International Labour Organization

ILO brief

Policy Brief

March 2021

From potential to practice: Preliminary findings on the numbers of workers working from home during the COVID-19 pandemic[1]

Key points

- We update estimates of working from home during the pandemic using data from 33 household surveys covering 31 countries.
- We estimate that during the second quarter of 2020, 557 million workers worked from home, accounting for 17.4 per cent of the world's employment.
- The figure is derived by stratifying the world's workers by country income and deriving a worldwide estimate with a 95% confidence interval that ranges from 14.9 per cent and 19.9 per cent, with 17.4 per cent as the midpoint
- The 17.4 percent estimate, based upon real world data from household surveys, is remarkably close to the ILO estimate of 18 per cent published in May 2020 using only the occupational distribution of employment and a Delphi study of home-workability.

At the onset of the COVID-19 crisis, the ILO (2020a) estimated the potential of working from home given its efficacy as a measure to mitigate the spread of the contagion while allowing productive activities, necessary for the functioning of economies, to continue.[2] With public health restrictions affecting nearly all countries of the world, it was clear that the shift to working from home was dramatic.

Yet one year since the onset of the pandemic, it is still not known how many people globally are actually working from home. The reasons for this dearth of information are understandable: far from all countries have household survey data available for the pandemic period and even among those surveys that are available, relatively few have information on working from home. Nevertheless, as more and more data become available, it is no longer acceptable to not have estimates of home-based employment. As such, making a preliminary estimate, based on the available data, is the objective of this brief.

Who can work from home and why

Prior to the COVID-19 pandemic, 7.9 per cent of the world's workforce, or approximately 260 million workers, were home-based workers — that is, they worked from

[1] This brief was written by Sergei Soares, Florence Bonnet, Janine Berg and Rodrigo Labouriau. The authors thank Vladimir Gimpleson for help on localising data on the Russian Federation.

[2] Some academics make the distinction between teleworkers as individuals who work "from home", whereas other home-based workers are considered to work "at home". We do not distinguish between working "from home" and working "at home" and consider all home-based workers to be working from home.

home on a permanent basis.[3] Most of these workers lived in lower-middle income countries and worked as artisans, self-employed business owners or industrial homeworkers (e.g., seamstresses, embroidery stitchers, beedi rollers). Employees accounted for 19 per cent of the total number of home-based workers worldwide, although this number was as high as 54 per cent in high-income countries, where home-based work was dominated by teleworkers who worked remotely from their homes carrying out office work. Globally, among all employees, three per cent were working exclusively or mainly from their home before the COVID-19 pandemic (ILO, 2020b).

The COVID-19 pandemic and its associated restrictions on movement and gatherings shifted these numbers dramatically. Throughout the world, workers in occupations that could be carried out with limited physical contact and who had access to the needed technological infrastructure to carry out and deliver their work remotely shifted to working from home as a way to preserve their jobs and continue providing needed services. Yet the ability to make this shift varied from place to place, reflecting differences in local infrastructure and labour market structures. Many workers, particularly in developing nations, are in occupations and sectors such as construction, retail trade or other services involving direct interactions with customers, and cannot work from home. 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 labourers who work on someone else's land are 17 times more common in low-income countries than in high-income ones.[4]

At the beginning of the pandemic, the ILO published estimates of the possibility of working from home during the pandemic. These estimates were based on a Delphi survey of labour market experts located throughout the world who assessed the feasibility of working from home in their country according to ISCO occupations at the three-digit level. In general, most elementary occupations were assessed as not tele-workable, whereas other occupations, such as those within the managerial and professional categories, were assessed as having a high teleworking potential. For other occupations, estimates varied across groups of countries. For example, only 20 per cent of clerical support workers were estimated to be able to work from home in low and lower-middle income countries but 42 per cent of them were estimated to be able to work from home in high-income countries (ILO, 2020a).

Overall, the ILO estimated that close to 18 per cent of world's workers are in occupations and live in countries with the infrastructure that allow them to work from home. Regional variations were also wide: around 30 per cent of North American and Western European workers were estimated to be in occupations that allowed home-based work as opposed to only 6 per cent of Sub-Saharan African and 8 per cent of South Asian workers. By country income group, the variations were stark: potential home-based work varies from 27 per cent of the workforce in high-income countries, passing through 17 per cent in middle-income countries and only 13 per cent in low-income ones.

In addition to the global ILO study mentioned above, there have been a range of studies producing estimates on the feasibility of working from home for a plethora of countries. Beginning with the work by Dingel and Neiman (2020), who use occupational descriptions from the Occupational Information Network (O*NET) to estimate the degree to which different occupations in the United States can be potentially be carried out from home. Among these are: Hensvik, Le Barbanchon and Rathelot (2020) for the United States; Ramiro Albrieu (2020) and Foschiatti and Gasparini (2020) for Argentina; Guntin (2020) for Uruguay; Martins (2020) for Portugal; British Office for National Statistics (2020) for the United Kingdom; and Boeri, Caiumi, and Paccagnella (2020) for Italy, France, Germany, Spain, Sweden and the United Kingdom.

In the United States, preliminary research on teleworking found that increased use of teleworking reflected the industrial and occupational structure of the economy more than the intensity of the pandemic (Brynjolfsson et al., 2020). States with more people in management, professional and related occupations were more likely to see large shifts toward working from home and had fewer

[3] These estimates are based on data from 118 countries representing 86 per cent of global employment.

