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When Face-to-Face Interactions Become an Occupational Hazard

Jobs in the Time of COVID-19

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Abstract

There is a crisis of demand brewing around the globe as social distancing becomes the norm to counter the COVID-19 outbreak. So, which parts of the economy are most in the line of fire? Looking at jobs that can be done at home or that require a high degree of face-to-face interactions with consumers can capture complementary but distinct mechanisms to assess this vulnerability. This paper uses data on 900 job titles from the Occupational Information Network (O*NET) database for the United States to demonstrate that there is substantial heterogeneity in vulnerability across industries, income groups, and gender. First, industries vary in whether they emphasize face-to-face interactions and home-based work and the two do not always go hand-in-hand. Second, occupations that are less amenable to home-based work are largely concentrated among the lower wage deciles. Third, a larger share of women's employment is accounted for by occupations that are intensive in face-to-face interactions.

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1. Introduction

There is a crisis of demand brewing around the globe as social distancing becomes the norm to counter the COVID-19 outbreak. Examples abound of job cuts as authorities ask restaurants and bars to close shop. Manufacturing activity in global value chains is increasingly disrupted too. Ripple effects will likely be felt with a negative demand shock for consumer durables such as cars and the ability of factories to supply at capacity will be affected as lockdowns are imposed. So, which parts of the economy are most in the line of fire?

There is an emerging classification of "shutdown" sectors, which includes accommodation and food services, passenger transport, personal services (e.g. hairdressers), arts, recreation and entertainment, non-essential retail, and sensitive manufacturing (Vavra 2020). While transparent and quick, such measures are somewhat ad-hoc and not data driven. One way to assess vulnerability during the COVID-19 pandemic is to look at jobs that can be done at home. Dingel and Neiman (2020) use Occupational Information Network (O*NET) data from the United States to develop a home-based work (HBW) measure. The authors define a binary (dummy) variable for whether a job can be done from home or not based on whether it comprises tasks that relate to "daily work outdoors" or the "operation of vehicles, mechanized devices, or equipment". An occupation may consist of many jobs, although the two are identical at the most granular level. Therefore, the HBW measure reflects the percentage of jobs that can be done from home by occupation. There is, however, also a different and equally relevant dimension of measuring face-to-face interactions with consumers, which we aim to capture through a face-to-face index based on Blinder (2009).

Home-based work (HBW) and face-to-face (F2F) interactions represent related, but complementary aspects of how social distancing is likely to affect jobs. They differ along three main dimensions, namely a) temporal (short run vs. medium run), b) the primary channel of effects (supply vs. demand) and c) the relevant margins (intensive vs. extensive).

In the short-run, HBW is what matters for immediate job losses during lockdown. However, as restrictions are lifted, activities intensive in F2F interactions can be slower to recover as consumers may remain apprehensive.

Furthermore, F2F is more related to demand, while HBW is more related to labor supply considerations. F2F indicates the importance of face-to-face interactions *with clients* and therefore isolates this aspect of demand. In the context of COVID-19, a higher F2F value means a larger potential for loss of demand from social distancing measures. HBW, on the other hand, also includes workers who do not interact with clients – such as those employed in manufacturing activity – and would therefore not experience a direct fall in demand due to social distancing. It primarily captures a labor supply dimension, i.e. the (in)ability of workers to supply labor remotely from home. Neither of these measures captures the general reduction in demand resulting from negative income shocks. This matters for analyzing relative vulnerability to the extent these shocks affect industries asymmetrically. The demand for consumer durables has, for example, typically fallen more during previous crises (Bils and Klenow 1998) and this effect can also be transmitted through international trade and investment links.

Lastly, HBW, is fundamentally binary and therefore cannot capture how well work can be done from home. F2F, in contrast, can capture the quality or productivity dimension related to home-based work. In other words, HBW captures the extensive margin of how social distancing affects jobs, while F2F is more related to the intensive margin.

We compare these complementary, but distinct, measures in the remainder of the paper to assess the implications of the COVID-19 pandemic on jobs across industries, income groups and gender. Section 2 outlines the methodology to construct an index which measures face-to-face interactions with consumers. Section 3 discusses the results. Section 4 provides conclusions.

