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How many jobs can be done at home?☆

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ABSTRACT

Evaluating the economic impact of "social distancing" measures taken to arrest the spread of COVID-19 raises a fundamental question about the modern economy: how many jobs can be performed at home? We classify the feasibility of working at home for all occupations and merge this classification with occupational employment counts. We find that 37% of jobs in the United States can be performed entirely at home, with significant variation across cities and industries. These jobs typically pay more than jobs that cannot be done at home and account for 46% of all US wages. Applying our occupational classification to 85 other countries reveals that lower-income economies have a lower share of jobs that can be done at home.

1. Introduction

Evaluating the economic impact of "social distancing" measures taken to arrest the spread of COVID-19 raises a number of fundamental questions about the modern economy: How many jobs can be performed at home? What share of total wages are paid to such jobs? How does the scope for working from home vary across occupations, cities, industries, and countries?

We use surveys describing the typical experience of US workers in nearly 1000 occupations to classify each occupation as able or unable to be done entirely from home. We find that 37% of jobs in the United States can be performed entirely at home, with significant variation across cities and industries. These jobs typically pay more than jobs that cannot be done at home and account for 46% of all US wages.

Applying our occupational classification to 85 other countries reveals that lower-income economies have a lower share of jobs that can be done at home. Developing and emerging market countries with per capita GDP levels below one-third of US levels may only have half as many jobs that can be done from home.

Our measure, which was constructed using pre-pandemic data, correlates well with early estimates of the share of workers who have in fact worked from home during the crisis. Our online replication package reproduces and details all results summarized in the paper.[1] We hope our work proves useful in identifying sectors that can safely operate without spreading the virus, in characterizing which workers face greater economic and health risks, and in pondering the likelihood of a future, after the public health crisis abates, in which remote working is far more common.

We start in Section 2 describing how we construct our work-from-home measure using surveys from the Occupational Information Network (O*NET). Section 3 reports the results of merging this occupation-level measure with information from the US Bureau of Labor Statistics (BLS) on the prevalence of each occupation in the aggregate US economy as well as in particular metropolitan areas and industries. In Section 4, we merge our classification with occupational employment data for many countries provided by the International Labour Organization (ILO) to reveal a positive relationship between the share of jobs that can be done at home and a country's level of economic development. Section 5 reviews the related literature, including recent efforts to measure work-from-home behavior during the initial months of the crisis. Section 6 concludes.

2. Classification of occupations

We classify the feasibility of working at home for all occupations using the responses to two surveys included in release 24.2 of the

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[1] All code and data are available at https://github.com/jdingel/DingelNeiman-workathome. Our code makes it easy for users to explore alternative assumptions about whether any given occupation can be done from home.

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database administered by O*NET, a program sponsored by the US Department of Labor to improve our understanding of the nature of work and the workforce. The O*NET database contains hundreds of standardized and occupation-specific descriptors on almost 1000 occupations. The first survey is called the Work Context Questionnaire and includes questions aiming to capture the "physical and social factors that influence the nature of work" such as interpersonal relationships, physical work conditions, and structural job characteristics. The second survey is called the Generalized Work Activities Questionnaire and includes questions aiming to capture the "general types of job behaviors occurring on multiple jobs" such as the input of information, interaction with others, mental processes, and work output. The median occupation had 26 respondents for each Work Context question and 25 respondents for each Generalized Work Activities question.

If any of the following conditions in the Work Context survey responses are true for an occupation, we code that occupation as one that cannot be performed at home:

- Average respondent says they use email less than once per month (Q4)
- Average respondent says they deal with violent people at least once a week (Q14)
- Majority of respondents say they work outdoors every day (Q17 & Q18)
- Average respondent says they are exposed to diseases or infection at least once a week (Q29)
- Average respondent says they are exposed to minor burns, cuts, bites, or stings at least once a week (Q33)
- Average respondent says they spent majority of time walking or running (Q37)
- Average respondent says they spent majority of time wearing common or specialized protective or safety equipment (Q43 & Q44)

If any of the following conditions in the Generalized Work Activities survey responses are true, we code the occupation as one that cannot be performed at home:

- Performing General Physical Activities is very important (Q16A)
- Handling and Moving Objects is very important (Q17A)
- Controlling Machines and Processes [not computers nor vehicles] is very important (Q18A)
- Operating Vehicles, Mechanized Devices, or Equipment is very important (Q20A)
- Performing for or Working Directly with the Public is very important (Q32A)
- Repairing and Maintaining Mechanical Equipment is very important (Q22A)
- Repairing and Maintaining Electronic Equipment is very important (Q23A)
- Inspecting Equipment, Structures, or Materials is very important (Q4A)

We then merge this information with BLS data on the number and wages of workers in each standard occupational classification (SOC) code in the country as a whole as well as in metropolitan areas and industries.

