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Abstract

We document the dynamics of labor—changes in employment and hours worked—and of *actual* telework use during the pandemic. We find that employment losses are unrelated to telework use starting in 2020-Q4. This is in stark contrast with the onset of the pandemic that disproportionately affected skills, occupations and industries with low telework use. Our findings are the results of two phenomena. First, labor is dynamically heterogeneous: employment of skill and occupation groups that are most affected by the initial Covid-19 shock recover quickly, catching up with the rest of the economy by October 2020. Second, the use of telework has homogeneously declined within skills, occupations and industries—by 40 percent on average—leaving the relative ranking of telework use across groups unaltered. Finally, there is substantial and persistent cross-industry heterogeneity in labor market outcomes one year into the pandemic that is unrelated to the use of telework.

Keywords: Labor, Dynamics, Telework, Skills, Occupations, Industries, Covid-19
JEL Classification: E01, E22, E25

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1 Introduction

This paper documents the effects of the ongoing pandemic recession on employment and hours worked across skills, occupations and industries in the United States. Monthly household-survey data from the Current Population Survey (CPS) reveals that the impacts of a pandemic recession are heterogeneous and dynamic in that they have evolved as the pandemic recession persists. Although the initial dip (April 2020) was largely driven by unskilled work and by occupations and industries that had low actual use of telework, these groups actually recovered relatively quickly from the great lock down period. The recession that is emerging in the aftermath of the Covid-19 shock shows to be unrelated to telework use (at least, as of December 2020): employment growth has stalled for all groups of skill, occupations and industries. Our results suggest that although telework served as a cushion against the initial Covid-19 shock, it no longer insulates from what appear to be more traditional the recession dynamics.

We develop this reasoning along three lines. First, we show the strong sectoral heterogeneity of the labor dynamics that follow the initial Covid-19 shock: while employment losses across skill and occupation groups were equally distributed by the end of year (2020), this is not the case across industries. Specifically, less skilled workers suffered most upon at the onset of the pandemic but they also recovered relatively quickly. By December 2020 the employment losses—defined as the percentage deviations of group-specific employment relative to their pre-pandemic levels—are relatively similar across skill groups[1]. For example, the employment loss for individuals with a high school education is around 20 percent in April 2020, compared to a decline slightly above 5 percent for college educated workers. However, by December 2020 employment of high school educated workers had climbed back up to around 5 percent below its pre-pandemic trend, which is where the college educated employed stood at the same date. Similar insights arise by occupation. For example, sales, service and related occupations recover relatively quick after suffering the largest employment losses earlier in the pandemic. Employment in these occupation caught up with the

[1] In Appendix A, we provide a similar analysis using aggregated total hours worked.

amount of losses experienced by managers and professionals, a group relatively unaffected by the initial the Covid-19 shock and whose employment has remained relatively constant throughout the pandemic. In contrast, the loss of employment across industries is heterogeneous both upon the impact of the Covid-19 shock and throughout the pandemic. For instance, leisure and personal services have larger employment losses than other industries in both April 2020 and December 2020.

Second, we show that the actual use of telework decreases throughout the pandemic using the new Covid-19 questions introduced in May 2020 by Bureau of Labor Statistics (BLS) as a supplement to the CPS micro data. This decline in actual telework use is large. Precisely, 36 percent of the employed population used telework in May 2020, whereas this figure is 22 percent in November 2020, a 40 percent economy-wide decline since early stages of the pandemic. Further, the decline in telework use occurs by skills, occupations and industries. For example, across skill groups, we find that telework use declines from 55.3 percent in May 2020 to 34.7 percent in November 2020 for college graduates and from 14.2 percent to 6.7 percent for individuals with a high-school degree. Across occupations we also find declines for both occupations with high and low telework use intensity. For example, professionals drop from 58.6 percent telework use in May 2020 to 39.6 percent in November, whereas 9.1 percent of the employed in service occupations use telework in May 2020 and this figure drops to 3.9 percent in November. The decline in telework also occurs across industries. For example, the finance, insurance and real estate (FIRE) sector shows a decline in the proportion of employed using telework from 61.5 percent in May to 42.8 percent in November. The leisure sector drops from 38.6 percent in May to 20.4 percent in November, and the personal services sector drops from 13.3 percent in May to 6.8 percent in November. Importantly, the ranking within skills, occupations and industries in telework use is largely preserved over the course of the pandemic.

Third, we assess whether (and by how much) actual telework use protects against employment losses over the course of the pandemic. We address this question using variation across skills,

occupations and industries in order to relate employment losses and actual telework use on a monthly basis. We find that, during the early stages of the pandemic, the amount of employment loss is highly and negatively related to telework use. However, this negative relationship weakens with the over time up to the point when, starting September 2020, employment losses are unrelated to telework use. We show that for the months in the third quarter of 2020 the relationship between actual telework use and employment loss is not statistically different from zero. These dynamic effects of actual telework use on employment losses emerge across skills, occupations and industries (and their interactions). Our interpretation of this result is that, at impact, the Covid-19 shock was cushioned with telework due to the specific nature of the shock that required social distancing to avoid, among others, contagion at work. However, the aftermath of the Covid-19 shock is that of an economy that enters into a recession that goes beyond the specificity of the Covid-19 workplace health concerns. In particular, we show that the emerging new phase of the recession is affecting the economy independently of the ability to telework and, hence, relatively equally across education and occupation groups. Moreover, it is likely that this new phase of the recession is demand-driven, and contains an element of reallocation shifting demand across sectors.

Our study relates to several aspects of the pandemic recession literature. First, we relate to a growing body of literature that studies the effects of telework. In the context of Covid-19, Dingel and Neiman (2020) first assessed how many jobs can be teleworked in the United States using the American Time Use (ATUS) survey, while Mongey et al. (2020) complement this work with information on the degree of contact required with the public for detailed occupations. More recently, Hensvik et al. (2020) uses the ATUS to show that even under normal circumstances, a substantial portion of the hours worked is teleworked. In Europe, several studies also show that an important share of European jobs can be teleworked (Fadinger and Schymik, 2020, Boeri et al., 2020). Our work contributes to this literature in two respects. In contrast to previous work that relies on pre-Covid-19 meaures of telework, we construct measures of actual telework use during the Covid-19 recession building on a set of new telework variables collected by the CPS

since May 2020. Also, unlike the annual-frequency ATUS measures of telework from previous studies, we focus on exploring the high-frequency (monthly) dynamic evolution of actual telework use throughout the pandemic. This allows us to uncover a declining trend in the use of telework (up to December 2020) that arises in the aggregate and across skills, occupations and industries.

Further, recent studies analyze the evolution of the adjustment of the U.S. labor market during the Covid-19 crisis. In this context, we relate to Chetty et al. (2020) and Cajner et al. (2020) who also study employment losses by type of worker. We depart from this previous work in two regards. First, unlike these previous studies that use rich and detailed contractual micro data from several sources (e.g. human resources companies), we use publicly available data from the CPS monthly household survey. The CPS monthly fits our purposes insofar as it is nationally representative, and it allows us to scrutinize labor losses by a set of specific observables such skills, occupations and industries. Our second point of departure is our focus on the link between the dynamics of loss of employment and the use of telework. Our study allows us to uncover limitations of the ability of telework in cushioning the pandemic recession by showing that starting in September 2020 (and thereafter, up to December 2020) telework does not determine employment losses.

The rest of the paper is organized as follows. We discuss aggregate labor market dynamics before focusing on skill, occupations and industries in Section 2. Section 3 discusses the use of telework during the pandemic. In Section 4 we assess how much telework protects skills, occupations and industries against labor losses. Last, we conclude.

2 Labor Dynamics during Covid-19

2.1 Aggregate Labor Dynamics during Covid-19

Although the U.S. economy was recovering quickly from the sharp and massive loss of employment that occurred in April 2020, the latest evidence shows that the U.S. labor market has lost momentum. This can be seen in the evolution of total hours since 2018 in Figure 1, panel (a)

where the months of 2020 are indicated in red. There is a sharp, unprecedent drop in April that is followed by a rapid rebound during the summer months that begins to stall in August. Since then there have been only modest increases in total hours worked.