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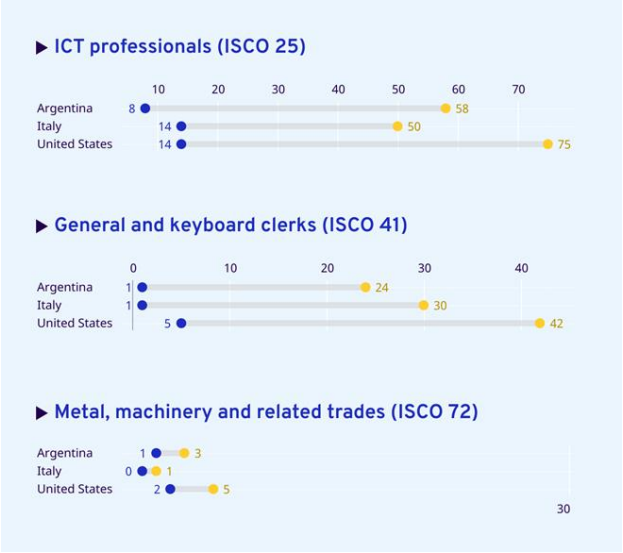
people laid off or furloughed. Both United States and European data show that higher percentages of teleworkers are inversely related to unemployment, but the effect is stronger between European countries than among American states (Eurofound, 2020; Brynjolfsson et al., 2020).

▶ **Figure 1. Shifting to working from home between 2019 and 2020 in Argentina, Italy and the United States (selected occupations)**



Source: Argentina EPH, Italy LFS, United States CPS.

The importance of occupation in determining the ability to work from home is evident in the available data. Comparing three different professions — ICT professionals, keyboard clerks and machinery and related trades workers – in Argentina, Italy and the United States, reveals the dramatic increase in working from home during the crisis in those occupations that lend themselves to remote work (See Figure 1). In all three countries, ICT professionals switched in droves to remote work, with Argentina experiencing a 50 percentage-point increase and the United States, a 60 percentage-point increase. In Italy, the jump was somewhat lower but still dramatic, at 36 percentage points. Similarly, among keyboard clerks, there were dramatic increases, ranging from 23 percentage points in Argentina to 37 percentage points in the United States, whereas among machinery and metal trades workers, the increases were trivial, reflecting the unrealistic possibility of conducting this work remotely. The data also show, however, the differences among the three countries in the extent of working from home within specific occupational categories, reflecting country differences in digital access, but also in the organization of work, such as for example, whether office processes are digitized. Among general and keyboard clerks, for example, 42 per cent of American workers in this occupational category were able to work from home during the pandemic compared with just 24 per cent in Argentina and 30 per cent in Italy.

There are far fewer studies on how many people are effectively working from home, reflecting existing data limitations. There are, nevertheless, a few studies for the second quarter of 2020. Barrero, Bloom and Davis (2020) use CPS data to conclude that 37.1 per cent of American workers were working from home, Felstead and Reuschke (2020) conclude that 43 per cent of British workers were working from home, and Gottlieb et al. (2020) find work from home numbers in Costa Rica and Brazil, respectively at 13 per cent and 11 per cent. Gottlieb et al. (2020) further link their results to their previous results on remote-workability using the STEP surveys and find that the potential and measured working from home numbers lie close to each other.

The difficulty of measuring working from home during the pandemic: A closer look at labour force surveys

The most important limitation in measuring working from home during the pandemic has been survey availability. In Spring 2021, there were only 32 surveys with questions on the place of work that allowed for the identification of workers working at home and provided data from 2020. Two additional issues for the reliability of data for estimating the number home-based workers are sampling and questionnaire. We will deal first with questionnaire and then with sampling and surveys, which are related.

The place of work question

Prior to the COVID-19 pandemic, various surveys had questions from which to glean who was and who was not a home-based worker. As explained in ILO (2020a), the home-based worker question can take various forms.

The first typically reads: *In what type of place do you usually work?*

Various options, such as “in an office”, “in the street” and “at home”, are then given and home-based workers are usually considered those who respond that they work

either "at home" or in a "structure attached to the home". This formulation is common in Latin American household surveys, although other surveys, such as the labour force surveys undertaken in the United Kingdom and in Mongolia, also use it.

A second formulation is usually included together with time organization questions, such as working evenings or holidays. It is common in European Labour Force Surveys and reads: *How often do you work at home?*

Those who qualify for inclusion as home-based workers are those who respond "person usually works at home" or "person works at home more than 50% of the time."

There are also questions which investigate place of work that are part of the commuting question and others that ask how many hours a worker worked in each of a set of localities (similar to the first formulation, though it allows for multiple option responses).

One crucial aspect of the question for the purposes of this brief is whether the question asks from where you *normally worked* or from where you *effectively worked* in a given time period (such as the previous week). Two examples of the "normal" place of work are:

The place of work question in the Brazilian PNADC: *Where did you normally work from?*

The United Kingdom's LFS asks: *(In your main job) do you work mainly*... and presents the usual list of places.

These questions lead the respondent to think of a long period and not specifically of the COVID-19 pandemic. We believe that this type of question worked well prior to COVID-19 to capture home-based work, but they are not sufficient to identify those working from home predominantly as a result of pandemic-related restrictions. This is because pandemic-induced home-based work might be perceived as temporary and not typical over a longer period.

Other surveys such as the Portuguese *Inquérito ao Emprego* or the Italian *Rilevazione sulle forze di lavoro* specifically ask whether the respondent worked from home during the previous four weeks. This question should in principle lead a respondent working from home due to a lockdown to answer that he or she worked from home, even if they do not consider themselves as home-based.

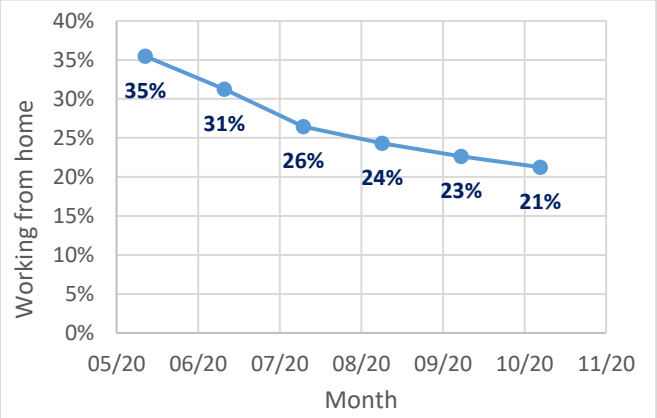
COVID-specific questions and COVID-specific surveys

With the advent of the COVID-19 pandemic and its ensuing lockdowns, a series of ad hoc questions were added to existing surveys and a number of ad hoc surveys were undertaken by different national statistical offices throughout the world. This created a new group of working from home questions that are highly varied.