Table A.1 in Appendix A summarizes the contribution of each O*NET survey question to our classification of which occupations can be done from home in two ways. First, the columns labeled "Cannot do at home" report the shares of jobs (unweighted and weighted by their wages) that satisfy each condition causing us to classify an occupation as unable to be performed entirely at home. "Majority of time walking or running" and "majority of time wearing protective or safety equipment" are the two conditions that are satisfied most frequently. Multiple conditions can hold for any single occupation, so the sum of these shares far exceeds the share of jobs that we infer cannot be performed entirely at home. Second, the columns labeled "Sole condition" consider the 14% of employment held by occupations where a single condition alone renders the occupation unable to be done from home. Among those cases, "performing or working directly with the public" is the condition that mostly commonly causes this classification.

To check the sensibility of our algorithm, we each manually assigned values of 0, 0.5, or 1 to each 5-digit SOC code based on introspection and then averaged our judgments. Our two assessments about whether an occupation could be done at home or not agreed in about 85% of the cases, and our disagreements were only rarely greater than 0.5. The scores generated by this manual assignment are highly correlated with our O*NET-derived classification, though we manually assigned slightly fewer occupations as able to work from home. Appendix Table A.2 reports the 5-digit occupation codes for which the two measures differ by 0.8 or more.

3. Results for the United States

Our classification implies that 37% of US jobs can plausibly be performed at home. Our classification uses job characteristics that clearly rule out the possibility of working entirely from home and neglects many characteristics that would merely make working from home difficult.[2] It is, therefore, an upper bound on what might be feasible and greatly exceeds the share of jobs that in fact have been performed entirely at home in recent years. According to the 2018 American Time Use Survey, less than a quarter of all full-time workers work at all from home on an average day, and even those workers typically spend well less than half of their working hours at home.

Table 1 reports the share of jobs that can be performed at home when we aggregate our occupational classification to the major group (2-digit) level. There is significant variation across occupations. Managers, educators, and those working in computers, finance, and law are largely able to work from home. Farm, construction, and production workers cannot.

Workers in occupations that can be performed at home typically earn more. If we assume all occupations involve the same number of hours of work, the 37% of US jobs that can plausibly be performed at home account for 46% of all wages. Fig. 1 plots the share of jobs that can be done at home in each major occupation group against its median hourly wage.[3] There is a clear positive relationship between our work-from-home measure and the typical hourly earnings at the occupation level. Mongey et al. (2020) use a variant of our occupational classification to study the characteristics of individuals who cannot work at home. They find that these individuals are more likely to be lower-income, lack a college degree, rent their dwellings, be non-white, and lack employer-provided health insurance.

There is significant variation in the share of jobs that can be done at home across US cities. The first two columns in Table 2 report the top ten and bottom ten metropolitan statistical areas (from among the 100 largest, by employment) in terms of the share of jobs (unweighted and weighted by wage) that could be done at home. More than 45% of jobs in San Francisco, San Jose, and Washington, DC could be performed at home, whereas this is the case for 30% or less of the jobs in Fort Myers, Grand Rapids, and Las Vegas. Fig. A.1 in Appendix A depicts the geographic distribution of our unweighted measure of the share of jobs that can be done at home across metropolitan areas.

The last four columns of Table 2 list for each city the characteristics analyzed by Mongey et al. (2020). Across all metropolitan areas, the share of jobs that can be performed at home is strongly positively correlated with median household income (0.53) and its share of residents who attained a college degree (0.71) and negatively correlated with its home ownership rate (−0.31) and its share of residents who are

[2] For example, our classification codes 98% of the 8.8 million teachers in the United States as able to work from home, which seems sensible given the large number of schools currently employing remote learning. Re-coding these teaching jobs as unable to be performed from home would, in the aggregate, reduce our estimate of the share of jobs that can be done at home by about six percentage points.

[3] In an earlier blogpost, Avdiu and Nayyar (2020) plotted an equivalent relationship between our measure of the share of jobs that can be done at home and the occupation's income decile. Costa Dias et al. (2020) provide related evidence for the United Kingdom.

Table 1
Share of jobs that can be done at home, by occupation's major group.

