

Uptake and Inequality of Telework Dashboard: Technical Documentation and Methodology

INTRODUCTION

This dashboard was conceptually developed for two goals: understanding the uptake of telework, across years, countries and occupations, and how inclusive it is across socio-economic groups. A dashboard format has been chosen so that users can customise the data and visualisations for specific regions and years of interest, to easily access and monitor the most recent available data and to understand the policy topic from an inclusive angle.

This dashboard is a part of the [Future of Work and Inclusive Growth in Europe](#) project at Bruegel, which aims to develop multiple dashboards on labour market topics. It has been produced with the financial support of the Mastercard Center for Inclusive Growth.

This document gives more information about how the source data is used to obtain the indicators and figures. It is structured as follows. First, the source databases and the most important indicators that are used throughout the dashboard are explained. Second, the explanation by figure and functionalities section allows for the user to get detailed information on how each figure is constructed and which functionalities the dashboard has. Next, an overview of the missing values can be found and why they are missing. Finally, the annex comprises a screenshot of the dashboard that numbers each figure and functionality which can be used as a reference throughout this document and an overview of the missing values in a matrix format.

INPUT DATA AND MAIN INDICATORS

The indicators constructed in this dashboard are based on data from the European Labour Force Survey ([LFS](#))¹, the European Statistics on Income and Living Conditions ([SILC](#))² and a telework index by [Sostero et al.](#) (2020).

Our main indicators throughout the dashboard are the “uptake of telework” and “telework potential”. The first is directly derived from the LFS, using the variable HOMEWK (or HOMEWORK from 2021 onwards). All people in employment indicate whether they usually, sometimes or never work at home for their main job. In the dashboard, the indicator “uptake of telework” shows the weighted percentage of respondents that indicated they usually or sometimes work at home. The second, telework potential, is calculated using the teleworkability index from Sostero et al. (2020). In their work, they calculate for each occupation the technical teleworkability using the International Standard Classification of Occupations ([ISCO](#)) on 3-digit level³. Their methodology consists of looking at the tasks that make up an occupation and giving a score to each task on whether they can technically be performed remotely. The teleworkability index of the occupation is then an average of these scores (0 = not possible to telework, 1 = can be performed fully remotely)⁴. Throughout the dashboard, the telework potential shows the weighted average of the teleworkability index, taking into account the number of people employed in each occupation. Next to the technical teleworkability, they also developed a social interaction index, which measures to which extent an occupation benefits from social interaction. This has **not** been taken into account in the calculation of telework potential in the

¹ A full overview of the variables available in this dataset can be found [here](#).

² A full overview of the variables available in this dataset can be found [here](#).

³ The occupations and their technical teleworkability can be downloaded [here](#).

⁴ A full methodology can be found in [their paper](#) from page 28 to page 37.

dashboard. The technical teleworkability of a country can change over time because of two reasons. First, some tasks can become easier to perform remotely because of technological developments, for example, through virtual reality it might be common in the future to control a robot in a plant from home. This is not taken into account in the dashboard, as it requires updates of the index by the original authors. Second, industries and employment structures of countries can change, for example, less people could be employed as veterinarians (low teleworkability) and more people will work as authors, journalists and linguists (highly teleworkable). This second effect is taken into account in the dashboard.

It is important to keep in mind that the telework potential (technical teleworkability) is not directly comparable to the uptake of telework nor is it a target that should be achieved normatively. It serves as a reference so that the uptake of telework can be better compared across geographies, time and socio-demographics.

Note that due to missing values in the source data, not all indicators are available for each year and country. Please consult the missing values section for an overview of which indicators are missing and why.

EXPLANATION BY FIGURE AND FUNCTIONALITIES

Uptake of telework (figure 1)

The uptake of telework shows the percentage of people that usually or sometimes work from home, for the selected year and country. It is constructed with the variable HOMEWK from LFS as explained above. It can be compared with number next to it: the telework potential.

$$\text{Uptake of telework} = \frac{\text{Number of people that usually or sometimes work from home}}{\text{Total employment}}$$

Telework potential (figure 2)

The telework potential shows the percentage of people that could technically telework, for the selected year and country. As explained above, it is constructed using the taxonomy of Sostero et al. (2020), where each 3-digit occupation is given a teleworkability score as a percentage. This results in the following formula:

$$\text{Telework potential} = \frac{\sum_{occ=1}^n \text{Teleworkability}_{occ} \cdot \text{Employment}_{occ}}{\text{Total employment}}$$

Where occ represents the ISCO 3-digit occupations.