A clearer assessment of the dynamics of the labor market during a crisis that is nearing its second year needs to take into account the shortfalls relative to pre-existing trends. Figure 1a also shows a predicted series for 2020 based on a linear trend and monthly dummies to control for seasonality in the monthly series using pre-2020 data (light blue).[2] The difference (in percentages) between the predicted series and the actual data in 2020, shown in panel (b) of Figure 1, provides the deseasonalized shortfalls relative to pre-pandemic trends. There was a large drop in aggregate hours, 17.6%, in April 2020.[3] Then, the economy started to recover converging to trend in a concave fashion from below, closing more than half of the gap by July 2020 when aggregate hours were 9.6% below trend. However, the economic recovery has stalled since August 2020 when aggregate hours enter a stable path, remaining approximately 7% below trend in each month from August 2020 to December 2020. The largest effects on aggregate hours are due to employment that accounts for 80.6% of the drop in aggregate hours in April 2020 and for an average of 74.1% of the shortfall in aggregate hours in each month from August 2020 to December 2020.[4]

2.2 Heterogeneous Labor Dynamics during Covid-19

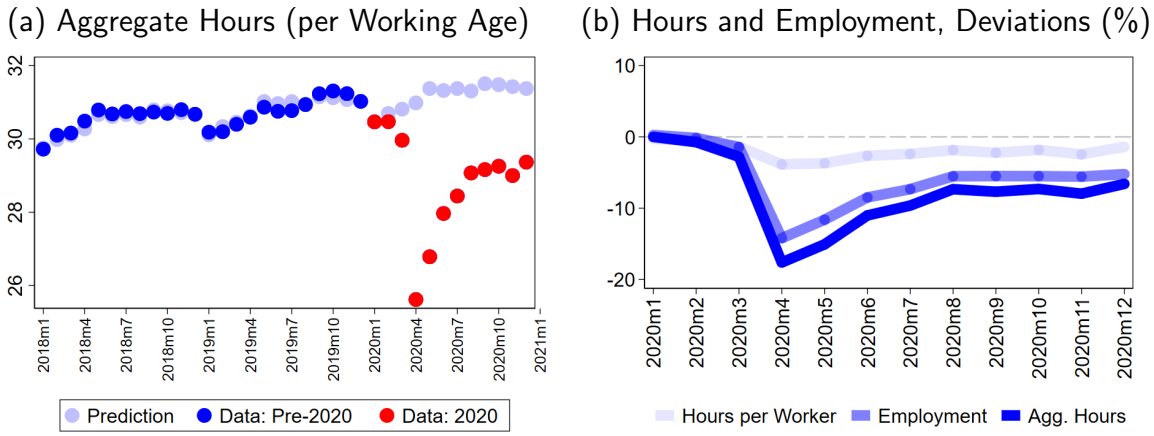
We find that the Covid-19 recession shows substantial heterogeneity in labor dynamics over the course of the pandemic. In particular, we consider the heterogeneous effects of the pandemic on employment within skill groups, occupations and industries. The results for total hours worked

[2]Our predictive sample starts in 2014. We note that the CPS monthly reference week is the week that includes the 12th. This implies that the CPS interviews in September occasionally include the Labor Day. This is the case in September 2020 in which we consequently observe an increase in the proportion of households that report 32 hours of work per week. To control for the significant drop in weekly hours per worker—and the increase in part-time work—associated with Labor Day we add a dummy equal to one in the months of September that in our sample are affected by the Labor Day—i.e 2015 and 2020—and zero for the months of September for which sample does not include the Labor Day.

[3]This drop is larger if we focus on the nonfarm business wage earners.

[4]In the same fashion, an aggregate and sectoral comparison of hours and employment in the U.S. and the E.U. during Covid-19 is conducted in Eyméoud et al. (2021) using quarterly data.

Figure 1: Aggregate Labor Dynamics during Covid-19



Note: Authors' calculations based on the Current Population Survey. Detrended and deaseasonlized using pre-recession data. See data appendix for details.

are available in appendix A.

2.2.1 Employment Dynamics by Skill

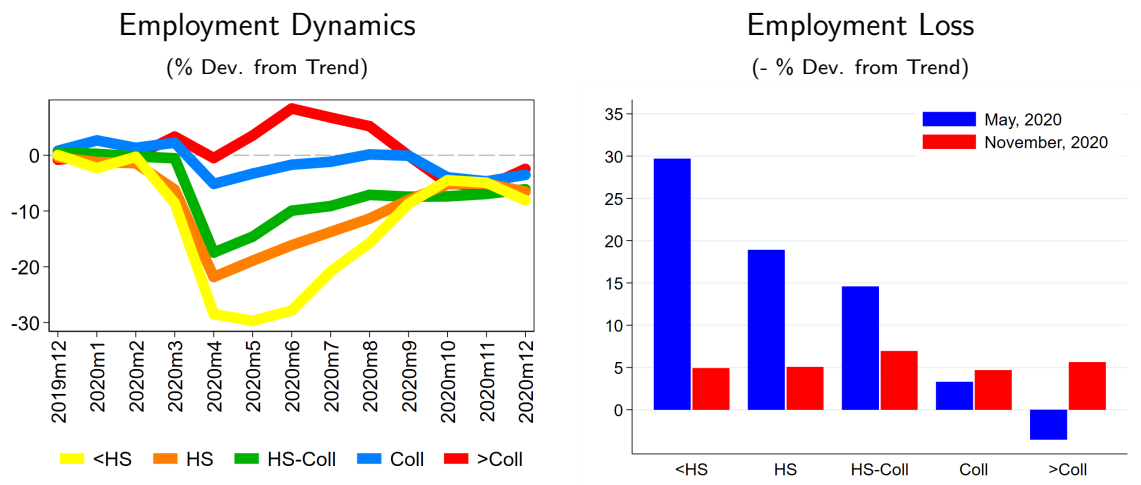
Employment dynamics differ substantially across skill groups, as shown in Figure 3a for for five levels of educational attainment. The initial large drop in employment at the start of the pandemic is highly associated with skills. College educated workers saw a 5% drop in employment 5.1% below their trend in April 2020, whereas individuals with more than a college degree (e.g., Masters and PhDs) are barely affected by the recession with a loss employment of 0.5%. In stark contrast, the the level of employment for high school educated workers drop of 21.8% relative trend in April 2020. Individuals with less than a high school degree fare worse with a drop of 28.5%.[5]

The employment dynamics of the skill groups in the months following the initial shock are just as heterogeneous as those of the impact. That is, the heterogeneous effects change over the course of the pandemic in two phases. During the first, from April to August 2020, lower skilled groups closes their employment gaps quickly: the less skilled groups recover approximately half of the April drop by August 2020. Individuals with a high-school degree, for instance, had

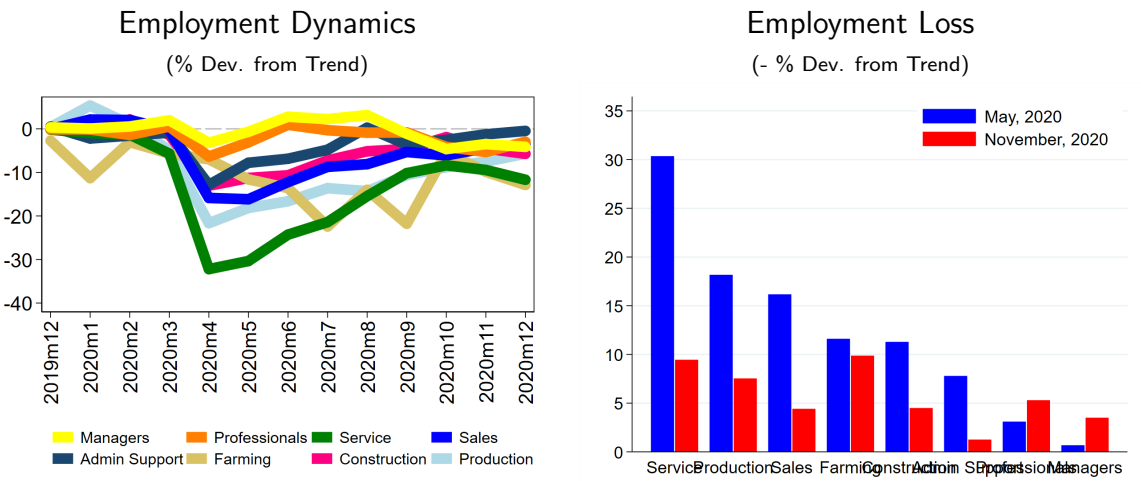
[5]A simple decomposition of aggregate hours shows that the heterogeneity across skills at these early stages of the pandemic is driven by the employment margin whereas hours per worker are relatively similar across skills; see Appendix.