Occupation		O*NET-derived baseline	Manual assignment
15	Computer and Mathematical Occupations	1.00	1.00
25	Education, Training, and Library Occupations	0.98	0.85
23	Legal Occupations	0.97	0.84
13	Business and Financial Operations Occupations	0.88	0.92
11	Management Occupations	0.87	0.84
27	Arts, Design, Entertainment, Sports, and Media Occupations	0.76	0.57
43	Office and Administrative Support Occupations	0.65	0.51
17	Architecture and Engineering Occupations	0.61	0.88
19	Life, Physical, and Social Science Occupations	0.54	0.36
21	Community and Social Service Occupations	0.37	0.50
41	Sales and Related Occupations	0.28	0.21
39	Personal Care and Service Occupations	0.26	0.00
33	Protective Service Occupations	0.06	0.00
29	Healthcare Practitioners and Technical Occupations	0.05	0.06
53	Transportation and Material Moving Occupations	0.03	0.00
31	Healthcare Support Occupations	0.02	0.00
45	Farming, Fishing, and Forestry Occupations	0.01	0.00
51	Production Occupations	0.01	0.00
49	Installation, Maintenance, and Repair Occupations	0.01	0.00
47	Construction and Extraction Occupations	0.00	0.00
35	Food Preparation and Serving Related Occupations	0.00	0.00
37	Building and Grounds Cleaning and Maintenance Occupations	0.00	0.00

NOTES: This table reports the share of jobs that can be done at home for each 2-digit SOC major group. We aggregate our 6-digit SOC classification using the employment counts in the BLS's 2018 Occupational Employment Statistics. The O*NET-derived classification in the first column is the basis for all subsequent results reported in this paper. The results using the manual assignment, reported in the second column, are available in our replication package.

white (−0.12). The fact that the latter two cross-city correlations have the opposite sign of the corresponding cross-individual correlations reported by Mongey et al. (2020) underlines the importance of distinguishing between people and places when describing variation in economic conditions.

Table 3 aggregates our classification to the 2-digit industry level. Whereas most jobs in finance, corporate management, and professional and scientific services could plausibly be performed at home, very few jobs in agriculture, hotels and restaurants, or retail could be.

4. Results for countries other than the United States

To produce estimates for other countries, we merge our work-from-home classification of each 6-digit SOC based on the US O*NET surveys with the 2008 edition of the international standard classification of occupations (ISCO) at the 2-digit level. The ISCO standard for classifying occupations was adopted by the ILO, which compiles information on employment in each 2-digit ISCO for a large number of countries. We employ a crosswalk between the SOC and ISCO schemes from the US BLS.

The mapping of (6-digit) SOCs to (2-digit) ISCOs is many-to-many, so determining the share of jobs that can be done from home in any ISCO is not trivial. To summarize, our classification of whether a 6-digit SOC can be done at home is determined entirely using only US data, our mapping of 6-digit SOCs to 2-digit ISCOs is common to all countries, and the weighted average for each 2-digit ISCO is country-specific. For more details, see Appendix A.

