



► Policy Brief

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Working from Home: A potential measure for mitigating the COVID-19 pandemic

As the COVID-19 pandemic destroys lives and ravages economies across the globe, epidemiologists and doctors have made it clear that the virus spreads where people congregate: schools, public transportation, and workplaces. An important measure taken by governments across the world to contain the spread of COVID-19 is to encourage those who can work from home to do so. As a result, as of mid-April 2020, 59 countries had implemented telework for non-essential publicly employed staff. And whether in lockdown or not, governments across the world have encouraged employers to allow working from home as a means to further social distancing.¹

Staying in one's job but performing work remotely is an excellent strategy for mitigating job losses and allowing for the continuation of many of our economies' functions, but also for keeping the population safe. The objective of this brief is to estimate the potential share of workers across the different regions of the world who could perform their activities from home, if needed, as well as discuss some of the policy issues associated with working from home.

Studies estimating the potential to work from home

Since the beginning of the pandemic, there has been a remarkable volume of research on the potential for home-based work as a crisis response. Dingel and Neiman (2020) use occupational descriptions from the Occupational Information Network (O*NET) to estimate the degree to which different occupations in the United States can be done remotely. They then aggregate these estimates using US employment in occupational categories as weights. Their preferred estimate is that 34% of American jobs "can plausibly be performed from home."² Ramiro Albieu (2020) and Foschiatti and Gasparini (2020) apply the Dingel and Neiman methodology to Argentina and conclude that from 26% to 29% of occupations can be performed remotely. Guntin applies an adapted methodology and estimate that between 20% and 34% of Uruguayan workers are in occupations that can be done at a distance. Finally, Boeri, Caiumi, and Paccagnella (2020) use a similar adapted methodology and estimate the home-based work potential as 24% for Italy, 28% for France, 29% for Germany, 25% for Spain, and 31% for Sweden and the United Kingdom.

Variations on the Dingel and Neiman methodology have dominated the literature, possibly since they rely on a reasonably objective measure of whether each occupation can be done from home or not. The limitation of this methodology is that O*NET data are for the United States. This means this data can, at most, be used for economies whose work environment is close to that of the United States.

Using a methodology close to the one that will be used in this brief – and not using O*NET – Martins (2020) estimates the percentage of jobs that can be done from home at 30% for Portugal. The British Office for National Statistics (2020), using a somewhat different approach based on actual home-based work, estimate that less than 30% of the UK workforce could work from home without major changes in the labour market. Another approach is Hensvik, Le Barbanchon and Rathelot (2020), who use industrial sector data to estimate the potential for home-based work in the American labour market; they derive figures that are similar to those of Dingel and Neiman (2020).

1 For more information on measures taken by country see websites of acaps.org; covid19globalemployer.com; ilo.org

2 Other studies on the US include Leibovici, Santacreu, and Famiglietti (2020) and Mongey and Weinberg (2020); these studies rely on the O*NET source as well as descriptions on whether jobs require personal contact.

There have been some attempts to provide rough estimates of working from home during the crisis via surveys, though based on small samples. One such survey for Brazil (XP Investments) estimates that 35% of workers are working from home. Another, from Ukraine (Sapiens), finds that 22% of Ukrainians are either teleworking or tele-studying. Finally, another Brazil survey (Datafolha) reports that the percentage of workers who believe they can work from home fell from 46% on the 20th of March (when the restrictions were beginning in Brazil) to 33% on the 3rd of April.³ This may reflect initially optimistic workers coming to grips with the harsh realities of the economic meltdown, including a lack of demand for their services. Nevertheless, these are recent results that do not share the robust samples and well-tested questionnaires of labour force surveys and administrative data.

The potential for working from home across the globe: Delphi survey findings

Based on data from labour force surveys, the ILO estimates that 7.9% of the world's workforce worked from home on a permanent basis prior to the COVID-19 pandemic, or approximately 260 million workers. These estimates are based on data from 118 countries representing 86% of global employment (See figure 1). The figure represents the actual number of home-based workers, but before the pandemic began. Although some of these workers were "teleworkers,"⁴ most were not, as the figure includes a wide range of occupations including industrial outworkers (e.g., embroidery stitchers, beedi rollers), artisans, self-employed business owners, freelancers, in addition to employees. Employees accounted for 18.8% of the total number of home-based workers worldwide, but this number is as high as 55.1% in high-income countries. Globally, among employees, 2.9% were working exclusively or mainly from their home before the COVID-19 pandemic.

The number of people who can work from home, however, is likely to be much larger than the number of people who were working from home previous to COVID-19. Making an estimate of the share of workers who could work from home if necessary, around the globe, is the objective of this study.