Figure 2: Heterogeneous Employment Dynamics during Covid-19

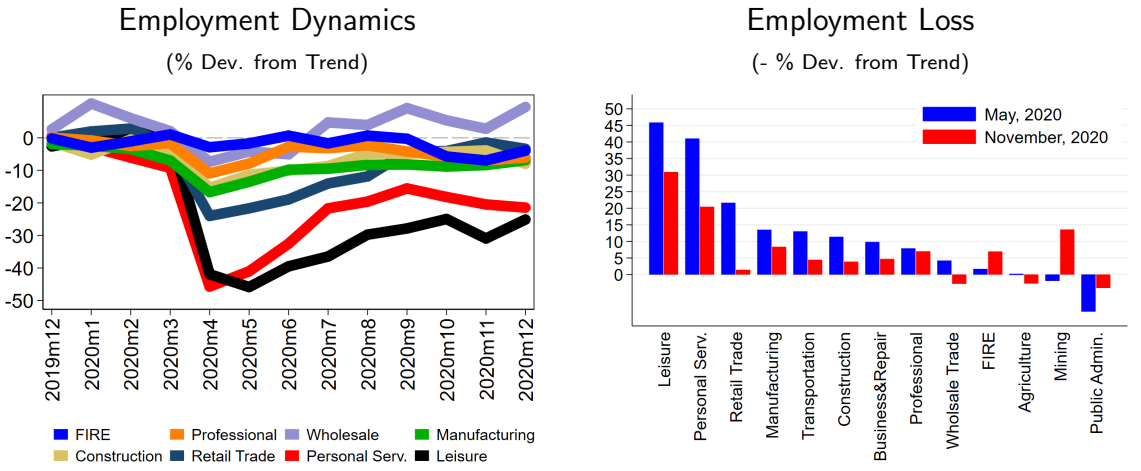
(a) By Skills



(b) By Occupation



(c) By Industries



Note: This figure shows time series of employment losses (seasonally adjusted and relative to trend as detailed in the appendix) by skill groups in panel (a), by occupations in panel (b) and by industries in panel (c) between Dec. 2019 and Dec. 2020 (left column) and comparing April 2020 and December 2020 (right column). In the left column of panel (c) we selected eight industries out of the total of 15 industries that we study. In the right column of panel (c) we merged the manufacturing of durables and nondurables into one sector and the wholesale trade of durables and nondurables into one sector.

a loss of employment of 11.3% in August, up from 21.8% in April. At the same time, the more skilled groups (college and more-than-college educated individuals) close their small employment losses and back to their respective trends by August 2020. During the second, after August 2020, the effects of the recession in terms of employment losses look more similar across skill groups. Precisely, for the months covering the fourth quarter of 2020 the labor loss is 5.8% for individuals with less than a high-school degree, 5.6% for individuals with a high-school degree, 6.8% for individuals with more than high school but without a college degree, 4.0% for individuals with a college degree and 4.4% for individuals with more than a college degree. Further, in the right column of panel (a) of Figure 3 we directly compare the employment loss across skills in April 2020 and December 2020. Clearly, the heterogeneous effects of the recession on labor are dynamically evolving over the course of the pandemic in a manner that is tending to equalize (at least, up to December 2020) the employment losses across skill groups.[6]

2.2.2 Employment Dynamics by Occupations

Occupations also show heterogeneous dynamics during the pandemic, with similar separation into two phase following the initial shock (see panel (b) in Figure 2).[7] During the initial contraction, in April 2020, employment in service occupations fells by 32.2%, by 21.6% in transportation

[6]Note that this initially divergent evolution of employment across skill groups that tends to converge after the initial covid-19 shock is consistent with the behavior across the wage distribution in Cajner et al. (2020) that shows that low wage workers recover fast (up to their, to the best of our knowledge, most updated version that includes June). The employment dynamics that we document are, however, potentially more contrasted with Chetty et al. (2020) (e.g. Tracker Paper Figure 7a page 84 (downloaded Feb. 3, 2021)). Although we focus on different objects (we study a partition by education groups as a proxy for skills while these authors focus on a partition by quantiles of wages), we think that our main differences might be driven from our different data sources that are constructed with dissimilar sample strategies (we use the CPS whereas Chetty et al. (2020) use a variety of detailed micro and macro sources) together with alternative detrending methods in order to define employment losses during Covid-19. For example, if we use the normalization procedure as described in Chetty et al. (2020) that define employment losses with respect to January 2020, we find a persistent gap between the most educated and the less educated workers, about 13%, which is closer to the gap across wage quantiles dicussed by these authors; see our panel (a) in Figure 9 in the Appendix. Importantly for us, this potential discrepancy between the heterogeneous labor dynamics that we document and those that arise under the detrending method in Chetty et al. (2020) does not alter our main findings on the joint relationship between employment and telework; see panel (b) and (c) in Figure 9.

[7]Recently, Houstecka et al. (2020) use micro panel data to show how occupations directly determine the odds of infection in the context of the flu. At the zip-code level, the occupation structure has also been emphasized to determine Covid-19 hospitalizations in Almagro and Orane-Hutchinson (2020).

occupations, and by 15.9% in sales and related occupations, while they fell by 6.3% for professionals and 3.2% for management, financial occupations. All occupations show a recovery towards in the rebound months through August 2020, with the fastest growth for managers, professionals and admin support and somewhat slower for sales, construction and production. However, the recovery for those latter groups was sustained over this period such all occupations have a relatively similar deviation from trend in September 2020. Moreover, this convergence in occupation specific employment losses was maintained through the end of 2020. We show this movement towards a more similar loss of employment across occupations by directly comparing the cross-occupation effects in April versus those in December in the right column of panel (b) in Figure 3.

2.2.3 Employment Dynamics by Sectors

The sectoral nature of the economic impacts of the pandemic is evident throughout the recession. First, sectors that depend most heavily on in person interaction or presence, such as the leisure and personal services sectors, have and continue to suffer the most. They experienced a massive loss in employment in April 2020 of, respectively, 45.7% and 41.9% —defined as percentage deviations from their own respective trends in April 2020 (see panel (c) in Figure 3, show our results for selected industries). In December 2020, leisure and personal services remain the sectors faring worst with a loss in employment relative to trend of 25.1% and 21.4%, respectively. Second, there is a set of sectors with declines in employment level between 10% and 30% in April 2020 that perform relatively better in the months that follow, although to varying degrees. For example, manufacturing and construction, whose employment fell by 16.7% and 15.3% relative to their respective trends in April 2020, have recovered to 6.8% and 6.4% below their respective trends by December 2020. Within this set of sectors, retail trade performs worst in April 2020 with a loss of employment of 23.4% but recovers fastest experiencing a loss of 3.4% in December 2020. The wholesale trade sector also performs particularly well with a loss of labor of 7.3% in April 2020 and actually reaching labor gains 9.5% above trend in December 2020. Third, sectors

that experience less than a 10% labor losses in April 2020 include Finance, Insurance and Real Estate (FIRE) with a loss of 2.9%, the agricultural sector and public administrations that do not lose labor. These sectors also do relatively well in December 2020 where FIRE experiences a loss of 3.9%, agriculture a gain of 0.8% and public administration experiences a gain of 6.6%.

