Impact of the covid-19 pandemic: Cascading Risks

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Abstract. Workers are unequal in the face of the COVID-19 epidemic: workers in essential sectors face a higher health risk than other workers and those working in sectors providing services to the public face a higher economic risk. Both the health and economic risk cascade into other sectors through supply chains and demand linkages. We estimate that in the U.S., the cascading effects account for about a third of the exposure to both risks. The cascading effect increases the health risk faced by workers in the retail, auxiliary transportation and mining sectors, and it increases the economic risk faced by workers in the textile, petroleum and wholesale sectors. We also provide estimates of the health and economic risks across states with the U.S. and for 42 other countries (at the national level).

The covid-19 pandemic poses great public health and economic challenges to countries around the world. Slowing down the spread of the pandemic requires implementing social distancing measures that disrupt economic activity. At the same time, some activities need to be maintained, which puts workers in these sectors at risk of contracting the virus. How does the workers' exposure to these health and economic risks vary across sectors? How do these risks propagate across sectors?

We focus in this paper on how risk cascade from the two groups of workers the most hard it by the pandemic. The first group of workers is those working in sectors providing *essential goods and services*, such as health care, food or pharmaceutical products. These workers face a higher health risk than other workers: at the risk of being infected, workers in those sectors are asked to continuing working to ensure that the population's essential needs are met, even when strict lockdown measures are imposed. The second group of workers is those working in establishments providing services to the public, such as hotels, restaurants, or cinemas, which we call *social consumption sectors*. These workers face a higher economic risk than other workers. Given the high transmission risk associated with social gatherings, these establishments are typically the first ones to be shut down when lockdown measures are taken and the last ones allowed to reopen when the measures are relaxed. Moreover, these establishments are likely to operate at low occupancy, even as government-mandated closings are lifted, both because social distancing reduces the number of customers that they can serve and because customers will most likely avoid these establishments until a vaccine or a treatment becomes available.

We provide, for 43 countries, a measure of each sectors' exposure to the health and economic risk that captures the spillover from the two groups of workers. The health risk is the risk coming from meeting the households' essential needs and the economic risk is the risk due to the unprecedented reduction in the demand for social-consumption establishments. We use a simple input-output framework, calibrated on data from the World Input Output Database, to compute the proportion of workers exposed to each type of risk and the spillover effects. We measure the health risk as the proportion of workers needed *at the workplace* to maintain the pre-pandemic household consumption in essential goods and services. We combine our employment result with the recent work by Dingel and Neiman (2020), which gives a lower bound for the fraction of each sector's jobs that can be done at home, to derive the health risk measure. We measure the economic risk as the decline in employment induced by the collapse of the demand for social consumption.

We find that... (to be completed) the cascading effects account for about a third of the exposure to both risks. The cascading effect increases the health risk faced by workers in the retail, auxiliary transportation and mining sectors, and it increases the economic risk faced by workers in the textile, petrol and wholesale sectors. Workers in the education, construction and real-estate sectors are spared: they face both lower health and economic risks than others.

Our employment estimates, which underlies the two risk indicators, are based on the input-output framework of Leontief (1936). The key assumption behind this framework is that firms' inputs are perfectly complementary (in other words, firms cannot substitute between their different inputs). This assumption is the most adequate for short-run analysis because it takes time for firms to reorganize production and change their input mix.[1] Moreover, anecdotal evidence suggests household will not be able to substitute much between products in the short run. Recent reports of food waste are direct illustration of this limited substitutability.[2] In addition to accounting for the complementarity in the production pro-

[1] In addition, we show in the Appendix that even a model with some degree of substitution between inputs behave virtually like the Leontief perfect-complementarity model when labor cannot be reallocated across sectors and wages are rigid. This model is based on Osotimehin and Popov (2020). Only the case for demand shocks?