Estimated Probabilities by Three-Digit Occupation. Using the Delphi method, we received 23 estimates for 19 countries and two country groups, from labour market experts from around the world, of the proportion of

workers in each occupation who are capable of working from home (for details on the methodology, see Appendix 1). The estimates vary from place to place, reflecting changes in local infrastructure and labour market conditions, but the overall trends are the same. Figure 2, below, shows the estimates among high, medium and low-income countries of the likelihood of a worker in a given occupation to be able to work from home. The differences between the estimates reflect to a small extent subjective differences between experts, but to a larger extent they reflect differences in the underlying social, economic and infrastructure conditions between groups of countries.

The estimates show that there are some types of occupations that simply do not lend themselves to working from home. Occupations such as plant and machine operator and assembler or service and sales worker do not lend themselves to working from home; labour market experts estimate their home-based work probabilities between zero and 2%. At the other extreme are managers and professionals, half of whom could potentially work from home. For some types of occupations estimates vary across groups of countries. Only 20% of clerical support workers, for example, are estimated to be able to work from home in low and lower-middle income countries but 42% of them are estimated to be able to work from home in high-income countries.

Estimates of the Home-Based Work Potential. Having the harmonized ISCO 2008 occupational profiles (at 3 digits) for groups of countries (from household surveys⁵ or labour market administrative data) and the home-based work probabilities (from the Delphi survey) for these same groups, we can calculate the percentage of workers who can work from home. For details of how these estimations are made, see the appendices.

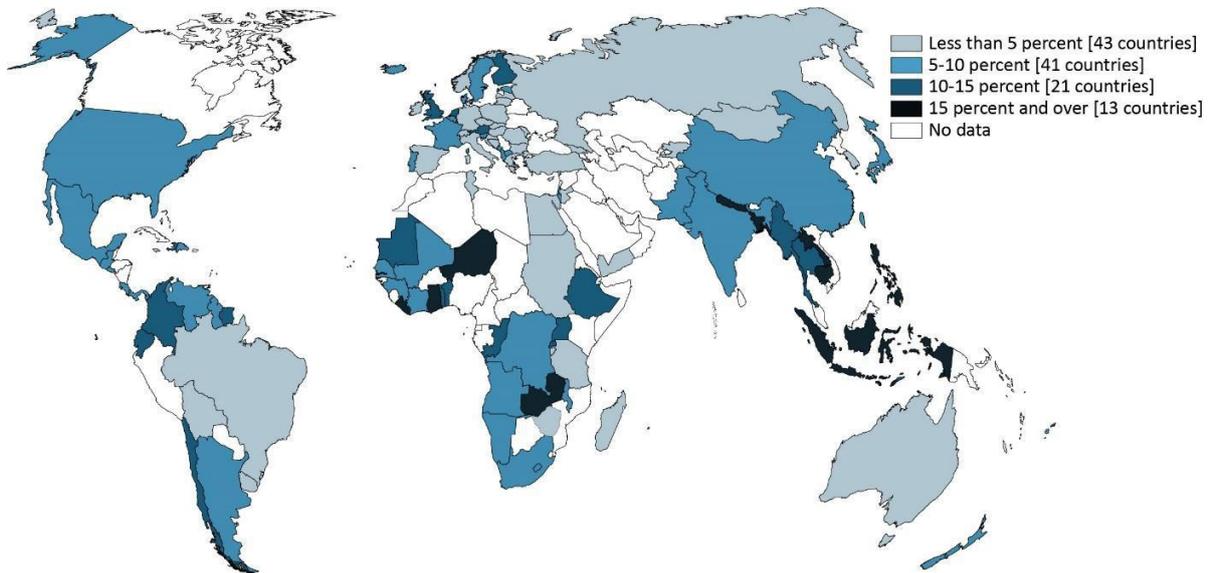
According to our calculations, close to 18% of workers work in occupations and live in countries with the infrastructure that would allow them to effectively perform their work from home. Not surprisingly, there are important differences across regions of the world and income level of each country, reflecting the economic and occupational structures of countries, but also environmental factors, such as access to broadband internet and likelihood of owning a personal computer, whether the housing situation allows working from home, or whether the person has the necessary social networks, such as having fixed clients, for other types of home-based work.

³ These results are only indicative as they are based on small samples that may not be sufficiently representative of the national population. The two Brazilian surveys used samples of 1000 (XP) and 1511 (Datafolha) phone interviews. The Ukrainian survey interviewed 809 respondents.

