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STRENGTHEN2

# ► Employment Satellite Account: from “Employed” to “Full-Time Equivalent”

STRENGTHEN2: Employment  
impact assessment to maximize job  
creation in Africa

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## ► Non-technical summary

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Employment data is a critical input for conducting an Employment Impact Assessment (EmpIA) by any international financial institution, donor agency or social partner wishing to evaluate the employment impact of their interventions. However, as EmpIA requires high-quality employment data by detailed industry classification over a certain number of years, the existing published official data are often not fit for purpose.

Using ILOSTAT, which gathers Labour Force Surveys and Household Surveys from national statistical offices, this paper describes the efforts to clean reported employment data and to impute missing values at the detailed *International Standard Industrial Classification (ISIC) of All Economic Activities 2-digit level* (as reported in either ISIC Revision 3.1 or ISIC Revision 4). The results of this paper are measures of employment in terms of both headcounts and full-time equivalents, which are also broken down by sex, age, skills, and employment formality. Data are available for 187 countries for the years 2004-2021. The employment data are subsequently mapped on to GTAP regional aggregations where appropriate, and are available for 158 (out of 160) countries and regions.

The imputed observations are subject to sizeable uncertainty and should therefore not be used for cross-country comparisons or rankings.

## ► Résumé non-technique

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Les données relatives à l'emploi constituent un élément essentiel pour la réalisation d'une évaluation de l'impact sur l'emploi (EmpIA) par toute institution financière internationale, agence donatrice ou partenaire social souhaitant évaluer l'impact de ses interventions sur l'emploi. Toutefois, étant donné que les études d'impact sur l'emploi requièrent des données de haute qualité sur l'emploi selon une classification industrielle détaillée sur un certain nombre d'années, les données officielles publiées existantes ne sont souvent pas adaptées à l'objectif visé.

En utilisant ILOSTAT, qui rassemble les enquêtes sur les forces de travail et les enquêtes auprès des ménages des bureaux nationaux de statistiques, ce document décrit les efforts déployés pour nettoyer les données sur l'emploi et imputer les valeurs manquantes au niveau détaillé à deux chiffres de *la classification internationale type, par industrie (CITI), de toutes les activités économiques* (comme indiqué dans la révision 3.1 de la CITI ou la révision 4 de la CITI). Les résultats de cette étude sont des mesures de l'emploi sous forme d'effectifs et d'équivalents temps plein, qui sont également ventilés par sexe, âge, compétences et formalité de l'emploi. Des ensembles de données sont disponibles pour 187 pays pour les années 2004-2021. Les données sur l'emploi sont ensuite mises en correspondance avec les agrégations régionales GTAP, le cas échéant, et sont disponibles pour 158 (sur 160) pays et régions.

Les observations imputées sont sujettes à une grande incertitude et ne doivent donc pas être utilisées pour des comparaisons ou des classements entre pays.

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## ► 1. Introduction

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Showcasing a strategic partnership between the European Union (EU) and the International Labour Organization (ILO), the STRENGTHEN2 project was launched in 2020, with the overall goal of leveraging employment impact assessments to promote the creation of more and better jobs in sub-Saharan African countries. One of the major outcomes of the project is to streamline employment impact assessments—to introduce common standards and practices in modelling tools used by various development banks and development agencies.

To contribute to this objective, STRENGTHEN2 has not only actively engaged with nine sub-Saharan African countries<sup>1</sup> to refine existing methodologies for Employment Impact Assessment (EmpIA) at the field level, but has also been tasked with developing a generic web-based application that uses Global Trade Analysis Project (GTAP) data to assess employment impact for its stakeholders. The employment data published by ILOSTAT form the basis of both the in-depth country studies and the web-based application.

However, there are a number of challenges in producing harmonized employment data for all countries, including definitions of employment statistics, out-of-sync data collection cycles and differences in the industrial classification of countries, to name but a few. The Statistics Department of the ILO has addressed some of these challenges with great success—the most notable achievement being the use of microdata collected directly from labour force surveys and processed in a harmonized manner so that the data are able to be compared internationally and over time.

There are other studies that have looked at the development of harmonized employment data at the detailed industry level in the past, such as the GTAP Employment Satellite Account for macroeconomic modelling, the OECD Trade in Employment project,<sup>2</sup> ILO modelled estimates (2023) for the ILO flagship publications (the World Employment and Social Outlook for example), and the output of an ILO internal model that has supported the analyses of various policy briefs (such as ILO 2020, ILO 2022 and ADB 2023).<sup>3</sup>

Recognising the achievements of the GTAP Employment Satellite Account and other initiatives, the shortcoming is clear: as data about *mean weekly hours actually worked* become increasingly available on ILOSTAT, the employment data should follow suit to better estimate labour productivity using full-time equivalent measures and to provide more realistic estimates of jobs created/supported by specific financial interventions, or by technical assistance and policy programmes implemented in the target countries or regions.

The aim of this paper is to provide an employment satellite account available at the *International Standard Industrial Classification (ISIC) of All Economic Activities 2-digit level*. Employment data are further broken down by sex (male, female), age (15-24 and 25+), employment formality (formal and informal), occupation and skills (skilled and unskilled). These employment data are further combined with *mean weekly hours actually worked* to estimate the number of full-time equivalent jobs. All data are subsequently fitted to GTAP sectoral classifications and GTAP regional aggregations for macroeconomic modelling purposes. The dataset is built to support the needs of the STRENGTHEN2 project: enabling numerous in-depth project-level studies and the construction of a web-based application for project stakeholders. Moreover, it extends the regional scope of STRENGTHEN2 that targets sub-Saharan African countries to further support macroeconomic models that aim to address employment issues outside Africa. The imputed observations are subject to sizeable uncertainty. Therefore, these data should not be used for cross-country comparisons or rankings.

This paper is structured as follows. Section 2 explains the data sources and basic steps necessary to clean the employment data. Section 3 highlights the methods for imputing missing employment data and how these estimates are benchmarked to the reported data at a higher level of aggregation, where applicable. Section 4 investigates the stability of countries' employment structures, focusing on a small number of selected countries. Section 5 lists the output of this paper and how the methodology could be further improved in the future.

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<sup>1</sup> Cameroon, Côte d'Ivoire, Kenya, Madagascar, Malawi, Namibia, Rwanda, Senegal and Zambia.

<sup>2</sup> See Horvát et al. (2020) where employment data has sourced from OECD Structural Analysis (STAN) database and Systems of National Accounts.

<sup>3</sup> Include OECD STAN and UNIDO employment data as part of data input to estimate employment data at the detailed sectoral level.

## ► 2. Data sources

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The data used in this paper come from the ILO's ILOSTAT, the World Bank's World Development Indicators (WDI) and the GTAP database that is maintained and regularly updated by Purdue University. ILOSTAT is undoubtedly one of the leading sources of employment statistics and is used by many macroeconomic models, including the GTAP model, and has been adopted by many different initiatives that aim to assess the dynamics of the labour market in response to a given economic policy or financial intervention, such as the Joint Impact Model (JIM) of the JIM Foundation and the Job Creation Toolkit (JCT) of the Program for Infrastructure Development in Africa (PIDA).

The target variables to be imputed for the STRENGTHEN2 project-level assessments, in particular for the web-based employment impact assessment application, are the employment data and *the mean weekly hours actually worked* (see Table 1 and Table 2 for a summary of the data sources used for modelling or as constraints after imputation). The two variables are combined to calculate employment in full-time equivalent (FTE). The WDI data described in this section are used as explanatory variables, while the GTAP compensation of employees (estimated with wage data available for very few countries) provides the basis for the breakdown within a given ISIC 2-digit level aggregation.

### Employment data

ILOSTAT hosts labour and population data, such as Labour Force Statistics, Short-Term Labour Force Statistics, Wages and working time statistics, and ILO modelled estimates. The Labour Force Statistics, Short-Term Labour Force Statistics and Wages and working time statistics are sourced from official statistics. With the aim of promoting international comparability, these statistics presented on ILOSTAT are based on standard international definitions wherever feasible and may differ from official national figures. Most of the series are based on the definitions of the 13th International Conference of Labour Statisticians (ICLS).

Meanwhile, ILO modelled estimates provide a complete set of internationally comparable labour statistics, including both nationally reported observations and imputed data for countries with missing data (through a series of econometric models maintained by the ILO). The purpose of estimating labour market indicators for countries with missing data is to “obtain a balanced panel data set so that, every year, regional and global aggregates with consistent country coverage can be computed” (ILO 2023). The country-level data (combining both reported and imputed observations), as published under the *ILO modelled estimates*, constitute a unique, internationally comparable dataset on labour market indicators.

### Employment by Sex and Economic Activity

Employment data<sup>4</sup> by sex and economic activity are sourced from ILO Labour Force Statistics and ILO modelled estimates. The datasets used, as published on ILOSTAT, are:

- Employment by sex and by economic activity—ISIC level 2 (headcount in thousands), Annual (available for 153 countries)
- Employment by sex and economic activity—ILO modelled estimates, Nov. 2022 (headcount in thousands), Annual (available for 189 countries and territories)

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<sup>4</sup> The concept of being “employed” comprises all persons of working age who, during a specified brief period, were in one of the following categories: a) paid employment (whether at work or with a job but not at work); or b) self-employment (whether at work or with an enterprise but not at work).



The first—employment by sex and by economic activities (ISIC 2-digit)—has coverage for 153 countries, but there are missing observations in time series or at the sectoral level. Data disaggregated by economic activity are published according to the latest version of the *International Standard Industrial Classification of All Economic Activities* (ISIC) available for that year. Data may have been regrouped from national classifications, which may not be strictly compatible with ISIC. Sex breaks down into total, female, male and other. Few countries have reported data in the “other” category, and even then, only in selected years.<sup>5</sup> The second—employment by sex and economic activity (available at ISIC level 1, with certain sectors aggregated)—is from ILO modelled estimates and used for benchmark purposes. The dataset provides, in addition to reported data, imputed observations that are not based on the national data. Sex breaks down by total, female, and male.

## Employment by Age and Economic Activity

Employment data by age and economic activity are sourced from ILO Labour Force Statistics. Therefore, being “employed” and the ISIC classification are defined in the same way as employment breakdowns by sex and economic activity. The datasets used, as published on ILOSTAT, are:

- Employment by age and economic activity—ISIC level 2 (headcount in thousands), Annual (available for 129 countries)
- Employment by sex, age and economic activity (headcount in thousands), Annual (available for 148 countries)
- Employment by sex and age—ILO modelled estimates, Nov. 2022 (headcount in thousands), Annual (available for 189 countries and territories)

The first dataset, available at ISIC level 2, provides the basis for econometric analyses, while the latter two are used for the purpose of benchmarking (the third dataset is used as constraints on top of the second if available). The estimates for total employment (derived from employment by sex dataset) are used as constraints for the age split because the employment data by sex has better coverage (available for 153 countries at the ISIC 2-digit level) than the employment data by age (available for 129 countries). Data by age includes various age bands, and we only focus on a few categories: 1) youth, adults: 15+, 2) youth, adults: 15-24, and 3) youth, adults: 25+.

## Informal Employment

Informal employment comprises persons who in their main or secondary jobs were (a) own-account workers, employers and members of producers' cooperatives employed in their own informal sector enterprises; (b) own-account workers engaged in the production of goods exclusively for own final use by their household (e.g. subsistence farming); (c) contributing family workers, regardless of whether they work in formal or informal sector enterprises; or (d) employees holding informal jobs, whether employed by formal sector enterprises, informal sector enterprises, or as paid domestic workers by households. These harmonized series for informal employment are all derived using the same set of criteria across countries to improve comparability. The criteria used are based on employment status, institutional sector, destination of production, bookkeeping, registration, social security contribution, places of work, and size.

Informal employment data by sex and economic activity (ISIC level 2) and by sex, age and economic activity are primarily sourced from ILO Labour Force Statistics. Data disaggregated by economic activity are provided according to the latest version of the ISIC available for that year. It may have been regrouped from national classifications, which may not be strictly compatible with ISIC.

<sup>5</sup> Employment data from ILOSTAT are validated and slightly processed (if necessary) before using them as input for the statistical model. The missing total employment or missing components such as female and male employment are derived whenever possible. At times, the “other” (than male and female) category has values, which applies to a few countries in certain years. These values are redistributed to male and female employment according to their shares in total employment. For countries with at least one yearly data point, a country's missing employment data is pre-filled with data available in most adjacent years with the priority given to t-n over t+n.

The datasets used, as published on ILOSTAT, are:

- Informal employment by sex and economic activity—ISIC level 2 (headcount in thousands), Annual (available for 97 countries)<sup>6</sup>
- Informal employment rate by sex and economic activity (%), Annual, Annual (available for 138 countries)
- SDG indicator 8.3.1—Proportion of informal employment in total employment by sex and sector (%), Annual (available for 140 countries and territories)

## Employment by Occupation/skills

Data disaggregated by occupation are provided according to the latest version of the International Standard Classification of Occupations (ISCO). Data may have been regrouped from the national classifications, and therefore are not strictly compatible with ISCO. Employment by economic activity and occupation data and more aggregated data (without breakdowns by economic activity) are also available from Labour Force Statistics. ILO modelled estimates extend this coverage to 189 countries and territories.

- Employment by economic activity and occupation (headcount in thousands), Annual (available for 179 countries)
- Employment by sex and occupation—ILO modelled estimates, Nov. 2022 (headcount in thousands), Annual (available for 189 countries and territories)

► **Table 1. Employment data: summary**

| Dataset                                                              | Primary Data                                                                                                                                                          | Benchmark data 1                                                                                                                                                       | Benchmark data 2                                                                                                                                                                            |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Employment by sex and economic activity – <b>ISIC level 2</b>        | Employment by Sex and by Economic Activity - ISIC level 2 (thousands), Annual<br><b>Database:</b> Labour Force Statistics<br><b>Code:</b> EMP_TEMP_SEX_EC2_NB_A       | Employment by sex and economic activity - ILO modelled estimates, (thousands), Annual<br><b>Database:</b> ILO Modelled Estimates<br><b>Code:</b> EMP_2EMP_SEX_ECO_NB_A |                                                                                                                                                                                             |
| Employment by age and economic activity – <b>ISIC level 2</b>        | Employment by age and economic activity - ISIC level 2 (thousands), Annual<br><b>Database:</b> Labour Force Statistics<br><b>Code:</b> EMP_TEMP_AGE_EC2_NB_A          | Employment by sex, age and economic activity (thousands), Annual<br><b>Database:</b> Labour Force Statistics<br><b>Code:</b> EMP_TEMP_SEX_AGE_ECO_NB_A                 | Employment by sex and age - ILO modelled estimates, (thousands), Annual<br><b>Database:</b> ILO Modelled Estimates<br><b>Code:</b> EMP_2EMP_SEX_AGE_NB_A                                    |
| Informal employment by economic activity – <b>ISIC level 2</b>       | Informal employment by sex and economic activity (thousands) - ISIC level 2, Annual<br><b>Database:</b> Labour Force Statistics<br><b>Code:</b> EMP_NIFL_SEX_EC2_NB_A | Informal employment rate by sex and economic activity (%), Annual<br><b>Database:</b> Labour Force Statistics<br><b>Code:</b> EMP_NIFL_SEX_ECO_RT_A                    | SDG indicator 8.3.1 - Proportion of informal employment in total employment by sex and sector (%), Annual<br><b>Database:</b> Labour Force Statistics<br><b>Code:</b> SDG_0831_SEX_ECO_RT_A |
| Employment by economic activity and occupation – <b>ISIC level 1</b> | Employment by economic activity and occupation (thousands), Annual<br><b>Database:</b> Labour Force Statistics<br><b>Code:</b> EMP_TEMP_ECO_OCU_NB_A                  | Employment by sex and occupation -- ILO modelled estimates, (thousands), Annual<br><b>Database:</b> ILO Modelled Estimates<br><b>Code:</b> EMP_2EMP_SEX_OCU_NB_A       |                                                                                                                                                                                             |

Source: Own elaboration.

## Mean weekly hours actually worked per employed person

Data on *hours of work* are based, whenever possible, on the average number of hours of work per week and refer hours worked in the main (paid) job regardless of working time arrangements (e.g. full-time and part-time). Data disaggregated by economic activity are provided according to the latest version of ISIC available for the year in question, and data disaggregated by occupation are provided according to the latest version of ISCO. Data may have been regrouped from

<sup>6</sup> There are several alternative data sources that can be used for this statistical task of imputing missing data for informal employment, including: a) Informal employment by age and economic activity—ISIC level 2 (headcount in thousands), Annual (for 97 countries), b) Share of employment outside the formal sector by sex and economic activity - ISIC level 2 (%), annual (for 97 countries), and c) Share of employment outside the formal sector by age and economic activity - ISIC level 2 (%), annual (for 97 countries). The underlying data are the same regardless the various statistics presented in the ILOSTAT

national classifications, which may not be strictly compatible with ISIC or ISCO. The datasets<sup>7</sup> used for this paper are summarised in Table 2.