[2] For instance, dairy processing plants that used to sell cheese to restaurants cannot sell their production to retail stores instead because their equipment is designed to package cheese in large 20-pounds bags that are too

cess, we incorporate into our analysis complementarity in the households' demand. We focus on the complementarity between, on the one hand, the consumption of manufacturing goods and on the other hand, the consumption of trade and transportation services. This approach fully accounts for the central role of trade and transportation in the production network.

Note that the measures are not meant to give a precise forecast of the sectoral impact of the pandemic. Rather, we propose indicators of each sector's risk exposure to shed light on how these risks propagate across sectors through supply and demand linkages. Moreover, it should be noted that many factors that could affect each sector's exposure to health and economic risk are missing from our measure. In terms of exposure to health risks, sectors differ in how extensively and closely their workers interact with other people (and with infected people), which affects how likely they are to be infected. Sectors also differ in the age and gender composition of its workers which would also affect the each sector's health risk. In terms of economic risks, many dimensions would deserve more attention as well, such as the effect of uncertainty on consumption and investment, the effect of business liquidity and bankruptcies, and the reduction in international trade. Although our analysis does not account for these very important effects, we believe our indicators provide a useful perspective on the inequality in the workers' exposure to the health and economic fallout of covid-19.

Related literature:

Our analysis is related to the recent work by Barrot et al. (2020) who use an input-output framework to study the economic impact of the epidemic in France and other European countries. In contrast to them, our objective is not to forecast the GDP impact of the covid-19 epidemic but rather to shed light on the health and economic risk faced by workers across sectors. Moreover, we use a different approach. Whereas Barrot et al. (2020) compute the effects of the fall in labor supply on output, we study the effects of changes in final demand on employment. Our paper hence complements their paper by focusing on the demand side rather than on the supply side. Other recent work, which also focus on the supply side, analyse important dimensions that are absent from our analysis. For example, Luo and Tsang (2020) and **?** focus on the propagation of the shock across countries and the disruption in international supply chains. **other references???**. The economic fallout of the pandemic also reveals the essential role played by trade and transportation in the production network,

large for retail customers. See for example "Dumped Milk, Smashed Eggs, Plowed Vegetables: Food Waste of the Pandemic" - The New York April 11 2020 https://www.nytimes.com/2020/04/11/business/coronavirus-destroying-food.html which is usually neglected in the input-output literature.[3] The paper also brings a lesson beyond the analysis of the covid-19 pandemic. (+++)

1 A measure of sectors' exposure to health and economic risks

We study the inequality across workers in their exposure to the health and economic risk caused by the covid-19 pandemic. We measure the health risk faced by essential workers... and the economic risk faced by workers in social consumption sectors. Workers employed in those two groups of sectors are however not the only ones that are disproportionately affected by the pandemic, as people working for the suppliers of these sectors, and for the suppliers of their suppliers, and so on, will also be severely affected. A more complete picture of each sector's exposure to the economic and health risks must hence take into account the links across sectors coming from supply chains.

Methodology We use the input-output framework of Leontief (1936), which we calibrate on data from the World Input-Output Database (WIOD).[4] In addition to the intersectoral links coming from supply chains, we incorporate the links in final demand, caused by complementarities in the households' consumption. The main complementarity we focus on is that between distribution services (retail, wholesale and transportation) and the purchase of manufactured goods. We compute simple measures of the exposure to the health and economic risks that takes into account these supply and demand linkages The measures are calculated using the model's sectoral-employment prediction, under two shutdown scenarios that capture the disproportionate impact of the crisis on the essential and social-consumption sectors. The list of sectors directly affected is given in Appendix xxx. (or here?)

Exposure to health risk. The health-risk indicator is the proportion of each sectors' pre-epidemic employment needed *at the workplace* to meet the pre-pandemic final demand of essential goods and services. This corresponds to a strick lockdown scenario in which non-essential final demand is shut down. A sector's exposure to the health risk depends not only on the proportion of employment needed but also on whether the work needs to be done at the workplace or can be done at home. Our measure accounts for this dimension using the recent workable-from-home indicator proposed by Dingel and Neiman (2020). They

[3]The literature typically assumes that the elasticity between final demand is high and does not separate the different elasticity of substitution of trade and transportation. (examples are ......)