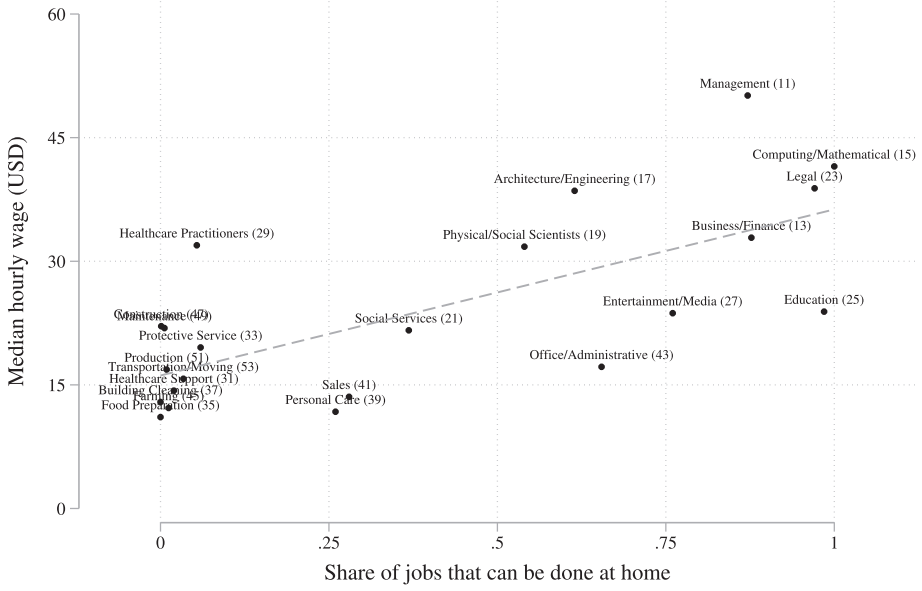


Fig. 1. Jobs that can be done at home typically earn higher wages. NOTES: This graph depicts the median hourly wage and share of jobs that can be done at home for each 2-digit SOC major group. We compute these shares using our O*NET-derived classification of occupations that can be done at home and employment counts in the BLS's 2018 Occupational Employment Statistics. The latter is the source of median hourly wages.

Table 2
Share of jobs that can be done at home, by metropolitan area.

	Share of jobs		Metropolitan characteristics			
	Unweighted	Weighted by wage	BA share	Median income	White share	Owner share
Top ten						
San Jose-Sunnyvale-Santa Clara, CA	0.51	0.66	0.50	115	0.46	0.57
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.50	0.64	0.51	101	0.54	0.63
Durham-Chapel Hill, NC	0.46	0.57	0.47	60	0.62	0.60
Austin-Round Rock, TX	0.46	0.58	0.44	73	0.77	0.58
San Francisco-Oakland-Hayward, CA	0.45	0.58	0.49	100	0.50	0.54
Boston-Cambridge-Nashua, MA-NH	0.44	0.55	0.47	86	0.76	0.62
Bridgeport-Stamford-Norwalk, CT	0.44	0.58	0.47	93	0.73	0.67
Hartford-West Hartford-East Hartford, CT	0.44	0.53	0.39	76	0.76	0.67
Salt Lake City, UT	0.43	0.53	0.34	71	0.80	0.67
Des Moines-West Des Moines, IA	0.43	0.53	0.37	69	0.87	0.69
Bottom ten						
Baton Rouge, LA	0.30	0.36	0.28	57	0.59	0.68
Las Vegas-Henderson-Paradise, NV	0.30	0.37	0.24	57	0.61	0.53
Riverside-San Bernardino-Ontario, CA	0.30	0.35	0.21	62	0.61	0.63
Scranton–Wilkes-Barre–Hazleton, PA	0.30	0.36	0.25	52	0.90	0.68
McAllen-Edinburg-Mission, TX	0.30	0.31	0.18	38	0.88	0.68
Grand Rapids-Wyoming, MI	0.29	0.37	0.32	61	0.84	0.73
Lancaster, PA	0.29	0.36	0.27	64	0.89	0.68
Bakersfield, CA	0.29	0.36	0.16	52	0.75	0.58
Stockton-Lodi, CA	0.29	0.33	0.18	61	0.56	0.56
Cape Coral-Fort Myers, FL	0.28	0.34	0.28	55	0.85	0.71

NOTES: This table reports the metropolitan areas with the largest and smallest shares of jobs that can be done at home among the 100 largest metropolitan areas (as ranked by total employment). The first two columns report these shares unweighted and weighted by average wages. The remaining four columns report the metropolitan areas' fraction of population 25 years or older whose educational attainment is bachelor's degree or higher (series B15003), median household income in thousands of (2018) US dollars (B19013), fraction of residents whose race is "white alone" (B02001), and fraction of housing units that are owner-occupied (B25003), as reported in the American Community Survey 2014–2018 5-Year Estimates for metropolitan areas.

Fig. 2(a) plots our measure of the share of jobs that can be done at home in each country against its per capita income. We compute the jobs share using the most recent employment data available from the ILO after restricting attention to countries that report employment data for 2015 or later. The income measure is GDP per capita in 2019 adjusted for purchasing power parity (PPP). The figure reveals a clear positive relationship between income levels and the shares of jobs that can be done from home. While fewer than 25% of jobs in Mexico and Turkey could be performed at home, this share exceeds 40% in Sweden and the United Kingdom.[4] Note that our classification assesses the ability to perform a particular occupation from home based on US data and that the nature of an occupation likely varies across economies with different income levels. With that caveat, the striking pattern in Fig. 2(a) suggests that developing economies and emerging markets may face an even greater challenge in continuing to work during periods of stringent social distancing.

Table 3
Share of jobs that can be done at home, by industry.