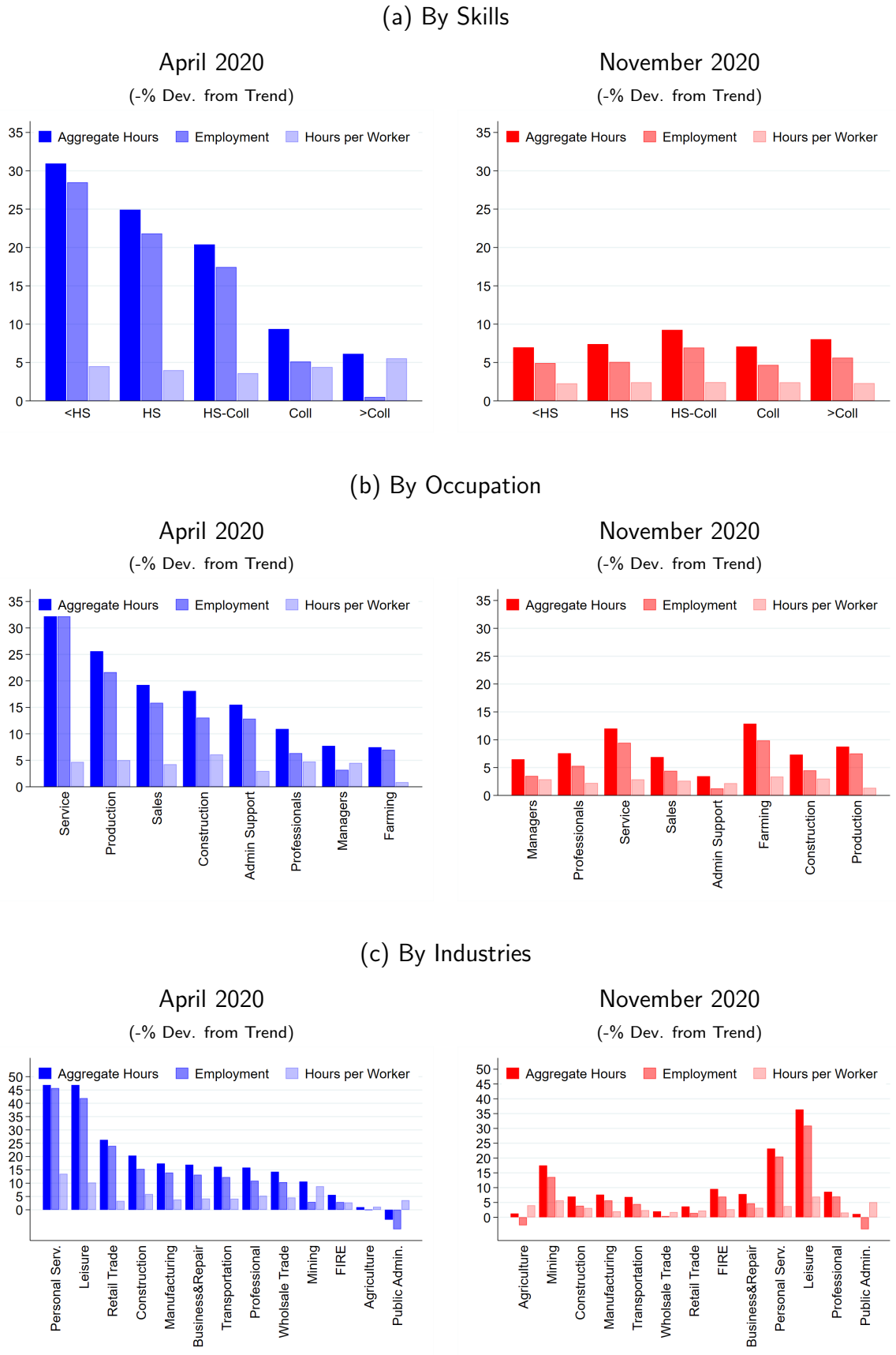
Summing up, there is a substantial amount of sectoral heterogeneity in labor dynamics. A group of industries underperformed throughout the pandemic (leisure and personal services); a group of industries that perform relatively well throughout the pandemic (e.g. FIRE) and a group of industries that show employment losses in April 2020 but do relatively well in December 2020 (e.g. wholesale trade and retail trade). This implies that after the initial Covid-19 shock—which generated large cross-industry heterogeneity in employment losses that lessened through the 2020-Q2, the most recent evidence that we provide shows that cross-industry heterogeneity stands large and persists relatively stable after 2020-Q2 (and up to December 2020).

2.2.4 Aggregate Hours, Employment and Hours per Worker

In our previous analysis we focused on employment dynamics. Here we assess the dynamics of the aggregate hours and of its two components: employment and hours per worker. Our economy-wide analysis in Section 2.1 shows that approximately 80 percent of the loss in aggregate hours is driven by employment and the remaining by adjusting hours per worker. We now unpack this decomposition by skills, occupations and industries. We focus our analysis on the comparison between the onset of the epidemic (April 2020) and the most recent available month of data (November 2020).

Across skills, we find that for individuals that suffered the largest losses in aggregate hours in April 2020, these losses are largely accounted for by employment. For example, individuals with a high school degree face a loss in aggregate hours of 24% in April 2020 that is the sum of a loss of 21% in employment plus a loss of 3% in hours per worker in April 2020. In contrast, individuals with a college degree face a loss in aggregate hours of 9% that is relatively balanced with a loss

Figure 3: Heterogenous Hours and Employment Losses during Covid-19



Note: This figure show losses for aggregate hours, employment and hours per worker by skill groups in panel (a), by occupations in panel (b) and by industries in panel (c). These losses in 2020 are defined as percentage deviations from respective pre-Covid-19 trends. The left column refers to April 2020 and the right column refers to November 2020.

of employment of 5% and a loss of hours per worker of 4% at the onset of the epidemic. Further, moving up to individuals with more than a college degree, we find that the loss of aggregate hours in April 2020, 6%, is almost entirely driven by hours per worker that drops more than 5% whereas this figure is less than 1% for more-than-college employment. That is, the picture that emerges is one in which less skilled workers clearly face employment losses in 2020, while skilled workers are fending off employment losses with lower hours per worker at the earliest stages of the epidemic. By November 2020 the picture is very different as we find a more similar behavior of losses in aggregate hours across skills—6% on average—and also a similar contribution of employment and hours worked, respectively, 65% and 35% on average.

Similar insights arise across occupations. In April 2020, all occuptions show losses in aggregate hours that are largely attributed to emplomet losses. The exceptions in that regard are professionals, where employment and hours worked account for the drop in aggregate hours by similar amounts, and managers that show a larger drop in hours worked than in employment. As in skills, by November 2020, all occupations show relatively smaller and more similar losses in aggregate hours. These are largely explained by employment.

Across industries, in April 2020, close to 80% of the drop in the sectors with the largest losses in aggregate hours, personal services and leisure, is explained by employment, and the remaining by hours worked. This contribution is similar across industries—except for mining and public administration where hours play a larger role. In November 2020, leisure and personal services stand as the sectors with the largest loss in aggregate hours which is, in both cases, larely explained by employment. In general, other industries show a more similar and relatively larger role for hours worked in explaining—approximately 30$ of—the loss of aggregate hours.

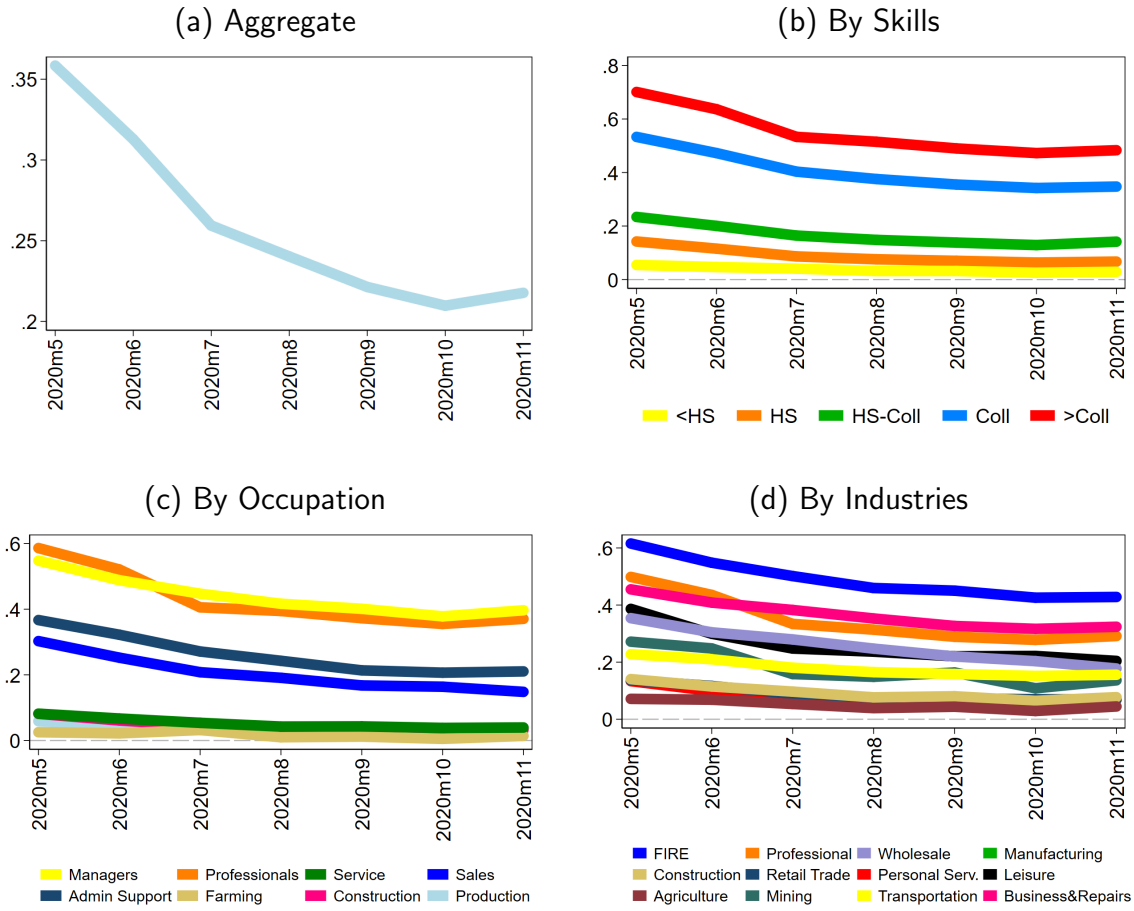
3 Actual Telework Use Dynamics during Covid-19