⁴ The term "teleworking" typically refers to employees and includes mobile work in addition to work from home. See Messenger, 2019.

⁵ The distribution of employment according to ISCO 2008 at 3 digits was available for 89 countries representing 77 per cent of global employment with a good representation of all income groups of countries and regions, with the exception of the Arab States.

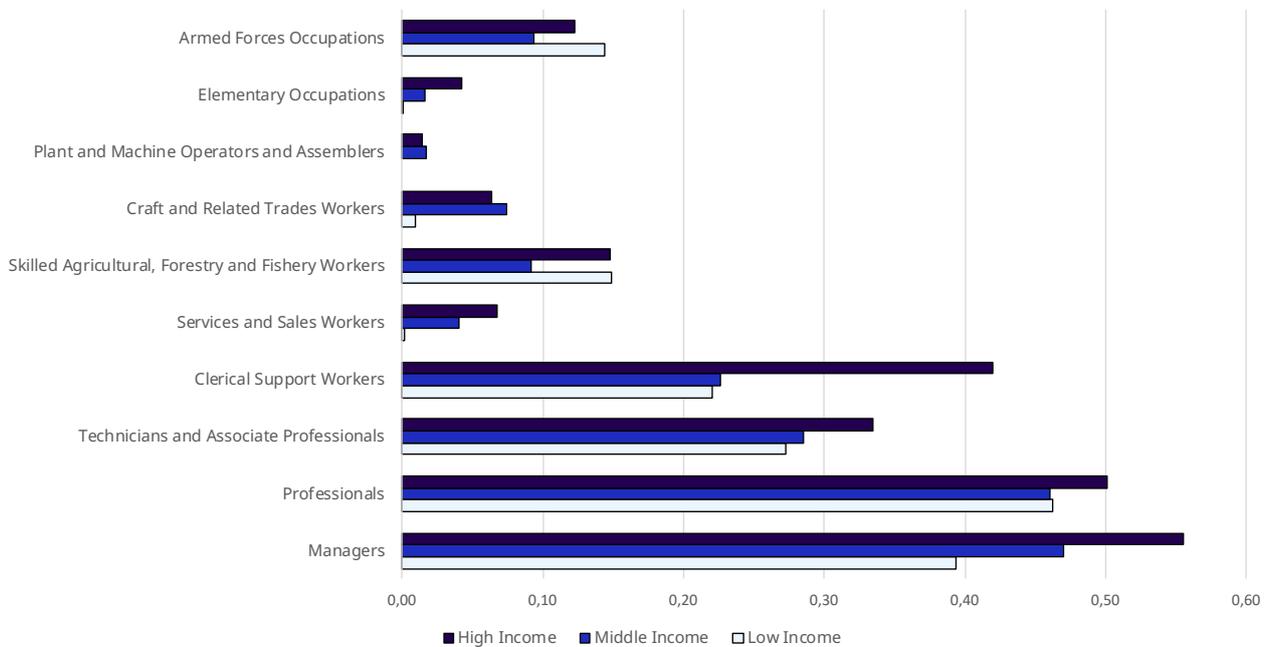
Figure 1. Percentage of workers that are home-based (all employment statuses), 2019



Note: This figure includes all types of home-based workers, including teleworkers.

Source: Computations by F. Bonnet based on data for 118 countries. Forthcoming in ILO (2020) The home as workplace: Trends and policies for ensuring decent work.

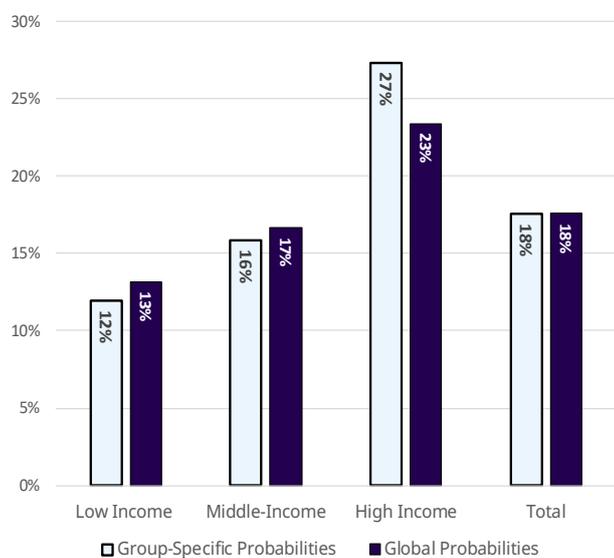
Figure 2. Estimates of the likelihood of being able to work from home by occupation, by country income groups



Observation: World Bank country groupings.

