COVID-19 Is Also a Reallocation Shock

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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 3 to 4 new hires for every 10 layoffs from March 1 to mid-May 2020. Second, we project that one-third or more of 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 2 to 5 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 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.[1] The U.S. economy shrank an annualized 4.8 percent in the first quarter of 2020, and many analysts project an annualized drop of 25% or more in the second quarter.[2] 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 U.S. 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 1 March, 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 12.8 percent of March 1 employment and new hires equal to 3.8 percent. In other words, the COVID-19 shock caused 3 new hires in the near term for every 10 layoffs. Similarly, the Job Openings and Labor Turnover Survey reports more than 4 hires for every 10 layoffs in March and April. This large volume of new hires amidst a tremendous employment contraction aligns well with payroll statistics reported in Cajner et al. (2020), with Census Bureau statistics on

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[1] The unemployment claims data are available at https://oui.doleta.gov/unemploy/claims_arch.asp.
[2] As of 31 March, Goldman Sachs projects that U.S. GDP will fall 34 percent (annualized) in the second quarter of 2020 (Carew, 2020). Baker, Bloom, Davis and Terry (2020) obtain a similar figure using the estimates implied by an empirical model of disaster effects that Baker, Bloom and Terry (2020) fit to historical data for 38 countries. According to Blue Chip Economic Indicators report of 10 April 2020, the mean forecast for U.S. GDP is a 24.5 percent (annualized) drop in the second quarter of 2020.

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 households in a Washington Post/Ipsos survey, and to unemployment benefit claimants in California. All three 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. Historically, many layoffs perceived as temporary when they happen do *not* result in recalls. Adjusting for this pattern, we project that one-third or more of COVID-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 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 lost jobs 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.[3] 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 1 percent of sales before the pandemic to

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[3] This statistic is the forward-looking analog to the backward-looking measures of excess job reallocation examined in Dunne, Roberts and Samuelson (1989), Davis and Haltiwanger (1992), and many later studies. See Davis and Haltiwanger (1999) for a review of the literature and Appendix C.2 for references to more recent studies that examine excess reallocation measures for other outcome variables.

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 pre-pandemic situation align well with worker responses to similar questions about working from home in the 2017-18 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 U.S.-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 2008-09 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.[4] 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 healthcare 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 U.S. 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 the employer's 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.

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[4] For examples of how this shift is playing out in groceries, restaurants and new automobile sales, see Mims (2020c), Naughton (2020) and Mims (2020b), respectively. Section II.C provides more examples.

I.   Evidence

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 fielded in the April 2020 SBU.[5] One question asks about impact on own-company staffing levels since 1 March 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. 92 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 et al. (2020, Figure 2.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 one-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 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.[6] The under sampling of young firms in the SBU, the omission

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[5] The SBU is a monthly panel survey of American firms fielded by the Federal Reserve Bank of Atlanta in cooperation with Chicago Booth and Stanford University. It covers all 50 states, every major nonfarm industry, and a range of firm sizes. See Altig, Barrero et al. (2020b) for a detailed description of the SBU and an analysis of the micro data.

[6] We can obtain a corresponding estimate of aggregate gross staffing reductions in the private sector as follows: There were 152.5 million employees in the nonfarm private sector as of February 2020, according to the BLS Current Employment Statistics. According to BLS (2017), independent contractors are 6.9 percent of employment in the Current Population Survey. Multiplying the February 2020 CPS employment figure by 6.9 percent yields an estimated 10.9 million contract workers. Finally, 18.3% of 163.4 (=152.5 + 10.9) million yields aggregate gross staffing reductions of 29.9 million.

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

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

Notes: Authors' calculations using data from the April 2020 Survey of Business Uncertainty.
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 3 new hires for every 10 layoffs [7] If we include contactors and leased workers, the ratio is about 2.7 gross staffing gains for every 10 gross staffing reductions. JOLTS data for March and April show 4.3 hires for every 10 layoffs.[8] Similarly, Cajner et al. (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 amidst the sharpest employment contraction since records began, simultaneous large-scale hiring and separations are a ubiquitous feature of U.S. labor markets. See, for example, Davis, Faberman and Haltiwanger (2006) and Lazear and Spletzer (2012).

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 U.S. private sector on the last (business) day of January and February 2020, 5.3 million on the last day of March, and 4.4 million on the last day of April. In other words, job openings after the pandemic struck were about 71 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 30 days. According to JOLTS data, actual hires in April 2020 were 60 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 in Appendix C of large pandemic-induced labor demand increases at some firms.

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

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[7] Of firms that report layoffs in the data behind Table 1, 21 percent also report hires. If we drop those hires, we obtain 2.5 hires for every 10 layoffs in the period from 1 March to mid-May.

[8] The JOLTS sample is much larger than the SBU sample, and presumably more representative of the U.S. private sector. SBU-based statistics are available much earlier, which is a major advantage in the wake of a huge and atypical shock. We first reported Table 3 on 1 May in Altig, Barrero et al., (2020a), while the JOLTS-based statistics for April were first reported on 9 June. Note that the two surveys also ask somewhat different questions: The SBU asks explicitly about the causal impact of COVID-19 developments. In contrast, the JOLTS askes about all hires and separations, regardless of cause.

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 five 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 pre-pandemic levels in June.

Figure 1: Weekly Count of High-Propensity Business Applications in 2020 and Percent Change Relative to the Same Week in 2019
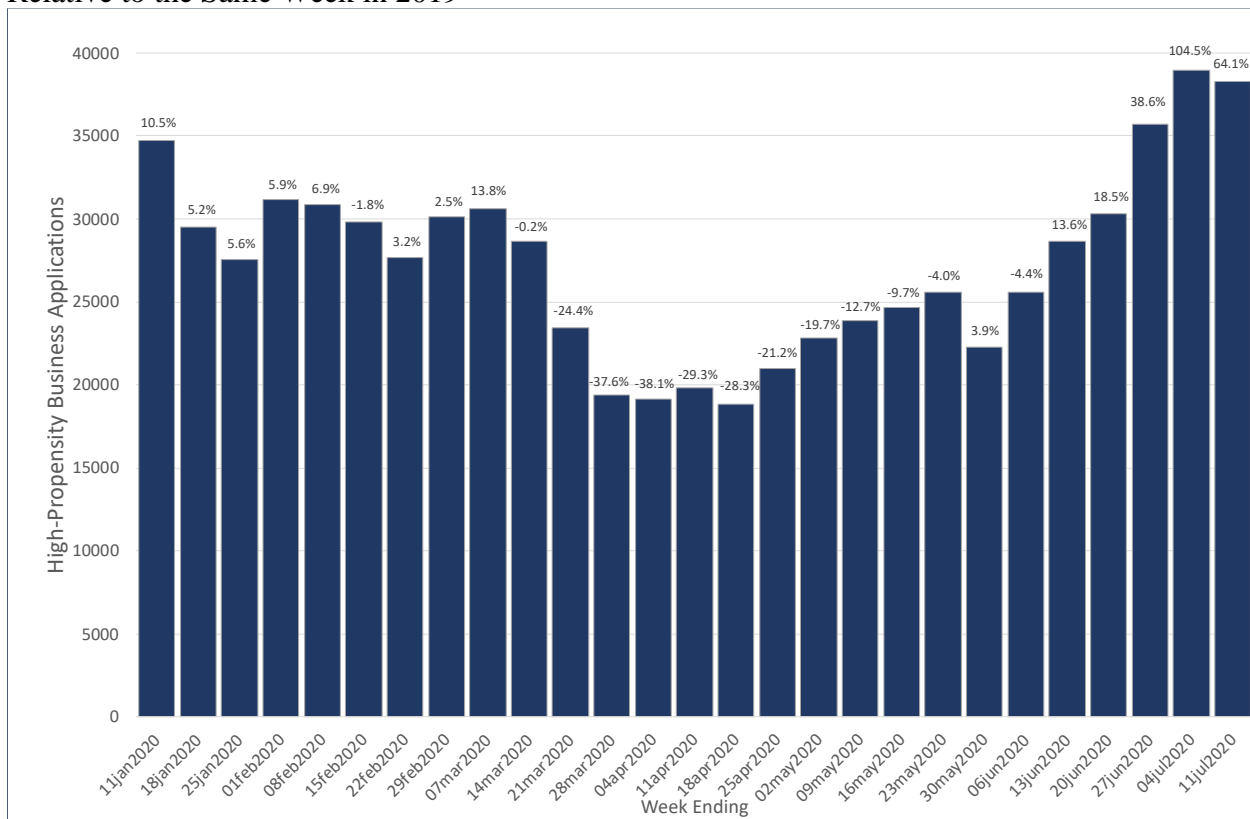
Source: Weekly Business Formation Statistics, U.S. Census Bureau

Notes: Bar heights report the count of "High-Propensity Business Applications" in the week ending on the indicated date. These statistics derive from administrative data on applications for a new Employer Identification Number (EIN) on IRS Form SS-4. "High-propensity" applications are those with a high propensity to hire paid employees based on certain characteristics, including

(a) they are from a corporate entity; (b) they indicate they are hiring employees, purchasing a business or changing organizational type; (c) they provide a first wages-paid date (planned wages); or (d) they have a NAICS industry code in manufacturing (31-33), retail stores (44), health care (62), or restaurants/food service (72). The values atop each bar are year-on-year percent changes in the number of high-propensity business applications relative to the same week in 2019.

b. Projecting the Permanent-Layoff Share of COVID 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. A Washington Post/Ipsos survey of 8,086 American adults fielded from 27 April to 4 May 2020 also finds that 23 percent of layoffs were seen as permanent.[9] 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.[10] In Appendix A, we develop two estimates for the permanent-layoff share of job losses between March and April 2020 using the Current Population Survey. 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 decision makers" commissioned by Upwork and fielded from 22-28 April finds that 47 percent of recent layoffs were perceived as permanent.[11]

As we discuss in Appendix A, it is challenging to estimate the permanent-layoff share of job losses using CPS data.[12] 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

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[9] See https://context-cdn.washingtonpost.com/notes/prod/default/documents/7a39185f-8222-4e28-9528-5741ebb137ad/note/2e5183d3-9f6f-45a1-84ab-7f2532c8c5fb.#page=1.

[10] Muhammad Akhtar and Till von Wachter kindly supplied the California data. See Appendix B.

[11] See Upwork (2020) and the slides at www.slideshare.net/upwork/2020-future-workforce-report/1.

[12] 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.

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 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.[13] The longer the pandemic persists, the longer it will take for the economy to recover, and the larger the share of recent layoffs that will turn out to be permanent. To get a sense for the fraction of layoffs that will lead to actual recalls, we turn to historical evidence from two sources. Using a sample of 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-Meyer figures to statistics in the rightmost column of 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 11.6 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-induced jobs losses. While there is uncertainty about the share of pandemic-induced job losses

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

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.