The employment structure for a given country and year is thus taken into account for the calculation of the telework potential.

Note that in some cases (for example Sweden in the year 2021) the uptake of telework is higher than the potential. However, this does not mean that the full potential has been reached, as people in some occupations might be teleworking more than technically feasible, due to for example status in the organisations (e.g. managers), whereas some people in some occupations might not have met their full telework potential yet (e.g. clerical support workers). For a detailed breakdown by occupation, consult figure 4.

Uptake and telework potential across time (figure 3)

This figure shows the uptake of telework and the telework potential, as described in the above two figures, across time for the selected country.

Uptake and telework potential across occupations (figure 4)

This figure shows the uptake of telework and the telework potential, as described in the above two figures, broken down for each occupational group (ISCO 1-digit⁵), for the selected year and country.

The figure has also the possibility to plot on a secondary y-axis the wage and supervisorship. It is there to illustrate that the uptake of telework is correlated with occupational status.

- Wage: The weighted average wage for each occupational group is calculated by taking the sum of the following income variables: the gross employee cash or near cash income, the gross non-cash employee income and the employer's social insurance contributions (PY010G, PY020G and PY030G, from SILC).
- Supervisorship: This variable shows the percentage of people that have supervisory responsibilities in their main job (SUPVISOR, from LFS). Note that the occupational categories are independent from this variable as it is derived from the question "do you supervise the work from of other employees on a regular basis?". This means that people in occupations that are not categorised under "manager" can also still have supervisory responsibilities.

Uptake of telework and its potential by socio-demographics: uptake and potential (figure 5 – panel A)

This figure shows for various socio-demographic breakdowns the uptake of telework and the telework potential (hereafter referred to as "the variables"), for the selected year and country. The following socio-demographic breakdowns are available:

- Age: Shows the variables for three age categories: 15-34 years, 35-49 years and 50-69 years (derived from AGE, from LFS).
- Sex: Shows the variables for men and women (based on SEX, from LFS). Note that gender unfortunately is unavailable.
- Education: Shows the variables by the highest level of education successfully completed by the respondent, aggregated into three categories (based on HATLEV1D, from LFS):
 - Low: early childhood education, primary education or lower secondary education (ISCED 0-2)
 - Middle: upper secondary education or post-secondary non-tertiary education (ISCED3-4)
 - High: short-cycle tertiary education, bachelors degree, masters degree and doctoral degree or equivalent tertiary education level (ISCED5-8)
- Income: Shows the variables for three income categories. It is derived from the income variable "INCDECIL" from the LFS, which indicated in which income decile the respondent is located. They are low (decile 1-3) middle (decile 4-6) and high (decile 7-10).
- Migrant: Shows the variables for two categories: migrant and non-migrant. We define a migrant in the dashboard as someone whose country of birth differs from the country they

⁵ The 1-digit ISCO occupations are: managers, professionals, technicians and associate professionals, clerical support workers, service and sales workers, skilled agricultural, forestry and fishery workers, craft and related trades workers, plant and machine operators and assemblers, elementary occupations.

are currently residing (derived from COUNTRY and COUNTRYB, from LFS). Consequently, a non-migrant is someone who resides in the country in which they were born.

- **Child in household:** Shows the variables for two categories: with child(ren) (child or children of the respondent live in the same household) and without (child or children do not live in the same household) (derived from HHCHILDR, from LFS).

Uptake of telework and its potential by socio-demographics: difference potential & uptake (figure 6 – panel B)

This figure shows the difference between the potential and uptake of telework for each socio-demographic group across time, for the selected country. For example, if the uptake of telework for women would be 25% and their telework potential is 35% (taking into account the occupations in which women are employed for the selected year and country), then the indicator would amount to 10%. Or, graphically, it is the difference between two bars of the same colour in the above figure.

$$\text{Difference potential \& uptake}_{s,g} = \text{telework potential}_{s,g} - \text{uptake of telework}_{s,g}$$

Where *s* stands for the socio-demographic breakdown (e.g. gender) and *g* stands for the group within that socio-demographic (e.g. women).

