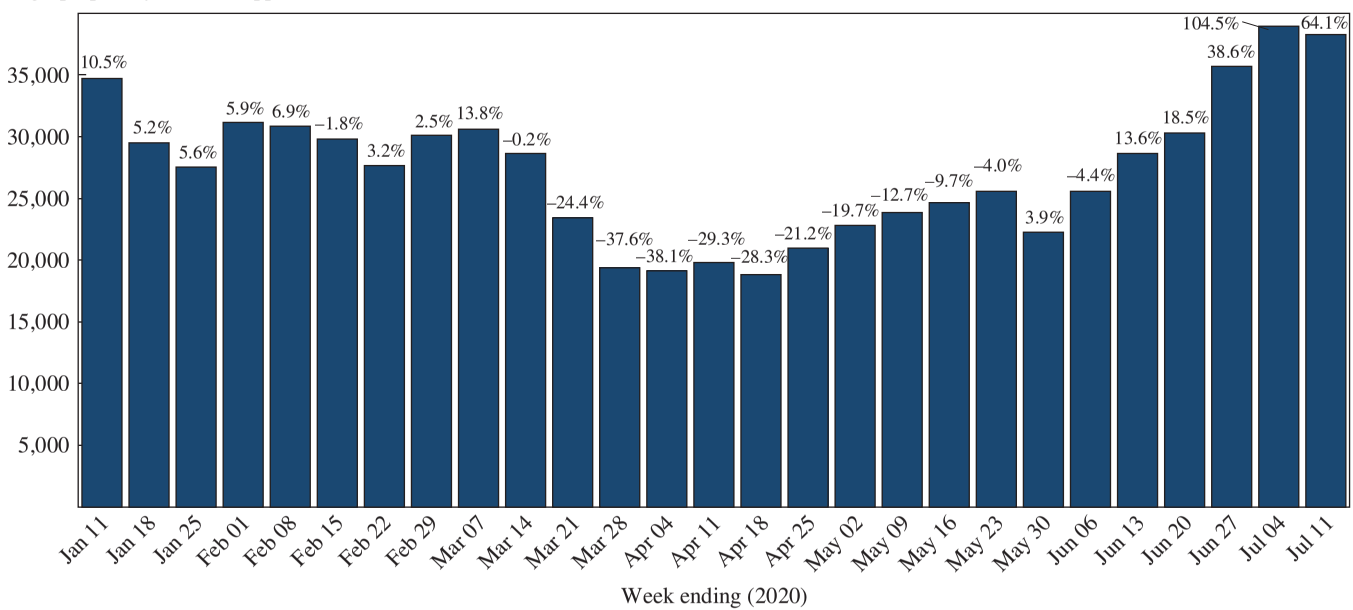
Census Bureau statistics on gross business formation also point to gross hiring activity in the near-term wake of the pandemic. These statistics derive from administrative data on applications for a new employer identification number (EIN) on IRS Form SS-4. Figure 1 reports statistics for "high-propensity" applications, which are the subset of applications for a new EIN that the Census Bureau regards as having a high propensity to hire paid employees. The figure makes three points. First, gross business formation in the second half of March and in April was down 20 to 38 percent relative to the same week in 2019. While depressed, business formation did not dry up in the immediate wake of the COVID-19 shock. Second, new business applications began to recover in May, and by late May were down less than 5 percent from a year earlier. Third, business formation continued to rise in June, surpassing both year-earlier values and the pace of business formation in early 2020. In sum, new business formation was greatly depressed, but not moribund, in the wake of the COVID-19 shock. It recovered in May and surpassed prepandemic levels in June.

I.B. Projecting the Permanent Layoff Share of COVID-19 Job Losses

According to table 1, employers perceived 23.5 percent of their layoffs from March 1 to mid-May as permanent at the time of job loss.

1. See, for example, Davis, Faberman, and Haltiwanger (2006) and Lazear and Spletzer (2012).

Figure 1. High-Propensity Business Applications in 2020 and Percent Change Relative to 2019



Source: Weekly Business Formation Statistics, https://www.census.gov/data/experimental-data-products/weekly-business-formation-statistics.html; US Census Bureau.

Notes: These statistics derive from administrative data on applications for a new employer identification number (EIN) on IRS Form SS-4. Characteristics of applicants indicating high-propensity include (a) being from a corporate entity; (b) hiring employees, purchasing a business, or changing organizational type; (c) providing a first wages paid date (planned wages); or (d) having a NAICS industry code in manufacturing (31-33), retail stores (44), health care (62), or restaurants/food service (72). Year-on-year percent changes in the number of high-propensity business applications relative to the same week in 2019 given as percentages above each bar.

A *Washington Post*–Ipsos survey of 8,086 American adults fielded from April 27 to May 4, 2020, finds that 20 percent of layoffs were seen as permanent.[2] Claimants for unemployment benefits in California from March to May 2020 perceived 23.2 percent of their job losses as permanent as of the filing date.[3] In online appendix A, we develop two estimates for the permanent layoff share of job losses between March and April 2020 using the Current Population Survey (CPS). Our lower CPS-based estimate of 26 percent arises by treating persons absent from work with pay for "other reasons" as on temporary layoff. Our higher estimate of 34 percent treats these persons as employed. A survey of 500 hiring decisionmakers commissioned by Upwork and fielded April 22–28 finds that 47 percent of recent layoffs were perceived as permanent.[4]

As we discuss in online appendix A, it is challenging to estimate the permanent layoff share of job losses using CPS data.[5] The 47 percent figure from the Upwork survey is an outlier, and we are inclined to discount it. We prefer the permanent layoff figures derived from the SBU, *Washington Post*–Ipsos poll, and California unemployment claimants, which are quite similar. Thus, we use SBU figures in our base case projections for the fraction of pandemic-induced job losses that ultimately turn out to be permanent in the sense that the job loser does not return to a job at his or her previous employer. Recall that 27.9 million Americans filed new claims for unemployment benefits in the six weeks ending April 25. Multiplying 27.9 million by the 23.5 percent permanent layoff share in the SBU yields over 6.5 million permanent layoffs.

Of course, there remains tremendous uncertainty about the economic outlook. For many firms, today's cash-flow problems will become tomorrow's insolvencies, and temporary layoffs will become permanent.[6] The longer the pandemic persists, the longer it will take for the economy to

2. See the *Washington Post*–Ipsos poll, conducted online April 27–May 4, 2020, https://context-cdn.washingtonpost.com/notes/prod/default/documents/7a39185f-8222-4e28-9528-5741ebb137ad/note/2e5183d3-9f6f-45a1-84ab-7f2532c8c5fb.#page=1, question 26. Another 3 percent of respondents express no opinion as to whether they will be re-hired by their more recent employer.

3. Muhammad Akhtar and Till von Wachter kindly supplied the California data. See online appendix B.

4. See the Upwork 2020 Future Workforce Report (slides), www.slideshare.net/upwork/2020-future-workforce-report/1.

5. Online appendix A also explains why the headline CPS statistic for the share of unemployed persons on temporary layoffs is not a sound estimate for the permanent layoff share of job losses.

6. For anecdotal evidence of how temporary layoffs are becoming permanent in the wake of COVID-19, see Morath (2020).

recover and the larger the share of recent layoffs that will turn out to be permanent. To get a sense of the fraction of layoffs that will lead to actual recalls, we turn to historical evidence from two sources. Using a sample of unemployment insurance (UI) recipients in Missouri and Pennsylvania from 1979 to 1981, Katz and Meyer (1990) find that 72 percent of UI recipients who initially anticipated recall were actually recalled. In addition, 13 percent of ex ante permanent layoffs were, in fact, recalled. Giuseppe Moscarini kindly provided us with alternative estimates based on Survey of Income and Program Participation data from 1990 to 2013 and the analysis in Fujita and Moscarini (2017). He estimates that 87.5 (6.6) percent of layoffs perceived as temporary (permanent) at the time of job loss led to actual recalls.

Applying the Katz and Meyer (1990) figures to statistics in the "Cumulative" column in table 1 implies actual recalls equal to (0.72)[11.4/14.9] + 0.13[(1.5 + 2.0)/14.9] = 58 percent of gross staffing reductions. This calculation adjusts for permanent layoffs that result in recalls and treats cuts in contractors and leased workers like permanent layoffs. According to this calculation, 42 percent of gross staffing reductions in table 1 will result in permanent layoffs. Applying the 42 percent figure to the 27.9 million new claims for unemployment benefits in the six weeks ending on April 25 yields 11.7 million permanently lost jobs. This number does not include later job losses caused by the COVID-19 shock. Applying instead the recall rates from Moscarini yields 32 percent as the realized permanent layoff share of COVID-19-induced job losses. While there is uncertainty about the share of pandemic-induced job losses that will ultimately result in permanent layoffs, that should not distract from the key point: many millions of jobs lost during the pandemic recession will result in permanent layoffs.