The most relevant in numerical terms is the question added to the American CPS: "At any time in the LAST 4 WEEKS, did you telework or work at home for pay BECAUSE OF THE CORONAVIRUS PANDEMIC?" This is a difficult question to work with because it creates both upward and downward biases. On the one hand, those who have always worked from home may answer "no" due to the "because of the coronavirus pandemic" qualifier. On the other hand, those who worked from home only occasionally would answer "yes" whereas a person under the same working arrangement would answer "no" to a question requiring that home be the main place of work.

For this reason, the United States will be treated as a special case in the calculations that follow. In any case, Figure 2 below shows the high percentages of telework since April of 2020 in the United States.

▶ **Figure 2. Pandemic Telework in the United States**



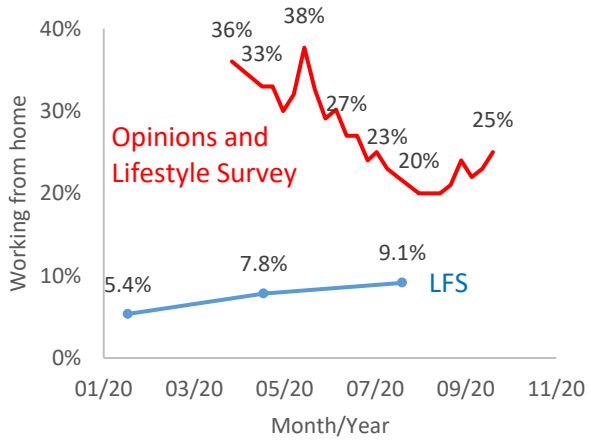
Source: Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 8.0 [dataset]. Minneapolis, MN: IPUMS, 2020.

New COVID-related questions were likewise added to the United Kingdom's Opinions and Lifestyle Survey. These are particularly good questions since they distinguish between occasional and fulltime COVID-induced work carried out at home.

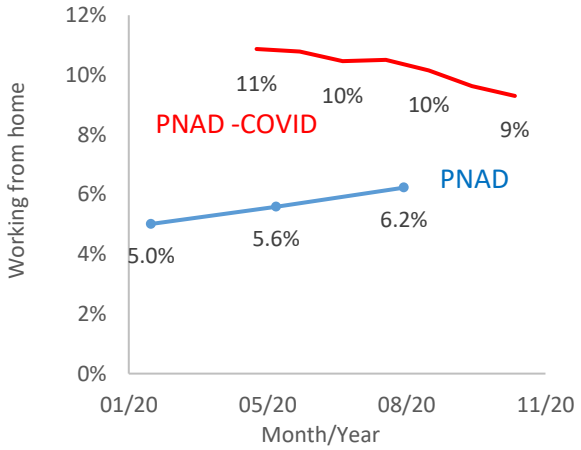
The Brazilian PNAD-Covid, which uses outgoing rotation groups from the regular PNADC and calls them by phone with a specific COVID-19 questionnaire, has a question also designed with the pandemic in mind. The question is phrased as: *Last week, were you in remote work (home office or telework)?*

Because both the United Kingdom and Brazil have parallel surveys undertaken at the same time and with the same sampling scheme, a comparison of how workers declare their place of work can be made. In both countries, outgoing rotation groups are contacted for further questions, which means that they answered both the "usual" and "COVID-19" place of work questions, although in different surveys. Figures 3 and 4 show the results.

▶ **Figure 3. Great Britain (LFS vs OLS)**



▶ **Figure 4. Brazil (PNAD-C vs PNAD-Covid)**



Sources: UK LFS, Brazil PNAD COVID and Brazil PNADC microdata. UK OLS data from ONS. (https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandwellbeing/bulletins/coronavirusandthesocialimpactsongreatbritain/previousReleases)

In the United Kingdom, the Opinions and Lifestyle Survey (OLS) average for the work at home question was 33.8 per cent of those employed but the Labour Force Survey figure was 7.8 per cent, a number about one-fourth of the OLS number. For Brazil the differences are less dramatic but still very significant at 5.6 per cent and 11 per cent. In other words, the wording of the place of work question is crucial.

In addition, the surveys show opposing trends. Even as the COVID-specific questions show a decrease in home-based work, the "usual place of work" questions show an increase. The obvious interpretation is that growing numbers of workers, after many months at home, begin to think of this work arrangement as normal and not anomalous.

There are two other surveys that capture home-based work during the pandemic even better, with two questions on work at home in the same survey.

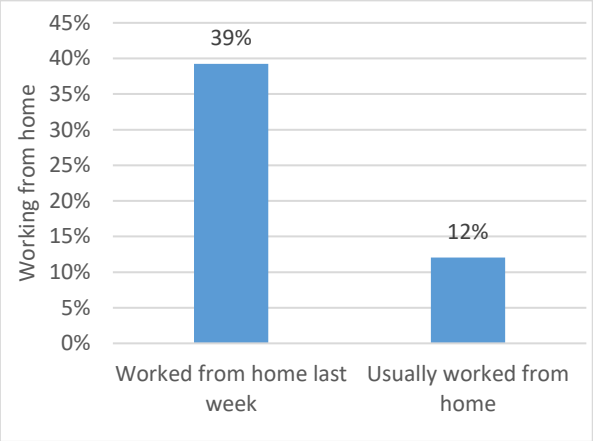
The Canadian Perspectives Survey Series has the following questions:

Which of the following best describes your usual place of work at your main job or business? And *during the week of ___, in which of these locations did you work the most hours?*

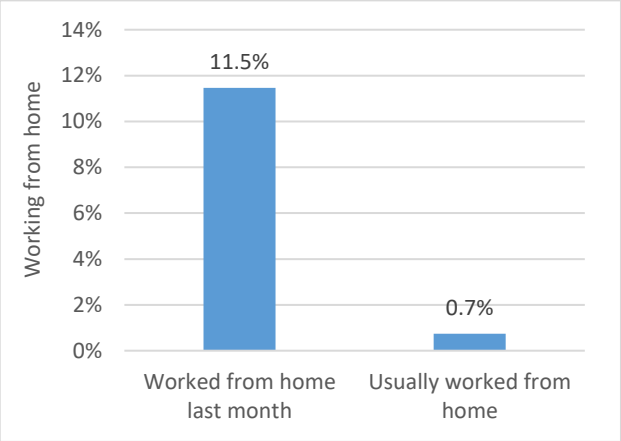
Likewise the Labour Force Survey carried out by the Agency for Statistics of Bosnia and Herzegovina has two home-based work questions. The first comes in the beginning of the questionnaire and asks where the person worked. While it does not specifically employ the words "normally" or "usually", the questionnaire flow implicitly suggests such an interpretation. The second question asks whether the person worked from home at least half of his or her time in the last four weeks.