[4]Timmer et al. (2015)

find that, in the U.S., at most 36% of jobs can be done from home. We use their sectoral estimates, tele_i, to compute our health-risk indicator:

$$\mathsf{hrisk}_i = (1 - \mathsf{tele}_i)\frac{L_i}{\bar{L}_i},$$

where $\bar{L}_i$ is the pre-pandemic employment in sector i.

Exposure to economic risk. The economic-risk measure is the proportion of each sectors' pre-epidemic employment not needed after a 90% reduction in the households' demand for social consumption services:

$$\mathsf{ecorisk}_i = \frac{L_i}{\bar{L}_i} - 1.$$

Among the social consumptions sectors, retail and transportation services are only partially affected by this drastic reduction in household demand. Retail services are only partially affected because food and pharmacies are allowed to stay open during the shutdown, and so are online retailers. We assume that online retail and the retail sales of food and chemical products stays at their pre-pandemic levels.[5] Transportation services are only partially affected because food and chemical products and all the products sold online continued to be delivered to household during the shutdown. We assume that the transportation of food, chemical products and products sold online stays at their pre-pandemic levels.

Aggregate and regional indicators. The aggregate risk measure is computed by taking the weighted average of the sectoral risk measures:

$$\mathsf{hrisk} = \sum_i (\bar{L}_i/\bar{L})\mathsf{hrisk}_i,$$

where $\bar{L} = \sum_i \bar{L}_i$. We also consider the risk at the regional level s.

$$\mathsf{hrisk}_s = \sum_i (\bar{L}_{si}/\bar{L}_s)\mathsf{hrisk}_i,$$

where $\bar{L}_s = \sum_i \bar{L}_{si}$. The economic aggregate and regional risk indicators are defined similarly.

Employment calculations. To compute the sectoral employment L_i underlying the two risk measures, we use a simple input-output model calibrated to the two scenarios described above. We provide the details of the methodology in the Appendix. We differ from standard

[5] discuss reallocation.

input-output modeling by explicitly incorporating the demand linkages between trade, transportation and manufacturing products. These demand linkages create additional spillover relative to the standard input-output model. We model the household demand for retail and wholesale trade as

$$C_d^{hh} = \sum_i \theta_d^i C_i^{hh}, \tag{1}$$

where d denotes a trade sector (retail trade or wholesale trade), C_i^{hh} is the household demand for product i and θ_d^i is the distribution margin, with $\theta_d^i > 0$ only for manufactured products. The demand for transportation includes both transportation margins and the demand for passenger transit:

$$C_{\mathsf{transp}}^{hh} = \sum_i \theta_{\mathsf{transp}}^i C_i^{hh} + C_{\mathsf{passenger}}^{hh}, \tag{2}$$

where C_{transp}^{hh} denotes the household demand for transportation services and $C_{\mathsf{passenger}}^{hh}$ its demand for passenger transit services. The trade and transportation margins (θ_d^i, $\theta_{\mathsf{transp}}^i$) and the share of passenger transportation are calibrated using US data from the Bureau of Economic Analysis (2012).[6]

2 Results

We compute the health and economic indicators for the 43 countries of the WIOD. We have made available all detailed results for each country as well as a detailed description of the methodology online: githublink. We describe here the results for the U.S.

2.1 Which sectors are the most exposed to the health risk?

We estimate that 30% of U.S. workers are disproportionately exposed to health risks during lockdowns, and a third of these workers are working in non-essential sectors. Accounting for the supply and demand linkages is therefore key to evaluating the exposure to this risk. The decomposition of the aggregate risk by sector is given in Table 1. In addition to showing the large share accounted for by the workers in non-essential sectors, the table shows that public servants and health care workers account for the bulk of the US exposure.