I.C. Constructing Forward-Looking Reallocation Measures

We now use SBU data to construct forward-looking reallocation measures. For this purpose, we rely on monthly SBU questions that elicit subjective forecast distributions over own-firm future outcomes at a one-year look-ahead horizon. (More precisely, the forecast horizon is twelve months for employment and four quarters for sales.) The survey instrument also gathers data for current and past outcomes. See Altig, Barrero and others (2020) for more information.

Let $E_t L_{i,t+12}$ denote the expected level of employment in month $t + 12$ at firm i implied by its subjective forecast distribution at t. Define the corresponding month t expected employment growth rate at a twelve-month look-ahead horizon as the arc change rate,

$$\mathrm{E}_t g_{i,t+12} = \frac{\mathrm{E}_t L_{i,t+12} - L_{it}}{0.5\left(L_{it} + \mathrm{E}_t L_{i,t+12}\right)},$$

where all quantities on the right side derive from survey responses in month t.[7] Denote the firm's activity weight as $z_{it} \equiv 0.5(L_{it} + E_t L_{i,t+12})$ and aggregate activity as $Z_t = \sum_i z_{it}$. Let $\mathcal{S}_t^+$ and $\mathcal{S}_t^-$ denote the sets of firms at t with positive and negative values, respectively, for $\mathrm{E}_t g_{i,t+12}$.

We compute the expected excess job reallocation rate in month t as

$$\mathrm{E}_t X_{t+12}^{\text{jobs}} = \sum_{i \in \mathcal{S}_t^-} \left(\frac{z_{it}}{Z_t}\right) \left|\mathrm{E}_t g_{i,t+12}\right| + \sum_{i \in \mathcal{S}_t^+} \left(\frac{z_{it}}{Z_t}\right) \left|\mathrm{E}_t g_{i,t+12}\right| - \left|\sum_i \left(\frac{z_{it}}{Z_t}\right) \mathrm{E}_t g_{i,t+12}\right|,$$

where the first term on the right side is the expected gross job destruction rate over the twelve-month forecast horizon, the second term is the expected gross job creation rate, and the third term is the absolute value of the expected net aggregate growth rate.[8] This statistic quantifies the volume of cross-firm job reallocation in excess of what's required by the aggregate change. Equivalently, we can calculate twice the minimum of expected gross job gains and losses and divide by the simple average of current and expected employment to obtain a rate. This equivalent calculation makes clear that our measure quantifies *simultaneous* creation and destruction.[9] We compute the expected excess sales reallocation rate in an analogous manner.[10]

7. This growth rate measure is symmetric about zero, bounded between −2 and 2, and equal to log changes up to a second-order Taylor series approximation. Growth rates computed this way aggregate exactly when combined with suitable weights, given by the simple mean of initial and (expected) terminal levels. They also accommodate births, deaths, and continuers in an integrated manner. This approach to growth rate measurement and aggregation has become standard in the literature on business-level dynamics. See Davis and Haltiwanger (1999).

8. In practice, we Winsorize the z_{it} values at 500 and the $\mathrm{E}_t g_{i,t+12}$ values at the 1st and 99th percentiles of the distribution of expected employment growth rates in data pooled over the period from October 2014 to December 2018. These thresholds follow Altig, Barrero, and others (2020).

9. For example, if three firms forecast employment changes of −3, −1, and zero, excess reallocation is zero. Alternatively, if three firms forecast employment changes of −3, −1, and 2, then excess reallocation is 4. If current employment is 4 for each firm, the expected excess reallocation rate is 36.4 percent in this example. See Davis and Haltiwanger (1999) for additional discussion.

10. For sales, we Winsorize z_{it} at the 90th percentile of its distribution in the pooled sample from September 2016 to April 2020. We Winsorize $\mathrm{E}_t g_{i,t+12}$ at the 1st and 99th percentiles of the distribution of expected sales growth rates in the pooled sample for the period from October 2014 to December 2018. See Altig, Barrero, and others (2020) for an explanation of how we obtain arc percentage changes and implied levels of expected future sales from SBU data on the forecast distribution over future sales growth rates.

Since we use SBU data to construct our forward-looking reallocation measures, we would like some assurance that the underlying firm-level data contain meaningful forecasts. In this regard, Altig, Barrero, and others (2020) and Barrero (2020) show that firm-level growth rate expectations in the SBU data are highly predictive of realized growth rates. Moreover, firm-level subjective uncertainty measures in the SBU response are highly predictive of the magnitudes of their forecast errors and future forecast revisions. Using survey questions with the same design as the SBU questions, a revision under way of Bloom and others (2017) finds that plant-level growth rate expectations in the Census Bureau's Manufacturing and Organizational Practices Survey are also highly predictive of realized outcomes. These studies give us confidence that our forward-looking reallocation measures reflect meaningful forecasts of firm-level growth rates.

That said, there are good reasons to think that our SBU-derived measures understate the expected reallocation rate on average and that they also understate the rise in expected reallocation activity in the wake of the pandemic. First, the SBU undersamples younger firms, which have much higher reallocation rates than mature firms. Second, highly stressed firms are less likely to respond to surveys, which leads to an understatement of expected destruction activity.[11] Third, we cannot sample firms that enter in the future, which causes an understatement of expected creation activity. Thus, we regard our estimates of forward-looking reallocation rates as conservative in terms of both average levels and the pandemic-induced response.

I.D. Expected Excess Reallocation Rates

Table 2 summarizes expected reallocation rates before and after the COVID-19 pandemic hit the US economy, and figure 2 displays monthly rates from September 2016 onward.[12] The pre-COVID expected excess job reallocation rate averages 0.97 percent for sales and 2.23 percent for jobs. It rises from 1.54 percent in January 2020 to 5.37 percent in April, which is 2.4 times the pre-COVID-19 mean. The upward jump from March to April is the largest move in the short history of the series. The expected sales reallocation rate jumps from 0.24 percent in January 2020

11. In line with this remark, the survey response rates among active SBU panelists are 57 percent in January 2020, 60 percent in February, 57 percent in March, and 52 percent in April, where active panelists are those who responded to the survey at least once in the previous six months.

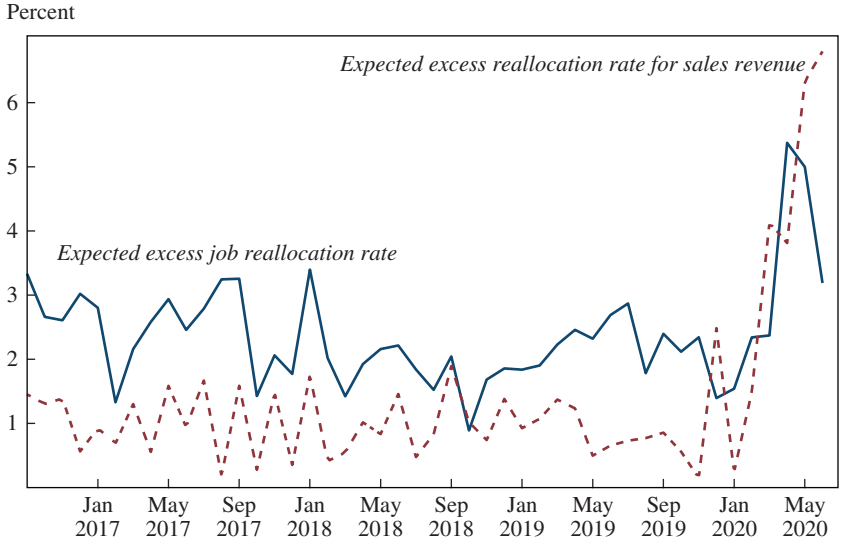
12. The SBU first went to field in October 2014, but the early monthly samples were small and our formulation of the look-ahead questions did not stabilize until September 2016.

Table 2. Expected Growth and Excess Reallocation Rates at One-Year Forecast Horizons, Average Values of Monthly Statistics for the Indicated Time Periods

	Expected growth rates		*Expected excess reallocation rates*	
	Sales	*Jobs*	*Sales*	*Jobs*
September 2016 to January 2020	4.37	1.59	0.97	2.23
April to June 2020	–0.57	1.04	5.62	4.52

Source: Authors' calculations using data on firm-level forecasts in the Survey of Business Uncertainty.
Notes: We first use the firm-level forecasts to compute activity-weighted statistics for each month. We then compute the simple mean over months of each statistic for the indicated time period to obtain the table entries. Figures 2 and C.1 (in the online appendix) plot the monthly values. For the period from April to June 2020, we have 386 firm-level observations for jobs and 361 for sales.