	Unweighted	Weighted by wage
Educational Services	0.83	0.71
Professional, Scientific, and Technical Services	0.80	0.86
Management of Companies and Enterprises	0.79	0.86
Finance and Insurance	0.76	0.85
Information	0.72	0.80
Wholesale Trade	0.52	0.67
Real Estate and Rental and Leasing	0.42	0.54
Federal, State, and Local Government	0.41	0.47
Utilities	0.37	0.41
Other Services (except Public Administration)	0.31	0.43
Administrative and Support and Waste Management and Remediation Services	0.31	0.43
Arts, Entertainment, and Recreation	0.30	0.36
Mining, Quarrying, and Oil and Gas Extraction	0.25	0.37
Health Care and Social Assistance	0.25	0.24
Manufacturing	0.22	0.36
Transportation and Warehousing	0.19	0.25
Construction	0.19	0.22
Retail Trade	0.14	0.22
Agriculture, Forestry, Fishing and Hunting	0.08	0.13
Accommodation and Food Services	0.04	0.07

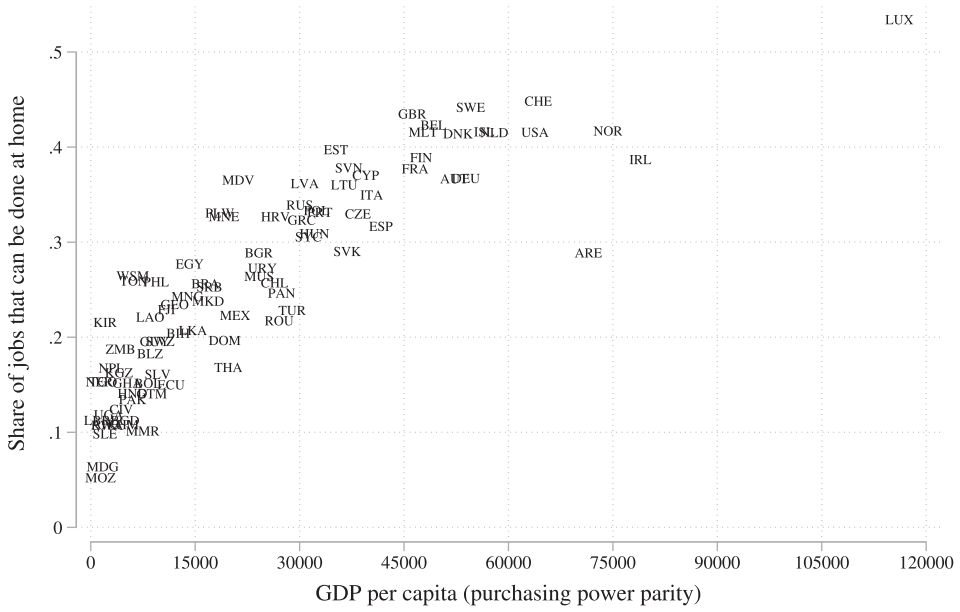
NOTES: This table reports the share of jobs that can be done at home in each 2-digit NAICS sector. We compute these shares using our O*NET-derived classification of occupations that can be done at home and the occupational composition of each 2-digit sector's employment by 6-digit SOC in the BLS's 2018 Occupational Employment Statistics.

5. Related literature and real-time measures

Our coding of occupational characteristics to determine how flexibly certain jobs can be relocated has clear roots in the exercise in Blinder (2009) that assessed the "offshorability" of jobs. While our approach is similar, we cannot simply use Blinder's index because the feasibility of working from home is quite distinct from offshorability. For example, Blinder and Krueger (2013) write, "we know that all textile manufacturing jobs in the United States are offshorable." Textile manufacturing jobs, of course, cannot be performed at home using current production technologies.

Several papers document the prevalence and consequences of working from home. Oettinger (2011) investigates the growth in home-based work from 1980 to 2000, as reported in the US Census of Population, and relates these changes to the frequency of face-to-face interactions, as measured in an O*NET survey. Bloom et al. (2015) estimate the effects of home-based work on employees' productivity using a randomized controlled trial within a Chinese travel agency. Mas and Pallais (2020) offer a detailed and helpful overview of the prevalence, features, and demand for alternative working arrangements, including the ability to work from home. Citing the Quality of Worklife Survey and the Understanding American Study, they report that less than 13% of full- and part-time jobs have a formal "work-from-home" arrangement, even though twice that

[4] The share for the United States in Fig. 2(a) is 41%. This differs from the 37% reported in the main text due to the different weights implicit in our use of ILO data rather than BLS data.