See above (figure 5) for more information about the socio-demographic breakdowns that are available.

Cross-country comparison of indicators (figure 7)

The map and tables allow to easily compare four indicators across countries, for the selected year: the uptake of telework (see figure 1), the telework potential (see figure 2), the difference between them and the inequality score. The two tables show the top and bottom three countries for the selected indicator.

The **inequality score** is an indicator that shows how inclusive teleworking is across countries and time, by comparing the difference in the difference between the potential and uptake of telework for each group within a socio-demographic breakdown (diff-in-diff). It takes into account age, gender, education, income, migrants and whether or not there are children in the household.

The differences for each socio-demographic are calculated as followed:

- $\text{Age}_{c,y} = \text{MAX}\left(\frac{\sum_{occ=1}^n (T_p - T_u)_{occ} \cdot E_{occ}}{E_{c,y}}\right)_{Y,M,O} - \text{MIN}\left(\frac{\sum_{occ=1}^n (T_p - T_u)_{occ} \cdot E_{occ}}{E_{c,y}}\right)_{Y,M,O}$
- $\text{Gender}_{c,y} = \text{MAX}\left(\frac{\sum_{occ=1}^n (T_p - T_u)_{occ} \cdot E_{occ}}{E_{c,y}}\right)_{M,W} - \text{MIN}\left(\frac{\sum_{occ=1}^n (T_p - T_u)_{occ} \cdot E_{occ}}{E_{c,y}}\right)_{M,W}$
- $\text{Education}_{c,y} = \text{MAX}\left(\frac{\sum_{occ=1}^n (T_p - T_u)_{occ} \cdot E_{occ}}{E_{c,y}}\right)_{L,M,H} - \text{MIN}\left(\frac{\sum_{occ=1}^n (T_p - T_u)_{occ} \cdot E_{occ}}{E_{c,y}}\right)_{L,M,H}$
- $\text{Income}_{c,y} = \text{MAX}\left(\frac{\sum_{occ=1}^n (T_p - T_u)_{occ} \cdot E_{occ}}{E_{c,y}}\right)_{L,M,H} - \text{MIN}\left(\frac{\sum_{occ=1}^n (T_p - T_u)_{occ} \cdot E_{occ}}{E_{c,y}}\right)_{L,M,H}$
- $\text{Migrant}_{c,y} = \text{MAX}\left(\frac{\sum_{occ=1}^n (T_p - T_u)_{occ} \cdot E_{occ}}{E_{c,y}}\right)_{Y,N} - \text{MIN}\left(\frac{\sum_{occ=1}^n (T_p - T_u)_{occ} \cdot E_{occ}}{E_{c,y}}\right)_{Y,N}$
- $\text{Child in household}_{c,y} = \text{MAX}\left(\frac{\sum_{occ=1}^n (T_p - T_u)_{occ} \cdot E_{occ}}{E_{c,y}}\right)_{Y,N} - \text{MIN}\left(\frac{\sum_{occ=1}^n (T_p - T_u)_{occ} \cdot E_{occ}}{E_{c,y}}\right)_{Y,N}$

Where *c* = country, *y* = year, *occ* = 3-digit ISCO occupation, *E* = employment, *T_p* = teleworkability of the occupation, *T_u* = uptake of telework of the occupation, and the letters after the brackets refer to the groups within the socio-demographic breakdowns.

For example, in Belgium for the year 2021, the difference amounts to 8.06% for 15–34-year-olds, 5.45% for 35-49-year-olds and 3.73% for 50-69-year-olds. In this case, $Age_{Belgium,2021} = 0.086 - 0.0373 = 0.0487$.