Figure 2. Expected Excess Reallocation Rates at One-Year Forecast Horizons, Monthly

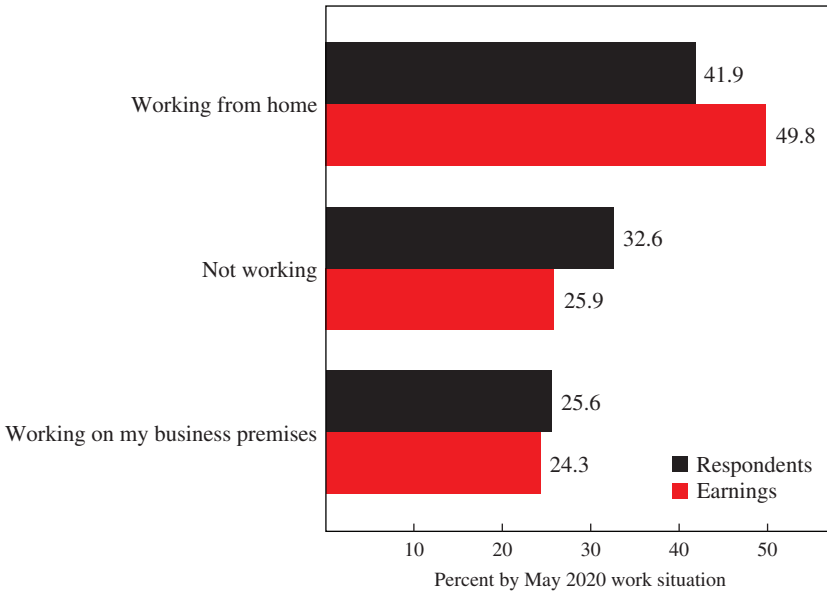


Source: Authors' calculations using data from the Survey of Business Uncertainty.

to 4.11 percent in March and above 6 percent in May and June. The March through June values are also the highest in the history of the series, and several times the pre-COVID mean. In sum, our forward-looking measures confirm that COVID-19 is a large reallocation shock.

Several other countries conduct surveys that could be used to construct forward-looking reallocation measures like the ones in figure 2. The UK Decision Maker Panel, a monthly survey that began in August 2016, includes questions patterned after the ones in the SBU (Bloom and others 2018).

Figure 3. Working from Home



Source: Survey by QuestionPro on behalf of Stanford University.

Notes: Survey fielded May 21–29, of 2,500 US residents age 20–64, earning more than $20,000 per year in 2019. Survey question read: "Currently (this week) what is your work status?" Response options: "Working on my business premises," "Working from home," "Still employed and paid, but not working," "Unemployed, but expect to be recalled to my previous job," "Unemployed, and do not expect to be recalled to my previous job," and "Not working, and not looking for work." We reweight the sample to match the share of individuals at the level of cells defined by the cross-product of earnings interval, state, and industry (using the current or most recent job) in CPS data from 2010 to 2019.

Surveys in Germany, Italy, and Japan also collect data on the expectations of firm-level variables. See Guiso and Parigi (1999), Bachmann and Elstner (2015), Massenot and Pettinicchi (2018), Tanaka and others (2020), and Chen and others (2019). Thus, it is feasible to construct forward-looking excess reallocation time series for several countries, which would be quite helpful in evaluating their predictive content and usefulness for policymakers.

I.E. The Shift to Working from Home

COVID-19 precipitated a mass social experiment in working from home. To quantify this phenomenon, we surveyed 2,500 US residents age 20–64 who earned more than $20,000 in 2019. Figure 3 summarizes their work status as of late May 2020 based on responses to the following

question: "Currently (this week) what is your work status?" Response options were "Working on my business premises," "Working from home," and other options that figure 3 groups under "Not working." Nearly 42 percent of our respondents report working from home. Adjusting for those not working, the survey results say that 62 percent of labor services were supplied from home as of late May (67 percent on an earnings-weighted basis).[13] In an independently conducted survey of persons who were employed pre-COVID, Brynjolfsson and others (2020) find that half were working from home as of late May and 10 percent had been recently laid off or furloughed. Adjusting for those not working, their results say that 56 percent of labor services were supplied from home as of late May. In another independent survey, Bick, Blandin, and Mertens (2020) find that 35 percent of persons employed in May 2020 report working entirely from home and another 14 percent report working from home on some days. All three surveys confirm that COVID-19 caused a massive shift to working from home.[14]

Anecdotal accounts and economic reasoning suggest that much of this shift will persist. For example, Horwitz (2020) reports that Facebook will move to a "substantially remote workforce over the next decade" in response to the "dispersed structure that the coronavirus pandemic forced on it." Facebook foresees a gradual shift to working from home because it "will require new techniques and tools to compensate for the loss of in-person office interactions." Given its success in creating platforms and tools for remote interactivity, Facebook's efforts to develop better tools for remote interactions are likely to have an outsized impact on the overall extent of working from home.

A large, permanent shift to working from home would have powerful effects on the spatial distributions of jobs, labor supply, and worker spending, with profound implications for the future of cities. Motivated by these considerations, we posed two questions in the mid-May SBU to assess how firms expect COVID-19 to change the extent of working from home *after* the pandemic recedes. To get a prepandemic starting point, we

13. The calculation is 41.9/(100 – 32.6) = 62 percent for the equal-weighted figure and 49.8/(100 – 25.9) = 67 percent for the earnings-weighted figure.

14. The propensity to work from home in May 2020 rises sharply with earnings, according to Bick, Blandin, and Mertens (2020), Barrero, Bloom, and Davis (2020), and the data that underlie figure 3. Since our sample excludes persons who earned less than $20,000 in 2019, it is likely to somewhat overstate the share of all employees who worked from home.

Table 3. Working from Home before and after the COVID-19 Pandemic

Survey of Business Uncertainty questions:
— What percentage of your full-time employees worked from home in 2019?
— What percentage of your full-time employees will work from home after the coronavirus pandemic?
Survey response period: May 11–22, 2020.

	Employment-weighted mean share of employees who worked				
	Rarely or never	*One full day per week*	*Two to four full days per week*	*Five full days per week*	*Paid workdays at home as a percentage of all workdays*
Survey of Business Uncertainty (May 2020)					
worked from home in 2019	90.3% (1.11)	3.4% (0.52)	2.9% (0.41)	3.4% (0.56)	5.5% (0.70)
will work from home after the coronavirus pandemic	73.0% (1.97)	6.9% (0.64)	9.9% (0.94)	10.3% (1.23)	16.6% (1.41)
American Time Use Survey (2017–2018)					
worked from home in 2017–2018	89.8%	3.8%	3.8%	2.6%	5.2%

Sources: Bureau of Labor Statistics (BLS) American Time Use Survey (ATUS); Survey of Business Uncertainty; authors' calculations.

Notes: In computing the Survey of Business Uncertainty statistics, we weight each firm by its employment and further weight to match the one-digit industry distribution of payroll employment in the US economy. We drop firms with responses that don't sum to approximately 100 percent across the response options for a given question. We also drop firms that clearly misinterpreted the pre-COVID-19 question as asking about the situation during the pandemic. The resulting sample has 279 observations for the 2019 question and 280 observations for the post-pandemic question. ATUS data cover full-time workers. We compute the number of paid workdays at home as a percent of all workdays by converting the number of days at home to a fraction of the workweek (0.2 for 1 day, 0.5 for 2–4 days, 1 for 5 days) and multiplying by the share in each category.

asked, "What percentage of your full-time employees worked from home in 2019?" And, to gauge the post-pandemic situation, we asked, "What percentage of your full-time employees will work from home after the coronavirus pandemic?" For each question, we let firms sort their full-time employees into five categories, ranging from a share that works from home five full days per week to a share that rarely or never works from home.

Table 3 summarizes the employment-weighted survey responses by firms as well as worker responses to a similar question in the 2017–2018 American Time Use Survey (ATUS). The firm-side SBU and worker-side

ATUS yield quite similar pre-COVID-19 results. Both surveys say 90 percent of employees rarely or never worked from home, and a very small fraction worked from home five full days per week.[15] As reported in the rightmost column, about 5 to 6 percent of full workdays were performed at home before the pandemic hit. According to the SBU results, the anticipated share of full workdays at home is set to triple after the pandemic ends—rising from 5.5 percent to 16.6 percent of all workdays. Put differently, more than one-tenth of full workdays will shift from business premises to residences. The implied spatial shift in worker spending is greater yet, because the scope for working from home is strongly positively correlated with earnings (Dingel and Neiman 2020).