An important aspect of this recession is that due to its pandemic nature the ability to telework has been highlighted as a potential cushion against the recession (Dingel and Neiman, 2020). In

contrast to these early studies of the pandemic that rely on pre-Covid-19 telework measures, here we document the dynamic patterns of actual telework use. We base our measure of telework use on a new set of Covid-19 related questions regarding with telework implemented in the basic monthly CPS survey since May 2020. We focus on the variable "COVIDTELEW" that categorically captures whether individuals "worked remotely for pay due to Covid-19 pandemic" or not. We find that since May 2020 — which together with April 2020 show the largest loss of employment from trend — telework use is monotonically declining. In May 36% of the employed population teleworked, whereas this figure is 22% in December; see panel (a) in Figure 4. This implies a reduction of 40% from May to November in the amount of telework use. Unfortunately, it is hard to tell whether these dynamics of telework use imply a mean-reversion behavior or not to the pre-Covid-19 use of telework. The reason is that our end-of-the-year CPS measures of telework use are defined differently to the measures available to construct the amount of telework in the pre-Covid-19 era such as those constructed from the American Time Use survey (ATUS) as in Dingel and Neiman (2020). In particular the two measures refer to a different interval, weekly in the CPS and yearly in ATUS.

The aggregate decline in the use of telework starting that we document is also present by skills, occupations and industries. Importantly, the relative ranking of telework use withing skills, occupations and industries does not generally change over the course of the pandemic recession. The employed with more than a college degree—the skill group that more intensively uses telework throughout the pandemic recession—faces a decline in telework use from 70.1% in May to 48.3% in November; see panel (b) in Figure 4. Individuals with a college degree reduce telework from 55.3% to 34.7% in the same span of time. Telework use is less prominent across the less skilled workers but, nevertheless, they also show a decline in their use of telework. For example, 14.2% of employed individuals with a high-school degree use telework in May 2020 whereas this figure drops to 6.7% in November 2020. Even the group of individuals with less than a high school degree—i.e., those with the least intense use of telework throughout the pandemic—also show a decline from 5.4% to 2.8%. In relative terms this implies a decline of telework use between May

Figure 4: Actual Telework Use during Covid-19



Note: Detrended and deaseasonlized using pre-recession data starting in 2014. We focus on the working age population and drop individuals that report more than 105 hours per week.

an November of 31.0% for more than college graduates, 34.8% for college graduates and 52% for high-school graduates.

Similar insights arise by occupations; see panel (c) in Figure 4. The occupations with highest telework use are professionals together with managers (and finance related occupations) that use telework by, respectively, 58.6% and 54.7% in May 2020 and 39.6% and 37.0% in November 2020. Occupations that show medium use of telework such as administration support and sales, also see a decline in telework use. Precisely, administration support occupations decline from 36.6% of their employed using telework in May to 21.0% in November and these figures for sales are, respectively, 30.2% in May and 14.8% in November. The occupations with the lowest use

of telework that include services, construction, transportation and farming also see a reduction in telework use. For example, 8.1% the employed in service occupations use telework in May, and this figure drops to 3.9% in November. In agriculture, the occupation with the lowest intensity of telework, its use drops from having 2.5% of their employed using telework in May to 1.5% in November.

In all industries we observe a declining pattern in the use of telework that, importantly, does not alter the ranking of industries using telework over the course of the pandemic recession. Panel (d) of Figure 4 shows the dynamics of telework use by industries. There is a substantial level differences in telework use across industries with FIRE, Professionals and Business and Repairs showing the highest degree of actual telework use throughout the entire recession with, respectively, 61.5%, 49.8% and 45.4% of their employed individuals working from home in May 2020. Industries as leisure and wholesale trade closely follow the first group with, respectively, 38.6% and 35.4% of their employed using telework. Then, manufacturing and transportation have, respectively, 28.6% 22.7% of their employed working from home. On the other side of the spectrum agriculture, personal services, retail trade and construction showing, respectively, 7.1%, 13.3%, 13.6% and 14.0% of their employed individuals working from home.

4 Does Telework Protect against Employment Losses during a Pandemic?

We can now elaborate further on the temporary shielding effects of telework and the end of its protection 9 months after the outburst of the pandemic. We will relate the dynamics of labor that we document in Section 2 and the telework use dynamics that we document in Section 3 in order to assess whether the actual use of telework is associated with the degree of labor loss during the pandemic. Our main finding is that the dynamic relationship between employment loss and telework evolved over the course of the pandemic recession. It was initially negative, and now is insignificantly different from zero. Moreover, this is the case across skills, occupations and

industries. Even emblematic examples of industries with low telework ability (personel services, leisure) are not enough to sustain the negative relation, and they themselves recovered to a large extent.

In the left column of panel (a) in Figure 5, we scatter plot (the negative of) employment loss across different skill groups against actual telework use across skill groups. We do it separately for the earliest and most recent months in which the CPS covid variables are available (in IPUMS), i.e. May and November 2020. Markers are proportional to each group's share of employment. Clearly, in May 2020 (blue), there is a significantly negative relationship between employment loss and the use of telework across skills. That is, in May 2020, the least skilled workers, which use telework less, suffered very large employment losses, whereas the most skilled workers, who rank very high in actual use of telework, experienced little to no employment losses. In contrast, in November 2020 (red) the employment losses are similar across all education groups despite the still large differences in telework use. Note that this pattern arises because the least skilled workers have closed some of the labor gap with respect to their trend by November 2020, whereas the more skilled workers have either maintained or even somewhat widened the their labor gap relative to trend.

This dynamic relationship between pandemic employment losses and the use of telework is captured more systematically in the right column of panel (a) in Figure 5 where we plot the unconditional effect of telework use on employment losses by month, We compute this unconditional effect by running an OLS on:

$$\text{Employment Loss}_g = cons. + \phi \text{Telework Use}_g$$

where the variable Employment Loss is in percentage deviations from pre-Covid-19 trend (as constructed in Section 2, Telework Use $\in [0, 1]$ captures the probability of conduction telework and g corresponds to each of our five skill groups. We estimate the unconditional effects of telework on employment loss, ϕ, separately by month. The estimated effect of telework on

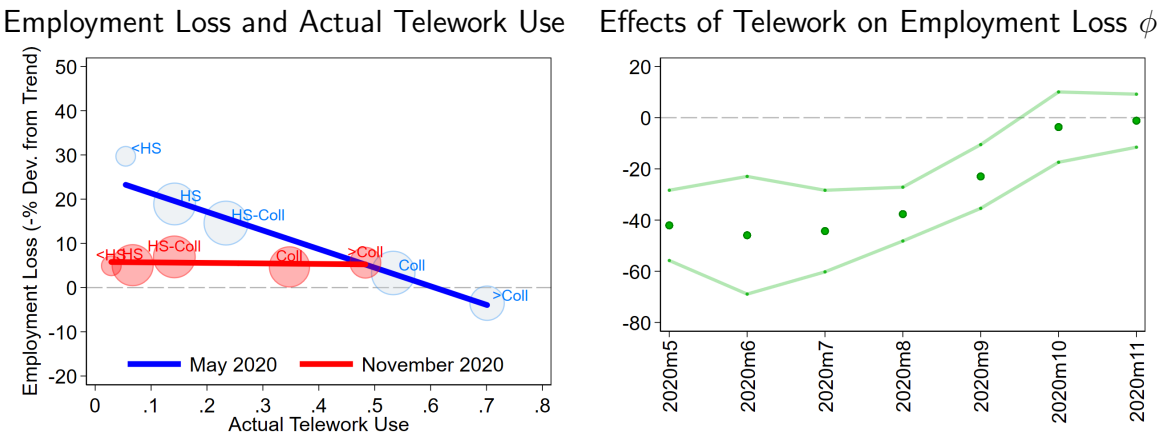
employment loss is significantly negative for the month of May 2020. However, the effect of telework tends to lessen over the course of the pandemic recession up to the point where by the third quarter of 2020 the effect of telework is not significantly different from zero. That is, our evidence shows that the ability of telework to insulate against the pandemic recession is shortly lived.