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 et al. (2020b) 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 12-month look-ahead horizon as the arc change rate,[14]

$$E_t g_{i,t+12} = \frac{E_t L_{i,t+12} - L_{it}}{0.5(L_{it} + E_t L_{i,t+12})},$$

where all quantities on the right side derive from survey responses in month t. 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 $E_t g_{i,t+12}$.

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

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

where the first term on the right side is the expected gross job destruction rate over the 12-month forecast horizon, the second term is the expected gross job creation rate, and the third term is the

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[14] 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).

absolute value of the expected net aggregate growth rate.[15] 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.[16] We compute the expected excess sales reallocation rate in an analogous manner.[17]

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 et al. (2020b) 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 underway of Bloom et al. (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 under samples younger firms, which have much higher reallocation rates than mature firms. Second, highly stressed firms are less likely to

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[15] In practice, we winsorize the z_{it} values at 500 and the $E_t g_{i,t+12}$ 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, Barrro et al. (2020b).

[16] For example, if three firms forecast employment changes of -3, -1 and 0, 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.

[17] 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 $E_t g_{i,t+12}$ 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 et al. (2020b) 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.

respond to surveys, which leads to an understatement of expected destruction activity.[18] 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.

d. Expected Excess Reallocation Rates

Table 2 summarizes expected reallocation rates before and after the Covid-19 pandemic hit the U.S. economy, and Figure 2 displays monthly rates from September 2016 onwards.[19] 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 5.39 percent in April, which is 2.4 times the pre-COVID 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 to 4.08 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.

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

| Time Period	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

Notes: Authors' calculations using data on firm-level forecasts in the Survey of Business Uncertainty. 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 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.

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

[19] 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.

Figure 2: Expected Excess Reallocation Rates at One-Year Forecast Horizons, Monthly
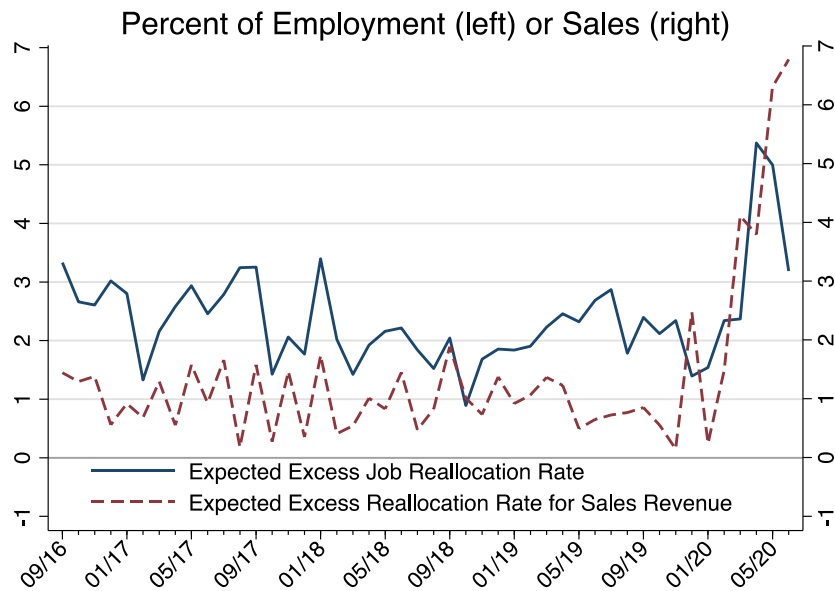
Source: Authors' calculations using data from the Survey of Business Uncertainty.

Several other countries conduct surveys that could be used to construct forward-looking reallocation measures like the ones in Figure 2. The U.K. Decision Maker Panel, a monthly survey that began in August 2016, includes questions patterned after the ones in the SBU (Bloom et al., 2018). 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 Pettinichi (2018), Tanaka et al. (2019) and Chen et al. (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 policy makers.

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 U.S. residents aged 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 are "Working on my business premises," "Working from home," and other options that Figure 3 groups under "Not working." Nearly 42 percent of our 2,500 respondents report working from

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home. Adjusting for those not working, our survey results say that 62 percent of labor services were supplied from home as of late May (67 percent on an earning-weighted basis). In an independently conducted survey of persons who were employed pre-COVID, Brynjolfsson et al. (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 et al. (2020) find that 35 percent of persons employed in May 2020 report working entirely from home and another 14 percent report working from on some days. All three surveys confirm that COVID-19 caused a massive shift to working from home.[20]

Figure 3: Working from Home Accounts for More Than 60 Percent of U.S. Labor Services Supplied in May 2020
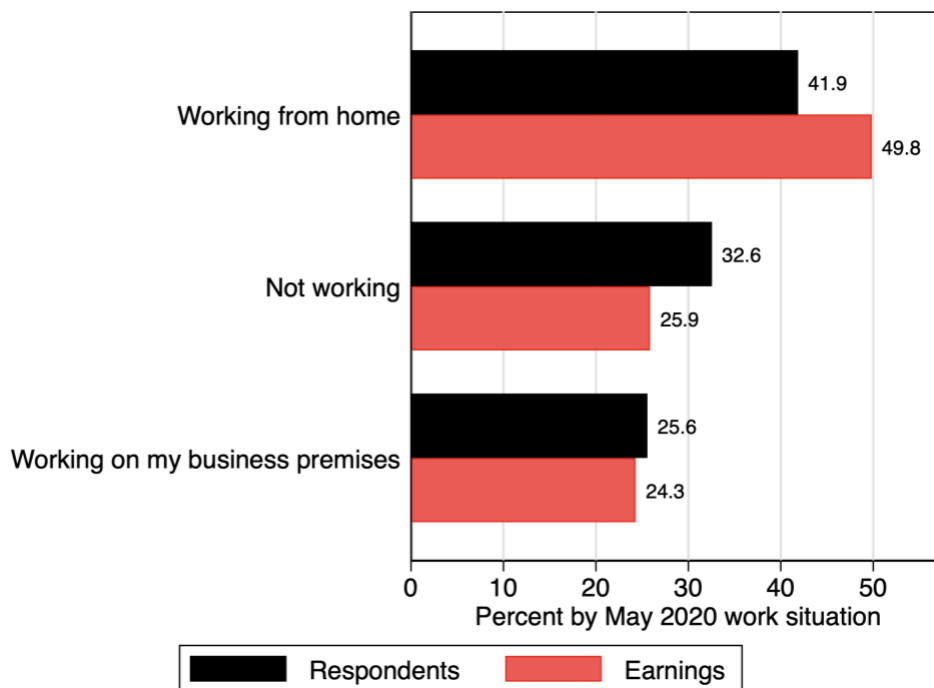
Notes: This chart summarizes responses to the following question: "Currently (this week) what is your work status?" Response options are "Working on my business premises," "Working from home," "Still employed and paid, but not working," "Unemployed, but expect to be recalled to my previous job," "Unemployed, and do not expect to be recalled to my previous job," and "Not

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[20] The propensity to work from home in May 2020 rises sharply with earnings, according to Bick et al. (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.

working, and not looking for work." The data are from a survey of 2,500 U.S. residents aged 20 to 64, earning more than $20,000 per year in 2019 fielded from 21-29 May by QuestionPro on behalf of Stanford University. We re-weight the sample to match the share of individuals at the level of cells defined by cross product of earnings interval, state and industry (using the current or most recent job) in CPS data from 2010 to 2019. Adjusting for those not working, the results displayed in the bar chart say that $(41.9/(100 - 32.6) = 62$ percent of labor services were supplied from home as of late May (67 percent on an earnings-weighted basis).

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 pre-pandemic starting point, we 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 the share that works from home five full days per week to the 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 2017–18 American Time Use Survey (ATUS). The firm-side SBU and worker-side ATUS yield quite similar pre-COVID 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.[21] 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 Nieman, 2020).

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…				
***Survey of Business Uncertainty* (May 2020)**	Rarely or never	1 full day per week	2 to 4 full days per week	5 full days per week	Paid workdays at home as a percent of all workdays
… 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)**	Rarely or never	1 full day per week	2 to 4 full days per week	5 full days per week	Paid workdays at home as a percent of all workdays
… work from home in 2017/18?	89.8%	3.8%	3.8%	2.6%	5.2%

Notes: In computing the SBU 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 question as asking about the situation during the pandemic. The resulting sample has 279 observations for the 2019 question and 280 for the post-pandemic question. ATUS data cover full-time workers. We compute the number of paid workdays

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[21] 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.

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.

Sources: Bureau of Labor Statistics (BLS) *ATUS (www.bls.gov/news_release/flex2.t03.htm)*; Survey of Business Uncertainty conducted by the Federal Reserve Bank of Atlanta, Stanford University, and the University of Chicago Booth School of Business; authors' calculations.

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.[22] This statistic implies a huge, persistent shift in worker spending power away from central business districts to locations closer to residences.

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 U.S.-listed firms.[23] 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 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 (e.g., Shiller, 1981, Campbell and Shiller, 1988, and 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.[24] In contrast, this heterogeneity shows up in return dispersion measures if the discount rate variation itself is dominated by common factors.

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[22] Calculated as 100 times (29.2 – 10.7)/(100 -10.7).

[23] 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.

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

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

<u>Survey Questions</u>:
- 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

|	**Full workdays at home as a percent 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)

pandemic?

<u>Survey Response Period</u>: May 11-22, 2020

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 firms in shocks to their expected future cash flows. 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 24 February to 21 March, the impact of the COVID-19 shock on the dispersion in returns is greater yet, as shown by the large dots in Figure 4.[25]