## World Development Indicators

The World Bank's WDI database provides a comprehensive set of internationally comparable statistics on country characteristics (such as population, birth rates, agricultural land areas) and economic development variables (such as GDP and rent from natural resources as a share of GDP). The database contains 1,400 time series indicators for 217 economies. We chose a subset of these indicators that are available for all countries (during the period of 2004-2021) and we used these as explanatory variables to predict employment values. There is a long list of variables provided by the WDI that can be used and tested to predict employment data. The variables we used to estimate employment data are the following (with the code as given in the WDI in the last brackets):

- Agricultural land (sq. km) (AG.LND.AGRI.K2)
- Energy intensity level of primary energy (MJ/\$2017 PPP GDP) (EG.EGY.PRIM.PP.KD)
- Fertility rate, total (births per woman) (SP.DYN.TFRT.IN)
- Life expectancy at birth, female (years) (SP.DYN.LE00.FE.IN)
- Life expectancy at birth, male (years) (SP.DYN.LE00.MA.IN)
- Merchandise exports by the reporting economy (current US\$) (TX.VAL.MRCH.WL.CD)
- Merchandise imports by the reporting economy (current US\$) (TM.VAL.MRCH.WL.CD)
- Population ages 15-64, female (SP.POP.1564.FE.IN)
- Population ages 15-64, male (SP.POP.1564.MA.IN)
- Population density (people per sq. km of land area) (EN.POP.DNST)
- Rural population (SP.RUR.TOTL)
- Sex ratio at birth (male births per female births) (SP.POP.BRTH.MF)
- Urban population (SP.URB.TOTL)

► **Table 2. Mean weekly hours actually worked data: summary**

| Dataset                                                                                                                   | Primary Data                                                                                                                                                                                                            | Secondary Data                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mean weekly hours actually worked per employed person by sex and economic activity – <b>ISIC level 2</b>                  | Mean weekly hours actually worked per employed person by sex and economic activity - ISIC level 2   Annual (136 countries)<br><b>Database:</b> Wages and Working Time Statistics<br><b>Code:</b> HOW_TEMP_SEX_EC2_NB_A  | Mean weekly hours actually worked per employed person by sex and economic activity   Annual (174 countries)<br><b>Database:</b> Wages and Working Time Statistics<br><b>Code:</b> HOW_TEMP_SEX_ECO_NB_A          |
| Mean weekly hours actually worked per employed person by age and economic activity – <b>ISIC level 2</b>                  | Mean weekly hours actually worked per employed person by age and economic activity - ISIC level 2   Annual (113 countries)<br><b>Database:</b> Labour Force Statistics<br><b>Code:</b> HOW_TEMP_AGE_EC2_NB_A            | Mean weekly hours actually worked per employed person by sex, age and economic activity   Annual (129 countries)<br><b>Database:</b> Wages and Working Time Statistics<br><b>Code:</b> HOW_TEMP_SEX_AGE_ECO_NB_A |
| Mean weekly hours actually worked per employed person by economic activity and employment formality – <b>ISIC level 2</b> | Mean weekly hours actually worked per employed person by economic activity and employment formality—ISIC level 2   Annual (83 countries)<br><b>Database:</b> ILOSTAT microdata<br>Unpublished – Special data extraction | Mean weekly hours actually worked per employed person by economic activity and employment formality   Annual (86 countries)<br><b>Database:</b> ILOSTAT microdata<br>Unpublished – Special data extraction       |
| Mean weekly hours actually worked per employee by economic activity and occupation – <b>ISIC level 1</b>                  | Mean weekly hours actually worked per employed person by economic activity and occupation   Annual (124 countries)<br><b>Database:</b> Labour Force Survey<br><b>Code:</b> HOW_TEMP_ECO_OCU_NB_A                        |                                                                                                                                                                                                                  |

Source: Own elaboration.

<sup>7</sup> The data also requires cleaning and processing before using it for further estimates. Data present for one category (e.g. mean weekly working hours for male employment) but not for the other (e.g. mean weekly working hours for female employment) are copied to the missing data. Observations with mean weekly working hours of more than 90 are disregarded and filled with the data from the most adjacent years available (preferring t-n over t+n, and with n<=3).

## **GTAP social accounting matrices: labor compensation**

The GTAP database uses harmonized Social Accounting Matrices (SAM) to represent the world economy consistently for pre-determined reference years. The latest GTAP version 11 release extended the time coverage to 2017. The database is based on several data sources, including national input-output (I-O) tables, trade, macroeconomic, and energy data. The input-output tables are heterogeneous in sources, methodology, base years, and sectoral detail, thus, to achieve consistency, considerable efforts are made to render the disparate sources comparable (see Annex 1 and 2 for country and sectoral coverage of the GTAP database). Therefore, there are some limitations due to the use of different data sources and data treatment methods. To provide employment satellite account that is consistent with the list of GTAP activities, we use labour compensation shares from GTAP to split ISIC level 2 employment into corresponding activities (see Annex 3 and 4).

## ► 3. Methodologies: data cleaning and imputation

### Employment data

Before estimating missing employment data, we have set some basic rules for cleaning the data. For example, if one of the two subcategories of employment is missing (e.g. male or female employment) but the total employment is available, we fill the gaps by subtracting female or male employment from the total. In some cases, we scale both values proportionally if the sum of the two subcategories does not equal the total.

Employment data between 2004 and 2019 are then estimated using an Ordinary Least Square (OLS) estimator with economic and social indicators from the World Bank's WDI dataset as explanatory variables. The choice of economic model has no specific economic motivation—the primary objective is to choose an econometric model that provides a good “fit”. A number of variables are included sequentially, and the best model is the one with the highest R-squared (see Annex 1 for the final choice of explanatory variables).<sup>8</sup> The regression is run separately for each sector of economic activity, which can be expressed as the following:

$$e_{cit} = \beta_{0i} + \beta_{1i} x1_{ct} + \beta_{2i} x2_{ct} + \beta_{3i} x3_{ct} + \dots + \beta_{ki} xK_{ct} + \delta_i t + \varepsilon_{cit} \quad (1)$$

where  $e_{cit}$  represents the logarithm of the number of employment (in headcount) when estimating total employment or employment ratio when estimating subcategories of employment (for example male over female) in a particular industry  $i$  in a given country  $c$  at time  $t$ ;  $xk_{ct}$  represents the logarithm of country  $c$ 's specific economic or social characteristics at time  $t$ ;  $t$  captures the trend over time; and  $\varepsilon_{cit}$  is the error term.<sup>9</sup>

The model is applicable where the entire employment time series at ISIC level 2 is missing, and the imputed values then benchmarked to the employment data at higher level of aggregation. Partially reported data with missing employment in certain activities (either because they were not reported/labelled 'unreliable' or because they were grouped under ISIC code X for confidentiality reasons) are also imputed using the model proposed above. The control total for these imputed values is given by the difference between total employment and the sum of reported employment.

Meanwhile, for those countries for which at least one data point is available in the time series, the employment structure of the country is assumed to remain constant and therefore the missing employment data of the country are filled with the most adjacent available data. Preference is given to t-n over t+n when both data points are available. Data are then restricted to a higher level of aggregation, e.g. ISIC level 1, if available.

Moreover, we have run separate estimations for those countries reported employment data in *ISIC rev. 3.1* and *ISIC rev. 4* respectively, and merge the two to complete the time series after the imputation.<sup>10</sup> The *International Standard Industry Classification of All Economic Activities (ISIC) revision 4*, replacing the *ISIC revision 3.1*, was first introduced in 2008.<sup>11</sup> A predominate number of countries had adopted this industry classification by 2009. The main difficulties for estimation are that not all the countries are switching to the *ISIC rev. 4* classification at the same time, and economic activities classified under *ISIC rev.3.1* and *ISIC rev.4* are not always the same (e.g., “Programming and broadcasting activities” have been separated from the “Telecommunications” in *ISIC rev. 4*). For those countries that reported data for at least one year, the ISIC reference is carried over to the neighbouring missing years. For those countries with entire time series missing, imputed data are reported in *ISIC rev. 4* from 2009. Prior to that, imputed data are reported using *ISIC rev. 3.1*. Due to limited reporting under the codes P96 and P97 in *ISIC rev. 3*, which represents *undifferentiated goods-producing activities of private households for own use* and *undifferentiated services-producing activities of private households for own use* respectively. These activities are not imputed and set to zeros.

<sup>8</sup> Selected expletory variables are available for all ILO and GTAP countries and for 2004-2019 except “Chinese Taipei” and “Western Sahara”, which are not covered in the WDI database. See Section 2 data sources for a list of variables used for this model.

<sup>9</sup> The UN Statistics Division releases total value-added data and its breakdowns for 7 board economic activities on a regular basis, which include the following: Agriculture, hunting, forestry, fishing (ISIC A-B); Mining, Manufacturing, Utilities (ISIC C-E); Manufacturing (ISIC D); Construction (ISIC F); Wholesale, retail trade, restaurants and hotels (ISIC G-H); Transport, storage and communication (ISIC I); and Other Activities (ISIC J-P). This dataset provides a basic economic structure that is considered to have strong correlations with employment. We have tested these economic breakdowns as supplements for independent variables provided by the WDI. The idea was abandoned because the constraints for employment data are available at more detailed sectoral level.

<sup>10</sup> For those countries that reported for at least one year, the reference to ISIC is carried over to the neighbouring missing years. For those countries with entire time series missing, imputed data are reported using *ISIC rev. 4* from 2009. Prior to that, imputed data are reported using *ISIC rev. 3.1*.

<sup>11</sup> [https://unstats.un.org/unsd/publication/seriesm/seriesm\\_4rev4e.pdf](https://unstats.un.org/unsd/publication/seriesm/seriesm_4rev4e.pdf).

The subcategories of the employment breakdown (male and female employment, youth and adult employment, formal and informal employment<sup>12</sup>, or skilled and unskilled) are estimated using a ratio as specified in equation (1). For example, the male and female employment at ISIC 2-digit level is estimated together using the ratio of male employment to female employment, and their respective employment figures (in headcount) are constrained by the estimated total employment (i.e., the sum of the two subcategories equals to the total). These data are then constrained by the employment by sex available at ISIC level 1 from the ILO modelled estimates. The same process is repeated for other datasets: employment data at ISIC level 2 by age, employment data at ISIC level 2 by employment formality, and employment data at ISIC level 1 by occupation/skills, all estimates being constrained with data at a higher level of aggregation where available (see Annex 5 for ISIC level 1 mapping between *ISIC rev.3.1*, *ISIC rev.4* and *ISIC rev.4* available in the ILO Modelled Estimates).

Employment data during the COVID pandemic (2020-2021) are imputed differently from the early years (2004-2019). Due to potential breaks in the time series, we have adopted a simpler approach to estimating employment for the crisis years: using the employment structure of 2019 and scaling up or down according to the constraints available at the aggregate level.

► **Table 3: Data processing and imputation methodology with imputation code**

| VAR                               | CODE                | DESCRIPTIONS                                                                                  | FREQUENCY |
|-----------------------------------|---------------------|-----------------------------------------------------------------------------------------------|-----------|
| Employment (headcount in 1000)    | A.C                 | Imputed and benchmarked at higher level of aggregation                                        | 41.8%     |
|                                   | A.T                 | Imputed with time series (A.C) and benchmarked at higher level of aggregation                 | 35.2%     |
|                                   | L.C                 | Imputed with basic logic (i.e. female + male = total)                                         | 0.6%      |
|                                   | L.T                 | Using L.C data from another year                                                              | 0.0%      |
|                                   | R.C                 | Real data                                                                                     | 14.7%     |
|                                   | R.T                 | Using real data available from another year                                                   | 0.0%      |
|                                   | U.C                 | Imputed and un-benchmarked data                                                               | 6.1%      |
|                                   | U.T                 | Imputed with time series (U.C) and un-benchmarked (most used for imputing 2020 and 2021 data) | 0.9%      |
|                                   | X.C                 | Imputed, employment data missing in subcategories or grouped under Code X                     | 0.0%      |
|                                   | X.T                 | Imputed with X.C (most used for imputing 2020 and 2021 data)                                  | 0.0%      |
|                                   | UnEst <sup>13</sup> | Unable to estimate                                                                            | 0.6%      |
| Mean weekly hours actually worked | A.C                 | Data available at higher level of aggregation, current year                                   | 11.2%     |
|                                   | A.T                 | Using A.C data to fill gaps, with data available in T-3 and T+3 range                         | 6.0%      |
|                                   | L.C                 | Imputed with basic logic (e.g., female working hours=total working hours), current year       | 1.5%      |
|                                   | L.T                 | Using L.C data to fill gaps, with data available in T-3 and T+3 range                         | 1.2%      |
|                                   | M1.C                | National means, current year                                                                  | 2.2%      |
|                                   | M1.T                | Using M1.C data to fill gaps, with data available in T-3 and T+3 range                        | 2.0%      |
|                                   | M2.C                | Regional means, current year                                                                  | 48.5%     |
|                                   | M3.C                | Income means, current year                                                                    | 2.6%      |
|                                   | M4.C                | Global means, current year                                                                    | 4.0%      |
|                                   | R.C                 | Real data                                                                                     | 14.0%     |
|                                   | R.T                 | Using real data to fill gaps, with data available in T-3 and T+3 range                        | 6.7%      |

Source: Own elaboration.

Note: The imputation codes for variable FTE employment (in 1000) are compounds of the imputation codes for “employment” and for “mean weekly hours actually worked”, joined by a hyphen, e.g. R.C-M3.C or A.T-L.C. Imputation categories with a small number of observations (less than 1,232 observations) are rounded to 0.0 per cent.

<sup>12</sup> The ILO Informal Employment by Economic Activity dataset only publishes informal employment statistics. Formal employment is first calculated by subtracting informal employment data from total employment to obtain the ratio of informal to formal employment.

<sup>13</sup> Applies to sector 96 and 97 in ISIC rev. 3.1.

The full set of employment data are available at ISIC level 2 for 187 countries and territories, with a code for each data point indicating the adjustment method used. Table 3 lists the imputation codes used and the percentage of observation applied to each adjustment methods.

## Mean weekly hours actually worked per employed person

*Mean weekly hours actually worked per employed person* by sex, age, employment formality and occupation/skills are also subject to data cleaning and imputation. These data are not of the same nature as the employment data, and have therefore been imputed differently. The data are first subjected to a simple logical check, and if the *mean weekly hours actually worked* is missing for one or both of the subcategories, but is available at the total level, the working hours are set to equal to the total (e.g., female working hours = total working hours or male working hours = total working hours) or vice versa.<sup>14</sup> Second, the missing data are filled with the most adjacent data available (with priority given to t-n over t+n, and with n<=3). The remaining data gaps in *mean weekly hours actually worked* by sex, age, and employment formality available at ISIC level 2 are filled with the data available at the less detailed level of aggregation, i.e., ISIC level 1. This implies that all economic activities in the same ISIC level 1 have the same *mean weekly hours actually worked*. Similarly, this is also used to fill the gaps in the neighbouring years between t-3 and t+3.

► Table 4. Final datasets by ISIC classification

| VARIABLE                                 | DATASET                         | CATEGORY                                                                 | COVERAGE  |
|------------------------------------------|---------------------------------|--------------------------------------------------------------------------|-----------|
| Employment (EMP)                         | By ISIC level 2 and sex         | <b>Total</b> , Male, Female                                              | 2004-2021 |
|                                          | By ISIC level 2 and age         | 15-24, 25+                                                               | 2004-2021 |
|                                          | By ISIC level 2 and formality   | Formal, Informal                                                         | 2004-2021 |
|                                          | By ISIC level 2 and occupation* | Occupation breakdown – aggregated to <i>skilled</i> and <i>unskilled</i> | 2004-2021 |
| Mean weekly hours actually worked (MEAN) | By ISIC level 2 and sex         | <b>Total</b> , Male, Female                                              | 2004-2021 |
|                                          | By ISIC level 2 and age         | 15-24, 25+                                                               | 2004-2021 |
|                                          | By ISIC level 2 and formality   | Formal, Informal                                                         | 2004-2021 |
|                                          | By ISIC level 2 and occupation  | Occupation breakdown – aggregated to <i>skilled</i> and <i>unskilled</i> | 2004-2021 |
| FTE: derived by EMP x MEAN/40 hours      | By ISIC level 2 and sex         | <b>Total</b> , Male, Female                                              | 2004-2021 |
|                                          | By ISIC level 2 and age         | 15-24, 25+                                                               | 2004-2021 |
|                                          | By ISIC level 2 and formality   | Formal, Informal                                                         | 2004-2021 |
|                                          | By ISIC level 2 and occupation* | Occupation breakdown – aggregated to <i>skilled</i> and <i>unskilled</i> | 2004-2021 |

Source: Own elaboration.

Note: \*These data are obtained from Employment and FTE data “by ISIC level 1 and occupation”, which are split into ISIC economic activity level 2 proportionally (based on the employment and FTE shares reported/estimated). **For employment data, subcategories such as male and female employment add up to the total employment. However, for FTE data, the subcategories do not necessarily add up to the total FTE due to statistical discrepancies in mean weekly hours actually worked and also due to imputation methods used.**

<sup>14</sup> In theory, the missing working hours can be calculated if only one of the categories is missing. For example, one can use female employment x female working hours + male employment x male working hours / total employment to give total working hours. However, this calculation is conditional on employment data and working hours data available at the same time for the same industry in the same year and all the data are correctly reported, which rarely the case. The calculation limits where we can come up with statistical estimates, and with data discrepancy the calculated working hours are not always in expected range.