These questions allow for the comparison between those who habitually worked from home (the way the Brazilian or United Kingdom usual questions might be answered) and COVID-induced work from home. Figures 5 and 6 show the difference of asking the question in different ways in the same survey.

▶ **Figure 5. Canadian Perspectives Survey)**



▶ **Figure 6. Bosnia & Herzegovina LFS**



Sources: Canadian Perspectives Survey and Bosnia & Herzegovina LFS microdata.

The differences are no less impressive than for the United Kingdom and Brazil. The number of workers carrying out their work from home triples compared to the number of "usual home-based workers" with the specific question in Canada, and goes up by a factor of more than ten in Bosnia and Herzegovina, although from a very low baseline.

In addition to new questions in existing surveys, there are also a plethora of surveys undertaken specifically for COVID-19 and its effects. Among these are the:

- World Bank-supported high-frequency phone surveys, undertaken mainly in Africa, which uses information from a previous Living Standards Measurement Survey in the country. They typically ask whether the employer of the person answering the survey allowed working from home. This of course limits the responding universe to employees, which are a minority of workers in sub-Saharan Africa. The exception is the Kenya survey, which asks if workers with all labour market insertions were able to work from home.
- South Africa's National Income Dynamics Study-Coronavirus Rapid Mobile Survey, which took advantage of the fifth wave of an Income Dynamics study started in 2017 with a representative sample. The question was: *Were you able to work from home?*
- The ILO supported telephone surveys in Egypt, Ethiopia, Morocco and Tunisia also inquiring about workers carrying out their work from home. As with South Africa, the working from home question was phrased as: *Were you able to work from home?*
- Malaysia's Effects of COVID-19 on Economy and Individual, which consists of twin online surveys of enterprises and the working-age population.

This means that a choice must be made: Do we want to know how many people saw themselves as home-based workers during the COVID-19 pandemic or how many were effectively working from home? Although knowing how many people have transitioned to seeing themselves as home-based workers during the pandemic is undoubtedly an interesting question, in this brief our focus is on how many people were effectively working from home during the second quarter of 2020.

This means that we must choose formulations of the place of work question that are consistent with the question the brief hopes to answer. Whenever we have the choice, we should thus chose questions that define specific reference periods for working from home and eschew questions about "usual" or "normal" place of work. Luckily, most of the 33 surveys we base our estimates upon define specific reference periods.

Surveys and sample sizes

High quality household surveys with large samples and tried and true questionnaires are the ideal when attempting to estimate how many people actually work from home. We have 21 such surveys with place of work questions for 2020. In the absence of these, a second best solution are telephone surveys based upon household survey respondents which keep up the sampling schemes but inevitably incur a selection bias from differential response, although re-weighing allows the surveys to keep such bias manageable. We have 12 such surveys.

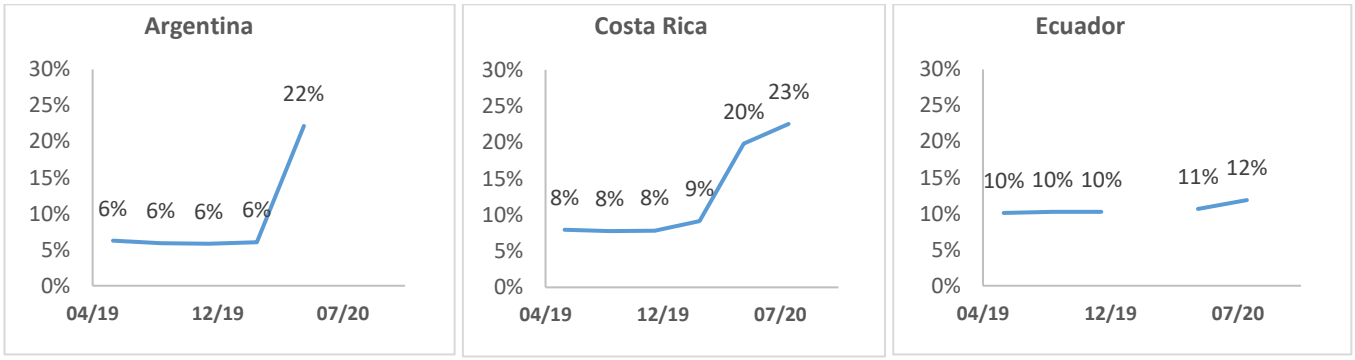
Many other smaller surveys have been undertaken by firms and other actors, but for the most part they were not used in this brief. We considered that the universes were too limited (such as employees of large multinational firms) or the surveys too limited (such as online surveys which have no sampling scheme to speak of) and decided to eschew the use of such untrustworthy sources.

With only these 31 countries (33 surveys, but Brazil and the United Kingdom have two each), it is impossible to draw global conclusions from simple averages. The countries for which we have surveys represent 43 per cent of employment in high-income countries, 19 per cent in upper-middle income ones (no information available for China or Indonesia) and only 14 per cent of lower middle- and low-income ones (no India). The solution of course is to stratify countries by income level and thereby make a worldwide estimate. Nevertheless, these numbers should be used with caution. There are two important limitations.

The first and most obvious is the limited number of countries being used to extrapolate a figure for the entire world. In particular, although some high population countries such as the United States, the Russian Federation and Brazil are in the figures, China, India and Indonesia are not.