Figure 4: The Dispersion of Monthly Firm-Level Stock Returns, January 1984 to June 2020
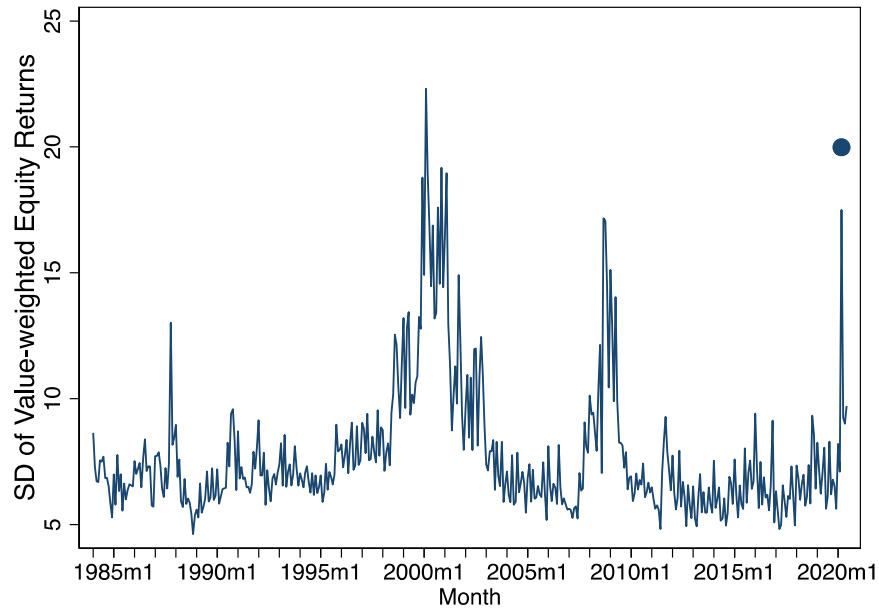
A. Interquartile Range of Equity Returns in the Value-Weighted Return Distribution
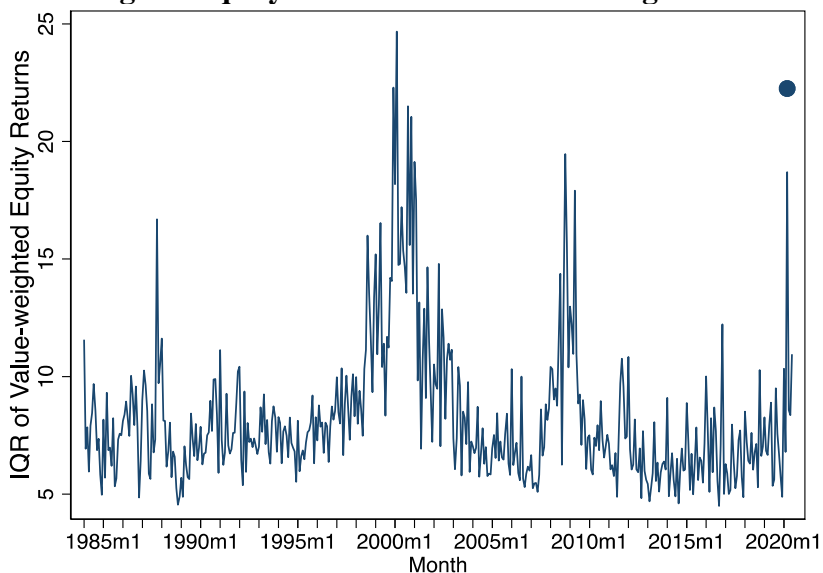
B. Standard Deviation of Equity Returns in the Value-Weighted Return Distribution

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[25] We chose 24 February, because it is the first large daily move in the U.S. stock market that next-day journalistic accounts attribute to the COVID-19 pandemic. See Baker et al. (2020).

Notes: We consider common equity securities traded on the NYSE, AMEX and NASDAQ with share prices quoted in U.S. Dollars. Data are from Compustat - Capital IQ Daily Security Files and from CRSP, both via the Wharton Research Data Services. We compute returns for month *t* 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 24 February to 21 March 2020.

Several recent studies provide evidence on the sources of heterogeneity in the COVID-19 impact on listed firms. Hassan et al. (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 (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 14 February 2020 to 15 June, 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.[26] Pagano et al. (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 et al. 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.

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

II. Implications for the Economic Outlook

a. Reasons to Anticipate a Long Recovery

As of 19 July, confirmed cases of COVID-19 exceed 14 million worldwide, with 603,000 persons thought to have died from the disease.[27] After slowly falling from mid-April to early June, weekly reported new cases in the United States rose rapidly and quickly surpassed earlier peaks.[28] Weekly (excess) deaths in the United States have continued to fall since mid-April.[29] At this juncture, more than four months after the pandemic struck the United States, there remains great uncertainty about how it will evolve and its longer term economic effects. It appears that recent decisions to relax restrictions on commercial activity contributed to a surge in new U.S. cases, prompting some authorities to re-impose 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 (2020) projects (as of June 2020) that real GDP will not return to pre-pandemic levels until mid-2022, and that unemployment will remain above 6 percent through 2023-24. 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 6-12 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, which further depresses consumption expenditures and investment demand. Since uncertainties about the course of the pandemic and the stringency of social distancing measures

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[27] See the Johns Hopkins Coronavirus Resource Center at https://coronavirus.jhu.edu/map.html.
[28] https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html.
[29] https://www.cdc.gov/nchs/nvss/vsrr/covid19/excess_deaths.htm.

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 et al., 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 in the past four months. 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-packed patrons.

Second, universities, government labs, and commercial facilities have shuttered non-COVID research projects. Schools have sent students home, and universities are making do with remote classes. Barrero, Bloom and Wright (2017) and Bansal et al. (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 (Altig, Baker et al., 2020) may depress investments in these intangibles.

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.

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 U.S. 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 1-2 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.[30] 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 U.S. auto industry was dedicated to the production of larger rather than smaller cars. Second, U.S. auto workers had accumulated skills that were specialized in the production of particular models, and these tended to be larger vehicles. Third, many auto workers laid off from large-car plants could not take up employment at small-car plants without a costly relocation. Fourth, the dealership network and salesforce of the U.S. auto industry had evolved under an era of thriving large-car sales, and they

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[30] This paragraph and the next borrow from Davis and Haltiwanger (2001).

were adapted to market and service larger cars. Fifth, the knowledge base and the research and design personnel at U.S. 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, U.S. 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 Kenny, 1988).

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 U.S. manufacturing sector into about 450 four-digit Standard Industrial Classifications, 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.[31] 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 U.S. restaurants yields more than 100,000 permanent restaurant

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[31] 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.

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.

Turning to another salient example, an unsettled economy and uncertain outlook favor large incumbents with deep pockets (Mims, 2020a). 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 new-found 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."[32] In a recent article in *Medical Economics,* a publication aimed at healthcare professionals and business managers, Mann (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,

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

revenues and workers across practices and clinics. A similar dynamic will play out in other professional, business, and 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 U.S. grocery sales are up an estimated 450 percent from August 2019 and 24 percent from April 2020.[33] One-third of U.S. 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 re-configured stores to meet the growing demand for online shopping. Walmart is testing new technology to autonomously select items from a store room, 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 underway, as indicated by a wave of recent bankruptcies and massive downsizings at J.C. Penney (general merchandise), J.Crew (apparel), Nieman Marcus (luxury retailer), Pier 1 (imported household goods), Stage Stores (department stores), and Victoria's Secret (lingerie) (Kapner, 2020ab).

There are also well-documented examples of major past structural transformations that took the form of intra-industry reallocation. Foster, Haltiwanger and Krizan (2006) attribute large productivity gains in the U.S. 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 & 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,

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

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 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).

d. Potential for Transformative Shifts

Jones et al. (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 is 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% 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." 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, and Mattioli and Putzier, 2020). According to a survey of 500 "hiring decision makers" 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."[34] 56 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.

Shiva (2020) argues that countries around the world need large investments to upgrade public health systems and healthcare capacity: hospitals, treatment capabilities, protective gear for front-line healthcare 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 healthcare capacity will have broad appeal.

III.   Messages for Policy

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 consider 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.

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[34] See Upwork (2020) and the slide deck at 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.

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 U.S. 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.

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 27 March 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.[35] 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.[36] Ganong et al. (2020) estimate that, under the CARES Act, the median replacement rate for unemployment benefit recipients is 134 percent. They also

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[35] The Federal Pandemic Unemployment Compensation provision of the CARES Act also expanded UI eligibility to independent contractors, gig workers, self-employed persons and to certain 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 13 weeks, and relaxed job search requirements. See the U.S. Department of Labor at https://www.dol.gov/coronavirus/unemployment-insurance, accessed on 28 April 2020.

[36] This and the previous sentence reflect personal communications with CEA staff.

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 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 15 May 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 30 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.

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 million about a month later, bringing the total to $670 billon (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 headcount 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 headcount. 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. PPP loan recipients include U.S. 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 et al., 2020 and Vielkind, 2020). The U.S. 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.[37]

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 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 another job 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

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[37] Our example reflects the PPP as designed in the CARES Act. On 3 June 2020, Congress passed the Paycheck Protection 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.

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 largely eliminate 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 U.S. Treasury struck an agreement with ten major U.S. 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 U.S. airports were, relative to a year earlier, down 93 percent on 31 March 2020, 94 percent on 30 April and 87 percent on 30 June.[38] Airline executives say "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 U.S. airlines also plan to cut employment this fall. Boeing plans to cut 13,000 jobs in the U.S. 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 afterwards.

d. Occupational Licensing Restrictions

Certain legacy features of the U.S. policy landscape will also, unless reformed, inhibit the economy's response to the reallocative nature of the COVID-19 shock. Appendix C.5 discusses

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[38] See TSA's "Total Traveler Throughput" data at www.tsa.gov/coronavirus/passenger-throughput.

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% in the 1950s to more than 25% 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.[39] The other two-thirds reflects a greater prevalence of licensing requirements within occupations. Carpenter et al. (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.[40] 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. See Carpenter et al. (2012), the U.S. Treasury Office of Economic Policy (2015), Johnson and Kleiner (2017), and Kleiner and Xu (2019) and Hermansen (2019) for evidence that licensing reduces job-to-job mobility among workers, lowers occupational entry rates, reduces interstate mobility rates of workers in affected occupations, 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 et al. (2020).

Occupational licensing restrictions have recently presented themselves in a particularly pointed manner, as observed in a recent *Wall Street Journal* (2020) 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.

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[39] U.S. Department of the Treasury Office of Economic Policy (2015), page 20.
[40] These examples are drawn from Table 1 in Carpenter et al. (2012).

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 U.S. Department of the Treasury Office of Economic Policy (2015) and Thierer (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 COVID-19 shock and other reallocation shocks.

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 U.S. 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 et al. (2018) present evidence that plant-level employment growth became less responsive to plant-level total factor productivity (TFP) shocks after the 1980s in the U.S. 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 upwards since at least the mid-1990s. Decker et al. also find that firm-level employment growth has become less sensitive to labor productivity shocks in the U.S. 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.

Gutierrez 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 U.S. economy. It is complementary to the plant-level and firm-level evidence in Decker et al. (2018).

Davis (2017) presents evidence that the U.S. 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 U.S. 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 healthcare 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 healthcare capacity, and inhibit the healthcare sector's responsiveness to reallocation shocks is obvious.

The number of U.S. states with CON laws went from zero before 1964 to 23 in 1970 and 49 in 1980 (Mitchell and Koopman, 2016). Since then, many states have repealed CON laws, and they are currently in effect in 35 states and the District of Columbia. 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 that CON laws will hamper the healthcare sector's response to demand shifts driven by the COVID-19 shock and make it harder and costlier to strengthen healthcare capacity in the United States. Mitchell, Amez-Droz and Parsons (2020) offer several suggestions for phasing-out or otherwise reforming CON laws.

References

Altig, Dave, Scott Baker, Jose Maria Barrero, Nick Bloom, Phil Bunn, Scarlet Chen, Steven J. Davis, Julia Leather, Brent Meyer, Emil Mihaylov, Paul Mizen, Nick Parker, Thomas Renault, Pawel Smietanka and Greg Thwaites, 2020. "Economic Uncertainty Before and During the COVID-19 Pandemic," NBER Working Paper 27418, June.