As reported in table 4, firms in every sector anticipate a large shift to working from home. Consider finance, insurance, professional services, and business services, industries that disproportionately employ well-paid office workers in city business districts. Firms in this sector anticipate that full workdays at home by full-time employees will rise from 10.7 percent of all workdays before the pandemic to 29.2 percent after the pandemic. These figures say that 21 percent of full workdays performed on business premises before COVID-19 will switch to working from home.[16] This statistic implies a huge, persistent shift in worker spending power away from central business districts to locations closer to residences.

I.F. Dispersion in Equity Returns across Firms

Tables 1–4 and figures 1–3 draw on data sources with short histories, which makes it hard to situate the evidence in a broad historical context. Thus, we turn to time series evidence on the dispersion of returns across the common equity securities of US-listed firms.[17] Specifically, we compute the interquartile range and the standard deviation of value-weighted returns across firms using closing market prices from the end of one month to

15. For SBU industry sectors that we can match to ATUS statistics, the two sources imply a similar pre-COVID incidence of working from home. For manufacturing, SBU data say 9 percent of employees worked at home at least one day a week before COVID-19, and the ATUS data say that 7.3 percent did so. For retail and wholesale trade, the corresponding figures are 4.1 percent and 4.0 percent.

16. Calculated as $100 \times (29.2 - 10.7)/(100 - 10.7)$.

17. We are hardly the first to use the dispersion in stock returns as a proxy for reallocative shocks. See, for example, Loungani, Rush, and Tave (1990), Brainard and Cutler (1993), and Davis, Loungani, and Mahidhara (1997). Unlike these earlier works, we consider dispersion across firms rather than industries.

Table 4. Working from Home before and after the COVID-19 Pandemic by Industry Sector

Survey questions:
—What percentage of your full-time employees worked from home in 2019?
—What percentage of your full-time employees will work from home after the coronavirus pandemic?
Survey response period: May 11–22, 2020.

	Full workdays at home as a percentage of all paid workdays	
	2019	*After the coronavirus pandemic*
Overall	5.5 (0.70)	16.6 (1.41)
Finance, insurance, professional services, and business services	10.7 (1.88)	29.2 (2.96)
Education, health, and other services except government	4.6 (1.62)	14.1 (3.69)
Manufacturing	6.8 (1.50)	11.5 (1.91)
Retail and wholesale trade	2.6 (1.00)	7.4 (2.27)
Construction, real estate, mining, and utilities	1.4 (0.44)	22.4 (4.97)

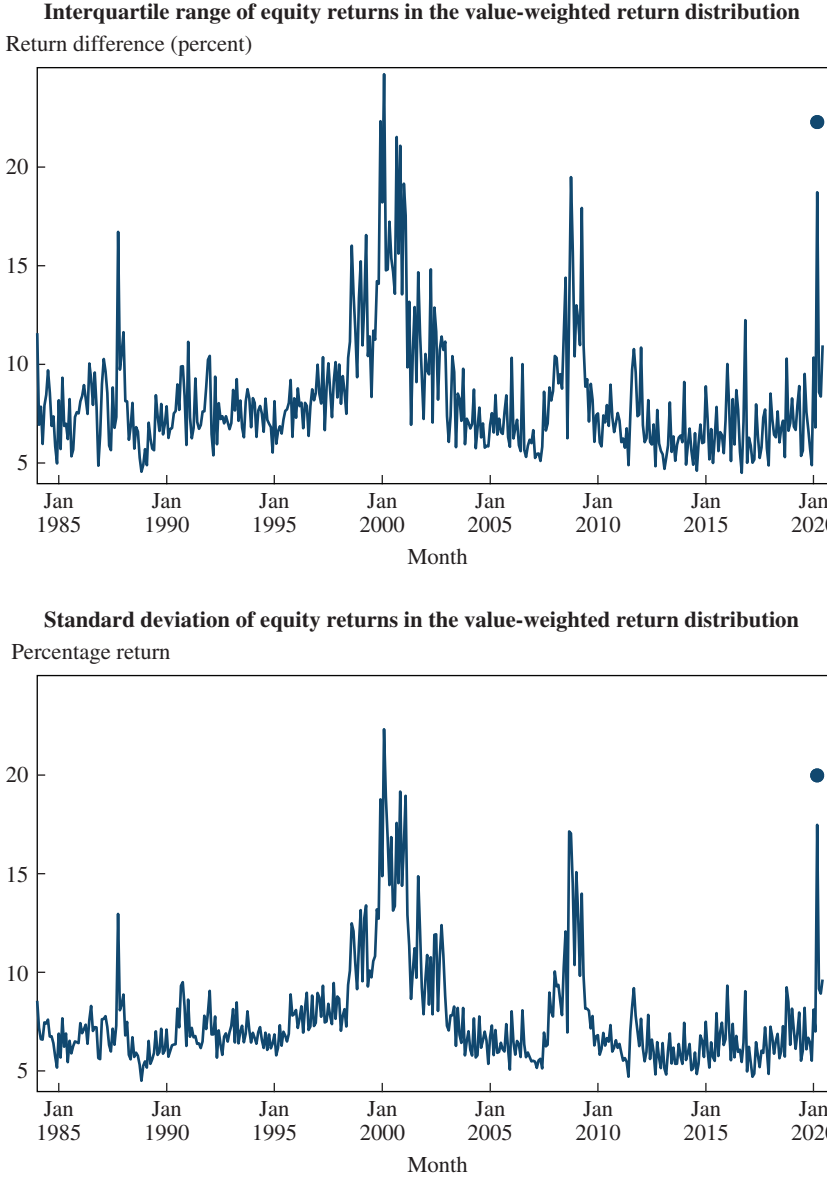
Source: Survey of Business Uncertainty; authors' calculations.

the end of the next. We consider return dispersion rather than the excess reallocation of equity value given the predominant role of discount rate variation in aggregate stock market moves (Shiller 1981; Campbell and Shiller 1988; Cochrane 2011). If discount rates on risky securities generally rose in reaction to the COVID-19 shock, an excess reallocation measure would obscure heterogeneity in the shock's impact on expected firm-level cash flows.[18] In contrast, this heterogeneity shows up in return dispersion measures if the discount rate variation itself is dominated by common factors.

Figure 4 displays the dispersion in monthly equity returns from January 1984 to April 2020. Three episodes stand out: the dot.com market bust in the early 2000s, the financial crisis of 2008–2009, and the market's reaction to the COVID-19 shock. The first two episodes involve high return dispersion for more than a year and multiple peaks. It remains to be seen whether the same pattern will play out this time. Nevertheless, figure 4 suggests that the COVID-19 shock triggered unusually large differences across

18. That discount rates rose in reaction to COVID-19 finds support in Gormsen and Koijen (2020).

Figure 4. Dispersion of Monthly Firm-Level Stock Returns, January 1984 to June 2020



Source: Compustat Capital IQ Daily Security Files and CRSP, both via the Wharton Research Data Services.

Notes: Common equity securities traded on the NYSE, AMEX, and NASDAQ with share prices quoted in US dollars. Returns for month t computed as 100 times the log change of closing prices on the last trading days in months $t - 1$ and t with adjustments for dividends, share repurchases, stock splits, and reverse splits. The large dots reflect log changes from February 24 to March 21, 2020.

firms in shocks to their expected future cash flows. Online appendix C reports similar results for firm-level stock returns computed over four-month rather than one-month intervals. Thus, stock return data support the view that the COVID-19 shock had large reallocative effects among publicly traded firms. When we consider the one-month interval from February 24 to March 21, the impact of the COVID-19 shock on the dispersion in returns is greater yet, as shown by the large dots in figure 4.[19]

Several recent studies provide evidence on the sources of heterogeneity in the COVID-19 impact on listed firms. Hassan and others (2020) characterize and quantify the concerns that senior executives express in corporate earnings conference calls. As the pandemic spread from January to March, executives voiced growing concerns about negative demand shifts, rising uncertainty, supply chain disruptions, capacity curtailments, and employee welfare. Davis, Hansen, and Seminario-Amez (2020) and Ramelli and Wagner (2020) trace COVID-induced differences in firm-level returns to differences in their exposures to global supply chains, exports to China, food and drug regulation, energy regulation, and financial regulation. Papanikolaou and Schmidt (2020) report daily equity returns in 2020 for firms sorted by the share of employees able to work remotely. From February 14, 2020 to June 15, the cumulative return differential between the top and bottom quartiles is 19.4 percentage points, with the bulk of the return differential emerging by mid-March.[20] Pagano, Wagner, and Zechner (2020) also find much higher returns in the wake of COVID-19 at firms that are "resilient" to social distancing requirements, as measured by ability to perform jobs at home and without interactions in physical proximity. Resilient firms also enjoyed strong relative returns from 2014 to 2019, suggesting that the COVID-19 shock reinforced shifts in the economy that began before the pandemic. This reinforcing aspect of the shock may further raise unemployment and slow its decline, as argued in Davis (1987). Finally, Pagano, Wagner, and Zechner (2020) provide evidence that investors continue to price pandemic-related risks into firm-level equity prices as of May 2020, suggesting they assign material probabilities to future pandemics.