Annex 1 shows all the surveys used in calculating the number in this brief. Thirty-three surveys from 31 countries covering all continents but Oceania and all country income groups were used. Of these, 12 were specific COVID-19 surveys, three were surveys with specific COVID-19 questions and the remaining 17 were regular household or labour force surveys whose questions we judged as adequate. The proportion of workers working from home is shown for nine of these surveys in Figures 7 and 8 below.

▶ **Figure 7. Latin America**

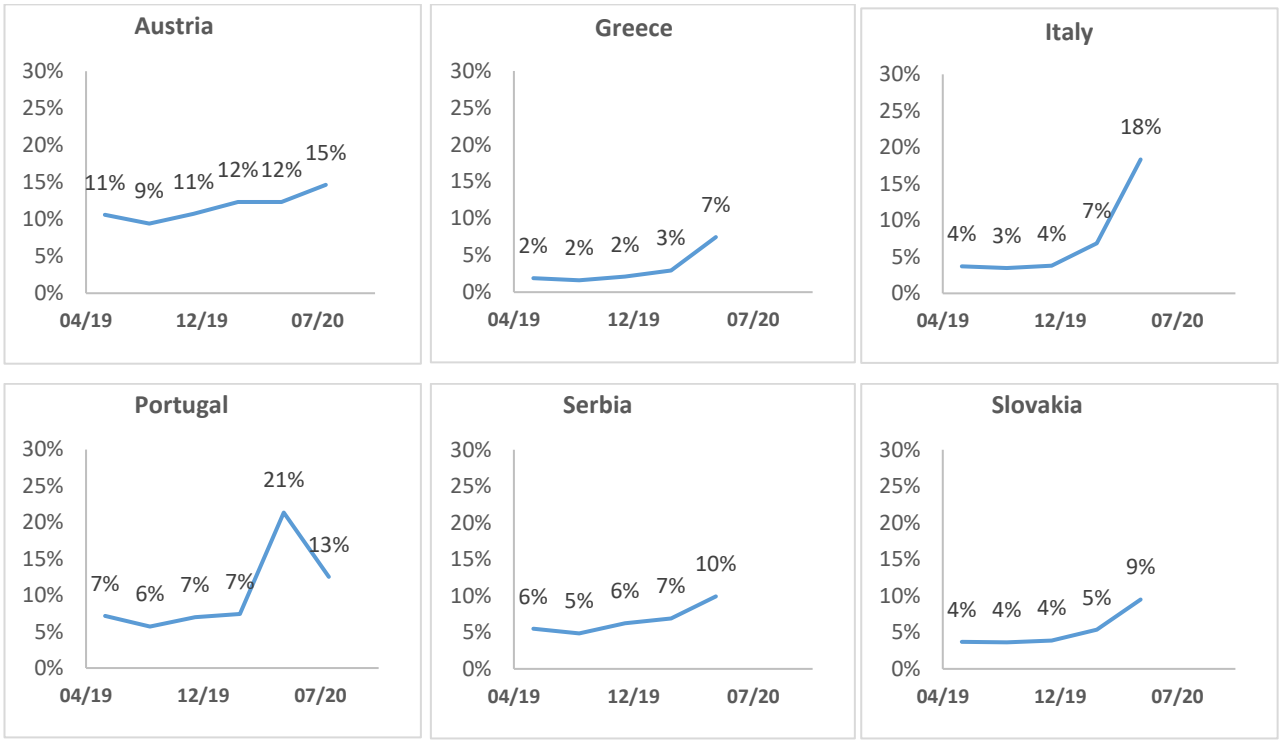


Sources: Household Survey microdata.

These figures show that working from home behaviours varied considerably from country to country. While workers in Argentina, Costa Rica, Italy and Portugal changed to working from home in droves, those in Ecuador, Austria, Serbia and Slovakia did so in a more measured fashion.

An astute reader will notice that the countries represented in Figures 7 and 8 are all from either Latin America or Europe and that this contrasts to the boastful declarations made about our surveys covering all country groups and almost all continents. The reason for this apparent discrepancy is that most of the ad hoc surveys are from Africa and Asia and both the United States and Canada have ad hoc questions added to their Current Population and Canadian Perspectives Surveys.