Where a country's data are partially reported or completely missing, several methods are explored to fill the gaps, including the model used in the ILO Modelled Estimates (ILO 2023).<sup>15</sup> We have opted for a simple mean imputation to avoid out-of-range estimates (e.g., the estimated *mean weekly hours actually worked* could go higher than 80). We use the mean of *mean weekly hours actually worked* for the country, the region, the income group, or in rare circumstances the world to fill in the data gaps. The imputation codes, which indicate the methods of data adjustment and imputation, are as far as possible consistent with those used for the treatment of employment data (see Table 3).

The full set of *mean weekly hours actually worked* are available at ISIC level 2 for 187 countries and territories, with a code for each data point indicating the adjustment method used where applicable.

## Calculating FTE and convert data to GTAP sectoral classification

Employment in FTE (assuming 40 working hours per week) is a short calculation away once the *employment* data and *mean weekly hours actually worked* data by ISIC level 2 have been treated (Table 4 summarizes all datasets available). The employment in headcount and in FTE are then mapped onto detailed GTAP sectors based on the correspondence tables between ISIC level 2 and GTAP classifications (see Annex 3 *ISIC rev. 3.1* and GTAP and Annex 4 for *ISIC rev. 4* and GTAP). Where one economic activity in the ISIC classification—for example agriculture, hunting and related services activities—is to be split into multiple categories in GTAP, we use GTAP labour compensation as a proxy<sup>16</sup> to split employment and FTE data by assuming that there are no differences in employment compensation across different sectors (e.g., workers in the production of paddy rice, wheat, and vegetable etc. have the same wages). The employment data by GTAP classification are available for 2004, 2007, 2011, 2014, 2017, and 2021.<sup>17,18</sup> The 2021 employment data in ISIC classifications are split based on GTAP 2017 labour compensation.

The GTAP database provides data coverage for 160 countries, territories and regions, among which we can provide matching employment data for 158.<sup>19</sup> GTAP regional aggregation often have an integrated account for a number of small countries/territories where there are limited SAMs or other statistics available. For example, the “Rest of East Asia” includes “Korea, democratic people’s republic” and “Macao, China” and the “Rest of European Free Trade Association” includes Iceland and Liechtenstein. During the conversion from individual countries/territories to GTAP regions, the countries/territories corresponding to the GTAP region are aggregated if employment data available for each country/territory, as such was the case for “Rest of East Asia”. However, when employment data are partially available, employment data of this region are extrapolated proportionally based on population statistics from WDI database, as such was the case for the “Rest of European Free Trade Association” (with employment data available for Iceland but not for Liechtenstein).

<sup>15</sup> We also tried to use a similar approach to ILO Modelled Estimates (ILO 2023) to impute non-reported mean weekly working hours with the following: a) the share of the population aged 15–64 in the total population, b) the employment-to-population ratio and c) time-related underemployment rate.

<sup>16</sup> Labour compensations are usually less frequently reported and less robust than employment statistics. The GTAP deploys a modelling approach to clean and impute missing data for certain countries and years. Therefore, the employment data from ISIC classification to GTAP sectoral breakdown reflect the assumptions of the model.

<sup>17</sup> Labour compensation by economic activity in the GTAP database is only available for discontinuous years, including 2004, 2007, 2011, 2014 and 2017.

<sup>18</sup> After mapping employment data from the ISIC to GTAP sectors, the employment data were compared with the output given in the GTAP database to check for outliers in labour productivity, which is defined by output to labour ratio. Within an economic activity, all outliers with labour productivity above the 95<sup>th</sup> percentile were trimmed to the 95<sup>th</sup> percentile. The additional employment (which was trimmed after the outlier detection) is subsequently redistributed to other sectors proportionally. This adjustment only applies to the 2017 employment data by GTAP sectoral classification, which was used for the webtool application of the Structure Model for Sustainable Development (SMSD).

<sup>19</sup> “Taiwan, China” and the “Rest of North America” (which includes Bermuda, Greenland, and Saint Pierre and Miquelon) unavailable.



## ► 4. Results and data validation

A simplified statistical approach, as adopted in this paper, results from prioritizing data stability over the mixed use of various more advanced or sophisticated models. As part of the data validation process, we show estimated and reported employment and FTE data for 12 target countries that represent a wide range of regions and income groups, and most importantly, have distinctive differences in the availability of their employment data (see Table 5).

South Africa and the United States provided employment statistics with the best coverage—with no reporting gaps in the time series. However, the difference between the two countries is that South Africa has reported all its employment statistics in *ISIC rev. 3.1*, while the United States has revised its historical employment statistics using *ISIC rev. 4* according to the newer classification. In contrast, there are no employment data available at ISIC level 2 for Cameroon, China, Morocco, and Tunisia, and therefore the total employment structure of each of these countries at ISIC level 2 is estimated on the basis of the model (eq. 1). Furthermore, Cameroon has never reported data on *mean weekly hours actually worked*. The remaining countries in Table 5 show a mixed picture for their reported employment statistics, often with some gaps in the time series.

► **Table 5. Employment and mean weekly hours actually worked data availability**

*for selected countries*

| Country      | Employment data |      |      |      |      |      | Mean weekly hours actually worked |      |      |      |      |      |
|--------------|-----------------|------|------|------|------|------|-----------------------------------|------|------|------|------|------|
|              | 2004            | 2007 | 2011 | 2014 | 2017 | 2021 | 2004                              | 2007 | 2011 | 2014 | 2017 | 2021 |
| Cameroon     | A.C             | A.C  | A.C  | A.C  | A.C  | A.T  | M2.C                              | M2.C | M2.C | M2.C | M2.C | M2.C |
| China        | A.C             | A.C  | A.C  | A.C  | A.C  | A.T  | A.T                               | A.C  | A.C  | A.C  | A.C  | M2.C |
| Egypt        | A.T             | A.T  | R.C  | A.T  | R.C  | R.C  | M2.C                              | R.T  | R.C  | R.T  | R.C  | R.C  |
| India        | A.T             | A.T  | A.T  | A.T  | A.T  | R.C  | M3.C                              | M2.C | M2.C | M2.C | R.T  | R.C  |
| Indonesia    | R.C             | R.C  | A.T  | R.C  | A.T  | A.T  | R.C                               | R.C  | A.C  | R.C  | A.C  | A.C  |
| Jordan       | A.T             | A.T  | A.T  | A.T  | R.C  | R.C  | M2.C                              | M2.C | M2.C | R.T  | R.C  | R.C  |
| Kenya        | A.T             | A.T  | A.T  | A.T  | A.T  | A.T  | M3.C                              | M2.C | M2.C | M2.C | R.T  | R.T  |
| Madagascar   | A.T             | A.T  | A.T  | A.T  | A.T  | A.T  | M4.C                              | A.T  | A.T  | M1.T | M1.T | M2.C |
| Morocco      | A.C             | A.C  | A.C  | A.C  | A.C  | A.T  | M2.C                              | M2.C | A.C  | A.T  | M2.C | R.C  |
| South Africa | R.C             | R.C  | R.C  | R.C  | R.C  | R.C  | R.C                               | R.C  | R.C  | R.C  | R.C  | R.C  |
| Tunisia      | A.T             | A.T  | A.T  | A.C  | A.T  | A.T  | M2.C                              | M2.C | M2.C | M2.C | R.T  | R.T  |
| USA          | R.C             | R.C  | R.C  | R.C  | R.C  | R.C  | R.C                               | R.C  | R.C  | R.C  | R.C  | R.C  |

Source: Own elaboration.

Note: Green-shaded areas indicate that employment data are reported using the ISIC rev. 3.1 classification and yellow-shaded areas ISIC rev. 4. The codes shown in the table are the most frequently used ones in a given country and year (see Table 3 for the list of codes and corresponding data cleaning and imputation methods).

### Employment data validation with internal/external data

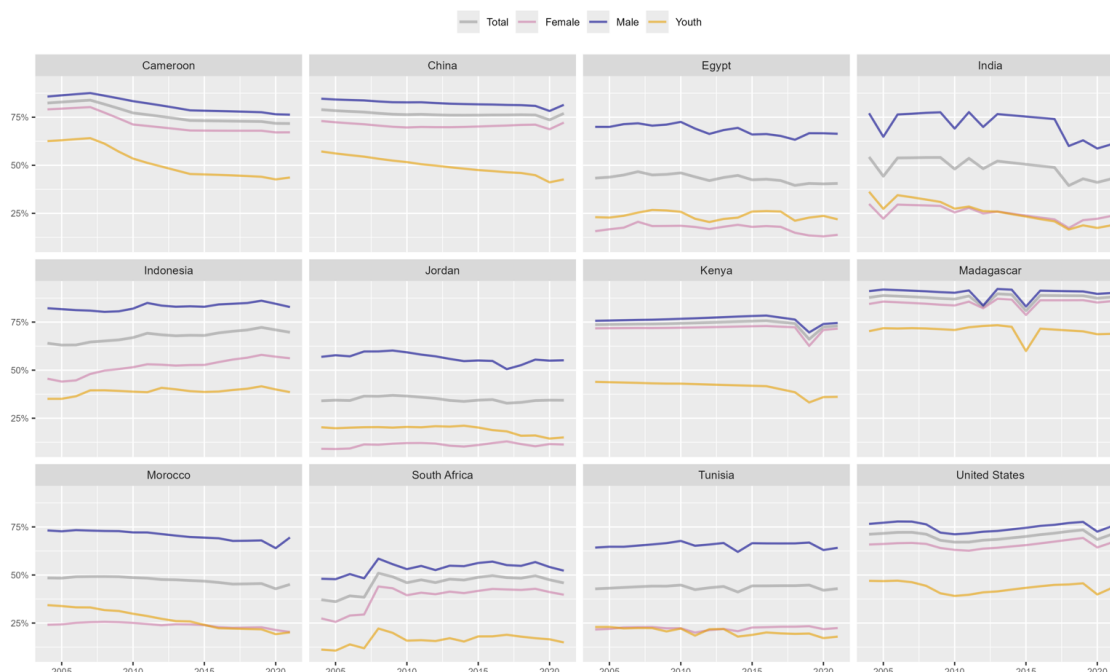
The data are checked and validated using two simple approaches: 1) reported and estimated employment data are compared with relevant statistics, such as GDP and total working-age population with respect to reference years and 2) employment structure stability for the selected years is statistically and visually inspected.

The aggregated employment data are combined with the working age population (aged 15 to 64) from the ILO Modelled Estimates to calculate employment to working age population ratios from 2004 to 2021, shown separately for male, female and youth below (see Figure 1). Since the ILO Modelled Estimates have provided data for all countries which we have incorporated as constraints, Figure 1 therefore essentially only shows the stability of employment data as provided by the ILO Modelled Estimates.

The employment data is relatively stable over the period we have investigated—with some exceptions in the time series for South Africa in 2008, Jordan in 2017, India in 2010 and 2012, as well as many for countries during the COVID pandemic years when global employment experienced a downturn. Moreover, distinctive low female labour force participation rates can be observed in Indonesia, India and selected MENA (Middle East and North Africa) countries (i.e., Jordan, Morocco, Egypt and Tunisia).

► **Figure 1. Employment to work age population ratio for selected countries, 2004-2021**

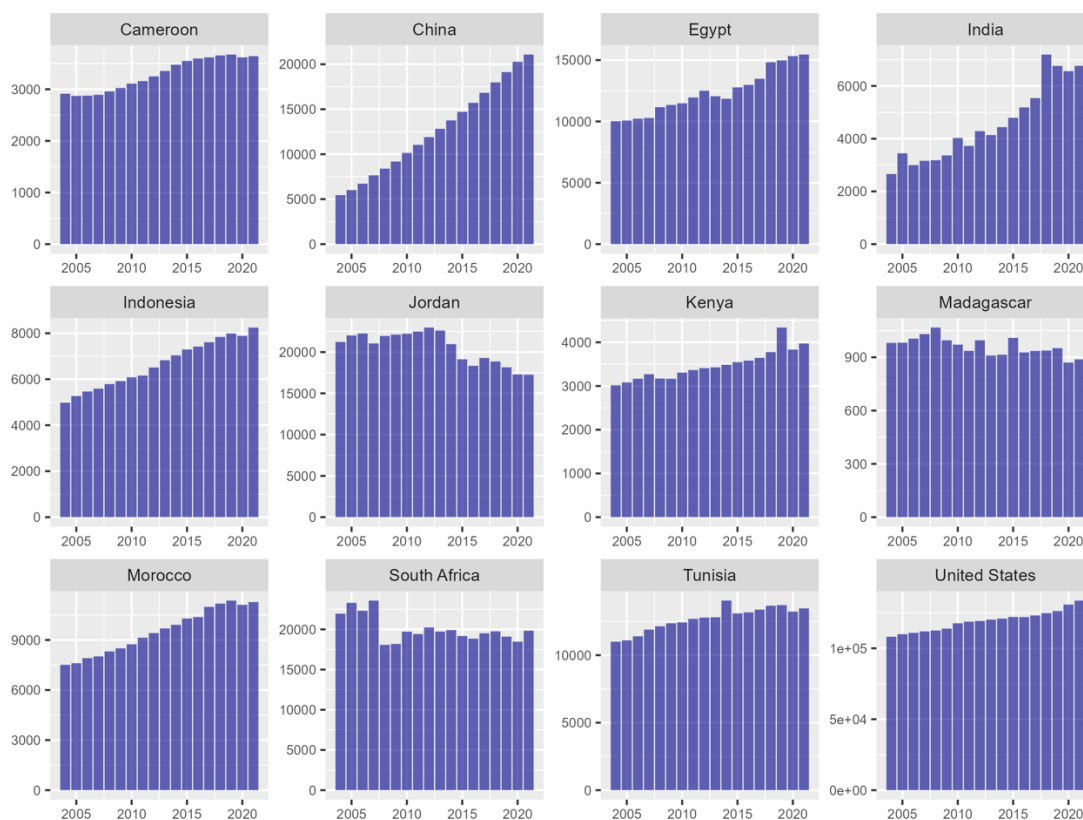
*for male, female and youth*



Source: Own elaboration.

Note: The denominator is the working age population (aged 15 to 64 years old) sourced from the ILO Modelled Estimates (2024).

► **Figure 2. GDP per employed person for selected countries, 2004-2021**



Source: Own elaboration.

Note: The Denominator is constant GDP (2015 prices) from the WDI.

GDP is also divided by employment as an alternative measure of productivity since output data is not available in the WDI database (see Figure 2). It shows that, for most of these selected countries, GDP per employment is stable over the years with the exception of where we have seen employment changes in South Africa and Jordan.

## Structural changes in employment

To better illustrate the changes in employment structure over time, we have calculated the root mean square difference of the employment share by sector for two consecutive years, and the statistics are summarized in Table 6 for selected countries. The largest employment structure changes are often observed in 2008 in the face of the global financial crisis, and again in 2012 in India and Indonesia, probably due to the earthquake in the eastern Indian Ocean. We also used the same approach to examine the employment structure of any given sub-employment categories (i.e., by sex, age, employment formality and occupation/skills). The employment shares of Cameroon (all estimated), Jordan (2014 data is estimated, and 2017 and 2021 reported), and the United States (all reported) are presented in Annex 6.

► **Table 6. Employment structure change**

Proxied by root-mean-square difference of employment share changes from t-1 to t

| Country           | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|-------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Cameroon          | 0.13 | 0.15 | 0.16 | 1.54 | 0.18 | 0.18 | 0.21 | 0.19 | 0.21 | 0.20 | 0.11 | 0.11 | 0.08 | 0.08 | 0.07 | 0.06 | 0.08 |
| China             | 0.27 | 0.28 | 0.25 | 1.84 | 0.15 | 0.18 | 0.21 | 0.12 | 0.24 | 0.20 | 0.13 | 0.10 | 0.09 | 0.13 | 0.08 | 0.05 | 0.05 |
| Egypt             | 0.23 | 0.09 | 0.12 | 0.34 | 2.53 | 0.57 | 0.32 | 0.36 | 0.26 | 0.26 | 0.33 | 0.17 | 0.22 | 0.35 | 0.29 | 0.17 | 0.19 |
| India             | 0.77 | 0.61 | 0.15 | 0.17 | 0.15 | 0.36 | 0.22 | 2.19 | 0.30 | 0.07 | 0.30 | 0.19 | 0.07 | 0.54 | 0.44 | 0.71 | 0.17 |
| Indonesia         | 0.41 | 0.30 | 0.38 | 0.11 | 0.13 | 0.20 | 0.34 | 2.62 | 0.11 | 0.11 | 0.14 | 0.17 | 0.11 | 0.11 | 0.12 | 0.09 | 0.08 |
| Jordan            | 0.05 | 0.05 | 0.05 | 0.08 | 0.10 | 0.15 | 0.30 | 0.28 | 0.07 | 0.04 | 0.07 | 0.04 | 0.13 | 0.45 | 0.59 | 0.76 | 0.76 |
| Kenya             | 0.07 | 0.09 | 0.08 | 0.05 | 0.07 | 0.09 | 0.08 | 0.08 | 0.08 | 0.09 | 0.09 | 0.08 | 0.09 | 0.10 | 0.22 | 0.18 | 0.07 |
| Madagascar        | 0.19 | 0.19 | 0.23 | 0.25 | 0.10 | 0.21 | 0.22 | 0.42 | 0.46 | 0.58 | 0.13 | 0.29 | 0.25 | 0.01 | 0.04 | 0.02 | 0.04 |
| Morocco           | 0.08 | 0.28 | 0.23 | 2.22 | 0.11 | 0.07 | 0.07 | 0.14 | 0.12 | 0.09 | 0.12 | 0.07 | 0.08 | 0.06 | 0.08 | 0.12 | 0.06 |
| South Africa      | 0.99 | 0.82 | 0.56 | 1.74 | 0.15 | 0.75 | 1.20 | 0.43 | 0.44 | 0.23 | 0.24 | 0.25 | 0.54 | 0.19 | 0.45 | 0.65 | 0.12 |
| Tunisia           | 0.05 | 0.10 | 0.08 | 0.37 | 0.08 | 0.32 | 0.38 | 0.45 | 0.92 | 1.17 | 0.95 | 0.06 | 0.44 | 0.06 | 0.05 | 0.02 | 0.06 |
| the United States | 0.04 | 0.05 | 0.05 | 0.06 | 0.10 | 0.05 | 0.04 | 0.05 | 0.05 | 0.07 | 0.04 | 0.04 | 0.03 | 0.04 | 0.06 | 0.13 | 0.08 |

Source: Own elaboration.