We now turn to the risk faced by workers in each sector. As shown in Figure 1A, the health risk is the highest in three sectors providing essential goods and services (health, agriculture and food industry). Exposure in the other essential sectors is lower but still

[6] For all countries, food online and trade and transportation margin....

high (50%): chemical and public administration. Other essential sectors include post and telecommunication and finance with less than 25% risk. To better understand the low exposure of some of the essential sectors, we decompose the two dimensions of the health risk. In Figure 1B, we report the fraction of employment needed separately from the fraction of work that can be done from home. Sectors in the south-east quadrant are the most exposed and sectors in the north west quadrant are the least exposed. The figure shows that the financial and post-and-telecommunication sectors are exposed to a lower risk than other essential sectors because work in these sectors can be done from home and not because the sectors are supplying inputs to non-essential services. Figure 1A shows the spillover effects coming from supply chains and demand linkages. Workers in non-essential sectors are also at risk since maintaining the consumption of essential goods and services requires maintaining some production in other sectors as well (these sectors are shown in light blue). The most exposed sectors are retail, auxiliary transportation and inland transportation, and mining. Least exposed sectors are education, material and equipment and construction

2.2 Which sectors are the most exposed to the economic risk?

We estimate that 23% of U.S. workers are disproportionately exposed to the economic risk caused by the shutdown of social consumption. Here as well, about a third of these workers are in sectors not directly impacted but exposed through supply and demand linkages. The decomposition of the aggregate risk by sector is given in Table 2. In addition to showing the large share accounted for by the workers in sectors that are not providing social consumption, the table shows that workers in hotel and restaurants and in retail account for the bulk of the US exposure. Figure 3 shows that, as expected, the economic risk is high in the sectors' directly affected by the shutdown, such as hotels and restaurant, social and personal services, air transportation. Despite also being directly affected, workers in retail and inland transportation face a substantially lower risk than hotels-and-restaurants workers (risk of about 50% vs 70%). Retail services are only partially affected by the shutdown since food retail are excluded from the shutdown measure and some shopping can be done online. Inland transportation is less affected because the transportation of commodities continues even if passenger transit is shut down. The strongest spillover effects are experienced by the textile industry, petroleum and wholesale trade (risk =50%). The least affected sectors are health, public administration, construction, and education.

2.3 Which U.S. states are the most exposed?

The results are presented in Figure 4. Considering economic risk, the big majority of states have relatively similar exposure. Big outliers are Nevada and Hawaii on the high side and District of Columbia on the negative side. On the other hand, there is a much bigger spread in health risk of roughly 10 percentage points (corresponding to 40% difference between the smallest and largest health exposure), which suggests a need for targeted support for states.

If we remove the Nevada outlier, there is no relationship between the two effects.

Figure 1: Exposure to health risk

../codes/output/graph_hrisk1_by_sec_US-eps-converted-to.p

Note:

Figure 2: The two components of the exposure to health risk

../codes/output/graph_hrisk2_by_sec_US-eps-converted-to.p

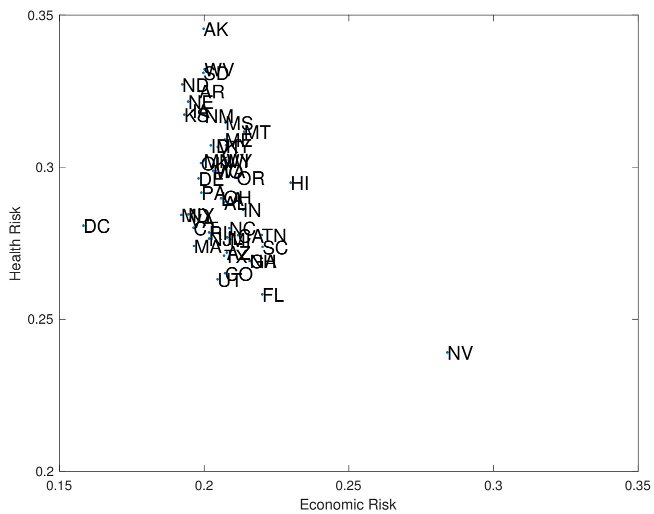
Note:

Figure 3: Exposure to economic risk

../codes/output/graph_ecorisk_by_sec_US-eps-converted-to.p

Note:

Figure 4: Health and economics risk across U.S. states



Note:

Table 1: Decomposition of the aggregate health risk

total	agr	food	chemical	utilities	telecom	finance	public	health	indirect
xx	0.011	0.007	0.003	0.003	0.002	0.007	0.087	0.091	0.092

Note:...