2. Methodology

We measure the importance of face-to-face (F2F) interactions with consumers based on the extent to which an occupation involves (a) establishing and maintaining personal relationships; (b) assisting and caring for others; (c) performing for or working directly with the public; and (d) selling to or influencing others. These work activities were originally identified by Blinder (2009) to measure the

remote delivery or offshorability of different tasks. The O*NET database for the United States includes scores on the importance of these four work activities across 900 job titles, based on surveys of workers and experts. Following Oldenski (2012), we aggregate and normalize the score for each of these four work activities on a scale of 0-1. The F2F interactions index is then a simple average of these four task scores by occupation. A similar F2F interactions index was employed in the World Trade Report 2019 (WTO 2019). This approach is also analogous to Autor and Acemoglu (2011), who average different O*NET attributes to create several categories of routine and non-routine labor.

Figure 1: Face-to-face interactions are stable at the occupational level
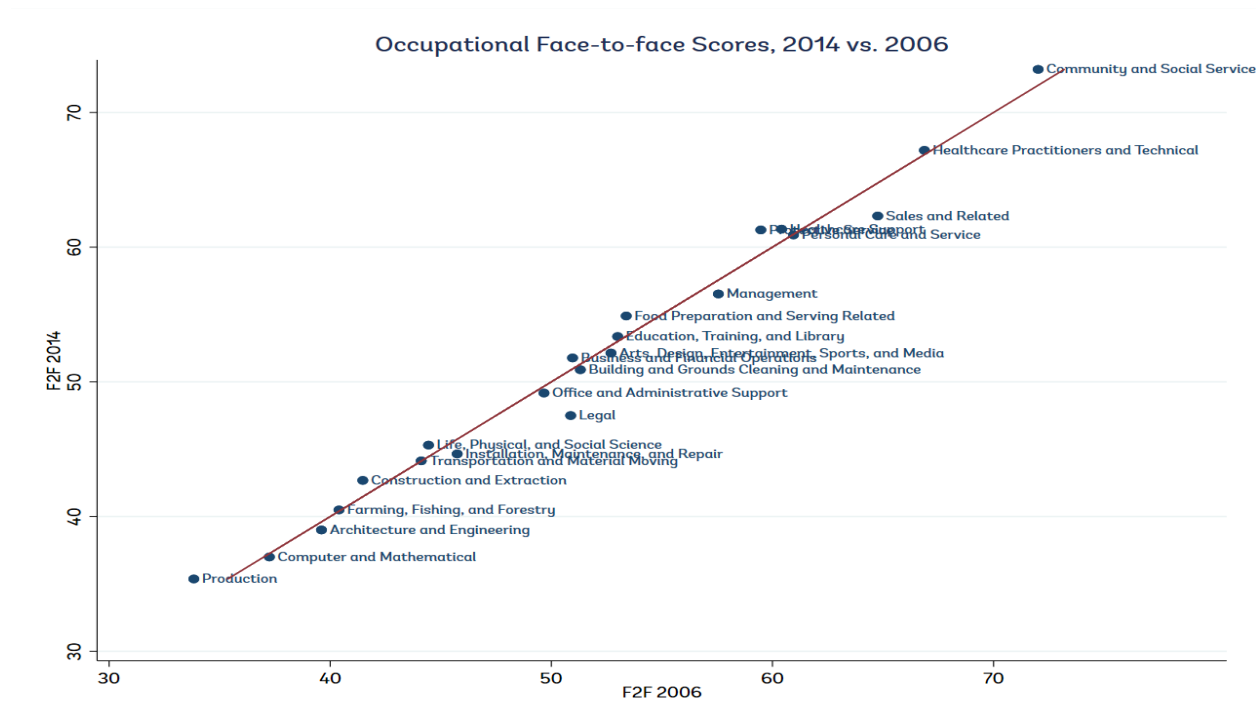
Source: Authors' calculations based on the O*NET database.

The importance of these F2F interactions across jobs is stable and unlikely to experience a major change quickly. Even across 2-digit occupation categories in the United States, for instance, the F2F interactions index is almost identical between 2006 and 2014 (figure 1). This suggests that the tasks or work activities underlying the index are more innate than context specific. As a result, it is possible to compute the exposure to face-to-face interactions with consumers by industry, income groups, and gender based on the distribution of different job titles across these groups. Furthermore, if the necessary task-level data to construct the F2F interactions index at the occupational level are

unavailable for other countries, occupation-level scores for the United States can be multiplied with the share of each occupation by industry, region, gender or income group elsewhere.[2] It is also possible to construct a composite index of F2F interactions and HBW, but this entails transforming one of the two measures because the former is continuous and the latter binary.[3]

The four tasks that underlie the F2F interactions index with consumers are drawn from the list of "work activities" in the O*NET database. There are potential alternatives, such as "contact with others (face-to-face, by telephone, or otherwise)", "face-to-face discussions" and "physical proximity", which derive from the list of "work contexts". Several authors, including Blinder (2009), caution against their use because "work contexts" are very general, mix many elements, and provide "mechanical" indices. As a result, they are more prone to endogeneity and can fail to capture the relationship between F2F interactions and the quality of remote work.