Altig, David, Jose Maria Barrero, Nick Bloom, Steven J. Davis, Brent Meyer, Emil Mihaylov and Nick Parker, 2020a. "COVID-19 Caused 3 New Hires for Every 10 Layoffs," Technical Report, Federal Reserve Bank of Atlanta, 1 May.

Altig, David, Jose Maria Barrero, Nick Bloom, Steven J. Davis, Brent Meyer and Nick Parker, 2020b. "Surveying Business Uncertainty" NBER Working Paper 25956. Revised, March 2020. Forthcoming, *Journal of Econometrics.*

Bachmann, Ruediger and Stefan Elstner, 2015. "Firm optimism and pessimism," *European Economic Review*, *79* (October), 297-325.

Baker, Scott, Nicholas Bloom, Steven J. Davis, Kyle Kost, Marco Sammon and Tasaneeya Viratyosin, 2020. "The Unprecedented Stock Market Reaction to COVID-19," *COVID Economics: Vetted and Real-Time Papers,* 1, 5 April. Revised and expanded on 16 June.

Baker, Scott, Nicholas Bloom, Steven J. Davis and Stephen J. Terry, 2020. "COVID-Induced Economic Uncertainty," NBER Working Paper 26983.

Bansal, Ravi, Marian Max Croce, Wenxi Liao, and Samuel Rosen, 2019. "Uncertainty-Induced Reallocations and Growth," NBER Working Paper No. 26248.

Barrero, Jose Maria, 2020. "The Micro and Macro of Managerial Beliefs," working paper, Instituto Tecnológico Autónomo de México.

Barrero, Jose Maria, Nick Bloom and Steven J. Davis, 2020. "The Future of Working from Home," paper in progress presented at the World Bank, July.

Bick, Alexander, Adam Blandin and Karel Mertens, 2020. "Work from Home after the COVID-19 Outbreak," Federal Reserve Bank of Dallas Working Paper 2017, June.

Bloom, Nicholas, Philip Bunn, Scarlet Chen, Paul Mizen, Pawel Smietanka, Greg Thwaites and Garry Young, 2018. "Brexit and uncertainty: insights from the Decision Maker Panel," *Fiscal Studies*, *39*, no. 4, 555-580.

Bloom, Nicholas, Steven J. Davis, Lucia Foster, Brian Lucking, Scott Ohlmacher and Itay Saporta Ecksten, 2017. "Business-Level Expectations and Uncertainty," working paper.

Boggs, Justin, 2020. "Congress Approves Replenishing the Paycheck Protection Program," *Denver Channel,* 23 April.

Brainard, S. Lael and David M. Cutler, 1993. "Sectoral Shifts and Cyclical Unemployment Reconsidered," *Quarterly Journal of Economics,* 108, no. 1 (February): 219-243.

Bresnahan, Timothy F. and Valery A. Ramey, 1993. "Segment Shifts and Capacity Utilization in the U.S. Automobile Industry," *American Economic Review,* 83, 2, 213-218.

Brynjolfsson, Eric, John J. Horton, Adam Ozimek, Daniel Rock, Garima Sharma and Hong-Yi TuYe, 2020. "COVID-19 and Remote Work: An Early Look at U.S. Data," NBER Working Paper 27344.

Bureau of Labor Statistics, U.S. Department of Labor, 2017. "Contingent and Alternative Employment Arrangements – May 2017," at www.bls.gov/news.release/pdf/conemp.pdf.

Caballero, Ricardo and Mohammed Hammour, 1994. "The Cleansing Effect of Recessions," *American Economic Review,* 84, no. 5 (December), 1350-1368.

Cajner, Tomaz, Leland D. Crane, Ryan A. Decker, John Grigsby, Adrian Hamins-Puertolas, Erik Hurst, Christopher Kurz and Aju Yildirmaz, 2020. "The U.S. Labor Market during the Beginning of the Pandemic Recession," June. Prepared for the *Brookings Papers on Economic Activity*.

Cameron, Doug, 2020. "Boeing Details Plans for Mass Job Cuts," *Wall Street Journal,* 27 May.

Cameron, Doug and Alison Sider, 2020. "United Airlines Warns It May Furlough 36,000 Staff," *Wall Street Journal,* 8 July.

Campbell, John Y. and Robert J. Shiller, 1988. "The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors," *Review of Financial Studies,* 1, 195-228.

Carew, Sinead, 2020. "Goldman Sachs Slashes U.S. GDP Estimate Further," *U.S. News & World Report,* 31 March.

Carpenter, Dick M., Lisa Knepper, Angela C. Erickson, and John K. Ross. 2012. *License to Work: A National Study of Burdens from Occupational Licensing,* Arlington, VA: Institute for Social Justice.

Chen, Cheng, Tatsuro Senga, Chang Sun and Hongyong Zhang, 2019. "Uncertainty, Imperfect Information and Learning in the International Market," working paper.

Cochrane, John, 2011. "Presidential Address: Discount Rates," *Journal of Finance,* 68, no. 4, 1047-1108.

Congressional Budget Office, 2020. "An Update to the Economic Outlook," July.

Cutter, Chip and Patrick Thomas, 2020. "Looking for a Job? Big Tech Is Still Hiring?" *Wall Street Journal,* 14 April.

Davis, Steven J., 1987. "Fluctuations in the Pace of Labor Reallocation," *Carnegie-Rochester Conference Series on Public Policy,* 27, 335-402.

Davis, Steven J., 2017. "Regulatory Complexity and Policy Uncertainty: Headwinds or Our Own Making," Becker Friedman Institute Working Paper, April.

Davis, Steven J., Jason Faberman, and John Haltiwanger, 2006. "The Flow Approach to Labor Markets: New Data Sources and Micro-Macro Links," *Journal of Economic Perspectives,* 20, no. 3 (Summer), 3-26.

Davis, Steven J., Jason Faberman, John Haltiwanger and Ian Rucker, 2010. "Adjusted Estimates of Worker Flows and Job Openings in JOLTS," in *Labor in the New Economy,* edited by K. Abraham, J. Spletzer and M. Harper, University of Chicago Press.

Davis, Steven J. and John Haltiwanger, 1992. "Gross Job Creation, Gross Job Destruction, and Employment Reallocation." *Quarterly Journal of Economics*, August.

Davis, Steven J. and John Haltiwanger, 1999. "Gross Job Flows," *Handbook of Labor Economics,* Volume 3B, Orley Ashenfelter and David Card, editors, Amsterdam: North-Holland.

Davis, Steven J. and John Haltiwanger, 2001. "Sectoral Job Creation and Destruction Responses to Oil Price Changes," *Journal of Monetary Economics*, December.

Davis, Steven J., John C. Haltiwanger, and Scott Schuh, 1996. *Job Creation and Destruction.* Cambridge, MA: MIT Press.

Davis, Steven J., Stephen Hansen and Cristhian Seminario, 2020. "Firm-Level Risk Exposures and Stock Price Reactions to COVID-19," working paper.

Davis, Steven J., Prakash Loungani and Ramamohan Mahidhara, 1997. "Regional Labor Fluctuations: Oil Shocks, Military Spending, and other Driving Forces," Board of Governors of the Federal Reserve System, International Finance Discussion Papers 578.

Decker, Ryan A., John C. Haltiwanger, Ron S. Jarmin and Javier Miranda, 2018. "Changing Business Dynamism and Productivity: Shocks vs. Responsiveness," NBER Working Paper No. 24236.

Dingel, Jonathan I. and Brent Neiman, 2020. "How Many Jobs Can Be Done at Home?" *COVID Economics: Vetted and Real-Time Papers,* 1, 5 April.

Dunne, Timothy, Mark Roberts, and Larry Samuelson, 1989. "Plant Turnover and Gross Employment Flows in the U. S. Manufacturing Sector," *Journal of Labor Economics*, 7, 48-71.

Farronato, Chiara, Andrey Fradkin, Bradley J. Larsen and Erik Brynjolfsson, 2020. "Consumer Protection in an Online World: An Analysis of Occupational Licensing," March.

Foster, Lucia, John Haltiwanger and C.J. Krizan, 2006. "Market Selection, Reallocation, and Restructuring in the U.S. Retail Sector in the 1990s," *Review of Economics & Statistics,* 88, 748-758.

Fujita, Shigeru and Giuseppe Moscarini, 2017. "Recalls and Unemployment," *American Economic Review,* 107, no. 12 (December), 3875-3916.

Ganong, Peter, Pascal Noel and Joseph Vavra, 2020. "Unemployment Insurance Replacement Rates During the Pandemic," working paper, May.

Gormsen, Niels J. and Ralph S. Koijen, 2020. "Coronavirus: Impact on Stock Prices and Growht Expectations," working paper, 23 April.

Government Accountability Office, 2020. "COVID-19: Opportunities to Improve Federal Response and Recovery Efforts," Report to the Congress, June.

Guerrieri, Veronica, Guido Lorenzoni, Ludwig Straub and Ivan Werning, 2020. "Macroeconomic Implications of COVID-19: Can Negative Supply Shocks Cause Demand Shortages?" NBER Working Paper No. 26918.

Guiso, Luigi and Giuseppe Parigi, 1999. "Investment and demand uncertainty," *Quarterly Journal of Economics*, *114*, no. 1, 185-227.

Hassan, Tarek A., Stephan Hollander, Laurence van Lent and Ahmed Tahoun, 2020. "Firm-Level Exposure to Epidemic Diseases: COVID-19, SARS, and H1N1," NBER Working Paper No. 26971.

Hermansen, Mikkel, 2019. "Occupational Licensing and Job Mobility in the United States," OECD Economics Department Working Paper No. 1585.

Horn, Daniel, 2020. "The Pandemic Could Put Your Doctor out of Business," *Washington Post,* 24 April.

Horwitz, Jeff, 2020. "Facebook to Shift Permanently toward More Remote Work after Coronavirus," *Wall Street Journal,* 21 May 2020.

Huffman, Kurt, 2020. "Our Restaurants Can't Reopen Till August," *Wall Street Journal,* 21 August.

International Monetary Fund, 2020. *World Economic Outlook,* Chapter 1, April.

Jackson, Nancy Mann, 2020. "Coronavirus Offers Opportunity for Physicians to Try Telemedicine," *Medical Economics,* 18 March.

Johnson, Janna E., and Morris M. Kleiner. 2017. "Is Occupational Licensing a Barrier to Interstate Migration?" NBER Working Paper 24107.

Jones, Karen E., Nikkita G. Patel, Marc A. Levy, Adam Storeygard, Deborah Balk, John L. Gittelman and Peter Daszak, 2008. "Global Trends in Emerging Infectious Diseases," *Nature,* 451, 990-993.

Kapner, Suzanne, 2020a. "J.C. Penny to Close Nearly 30% of Its Stores," *Wall Street Journal,* 18 May.

Kapner, Suzanne, 2020b. "Coronavirus Widens the Retail Divide," *Wall Street Journal,* 21 May.

Katz, Lawrence F. and Bruce D. Meyer, 1990. "The Impact of the Potential Duration of Unemployment Benefits on the Duration of Unemployment," *Journal of Public Economics,* 41, no. 1, 45-72.