Table 2: Decomposition of the aggregate economic risk

total	hotels & rest.	inland transp.	air transp.	Social & pers.	Sale motor	Retail	indirect
xx	0.061	0.005	0.002	0.030	0.012	0.042	0.075

Note:...

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APPENDIX

A Methodology

Supply chains. The input-output framework allows us to compute how changes to final demand spill over to other sectors of the economy. Each sector's product is used either by final users (consumers, government, investment or exports) or as an input by other firms:

$$p_i Q_i = p_i C_i + \sum_j p_i X_{ji},$$

with Q_i gross output of sector i, C_i its use by final users, and X_{ji} its use by sector j. Note that final demand C_i is composed of the demand from household, C_i^{hh}, as well as investment and exports. This system of equations can be rewritten in matrix form:

$$\boldsymbol{q} = \boldsymbol{c} + \boldsymbol{M}'\boldsymbol{q},$$

with $q_i = p_i Q_i$, $c_i = p_i C_i$, and $M_{ij} = (p_j X_{ij})/(p_i Q_i)$. Hence, gross output is given by

$$\boldsymbol{q} = (\boldsymbol{I} - \boldsymbol{M}')^{-1}\boldsymbol{c}, \tag{A.1}$$

with $\boldsymbol{I}$ the identity matrix. The matrix $(\boldsymbol{I} - \boldsymbol{M}')^{-1}$ is called the total requirement matrix. The first column of the matrix gives how many dollars of each sector's product is required to produce one dollar of final output of the first sector's product.

Demand linkages. In addition to accounting for supply chains, we account for the complementarity between the demand for retail trade, wholesale and transportation, and the demand for manufacturing goods.

The household demand for retail and wholesale trade is

$$c_d^{hh} = \sum_i \theta_d^i c_i^{hh}, \tag{A.2}$$

where d denotes a distribution sector (retail trade or wholesale trade), c_i^{hh} is the value of household demand for product i and θ_d^i is the distribution margin, with $\theta_d^i > 0$ only for manufactured products. The demand for transportation includes both transportation margins and the demand for passenger transit:

$$c_{\mathsf{transp}}^{hh} = \sum_i \theta_{\mathsf{transp}}^i c_i^{hh} + c_{\mathsf{passenger}}^{hh}, \tag{A.3}$$

where c_{transp}^{hh} denotes the household demand for transportation services and $c_{\mathsf{passenger}}^{hh}$ its demand for passenger transit services.

Health risk measure. We measure the exposure to the health risk (during the lockdown) as the proportion of workers needed *at the workplace* to maintain the final use of essential goods and services to its pre-pandemic level.

1. We compute the vector of final output, $\boldsymbol{c}$, when only essential goods and services are maintained. Final demand is set equal to the prepandemic level for all essential sectors. All the non-essential sectors' final demand is set to zero, except for retail, wholesale and transportation. Although these three sectors are not essential sectors, their services are required to ensure the delivery of essential goods. We compute their final use from equation (**??**) where c_i is nonzero only for essential goods.

2. We use equation (A.1) to compute the gross output required in all the sectors to produce the vector of final demand .

3. Assuming that labor productivity is constant, the proportion of pre-pandemic employment needed is equal to the ratio of the gross-output to its pre-pandemic level.

4. Finally, we adjust the measure by subtracting the proportion of the employment needed that can be done from home using the Dingel and Neiman (2020) measure, as described in equation (**??**).