Source: Delphi questionnaires.

Figure 3. Home Based Work Estimates



Observation: World Bank country groupings.

Source: Delphi questionnaires.

Figure 3 shows two numbers. The light colored bars titled “Group-Specific Probabilities” show the proportion of the labour force that could work from home. The variation between them takes into account both changes in occupational structure and in underlying social and physical infrastructure. The darker bars entitled “Global Probabilities” show the proportion of workers that could work from home if all countries had the same occupation-specific work from home probabilities. In other words, it shows the variation that stems only from changes in the occupation structure.

The fact that workers in developed economies are more capable of working from home is not a surprise. Many workers in developing nations are employed in occupations such as construction worker or in informal services and cannot work from home.⁶ Such differences in occupational structure alone account for a difference of ten percentage points between workers in advanced economies and developing ones (13% for developing economies against 23% for developed ones). In addition, the social, physical, and information technology infrastructure is often less adapted to home-based work in developing countries than in developed ones. If these differences are taken into consideration, the difference between low and high-income countries increases from ten to 15 percentage-points (see Annex II).

There are also regional variations that closely follow income variations. According to our estimates, around 30% of North American and Western European workers are in occupations that allow home-based work as opposed to only 6% of Sub-Saharan African and 8% of South Asian workers. Latin American and Eastern European workers fall somewhere in between at 23% and 18%, respectively (See Annex II).

Beyond differences in occupational structure among countries, there are also differences in underlying labour market conditions. An occupation may be done from home in one country, but not another. For workers who need to telework, internet availability is an issue. According to the International Telecommunication Union, access to the internet varies from under 5% for Guinea-Bissau, Eritrea, and Somalia to over 95% in the Republic of Korea, Norway, Bahrain, Kuwait and another ten countries. In the median country, Panamá, only 58% of citizens have access to the internet. While these figures do not specifically refer to workers, we can assume that the access levels of workers at home is no higher than for the population as a whole. This suggests that for some, access to adequate telecommunications may be the limiting factor preventing telework.

An additional consideration, but one that is unfortunately not accounted for in the methodology, is that the COVID crisis is negatively affecting the operations of enterprises and likely their need for home-based workers. Also, given disruptions in supply chains, many traditional, home-based workers that assemble industrial goods may be unable to work if they cannot get their inputs, or if falling product demand has ceased orders.

Working from Home: A long-standing practice

For most of history, working from home has been the norm. Until the last century, most production was home-based, with families producing goods for their own consumption or as a source of income, in what have been commonly referred to as cottage industries. With industrialization, working from home did not disappear, but rather was subsumed within production, with tasks most amenable to parsing often outsourced to “homeworkers.” Homeworkers differed from the independent artisans of cottage industries, in that, while home-based, they produced a product or service, as specified by the employer or intermediary, for remuneration.⁷

6 For example, street vendors are six times more common in low-income as they are in-high income countries and car, van and motorcycle drivers are four times more common. Agricultural laborers (not farmers who farm their own land, but laborers who work on someone else’s land) are 17 times more common in low-income countries than in high-income ones.

7 See the next section for the ILO definition of homeworker.

In France, in the early 1900s, one out of every three women was a homemaker, producing garments as well as a range of other consumer goods.⁸ With shifts in economic structure, homeworking branched into the service sector. In the 1940s and 1950s in the United States, the burgeoning direct mail industry relied on homeworkers for most of its clerical typing tasks;⁹ in the 1980s, the insurance industry used homeworkers to help process insurance claims. Though industrial homework has declined in North America and Europe, it has not disappeared, and can be found, for example, in Italy's high-end fashion industry.¹¹ Yet most industrial homework is in the developing world. In India alone, it is estimated that there are about 37 million home-based workers (8.5 percent of employment), including both independent artisans and homeworkers. Homeworkers, most of whom are women, are found predominantly in manufacturing, as beedi rollers (3.5 million) or as embroiderers for the country's garment export sector.¹²

Like homeworking, teleworking is a more narrow concept than home-based work, in that it is understood as applying to employees who carry out their work remotely from home. First described as "telecommuting", telework emerged in the 1970s in California, when employees in the IT industry, began using information and communication technology (ITC) tools to work remotely from home.¹³ Like previous industrial and clerical homework, teleworking has also been advocated as a means for allowing women (and some men) to earn an income yet still be present, and doing unpaid care work, in the home.¹⁴ Although teleworking receives much attention, prior to the COVID-19 pandemic, most teleworking was occasional, with just a small percentage of workers doing so on a permanent basis. In the United States, according to the American Time Use Survey, 29 percent of wage and salary workers could work from home, but only 4 percent had jobs that required them to do so.¹⁵ In France, 3 percent of salaried workers teleworked once a week, and just