Finally, we calculate the average of these differences to obtain the inequality score.

$$Inequality\ score_{c,y} = \frac{Age_{c,y} + Gender_{c,y} + Education_{c,y} + Income_{c,y} + Migrant_{c,y} + Child\ in\ household_{c,y}}{6}$$

Functionalities

An overview of the functionalities of the dashboard can be found in the table below.

Reference	Action
A	By clicking on the tile, the figures will show the indicators for the selected country. These are figures 1, 2, 3, 4, 5 and 6. Note that the dashboard does not allow for multiple selections at the same time.
B	By clicking on the tile, the figures will show the indicators for the selected year. These are figures 1, 2, 4, 5 and 7. Note that the dashboard does not allow for multiple selections at the same time.
C	This button brings back the dashboard to its default settings, i.e. the European Union for the latest available year (2021).
D	This button opens the technical documentation and methodology document (i.e. this document).
E	This button opens the underlying data that was used to construct the dashboard.
F	This button opens the associated blog post that was written using the underlying data of this dashboard (forthcoming).
G	This button opens the Bruegel Future of Work and Inclusive Growth homepage.
H	By hovering over the information buttons, a short explanatory text about the figure pops up.

By right-clicking on the figures, some other options are available depending on the figure:

- “Show as table”: this will take you a zoomed-in version of the graph with below a table that shows the exact values for each observation.
- “Include” and “exclude”: these options allow you to include or exclude a specific data point that is being shown on the figure. We do not recommend using this option as it can distort the figure and lead to misinterpretations. Unfortunately, it is impossible to remove this option once it has been selected. In case you have selected this option, you can use the return to default button on the top ribbon at the right.

MISSING VALUES

Since not every variable is available in our source data for each country and year, there are some missing values in the dashboard. These are the following:

- Malta, Slovenia and Bulgaria are not present in the dashboard, because they do not have the 3-digit level occupation available for their respondents. Since this is integral for the calculation of the telework potential and to ensure comparability across geographies, these countries have been omitted. Note that therefore the EU breakdown also **does not** include these countries.
- The income breakdown in the two socio-demographics figures (5d and 6d) is not available for the year 2021 for all countries, as there is no income variable present in the LFS in 2021. In addition, it is also not available for Czechia in the years 2018-2021, Sweden in the years 2012-2021 and Slovakia in the years 2020-2021, for the same reason. The variable wage from SILC is not used to replace these missing values in order to remain consistent across years.
- The breakdown by migrant status in the two socio-demographics figures (5e and 6e) is not available for Germany in the years 2012-2016, since the variable “country of birth” is not available in the source data (LFS).
- The option to plot wage for Poland and Slovakia in the occupations figure (4a) is not available for the year 2021 since wage is missing in the source data (SILC) for these countries.
- The Netherlands only gave respondents the opportunity to respond with “not working from home” or “usually working from home” up until 2015. Afterwards, the option “sometimes working from home” was introduced, which was indicated by around 20% of the respondents. This explains the jump observed in 2015 for The Netherlands, as we define telework uptake as people who usually **and** sometimes work from home.

An overview by country and year of which figures are missing can be found in Annex B.