Kleiner, Morris M., and Alan B. Krueger. 2013. "Analyzing the Extent and Influence of Occupational Licensing on the Labor Market." *Journal of Labor Economics* 31, no. 2: S173–S202.

Kleiner, Morris M. and Ming Xu, 2020. "Occupational Licensing and Labor Market Fluidity," working paper, August.

Krueger, Alan B. and Andreas Mueller, 2010. "Job Search and Unemployment Insurance: New Evidence from Time Use Data," *Journal of Public Economics,* 94, nos. 3-4, 546-572.

Kullgren, Ian, 2020. "Restaurants' Bailout Problem: Unemployment Pays More," *Politico,* 20 April 2020.

Lazear, Edward P. and James R. Spletzer, 2012. "Hiring, Churn, and the Business Cycle," *American Economic Review,* 102, no. 3, 575-579.

Lee, Dave, 2020. "US Online Grocery Shopping Jumps as Chains Rush to Add Capacity," *Financial Times*, 1 June 2020.

Letteiri, John, 2020. "The Paycheck Protection Program Needs Fundamental Improvements, Not Just More Funding," Economic Innovation Group, 16 April.

Letteiri, John and Catherine Lyons, 2020. "Understanding the Paycheck Protection Program," Briefs and Blogs, Economic Innovation Group, 26 March.

Lyons, Catherine, 2020. "Congress Improves the Paycheck Protection Program," 4 June.

Loungani, Prakash, Mark Rush and William Tave, 1990. "Stock Market Dispersion and Unemployment," *Journal of Monetary Economics,* 25, no. 3 (June), 367-388.

Mair, Andrew, Richard Florida and Martin Kenney, 1988. "The New Economic Geography of Automobile Production: Japanese Transplants in North America," *Economic Geography,* 64, no. 4 (October), 352-373.

Massenot, Baptiste and Yuri Pettinicchi, 2018. "Can firms see into the future? Survey evidence from Germany," *Journal of Economic Behavior & Organization*, *145*, 66-79.

Mattioli, Dana and Konrad Putzier, 2020. "When It's Time to Go Back to the Office, Will It Still Be There?" *Wall Street Journal,* 16 May.

Mims, Christopher, 2020a. "Not Even a Pandemic Can Slow Down the Biggest Tech Giants," *Wall Street Journal,* 23 May 2020.

Mims, Christopher, 2020b. "The New Recipe for Restaurant Survival? Become the Next Domino's," *Wall Street Journal,* 6 June 2020.

Mims, Christopher, 2020c. "The Next Phase of the Retail Apocalypse: Stores Reborn as E-Commerce Warehouses," *Wall Street Journal,* 18 July 2020.

Mitchell, Matthew D., 2020. "First, Do No Harm: Three Ways that Policymakers Can Make It Easier for Healthcare," Mercatus Special Edition Policy Brief, 24 March.

Mitchell, Matthew D., Alise Amez-Droz, and Anna K. Parsons, 2020. "Phasing Out Certificate-of-Need Laws: A Menu of Options," Mercatus Center Policy Brief, 7 February.

Mitchell, Matthew D. and Christopher Koopman, 2016. "40 Years of Certificate-of-Need Laws Across America," Mercatus Center, 27 September.

Morath, Eric, 2020. "The Job Market's Long Road Back," *Wall Street Journal,* 23 May.

Naughton, Nora, 2020. "The Pandemic Has Pushed Car Buying Online. It's Expected to Stick," *Wall Street Journal,* 20 June.

Pagano, Marco, Christian Wagner and Joseph Zechner, 2020. "Disaster Resilience and Asset Prices," *COVID Economics: Vetted and Real-Time Papers,* Issue 21, 22 May.

Papanikolaou, Dimitris and Lawrence D.W. Schmidt, 2020. "Working Remotely and the Supply-Side Impact of COVID-19," NBER Working Paper No. 27330.

Prang, Allison, 2020. "Small Businesses Need Money – But First They Need the U.S. to Reopen," *Wall Street Journal,* 17 April.

Ramelli, Stefano and Alexander F. Wagner, 2020. "Feverish Stock Price Reactions to COVID-19," Swiss Finance Institute Research Paper No. 20-12, 21 April.

Podkul, Cezary and Orla McCaffrey, 2020. "Firms with Troubled Pasts Got Millions of Dollars in PPP Small-Business Aid," *Wall Street Journal,* 18 July.

Shiller, Robert J., 1981. "Do Stock Prices Move Too Much to Be Justified by Subsequent Changes in Dividends?" *American Economic Review,* 71, 421-436.

Shiva, Mehdi, 2020. "We Need a Better Head Start for the Next Pandemic," *VOX CEPR Policy Portal,* 26 April 2020.

Sider, Alison, 2020a. "Airlines Have the Cash. Now They Need the Passengers," *Wall Street Journal,* 15 April.

Sider, Alison, 2020b. "U.S. Airlines Brace for Slow Recovery as Coronavirus Losses Mount," *Wall Street Journal,* 2 May.

Tampa Dispatch, 2020. "Occupational Licensure in Florida: Gov. Desantis Signs 'The Occupational Freedom and Opportunity Act'," 3 July.

Tanaka, Mari, Nicholas Bloom, Joel M. David and Maiko Koga, 2019. "Firm Performance and Macro Forecast Accuracy," *Journal of Monetary Economics*, forthcoming.

Taylor, Kate, 2020. "3 Million out of Work, $25 Billion Lost, 8 Figures Reveal How the Coronavirus Pandemic Is Devastating Restaurants across America," *Business Insider,* 31 March

The Editorial Board, "Doctors Without State Borders: Governors Are Easing Rules on Caregivers, and It's Long Overdue," *Wall Street Journal,* 12 April.

Thierer, Adam and Trace Mitchell, 2020. "Occupational Licensing Reform and the Right to Earn a Living: A Blueprint for Action," Policy Brief, Mercatus Center, April.

Thomas, Patrick and Chip Cutter, 2020. "Companies Cite New Government Benefit in Cutting Workers," *Wall Street Journal,* 7 April.

Upwork, 2020. *2020 Future Workforce Report.*

U.S. Department of the Treasury Office of Economic Policy, 2015. "Occupational Licensing: A Framework for Policy Makers." Report prepared by Council of Economic Advisers, Department of the Treasury, and the Department of Labor.

Vielkind, Jimmy, 2020. "Top New York Lobbying Firms Took PPP Loans," *Wall Street Journal,* 19 July.

Weaver, Courtney, Sujeet Indap, Fan Lei and Laura Noonan, 2020. "Luxury Fashion and Law Firms among U.S. Bailout Recipients," *Financial Times,* 7 July.

Weidinger, Matt, 2020. "Extended: A Review of the Current and Proposed Duration of 'Pandemic' Unemployment Benefits," American Enterprise Institute, June.

Online Appendices

Appendix A: Inferring the Permanent-Layoff Share of Job Losses from CPS Statistics

The monthly BLS Employment Situation Summary (ESS) reports statistics on unemployment by reason based on data from the Current Population Survey of households. Table A-11 in the April 2020 ESS, issued on 8 May, reports 2.56 million permanent job losers (including persons who completed temporary jobs) among the 23.08 million persons classified as unemployed.[41] That is, the CPS data say that 11 percent of unemployed persons in April had permanently lost their jobs. However, this 11 percent figure is *not* the share of layoffs that are permanent, nor is it the share perceived as permanent at the time of job loss.

Estimating the Permanent-Layoff Share of Job Losses between the March and April Surveys

To obtain a rough CPS-based estimate for the April 2020 share of recent job losses that are perceived as permanent at the time of job loss, we proceed as follows. First, 14.28 million persons became newly unemployed within the previous 5 weeks, according to the April CPS. We treat all of these persons as recent job losers. Second, CPS statistics for the number of persons unemployed 5-14 weeks rose by 5.21 million from March to April, which is too large to be consistent with the February CPS figure of 1.80 million persons who then reported an ongoing unemployment spell of less than five weeks duration. It is well known that survey data on the duration of ongoing unemployment spells are subject to recall bias and reporting errors. Accordingly, we treat the gap, (5.21-1.80) = 3.41 million, as persons who actually lost jobs between the March and April surveys. Summing yields 14.28 + 3.41 = 17.69 million persons who lost jobs between the March and April surveys. Third, recall that a worker who experiences a permanent job loss and does not search is classified as out of the labor force, not unemployed. We need an estimate for these persons as well to obtain a CPS-based estimate for total number of job losers between the March and April surveys.

Given the very rough labor market conditions that prevailed in April 2020 (and the second half of March), fears about contracting the virus on the job, and new-found needs to care for school-age children at home, many persons who experienced a permanent job loss between

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[41] We use seasonally adjusted CPS statistics unless noted otherwise.

the March and April surveys likely chose not to search for a new job and, hence, did not show up in the April unemployment statistics. (Job losers on temporary layoff are counted as unemployed, whether they search or not.) Indeed, according to CPS data, the labor force fell by 6.4 million persons from the March survey to the April survey. We treat this (historically large) fall as a response to the COVID-19 pandemic.

The March-April fall in the labor force includes (a) persons who lost jobs between the March and April surveys and left the labor force, (b) a fall in "Reentrants" and "New Entrants" to the unemployment pool from March to April, and (c) persons unemployed as of the March survey who left the labor force by the April survey. We seek an estimate for item (a). Published CPS statistics imply that item (b) equals 421,000. The number of people unemployed for 15 weeks or more fell by 200 thousand from March to April. We treat all of these persons as having left the labor force. Thus, we estimate that $6.43 - 0.42 - 0.20 = 5.81$ million persons experienced a job loss between the March and April surveys and left the labor force.[42] Adding this figure to the 17.69 million figure above, we obtain our CPS-based estimate for the number of persons who lost jobs between the March and April surveys: $5.81 + 17.69 = 23.5$ million.

How many of those new job losses were perceived to be permanent as of the April survey date? 5.81 million plus the fraction of the 17.69 million that met the CPS criteria for unemployment and permanent job loss. To our knowledge, the published CPS statistics don't include a two-way breakdown of unemployment by reason and duration. So, we use the overall fraction of unemployed job losers who are permanently laid off, according to the April CPS. That fraction is $(2,563/20,626) = 12.4\%$. Multiplying this figure by 17.69 million yields 2.19 million. Adding this figure to our previous estimate for the number of new job losers who left the labor force yields a total of $5.81 + 2.19 = 8.0$ million permanent layoffs between the March and

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[42] Three other assumptions are implicit in our calculation. First, we effectively grouped persons who quit jobs to leave the labor force with persons who lost jobs and left the labor force. Second, we ignored persons who transitioned directly from out of the labor force to employment. Including these latter transitions would *increase* the implied number of gross exits from the labor force and raise our estimate for the number of persons who lost jobs and left the labor force. Third, we ignored persons who lost jobs in a permanent layoff and found another job between surveys. Including an estimate for these transitions would also raise our estimate for the number of permanent layoffs.