0.9 percent did so for three days of more per week. Moreover, the practice was mainly limited to managerial and professional staff.¹⁶

With the COVID-19 pandemic, the percentage of workers teleworking has risen tremendously, as companies have taken steps to facilitate the practice in an effort to keep their operations ongoing. A March 25th survey of 250 large firms in Argentina found, for example, that 93% had adopted teleworking as a policy in response to the COVID-19 pandemic.¹⁷ Similarly, the Indian business process outsourcing giant, Tata Consultancy Services, reported that around 85 per cent of its 400,000 employees in India and elsewhere in the world were working from home as a result of lockdowns in India and other places.¹⁸ But the adjustment to teleworking is not always so straightforward. While many companies recognize the benefits of teleworking, some have had difficulty making the transition. In Japan, for example, a survey conducted by the Japan Association for Chief Financial Officers of 577 CFOs and Finance Directors prior to the 7 April announcement of the State of Emergency, found that while 96% of respondents agreed with the importance of teleworking, 31% of companies were unable to adopt teleworking because paperwork was not yet digitized and internal rules and procedures necessary for teleworking were not ready.¹⁹ Concerns over confidentiality of information or possible security breaches can also limit the use of teleworking.

Many small and medium-sized enterprises (SMEs) also struggle with telework. The Argentine SME Observatory found the use of telework by SMEs to be far lower than the large firms. Only 55% of SMEs in the service sector, 24% of SMEs in industry and 23% of SMEs in retail trade use telework. This is a particularly serious limitation, considering that SMEs usually also have less cash and credit than large companies and are thus less able to withstand long periods with little or no revenue. For many, working from home may be the key to survival.

8 Perrot, 1997.

9 Boris, 1994.

10 Costello, 1989.

11 Elizabeth Paton and Milena Lazazzera "Inside Italy's Shadow Economy," The New York Times, September 20, 2018.

12 Mazumdar, 2018.

13 Messenger, 2019.

14 Christensen, 1989; Boris, 1994.

15 "Job flexibilities and work schedules, 2017-2018. Data from the American Time Use Survey," Bureau of Labour Statistics, U.S Department of Labour, Tuesday, September 24, 2019.

16 « Quels sont les salaires concernés par le télétravail ? » DARES Analyses, n° 051, novembre 2019.

17 This does not imply, however, that all staff could continue in their functions. Only 48 percent of firms were able to continue normal operations; 60% had partially or completely suspended their activities. Nevertheless, for those staff who continue duties from home, these companies were able to make the shift to remote work. See PNUD (2020).

18 "India coronavirus shutdown hits outsourcing groups," Financial Times, 30 March, 2020.

19 Japan Association for Chief Financial Officers. 2020. Announcement of the results and analysis of survey on the impact of Covid-19 on financial operations. News Release 06 April 2020 (Tokyo). Available online at [cfo.jp](https://www.cfo.jp)

Working from Home: Policies to ensure decent work

Regardless of where work is conducted, it is important to ensure that all workers are privy to certain rights and protections. Ensuring decent work for homeworkers has been a concern of the ILO since its founding in 1919. One of the earliest ILO conventions, the Minimum Wage-Fixing Machinery Convention, 1928 (No. 26) obliged ratifying States to “maintain machinery whereby minimum rates of wages can be fixed for workers employed in certain of the trades or parts of trades (*and in particular in home working trades*) in which no arrangements exist for the effective regulation of wages by collective agreement or otherwise and wages are exceptionally low”. (italics added)

In 1996, the ILO passed the Home Work Convention, 1996 (No. 177), calling for equality of treatment between homeworkers and other wage earners, taking into account the special characteristics of home work. Specifically, the Convention and its accompanying Home Work Recommendation, 1996 (No. 184), called for the promotion of equality of treatment in relation to:

- (a) the homeworkers’ right to establish or join organizations of their own choosing and to participate in the activities of such organizations;
- (b) protection against discrimination in employment and occupation;
- (c) protection in the field of occupational safety and health;
- (d) remuneration;
- (e) statutory social security protection;
- (f) access to training;
- (g) minimum age for admission to employment or work; and
- (h) maternity protection.