A similar picture emerges between employment losses and telework use across occupation groups, shown in Figure 5(b). For example, employment losses amounted 30% in service occupations employment, 16% in sales, and 3% for professional occupations. Each occupation's actual use of telework was, respectively, 8%, 31% and 59%. That is, occupations with high telework use were better able to cushion the initial Covid-19 shock. However, by November 2020, labor losses are similar across occupations independently of their actual use of telework: 9% for service occupations, 4% for sales and 5% for professionals, while telework use across these three occupations is, respectively, 4%, 15% and 37%. The correlation between employment loss and telework use across occupation, shown in the second column of Figure 5(b), presents the same patterns as discussed for skill group. At early stages of the epidemic there is a negative and significant unconditional effect of telework on employment loss that disappears by the third quarter of 2020.

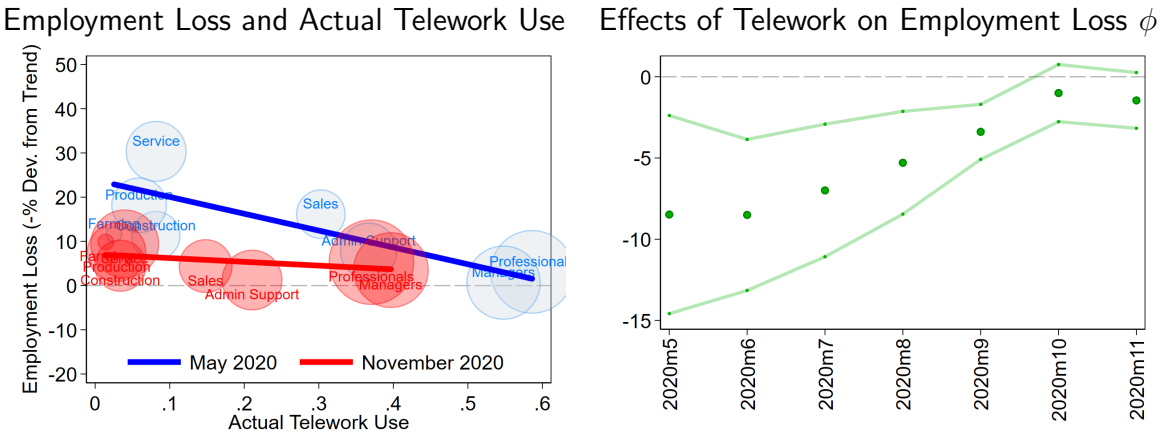
Looking across industries, similar but weaker patterns emerge, with clear outliers. Although there is a clear negative relation between employment loss and telework use by industry in May 2020, it is marginally significant (see the second column in Figure 5(c)), and it has disappeared by the third quarter of 2020. As was the case for skills and occupations, this is due to both the fact that industries that show large losses in May 2020 display less losses in November 2020 (e.g. retail trade and wholesale trade), and that industries that show small losses in May 2020 end up displaying similar losses to the remaining industries in December 2020 (e.g. FIRE). This labor dynamics together with the fact that the decline of telework use does not alter the ranking of its use across industries explains the change from a negative relationship between telework and employment loss across industries to a relationship that is is no longer significantly different from

Figure 5: Employment Loss and Actual Telework Use during Covid-19

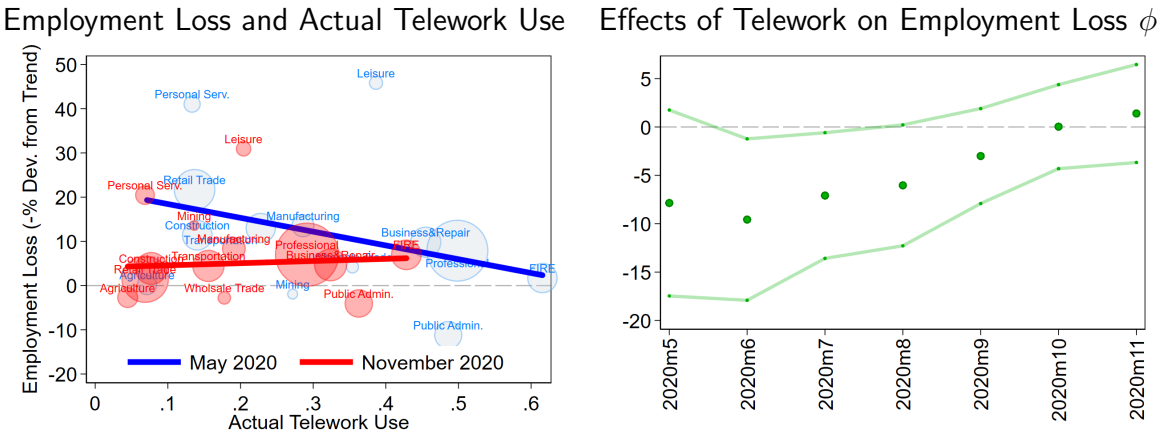
(a) By Skills



(b) By Occupations



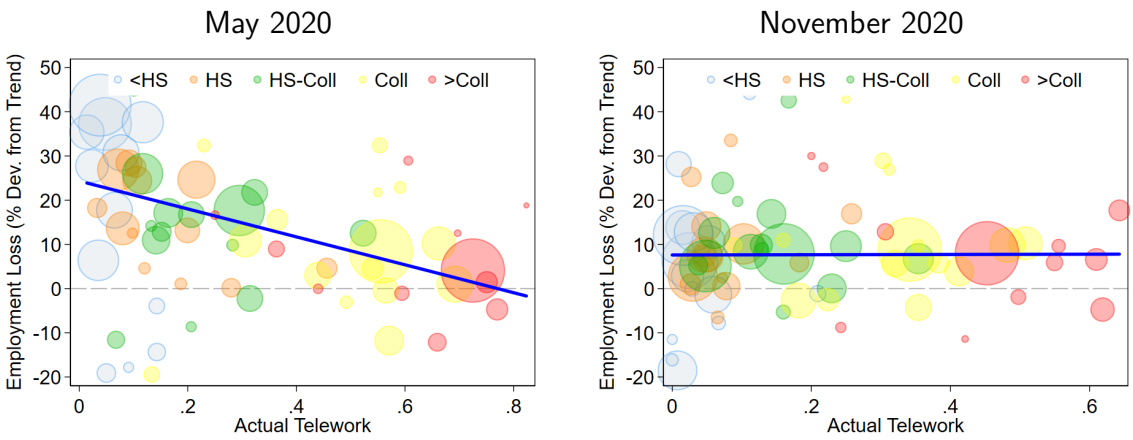
(c) By Industries



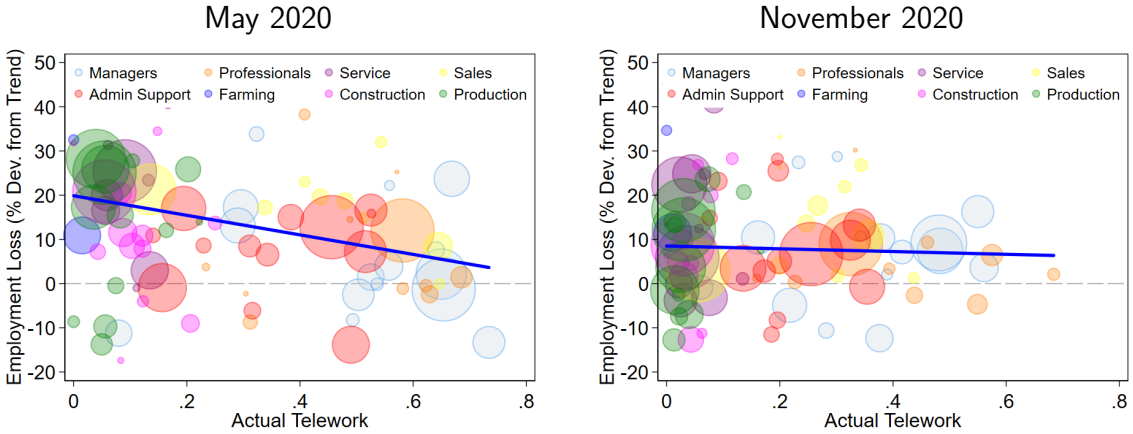
Note: The left column scatter plots the employment loss (vertical axis) defined as the negative of the percentage deviation from detrended and deseasonalized data separately for May 2020 (blue) and November 2020 (red) against the actual telework use in the corresponding month. We report this by skills in panel (a), occupations in panel (b) and industries in panel (c). The size of the dots captures the employment share of each group. The right column shows the effect (ϕ) of telework on employment loss estimated from a simple OLS: Employment Loss$_g = cons. + \phi$ Telework Use$_g$ for $g \in \mathcal{G}$ and that we separately run for each partition $\mathcal{G}$ ={skills, occupations, industries}.