19. We chose February 24 because it is the first large daily move in the US stock market that next-day journalistic accounts attribute to the COVID-19 pandemic. See Baker and others (2020).

20. See the third chart at https://sites.google.com/site/lawrencedwschmidt/covid19, accessed on June 18, 2020. February 14 is the baseline date in this chart, and June 15 is the most recent available date.

II. Implications for the Economic Outlook

II.A. Reasons to Anticipate a Long Recovery

As of July 19, confirmed cases of COVID-19 exceeded 14 million worldwide, with roughly 603,000 persons thought to have died from the disease.[21] After slowly falling from mid-April to early June, weekly reported new cases in the United States rose rapidly and quickly surpassed earlier peaks.[22] Weekly (excess) deaths in the United States continued to fall until early July and then resumed an upward course.[23] As of mid-July 2020, more than four months after the pandemic struck the United States, there remained great uncertainty about how it will evolve and its longer-term economic effects. It appears that decisions at that time to relax restrictions on commercial activity contributed to a surge in new US cases, prompting some authorities to reimpose tight restrictions. Obviously, the future course of the pandemic and containment efforts will affect the recovery path. If pandemics with serious health effects become a recurring phenomenon, it will undercut growth for many years.

Under current tax and spending laws, the Congressional Budget Office (CBO 2020) projects (as of June 2020) that real GDP will not return to prepandemic levels until mid-2022 and that unemployment will remain above 6 percent through 2023–2024. The CBO is careful to note that these projections are subject to an unusually high degree of uncertainty. We anticipate a long recovery path even under an optimistic scenario, which we characterize as follows: the pandemic comes under control in the next few months, COVID-19 treatments continue to improve, an effective vaccine becomes available and widely deployed within six to twelve months, and the economy gradually comes back on line without further serious setbacks. We turn now to some reasons to expect a long recovery even in this optimistic scenario.

Voluntary and government-mandated efforts to contain the virus will curtail current and near-term aggregate demand through several channels. First, labor incomes and profits are still depressed and will remain so for some time. Second, economic uncertainty is extraordinarily elevated,

21. See the Johns Hopkins Coronavirus Resource Center at https://coronavirus.jhu.edu/map.html.

22. Centers for Disease Control and Prevention, "CDC COVID Data Tracker," https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html.

23. Centers for Disease Control and Prevention, "Excess Deaths Associated with COVID-19," https://www.cdc.gov/nchs/nvss/vsrr/covid19/excess_deaths.htm.

which further depresses consumption expenditures and investment demand. Since uncertainties about the course of the pandemic and the stringency of social distancing measures may abate in the coming months (and will, hopefully), firms have strong incentives to defer investments that are costly to reverse. Third, temporary disruptions on the supply side of the economy can cause aggregate demand to fall more than one-for-one with the direct impact of the supply shock (Guerrieri and others 2020). Fourth, as we discuss momentarily, the COVID-19 shock has negative effects on the economy's near- and medium-term productive potential. That lowers expected future incomes, further depressing spending demands by forward-looking agents.

The overall fall in aggregate demand is massive. While policymakers have aggressively deployed fiscal and monetary tools to counter this fall, it seems unlikely that they will or can achieve a full offset. Thus, we expect demand-side forces to depress employment and output for at least the next few months. We also think it unlikely that fiscal stimulus will be as large in the next several months as it has been from March to July 2020. The tapering of fiscal stimulus is a source of falling aggregate demand in the coming months.

We now turn to supply-side considerations, with a focus on developments that influence the economy's future productive potential. First, the cash-flow crunch caused by the lockdown, uncertainty about the future course of the pandemic, concerns about reduced incomes in the near- and medium-term, and uncertainty about the outlook for growth and product demand have depressed capital investment in recent months and are likely to continue doing so for several months or more. Thus, the economy will carry a smaller stock of productive capital into the future as a consequence of the COVID-19 shock. In addition, pandemic-induced demand shifts and continuing concerns about infectious disease will undercut the production value of certain forms of capital such as large-scale entertainment venues, high-density retail facilities, and restaurants with closely seated patrons.

Second, universities, government labs, and commercial facilities have shuttered research projects that are not related to COVID-19. Schools have sent students home, and universities are making do with remote classes. Barrero, Bloom, and Wright (2017) and Bansal and others (2019) provide evidence that R&D investments are highly sensitive to uncertainty, because they are irreversible and riskier than investments in physical capital. Extraordinarily high levels of uncertainty in the wake of the COVID-19

shock may depress investments in these intangibles (Altig, Baker, and others 2020). Immigration and trade, facilitators of innovation, have also shriveled. We see these developments as lowering the trajectory of future productivity into 2021 and beyond.

The third reason we anticipate a slow recovery on the supply side leads us back to the pandemic-induced reallocation shock.

II.B. Creation Lags Destruction in the Response to Reallocation Shocks

Davis and Haltiwanger (2001) study the dynamic effects of oil price shocks in the 1970s and 1980s on job creation and destruction activity in the US manufacturing sector. They find sizable reallocative effects of oil price shocks spread out over several years. A key message is that the destruction side of reallocation precedes the creation side by one to two years. Employment and output are depressed in the interim. Reasons for the delayed creation response include the time needed to plan new enterprises and business activities, the time required to navigate regulatory hurdles and permitting processes to start or expand businesses, time to build in capital formation, uncertainties that lead to delays in making sunk investments, and search and matching frictions in forming new relationships with suppliers, employees, distributors, and customers.

To appreciate why creation responses can lag months and years behind destruction responses, consider the experience of the American auto industry in the wake of the 1973 oil price shock.[24] As Bresnahan and Ramey (1993) document, the shock increased the demand for small, fuel-efficient cars and simultaneously reduced the demand for larger cars. Capacity utilization and output fell in the wake of the oil price shock, even though a handful of plants equipped to produce small cars operated at peak capacity.

Several factors made it hard for the industry to respond rapidly to the increased demand for small, fuel-efficient cars. First, much of the physical capital in the US auto industry was dedicated to the production of larger rather than smaller cars. Second, US autoworkers had accumulated skills that were specialized in the production of particular models, and these tended to be larger vehicles. Third, many autoworkers laid off from large-car plants could not take up employment at small-car plants without a costly relocation. Fourth, the dealership network and sales force of the US auto industry had evolved under an era of thriving large-car sales,

24. This paragraph and the next borrow from Davis and Haltiwanger (2001).

and they were adapted to market and service larger cars. Fifth, the knowledge base and the research and design personnel at US auto companies were specialized in engineering larger cars. The development of smaller, more fuel-efficient cars required a reorientation of the knowledge base and the development of new skills by research and design personnel. Over time, US automakers adapted to the shift in demand for vehicle types, but much of the creation response involved the entry and expansion of new facilities in the United States built and operated by Japanese automakers (Mair, Florida, and Kenney 1988).

II.C. Intra-industry Reallocation

Perhaps because we often conceptualize the economy in terms of industries and regions, one might guess that pandemic-induced reallocation will mainly involve cross-industry and cross-region shifts. A large body of evidence suggests otherwise. Idiosyncratic, employer-specific factors dominate gross job creation and destruction, while employment shifts between industries and regions account for only a small share of job reallocation. For example, when Davis and Haltiwanger (1992) split the US manufacturing sector into some 450 four-digit Standard Industrial Classifications (SICs), between-industry shifts account for only 13 percent of annual excess job reallocation during the 1970s and 1980s. When they split manufacturing into roughly a thousand groups defined by the cross product of states and two-digit SICs, between-group shifts account for only 14 percent of excess job reallocation. This type of finding has been replicated many times across countries, sectors, and time periods.[25] Hence, we expect the bulk of the pandemic-induced reallocation response to occur within industries and regions.

The restaurant industry provides a salient example of intra-industry reallocation in the current crisis. A survey by the National Restaurant Association in late March finds that 3 percent of restaurant owners and operators had permanently closed in response to COVID-19, and another 11 percent expected to close permanently in the next 30 days (Taylor 2020). Applying these figures to the number of US restaurants yields more than 100,000 permanent restaurant closures in the near-term wake of the COVID-19 shock. At the same time, takeout and delivery-oriented chains have experienced a huge demand boom.