ANNEX A: REFERENCES TO DASHBOARD FIGURES AND ELEMENTS

UPTAKE AND INEQUALITY OF TELEWORK

You are looking at
Country: European Union
Year: 2021

UPTAKE OF TELEWORK

24%

TELEWORK POTENTIAL

39%

UPTAKE AND TELEWORK POTENTIAL ACROSS TIME

Potential Uptake



CROSS-COUNTRY COMPARISON OF INDICATORS

UPTAKE

POTENTIAL

INEQUALITY SCORE

DIFFERENCE
POTENTIAL&UPTAKE

TOP 3 COUNTRIES

The Netherlands	54.23%
Sweden	46.15%
Luxembourg	45.45%

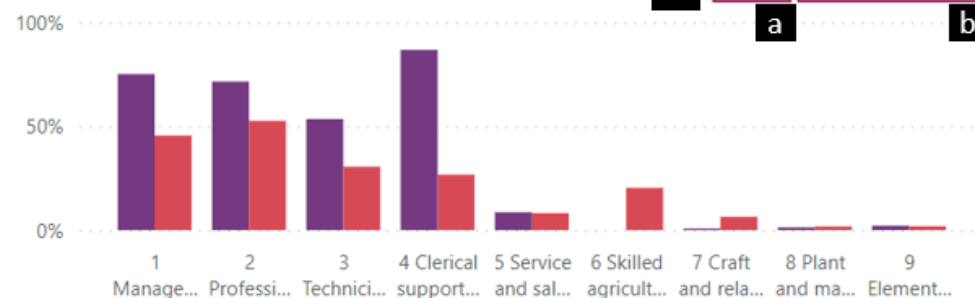
BOTTOM 3 COUNTRIES

Hungary	13.47%
Cyprus	12.93%
Romania	6.63%



UPTAKE AND TELEWORK POTENTIAL ACROSS OCCUPATIONS

Potential Uptake



UPTAKE AND TELEWORK POTENTIAL ACROSS SOCIO-DEMOGRAPHICS

AGE

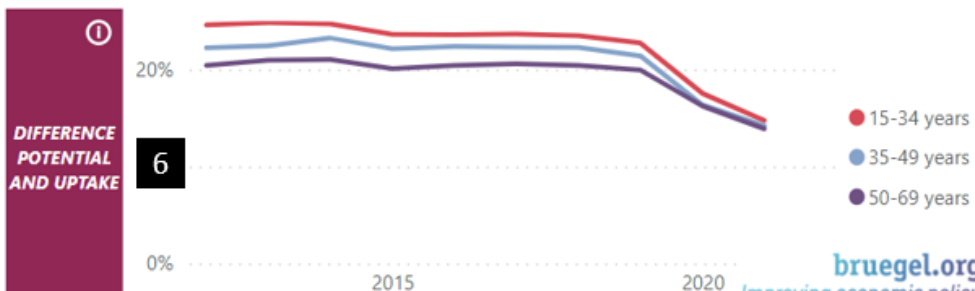
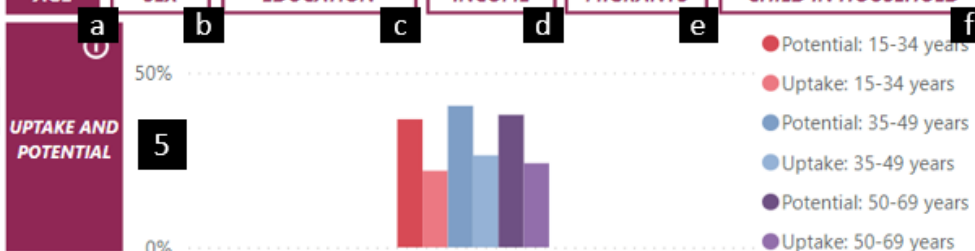
SEX

EDUCATION

INCOME

MIGRANTS

CHILD IN HOUSEHOLD



ANNEX B: MISSING VALUES MATRIX

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
AT										5d, 6d
BE										5d, 6d
CY										5d, 6d
CZ							5d, 6d	5d, 6d	5d, 6d	5d, 6d
DE	5e, 6e	5e, 6e	5e, 6e	5e, 6e	5e, 6e					5d, 6d
DK										5d, 6d
EE										5d, 6d
EL										5d, 6d
ES										5d, 6d
EU										5d, 6d
FI										5d, 6d
FR										5d, 6d
HR										5d, 6d
HU										5d, 6d
IE										5d, 6d
IT										5d, 6d
LT										5d, 6d
LU										5d, 6d
LV										5d, 6d
NL	*	*	*							5d, 6d
PL										4a, 5d, 6d
PT										5d, 6d
RO										5d, 6d
SE	5d, 6d	5d, 6d	5d, 6d	5d, 6d	5d, 6d	5d, 6d	5d, 6d	5d, 6d	5d, 6d	5d, 6d
SK									5d, 6d	4a, 5d, 6d

* The Netherlands only gave respondents the opportunity to respond with “not working from home” or “usually working from home” up until 2015. Afterwards, the option “sometimes working from home” was introduced, which was indicated by around 20% of the respondents. This explains the jump observed in 2015 for The Netherlands, as we define telework uptake as people who usually **and** sometimes work from home.