The term, home work, as defined by the Convention, referred to work carried out by a person (“homeworker”) “(i) in his or her home or in other premises of his or her choice, other than the workplace of the employer; (ii) for remuneration; and (iii) which results in a product or service as specified by the employer, irrespective of who provides the equipment, materials or other inputs used, unless this person has the degree of autonomy and of economic independence necessary to be considered an independent worker under national laws, regulations or court decisions.” The Convention extends beyond employees to include workers who do not have the autonomy or economic independence to be considered an independent worker and who are producing a good or service as specified by an employer who “either directly or through an intermediary...gives out home work in

pursuance of his or her business activity”. While the Convention does not apply to employees who occasionally perform their work as employees at home, rather than at their usual workplaces, it does include employees who perform their work at home on a regular basis. Since many of the COVID-19 homeworkers are working from home on a regular and extended basis, telework as a response to the COVID-19 pandemic would likely be recognized as falling within the scope of C177.²⁰

Convention no. 177 was an important step in advancing rights to homeworkers, many of whom – by virtue of conducting their work from home – have long been invisible. With the increased need to work from home as a result of the COVID-19 pandemic, it is vital that the rights and benefits of those now working at home not be less favourable than what they were prior to the move to home-based work, and that working from home not be grounds for discrimination. In addition, greater attention will be needed to address the possible implications of working from home on work-life balance, which may be difficult to manage particularly if children or other dependents require attention. The potential overlap between paid work and personal life can have negative effects for workers (particularly women, who still undertake the largest share of care-related tasks), but also for enterprises, if it negatively impacts productivity. Managing these possible tensions, through social dialogue, is critical. Social dialogue is also essential for implementing specific occupational safety and health measures for working from home, as called for in the Home Work Recommendation, 1996 (No. 184).

Conclusion

We do not know whether the Covid-19 emergency will last a few more weeks or years, or how many times countries will have to revert to lockdowns. We do not know when vaccines or treatments will be available nor how long it will take, if ever, to achieve herd immunity. Home-based work is a vital part of the response that governments and firms are taking in the face of the conundrum of keeping the economy from crashing while at the same time containing a public health crisis.

Our analysis shows that while not all occupations can be done at home, many could – approximately one in six at the global level and just over one in four in advanced countries – but that the potential to do so requires, at a minimum, that countries make the necessary investments in improving telecommunications infrastructure. Other digital advances such as digital authentication and mobile banking and mobile payment systems can potentially allow more occupations to continue their activities. Future investments in housing could relieve overcrowding, making it more feasible for people to work from home, or at least to be more productive whilst working from home.

20 As explained in the ILO 2020, General Survey, para. 622, “teleworking as a permanent arrangement, whether full-time or part-time, but not in alternation with office-based work, is clearly covered by the definition of “home work” in Article 1(a) of the Convention.

With the shift to working from home, both during and potentially after the crisis, it will be necessary for governments to ensure that homeworkers — whether traditional, industrial homeworkers, or ITC-enabled home-based employees— are provided the same rights and benefits as if they were working at their employers' site, including equality of treatment in remuneration and other working conditions. In addition, both enterprises and workers will be best served if social dialogue is used to identify and address specific challenges with respect to work-life balance and productivity, so that the needs of both parties are best met.