"Work activities" used in this paper capture the fundamental reasons as to why F2F interactions may be important, e.g. in order to influence others. Hence, in these cases, we know why and for what F2F interactions are necessary, giving a good measure of the implications of remote delivery on the quality of work. Conversely, "work contexts" focus on outcomes rather than fundamental inputs. The risk of endogeneity here is that as firms adjust to the crisis, the outcomes are more likely to change than the inputs. For example, a worker may typically have lots of F2F discussions in normal times, but a firm may invest in ICT due to COVID-19, thereby reducing that outcome. However, the fundamental task (input) remains unchanged by the crisis, such as the need for salespeople to be able to sell and influence others.

Beyond this general caveat, there are specific issues with measures listed in "work contexts" too. A main problem with the variable "contact with others (face-to-face, by telephone, or otherwise)" is the inability to distinguish between the forms of contact. A worker who spends all their time on the phone would have the same score as one who spends all their time in face-to-face discussions. However, the former is unaffected by COVID-19, unlike the latter. Further, the variable "face-to-face discussions"

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[2] If there is reason to believe that the importance of certain tasks by occupation differs significantly from the United States, these data cannot be readily used.

[3] One way to combine the two is to define a variable that equals 1 if the F2F score is above some threshold (e.g. the median) and zero otherwise. Then aggregating F2F will yield the percentage of jobs requiring face-to-face contact and is hence directly comparable to HBW. Inverting HBW (by taking 1-HBW) and taking a simple or weighted average of the new F2F dummy variable and the inverted HBW measure will then give "the percentage of jobs that require face-to-face contact and cannot be done from home". An alternative is to simply average the F2F score rescaled between 0-1. This makes the two indices comparable by scale, but not by unit.

cannot distinguish between discussions among coworkers and clients. The same issue applies to the "physical proximity" measure, which is used by Leibovici et al. (2020).

3. Results

Our first result is that industries vary in whether they emphasize face-to-face interactions and home-based work. Home-based work and face-to-face interactions expectedly go hand-in-hand in several industries. For example, professional, scientific and technical services can be provided from home and require little face-to-face interaction. Conversely, accommodation and food services or retail trade are not amenable to home-based work and are expectedly the most intensive in face-to-face interactions. The same holds true for health care and social assistance, which is at the forefront of providing essential services during the COVID-19 pandemic. But there are industries where these two measures diverge, which is why it is important to look at both. For example, manufacturing and construction work cannot be done from home but also do not involve much face-to-face interaction with consumers. Conversely, education services are amenable to home-based work and yet intensive in face-to-interactions (figure 2).[4]

The ease of doing home-based work is key during lockdown, while the intensity of face-to-face interactions assumes greater importance as restrictions ease. As non-essential services are increasingly suspended due to the COVID-19 outbreak, industries less amenable to home-based work are particularly vulnerable to immediate job losses. This includes accommodation and food services and retail trade where worker layoffs in restaurants (home delivery options notwithstanding) and department stores are becoming increasingly commonplace. Manufacturing may also face job losses during lockdown if the need for social distancing among factory co-workers or the closure of public transportation suspends the production of non-essential goods. The health care industry is less vulnerable to job loss, but doctors, nurses, and other health personnel face the risk of getting infected as they respond to COVID-19 related cases. The same holds true for other "essential" or "frontline" services as identified by governments.[5]

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[4] To facilitate a comparison to HBW, we invert and transform the F2F index on a scale of 0-1, where a higher value denotes a lower importance of F2F interactions.