25. Davis and Haltiwanger (1999, table 5) review evidence from studies that span thirteen countries. Employment shifts between regions and industries account for less than 10 percent of excess job reallocation in half the studies and 10 to 20 percent in the rest.

Turning to another salient example, an unsettled economy and uncertain outlook favor large incumbents with deep pockets (Mims 2020). As Cutter and Thomas (2020) write:

> The biggest players in tech are hoovering up talent in the midst of the coronavirus pandemic.
>
> As some of Silicon Valley's most-promising startups lay off workers and others freeze hiring, established companies including Apple Inc., Alphabet Inc.'s Google and Amazon.com Inc. are pursuing software engineers, data scientists, product designers and others. Facebook Inc. says usage has spiked during the coronavirus crisis and it is committed to policing platforms ahead of the 2020 presidential election, so it will hire more than 10,000 people this year for critical roles on its product and engineering teams. The current moment may give well-capitalized tech companies a chance to poach skilled workers who until recently were gravitating to smaller upstarts, veteran technology recruiters say.

These remarks suggest that the pandemic will induce a reallocation from smaller, younger tech firms to larger, established ones. A similar dynamic may play out in other industries as incumbents with deep pockets attract workers concerned about job security.

A third example highlights the role of newfound concerns about face-to-face interactions. Before the pandemic, Medicare and Medicaid regulations largely precluded doctors, nurse practitioners, clinical psychologists, and licensed social workers from reimbursement for patient services provided in virtual consultations. These regulations were cast aside during the pandemic, unleashing a flood of virtual consultations and surging interest in telemedicine.[26] In a recent article in *Medical Economics,* a publication aimed at health care professionals and business managers, Jackson (2020) remarks that telemedicine works "for most medication refills . . . urinary tract infections, colds and rashes, diabetes and hypertension follow-ups, lab results, post-op visits, birth control and fertility, and mental health." While a pandemic-induced shift to telemedicine may have little impact on the net demand for medical services, some physician practices and medical clinics will respond adroitly to the shift, and many will not. Horn (2020) offers an insightful glimpse into the commercial challenges presented by a partial shift to telemedicine. As his discussion suggests, there is high potential for a reallocation of customers, revenues, and workers across practices and clinics. A similar dynamic will play out in other professional, business, and

26. For a description of these regulatory changes, see the announcements by the Centers for Medicare and Medicaid Services at www.cms.gov/newsroom.

personal services: some businesses will respond deftly to newly intensified customer concerns about face-to-face interactions, and many will not.

A fourth example pertains to the grocery business and general retail. Concerns about face-to-face interactions have stimulated huge increases in the demand for online grocery shopping and delivery services. As of May 2020, online US grocery sales are up an estimated 450 percent from August 2019 and 24 percent from April 2020.[27] One-third of US households used online grocery shopping services in May 2020, more than double pre-pandemic projections for the month. Many large retailers, including Whole Foods, have hired new staff and reconfigured stores to meet the growing demand for online shopping. Walmart is testing new technology to autonomously select items from a storeroom, pack them, and prepare them for pickup or delivery. Amazon is experimenting with robot-powered fulfillment centers for online orders. These capacity expansions and investments in new technologies suggest that retailers see the pandemic as driving a persistent shift from traditional shopping modes to online shopping. Amazon, Walmart, and some other retailers are well positioned to respond to this shift. Many other retailers are not. So a large shift in shopping modes also means a reallocation of jobs and workers across firms. This process is already well under way, as indicated by a wave of recent bankruptcies and massive downsizings at J. C. Penney (general merchandise), J. Crew (apparel), Neiman Marcus (luxury retailer), Pier 1 (imported household goods), Stage Stores (department stores), and Victoria's Secret (lingerie) (Kapner 2020a, 2020b).

There are also well-documented examples of major structural transformations in the past that took the form of intra-industry reallocation. Foster, Haltiwanger, and Krizan (2006) attribute large productivity gains in the US retail sector in the 1990s mainly to a reallocation from small retail outlets to larger, more productive stores operated by national chains. Walmart, Target, Home Depot, Staples, Barnes and Noble, and Best Buy played significant roles in this process, expanding at the expense of rivals. Later, the rise of online shopping brought another major reallocation. In this regard, it's worth recalling that Amazon began as an online bookseller, eventually displacing rival booksellers who shifted online too little or too late. The coronavirus pandemic is accelerating the shift to online shopping.

As a final point about intra-industry reallocation, the long expansion that preceded the COVID-19 shock probably delayed the exit and contraction of marginal businesses, factories, and product lines that were sliding

27. This and other factual claims in this paragraph are based on Lee (2020).

toward obsolescence in any event. By depressing demand now and for at least several months, the COVID-19 shock triggered a recession that will likely involve some cleansing dynamics, as in the model of Caballero and Hammour (1994).

II.D. Potential for Transformative Shifts

Jones and others (2008) document the emergence of 335 new infectious diseases in human populations from 1940 to 2004, with a rising incidence over time even after efforts to control for reporting bias. Urbanization, long-distance travel, and cross-border commuting create the potential for new disease outbreaks to spread rapidly and become global pandemics. If major pandemics become a recurring phenomenon, we may see population shifts away from densely populated cities. Even if those shifts are largely confined to retirees and the well-off, it would involve a large reallocation of business, jobs, workers, and capital. Persistent concerns about disease transmission will also provide strong impetus for new products and new efforts to allay customer concerns about infection risks. Driverless taxis that automatically disinfect interior spaces after each passenger trip are but one possibility among many.

The capacity for large-scale, necessity-driven experiments to drive major shifts in workplace organization is well captured by Morgan Stanley's CEO James Gorman on a mid-April earnings call: "If you'd said three months ago that 90 percent of our employees will be working from home and the firm would be functioning fine, I'd say that is a test I'm not prepared to take because the downside of being wrong on that is massive" (Mattioli and Putzier 2020). In addition to Morgan Stanley and Facebook, Twitter, OpenText, Shopify, Snap (a messaging company), Skift (a business media company), and Discovery (parent of TV channels TLC and Food Network) have also indicated they plan large, permanent increases in working from home (Horwitz 2020; Mattioli and Putzier 2020). According to a survey of 500 hiring decisionmakers fielded in April 2020, 62 percent of respondents say working from home will increase in their organizations "as a result of their experiences during COVID-19."[28] Fifty-six percent of respondents say working remotely has exceeded their expectations, as compared to 9 percent that say it has fallen short. Barrero, Bloom, and Davis (2020) find similar results.

28. See the Upwork 2020 Future Workforce Report (slides), www.slideshare.net/upwork/2020-future-workforce-report/1. The survey covers most major industry sectors; 43 percent of respondents are from companies with more than 1,000 employees.

Shiva (2020) argues that countries around the world need large investments to upgrade public health systems and health care capacity: hospitals, treatment capabilities, protective gear for frontline health care workers, greatly enhanced testing capabilities, vaccine stocks, and stockpiles of masks and equipment to control and monitor infection risks. In the wake of the COVID-19 pandemic and its enormous economic toll, arguments for greater investments in public health systems and health care capacity will have broad appeal.

III. Messages for Policy

III.A. Many Lost Jobs Are Gone for Good

Many jobs lost since early March will return as the pandemic recedes and lockdowns ease. Many others are gone for good, as implied by our projections for the permanent layoff share of recent job losses. Broadly speaking, we anticipate permanent job losses in three overlapping categories: those due to COVID-induced demand shifts, jobs formerly at marginal firms that don't survive the pandemic and lockdown, and jobs lost due to the spatial and intra-industry reallocation triggered by the pandemic and by post-pandemic concerns about the transmission of infectious diseases. Sections I and II considered multiple types of evidence, and a few historical experiences, to explain why we anticipate many permanent job losses in each category.

If we are correct that many lost jobs are gone for good, there are important implications for policy. First, policy efforts to preserve all pre-COVID jobs and employment relationships could prove quite costly. They are analogous to policies that prop up dying industries and failing firms. These policies are feasible, but the cost is high in terms of resource misallocation and taxpayer burden. Second, there are large benefits of policies and policy reforms that facilitate a speedy reallocation of jobs, workers, and capital to newly productive uses in the wake of the pandemic. Policies that deter or slow reallocation are likely to further lengthen the lag of creation behind destruction, slowing the overall recovery from the pandemic, the lockdown, and the pandemic-induced reallocation shock.