Economic risk measure We measure the exposure to the economic risk as the decline in employment following a 90% decline in the household demand for sectors providing social consumption. We assume that investment and exports remain constant and that the shutdown only affect the households' final demand, denoted by c_i^{hh}. The transportation and retail sectors are only partially affected by this shock. The retail sales of agricultural, food, and chemical products are spared from the shutdown, capturing the fact that households that foods stores and pharmacies remain open. Moreover, online retailers are not affected by the shock either. This hence has consequences on the transportation services required to purchase agricultural, food and chemical products and products purchased online. Retail is a specific case also because the shutdown of stores has repercussions for the demand of manufactured goods. The pre-pandemic variables are denoted $\overline{q}$, $\overline{c}$ and $\overline{c}^{hh}$.

1. We compute the vector of final demand, $\boldsymbol{c}$, following this drastic demand shock. Final demand change is not the same across sectors.

(a) For social-consumption sectors except retail, wholesale trade and transportation, final demand is:

$$\frac{c_i}{\bar{c}_i} = -0.9\frac{\bar{c}_i^{hh}}{\bar{c}_i} + 1.$$

(b) For retail trade, final demand is

$$\frac{c_{\mathsf{rtrade}}}{\bar{c}_{\mathsf{rtrade}}} = -0.9(1-\phi_{\mathsf{rtrade\_open}})(1-\phi_{\mathsf{rtrade\_online}})\frac{\bar{c}^{hh}_{\mathsf{rtrade}}}{\bar{c}_{\mathsf{rtrade}}} + 1$$

where $\phi_{\mathsf{rtrade\_open}} = \bar{c}^{hh}_{\mathsf{rtrade\_open}}/\bar{c}^{hh}_{\mathsf{rtrade}}$ denotes the share of retail trade services for the procurement of agricultural, food, and chemical products, and $\phi_{\mathsf{rtrade\_online}} = \bar{c}^{hh}_{\mathsf{rtrade\_online}}/\bar{c}^{hh}_{\mathsf{rtrade}}$ denotes the share of online retail trade services.

(c) For transportation services, the final demand is

$$\frac{c_{\mathsf{transp}}}{\bar{c}_{\mathsf{transp}}} = -0.9\left[\phi_{\mathsf{passenger}}+(1-\phi_{\mathsf{passenger}})(1-\phi_{\mathsf{transp\_open}})(1-\phi_{\mathsf{rtrade\_online}})\right]\frac{\bar{c}^{hh}_{\mathsf{transp}}}{\bar{c}_{\mathsf{transp}}}+1$$

where $\phi_{\mathsf{transp\_open}} = \bar{c}^{hh}_{\mathsf{transp\_open}}/\bar{c}^{hh}_{\mathsf{transp}}$ denotes the share of transportation services for the procurement of agricultural, food, and chemical products, and $\phi_{\mathsf{passenger}} = \bar{c}^{hh}_{\mathsf{passenger}}/\bar{c}^{hh}_{\mathsf{transp}}$ denotes the share of passenger transit.

(d) For wholesale trade, the final demand is

$$\frac{c_{\mathsf{wtrade}}}{\bar{c}_{\mathsf{wtrade}}} = -0.9(1-\phi_{\mathsf{wtrade\_open}})(1-\phi_{\mathsf{rtrade\_online}})\frac{\bar{c}^{hh}_{\mathsf{wtrade}}}{\bar{c}_{\mathsf{wtrade}}} + 1,$$

where $\phi_{\mathsf{wtrade\_open}} = \bar{c}^{hh}_{\mathsf{wtrade\_open}}/\bar{c}^{hh}_{\mathsf{wtrade}}$ denotes the share of wholesale trade services for the procurement of agricultural, food, and chemical products.