(a) Variation by GDP (PPP) per capita

(b) Comparison with real-time survey data

Fig. 2. Cross-country variation in share of jobs that can be done at home. NOTES: Panel (a) depicts the share of jobs that can be done at home and GDP per capita for 86 economies. The shares are computed by mapping our classification of 6-digit SOC codes to 2-digit ISCO codes using country-specific weights as described in Appendix A. We use the most recent 2-digit ISCO employment counts available from the ILO for 2015 or later. GDP per capita in 2019 (at current prices and translated into international dollars using PPP exchange rates) comes from the International Monetary Fund. Panel (b) compares our country-level measures to the share of Eurofound survey respondents in 26 European countries reporting that they started to work from home due to COVID-19.

amount work often from home.[5] According to Mas and Pallais, the "median worker reports that only 6 percent of their job could be feasibly done from home," but plenty of jobs, including those in "computer and mathematical" and "business and financial operations" can do a majority of their work from home. We note that, in the context of the response to COVID-19, there is an important distinction between being able to do most and all of one's work at home.

Saltiel (2020) estimates the share of jobs that can be done from home in ten developing economies using surveys of occupations in those ten lower-income contexts. Following our approach, he uses information on workers' tasks in the Skills Toward Employability and Productivity (STEP) survey to define the feasibility of working from home.

[5] United Kingdom Office for National Statistics (2020) surveys conducted in 2019 found that while 27% of the U.K. workforce said they've previously worked from home, only about 5% said they mainly work from home. Whether people have actually worked from home differs conceptually from the focal question of this paper, which is whether these people could feasibly work from home.

The advantage of using these data is that it addresses the concerns raised by defining the feasibility of performing a job at home based on the US economic context.[6] Saltiel (2020) finds that few jobs can be done at home, ranging from 5% to 23% across the ten economies, and reports a positive correlation between this share and GDP per capita. Five of the economies covered by Saltiel (2020) also appear in our Section 4 results. Our results for Bolivia, Georgia, and Macedonia are within a few percentage points of the numbers Saltiel reports. Our results for Ghana and Laos are notably higher, 14% and 21% versus roughly 5% and 9%, respectively. In addition to differences in the O*NET and STEP survey questions, these differences may be attributable to the ILO data and STEP survey differing in temporal (2017 vs 2012–2013) and geographic (national vs urban) coverage.

In addition to characterizing who works in the jobs that can be done at home, Mongey et al. (2020) use O*NET data to produce job-level measures of physical proximity in the workplace. Baker (2020) and Koren and Petö (2020) also use O*NET survey data to construct measures of which occupations cannot be done at home or will be affected by social distancing.

Recent research uses surveys to produce real-time measures of working from home. For the United States, Brynjolfsson et al. (2020) report that nearly half of the individuals they surveyed said they were working from home during the first week of April 2020, while Bick et al. (2020) report that 35% of their US respondents worked entirely from home in May 2020. Examining cross-industry variation, Bick et al. (2020) find that the share of respondents in an industry working from home in May is highly correlated with our estimate of the feasible share for that industry. The Decision Maker Panel, an entity set up by the Bank of England, conducts a real-time survey of U.K. firms and shows that 37% of employees were reported to be working from home in both April and May 2020.[7] Finally, Eurofound (2020) tabulates results from a survey of more than 85,000 people and reports for 26 European Union countries the share of employees who started working from home as a result of COVID-19. Fig. 2(b) plots these results against our country-level estimates discussed in Section 4 and shows a very close correspondence.

6. Conclusion

Due to COVID-19, many employees are unable to travel to work. Identifying which jobs cannot be performed from home is useful as policymakers try to target social insurance payments to those that most need them. Likewise, the share of jobs that could be performed at home is an important input to predicting the economy's performance during this or subsequent periods of social distancing.[8] We note, however, that it is not straightforward to use these values to estimate the share of output that would be produced under stringent stay-at-home policies. An individual worker's productivity may differ considerably when working at home rather than her usual workplace. More importantly, there are likely important complementarities between jobs that can be performed at home and those that cannot. Incorporating our measures together with these richer considerations is a fruitful avenue for future research.

Appendix A

This Appendix describes how we map 6-digit SOC codes to 2-digit ISCO codes for our analysis of countries other than the United States. It also presents one figure and two tables that are mentioned in the main text.