In the rest of the paper, we develop these themes in connection with specific policy interventions and legacy features of the US policy landscape. We focus on policies that directly impact the economy's reallocation response to the COVID-19 shock. Policies that facilitate productive reallocation can also ease supply constraints and complement the role of fiscal and monetary policy in stabilizing demand. In turn, aggregate demand

stabilization and monetary policy actions that ensure the smooth functioning of the financial system help set the stage for a speedier reallocation of jobs, workers, and capital to their most efficient uses.

III.B. High Unemployment Benefits Encourage Layoffs, Discourage Work, and Delay Productive Reallocation

President Trump signed the Coronavirus Aid, Relief, and Economic Security (CARES) Act on March 27, 2020. As part of this relief bill, the federal government is supplementing unemployment insurance (UI) benefit levels by $600 per week through the end of July 2020.[29] Each UI recipient receives the extra $600 per week irrespective of previous earnings or their potential earnings on a new job. For most workers, the extra $600 pushes total unemployment benefits to levels that exceed their previous earnings.

The Council of Economic Advisers estimates that, with the $600 weekly supplement, 64 percent of workers receive more income from unemployment benefits than from working. Industries like hospitality and retail have an even greater share of workers for whom unemployment benefits exceed earnings.[30] Ganong, Noel, and Vavra (2020) estimate that, under the CARES Act, the median replacement rate for unemployment benefit recipients is 134 percent. They also estimate that two-thirds of eligible workers receive benefits that exceed lost earnings, and that one-fifth receive benefits that are at least twice as high as lost earnings.

These generous unemployment benefits are not lost on employers. "When Equinox had to start furloughing some employees at its chain of upscale fitness clubs, Executive Chairman Harvey Spevak had a surprising message to stakeholders. 'We believe most will be better off receiving government assistance during our closure.'" This passage is from Thomas and Cutter (2020), who also write: "Equinox joins a number of companies, including Macy's . . . and [furniture maker] Steelcase, . . . that are citing the federal government's beefed-up unemployment benefits as they furlough or lay off staff amid the coronavirus pandemic. The stimulus package is changing the calculus for some employers, which can now cut payroll costs without feeling they are abandoning their employees." Thomas and Cutter also report that some workers in essential businesses who would receive

29. The Federal Pandemic Unemployment Compensation provision of the CARES Act also expanded UI eligibility to independent contractors, gig workers, self-employed persons, and to persons who are "unable or unavailable to work because of certain health or economic consequences of the COVID-19 pandemic," extended the duration of unemployment benefits by up to thirteen weeks, and relaxed job search requirements. See the US Department of Labor at https://www.dol.gov/coronavirus/unemployment-insurance, accessed on April 28, 2020.

30. This and the previous sentence reflect personal communications with CEA staff.

more income while unemployed are asking to be laid off. These remarks suggest that federal supplemental unemployment benefits have boosted layoffs and unemployment benefit claims during the pandemic.

The extra $600 per week in supplemental benefits also discourages unemployed persons from returning to work. Even at replacement rates in the historical range of 40–50 percent of prior earnings, unemployment benefits discourage job search by recipients; see, for example, the studies by Katz and Meyer (1990) and Krueger and Mueller (2010). Evidence has already emerged that today's much higher replacement rates discourage a return to work. Huffman (2020) and Kullgren (2020), for example, offer anecdotal evidence from the restaurant industry. The problem worsens as the economy reopens and employers seek to recall laid-off employees or hire new ones. On May 15, 2020, the House passed the Heroes Act, which would extend the supplemental $600 per week through January 2021 (with a phaseout through March 2021) and disregard the value of supplemental benefits in assessing eligibility for other means-tested federal assistance programs (Weidinger 2020). If enacted, these provisions in the Heroes Act would further discourage a return to work and slow the economy's response to the reallocative aspects of the COVID-19 shock.

Prang (2020) supplies an interesting example of how the $600 supplemental benefit affected a cleaning company that employed thirty workers before the pandemic. The owner received a $250,000 loan under the Paycheck Protection Program. The loan is forgivable if the company reopens within eight weeks and rehires its former employees. The owner thinks it will take more than eight weeks to reopen and that it is "unclear if his workers would want to stay at the firm over the next couple of months because many of them stand to make more from the country's expanded unemployment benefits. [The owner] estimated he would have to raise the pay of certain employees by up to 40% to compete with collecting unemployment." Many owners will confront similar challenges as they seek to reopen their businesses.

III.C. Linking Firm Aid to Employee Retention Deters Productive Reallocation

The CARES Act also created the Paycheck Protection Program (PPP), an emergency lending facility that extends loans to small businesses on favorable terms. Congress allocated $349 billion to the PPP in the CARES Act and added $321 billion about a month later, bringing the total to $670 billion (Boggs 2020). As Letteiri and Lyons (2020) explain, the PPP

has two main goals: "1) help small businesses cover their near-term operating expenses during the worst of the crisis, and 2) provide a strong incentive for employers to retain their employees." Initially, PPP loans were forgivable in an amount up to the borrower's expenditures on payroll, rent, utilities, and mortgage interest in the eight weeks after loan receipt, *if* the borrower maintains its pre-crisis level of full-time equivalent employees. Otherwise, the amount forgiven falls in proportion to the head count reduction. In addition, payroll expenses must account for at least 75 percent of the forgiven amount. Thus, the loan becomes a grant if covered operating costs exceed the loan amount and the borrower maintains head count. Congress modified the PPP in June, relaxing the circumstances under which loans are forgivable.

If there is social value to business continuity that exceeds the private value captured by owners, employees, suppliers, and customers, then taxpayer subsidies that encourage the operation of temporarily unprofitable businesses might create positive social value. We say "might" because these subsidies involve other costs, including the deadweight cost of taxation and the misallocation and misuse of funds. In this regard, we note that PPP loan recipients to date include US congressional members, politically connected firms, top law and lobbying firms, and firms that allegedly defrauded student borrowers or sold fake coronavirus treatments (Podkul and McCaffrey 2020; Weaver and others 2020; Vielkind 2020). The US government watchdog agency recently expressed concerns about the potential for fraud and misuse of PPP funds (GAO 2020).

We make no effort to analyze the full range of benefits and costs of the PPP or to assess its implementation. Our modest aim is to highlight the program's potential for harmful effects on static efficiency and reallocation incentives in the wake of the COVID-19 shock. Given the program's design, an eligible firm has financial incentives to tap the PPP to fund current operations, even when its output has negative social value and its workers and other inputs would be more efficiently deployed elsewhere.[31]

Consider, for example, a restaurant that can generate $5,000 per week in revenues at a cost of $8,000 per week for payroll and $2,000 for food

31. Our example reflects the PPP as designed in the CARES Act. On June 3, 2020, Congress passed the Paycheck Protection Program Flexibility Act, which relaxed employee retention requirements, extended the period over which borrowers can accrue operating expenses for loan forgiveness, and lowered the amount firms must spend on payroll to qualify for loan forgiveness. See Lyons (2020) for a useful summary. We see these reforms as a belated, partial recognition of problems inherent in the design of the PPP.

and utilities. The short-run profit maximizing decision for the restaurant owner is to shut down during the crisis, saving $5,000 a week. That privately sensible decision frees up the employees to take other jobs or, if not working, to devote more time to valuable activities at home such as caring for children and monitoring their studies while schools are closed. That same owner with a PPP loan of $64,000 will find it profitable to stay open. The forgivable loan covers labor costs during the eight-week period, leaving net profits of $3,000 per week for the restaurant owner. In this example, the PPP-induced loss in social value is $5,000 per week in (net of subsidy) operating losses plus the value of employee time in alternative uses.

The PPP also creates incentives to delay socially valuable reallocation responses to the COVID-19 shock. To see this point, return to the example and suppose the owner anticipates the restaurant will remain unprofitable even after the pandemic recedes. This scenario is a plausible one, because the fall in demand for dine-in restaurants will persist, as we discussed above. Even in these circumstances, the PPP gives the restaurant owner a financial incentive to continue operating as long as forgivable loans are available to turn an unprofitable business into a privately profitable one. In other words, the PPP creates incentives to keep workers engaged in businesses that will not succeed beyond the duration of government subsidies and to postpone their redeployment to businesses with better outlooks.

There are other ways to channel liquidity support to viable, cash-strapped businesses during the crisis. Delinking financial assistance from employee retention would reduce the incentive to inefficiently deploy labor. Assistance in the form of low-interest loans without forgiveness provisions would discourage firms with poor prospects from applying for assistance. That way, taxpayer-backed programs to provide liquidity support for businesses could be directed to firms with better survival prospects. Modifying the PPP in these respects would also facilitate a speedier reallocation of inputs away from businesses with poor future prospects in the wake of the COVID-19 shock to existing and new businesses with better prospects.