April surveys. Finally, computing the ratio of permanent layoffs to all job losses, we estimate that 8.0/23.5 = 34 percent of new job losses in April were perceived as permanent at the time.

<u>Concerns Related to the CPS-Based Estimate of the Permanent-Layoff Share</u>

Undoubtedly, one could obtain a better estimate for the fraction of new job losses perceived as permanent as of mid-April 2020 by working with the CPS micro data. However, we see no reason to think that using micro data will alter our conclusion that permanent layoffs account for a large share of recent job losses.

There are, however, several other matters that warrant attention. First, as discussed in the main text, a sizable share of layoffs perceived as temporary when they happen turn out to be permanent ex post. We think the same will be true of recent job losses reflected in the CPS. In fact, the gap between initial perceptions and eventual realizations may prove considerably larger in the wake of the COVID-19 pandemic than in the past.

Second, there was a major change to CPS interview guidance in March and April that inflates the CPS temporary layoff numbers. Basically, if a respondent mentioned the coronavirus as the reason for job loss and expressed uncertainty about whether he/she would be recalled to his/her lost job within 6 months or did not know how to answer the question, the interviewer was instructed to code the response as on "temporary layoff" rather than "don't know."

The interview guidance is described at <u>www.bls.gov/cps/employment-situation-covid19-faq-april-2020.pdf</u>, and the relevant passage reads as follows:

8. Household survey: Were interviewers provided with any special guidance?

Due to the unusual circumstances related to the pandemic, additional guidance was provided to Census Bureau interviewers prior to collecting data in April. This was similar to the guidance that had been provided in March. In both months, guidance was provided only for the three items discussed below. Information was not provided for other survey questions…. For those who did not work at all during the survey reference week of April 12–18, if a person indicated they were under quarantine or self-isolating due to health concerns, the interviewer should select "own illness, injury, or medical problem." For people who were not ill or quarantined but said that they did not work last week "because of the coronavirus," the interviewer should select "on layoff (temporary or indefinite)." This scenario would include people who reported "I work at a sports arena and everything is postponed" or "the restaurant closed for

now because of the coronavirus." To be classified as unemployed on temporary layoff, a person has either been given a date to return to work by their employer or expects to be recalled to their job within 6 months. Additional guidance was also provided to household survey interviewers regarding the question "Have you been given any indication that you will be recalled to work within the next 6 months?" If, because of the coronavirus, a person was uncertain of when they would be able to return to work and thus was unsure of how to answer the question, the interviewer was instructed to enter a response of "yes," rather than "don't know." This would allow the individual to be included among the unemployed on temporary layoff. In light of the uncertainty of circumstances related to the pandemic, this unusual step was taken as part of an attempt to classify people who were effectively laid off due to pandemic-related closures among the unemployed on temporary layoff.

In short, the guidance instructs interviewers to classify pandemic-related layoffs as temporary, unless the respondent confidently states otherwise. It's hard to know how much this interview guidance inflates the temporary-layoff share of recent job losses, but it likely leads to a material upward bias. As we report in Appendix B, 12.9 percent of new claimants for unemployment benefits in California during the period from March to May 2020 said their layoff status (temporary or permanent) was unknown as of their claim filing date.

A third matter cuts in the other direction. The BLS notes that the April 2020 CPS data include an extraordinarily high number of persons classified as "employed with a job but not at work" for "other reasons." There were 7.53 million more such persons in April 2020 than in April 2019.[43] The BLS also notes that its "analysis of the underlying data suggests that this group included workers affected by the pandemic response who should have been classified as unemployed on temporary layoff." If we treat the entire 7.53 million increase in April 2020 (relative to April 2019) as unemployed on temporary layoff, our estimate for the share of recent job losses that are permanent becomes $8.0/(23.5+7.5) = 26$ percent.

Finally, it's worth noting that the CPS household response rate in April 2020 is 70 percent, 13 percentage points lower than both April 2019 and the twelve months ending in February 2020.

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[43] See the FAQs at www.bls.gov/cps/employment-situation-covid19-faq-april-2020.pdf. The 7.53 million figure is from Table C and is not seasonally adjusted.

Appendix B: Projections for the Permanent-Layoff Share of COVID-Induced Job Losses

Table B.1 reports 12 projections for the percentage of COVID-induced layoffs that will turn out to be permanent in the sense that the job-losing worker does not return to his previous employer. These projections rely on six alternative estimates for the fraction of layoffs perceived as permanent at the time of job loss. For each such estimate, we draw on two studies that provide information about the realized recall rate for "temporary" and "permanent" layoffs in previous historical episodes. Thus, we obtain 6 times 2 = 12 projections.

Table B.1 Projections of the Permanent-Layoff Share of Pandemic Job Losses

| Source | Respondents and Sample Period | (A) Layoff Share Perceived as Permanent at the Time of Job Loss | Projected Permanent-Layoff Share, Using Realized Recall Rates in: | |
			(B) Katz and Meyer (1990)	(C) Fujita and Moscarini (2017)
(1) Survey of Business Uncertainty	Senior Business Executives, 13-24 April 2020	23.5%	41.9%	31.5%
(2) Washington Post/IPSOS Poll (2020)	Households, 27 April to 4 May 2020	23%	41.6%	31.1%
(3) CPS, Low Estimate	March and April Household Surveys	26%	36.4%	30.4%
(4) CPS, High Estimate	March and April Household Surveys	34%	48.1%	40.0%
(5) Upwork (2020)	Hiring Decision Makers, 22-28 April 2020	47%	55.7%	50.5%
(6) California Policy Lab	New UI Claims, in California, March-May 2020	23.2%	41.7%	31.3%

Notes: The main text develops the entries in Row (1). We obtain the Column (A) entries for Rows (2) and (5) directly from the indicated sources. Appendix A derives the CPS Low and High Estimates in Rows (3) and (4) of Column (A). We calculate the entry in Column (A) of Row (6) using data from the California Policy Labor (CPL) kindly supplied by Muhammad Akhtar and Till von Wachter. The CPL data contain the number of new claimants for unemployment benefits in California who perceive their layoff status to be temporary, permanent, and unknown based on responses to "Do you expect to return to a former employer?" This question is asked at the claimant's initial filing. According to CPL data for for the period

from March to May in 2020, 16.7 percent of layoffs were perceived as permanent on the filing date, 70.4 percent were perceived as temporary, and 12.9 percent were unknown. Assiging one-half of the unknown cases to the permanent category yields the 23.2 percent figure reported in the Column (A) of Row (6). The realized recall rates from Katz and Meyer (1990) are 72 percent of "temporary" layoffs and 13 percent of "permanent" layoffs. The realized recall rates supplied by Giuseppe Moscarini (based on Fujita and Moscarini, 2017) are 87.5 percent and 6.6 percent. All values reported in columns (B) and (C) follow the calculations in Section IV.a of the main text, except for the "CPS, Low Estimate" values. In computing these values in Row (3), we assume that 100 percent of the extra 7.53 million persons in April 2020 (relative to April 2019) who were absent from work with pay for "other reasons" will be recalled.

Appendix C: Additional Material

1. Anecdotal evidence of the pandemic's near-term impact on hiring and reallocation

News stories highlight the millions of layoffs triggered by the pandemic and lockdown. They also recount many examples of large-scale hiring. Walmart has hired 235,000 new employees since mid-March (as of mid-June) and plans to convert many of them to permanent positions. Amazon has hired 175,000 new employees since March and plans to convert more than 70 percent of them to permanent positions (Herrera, 2020). Dollar General aimed to hire 50,000 new workers by the end of April.[44] Lowe's, the home improvement chain, aimed to hire 30,000 new employees this spring (Tyko, 2020). As of late March, many takeout and delivery-oriented firms were scrambling to hire workers. Instacart, for example, added 300,000 shoppers to its payroll, and Domino's added 10,000 pizza delivery drivers (Bender and Dalton, 2020). Papa John's sought 20,000 new employees to meet heightened demand for pizza delivery (Bandolm, 2020). Outschool sought to hire 5,000 new teachers in the last two weeks of March to offer more online classes in light of school closures.[45] Beyond the massive increase in shipping, delivery and warehouse staff, there are large surges in demand for contact tracers, thermal monitors, social-distancing monitors, and decontamination technicians (Green and Matthews, 2020).

Stafford et al. (2020) describe how COVID-induced "changes to the way people everywhere work, talk, eat and shop "led to explosive growth at six companies: MarketAxess, an electronic bond trading platform saw large increases in trading volume and its stock market value; Discord, a gaming-orienting messaging app, has morphed into a home school aid; Nissin Foods, a producer of instant noodles with 36 factories in 16 countries, has enjoyed large gains in sales and profitability; FRP Advisory, which advises firms on restructuring, has experienced a quadrupling of client numbers; customer orders at Berlin-based Delivery Hero doubled from a year earlier, leading the firm to open dozens of its own kitchens to service its delivery operations; retail sales at Lavazza, the Italian coffee firm, grew 15 percent globally and 10 percent in Italy during the

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[44] See https://careers.dollargeneral.com. Accessed on 19 April 2020.
[45] See https://blog.outschool.com/outschool-needs-5-000-teachers-to-start-offering-live-online-classes-outschool-needs-5-000-teachers-to-start-offering-live-online-classes-in-the-next-2-weeks/. Accessed on 19 April 2020.

first four months of 2020 as compared to 2019. A recent *Financial Times* report (2020) identifies the 100 publicly listed companies with the largest market capitalization gains in 2020 and briefly explains how pandemic-induced shifts are benefiting each company. Heading the list are Amazon, Microsoft, Apple, Tesla, Tencent, Facebook, Nvidia, Alphabet, PayPal and T-Mobile. Other companies on the list include Netflix, Shopify, Zoom Video, Adobe, Abbvie, Alibaba, Home Depot, Roche and Regeneron Pharmaceuticals.

Some companies formed partnerships that exploit the reallocative nature of the COVID-19 shock to speed hiring. Supermarket chain Kroger created an exchange with Sodexo, Sysco and Marriott International to hire workers laid off from food-service and hospitality firms. CVS Healthcare sought to recruit 50,000 new staff by partnering with the Hilton hotel chain, clothing retailer Gap, and Delta Airlines (Weber, 2020). Uber now lists job openings at 7-Eleven, Amazon and McDonald's and a dozen other companies for its unemployed drivers (Lee, 2020).

The near-term reallocative effects of the COVID-19 shock are also evident in consumer spending patterns. Earnest Research, a data analytics firms, tracked credit and debit card purchases for nearly six million Americans to assess the impact of the COVID-19 shock on consumer spending. For the week ending 1 April 2020, their data show that spending on airlines, hotels, rental cars, taxis, ride sharing and movie theaters was down 75-95 percent relative to spending in 2019 (Leatherby and Gelles, 2020). Spending on fast food, auto parts, and autos was down 35 percent, and spending on apparel was down 70 percent. At the same time, spending on home improvement, video streaming, gaming, food delivery, and online grocers boomed.