A.1. Mapping to international occupational codes

This section describes how we map 6-digit SOCs to 2-digit ISCOs. Ideally, each SOC would map to a unique ISCO, so that we could simply calculate the ISCO share as a weighted average of SOC shares, using the SOCs' US employment counts as the weights. However, given the many-to-many mapping, this approach would put disproportionate weight on those SOCs that happen to map to a larger number of ISCOs. To address this issue, when an SOC maps to multiple ISCOs, we allocate the SOC's US employment weight across the ISCOs in proportion to the ISCOs' employment shares in the "target" country. For instance, if a particular SOC has 100 US employees and is associated with two ISCOs that have respective totals of 3000 and 1000 employees in a country, we allocate 75 of the SOC's US employees to the larger ISCO and 25 to the smaller one. Those values of 75 and 25 are then used as that SOC's weight when calculating the average across all SOCs within each ISCO for that country. Since 2-digit ISCO employment shares vary by country, the reported share of jobs that can be done from home in each 2-digit ISCO differs across countries.

A.2. Additional exhibits

Table A.1

O*NET survey condition Contributions of O*NET survey questions to classification of occupations.	Cannot do at home		Sole condition	
	Jobs	Wages	Jobs	Wages
GWA23: Repairing and Maintaining Electronic Equipment	0.01	0.01	0.000	0.000
WC14: Deal with violent people weekly	0.01	0.01	0.003	0.003
GWA22: Repairing and Maintaining Mechanical Equipment	0.02	0.02	0.000	0.000
WC33: Exposed to minor burns, cuts, bites, or stings weekly	0.02	0.02	0.000	0.000
WC17/18: Majority of respondents say outdoors every day	0.04	0.04	0.000	0.000
GWA18: Controlling Machines and Processes	0.05	0.04	0.000	0.000

[6] Gottlieb et al. (2020) apply our classification of occupations to labor force and household surveys in 57 countries. In line with our findings, they report that smaller shares of jobs can be done at home in poorer economies. They note, however, that small family farms in principle could operate while limiting social interactions and obeying stay-at-home orders. Classifying all farming jobs as such substantially increases the estimated share of jobs that can be done at home in some poor economies with large agricultural employment shares. Stratton (2020) applies our classification to data for Australia. Barbieri et al. (2020) use the Italian equivalent of the O*NET surveys and a similar set of questions to produce a work-from-home measure for Italy. Boeri et al. (2020) combine O*NET information, a survey of the Italian Statistical Office and INAP, and their own assessment to estimate how many jobs can potentially be carried out remotely for six European economies.

[7] Adams-Prassl et al. (2020) also used surveys in Germany, the United Kingdom, and the United States to conclude that workers that are less able to do tasks at home are more likely to experience reduced hours, lower earnings, and job losses. Cajner et al. (2020) use payroll-processing data for the United States and find a more modest correlation between an industry's job losses and our measure of the feasibility of working from home.

[8] Our or similar measures of the capacity for working from home are used to calibrate quantitative models of the pandemic including Bonadio et al. (2020), Jones et al. (2020), Kaplan et al. (2020), and Rampini (2020).

Table A.1 (*continued*)

O*NET survey condition	Cannot do at home		Sole condition	
	Jobs	Wages	Jobs	Wages
GWA20: Operating Vehicles, Mechanized Devices, or Equipment	0.06	0.06	0.010	0.007
WC29: Exposed to diseases or infection weekly	0.08	0.11	0.001	0.004
GWA17: Handling and Moving Objects	0.09	0.07	0.001	0.001
GWA16: Performing General Physical Activities	0.11	0.09	0.002	0.002
GWA4: Inspecting Equipment, Structures, or Materials	0.11	0.12	0.000	0.000
WC4: Use email less than once per month	0.17	0.11	0.006	0.003
GWA32: Performing for or Working Directly with the Public	0.22	0.18	0.086	0.063
WC37: Majority of time walking or running	0.29	0.20	0.001	0.001
WC43/44: Majority of time wearing protective or safety equipment	0.39	0.35	0.027	0.033

Notes: This table summarizes the contribution of each O*NET survey question to our classification of occupations. The questions come from the Work Context ("WC") and Generalized Work Activities ("GWA") survey. For each question, the first two columns report the fraction of employment and wage-weighted employment that the survey question says cannot be performed entirely at home. Multiple conditions can hold for any single occupation, so the sum of these shares far exceeds the 63% of jobs that we infer cannot be performed entirely at home. The third and fourth columns report the fraction of employment and wage-weighted employment for which the survey question is the only question indicating that these occupations cannot be performed entirely at home. In total, 14% of employment is in occupations that a single survey condition implies cannot be performed at home. All employment and wage data are from the BLS's 2018 Occupational Employment Statistics.