References

- Albrieu, R. (2020) Evaluando las oportunidades y los límites del teletrabajo en Argentina en tiempos del COVID-19. Buenos Aires: CIPPEC.
- Boeri, T.; Caiumi, A.; Paccagnella, M. (2020) Mitigating the work-safety trade-off, in *Covid Economics: Vetted and Real-Time Papers*, Issue 2, April 8. CEPR.
- Boris, E. (1994) *Home to Work : Motherhood and the Politics of Industrial Homework in the United States*, Cambridge U. Press.
- Christensen, K. (1989) "Home-based clerical work: No simple truth, no simple reality, in Boris, E.; C. Daniels, eds. *Homework. Historical and Contemporary Perspectives on Paid Labor at Home* (Chicago: University of Illinois Press).
- Costello, C. (1989) "The clerical homework program at the Wisconsin Physicians Service Insurance Corporation," in Boris, E.; C. Daniels, eds. *Homework. Historical and Contemporary Perspectives on Paid Labor at Home* (Chicago: University of Illinois Press).
- Dingel, J.; B. Neiman (2020) "How Many Jobs Can be Done at Home?," Working Paper 26948. NBER.
- Foschiatti, C. B. and Gasparini, L. (2020). El Impacto Asimétrico de la Cuarentena: Estimaciones en base a una caracterización de ocupaciones. CEDLAS: Working Paper No. 261.
- Guntin, R. (2020) Trabajo a Distancia y con Contacto en Uruguay. Mimeo.
- Hensvik, L.; T. Le Barbanchon, R. Rathelot (2020) "Which Jobs Are Done from Home? Evidence from the American Time Use Survey" IZA DP No. 13138. Available at iza.org
- ILO. 2020. *Promoting employment and decent work in a changing landscape (General Survey), Report of the Committee of Experts on the Application of Conventions and Recommendations (articles 19, 22 and 35 of the Constitution) Report III (Part B)*, Geneva, ILO. Available at ilo.org
- Leibovici, F.; Santacreu, A. M.; Famiglietti, M. (2020) Social Distancing and Contact-Intensive Occupations. Federal Reserve Bank of St. Louis.
- Office for National Statistics (2020) "Coronavirus and Homeworking in the UK Labour Market: 2019", Released on 24 March 2020.
- Martins, P. (2020) « O Potencial de Teletrabalho em Portugal », in observador.pt
- Mazumda, I. (2018) "HOMEBASED WORK IN 21ST CENTURY INDIA," Centre for Women's Development Studies, Occasional Paper, no. 64.
- Messenger, J. (2019) *Telework in the 21st Century: An evolutionary perspective*, ILO and Edward Elgar.
- Mongey, S. and Weinberg, A. (2020) Characteristics of Workers in Low Work-From-Home and High. Becker Freidman Institute for Economics at UChicago White Paper.
- Perrot, M. (1997) "Les femmes ... l'usine", *L'Histoire : Puissance et Faiblesses de la France Industrielle, XIXe-XXe Siècle*, Paris, Seuil.
- PNUD-Pacto Global, "ENCUESTA : Respuestas de las empresas argentinas ante el impacto de la cuarentena general en sus operaciones," 30 de marzo 2020. Available at pactoglobal.org

Appendix I. Methodology

How can an estimate be made of something on which we have little data? Household surveys covering this emergency period will only be available (hopefully) once the pandemic has ended or is on its way to ending. We need better information much faster, which means we need a way to estimate, using an approach better than wild guessing, the percentage of occupations whose workers can work from home.

The approach we decided upon was to make educated estimates of the percentage of workers who can work from home, according to their occupation, and then use these estimates and the occupation profile for each country to calculate a final estimate of the number of workers who can work from home. In symbols, the number of workers who can work from home in country group g , HBW_g , is:

$$HBW_g = \sum_{k=1}^K H_{gk} O_{gk}$$

where O_{gk} is the number of workers in country group g occupation k , and H_{gk} is the percentage of these workers who can work from home.

Household surveys and labour market administrative data provide employment profiles according to occupation. No conceptual difficulties there. But where do the estimates of the percentage of workers which can potentially work from home come from? We decided to use the Delphi approach which entails asking labour market specialists to estimate the probabilities by occupation category. We sent queries to dozens of experts and in the end received 23 usable estimates.²¹

In addition to providing our best estimates for home-based work potential for each group of countries, the methodology also allows us to make a rough estimate of what part of the differences between these same country groups can be attributed solely to differences in the occupation profiles of these same groups. To do this, we calculate instead

$$HBW_g^* = \sum_{k=1}^K \underline{H}_k O_{gk}$$

where O_{gk} is the number of workers in country group g occupation k , and \underline{H}_k is the global percentage of workers in occupation k who can work from home. HBW_g^* is not a meaningful number for country group g if taken alone, but it can be used to compare two country groups. Since

the only thing that changes from one group to another is the occupation structure O_{gk} . Differences between two country groups in HBW_g^* are due entirely to differences in this structure.

Occupation Profiles

Although conceptually simple, the occupation structure at the level of 3 digits was quite difficult to estimate due to some countries having different classification systems. For countries with available data by occupation at least 3 digits, we sought to bring all classification systems to a single standard, which could be no other than the 2008 revision of the International Standard Classification of Occupations (ISCO-08). Most countries already use ISCO-08 or an ISCO based system for their classifications. For these, the most relevant difficulties were that many countries use the old ISCO-88 classification and also that some countries added numerous codes of their own to the ISCO-08 standard. We used the correspondence tables available in the ISCO web site to bring ISCO-88 countries to the ISCO-08 standard. These correspondence tables are, almost by definition, imperfect and in some cases we had to update some occupation codes manually. For the countries creating their own occupation categories within ISCO-08 we had to merge these idiosyncratic codes into standard ISCO-08 codes.

In addition, many countries such as the United States, Mexico, Argentina and Indonesia use their own classification systems. Some, such as the United States provide relatively good correspondence tables but others provide no such tables. For some countries, such as Mexico or Argentina, only two-digit correspondence tables were used.