(e) For all manufacturing goods except agricultural, food and chemical products: The demand for manufactured goods is proportional to the trade services (equation (**??**)), therefore the decline in the demand for non-food and non chemical products is

$$\frac{c_i}{\bar{c}_i} = -0.9(1-\phi_{\mathsf{rtrade\_online}})\frac{\bar{c}_i^{hh}}{\bar{c}_i} + 1$$

(f) Final demand is equal to the sector's pre-pandemic level for all other sectors.

2. We use equation (A.1) to compute the gross output implied by the new vector $\boldsymbol{c}$.

3. Assuming that labor productivity is constant, the employment loss is equal to the ratio of the decline in gross output relative to the pre-pandemic level.

B Data and calibration

All data used for the calibration are publically available.

Input-Output data. To calibrate the input-output parameters, $\boldsymbol{M}$, and the household consumption share, $\overline{c}_i^{hh}/\overline{c}_i$, we use data from the World Input Output data (2016 release), aggregated according to classification given in Table 3.

Sectoral employment. The sectoral employment data is obtained from the WIOD Socio-Economic Account (2016 release). We use the number of persons engaged in 2014 (latest year available). For state-level sectoral employment, we use employment data from the BEA: Table SAEMP25N Total Full-Time and Part-Time Employment by NAICS Industry. This data is in NAICS classification. We use crosswalk to ISIC and then from ISIC to WIOD to use the input-output data.

Transportation and trade margins. To calibrate the shares $\phi_{\mathsf{rtrade\_open}}$, $\phi_{\mathsf{wtrade\_open}}$, $\phi_{\mathsf{transp\_open}}$, and θ_i, we use US data on transportation and trade margins published by the BEA. latest available year is 2012. We apply these margins to all the countries of the sample. (all transportation cost but we allocate everything to inland transportation)

Online trade. For the share of online trade, $\phi_{\mathsf{rtrade\_online}}$, we use the estimates of the U.S Census 2017 Annual Retail Trade Survey : 9.1%

!!!!! We assume that it is equal to 5% for the rest of the countries.

Work-from-home Indicator. We use the workable from home index computed by Dingel and Neiman (2020), computed on the US, that we apply to all countries. The indicator shows the fraction of employment in each sector that can be *potentially* done from home, inferred from the characteristics of the occupations in the sector. We use their benchmark indicator (which is weighted by employment) It does not measure whether these activities are being *effectively* done at home during the lockdown.

C Connection with Osotimehin and Popov (2020)

Table 3: List of sectors

		Essential	Social Cons
AtB	Agriculture, Hunting, Forestry and Fishing	×	
C	Mining and Quarrying		
15t16	Food, Beverages and Tobacco	×	
17t19	Textiles and Textile Products; Leather and Leather Products		
20	Wood and Products of Wood and Cork		
21t22	Pulp, Paper, Paper , Printing and Publishing		
23	Coke, Refined Petroleum and Nuclear Fuel		
24	Chemicals and Chemical Products	×	
25	Rubber and Plastics		
26	Other Non-Metallic Mineral		
27t28	Basic Metals and Fabricated Metal		
29	Machinery, Nec		
30t33	Electrical and Optical Equipment		
34t35	Transport Equipment		
36t37	Manufacturing, Nec; Recycling		
E	Electricity, Gas and Water Supply	×	
F	Construction		
50	Sale and Repair of Motor Vehicles; Retail Sale of Fuel		×
51	Wholesale Trade and Commission Trade, Except of Motor Vehicles		
52	Retail Trade, Except of Motor Vehicles and Motorcycles		×
H	Hotels and Restaurants		×
60	Inland Transport		×
61	Water Transport		
62	Air Transport		×
63	Other Supporting and Auxiliary Transport Activities		
64	Post and Telecommunications	×	
J	Financial Intermediation	×	
70	Real Estate Activities		
71t74	Renting of M&Eq and Other Business Activities		
L	Public Admin and Defence; Compulsory Social Security	×	
M	Education		
N	Health and Social Work	×	
O	Other Community, Social and Personal Services		×
P	Private Households with Employed Persons		