Figure 6: Employment Loss and Actual Telework Use during Covid-19, Conditional on Industries

(a) By Education×Industry (75 Groups)



(b) By Occupation×Industry (120 Groups)



Note: Detrended and deaseasonlized using pre-recession data. We drop individuals that report more than 112 hours.

zero; see the right column of panel (c) in Figure 5.

Finally, we also study the interaction between education and occupations with industries in order to control for the possible effect of industries behind our results on skills and occupations. When we partition the economy in skills×industry groups we find similar insights than our unconditional results on skills. Precisely, we find a clear negative relationship between employment losses and telework use across 75 education×industry groups in May 2020; see the left column of panel (a) in Figure Figure 6. This is not the case anymore in November 2020; see the right

column of the same panel. This shows that industries in which skills are allocated does not determine our results on the effects of telework. The same patterns arise for occupation$\times$industry groups, see panel (b) in Figure 6.

5 Conclusion

We provide evidence (up to December 2020) on the heterogeneity of labor dynamics across skills, occupations and industries and of the dynamics of telework during Covid-19. We find that telework has postponed but not stopped the effects of the recession on the economic groups that actually use telework. In contrast with the initial Covid-19 shock, the emerging pandemic recession displays employment losses that are relatively similar by skills and occupations. We also document a declining pattern of telework use throughout the pandemic that arises in the aggregate and also across skills, occupations and industries. Put together, our results imply that the power of telework to protect against employment loss disappears over the course of the recession.

We also highlight substantial heterogeneity across industries labor performance in the most recent months of the pandemic. Clearly, the sectoral dynamics are divergent and in a manner that seems potentially long-lasting. In this context, as per our results on the joint dynamics of employment loss and telework, we argue that to pin down the longer-lasting heterogenous industry effects of the current recession we need to look into source shocks that are less related to supply (or, at least, to the ability to do so, i.e. telework) and more related to demand. This is an open question that we think deserves further exploration.

Whether the growing inability of telework to shield employment will continue to hold or not is unknown. For example, it is possible that the enactment of new and further stay-home (or related) policies can move labor market dynamics across skills or occupations back to being more similar to those that appeared on the initial Covid-19 shock. We will continue to provide updates of this paper to address this uncertainty.

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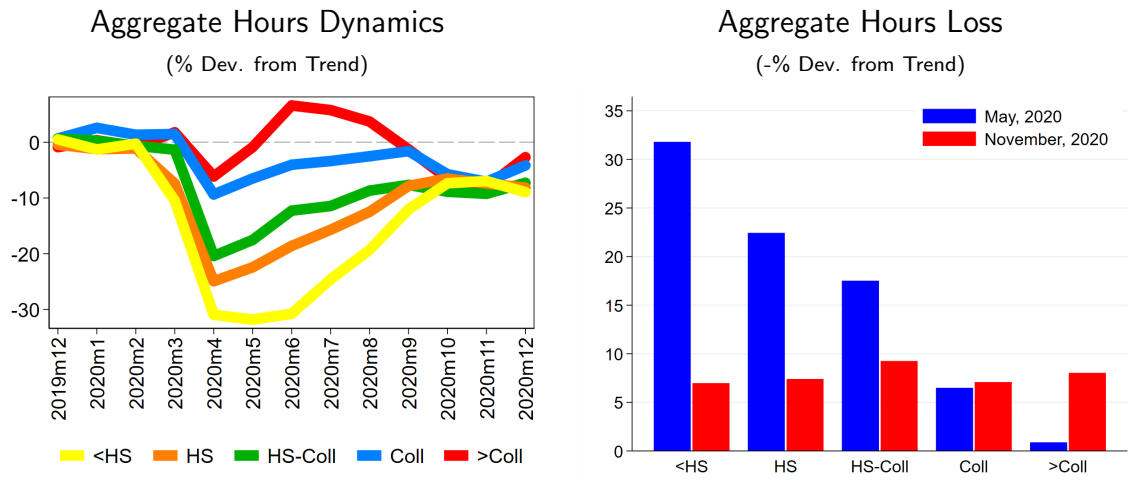
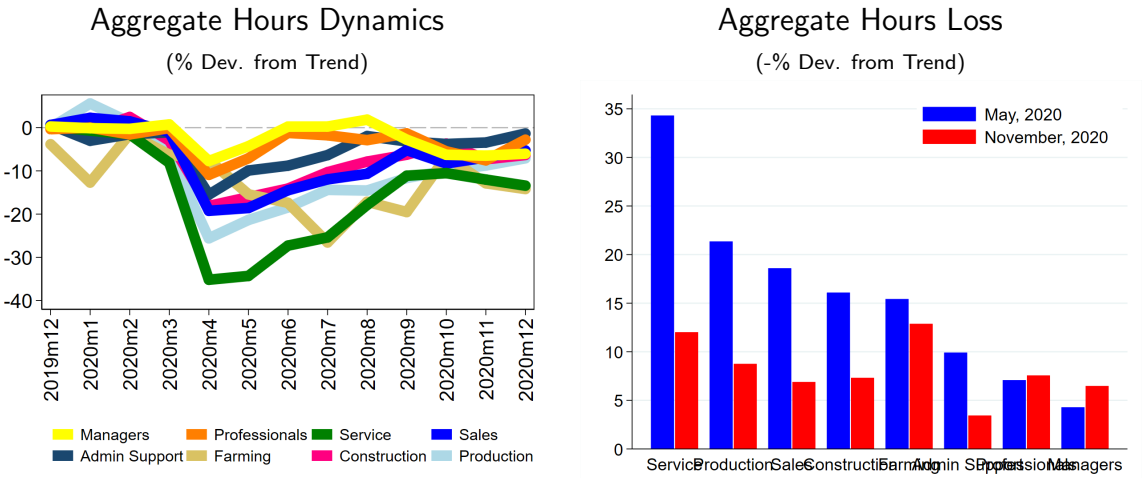
A Results for Aggregate Hours