[5] To assess the quantitative impact of the COVID-19 shock, one should adjust the scores for "frontline" occupations, such as medical occupations, police, and some public administration. These occupations require face-to-face contact (and

Figure 2: Home-based work and face-to-face interactions do not always go hand-in-hand
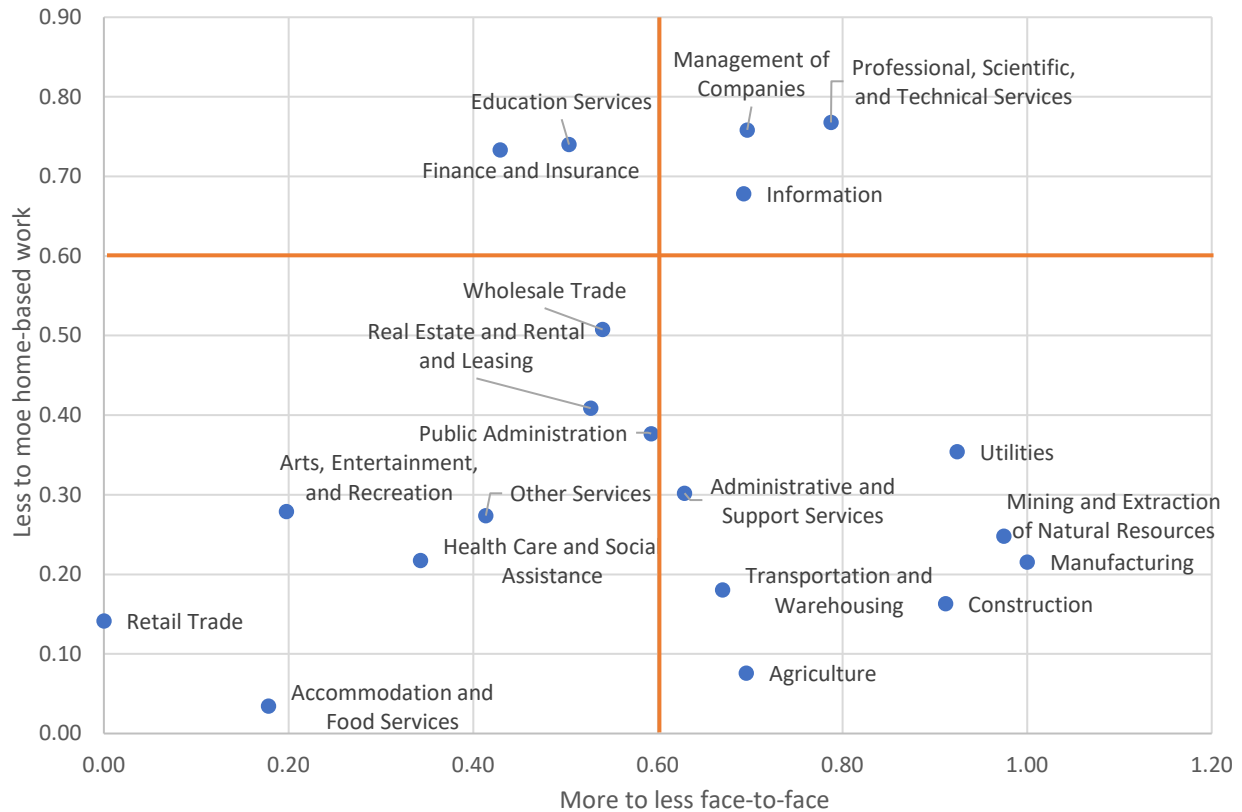
Source: Authors' calculations based on Dingel and Neiman (2020), the O*NET database and the US. Bureau of Labor Statistics.

Among industries that are amenable to home-based work, the supply of those least intensive in face-to-face interactions, such as professional, scientific and technical services, might be least affected.[6] However, those intensive in face-to-face interactions are likely to experience negative productivity shocks during lockdown even if some tasks can be delivered digitally. For example, high school teachers can provide lectures through web-based applications, but the teaching quality might be lower compared to interactive sessions in the classroom. Similarly, branch managers and investment advisors in financial services can liaise with clients through online and telephone banking, but their ability to sell new products might be inhibited.

cannot be done from home) but are likely to experience a surge in demand which can bias results. The scores for these observations can therefore be set to zero, to the minimum in the sample, or dropped.
[6] The overall reduction in incomes and demand is just as applicable to these industries.