2. Studies of excess reallocation in other settings

The expected excess reallocation measures displayed in Figures 2 and C.1 and summarized in Table 2 are forward-looking analogs to the excess job reallocation measures examined in Dunne, Roberts and Samuelson (1989), Davis and Haltiwanger (1992), and many later studies. See Davis and Haltiwanger (1999) for a review. For later applications of backward-looking reallocation measures to other outcomes, see Dell'Ariccia and Garibaldi (2005) and Craig and Haubrich (2013) on bank lending, Eisfeldt and Rampini (2006) on physical capital, Davis et al. (2009) on sales, Broda and Weinstein (2010) on consumer products, Iacovone and Jovorcik (2010) on

export products, Herrera, Kolar and Minetti (2011) on business credit, and Afonso and Lagos (2015) on the federal funds market.

3. Expected Growth Rates in the Wake of the Pandemic

Figure C.1 displays the expected growth rates of employment and sales at a one-year forecast horizon from September 2016 to June 2020, making use of the same SBU micro data as Figure 2 in the main text. Expected twelve-month employment growth fell about 3.4 percentage points from February to May 2020, and expected sales growth fell about 7.3 percentage points from February to April. While these statistics point to a sharp deterioration in the U.S. economic outlook in the wake of the COVID-19 shock, they are milder than some projections. One possibility is that SBU firms expected (circa April 2020) a very large near-term hit from the pandemic and lockdown in 2020 and a substantial, but partial recovery by April 2021.

To investigate that possibility, we turn to a special question fielded as part of the April 2020 SBU. The question reads as follows: "What is your best guess for the impact of coronavirus developments on your firm's sales revenue in 2020?" The response options are a respondent-supplied percentage amount, up or down, and no effect. The results, summarized in Table C.1, say that firms expect the coronavirus pandemic to lower their sales by 18-19 percent in 2020. This is an enormous negative shock, and it is more than twice as large as the fall from January to April 2020 in the average one-year sales forecast. Taken together, the evidence in Figure C.1 and Table C.1 says that firms in the SBU anticipate a huge negative shock to their sales in 2020 followed by a considerable but highly incomplete bounce back by April-June 2021.

Figure C.1: Expected Employment and Sales Revenue Growth Rates at One-Year Forecast Horizons, September 2016 to June 2020
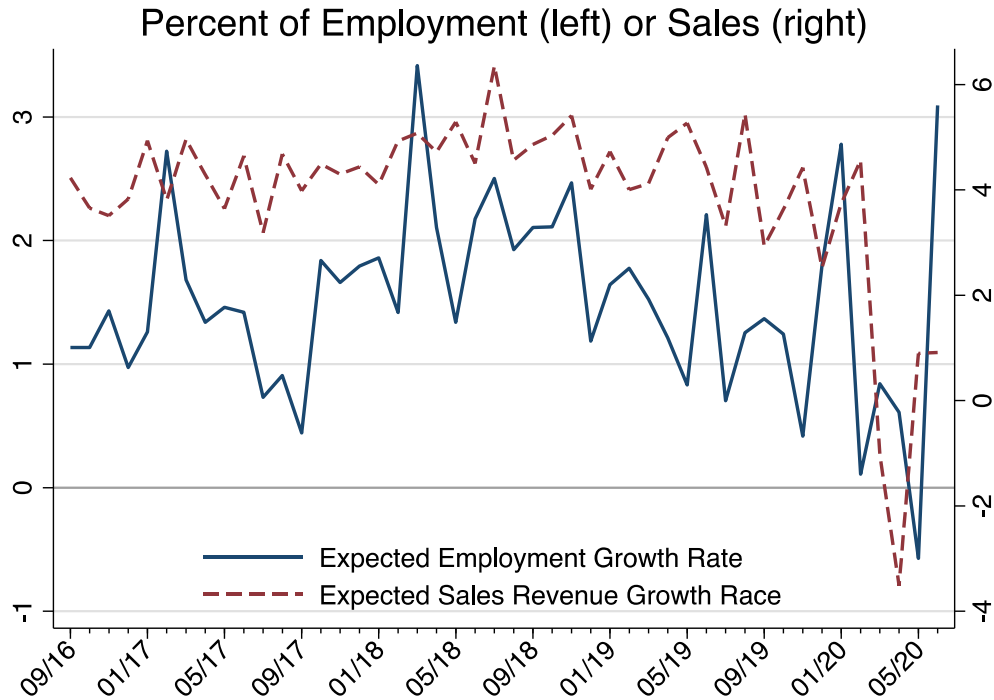
Source: Authors' calculations using data from the Survey of Business Uncertainty.

Table C.1.: Anticipated Coronavirus Impact on 2020 Sales Revenue, Percentage Amounts

Survey Question: What's your best guess for the impact of coronavirus developments on your firm's sales revenues in 2020? (Response options are a respondent-supplied percentage amount, up or down, and no effect.)
Survey Response Period: April 13-24, 2020

(1) Activity-Weighted Mean (Standard Error)	(2) Reweighted to Match the U.S. Industry Distribution	(3) Number of Survey Respondents
-17.6 (0.8)	-18.9 (0.9)	394

Notes: Authors' calculations using data from the April Survey of Business Uncertainty. Column (1) reports activity-weighted means in the April sample. Column 2 reports means after further weighting the sample observations to match the one-digit industry distribution of private sector gross output. According to the BEA, gross output is, "principally, a measure of an industry's sales or receipts ... [and capture] an industry's sales to consumers and other final users (found in GDP), as well as sales to other industries (intermediate inputs not counted in GDP). They reflect the full value of the supply chain by including the business-to-business spending necessary to produce goods and services and deliver them to final consumers." See Altig, Barrero et al. (2020) for additional information.

4. Additional Evidence about the Cross-Firm Dispersion in Equity Returns

We construct Figure C.2 in the same manner as Figure 4 in the main text, but Figure C.2 makes use of firm-level returns calculated over four-month intervals. The last four-month interval runs from the last trading day in March 2020 through the last trading day in June 2020. We work backward from there to compute firm-level returns over non-overlapping four-month intervals. The pattern in Figure C.2 is similar to the one in Figure 4. The most prominent difference is that the cross-firm dispersion of equity returns is even more pronounced in the dot.com bust when using four-month returns.

Table C.2 reports value-weighted equity returns for selected industries from the last trading day in February 2020 to the last trading day in June 2020. Specifically, we list the returns for the SIC-2 and NAICS-3 industries with ten lowest and highest returns among all covered industries. Some remarks are helpful for understanding differences between SIC-2 and NAICS-3 results:

- Motion Pictures (SIC 78) is among the top-performing SICs but among the worst-performing NAICSs (NAICS 512). That's because Netflix is classified in SIC 78 but not in NAICS 512. Netflix is classified as a "rental company" in NAICS.

- Airlines are absent from the SIC table but are among the worst-performing NAICS industries, because Airlines are mixed with other transportation industries in the SIC2 classification.

The *Financial Times* (2020) offers an informative list of the top-100 pandemic stock-market winners, along with short explanations for each firm on the list. See, also, Braithwaite (2020).
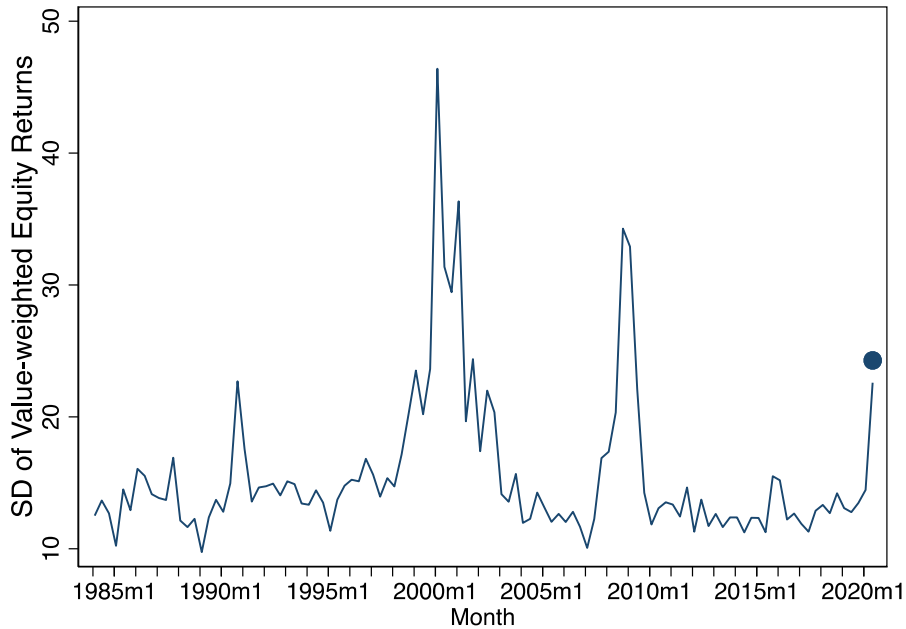
Figure C.2: The Dispersion of Four-Month Firm-Level Stock Returns, 1984 to June 2020

A. Interquartile Range of Equity Returns in the Value-Weighted Return Distribution
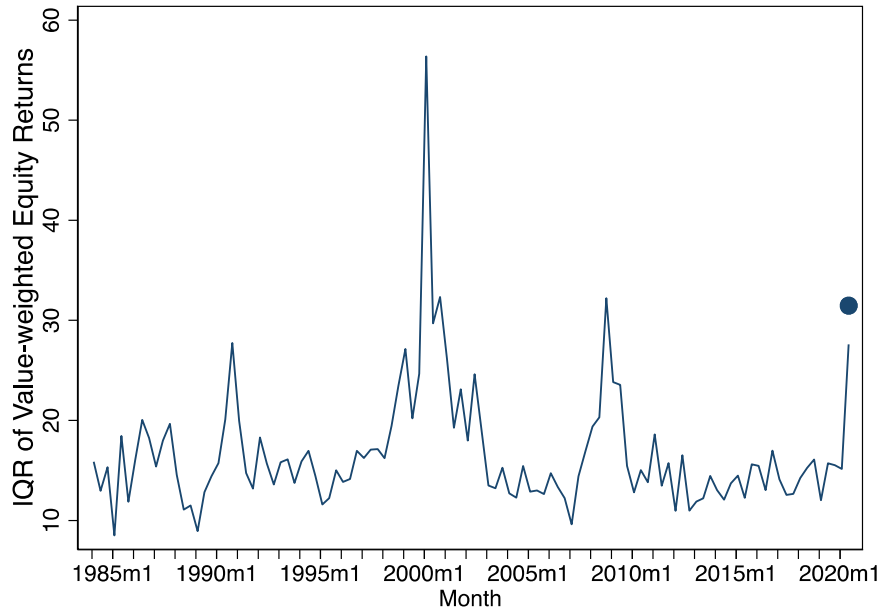
B. Standard Deviation of Equity Returns in the Value-Weighted Return Distribution

Notes: We construct these charts as in Figure 5, except that we now work with firm-level returns over four-month (rather than one-month) intervals. The last four-month interval runs from the last trading day in March 2020 through the last trading day in June 2020. The large dots show the dispersion of firm-level returns from 24 February to 24 June 2020.