Table A.2
Occupations for which O*NET-derived and manual measures differ considerably.

Occupation		O*NET-derived	Manual
		Baseline	assignment
13-113	Fundraisers	0.00	1
13-208	Tax Examiners, Collectors and Preparers, and Revenue Agents	0.00	1
19-305	Urban and Regional Planners	0.00	1
41-304	Travel Agents	0.00	1
43-202	Telephone Operators	0.00	1
43-418	Reservation and Transportation Ticket Agents and Travel Clerks	0.00	1
13-207	Credit Counselors and Loan Officers	0.10	1
17-302	Engineering Technicians, Except Drafters	0.17	1
39-301	Gaming Services Workers	0.85	0
25-205	Special Education Teachers	0.92	0
27-202	Athletes, Coaches, Umpires, and Related Workers	0.93	0
25-201	Preschool and Kindergarten Teachers	1.00	0
25-402	Librarians	1.00	0
25-403	Library Technicians	1.00	0
27-402	Photographers	1.00	0
33-902	Private Detectives and Investigators	1.00	0
39-303	Ushers, Lobby Attendants, and Ticket Takers	1.00	0
39-901	Childcare Workers	1.00	0
39-904	Residential Advisors	1.00	0
43-101	First-Line Supervisors of Office and Administrative Support Workers	1.00	0
43-502	Couriers and Messengers	1.00	0
43-905	Mail Clerks and Mail Machine Operators, Except Postal Service	1.00	0
43-907	Office Machine Operators, Except Computer	1.00	0

Notes: This table reports all 5-digit SOC codes for which the O*NET-derived classification and our manual assignment differ by 0.8 or more. Since the O*NET-derived measure is defined for 6-digit occupations, this measure is not necessarily 0 or 1 at the 5-digit level. We aggregate 6-digit occupations weighting by employment counts in the BLS's 2018 Occupational Employment Statistics.

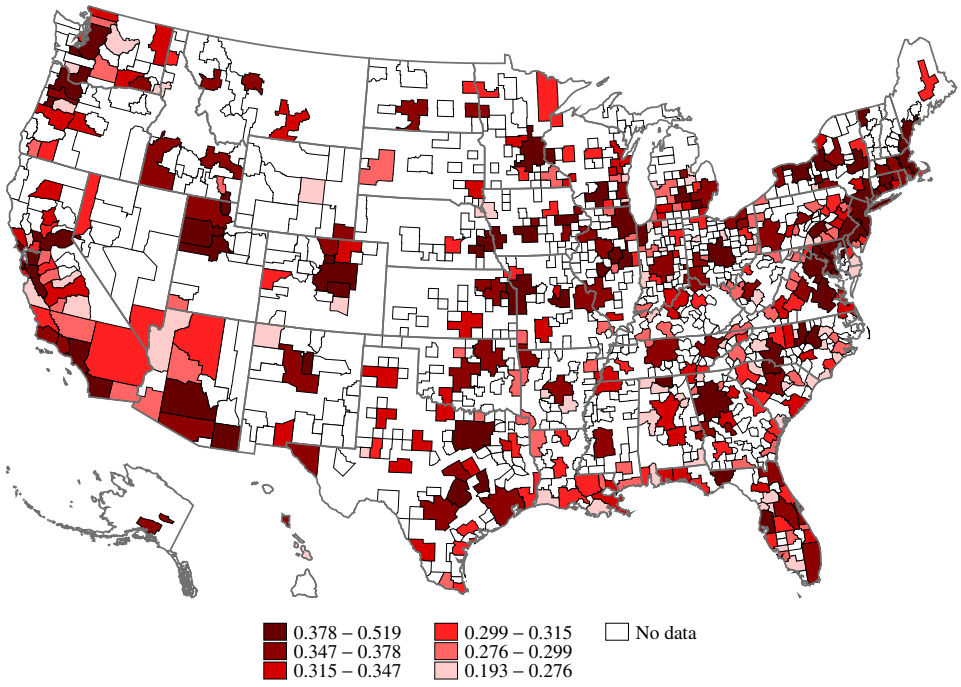


Fig. A.1. Share of jobs that can be done at home NOTES: This map depicts the share of jobs that can be done at home for 388 core-based statistical areas (CBSAs). We compute these shares using our O*NET-derived classification of occupations that can be done at home and the occupational composition of each CBSA's employment by 6-digit SOC in the BLS's 2018 Occupational Employment Statistics. The map depicts CBSAs based on 2013 definitions.

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