▶ **Figure 8. Europe**

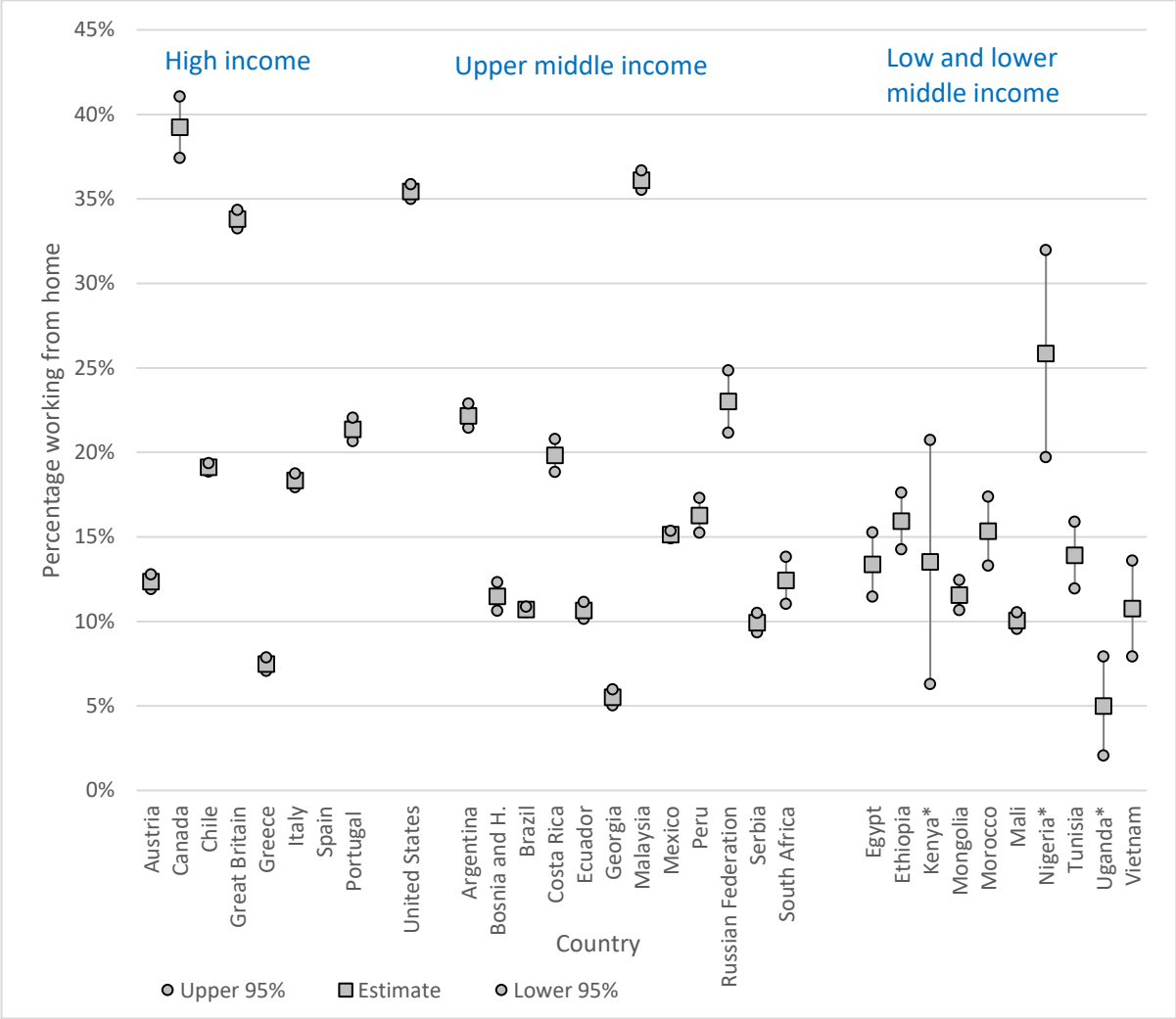


Sources: Labour Force Survey microdata.

This is an issue because not all surveys are of the same quality. Heterogeneities in the place of work question were already discussed above, but there is also the sampling issue. The samples of the surveys used in calculating the number of home-based workers varies from 381 thousand interviews that make up Brazil's PNAD-COVID to a mere 1.9 thousand in Egypt's ad hoc COVID survey. This means that sampling errors will also be heterogeneous. Figure 9 shows sampling errors for all surveys used.

The sampling errors for Kenya, Nigeria and Uganda are particularly high for two reasons. The first is the relatively limited sample and the second is that the working from home question is asked only of employees. Clearly, the sampling errors are much larger for lower middle- and low-income countries. This will not in principle have any impact upon the estimate to be made, but will affect the confidence intervals.

▶ **Figure 9. 95% Confidence intervals for home-based work, by country (survey)**



Source: Household, labour force and ad hoc COVID-19 surveys.
Note: 95% confidence intervals are calculated using the normality assumption. Since variances are estimated and not known, a t-distribution would be more appropriate. For large samples, the difference is small.

Calculating the number of individuals working from home during the COVID-19 pandemic

We have available and acceptable data on working from home for countries whose employment represents about 21 per cent of the world's three billion workers. China, India and Indonesia are sorely missed, but we must make do with what we have. The 21 per cent number strongly suggests that some kind of stratification is in order. Given the countries available, the best choice was to stratify using three country income groups: high income, upper-middle income and lower-middle and low income together. In addition, due to the particular question used in the Current Population Survey, the United States was considered a stratum by itself.

The stratum means are employment-weighted means of the countries in the stratum and the stratum variances are the (employment-weighted) sum of the country variances.

The details of the calculations can be found in the Table below.

▶ Table 1: Estimates for proportions of workers working from home

Country	No. home-based workers	Employed population	95% Sample Confidence Interval		
			Upper	Estimate	Lower
High income					
Austria	529,868	4,291,432	12.8%	12.3%	11.9%
Canada	6,775,677	17,271,607	41.1%	39.2%	37.4%
Chile	1,368,951	7,162,521	19.4%	19.1%	18.9%
Great Britain	11,006,482	32,573,192	34.3%	33.8%	33.2%
Greece	263,359	3,527,249	7.9%	7.5%	7.1%
Italy	4,165,553	22,714,482	18.7%	18.3%	17.9%
Spain	3,015,200	18,607,200	16.5%	16.2%	15.9%
Portugal	1,010,184	4,731,266	22.1%	21.4%	20.7%
High income	28,135,273	110,878,949	25.5%	25.4%	25.2%
United States	48,819,305	137,819,571	35.9%	35.4%	35.0%
Upper middle income					
Argentina	2,115,033	9,543,097	22.9%	22.2%	21.4%
Bosnia and H.	81,985	714,942	12.3%	11.5%	10.6%
Brazil	8,709,352	81,343,267	10.9%	10.7%	10.5%
Costa Rica	345,825	1,745,257	20.8%	19.8%	18.8%
Ecuador	656,819	6,171,386	11.1%	10.6%	10.1%
Georgia	92,656	1,683,977	6.0%	5.5%	5.0%
Malaysia	5,267,777	14,592,617	36.7%	36.1%	35.5%
Mexico	6,780,283	44,811,129	15.4%	15.1%	14.9%
Peru	1,062,937	6,534,152	17.3%	16.3%	15.2%
Russian Federation	15,788,041	68,643,656	24.8%	23.0%	21.2%
Serbia	282,083	2,843,121	10.5%	9.9%	9.3%
South Africa	1,882,747	15,157,951	13.8%	12.4%	11.0%
Upper middle	43,065,538	253,784,552	17.1%	17.0%	16.9%
Lower middle and low income					
Egypt	3,479,296	26,042,006	15.3%	13.4%	11.5%
Ethiopia	8,175,225	51,324,000	17.6%	15.9%	14.3%
Kenya*	3,187,770	23,031,377	20.7%	13.5%	6.3%
Mongolia	136,899	1,185,359	12.4%	11.5%	10.7%
Morocco	1,586,868	10,353,031	17.4%	15.3%	13.3%
Mali	626,450	6,236,226	9.6%	10.0%	10.5%
Nigeria*	539,420	2,087,791	32.0%	25.8%	19.7%
Tunisia	476,167	3,422,630	15.9%	13.9%	11.9%
Uganda*	48,571	972,935	7.9%	5.0%	2.1%
Vietnam	5,943,169	55,259,824	13.6%	10.8%	7.9%
Lower & lower middle	24,199,834	179,915,179	13.6%	13.5%	13.3%
World Estimate	**557,268,798**	**3,196,902,936**	**17.3%**	**17.4%**	**17.5%**

Source: Household, labour force and ad hoc COVID-19 surveys.