Note: The number in each cell indicates the magnitude of the change in employment structure between the previous year (t-1) and the year indicated (t), with the larger numbers (in red) showing bigger structure changes than others.

## ► 5. Conclusions and further enhancement

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Employment statistics by economic activities are the bread and butter of all Employment Impact Assessments (EmpIAs). As part of the STRENGTHEN2 project—for both in-depth country studies and the development of the web application—we have produced complete employment time series data for 187 countries/territories and various regional aggregates that are matched to the GTAP regional definitions. The final output of this research includes the following datasets:

### **By economic activities according to the ISIC classifications (with imputation code):**

- Employment data (in thousands),
- Mean weekly hours actually worked, and
- Full-time Equivalent (in thousands)

This dataset covers 187 (out of 189) countries/territories for the period of 2004-2021. “Taiwan, China” and “Western Sahara” are missing because their data are not available in the WDI database. All data are available by either *ISIC rev. 3.1* or *ISIC rev. 4* (the choice of ISIC classification depending on country and reference year), and data breakdowns are available by sex, age, employment formality, and occupation/skills.

### **By economic activities according to the GTAP classifications classification (without imputation code):**

- Employment data (in thousands), and
- Full-time Equivalent (in thousands)

This dataset covers 158 (out of 160) countries/territories and regional aggregations for the discontinuous years 2004, 2007, 2011, 2014, 2017 and 2021. “Taiwan, China” and “Rest of North America” employment data are missing due to the limited availability of explanatory variables. Data breakdowns are available by sex, age, employment formality, and occupation/skills.

Despite all efforts to smooth out unwanted changes in the employment structure (through making full use of the reported data even if there is only one observation available in the entire time series), the imputed observations could still be subject to uncertainty. The imputed data should therefore not be used for cross-country comparisons or rankings and are not recommended for employment trends analysis.

Employment is a very important target variable for macroeconomic policies. Understanding the employment situation is crucial not only for EmpIAs, but also for other research such as trade analysis and employment projection (see Horvát et al. 2020, ILO 2020, ILO 2022 and ADB 2023). Other existing data (e.g. OECD and UNIDO employment data, both of which have limitations in terms of country coverage) could also be used to test the possibility of improving employment estimates in the future.

## ► References

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ADB. 2023. "Chapter 3 Jobs in Global Value Chains", in Asean and Global Value Chains: locking in resilience and sustainability report. 2023 Asian Development Bank.

Aguiar, Angel, Maksym Chepeliev, Erwin Corong, and Dominique van der Mensbrugghe. (2022) 2023. "The Global Trade Analysis Project (GTAP) Data Base: Version 11". *Journal of Global Economic Analysis* 7 (2).  
<https://doi.org/10.21642/JGEA.070201AF>.

Corong, Erwin, Puangchit Pattawee, and Marinos Tsigas. 2022. "Chapter 12.B Disaggregating labor payments." In *Global Trade, Assistance, and Production: The GTAP 11 Data Base*, edited by A. Aguiar. Department of Agricultural Economics, Purdue University, West Lafayette, IN, center for global trade analysis 12.B.

Corong, Erwin, Thomas W. Hertel, Robert A. McDougall, Marinos E. Tsigas, and Dominique van der Mensbrugghe. 2017. "The Standard GTAP Model, Version 7." *Journal of Global Economic Analysis* 2 (1): 1–119.

Gomis, Roger, Paloma Carrillo, Steven Kapsos, Stefan Kühn, and Avichal Mahajan. 2022. "The ILO Nowcasting Model: Using High-Frequency Data to Track the Impact of the COVID-19 Pandemic on Labour Markets". *Statistical Journal of the IAOS* 38 (3): 815–830.

Liu, Jing, Nico van Leeuwen, Tri Thanh Vo, Rodney Tyers and Thomas Warren Hertel (1998). "Disaggregating Labor Payments by Skill Level in GTAP." GTAP Technical Paper 11. Centre for Global Trade Analysis, Department of Agricultural Economics, Purdue University. [https://www.gtap.agecon.purdue.edu/resources/res\\_display.asp?RecordID=314](https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=314).

Miller, Ronald and Peter Blair. (ed.). 2009. *Input-Output Analysis: Foundations and Extensions*.

Cambridge University Press, Cambridge, UK.

ILO. 2020. COVID-19 and global supply chains: How the jobs crisis propagates across borders. ILO Brief (Geneva).  
[https://www.ilo.org/global/research/policy-briefs/WCMS\\_749368/lang--en/index.htm](https://www.ilo.org/global/research/policy-briefs/WCMS_749368/lang--en/index.htm)

ILO. 2022. Annex 3 in Asia-Pacific Employment and Social Outlook 2022: Rethinking sectoral strategies for a human-centred future of work. International Labour Office – Geneva: ILO, 2022.  
[https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms\\_862410.pdf](https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_862410.pdf)

ILO. 2023 & 2024. Modelled Estimates Methodological Overview. Department of Statistics <https://www.ilo.org/ilostat-files/Documents/TEM.pdf>

Horvát, Peter, Colin Webb, and Norihiko Yamano. 2020. 'Measuring Employment in Global Value Chains'.  
<https://www.oecd-ilibrary.org/content/paper/00f7d7db-en>.

ILO. Harmonized Microdata, <https://ilostat.ilo.org/>.

ILO. ILO modelled estimates database, <https://ilostat.ilo.org/>.

Weingarden, A., and M. Tsigas. 2010. "Labor Statistics for the GTAP Database." Global Trade Analysis Project (GTAP), Center for Global Trade Analysis, Purdue University, West Lafayette, Indiana, 13th annual conference on global economic analysis, Penang, Malaysia.

Walmsley T. and Carrico C. (2013) "Disaggregating Labor Payments in the GTAP 8 Data Base"  
[https://www.gtap.agecon.purdue.edu/resources/res\\_display.asp?RecordID=4560](https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=4560)

## ► Annex 1. GTAP (version 11) country/region names matched to WDI and ILO country/territory

| GTAP |      |                                                   |                                      | WDI                       |          | ILO                                    |          |
|------|------|---------------------------------------------------|--------------------------------------|---------------------------|----------|----------------------------------------|----------|
| NO   | Code | Country/Region                                    | Country Name                         | Country Name              | ISO code | Country Name                           | ISO code |
| 1    | AUS  | Australia                                         | Australia                            | Australia                 | AUS      | Australia                              | AUS      |
| 2    | NZL  | New Zealand                                       | New Zealand                          | New Zealand               | NZL      | New Zealand                            | NZL      |
| 3    | XOC  | Rest of Oceania                                   | American Samoa                       | American Samoa            | ASM      |                                        |          |
| 3    | XOC  | Rest of Oceania                                   | Fiji                                 | Fiji                      | FJI      | Fiji                                   | FJI      |
| 3    | XOC  | Rest of Oceania                                   | French Polynesia                     | French Polynesia          | PYF      | French Polynesia                       | PYF      |
| 3    | XOC  | Rest of Oceania                                   | Guam                                 | Guam                      | GUM      | Guam                                   | GUM      |
| 3    | XOC  | Rest of Oceania                                   | Kiribati                             | Kiribati                  | KIR      |                                        |          |
| 3    | XOC  | Rest of Oceania                                   | Marshall Islands                     | Marshall Islands          | MHL      |                                        |          |
| 3    | XOC  | Rest of Oceania                                   | Micronesia, Fed. Sts.                | Micronesia, Fed. Sts.     | FSM      |                                        |          |
| 3    | XOC  | Rest of Oceania                                   | Nauru                                | Nauru                     | NRU      |                                        |          |
| 3    | XOC  | Rest of Oceania                                   | New Caledonia                        | New Caledonia             | NCL      | New Caledonia                          | NCL      |
| 3    | XOC  | Rest of Oceania                                   | Northern Mariana Islands             | Northern Mariana Islands  | MNP      |                                        |          |
| 3    | XOC  | Rest of Oceania                                   | Palau                                | Palau                     | PLW      |                                        |          |
| 3    | XOC  | Rest of Oceania                                   | Papua New Guinea                     | Papua New Guinea          | PNG      | Papua New Guinea                       | PNG      |
| 3    | XOC  | Rest of Oceania                                   | Samoa                                | Samoa                     | WSM      | Samoa                                  | WSM      |
| 3    | XOC  | Rest of Oceania                                   | Solomon Islands                      | Solomon Islands           | SLB      | Solomon Islands                        | SLB      |
| 3    | XOC  | Rest of Oceania                                   | Tonga                                | Tonga                     | TON      | Tonga                                  | TON      |
| 3    | XOC  | Rest of Oceania                                   | Tuvalu                               | Tuvalu                    | TUV      |                                        |          |
| 3    | XOC  | Rest of Oceania                                   | Vanuatu                              | Vanuatu                   | VUT      | Vanuatu                                | VUT      |
| 3    | XOC  | Rest of Oceania                                   | Cook Islands                         |                           |          |                                        |          |
| 3    | XOC  | Rest of Oceania                                   | Niue                                 |                           |          |                                        |          |
| 3    | XOC  | Rest of Oceania                                   | Pitcairn                             |                           |          |                                        |          |
| 3    | XOC  | Rest of Oceania                                   | Tokelau                              |                           |          |                                        |          |
| 3    | XOC  | Rest of Oceania                                   | United States Minor Outlying Islands |                           |          |                                        |          |
| 3    | XOC  | Rest of Oceania                                   | Wallis and Futuna Islands            |                           |          |                                        |          |
| 4    | CHN  | China                                             | China                                | China                     | CHN      | China                                  | CHN      |
| 5    | HKG  | Hong Kong, Special Administrative Region of China | Hong Kong SAR, China                 | Hong Kong SAR, China      | HKG      | Hong Kong, China                       | HKG      |
| 6    | JPN  | Japan                                             | Japan                                | Japan                     | JPN      | Japan                                  | JPN      |
| 7    | KOR  | Korea, Republic of                                | Korea, Rep.                          | Korea, Rep.               | KOR      | Korea, Republic of                     | KOR      |
| 8    | MNG  | Mongolia                                          | Mongolia                             | Mongolia                  | MNG      | Mongolia                               | MNG      |
| 9    | TWN  | Taiwan                                            | Taiwan                               |                           |          | Taiwan, China                          | TWN      |
| 10   | XEA  | Rest of East Asia                                 | Korea, Dem. People's Rep.            | Korea, Dem. People's Rep. | PRK      | Korea, Democratic People's Republic of | PRK      |
| 10   | XEA  | Rest of East Asia                                 | Macao SAR, China                     | Macao SAR, China          | MAC      | Macau, China                           | MAC      |
| 11   | BRN  | Brunei Darussalam                                 | Brunei Darussalam                    | Brunei Darussalam         | BRN      | Brunei Darussalam                      | BRN      |
| 12   | KHM  | Cambodia                                          | Cambodia                             | Cambodia                  | KHM      | Cambodia                               | KHM      |
| 13   | IDN  | Indonesia                                         | Indonesia                            | Indonesia                 | IDN      | Indonesia                              | IDN      |
| 14   | LAO  | Lao PDR                                           | Lao PDR                              | Lao PDR                   | LAO      | Lao People's Democratic Republic       | LAO      |
| 15   | MYS  | Malaysia                                          | Malaysia                             | Malaysia                  | MYS      | Malaysia                               | MYS      |
| 16   | PHL  | Philippines                                       | Philippines                          | Philippines               | PHL      | Philippines                            | PHL      |
| 17   | SGP  | Singapore                                         | Singapore                            | Singapore                 | SGP      | Singapore                              | SGP      |
| 18   | THA  | Thailand                                          | Thailand                             | Thailand                  | THA      | Thailand                               | THA      |
| 19   | VNM  | Viet Nam                                          | Vietnam                              | Vietnam                   | VNM      | Viet Nam                               | VNM      |
| 20   | XSE  | Rest of Southeast Asia                            | Myanmar                              | Myanmar                   | MMR      | Myanmar                                | MMR      |
| 20   | XSE  | Rest of Southeast Asia                            | Timor-Leste                          | Timor-Leste               | TLS      | Timor-Leste                            | TLS      |
| 21   | AFG  | Afghanistan                                       | Afghanistan                          | Afghanistan               | AFG      | Afghanistan                            | AFG      |
| 22   | BGD  | Bangladesh                                        | Bangladesh                           | Bangladesh                | BGD      | Bangladesh                             | BGD      |
| 23   | IND  | India                                             | India                                | India                     | IND      | India                                  | IND      |
| 24   | NPL  | Nepal                                             | Nepal                                | Nepal                     | NPL      | Nepal                                  | NPL      |
| 25   | PAK  | Pakistan                                          | Pakistan                             | Pakistan                  | PAK      | Pakistan                               | PAK      |
| 26   | LKA  | Sri Lanka                                         | Sri Lanka                            | Sri Lanka                 | LKA      | Sri Lanka                              | LKA      |
| 27   | XSA  | Rest of South Asia                                | Bhutan                               | Bhutan                    | BTN      | Bhutan                                 | BTN      |
| 27   | XSA  | Rest of South Asia                                | Maldives                             | Maldives                  | MDV      | Maldives                               | MDV      |