Table C.2: Industry-Level Equity Returns from the Last Trading Day in February 2020 to the Last Trading Day in June 2020, Top and Bottom 10 Industries

A. By 2-Digit SIC

Bottom 10, 2-Digit SIC	Value-weighted Mean Return	Sector Name	No. Firms
83	-128.249756	Social Services	1
12	-39.838003	Coal Mining	9
99	-24.850111	Unclassifiable (Conglomerates)	7
79	-24.199908	Amusement and Recreation Services	27
46	-24.141830	Pipelines Except Natural Gas	13
70	-23.994165	Hotels, Rooming Houses, Camps and Other Lodging Places	8
13	-23.504953	Oil and Gas	98
65	-23.480916	Real Estate	32
7	-22.314356	Agricultural Services	1
56	-21.550800	Apparel and Accessory Stores	28

Top 10, 2-Digit SIC	Value-weighted Mean Return	Sector Name	No. Firms
57	14.908433	Home Furniture, Furnishings, And Equipment Stores	10
73	16.997277	Business Services	382
39	18.348527	Miscellaneous Manufacturing Industries	19
52	18.399817	Building Materials, Hardware, Garden Supply, and Mobile Home Dealers	6
78	19.277529	Motion Pictures	9
36	21.581799	Electronic and Other Electrical Equipment and Components, Except Computer Equipment	186
42	21.606913	Motor Freight Transportation and Warehousing	20
2	24.283942	Agriculture production livestock and animal specialties	1
10	26.454256	Metal Mining	11
59	34.204911	Miscellaneous Retail	46

C. By 3-Digit NAICs

Bottom 10, 3-Digit NAICS	Value-weighted Mean Return	Sector Name	No. Firms
525	-43.57996	Funds, Trusts, and Other Financial Vehicles	42
999	-41.1662	Unclassifiable (Conglomerates)	6
512	-36.37305	Motion Picture and Sound Recording Industries	8
323	-32.33621	Printing and Related Support Activities	5
481	-30.18892	Air Transportation	10
711	-29.26831	Performing Arts, Spectator Sports, and Related Industries	6
721	-27.06383	Accommodation	14
622	-26.97374	Hospitals	7
623	-24.93246	Nursing and Residential Care Facilities	8
213	-24.90285	Support Activities for Mining	26

Top 10, 3-Digit NAICS	Value-weighted Mean Return	Sector Name	No. Firms
326	18.48937	Plastics and Rubber Manufacturing	19
334	18.53339	Computer and Electronic Product Manufacturing	292
451	18.92896	Sporting Goods, Hobby, Musical Instrument, and Book Stores	6
519	19.09642	Other Information Services	139
511	21.17475	Publishing Industries	74
484	21.58077	Truck Transportation	19
112	24.28394	Animal Production and Aquaculture	1
454	38.4449	Nonstore Retailers	23
453	56.78049	Miscellaneous Store Retailers	5
811	91.71714	Repair and Maintenance	1

Notes: We consider common equity securities traded on the NYSE, AMEX and NASDAQ with share prices quoted in U.S. Dollars. Data are from Compustat - Capital IQ Daily Security Files and from CRSP, both via the Wharton Research Data Services. We compute the returns from the last trading day of February to the last trading day of June 2020 as 100 times the log change of closing prices on the last trading days of each month with adjustments for dividends, share repurchases, stock splits, and reverse splits.

5. **Land-Use Restrictions**

As we discussed in Section III, certain legacy features of the U.S. policy landscape will, unless reformed, inhibit the economy's response to the reallocative nature of the COVID-19 shock. In this regard, the main text discusses the role of occupational licensing and regulatory barriers to business entry and expansion. Here, we discuss the role of land-use restrictions.

More stringent land-use regulations and greater organized political opposition to new real estate developments have reduced the elasticity of housing supply in many U.S. cities since the 1960s (Glaeser and Gyourko, 2018). These regulations take the form of minimum lot sizes, density restrictions, building height restrictions, urban growth boundaries, environmental impact rules designed to slow or stop development, and other land-use restrictions.[46]

By making it costlier for businesses and workers to move to the most productive cities, Hsieh and Moretti (2019) conclude that housing supply restrictions lowered aggregate U.S. growth by 36 percent from 1964 to 2009. Duranton and Puga (2019) also find large negative effects of residential land-use restrictions on aggregate growth in a model that explicitly considers the tradeoff between agglomeration benefits and congestions costs. Their model endogenizes excessive land-use restrictions as the outcome of decentralized political decision-making. In the political-economic equilibrium, land-use restrictions optimize the tradeoff between benefits and costs of population growth for local incumbents, while ignoring the impact on (potential) newcomers and creating deadweight losses for society.

Herkenhoff, Ohanian and Prescott (2018) consider state-level policies that restrict land availability for both housing and commercial purposes. Using a state-level growth model, they simulate the effect of moving all U.S. states halfway from their current land-use regulations to that of Texas, the least-restrictive state. Their model implies that such a move would lead to substantial population reallocations across U.S. states and raise aggregate U.S. output by 12

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[46] Gyourko and Molloy (2015) review evidence that land-use restrictions raise housing prices and reduce the elasticity of housing supply. Their Figure 1 shows that real house prices rose by 60 percent relative to real construction costs from the early 1980s to 2014. Glaeser, Gyourko and Saks (2005) present evidence that land-use restrictions play an especially important role in driving housing prices above construction costs in several major coastal cities – including New York, Boston, Los Angeles, San Jose, and San Francisco.

percent. In an empirical study, Ganong and Shoag (2017) link the slowing of cross-state income convergence since the 1980s to rising housing supply regulations.

Additional References for the Online Appendix

Alfonso, Gara and Ricardo Lagos, 2015. "Trade Dynamics in the Market for Federal Funds," *Econometrica,* 83, no. 1, 263-313.

Altig, David, Jose Maria Barrero, Nick Bloom, Steven J. Davis, Brent Meyer, Emil Mihaylov and Nick Parker, 2020. "American Firms Foresee a Huge Negative Impact of the Coronavirus," Technical Report, Federal Reserve Bank of Atlanta, 23 March.

Bandolm, Lana, 2020. "Papa John's Plans to Hire 20,000 Workers During Coronavirus Outbreak," *Forbes,* 23 March.

Bender, Ruth and Matthew Dalton, 2020. "Coronavirus Pandemic Compels Historic Labor Shift: Outbreak Reshapes Job Market as Some Sectors Shut Down, Other See Demand Surge," *Wall Street Journal,* 29 March 2020.

Braithwaite, Tom, 2020. "Prospering in the Pandemic: The Market Winners," *Financial Times,* 3 July.

Broda, Christian and David E. Weinstein, 2010. "Product Creation and Destruction: Evidence and Price Implications," *American Economic Review,* 100 (June), 691-723.

Craig, Ben R. and Joseph G. Haubrich, 2013. "Gross Loan Flows," *Journal of Money, Credit & Banking,* 45, no. 2-3.

Davis, Steven J., John Haltiwanger, Ron Jarmin, C.J. Krizan, Javier Miranda, Alfred Nucci, and Kristin Sandusky 2009, "Measuring the Dynamics of Young and Small Businesses: Integrating the Employer and Nonemployer Universes". In *Producer Dynamics: New Evidence from Micro Data,* edited by Timothy Dunne, J. Bradford Jensen and Mark J. Roberts, University of Chicago Press.

Dell'Ariccia, Giovanni and Pietro Garibaldi, 2005. "Gross Credit Flows," *Review of Economic Studies,* 72, 665-685.

Duranton, Gilles and Diego Puga, 2019. "Urban Growth and Its Aggregate Implications," NBER Working Paper 26591.

Eisfeldt, Andrea and Adriano A. Rampini, 2006. "Capital Reallocation and Liquidity," *Journal of Monetary Economics,* 53, 369-399.

Financial Times, 2020. "Prospering in the Pandemic: The Top 100 Companies," 18 June.

Ganong, Peter and Daniel Shoag, 2017. "Why Has Regional Income Convergence in the U.S. Declined?" *Journal of Urban Economics,* 102 (November), 76-90.

Glaeser, Edward and Joseph Gyourko, 2018. "The Economic Implications of Housing Supply, "*Journal of Economc Perspectives,* 32, no. 1 (Winter), 3-30.

Glaeser, Edward, Joseph Gyourko and Raven Saks, 2005. "Why Is Manhattan So Expensive? Regulation and the Rise in Housing Prices," *Journal of Law and Economics,* 48, no. 2 (October), 331-369.

Green, Jeff and Steve Matthews, 2020. "Reopening U.S. Economy Will Mean Creating All Kinds of New Jobs," *Bloomberg Quint,* 20 May.

Gyourko, Joseph and Raven Molloy, 2015. "Regulations and Housing Supply," *Handbook of Urban and Economics,* Volume 5B, 1290-1337.

Herkenhoff, Kyle F., Lee E. Ohanian, and Edward C. Prescott, 2018. "Tarnishing the Golden and Empire States: Land-Use Restrictions and the U.S. Economic Slowdown," *Journal of Monetary Economics,* 93 (January), 89-109.

Herrera, Anna Maria, Marek Kolar and Raoul Minetti, 2011. "Credit Reallocation," *Journal of Monetary Economics,* 58, 551-563.

Herrera, Sebastian, 2020. "Amazon to Keep Most of the Jobs It Added During Pandemic," *Wall Street Journal,* 28 May.

Hsieh, Chang-Tai and Enrico Moretti, 2019. "Housing Constraints and Spatial Misallocation," *American Economic Journal: Macroeconomics,* 11, no. 2, 1-39.

Iacovone, Leonardo and Beata S. Jovorcik, 2010. "Multi-Product Exporters: Product Churning, Uncertainty and Export Discoveries," *Economic Journal,* 120, Issue 544 (May), 481-499.

Leatherby, Lauren and David Gelles, 2020. "How the Virus Transformed the Way Americans Spend Their Money," *New York Times,* 11 April.

Lee, Dave, 2020. "Uber Starts Listing Other Jobs for its Drivers," *Financial Times,* 6 April.

Stafford, Phillip, Tim Bradshaw, Kana Inagaki, Tabby Kinder and Silvia Sciorilli Borrelli, 2020. "Six Business Finding an Upside in the Coronavirus Pandemic," *Financial Times,* 1 June.

Tyko, Kelly, 2020. "Lowe's Hiring for 30,000 New Positions, Giving Employees $80 Million in Bonuses Because of Coronavirus," *USA Today,* 25 March.

Weber, Lauren, 2020. "50,000 Jobs, 900,000 Resumes: Coronavirus Is Redeploying Workers at Record Pace," *Wall Street Journal,* 15 April.