In accordance to the literature on working at home potential, the higher the income, the higher the percentage of workers carrying out their work from home. For the United States, the percentage was 35 per cent, and for other high-income countries the percentage was 25 per cent. For upper-middle-income countries, the percentage was 17 per cent and for the lower-middle and low-income country group, it was 14 per cent. Using these strata, the global number of workers working from home was estimated at 558 million, which corresponds to 17 per cent of global employment.

The standard deviation of the estimate was 0.05%, which is very small. An important note is that this standard deviation is only the sampling error calculated using the sample sizes of the surveys. So 0.05% is the standard deviation of the estimate for telework of the 31 countries whose surveys were analysed.

We do not know how to estimate the error of imputing to Chinese workers the average working at home proportions of 12 upper-middle income countries or imputing to Indian workers the average of ten low and lower-middle income countries. This is, of course, the most important source of error – far more important than survey sampling error. The literature provides little guidance as to how to calculate such non-sampling errors, "but when in doubt [and looking for error estimates,] bootstrap".[5] Using a bootstrap procedure on each of our income strata with 1000 repetitions yields much larger confidence intervals and variance.

▶ **Table 2: Estimates for the proportions of workers working from home during Q2 2020**

	95% sample confidence interval			ILO (2020a)
Stratum	Upper	Estimate	Lower	Potential WFH
High income	17.8%	25.4%	33.0%	27%
United States	35.3%	35.4%	35.6%	
Upper middle	11.4%	17.1%	22.8%	16%
Lower middle and low	11.6%	13.6%	15.7%	12%
All countries	14.9%	17.4%	19.9%	18%

Source: Household, labour force and ad hoc COVID-19 surveys.

The final calculation is that between 14.9 per cent and 19.9 per cent of those employed in the world worked from home during the second quarter of 2020. This amounts to between 477 and 638 million workers, all with a 95 per cent confidence interval. Lying in the centre of this interval is the following figure: 557 million workers, which account for 17.4 per cent of the world's employment.

Other than the numerical conclusion above that 557 million worked from home, the main conclusion is that this number is surprisingly close to estimates calculated in May 2020 using only the occupational distribution of employment. The last column in Table 2 shows the numbers estimated by the ILO in May 2020 using only occupational data and a Delphi study of home-workability. The results are surprisingly close: 17.4 per cent for observational studies vs. 18 per cent for the occupational simulations.

[5] In statistical analysis, *bootstrapping* is a method for estimating the distribution of an estimator or test statistic by resampling one's data or a model estimated from the data. The quote is attributed to Ryan Holmes, Co-founder of Hootsuite, the social media managing platform. Mr. Holmes was not referring to estimating measurement errors, rather to having the courage to launch one's business, but the same principle applies to this exercise.

▶ References

Albrieu, R. 2020. *Evaluando las oportunidades y los límites del teletrabajo en Argentina en tiempos del COVID-19*. Buenos Aires: CIPPEC (Centro de Implementación de Políticas Públicas para la Equidad y el Crecimiento).

Barrero, J.M., N. Bloom and S. Davis. 2020. "60 million fewer commuting hours per day: How Americans use time saved by working from home", Becker-Friedman Working Paper No. 2020-132.

Brynjolfsson, E., J.J. Horton, A. Ozimek, D. Rock, G. Sharma, and H. TuYe. 2020. "COVID-19 and Remote Work: An Early Look at US Data", NBER Working Paper No. 27344.

Boeri, T., A. Caiumi, and M. Paccagnella. 2020. "Mitigating the work-safety trade-off." *Covid Economics: Vetted and Real-Time Papers,* Issue 2, April 8. CEPR.

Dingel, J., and B. Neiman 2020. "How Many Jobs Can be Done at Home?", NBER Working Paper 26948.

Eurofound. 2020. *Living, working and COVID-19: First findings* – April 2020. Publications Office of the European Union, Luxembourg.

Felstead, A., and D. Reuschke 2020. "Homeworking in the UK: Before and during the 2020 lockdown", August 2020. Wiserd working paper.

Foschiatti, C.B., and L. Gasparini. 2020. "El Impacto Asimétrico de la Cuarentena: Estimaciones en base a una caracterización de ocupaciones", CEDLAS Working Paper No. 261.

Gottlieb, C., J. Grobovšek, M. Poschke, and F. Saltiel. 2020. "Working From Home in Developing Countries", IZA Discussion Paper No. 13737.

Guntin, R. 2020. "Trabajo a Distancia y con Contacto en Uruguay", mimeo.

Hensvik, L., T. Le Barbanchon, and R. Rathelot. 2020. "Which Jobs Are Done from Home? Evidence from the American Time Use Survey", IZA Discussion Paper No. 13138.

ILO. 2020a. "Working from Home: Estimating the worldwide potential." Available at https://www.ilo.org/global/topics/non-standard-employment/publications/WCMS_743447/lang--en/index.htm.

ILO. 2020b. *Working from Home: From invisibility to decent work*, ILO, Geneva.