The PPP is not the only current program that uses taxpayer funds to underwrite employee retention without regard for the employer's commercial outlook. The US Treasury struck an agreement with ten major US airlines to provide $25 billion in subsidies in exchange for barring layoffs and furloughs before October (Sider 2020a). According to Transportation Security Administration data, passenger counts at US airports were, relative to a year earlier, down 93 percent on March 31, 2020, down 94 percent on

April 30, and down 87 percent on June 30.[32] Airline executives say that "it will likely take years to get back to travelling as usual" (Sider 2020b). As of early July, United Airlines is considering laying off 36,000 employees, nearly half its workforce, after employee-retention subsidies end (Cameron and Sider 2020). Other major US airlines also plan to cut employment this fall. Boeing plans to cut 13,000 jobs in the United States in view of the collapse in air travel, and its suppliers have announced additional job cuts (Cameron 2020). In circumstances like these, employee-retention subsidies delay the redeployment of workers and other productive inputs to more efficient uses during the crisis and afterward.

III.D. Occupational Licensing Restrictions

Certain legacy features of the US policy landscape will also, unless reformed, inhibit the economy's response to the reallocative nature of the COVID-19 shock. Online appendix C discusses the role of land-use restrictions in this regard. In the main text, we discuss the role of occupational licensing and regulatory barriers to business formation and expansion.

The share of American workers who must hold a license to do their jobs rose from less than 5 percent in the 1950s to more than 25 percent by 2008 (Kleiner and Krueger 2013). About one-third of the growth in occupational licensing since the 1960s reflects changes in the mix of jobs (US Department of the Treasury 2015). The other two-thirds reflects a greater prevalence of licensing requirements within occupations. Carpenter and others (2012) provide an illuminating description of state licensure requirements in 102 low- and moderate-income occupations. They document onerous licensing requirements for barbers, manicurists, tree trimmers, funeral attendants, massage therapists, auctioneers, sign language interpreters, and hundreds of other jobs.[33] Government-mandated restrictions on who can work in what jobs impede responses to reallocative shocks.

Most occupational licenses are at the state level, and cross-state reciprocity is limited. Thus, licensing raises entry barriers in many jobs *and* inhibits worker mobility across states. Carpenter and others (2012), US Department of the Treasury (2015), Johnson and Kleiner (2017), Kleiner and Xu (2020), and Hermansen (2019) provide evidence that licensing reduces job-to-job mobility among workers, lowers occupational entry rates, reduces interstate mobility rates of workers in affected occupations,

32. See "TSA checkpoint travel numbers for 2019 and 2020," TSA www.tsa.gov/coronavirus/passenger-throughput, accessed July 15, 2020.

33. These examples are drawn from table 1 in Carpenter and others (2012).

and lowers inward worker migration in states with more extensive and stricter licensing regulations. For a fuller set of references to studies of occupational licensing effects, see Farronato and others (2020).

Occupational licensing restrictions have recently presented themselves in a particularly pointed manner, as observed in a recent *Wall Street Journal* editorial:

> Last month [New York Governor] Cuomo allowed medical personnel licensed anywhere in the country to practice in the state without a New York license. The Governor also expanded "scope-of-practice" rules to allow nurse practitioners, physician assistants and nurse anesthetists to perform jobs they've been trained to do without supervision from a higher-trained professional. . . . Washington, Colorado and Massachusetts are relaxing licensing for out-of-state medical professionals. (*Wall Street Journal* 2020)

Relaxing restrictions of this sort are thus one route to facilitating a helpful response to the pandemic *and* the necessary post-pandemic reallocation of resources. The US Department of the Treasury (2015) and Thierer and Mitchell (2020) provide several proposals for reforming occupational licensing practices in the United States. The state of Florida recently passed sweeping reforms that eliminate licensure requirements in some occupations, relax requirements and fees in many others, and expand options for licensing reciprocity with other states (*Tampa Dispatch* 2020). These reforms make it easier for Florida's workers and businesses to adjust to the COVID-19 shock and other reallocation shocks.

III.E. Regulatory Barriers to Business Formation and Expansion

The strength of the recovery in coming months and years will depend partly on how successfully the economy responds to the reallocative aspects of the COVID-19 shock. There are reasons for concern in this regard. Available evidence suggests the US economy responds more sluggishly to reallocation shocks now than decades earlier and that regulatory barriers to business entry and expansion are important reasons for the increased sluggishness.

Decker and others (2018) present evidence that plant-level employment growth became less responsive to plant-level total factor productivity (TFP) shocks after the 1980s in the US manufacturing sector. Among plants operated by young firms in high-tech manufacturing, the fall in responsiveness began after the 1990s. Plant-level investment rates also became less responsive to TFP shocks after the 1990s. Moreover, the intra-industry dispersion of labor productivity has drifted upward since at least the mid-1990s. Decker and others (2018) also find that firm-level

employment growth has become less sensitive to labor productivity shocks in the US nonfarm private sector since the mid-1990s and that the intra-industry dispersion of labor productivity has risen since the mid-1990s. All of these findings point to greater sluggishness in responding to firm-level and establishment-level shocks.

Gutiérrez and Philippon (2019) find that the elasticity of market entry with respect to Tobin's q has declined since the late 1990s. They attribute this development mainly to rising entry costs driven by regulations and lobbying. Their evidence points to greater sluggishness at the level of markets in the US economy. It is complementary to the plant-level and firm-level evidence in Decker and others (2018).

Davis (2017) presents evidence that the US regulatory and tax systems grew enormously in scale, scope, and complexity in recent decades. He argues that regulatory burdens and complexity tend to fall more heavily on younger firms and incumbent businesses that expand into new markets. A vast, complex regulatory landscape creates large costs of learning the relevant regulations, developing compliance systems, and establishing relationships with regulators. Young businesses have had less time to develop the knowledge and internal processes required for compliance. Partly for this reason, complex regulatory systems favor incumbents while disadvantaging entrepreneurship and young businesses. Compared to smaller, newer, and would-be competitors, larger and incumbent firms have greater capacity and incentive to lobby for legislative exemptions, administrative waivers, and favorable regulatory treatment. Similar remarks apply to the US business tax code, which is also vast and complex.

We conclude with remarks on one class of regulations that is especially pertinent in light of the COVID-19 shock: certificate of need (CON) laws in the health care sector. As described by Mitchell (2020), these laws "limit the ability of healthcare professionals to open new facilities, expand existing ones, or offer new services. . . . [They] cover dozens of technologies and services . . . and are not intended to evaluate a provider's competency or safety record. Instead, [the CON process] is intended to evaluate the provider's claim that the service is actually needed. . . . Incumbent providers are invited to challenge the applications of their would-be competitors. Even if a CON is granted, applicants can expect the process to take months or years." In light of this description, the potential for CON laws to deter entry, reduce health care capacity, and inhibit the health care sector's responsiveness to reallocation shocks is obvious.

The number of US states with CON laws went from zero before 1964 to twenty-three in 1970 and forty-nine in 1980 (Mitchell and Koopman 2016).

Since then, many states have repealed CON laws, and they are currently in effect in thirty-five states and the District of Columbia (Mitchell and Koopman 2016). The adoption and repeal of CON laws at different times in different states is quite useful for research into their effects. According to Mitchell's (2020) timely summary of research in this area, CON laws are associated with fewer hospitals per capita, fewer hospital beds per capita, fewer ambulatory surgery centers per capita, fewer hospice care facilities, fewer dialysis clinics, fewer hospitals offering MRI, CT, and PET scans, and longer driving distances to obtain care.

This evidence suggests that CON laws will hamper the health care sector's response to demand shifts driven by the COVID-19 shock and make it harder and costlier to strengthen health care capacity in the United States. Mitchell, Amez-Droz, and Parsons (2020) offer several suggestions for phasing out or otherwise reforming CON laws.

ACKNOWLEDGMENTS We thank Katharine Abraham (our discussant), Dave Altig, Joseph Beaulieu, Jason Cummins, Marianna Kudlyak, Eddie Lazear, Brent Meyer, Adam Milsap, Giuseppe Moscarini, Jim Stock (the editor), participants at the summer meeting of the *Brookings Papers on Economic Activity*, and seminar participants at CBO, IGIER, and the IMF for helpful comments. We thank Emil Mihaylov for outstanding research assistance and Akhtar Muhammad and Till von Wachter for supplying data on the temporary layoff share of new unemployment claims in California. We gratefully acknowledge financial support from the Federal Reserve Bank of Atlanta, the Sloan Foundation, Stanford University, and the University of Chicago Booth School of Business.

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