As lockdowns are lifted, the constraint on only doing home-based work eases. Therefore, among industries not amenable to home-based work, those with low face-to-face interactions with consumers, such as in manufacturing, might see workers return to their jobs more easily. The risk of physical proximity with co-workers along assembly lines can potentially be addressed through personal protective equipment and other relevant precautions undertaken by factory managers. Industries intensive in face-to-face interactions with consumers, however, may be slower to recover as consumers will likely remain apprehensive of going to restaurants or stores that are frequented by many people.

Figure 3: Lower paid jobs are less amenable to home-based work
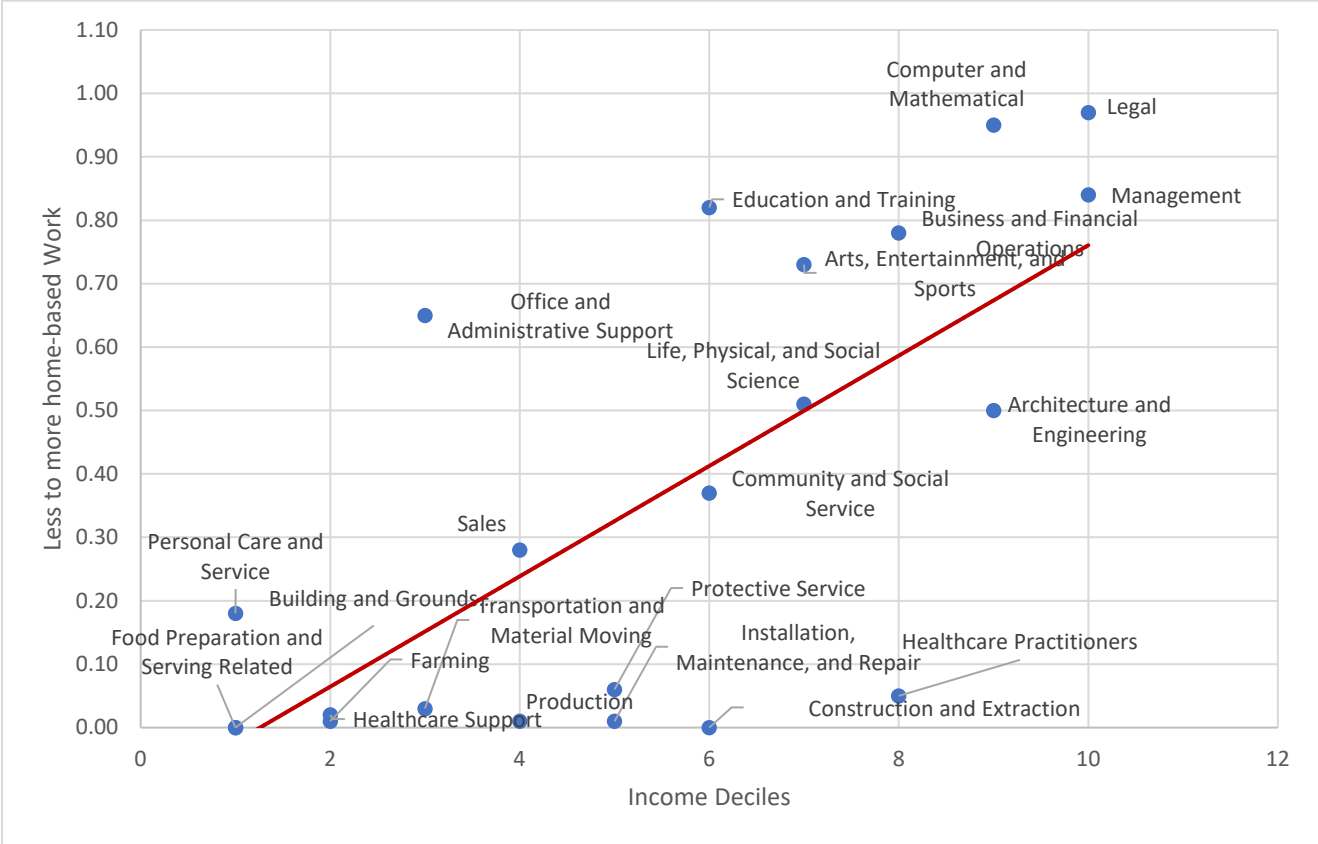
Source: Authors' calculations based on Dingel and Neiman (2020) and the US. Bureau of Labor Statistics.