Martins, P. 2020. "O Potencial de Teletrabalho em Portugal", *Observador.*

▶ Annex 1: The surveys

Country	Survey	Universe	Type of question	Sample	Employed sample	Period
Argentina	EPH	All workers	Place of work	37,132	12,800	Quarter 2
Austria	LFS	All workers	HBW > 1/2 of time	44,318	21,970	Quarter 2
Bosnia-Herz.	LFS	All workers	Two questions	18,706	5,428	Quarter 2
Brazil	PNAD-Covid	All workers	Covid	381,270	152,799	May
Brazil	PNADC	All workers	Place of work	369,156	137,860	Quarter 2
Canada	CPSS	All workers	Two questions	4,627	2,752	29/march to 3/april
Chile	LFS	All workers	Covid	72,104	23,653	Quarter 2
Costa Rica	ECE	All workers	Place of work +	20,720	6,457	Quarter 2
Ecuador	ENEMDU	All workers	Place of work	37,406	15,023	Quarter 2
Egypt	ERF Covid-19	All workers	Able to work from home	1,923	1,235	June
Ethiopia	ERF Covid-19	Urban workers	Able to work from home	2,544	1,828	Quarter 2
Georgia	LFS	All workers	HBW > 1/2 of time	14,325	8,837	Quarter 2
Great Britain	OPS	All workers	Covid	40,000	29,000	09/march to 25/june
Great Britain	LFS	All workers	Place of work	69,733	34,396	Quarter 2
Greece	LFS	All workers	HBW > 1/2 of time	51,905	16,854	Quarter 2
Italy	LFS	All workers	HBW > 1/2 of time	101,600	34,028	Quarter 2
Kenya	HFPS	Employees	Employer allows home work	4,457	86	July-September
Malaysia	Effects of Covid-19 on Economy and Individual	All workers	Covid	41,386	27,066	10/april-24/april
Mali	EMOP	All workers	Place of work	47,806	14,477	Year 2020
Mexico	ENOE (LFS)	Self employed	Place of work -	91,654	34,433	Quarter 2
Mongolia	LFS	All workers	Place of work	11,741	4,896	Quarter 2
Morocco	ERF Covid-19	All workers	Able to work from home	2,007	1,198	November
Nigeria	HFPS	Employees	Employer allows home work	1,925	196	July
Peru	ENAHO	Employees	Place of work	21,553	4,985	Quarter 3
Portugal	IE (LFS)	All workers	HBW > 1/2 of time	29,892	13,197	Quarter 2
Russian Federation	CLMS-HSE Covid-19 Labour Market Impact Survey	All workers	Covid	2,000	2,000	Quarter 2
Serbia	LFS	All workers	HBW > 1/2 of time	26,375	10,164	Quarter 2
South Africa	Covid-NIDS	Employees	Able to work from home	6,893	2,162	July and August
Spain	LFS	All workers	HBW > 1/2 of time	147,985	55,664	Quarter 2
Tunisia	ERF Covid-19	All workers	Able to work from home	2,000	1,186	November
Uganda	HFPS	Employees	Employer allows home work	2,147	213	September
United States	CPS	All workers	Covid	97,758	46,920	April
Vietnam	WB Vietnam Business Pulse Survey Wave 1	Employees	Employers asked if allow homework	499	499	June

▶ Annex 2: Selected place of work question examples

South Africa (National Income Dynamics Study (NIDS) – Coronavirus Rapid Mobile Survey (CRAM))

Are you able to work from home? If yes, some or most of the time? (only asked of employees)
- Yes - Most of the time
- Yes - Some of the time
- No - None of the time

Portugal (Inquérito ao Emprego)

Nessas 4 semanas exerceu a sua profissão em casa? (In the last 4 weeks did you work from home?)
Quantos dias? (How many days?)
- 14 ou mais dias
- Menos de 14 dias

Egypt, Morocco, Tunisia

Are you able to work from home? Yes/No

Great Britain (Labour Force Survey)

(In your main job) do you work mainly...
1. in your own home,
2. in the same grounds or buildings as your home,
3. in different places using home as a base,
4. or somewhere quite separate from home?

Canada (Canadian Perspectives Survey Series, 2020) – Two questions

Which of the following best describes your usual place of work at your main job or business?
ON-SCREEN HELP: Exclude any recent changes related to COVID-19.
- Work at a fixed location outside the home
- Work outside the home with no fixed location (Help text: e.g., driving, making sales calls)
- Work at home

During the week of ___, in which of these locations did you work the most hours?
- At a fixed location outside the home
- Outside the home with no fixed location
- At home
- Absent from work
- (Don't know, Refusal not allowed)

Costa Rica (Encuesta Continua de Empleo)

¿Dónde realiza principalmente (nombre) sus tareas? Where do you mainly work? - 15 choices, of which:
- Dentro de su vivienda por servicios prestados (in your house for services rendered)
- Dentro de su vivienda por pieza o producto (in your house for piece or product)
- Exclusivamente por internet (exclusively through the internet)
- Teletrabajo (telework)

Brasil (PNAD Covid)

Na semana passada, o(a) Sr(a) estava em trabalho remoto (home office ou teletrabalho)? (last week were you on remote work (telework or home office)) – yes/no

Brasil (PNAD Continua)

Então onde ... exercia normalmente esse trabalho ? (So where did you normally carry out your work?) – Eight choices of which:

No domicílio de residência, em local exclusivo para o desempenho da atividade (in your house with exclusive space)
No domicílio de residência, sem local exclusivo para o desempenho da atividade (in your house without exclusive space)

Argentina EPH

Dónde realiza principalmente sus tareas? (Where do you mainly carry out your tasks?) – 10 choices of which one is in this house.

United States (American Community Survey)

How did this person usually get to work LASTWEEK? Mark (X) ONE box for the method of transportation used for most of the distance. 12 choices of which: "Worked at home" is one.

United States (Current Population survey)

At any time in the LAST 4 WEEKS, did you telework or work at home for pay BECAUSE OF THE CORONAVIRUS PANDEMIC? Yes/No

Ethiopia (COVID-19 Urban Employment Impact Survey)

Since February, have you been able to do more work from home, or online?

Nigeria

What are the preventive measures taken by your employer for the safety of the staff at the workplace?

1. Use of disinfectant for cleaning
2. Provided hand sanitizer
3. Raising awareness about preventative measures
4. Provided masks
5. Provided gloves
6. Allowed work from home
7. I am not going to the office/my office is closed
8. My employer is not taking any preventative measures

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