Finally, for many countries, data were either not available or the occupation classification schemes were too poorly documented to be of any use. In these cases, we applied the regional averages. In other words, we supposed their occupational profile was the same as the average of countries of their region for which we did have data.

Home Work Probabilities

The Delphi approach consists in asking specialists to estimate home work profiles for the countries they work with or are knowledgeable about. However, rather than use only the estimate made for a given country for the calculations pertaining to that country, we pooled the estimates so as to reduce the idiosyncratic effects of each individual researcher. To allow for economic and social differences, however, not all estimates for the world were pooled together. Taking standard country classification schemes, estimates for similar countries were pooled together and applied to all countries in a given classification category. So for example, all 11

21 We received estimates for Argentina, Australia, Brazil, Chile, China, France, Ghana, India, Japan, Lebanon, Mozambique, Nepal, Philippines, Russian Federation, Spain, Thailand, Uruguay, North Africa and the Caribbean (Dutch and English-speaking). In addition, we incorporated the estimates for the United States of Dingel and Nieman, and for Portugal from Martins; we thank these authors for sharing their data.

estimates for Latin American and Caribbean countries were pooled together to yield a single vector, which was then applied to all the countries in the region. We calculated the correlation coefficients between the different estimates, and they vary between 0.30 and 0.99 with the average for all 253 coefficients being 0.66. This suggests that there is ample agreement between experts as to which professions can telework or work from home. For example, while the occupation “Mining and Construction Workers” was classified by all experts as zero percent home workable, the occupation “Mathematicians, Actuaries and Statisticians” was classified by almost all as 100% (or whatever was the maximum for those who never ascribed 100% to any profession).²²

Appendix II – Results

Since the strength of the Delphi method is to base results upon the expertise of more than one expert and also since we only have 23 estimates for 21 of the world’s countries and regions, we do not make country-specific estimates. Rather, we make different estimates based upon different groups of countries.

The tables below show two estimates of home-based work.

The last column, labelled Global Probabilities, is obtained by multiplying the average of all 23 estimates of home-based work probabilities by each region’s occupational structure. The only thing that changes between the regions is their occupation structure.

The second column, labelled Group-Specific Probabilities, shows the same calculations but with occupational structure being specific for each group of countries. For example, for Latin America, we use the average of Argentina, Brazil, Chile, Uruguay and the Caribbean. For Upper-Middle Income Countries, we use Argentina, Brazil, the Russian Federation, Lebanon, Thailand and the Caribbean.

A comparison between the two allows us to discern the differences that come only from changes in the occupational structure with changes that also are a results of underlying factors such as telecommunications infrastructure.

Region	Group-Specific Probabilities	Global Probabilities
Africa	7%	14%
Americas	27%	19%
Arab States	19%	19%
Asia and the Pacific	12%	17%
Europe and Central Asia	26%	24%
Total	18%	18%

World Bank Income Category	Group-Specific Probabilities	Global Probabilities
Low-income	12%	13%
Lower-middle-income	10%	13%
Upper-middle-income	22%	19%
High income	27%	23%
Total	18%	17%

Subregion broad	Group-Specific Probabilities	Global Probabilities
Northern Africa	14%	15%
Sub-Saharan Africa	6%	13%
Latin America and the Caribbean	23%	16%
Northern America	29%	22%
Arab States	19%	19%
Eastern Asia	19%	20%
South-Eastern Asia and the Pacific	7%	12%
Southern Asia	8%	14%
Northern, Southern and Western Europe	30%	25%
Eastern Europe	18%	22%
Central and Western Asia	21%	22%
Total	17%	17%

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Grouping 1	Group-Specific Probabilities	Global Probabilities
Northern Africa	14%	15%
Sub-Saharan Africa	6%	13%
Latin America and the Caribbean	23%	16%
Northern America	29%	22%
Arab States	19%	19%
Asia & the Pacific (low- & lower middle)	8%	13%
Asia & the Pacific (upper middle)	13%	20%
Asia & the Pacific (high)	22%	23%
Northern, Southern and Western Europe	30%	25%
Eastern Europe & Central and Western Asia	18%	22%
Total	17%	17%

Emerging countries	Group-Specific Probabilities	Global Probabilities
Low Income	12%	13%
Middle-Income	16%	17%
High Income	27%	23%
Total	18%	18%

Developing/ emerging versus developed	Group-Specific Probabilities	Global Probabilities
Developing/Emerging	15%	16%
Developed	27%	23%
Total	18%	18%

Contact details

International Labour Organization
Route des Morillons 4
CH-1211 Geneva 22
Switzerland

Conditions of Work and Equality Department
E: inwork@ilo.org