Figure 7: Heterogeneous Aggregate Hours Dynamics during Covid-19

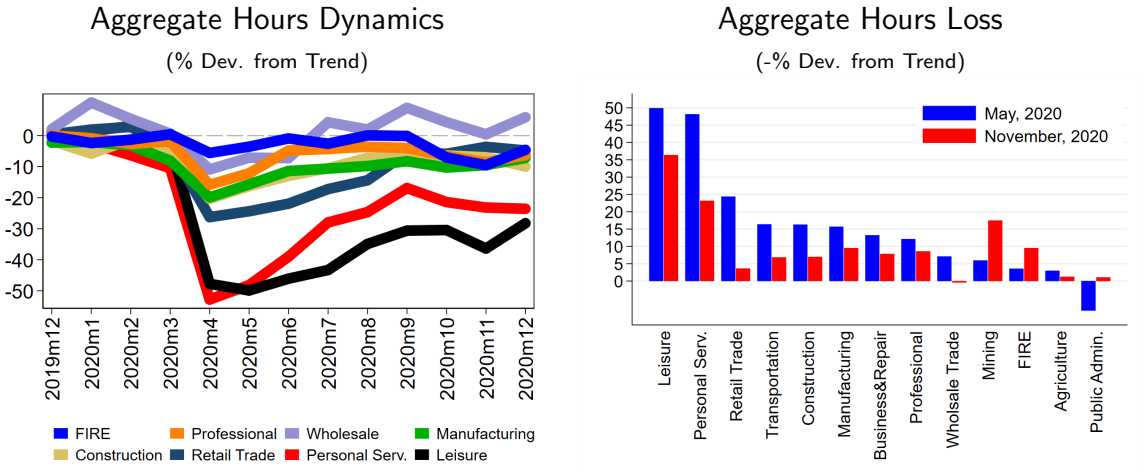
(a) By Skills



(b) By Occupation



(c) By Industries

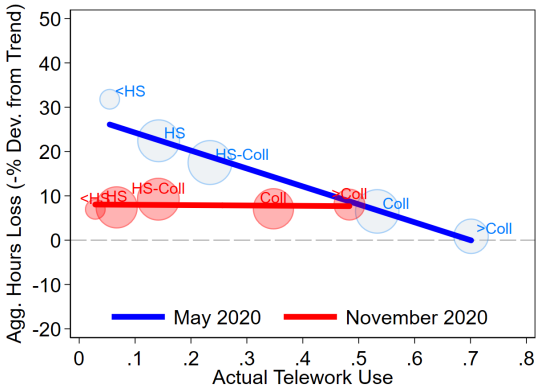


Note: This figure shows time series of labor losses (defined as aggregate hours per working age, seasonally adjusted and relative to trend as detailed in the appendix) by skill groups in panel (a), by occupations in panel (b) and by industries in panel (c) between Dec. 2019 and Dec. 2020 (left column) and comparing April 2020 and December 2020 (right column). In the left column of panel (c) we selected eight industries out of the total of 15 industries that we study. In the right column of panel (c) we merged the manufacturing of durables and nondurables into one sector and the wholesale trade of durables and nondurables into one sector.

Figure 8: Aggregate Hours Loss and Actual Telework Use during Covid-19

(a) By Skills

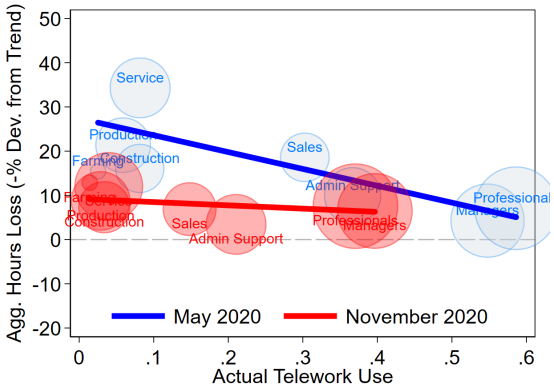
Aggregate Hours Loss and Actual Telework Use



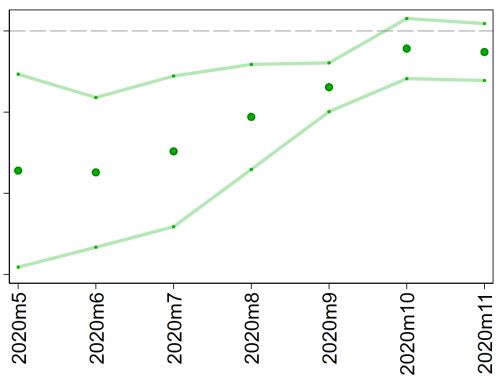
Effects of Telework on Aggregate Hours Loss ϕ

(b) By Occupations

Aggregate Hours Loss and Actual Telework Use

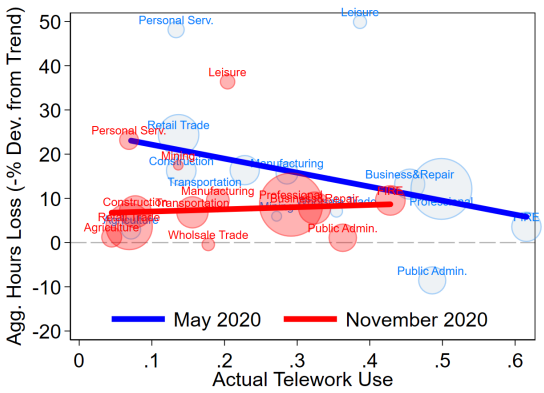


Effects of Telework on Aggregate Hours Loss ϕ

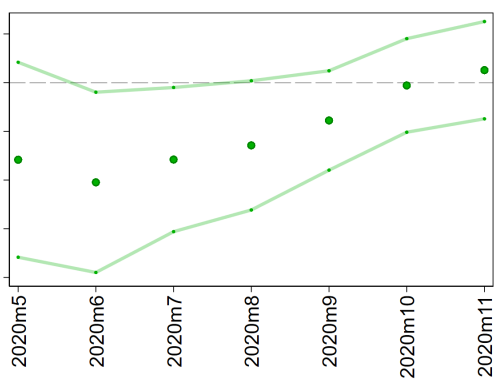


(c) By Industries

Aggregate Hours Loss and Actual Telework Use



Effects of Telework on Aggregate Hours Loss ϕ

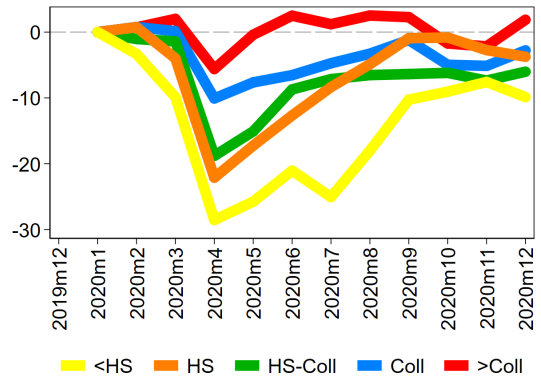


Note: The left column scatter plots the labor loss (vertical axis) defined as the negative of the percentage deviation from detrended and deseasonalized data separately for May 2020 (blue) and November 2020 (red) against the actual telework use in the corresponding month. We report this by skills in panel (a), occupations in panel (b) and industries in panel (c). The size of the dots captures the employment share of each group. The right column shows the effect (ϕ) of telework on labor loss estimated from a simple OLS: Labor Loss$_g = cons. + \phi$ Telework Use$_g$ for $g \in \mathcal{G}$ and that we separately run for each partition $\mathcal{G}$ ={skills, occupations, industries}.

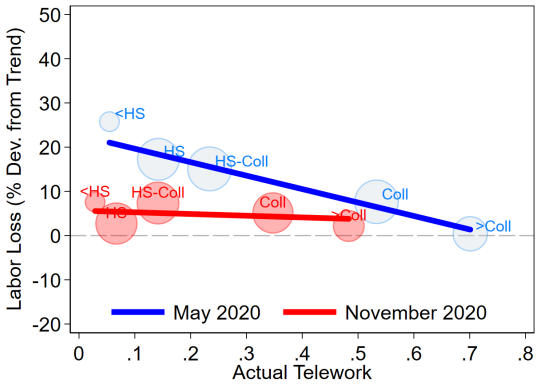
B Alternative Covid-19 Effects

Figure 9: Heterogeneous Aggregate Hours Dynamics during Covid-19: Using Chetty et al. Strategy to Capture Covid-19 Effects: Normalization to January 2020

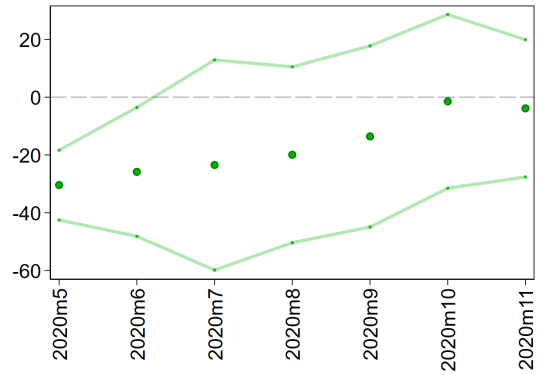
(a) Labor Dynamics (% Dev. from Trend)



(b) Labor Loss and Telework



(c) Effects of Telework on Labor Loss



Note: This figure shows time series of labor (defined as aggregate hours per working age) by skill groups in panel (a), by occupations in panel (b) and by industries in panel (c) as percentage deviations from their respective trends (left column) and a within-group comparison between the labor losses (in percentage deviations from trend) in April 2020 and December 2020 (right column). All series are detrended and deaseasonlized using pre-recession data starting in 2014. In the left column of panel (c) we selected eight industries out of the total of 15 industries that we study. In the right column of panel (c) we merged the manufacturing of durables and nondurables into one sector and the wholesale trade of durables and nondurables into one sector. We focus on the working age population and drop individuals that report more than 105 hours per week.