Furthermore, occupations where home-based work is less feasible and face-to-face interactions are necessary tend to be concentrated among vulnerable groups. Occupations that are more amenable to home-based work are largely concentrated among higher wage deciles. This includes legal, management, and computer-related jobs. In contrast, occupations that are less amenable to home-

based work and therefore at higher risk are largely concentrated among lower wage deciles. This includes personal care, food services, and production jobs (figure 3). Occupations that are intensive in face-to-face interactions that relate most closely to physical proximity are similarly concentrated among lower wage deciles. However, the correlation is stronger for HBW than for F2F because several well-paid occupations, such as professors and managers, ae amenable to remote work, but ideally require intense F2F interactions.

Lastly, a larger share of women's employment is also accounted for by occupations that are intensive in these face-to-face interactions (figure 4). The gender exposure measure is constructed by taking the F2F occupational scores and multiplying them by the share of employment by gender in each occupation as a share of total employment by gender. For example, a value of 100 for female workers would imply all women are employed in the occupation with the highest F2F score, while a score of 0 would mean all women are employed in the occupation with the lowest F2F score. The results clearly indicate much stronger effects for women than for men. It is also worth noting that women are more exposed according to the F2F index than the HBW measure. The reason is that women in the United States are less likely to work in manufacturing, mining, and construction occupations, which cannot be performed at home, but are less intensive in F2F interactions. Hence, as lockdowns are lifted, the longer lasting effects may be on female employment, as discussed above.

Overall, our results indicate the COVID-19 outbreak is likely to disproportionately affect vulnerable groups and could exacerbate inequality.

Figure 4: Women are more exposed to face-to-face interactions than men
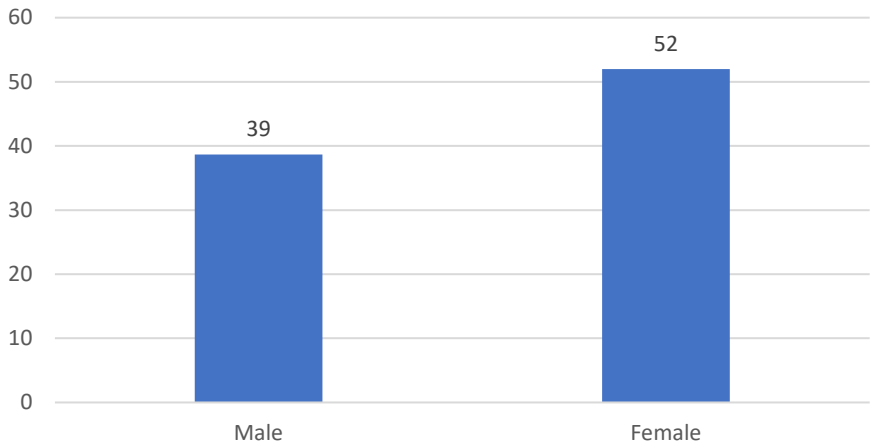
Source: Authors' calculations based on the O*NET database and US. Bureau of Labor Statistics.

4. Conclusion

The face-to-face index discussed here, as well as the home-based work index by Dingel and Neiman (2020) can provide quick, data-driven metrics of vulnerability to the COVID-19 crisis. These two related measures complement each other well and should therefore be used in conjunction.

It goes without saying that any forecast of vulnerability is necessarily a second-best approach in the absence of real-time information on the impact for firms and workers. In fact, initial unadjusted unemployment claims in the United States indicate that layoffs have largely occurred in sectors with high F2F and HBW scores (U.S. Department of Labor, 2020). Another caveat to consider is that some firms may adjust their business model in response to the crisis. For example, a retail firm may pivot to primarily add value through remote delivery. Further, some niche markets may even experience positive demand effects as a result of COVID-19, which these measures are not designed to capture. Lastly, the F2F interactions measure captures one aspect of demand where a negative shock results directly from social distancing. We do not aim to capture other demand shocks that are transmitted through global value chains, oil prices and the like.

Our results show considerable heterogeneity in the possible effects across industries and occupations. As a result, COVID-19 can have negative distributional impacts, disproportionately affecting lower-paid and female workers. In responding to job losses owing to the COVID-19 pandemic, governments should take this heterogeneity in the feasibility of doing home-based work and face-to-face interactions into account. The temporal dimension also matters. Once restrictions are lifted, continued support to industries will likely be most needed where face-to-face interactions matter. This could help the vulnerable tide over these difficult times. It will hopefully not be too long before the tide of COVID-19 turns too.

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