| GTAP |      |                                    |                                              | WDI                            |          | ILO                               |          |
|------|------|------------------------------------|----------------------------------------------|--------------------------------|----------|-----------------------------------|----------|
| NO   | Code | Country/Region                     | Country Name                                 | Country Name                   | ISO code | Country Name                      | ISO code |
| 28   | CAN  | Canada                             | Canada                                       | Canada                         | CAN      | Canada                            | CAN      |
| 29   | USA  | United States of America           | United States                                | United States                  | USA      | United States                     | USA      |
| 30   | MEX  | Mexico                             | Mexico                                       | Mexico                         | MEX      | Mexico                            | MEX      |
| 31   | XNA  | Rest of North America              | Bermuda                                      | Bermuda                        | BMU      |                                   |          |
| 31   | XNA  | Rest of North America              | Greenland                                    | Greenland                      | GRL      |                                   |          |
| 31   | XNA  | Rest of North America              | Saint Pierre and Miquelon                    |                                |          |                                   |          |
| 32   | ARG  | Argentina                          | Argentina                                    | Argentina                      | ARG      | Argentina                         | ARG      |
| 33   | BOL  | Bolivia                            | Bolivia                                      | Bolivia                        | BOL      | Bolivia                           | BOL      |
| 34   | BRA  | Brazil                             | Brazil                                       | Brazil                         | BRA      | Brazil                            | BRA      |
| 35   | CHL  | Chile                              | Chile                                        | Chile                          | CHL      | Chile                             | CHL      |
| 36   | COL  | Colombia                           | Colombia                                     | Colombia                       | COL      | Colombia                          | COL      |
| 37   | ECU  | Ecuador                            | Ecuador                                      | Ecuador                        | ECU      | Ecuador                           | ECU      |
| 38   | PRY  | Paraguay                           | Paraguay                                     | Paraguay                       | PRY      | Paraguay                          | PRY      |
| 39   | PER  | Peru                               | Peru                                         | Peru                           | PER      | Peru                              | PER      |
| 40   | URY  | Uruguay                            | Uruguay                                      | Uruguay                        | URY      | Uruguay                           | URY      |
| 41   | VEN  | Venezuela (Bolivarian Republic of) | Venezuela, RB                                | Venezuela, RB                  | VEN      | Venezuela, Bolivarian Republic of | VEN      |
| 42   | XSM  | Rest of South America              | Guyana                                       | Guyana                         | GUY      | Guyana                            | GUY      |
| 42   | XSM  | Rest of South America              | Suriname                                     | Suriname                       | SUR      | Suriname                          | SUR      |
| 42   | XSM  | Rest of South America              | Falkland Islands (Malvinas)                  |                                |          |                                   |          |
| 42   | XSM  | Rest of South America              | French Guiana                                |                                |          |                                   |          |
| 42   | XSM  | Rest of South America              | South Georgia and the South Sandwich Islands |                                |          |                                   |          |
| 43   | CRI  | Costa Rica                         | Costa Rica                                   | Costa Rica                     | CRI      | Costa Rica                        | CRI      |
| 44   | GTM  | Guatemala                          | Guatemala                                    | Guatemala                      | GTM      | Guatemala                         | GTM      |
| 45   | HND  | Honduras                           | Honduras                                     | Honduras                       | HND      | Honduras                          | HND      |
| 46   | NIC  | Nicaragua                          | Nicaragua                                    | Nicaragua                      | NIC      | Nicaragua                         | NIC      |
| 47   | PAN  | Panama                             | Panama                                       | Panama                         | PAN      | Panama                            | PAN      |
| 48   | SLV  | El Salvador                        | El Salvador                                  | El Salvador                    | SLV      | El Salvador                       | SLV      |
| 49   | XCA  | Rest of Central America            | Belize                                       | Belize                         | BLZ      | Belize                            | BLZ      |
| 50   | DOM  | Dominican Republic                 | Dominican Republic                           | Dominican Republic             | DOM      | Dominican Republic                | DOM      |
| 51   | HTI  | Haiti                              | Haiti                                        | Haiti                          | HTI      | Haiti                             | HTI      |
| 52   | JAM  | Jamaica                            | Jamaica                                      | Jamaica                        | JAM      | Jamaica                           | JAM      |
| 53   | PRI  | Puerto Rico                        | Puerto Rico                                  | Puerto Rico                    | PRI      | Puerto Rico                       | PRI      |
| 54   | TTO  | Trinidad and Tobago                | Trinidad and Tobago                          | Trinidad and Tobago            | TTO      | Trinidad and Tobago               | TTO      |
| 55   | XCB  | Rest of Caribbean                  | Antigua and Barbuda                          | Antigua and Barbuda            | ATG      |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | Aruba                                        | Aruba                          | ABW      |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | Bahamas, The                                 | Bahamas, The                   | BHS      | Bahamas                           | BHS      |
| 55   | XCB  | Rest of Caribbean                  | Barbados                                     | Barbados                       | BRB      | Barbados                          | BRB      |
| 55   | XCB  | Rest of Caribbean                  | British Virgin Islands                       | British Virgin Islands         | VGB      |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | Cayman Islands                               | Cayman Islands                 | CYM      |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | Cuba                                         | Cuba                           | CUB      | Cuba                              | CUB      |
| 55   | XCB  | Rest of Caribbean                  | Curacao                                      | Curacao                        | CUW      |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | Dominica                                     | Dominica                       | DMA      |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | Grenada                                      | Grenada                        | GRD      |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | Sint Maarten (Dutch part)                    | Sint Maarten (Dutch part)      | SXM      |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | St. Kitts and Nevis                          | St. Kitts and Nevis            | KNA      |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | St. Lucia                                    | St. Lucia                      | LCA      | Saint Lucia                       | LCA      |
| 55   | XCB  | Rest of Caribbean                  | St. Martin (French part)                     | St. Martin (French part)       | MAF      |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | St. Vincent and the Grenadines               | St. Vincent and the Grenadines | VCT      | Saint Vincent and the Grenadines  | VCT      |
| 55   | XCB  | Rest of Caribbean                  | Turks and Caicos Islands                     | Turks and Caicos Islands       | TCA      |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | Virgin Islands (U.S.)                        | Virgin Islands (U.S.)          | VIR      | United States Virgin Islands      | VIR      |
| 55   | XCB  | Rest of Caribbean                  | Anguilla                                     |                                |          |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | Bonaire, Sint Eustatius and Saba             |                                |          |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | Montserrat                                   |                                |          |                                   |          |
| 55   | XCB  | Rest of Caribbean                  | Saint Barthélemy                             |                                |          |                                   |          |
| 56   | AUT  | Austria                            | Austria                                      | Austria                        | AUT      | Austria                           | AUT      |
| 57   | BEL  | Belgium                            | Belgium                                      | Belgium                        | BEL      | Belgium                           | BEL      |
| 58   | BGR  | Bulgaria                           | Bulgaria                                     | Bulgaria                       | BGR      | Bulgaria                          | BGR      |
| 59   | HRV  | Croatia                            | Croatia                                      | Croatia                        | HRV      | Croatia                           | HRV      |

| GTAP |      |                                         |                        | WDI                    |          | ILO                       |          |
|------|------|-----------------------------------------|------------------------|------------------------|----------|---------------------------|----------|
| NO   | Code | Country/Region                          | Country Name           | Country Name           | ISO code | Country Name              | ISO code |
| 60   | CYP  | Cyprus                                  | Cyprus                 | Cyprus                 | CYP      | Cyprus                    | CYP      |
| 61   | CZE  | Czech Republic                          | Czechia                | Czechia                | CZE      | Czechia                   | CZE      |
| 62   | DNK  | Denmark                                 | Denmark                | Denmark                | DNK      | Denmark                   | DNK      |
| 63   | EST  | Estonia                                 | Estonia                | Estonia                | EST      | Estonia                   | EST      |
| 64   | FIN  | Finland                                 | Finland                | Finland                | FIN      | Finland                   | FIN      |
| 65   | FRA  | France                                  | France                 | France                 | FRA      | France                    | FRA      |
| 66   | DEU  | Germany                                 | Germany                | Germany                | DEU      | Germany                   | DEU      |
| 67   | GRC  | Greece                                  | Greece                 | Greece                 | GRC      | Greece                    | GRC      |
| 68   | HUN  | Hungary                                 | Hungary                | Hungary                | HUN      | Hungary                   | HUN      |
| 69   | IRL  | Ireland                                 | Ireland                | Ireland                | IRL      | Ireland                   | IRL      |
| 70   | ITA  | Italy                                   | Italy                  | Italy                  | ITA      | Italy                     | ITA      |
| 71   | LVA  | Latvia                                  | Latvia                 | Latvia                 | LVA      | Latvia                    | LVA      |
| 72   | LTU  | Lithuania                               | Lithuania              | Lithuania              | LTU      | Lithuania                 | LTU      |
| 73   | LUX  | Luxembourg                              | Luxembourg             | Luxembourg             | LUX      | Luxembourg                | LUX      |
| 74   | MLT  | Malta                                   | Malta                  | Malta                  | MLT      | Malta                     | MLT      |
| 75   | NLD  | Netherlands                             | Netherlands            | Netherlands            | NLD      | Netherlands               | NLD      |
| 76   | POL  | Poland                                  | Poland                 | Poland                 | POL      | Poland                    | POL      |
| 77   | PRT  | Portugal                                | Portugal               | Portugal               | PRT      | Portugal                  | PRT      |
| 78   | ROU  | Romania                                 | Romania                | Romania                | ROU      | Romania                   | ROU      |
| 79   | SVK  | Slovakia                                | Slovak Republic        | Slovak Republic        | SVK      | Slovakia                  | SVK      |
| 80   | SVN  | Slovenia                                | Slovenia               | Slovenia               | SVN      | Slovenia                  | SVN      |
| 81   | ESP  | Spain                                   | Spain                  | Spain                  | ESP      | Spain                     | ESP      |
| 82   | SWE  | Sweden                                  | Sweden                 | Sweden                 | SWE      | Sweden                    | SWE      |
| 83   | GBR  | United Kingdom                          | United Kingdom         | United Kingdom         | GBR      | United Kingdom            | GBR      |
| 84   | CHE  | Switzerland                             | Switzerland            | Switzerland            | CHE      | Switzerland               | CHE      |
| 85   | NOR  | Norway                                  | Norway                 | Norway                 | NOR      | Norway                    | NOR      |
| 86   | XEF  | Rest of European Free Trade Association | Iceland                | Iceland                | ISL      | Iceland                   | ISL      |
| 86   | XEF  | Rest of European Free Trade Association | Liechtenstein          | Liechtenstein          | LIE      |                           |          |
| 87   | ALB  | Albania                                 | Albania                | Albania                | ALB      | Albania                   | ALB      |
| 88   | SRB  | Serbia                                  | Serbia                 | Serbia                 | SRB      | Serbia                    | SRB      |
| 89   | BLR  | Belarus                                 | Belarus                | Belarus                | BLR      | Belarus                   | BLR      |
| 90   | RUS  | Russian Federation                      | Russian Federation     | Russian Federation     | RUS      | Russian Federation        | RUS      |
| 91   | UKR  | Ukraine                                 | Ukraine                | Ukraine                | UKR      | Ukraine                   | UKR      |
| 92   | XEE  | Rest of Eastern Europe                  | Moldova                | Moldova                | MDA      | Moldova, Republic of      | MDA      |
| 93   | XER  | Rest of Europe                          | Andorra                | Andorra                | AND      |                           |          |
| 93   | XER  | Rest of Europe                          | Bosnia and Herzegovina | Bosnia and Herzegovina | BIH      | Bosnia and Herzegovina    | BIH      |
| 93   | XER  | Rest of Europe                          | Faroe Islands          | Faroe Islands          | FRO      |                           |          |
| 93   | XER  | Rest of Europe                          | Gibraltar              | Gibraltar              | GIB      |                           |          |
| 93   | XER  | Rest of Europe                          | Isle of Man            | Isle of Man            | IMN      |                           |          |
| 93   | XER  | Rest of Europe                          | Kosovo                 | Kosovo                 | XKX      |                           |          |
| 93   | XER  | Rest of Europe                          | Monaco                 | Monaco                 | MCO      |                           |          |
| 93   | XER  | Rest of Europe                          | Montenegro             | Montenegro             | MNE      | Montenegro                | MNE      |
| 93   | XER  | Rest of Europe                          | North Macedonia        | North Macedonia        | MKD      | North Macedonia           | MKD      |
| 93   | XER  | Rest of Europe                          | San Marino             | San Marino             | SMR      |                           |          |
| 93   | XER  | Rest of Europe                          | Guernsey               |                        |          |                           |          |
| 93   | XER  | Rest of Europe                          | Holy See               |                        |          |                           |          |
| 93   | XER  | Rest of Europe                          | Jersey                 |                        |          |                           |          |
| 93   | XER  | Rest of Europe                          | Sark                   |                        |          |                           |          |
| 94   | KAZ  | Kazakhstan                              | Kazakhstan             | Kazakhstan             | KAZ      | Kazakhstan                | KAZ      |
| 95   | KGZ  | Kyrgyzstan                              | Kyrgyz Republic        | Kyrgyz Republic        | KGZ      | Kyrgyzstan                | KGZ      |
| 96   | TJK  | Tajikistan                              | Tajikistan             | Tajikistan             | TJK      | Tajikistan                | TJK      |
| 97   | UZB  | Uzbekistan                              | Uzbekistan             | Uzbekistan             | UZB      | Uzbekistan                | UZB      |
| 98   | XSU  | Rest of Former Soviet Union             | Turkmenistan           | Turkmenistan           | TKM      | Turkmenistan              | TKM      |
| 99   | ARM  | Armenia                                 | Armenia                | Armenia                | ARM      | Armenia                   | ARM      |
| 100  | AZE  | Azerbaijan                              | Azerbaijan             | Azerbaijan             | AZE      | Azerbaijan                | AZE      |
| 101  | GEO  | Georgia                                 | Georgia                | Georgia                | GEO      | Georgia                   | GEO      |
| 102  | BHR  | Bahrain                                 | Bahrain                | Bahrain                | BHR      | Bahrain                   | BHR      |
| 103  | IRN  | Iran, Islamic Republic of               | Iran, Islamic Rep.     | Iran, Islamic Rep.     | IRN      | Iran, Islamic Republic of | IRN      |
| 104  | IRQ  | Iraq                                    | Iraq                   | Iraq                   | IRQ      | Iraq                      | IRQ      |
| 105  | ISR  | Israel                                  | Israel                 | Israel                 | ISR      | Israel                    | ISR      |
| 106  | JOR  | Jordan                                  | Jordan                 | Jordan                 | JOR      | Jordan                    | JOR      |



| GTAP |      |                                  |                          | WDI                      |          | ILO                               |          |
|------|------|----------------------------------|--------------------------|--------------------------|----------|-----------------------------------|----------|
| NO   | Code | Country/Region                   | Country Name             | Country Name             | ISO code | Country Name                      | ISO code |
| 107  | KWT  | Kuwait                           | Kuwait                   | Kuwait                   | KWT      | Kuwait                            | KWT      |
| 108  | LBN  | Lebanon                          | Lebanon                  | Lebanon                  | LBN      | Lebanon                           | LBN      |
| 109  | OMN  | Oman                             | Oman                     | Oman                     | OMN      | Oman                              | OMN      |
| 110  | PSE  | Palestineian Territory, Occupied | West Bank and Gaza       | West Bank and Gaza       | PSE      | Occupied Palestinian Territory    | PSE      |
| 111  | QAT  | Qatar                            | Qatar                    | Qatar                    | QAT      | Qatar                             | QAT      |
| 112  | SAU  | Saudi Arabia                     | Saudi Arabia             | Saudi Arabia             | SAU      | Saudi Arabia                      | SAU      |
| 113  | SYR  | Syrian Arab Republic             | Syrian Arab Republic     | Syrian Arab Republic     | SYR      | Syrian Arab Republic              | SYR      |
| 114  | TUR  | Turkiye                          | Turkiye                  | Turkiye                  | TUR      | Turkiye                           | TUR      |
| 115  | ARE  | United Arab Emirates             | United Arab Emirates     | United Arab Emirates     | ARE      | United Arab Emirates              | ARE      |
| 116  | XWS  | Rest of Western Asia             | Yemen, Rep.              | Yemen, Rep.              | YEM      | Yemen                             | YEM      |
| 117  | DZA  | Algeria                          | Algeria                  | Algeria                  | DZA      | Algeria                           | DZA      |
| 118  | EGY  | Egypt                            | Egypt, Arab Rep.         | Egypt, Arab Rep.         | EGY      | Egypt                             | EGY      |
| 119  | MAR  | Morocco                          | Morocco                  | Morocco                  | MAR      | Morocco                           | MAR      |
| 120  | TUN  | Tunisia                          | Tunisia                  | Tunisia                  | TUN      | Tunisia                           | TUN      |
| 121  | XNF  | Rest of North Africa             | Libya                    | Libya                    | LBY      | Libya                             | LBY      |
| 121  | XNF  | Rest of North Africa             | Western Sahara           |                          |          | Western Sahara                    | ESH      |
| 122  | BEN  | Benin                            | Benin                    | Benin                    | BEN      | Benin                             | BEN      |
| 123  | BFA  | Burkina Faso                     | Burkina Faso             | Burkina Faso             | BFA      | Burkina Faso                      | BFA      |
| 124  | CMR  | Cameroon                         | Cameroon                 | Cameroon                 | CMR      | Cameroon                          | CMR      |
| 125  | CIV  | Côte d'Ivoire                    | Côte d'Ivoire            | Côte d'Ivoire            | CIV      | Côte d'Ivoire                     | CIV      |
| 126  | GHA  | Ghana                            | Ghana                    | Ghana                    | GHA      | Ghana                             | GHA      |
| 127  | GIN  | Guinea                           | Guinea                   | Guinea                   | GIN      | Guinea                            | GIN      |
| 128  | MLI  | Mali                             | Mali                     | Mali                     | MLI      | Mali                              | MLI      |
| 129  | NER  | Niger                            | Niger                    | Niger                    | NER      | Niger                             | NER      |
| 130  | NGA  | Nigeria                          | Nigeria                  | Nigeria                  | NGA      | Nigeria                           | NGA      |
| 131  | SEN  | Senegal                          | Senegal                  | Senegal                  | SEN      | Senegal                           | SEN      |
| 132  | TGO  | Togo                             | Togo                     | Togo                     | TGO      | Togo                              | TGO      |
| 133  | XWF  | Rest of Western Africa           | Cabo Verde               | Cabo Verde               | CPV      | Cabo Verde                        | CPV      |
| 133  | XWF  | Rest of Western Africa           | Gambia, The              | Gambia, The              | GMB      | Gambia                            | GMB      |
| 133  | XWF  | Rest of Western Africa           | Guinea-Bissau            | Guinea-Bissau            | GNB      | Guinea-Bissau                     | GNB      |
| 133  | XWF  | Rest of Western Africa           | Liberia                  | Liberia                  | LBR      | Liberia                           | LBR      |
| 133  | XWF  | Rest of Western Africa           | Mauritania               | Mauritania               | MRT      | Mauritania                        | MRT      |
| 133  | XWF  | Rest of Western Africa           | Sierra Leone             | Sierra Leone             | SLE      | Sierra Leone                      | SLE      |
| 133  | XWF  | Rest of Western Africa           | Saint Helena             |                          |          |                                   |          |
| 134  | CAF  | Central African Republic         | Central African Republic | Central African Republic | CAF      | Central African Republic          | CAF      |
| 135  | TCO  | Chad                             | Chad                     | Chad                     | TCO      | Chad                              | TCO      |
| 136  | COG  | Congo                            | Congo, Rep.              | Congo, Rep.              | COG      | Congo                             | COG      |
| 137  | COD  | Democratic Republic of the Congo | Congo, Dem. Rep.         | Congo, Dem. Rep.         | COD      | Congo, Democratic Republic of the | COD      |
| 138  | GNQ  | Equatorial Guinea                | Equatorial Guinea        | Equatorial Guinea        | GNQ      | Equatorial Guinea                 | GNQ      |
| 139  | GAB  | Gabon                            | Gabon                    | Gabon                    | GAB      | Gabon                             | GAB      |
| 140  | XAC  | Rest of South and Central Africa | Angola                   | Angola                   | AGO      | Angola                            | AGO      |
| 140  | XAC  | Rest of South and Central Africa | Sao Tome and Principe    | Sao Tome and Principe    | STP      | Sao Tome and Principe             | STP      |
| 141  | COM  | Comoros                          | Comoros                  | Comoros                  | COM      | Comoros                           | COM      |
| 142  | ETH  | Ethiopia                         | Ethiopia                 | Ethiopia                 | ETH      | Ethiopia                          | ETH      |
| 143  | KEN  | Kenya                            | Kenya                    | Kenya                    | KEN      | Kenya                             | KEN      |
| 144  | MDG  | Madagascar                       | Madagascar               | Madagascar               | MDG      | Madagascar                        | MDG      |
| 145  | MWI  | Malawi                           | Malawi                   | Malawi                   | MWI      | Malawi                            | MWI      |
| 146  | MUS  | Mauritius                        | Mauritius                | Mauritius                | MUS      | Mauritius                         | MUS      |
| 147  | MOZ  | Mozambique                       | Mozambique               | Mozambique               | MOZ      | Mozambique                        | MOZ      |
| 148  | RWA  | Rwanda                           | Rwanda                   | Rwanda                   | RWA      | Rwanda                            | RWA      |
| 149  | SDN  | Sudan                            | Sudan                    | Sudan                    | SDN      | Sudan                             | SDN      |
| 150  | TZA  | Tanzania, United Republic of     | Tanzania                 | Tanzania                 | TZA      | Tanzania, United Republic of      | TZA      |
| 151  | UGA  | Uganda                           | Uganda                   | Uganda                   | UGA      | Uganda                            | UGA      |
| 152  | ZMB  | Zambia                           | Zambia                   | Zambia                   | ZMB      | Zambia                            | ZMB      |
| 153  | ZWE  | Zimbabwe                         | Zimbabwe                 | Zimbabwe                 | ZWE      | Zimbabwe                          | ZWE      |
| 154  | XEC  | Rest of Eastern Africa           | Burundi                  | Burundi                  | BDI      | Burundi                           | BDI      |
| 154  | XEC  | Rest of Eastern Africa           | Djibouti                 | Djibouti                 | DJI      | Djibouti                          | DJI      |
| 154  | XEC  | Rest of Eastern Africa           | Eritrea                  | Eritrea                  | ERI      | Eritrea                           | ERI      |
| 154  | XEC  | Rest of Eastern Africa           | Seychelles               | Seychelles               | SYC      |                                   |          |
| 154  | XEC  | Rest of Eastern Africa           | Somalia                  | Somalia                  | SOM      | Somalia                           | SOM      |

| GTAP |      |                                     |                                | WDI             |          | ILO             |          |
|------|------|-------------------------------------|--------------------------------|-----------------|----------|-----------------|----------|
| NO   | Code | Country/Region                      | Country Name                   | Country Name    | ISO code | Country Name    | ISO code |
| 154  | XEC  | Rest of Eastern Africa              | South Sudan                    | South Sudan     | SSD      | South Sudan     | SSD      |
| 154  | XEC  | Rest of Eastern Africa              | Mayotte                        |                 |          |                 |          |
| 155  | BWA  | Botswana                            | Botswana                       | Botswana        | BWA      | Botswana        | BWA      |
| 156  | SWZ  | Eswatini                            | Eswatini                       | Eswatini        | SWZ      | Eswatini        | SWZ      |
| 157  | NAM  | Namibia                             | Namibia                        | Namibia         | NAM      | Namibia         | NAM      |
| 158  | ZAF  | South Africa                        | South Africa                   | South Africa    | ZAF      | South Africa    | ZAF      |
| 159  | XSC  | Rest of South African Customs Union | Lesotho                        | Lesotho         | LSO      | Lesotho         | LSO      |
| 160  | XTW  | Rest of the World                   | Channel Islands                | Channel Islands | CHI      | Channel Islands | CHA      |
| 160  | XTW  | Rest of the World                   | Antarctica                     |                 |          |                 |          |
| 160  | XTW  | Rest of the World                   | Bouvet Island                  |                 |          |                 |          |
| 160  | XTW  | Rest of the World                   | British Indian Ocean Territory |                 |          |                 |          |
| 160  | XTW  | Rest of the World                   | French Southern Territories    |                 |          |                 |          |

Source: GTAP and own elaboration.

Note: The GTAP database includes a full list of countries and regional aggregations, the majority of which can be matched to the World Bank's WDI and ILOSTAT country lists. Only some of the small islands are not mapped on to WDI and ILOSTAT. Countries where there is no employment data available (most of which are under the "X" series, such as XEC for the Rest of Eastern Africa and XER for the Rest of Europe, are extrapolated based on the data available with in the category and population data available. ILO does not provide the estimate for any of the counties under code XNA (Bermuda and Greenland). Therefore, the employment data is missing for this regional aggregation. The only territory identified under the code XTW is Channel Islands, which is not listed in the GTAP. As a result, Channel Islands' employment is used as a proxy for XTW.

## ► Annex 2. GTAP sector classification

| NO. | CODE | DESCRIPTION                    | NO. | CODE | DESCRIPTION                             |
|-----|------|--------------------------------|-----|------|-----------------------------------------|
| 1   | pdr  | Paddy rice                     | 34  | bph  | Basic pharmaceutical products           |
| 2   | wht  | Wheat                          | 35  | rpp  | Rubber and plastic products             |
| 3   | gro  | Cereal grains nec              | 36  | nmm  | Mineral products nec                    |
| 4   | v_f  | Vegetables, fruit, nuts        | 37  | i_s  | Ferrous metals                          |
| 5   | osd  | Oil seeds                      | 38  | nfm  | Metals nec                              |
| 6   | c_b  | Sugar cane, sugar beet         | 39  | fmp  | Metal products                          |
| 7   | pfb  | Plant-based fibers             | 40  | ele  | Computer, electronic and optic          |
| 8   | ocr  | Crops nec                      | 41  | eeq  | Electrical equipment                    |
| 9   | ctl  | Bovine cattle, sheep and goats | 42  | ome  | Machinery and equipment nec             |
| 10  | oap  | Animal products nec            | 43  | mvh  | Motor vehicles and parts                |
| 11  | rmk  | Raw milk                       | 44  | otn  | Transport equipment nec                 |
| 12  | wol  | Wool, silk-worm cocoons        | 45  | omf  | Manufactures nec                        |
| 13  | frs  | Forestry                       | 46  | ely  | Electricity                             |
| 14  | fsh  | Fishing                        | 47  | gdt  | Gas manufacture, distribution           |
| 15  | coa  | Coal                           | 48  | wtr  | Water                                   |
| 16  | oil  | Oil                            | 49  | cns  | Construction                            |
| 17  | gas  | Gas                            | 50  | trd  | Trade                                   |
| 18  | oxt  | Minerals nec                   | 51  | afs  | Accommodation, Food and services        |
| 19  | cmt  | Bovine meat products           | 52  | otp  | Transport nec                           |
| 20  | omt  | Meat products nec              | 53  | wtp  | Water transport                         |
| 21  | vol  | Vegetable oils and fats        | 54  | atp  | Air transport                           |
| 22  | mil  | Dairy products                 | 55  | whs  | Warehousing and support activities      |
| 23  | pcr  | Processed rice                 | 56  | cmn  | Communication                           |
| 24  | sgf  | Sugar                          | 57  | ofi  | Financial services nec                  |
| 25  | ofd  | Food products nec              | 58  | ins  | Insurance                               |
| 26  | b_t  | Beverages and tobacco products | 59  | rsa  | Real estate activities                  |
| 27  | tex  | Textiles                       | 60  | obs  | Business services nec                   |
| 28  | wap  | Wearing apparel                | 61  | ros  | Recreational and other services         |
| 29  | lea  | Leather products               | 62  | osg  | Public Administration and defence       |
| 30  | lum  | Wood products                  | 63  | edu  | Education                               |
| 31  | ppp  | Paper products, publishing     | 64  | hht  | Human health and social work activities |
| 32  | p_c  | Petroleum, coal products       | 65  | dwe  | Dwellings                               |
| 33  | chm  | Chemical products              |     |      |                                         |

Source: GTAP.

## ► Annex 3. ISIC rev. 3.1 to GTAP sector classification

| ISIC rev. 3 |                                                                                                                                      |    | GTAP |      |                                |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------|----|------|------|--------------------------------|
| L2          | DESCRIPTION                                                                                                                          | L1 | NO.  | CODE | DESCRIPTION                    |
| A01         | 01 - Agriculture, hunting and related service activities                                                                             | A  | 1    | pdr  | Paddy rice                     |
| A01         | 01 - Agriculture, hunting and related service activities                                                                             | A  | 2    | wht  | Wheat                          |
| A01         | 01 - Agriculture, hunting and related service activities                                                                             | A  | 3    | gro  | Cereal grains nec              |
| A01         | 01 - Agriculture, hunting and related service activities                                                                             | A  | 4    | v_f  | Vegetables, fruit, nuts        |
| A01         | 01 - Agriculture, hunting and related service activities                                                                             | A  | 5    | osd  | Oil seeds                      |
| A01         | 01 - Agriculture, hunting and related service activities                                                                             | A  | 6    | c_b  | Sugar cane, sugar beet         |
| A01         | 01 - Agriculture, hunting and related service activities                                                                             | A  | 7    | pfb  | Plant-based fibers             |
| A01         | 01 - Agriculture, hunting and related service activities                                                                             | A  | 8    | ocr  | Crops nec                      |
| A01         | 01 - Agriculture, hunting and related service activities                                                                             | A  | 9    | ctl  | Bovine cattle, sheep and goats |
| A01         | 01 - Agriculture, hunting and related service activities                                                                             | A  | 10   | oap  | Animal products nec            |
| A01         | 01 - Agriculture, hunting and related service activities                                                                             | A  | 11   | rmk  | Raw milk                       |
| A01         | 01 - Agriculture, hunting and related service activities                                                                             | A  | 12   | wol  | Wool, silk-worm cocoons        |
| A02         | 02 - Forestry, logging and related service activities                                                                                | A  | 13   | frs  | Forestry                       |
| B05         | 05 - Fishing, aquaculture and service activities incidental to fishing                                                               | B  | 14   | fsh  | Fishing                        |
| C10         | 10 - Mining of coal and lignite; extraction of peat                                                                                  | C  | 15   | coa  | Coal                           |
| C11         | 11 - Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying     | C  | 16   | oil  | Oil                            |
| C11         | 11 - Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying     | C  | 17   | gas  | Gas                            |
| C12         | 12 - Mining of uranium and thorium ores                                                                                              | C  | 18   | oxt  | Minerals nec                   |
| C13         | 13 - Mining of metal ores                                                                                                            | C  | 18   | oxt  | Minerals nec                   |
| C14         | 14 - Other mining and quarrying                                                                                                      | C  | 18   | oxt  | Minerals nec                   |
| D15         | 15 - Manufacture of food products and beverages                                                                                      | D  | 19   | cmt  | Bovine meat products           |
| D15         | 15 - Manufacture of food products and beverages                                                                                      | D  | 20   | omt  | Meat products nec              |
| D15         | 15 - Manufacture of food products and beverages                                                                                      | D  | 21   | vol  | Vegetable oils and fats        |
| D15         | 15 - Manufacture of food products and beverages                                                                                      | D  | 22   | mil  | Dairy products                 |
| D15         | 15 - Manufacture of food products and beverages                                                                                      | D  | 23   | pcr  | Processed rice                 |
| D15         | 15 - Manufacture of food products and beverages                                                                                      | D  | 24   | sgr  | Sugar                          |
| D15         | 15 - Manufacture of food products and beverages                                                                                      | D  | 25   | ofd  | Food products nec              |
| D15         | 15 - Manufacture of food products and beverages                                                                                      | D  | 26   | b_t  | Beverages and tobacco products |
| D16         | 16 - Manufacture of tobacco products                                                                                                 | D  | 26   | b_t  | Beverages and tobacco products |
| D17         | 17 - Manufacture of textiles                                                                                                         | D  | 27   | tex  | Textiles                       |
| D18         | 18 - Manufacture of wearing apparel; dressing and dyeing of fur                                                                      | D  | 28   | wap  | Wearing apparel                |
| D19         | 19 - Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear                               | D  | 29   | lea  | Leather products               |
| D20         | 20 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials | D  | 30   | lum  | Wood products                  |
| D21         | 21 - Manufacture of paper and paper products                                                                                         | D  | 31   | ppp  | Paper products, publishing     |
| D22         | 22 - Publishing, printing and reproduction of recorded media                                                                         | D  | 31   | ppp  | Paper products, publishing     |
| D23         | 23 - Manufacture of coke, refined petroleum products and nuclear fuel                                                                | D  | 32   | p_c  | Petroleum, coal products       |
| D24         | 24 - Manufacture of chemicals and chemical products                                                                                  | D  | 33   | chm  | Chemical products              |
| D24         | 24 - Manufacture of chemicals and chemical products                                                                                  | D  | 34   | bph  | Basic pharmaceutical products  |
| D25         | 25 - Manufacture of rubber and plastics products                                                                                     | D  | 35   | rpp  | Rubber and plastic products    |
| D26         | 26 - Manufacture of other non-metallic mineral products                                                                              | D  | 36   | nmm  | Mineral products nec           |
| D27         | 27 - Manufacture of basic metals                                                                                                     | D  | 38   | nfm  | Metals nec                     |
| D27         | 27 - Manufacture of basic metals                                                                                                     | D  | 37   | i_s  | Ferrous metals                 |
| D28         | 28 - Manufacture of fabricated metal products, except machinery and equipment                                                        | D  | 39   | fmp  | Metal products                 |
| D29         | 29 - Manufacture of machinery and equipment n.e.c.                                                                                   | D  | 42   | ome  | Machinery and equipment nec    |
| D30         | 30 - Manufacture of office, accounting and computing machinery                                                                       | D  | 42   | ome  | Machinery and equipment nec    |
| D31         | 31 - Manufacture of electrical machinery and apparatus n.e.c.                                                                        | D  | 41   | eeq  | Electrical equipment           |
| D32         | 32 - Manufacture of radio, television and communication equipment and apparatus                                                      | D  | 40   | ele  | Computer, electronic and optic |
| D33         | 33 - Manufacture of medical, precision and optical instruments, watches and clocks                                                   | D  | 40   | ele  | Computer, electronic and optic |
| D34         | 34 - Manufacture of motor vehicles, trailers and semi-trailers                                                                       | D  | 43   | mvh  | Motor vehicles and parts       |
| D35         | 35 - Manufacture of other transport equipment                                                                                        | D  | 44   | otn  | Transport equipment nec        |
| D36         | 36 - Manufacture of furniture; manufacturing n.e.c.                                                                                  | D  | 45   | omf  | Manufactures nec               |
| D37         | 37 - Recycling                                                                                                                       | D  | 36   | nmm  | Mineral products nec           |
| D37         | 37 - Recycling                                                                                                                       | D  | 37   | i_s  | Ferrous metals                 |
| D37         | 37 - Recycling                                                                                                                       | D  | 38   | nfm  | Metals nec                     |

| ISIC rev. 3 |                                                                                                     |    | GTAP |      |                                         |
|-------------|-----------------------------------------------------------------------------------------------------|----|------|------|-----------------------------------------|
| L2          | DESCRIPTION                                                                                         | L1 | NO.  | CODE | DESCRIPTION                             |
| E40         | 40 - Electricity, gas, steam and hot water supply                                                   | E  | 46   | ely  | Electricity                             |
| E40         | 40 - Electricity, gas, steam and hot water supply                                                   | E  | 47   | gdt  | Gas manufacture, distribution           |
| E41         | 41 - Collection, purification and distribution of water                                             | E  | 48   | wtr  | Water                                   |
| F45         | 45 - Construction                                                                                   | F  | 49   | cns  | Construction                            |
| G50         | 50 - Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel | G  | 50   | trd  | Trade                                   |
| G51         | 51 - Wholesale trade and commission trade, except of motor vehicles and motorcycles                 | G  | 50   | trd  | Trade                                   |
| G52         | 52 - Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods | G  | 50   | trd  | Trade                                   |
| H55         | 55 - Hotels and restaurants                                                                         | H  | 51   | afs  | Accommodation, Food and services        |
| I60         | 60 - Land transport; transport via pipelines                                                        | I  | 52   | otp  | Transport nec                           |
| I61         | 61 - Water transport                                                                                | I  | 53   | wtp  | Water transport                         |
| I62         | 62 - Air transport                                                                                  | I  | 54   | atp  | Air transport                           |
| I63         | 63 - Supporting and auxiliary transport activities; activities of travel agencies                   | I  | 55   | whs  | Warehousing and support activities      |
| I64         | 64 - Post and telecommunications                                                                    | I  | 56   | cmn  | Communication                           |
| J65         | 65 - Financial intermediation, except insurance and pension funding                                 | J  | 57   | ofi  | Financial services nec                  |
| J66         | 66 - Insurance and pension funding, except compulsory social security                               | J  | 58   | ins  | Insurance                               |
| J67         | 67 - Activities auxiliary to financial intermediation                                               | J  | 57   | ofi  | Financial services nec                  |
| J67         | 67 - Activities auxiliary to financial intermediation                                               | J  | 58   | ins  | Insurance                               |
| K70         | 70 - Real estate activities                                                                         | K  | 59   | rsa  | Real estate activities                  |
| K70         | 70 - Real estate activities                                                                         | K  | 65   | dwe  | Dwellings                               |
| K71         | 71 - Renting of machinery and equipment without operator and of personal and household goods        | K  | 60   | obs  | Business services nec                   |
| K72         | 72 - Computer and related activities                                                                | K  | 60   | obs  | Business services nec                   |
| K73         | 73 - Research and development                                                                       | K  | 60   | obs  | Business services nec                   |
| K74         | 74 - Other business activities                                                                      | K  | 60   | obs  | Business services nec                   |
| L75         | 75 - Public administration and defence; compulsory social security                                  | L  | 62   | osg  | Public Administration and defence       |
| M80         | 80 - Education                                                                                      | M  | 63   | edu  | Education                               |
| N85         | 85 - Health and social work                                                                         | N  | 64   | hht  | Human health and social work activities |
| O90         | 90 - Sewage and refuse disposal, sanitation and similar activities                                  | O  | 61   | ros  | Recreational and other services         |
| O91         | 91 - Activities of membership organizations n.e.c.                                                  | O  | 61   | ros  | Recreational and other services         |
| O92         | 92 - Recreational, cultural and sporting activities                                                 | O  | 61   | ros  | Recreational and other services         |
| O93         | 93 - Other service activities                                                                       | O  | 61   | ros  | Recreational and other services         |
| P95         | 95 - Activities of private households as employers of domestic staff                                | P  | 61   | ros  | Recreational and other services         |
| P96         | 96 - Undifferentiated goods-producing activities of private households for own use                  | P  | 61   | ros  | Recreational and other services         |
| P97         | 97 - Undifferentiated service-producing activities of private households for own use                | P  | 61   | ros  | Recreational and other services         |
| Q99         | 99 - Extraterritorial organizations and bodies                                                      | Q  | 62   | osg  | Public Administration and defence       |

Source: Own elaboration.

Note: ILOSTAT provides employment statistics under code X not elsewhere classified. It is an artificial code designed to group employment statistics for those categories where the data are confidential or there are data quality concerns. It is equivalent to the sum of all missing employment statistics under ISIC activity classification.

## ► Annex 4. ISIC rev. 4 to GTAP sector classification

| ISIC rev. 4 |                                                                                                                                      |    | GTAP |      |                                |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------|----|------|------|--------------------------------|
| L2          | DESCRIPTION                                                                                                                          | L1 | NO.  | CODE | DESCRIPTION                    |
| A01         | 01 - Crop and animal production, hunting and related service activities                                                              | A  | 1    | pdr  | Paddy rice                     |
| A01         | 01 - Crop and animal production, hunting and related service activities                                                              | A  | 2    | wht  | Wheat                          |
| A01         | 01 - Crop and animal production, hunting and related service activities                                                              | A  | 3    | gro  | Cereal grains nec              |
| A01         | 01 - Crop and animal production, hunting and related service activities                                                              | A  | 4    | v_f  | Vegetables, fruit, nuts        |
| A01         | 01 - Crop and animal production, hunting and related service activities                                                              | A  | 5    | osd  | Oil seeds                      |
| A01         | 01 - Crop and animal production, hunting and related service activities                                                              | A  | 6    | c_b  | Sugar cane, sugar beet         |
| A01         | 01 - Crop and animal production, hunting and related service activities                                                              | A  | 7    | pfb  | Plant-based fibers             |
| A01         | 01 - Crop and animal production, hunting and related service activities                                                              | A  | 8    | ocr  | Crops nec                      |
| A01         | 01 - Crop and animal production, hunting and related service activities                                                              | A  | 9    | ctl  | Bovine cattle, sheep and goats |
| A01         | 01 - Crop and animal production, hunting and related service activities                                                              | A  | 10   | oap  | Animal products nec            |
| A01         | 01 - Crop and animal production, hunting and related service activities                                                              | A  | 11   | rmk  | Raw milk                       |
| A01         | 01 - Crop and animal production, hunting and related service activities                                                              | A  | 12   | wol  | Wool, silk-worm cocoons        |
| A02         | 02 - Forestry and logging                                                                                                            | A  | 13   | frs  | Forestry                       |
| A03         | 03 - Fishing and aquaculture                                                                                                         | A  | 14   | fsh  | Fishing                        |
| B05         | 05 - Mining of coal and lignite                                                                                                      | B  | 15   | coa  | Coal                           |
| B06         | 06 - Extraction of crude petroleum and natural gas                                                                                   | B  | 16   | oil  | Oil                            |
| B06         | 06 - Extraction of crude petroleum and natural gas                                                                                   | B  | 17   | gas  | Gas                            |
| B07         | 07 - Mining of metal ores                                                                                                            | B  | 18   | oxt  | Minerals nec                   |
| B08         | 08 - Other mining and quarrying                                                                                                      | B  | 18   | oxt  | Minerals nec                   |
| B09         | 09 - Mining support service activities                                                                                               | B  | 18   | oxt  | Minerals nec                   |
| C10         | 10 - Manufacture of food products                                                                                                    | C  | 19   | cmt  | Bovine meat products           |
| C10         | 10 - Manufacture of food products                                                                                                    | C  | 20   | omt  | Meat products nec              |
| C10         | 10 - Manufacture of food products                                                                                                    | C  | 22   | mil  | Dairy products                 |
| C10         | 10 - Manufacture of food products                                                                                                    | C  | 23   | pcr  | Processed rice                 |
| C10         | 10 - Manufacture of food products                                                                                                    | C  | 24   | sgf  | Sugar                          |
| C10         | 10 - Manufacture of food products                                                                                                    | C  | 25   | ofd  | Food products nec              |
| C10         | 10 - Manufacture of food products                                                                                                    | C  | 21   | vol  | Vegetable oils and fats        |
| C11         | 11 - Manufacture of beverages                                                                                                        | C  | 26   | b_t  | Beverages and tobacco products |
| C12         | 12 - Manufacture of tobacco products                                                                                                 | C  | 26   | b_t  | Beverages and tobacco products |
| C13         | 13 - Manufacture of textiles                                                                                                         | C  | 27   | tex  | Textiles                       |
| C14         | 14 - Manufacture of wearing apparel                                                                                                  | C  | 28   | wap  | Wearing apparel                |
| C15         | 15 - Manufacture of leather and related products                                                                                     | C  | 29   | lea  | Leather products               |
| C16         | 16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials | C  | 30   | lum  | Wood products                  |
| C17         | 17 - Manufacture of paper and paper products                                                                                         | C  | 31   | ppp  | Paper products, publishing     |
| C18         | 18 - Printing and reproduction of recorded media                                                                                     | C  | 31   | ppp  | Paper products, publishing     |
| C19         | 19 - Manufacture of coke and refined petroleum products                                                                              | C  | 32   | p_c  | Petroleum, coal products       |
| C20         | 20 - Manufacture of chemicals and chemical products                                                                                  | C  | 33   | chm  | Chemical products              |
| C21         | 21 - Manufacture of pharmaceuticals, medicinal chemical and botanical products                                                       | C  | 34   | bph  | Basic pharmaceutical products  |
| C22         | 22 - Manufacture of rubber and plastics products                                                                                     | C  | 35   | rpp  | Rubber and plastic products    |
| C23         | 23 - Manufacture of other non-metallic mineral products                                                                              | C  | 36   | nmm  | Mineral products nec           |
| C24         | 24 - Manufacture of basic metals                                                                                                     | C  | 38   | nfm  | Metals nec                     |
| C24         | 24 - Manufacture of basic metals                                                                                                     | C  | 37   | i_s  | Ferrous metals                 |
| C25         | 25 - Manufacture of fabricated metal products, except machinery and equipment                                                        | C  | 39   | fmp  | Metal products                 |
| C26         | 26 - Manufacture of computer, electronic and optical products                                                                        | C  | 40   | ele  | Computer, electronic and optic |
| C27         | 27 - Manufacture of electrical equipment                                                                                             | C  | 41   | eeq  | Electrical equipment           |
| C28         | 28 - Manufacture of machinery and equipment n.e.c.                                                                                   | C  | 42   | ome  | Machinery and equipment nec    |
| C29         | 29 - Manufacture of motor vehicles, trailers and semi-trailers                                                                       | C  | 43   | mvh  | Motor vehicles and parts       |
| C30         | 30 - Manufacture of other transport equipment                                                                                        | C  | 44   | otn  | Transport equipment nec        |
| C31         | 31 - Manufacture of furniture                                                                                                        | C  | 45   | omf  | Manufactures nec               |
| C32         | 32 - Other manufacturing                                                                                                             | C  | 45   | omf  | Manufactures nec               |
| C33         | 33 - Repair and installation of machinery and equipment                                                                              | C  | 45   | omf  | Manufactures nec               |
| D35         | 35 - Electricity, gas, steam and air conditioning supply                                                                             | D  | 46   | ely  | Electricity                    |
| D35         | 35 - Electricity, gas, steam and air conditioning supply                                                                             | D  | 47   | gdt  | Gas manufacture, distribution  |
| E36         | 36 - Water collection, treatment and supply                                                                                          | E  | 48   | wtr  | Water                          |
| E37         | 37 - Sewerage                                                                                                                        | E  | 48   | wtr  | Water                          |
| E38         | 38 - Waste collection, treatment and disposal activities; materials recovery                                                         | E  | 48   | wtr  | Water                          |
| E39         | 39 - Remediation activities and other waste management services                                                                      | E  | 48   | wtr  | Water                          |

| ISIC rev. 4 |                                                                                                                 |    | GTAP |      |                                         |
|-------------|-----------------------------------------------------------------------------------------------------------------|----|------|------|-----------------------------------------|
| L2          | DESCRIPTION                                                                                                     | L1 | NO.  | CODE | DESCRIPTION                             |
| F41         | 41 - Construction of buildings                                                                                  | F  | 49   | cns  | Construction                            |
| F42         | 42 - Civil engineering                                                                                          | F  | 49   | cns  | Construction                            |
| F43         | 43 - Specialized construction activities                                                                        | F  | 49   | cns  | Construction                            |
| G45         | 45 - Wholesale and retail trade and repair of motor vehicles and motorcycles                                    | G  | 50   | trd  | Trade                                   |
| G46         | 46 - Wholesale trade, except of motor vehicles and motorcycles                                                  | G  | 50   | trd  | Trade                                   |
| G47         | 47 - Retail trade, except of motor vehicles and motorcycles                                                     | G  | 50   | trd  | Trade                                   |
| H49         | 49 - Land transport and transport via pipelines                                                                 | H  | 52   | otp  | Transport nec                           |
| H50         | 50 - Water transport                                                                                            | H  | 53   | wtp  | Water transport                         |
| H51         | 51 - Air transport                                                                                              | H  | 54   | atp  | Air transport                           |
| H52         | 52 - Warehousing and support activities for transportation                                                      | H  | 55   | whs  | Warehousing and support activities      |
| H53         | 53 - Postal and courier activities                                                                              | H  | 55   | whs  | Warehousing and support activities      |
| I55         | 55 - Accommodation                                                                                              | I  | 51   | afs  | Accommodation, Food and services        |
| I56         | 56 - Food and beverage service activities                                                                       | I  | 51   | afs  | Accommodation, Food and services        |
| J58         | 58 - Publishing activities                                                                                      | J  | 56   | cmn  | Communication                           |
| J59         | 59 - Motion picture, video and television programme production, sound recording and music publishing activities | J  | 56   | cmn  | Communication                           |
| J60         | 60 - Programming and broadcasting activities                                                                    | J  | 56   | cmn  | Communication                           |
| J61         | 61 - Telecommunications                                                                                         | J  | 56   | cmn  | Communication                           |
| J62         | 62 - Computer programming, consultancy and related activities                                                   | J  | 56   | cmn  | Communication                           |
| J63         | 63 - Information service activities                                                                             | J  | 56   | cmn  | Communication                           |
| K64         | 64 - Financial service activities, except insurance and pension funding                                         | K  | 57   | ofi  | Financial services nec                  |
| K65         | 65 - Insurance, reinsurance and pension funding, except compulsory social security                              | K  | 58   | ins  | Insurance                               |
| K66         | 66 - Activities auxiliary to financial service and insurance activities                                         | K  | 57   | ofi  | Financial services nec                  |
| K66         | 66 - Activities auxiliary to financial service and insurance activities                                         | K  | 58   | ins  | Insurance                               |
| L68         | 68 - Real estate activities                                                                                     | L  | 59   | rsa  | Real estate activities                  |
| L68         | 68 - Real estate activities                                                                                     | L  | 65   | dwe  | Dwellings                               |
| M69         | 69 - Legal and accounting activities                                                                            | M  | 60   | obs  | Business services nec                   |
| M70         | 70 - Activities of head offices; management consultancy activities                                              | M  | 60   | obs  | Business services nec                   |
| M71         | 71 - Architectural and engineering activities; technical testing and analysis                                   | M  | 60   | obs  | Business services nec                   |
| M72         | 72 - Scientific research and development                                                                        | M  | 60   | obs  | Business services nec                   |
| M73         | 73 - Advertising and market research                                                                            | M  | 60   | obs  | Business services nec                   |
| M74         | 74 - Other professional, scientific and technical activities                                                    | M  | 60   | obs  | Business services nec                   |
| M75         | 75 - Veterinary activities                                                                                      | M  | 60   | obs  | Business services nec                   |
| N77         | 77 - Rental and leasing activities                                                                              | N  | 60   | obs  | Business services nec                   |
| N78         | 78 - Employment activities                                                                                      | N  | 60   | obs  | Business services nec                   |
| N79         | 79 - Travel agency, tour operator, reservation service and related activities                                   | N  | 60   | obs  | Business services nec                   |
| N80         | 80 - Security and investigation activities                                                                      | N  | 60   | obs  | Business services nec                   |
| N81         | 81 - Services to buildings and landscape activities                                                             | N  | 60   | obs  | Business services nec                   |
| N82         | 82 - Office administrative, office support and other business support activities                                | N  | 60   | obs  | Business services nec                   |
| O84         | 84 - Public administration and defence; compulsory social security                                              | O  | 62   | osg  | Public Administration and defence       |
| P85         | 85 - Education                                                                                                  | P  | 63   | edu  | Education                               |
| Q86         | 86 - Human health activities                                                                                    | Q  | 64   | hht  | Human health and social work activities |
| Q87         | 87 - Residential care activities                                                                                | Q  | 64   | hht  | Human health and social work activities |
| Q88         | 88 - Social work activities without accommodation                                                               | Q  | 64   | hht  | Human health and social work activities |
| R90         | 90 - Creative, arts and entertainment activities                                                                | R  | 61   | ros  | Recreational and other services         |
| R91         | 91 - Libraries, archives, museums and other cultural activities                                                 | R  | 61   | ros  | Recreational and other services         |
| R92         | 92 - Gambling and betting activities                                                                            | R  | 61   | ros  | Recreational and other services         |
| R93         | 93 - Sports activities and amusement and recreation activities                                                  | R  | 61   | ros  | Recreational and other services         |
| S94         | 94 - Activities of membership organizations                                                                     | S  | 61   | ros  | Recreational and other services         |
| S95         | 95 - Repair of computers and personal and household goods                                                       | S  | 61   | ros  | Recreational and other services         |
| S96         | 96 - Other personal service activities                                                                          | S  | 61   | ros  | Recreational and other services         |
| T97         | 97 - Activities of households as employers of domestic personnel                                                | T  | 61   | ros  | Recreational and other services         |
| T98         | 98 - Undifferentiated goods- and services-producing activities of private households for own use                | T  | 61   | ros  | Recreational and other services         |
| U99         | 99 - Activities of extraterritorial organizations and bodies                                                    | U  | 62   | osg  | Public Administration and defence       |

Source: Own elaboration.

Note: ILOSTAT provides employment statistics under code X not elsewhere classified. It is an artificial code designed to group employment statistics for those categories where the data are confidential or there are data quality concerns. It is equivalent to the sum of all missing employment statistics under ISIC activity classification.

## ► Annex 5. Mapping between ISIC rev. 3.1 and ISIC rev. 4 at the one-digit level

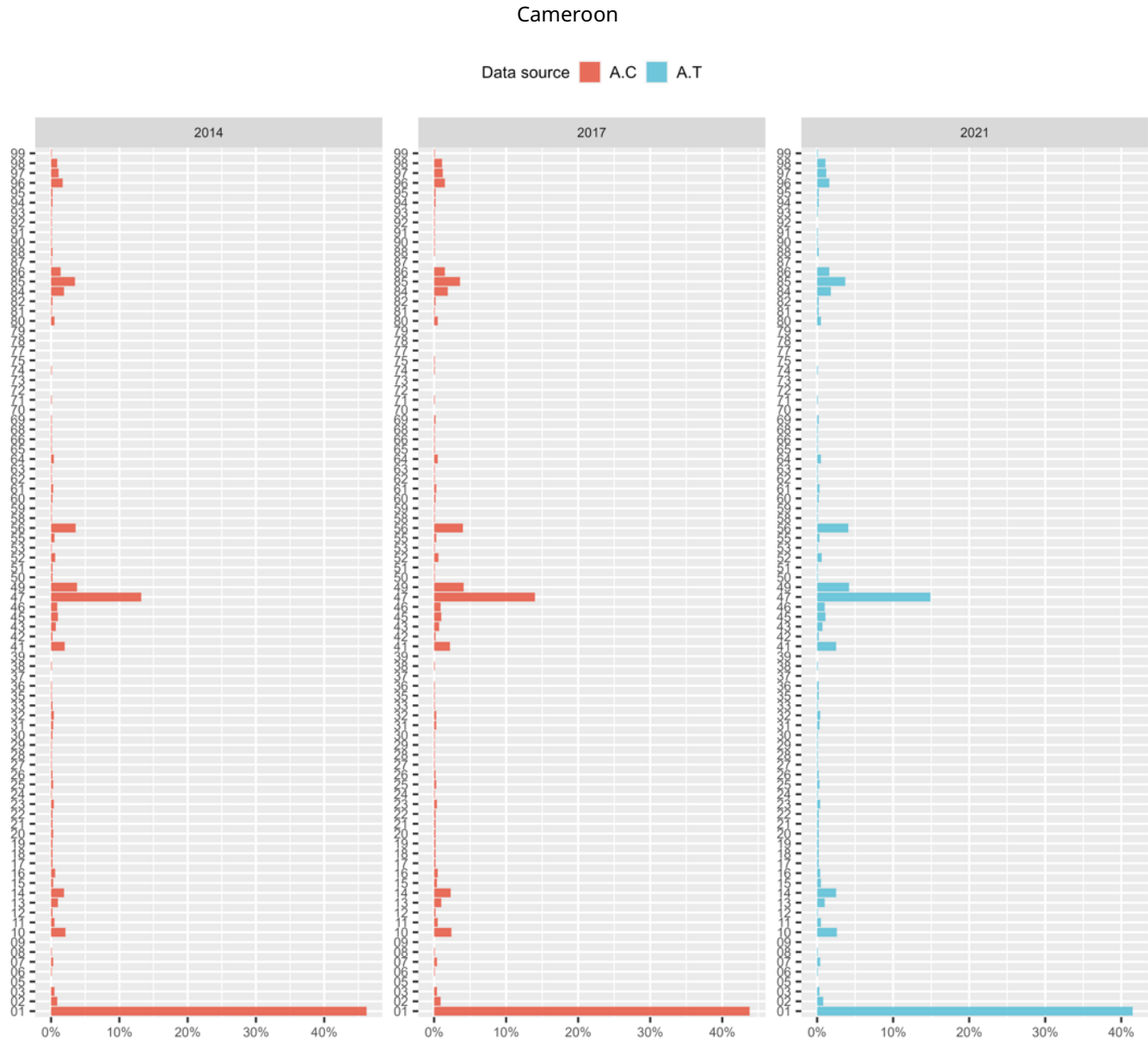
| ISIC rev. 3.1                                                                                                     | ISIC rev. 4.                                                                                                                  | ISIC rev. 4. Modelled Estimates                                                    |
|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| A. Agriculture, hunting and forestry                                                                              | A. Agriculture; forestry and fishing                                                                                          | Agriculture; forestry and fishing ~ISIC rev.4 A                                    |
| B. Fishing                                                                                                        |                                                                                                                               |                                                                                    |
| C. Mining and quarrying                                                                                           | B. Mining and quarrying                                                                                                       | Mining and quarrying ~ISIC rev.4 B                                                 |
| D. Manufacturing                                                                                                  | C. Manufacturing                                                                                                              | Manufacturing ~ISIC rev.4 C                                                        |
| E. Electricity, gas and water supply                                                                              | D. Electricity; gas, steam and air conditioning supply                                                                        | Utilities ~ISIC rev.4 D; E                                                         |
|                                                                                                                   | E. Water supply; sewerage, waste management and remediation activities                                                        |                                                                                    |
| F. Construction                                                                                                   | F. Construction                                                                                                               | Construction ~ISIC rev.4 F                                                         |
| G. Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods             | G. Wholesale and retail trade; repair of motor vehicles and motorcycles                                                       | Wholesale and retail trade; repair of motor vehicles and motorcycles ~ISIC rev.4 G |
| H. Hotels and restaurants                                                                                         | I. Accommodation and food service activities                                                                                  | Accommodation and food service activities ~ISIC rev.4 I                            |
| I. Transport, storage and communications                                                                          | H. Transportation and storage                                                                                                 | Transport; storage and communication ~ISIC rev.4 H; J                              |
|                                                                                                                   | J. Information and communication                                                                                              |                                                                                    |
| J. Financial intermediation                                                                                       | K. Financial and insurance activities                                                                                         | Financial and insurance activities ~ISIC rev.4 K                                   |
| K. Real estate, renting and business activities                                                                   | L. Real estate activities                                                                                                     | Real estate; business and administrative activities ~ISIC rev.4 L; M; N            |
|                                                                                                                   | M. Professional, scientific and technical activities                                                                          |                                                                                    |
|                                                                                                                   | N. Administrative and support service activities                                                                              |                                                                                    |
| L. Public administration and defence; compulsory social security                                                  | O. Public administration and defence; compulsory social security                                                              | Public administration and defence; compulsory social security ~ISIC rev.4 O        |
| M. Education                                                                                                      | P. Education                                                                                                                  | Education ~ISIC rev.4 P                                                            |
| N. Health and social work                                                                                         | Q. Human health and social work activities                                                                                    | Human health and social work activities ~ISIC rev.4 Q                              |
| O. Other community, social and personal service activities                                                        | R. Arts, entertainment and recreation                                                                                         | Other services ~ISIC rev.4 R; S; T; U                                              |
|                                                                                                                   | S. Other service activities                                                                                                   |                                                                                    |
| P. Activities of private households as employers and undifferentiated production activities of private households | T. Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use |                                                                                    |
| Q. Extraterritorial organizations and bodies                                                                      | U. Activities of extraterritorial organizations and bodies                                                                    |                                                                                    |

Source: Own elaboration.



## ► Annex 6. Shifts in Employment Structure

► Figure A7.1 Employment by sector, as a share of total employment for 2014, 2017 and 2021

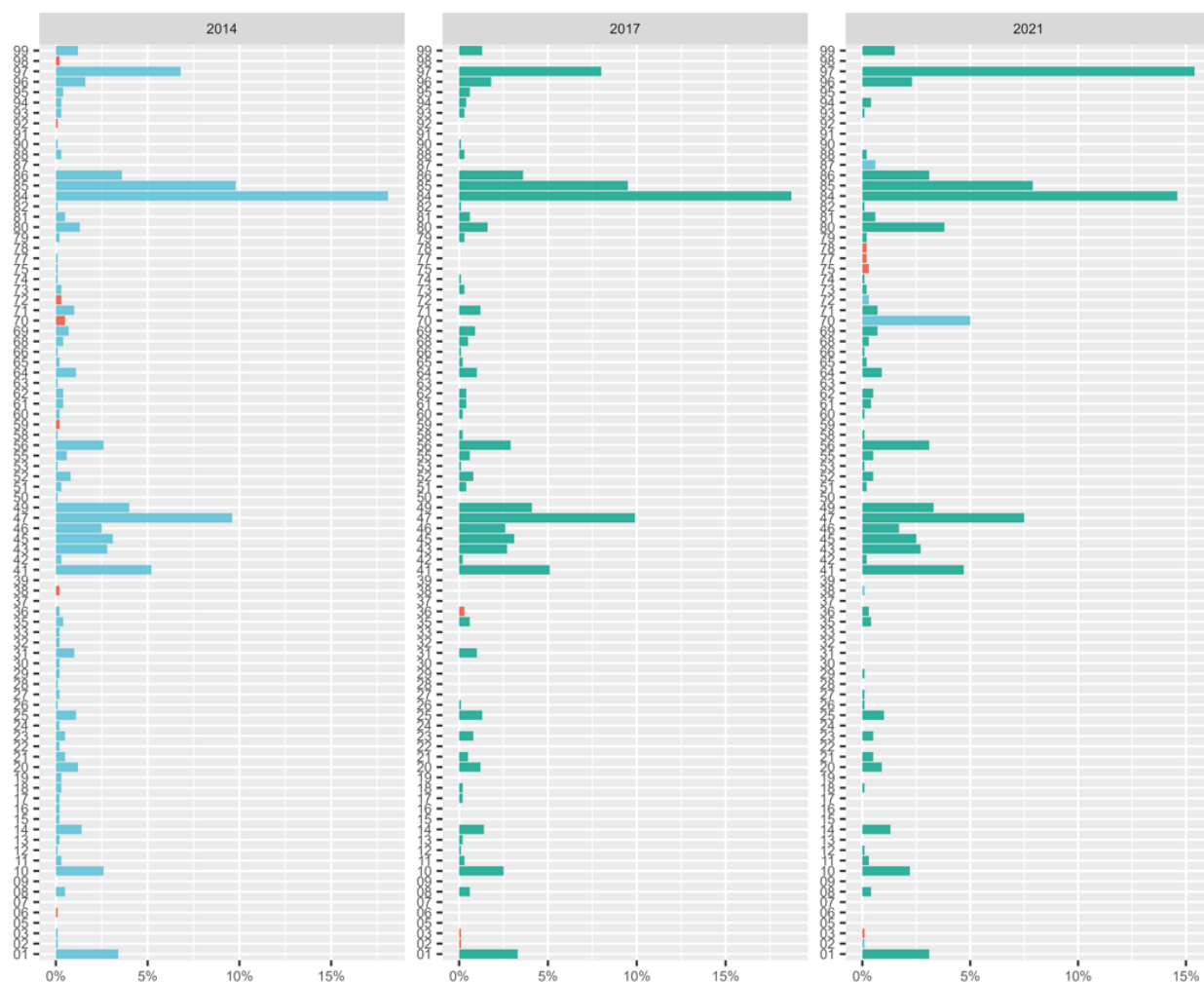


Source: Own estimates.

Note: Data source indicates the methodology used for imputation. See Table 2 for details.

## Jordan

Data source A.C A.T R.C

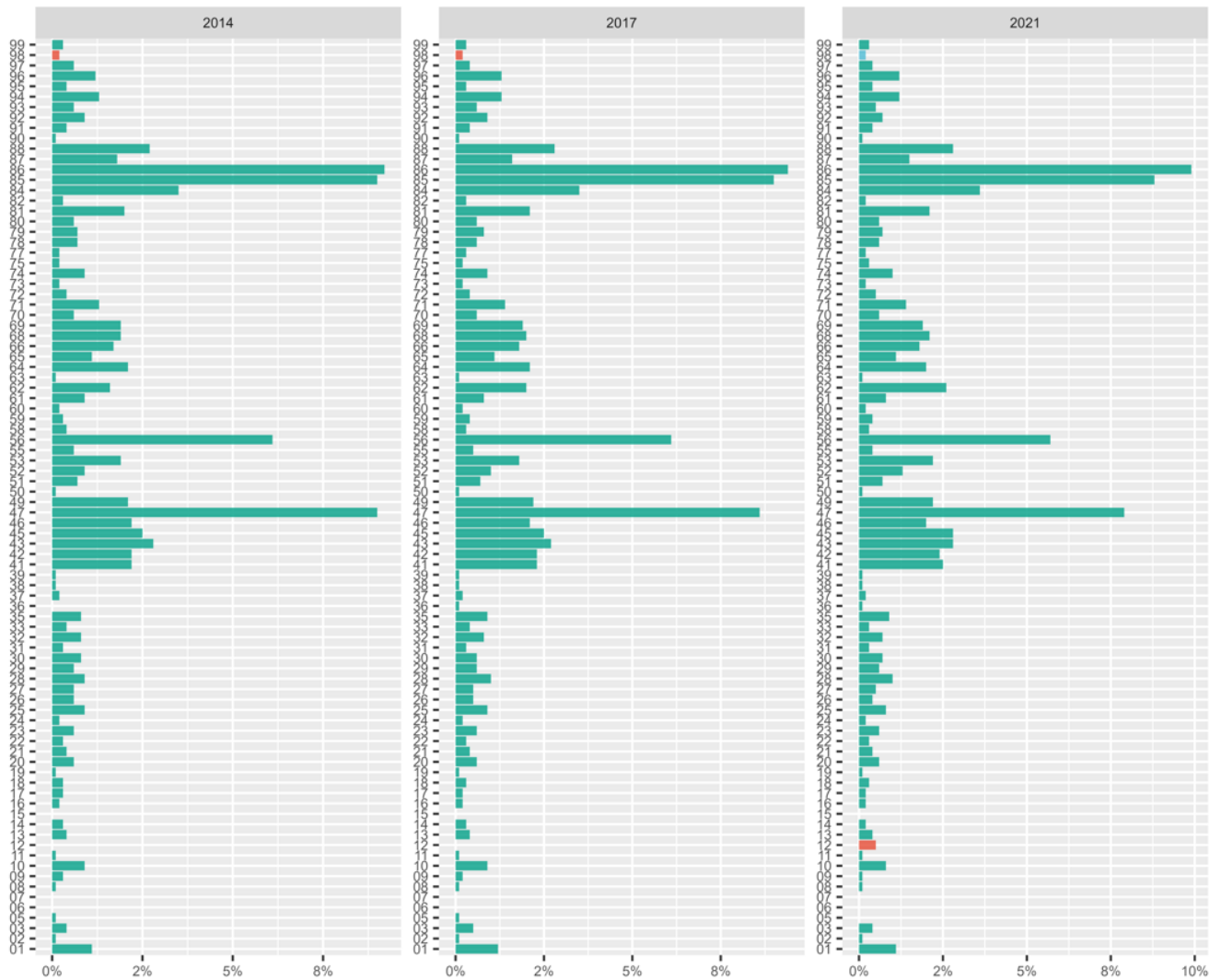


Source: Own estimates.

Note: Data source indicates the methodology used for imputation. See Table 2 for details.

# The United States

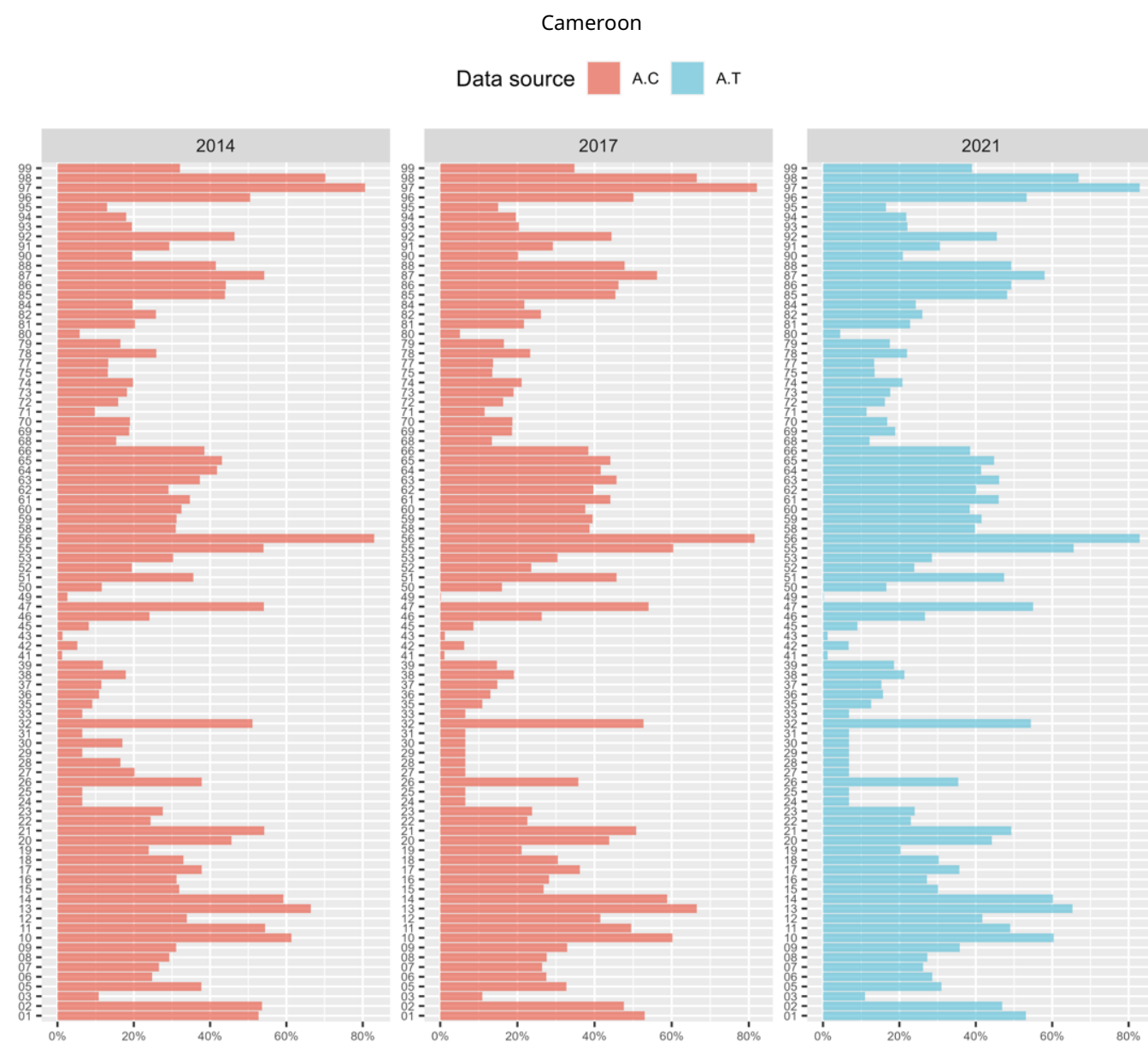
Data source A.C A.T R.C



Source: Own estimates.

Note: Data source indicates the methodology used for imputation. See Table 2 for details.

► Figure A7.2 Female employment share by ISIC sector, for selected years

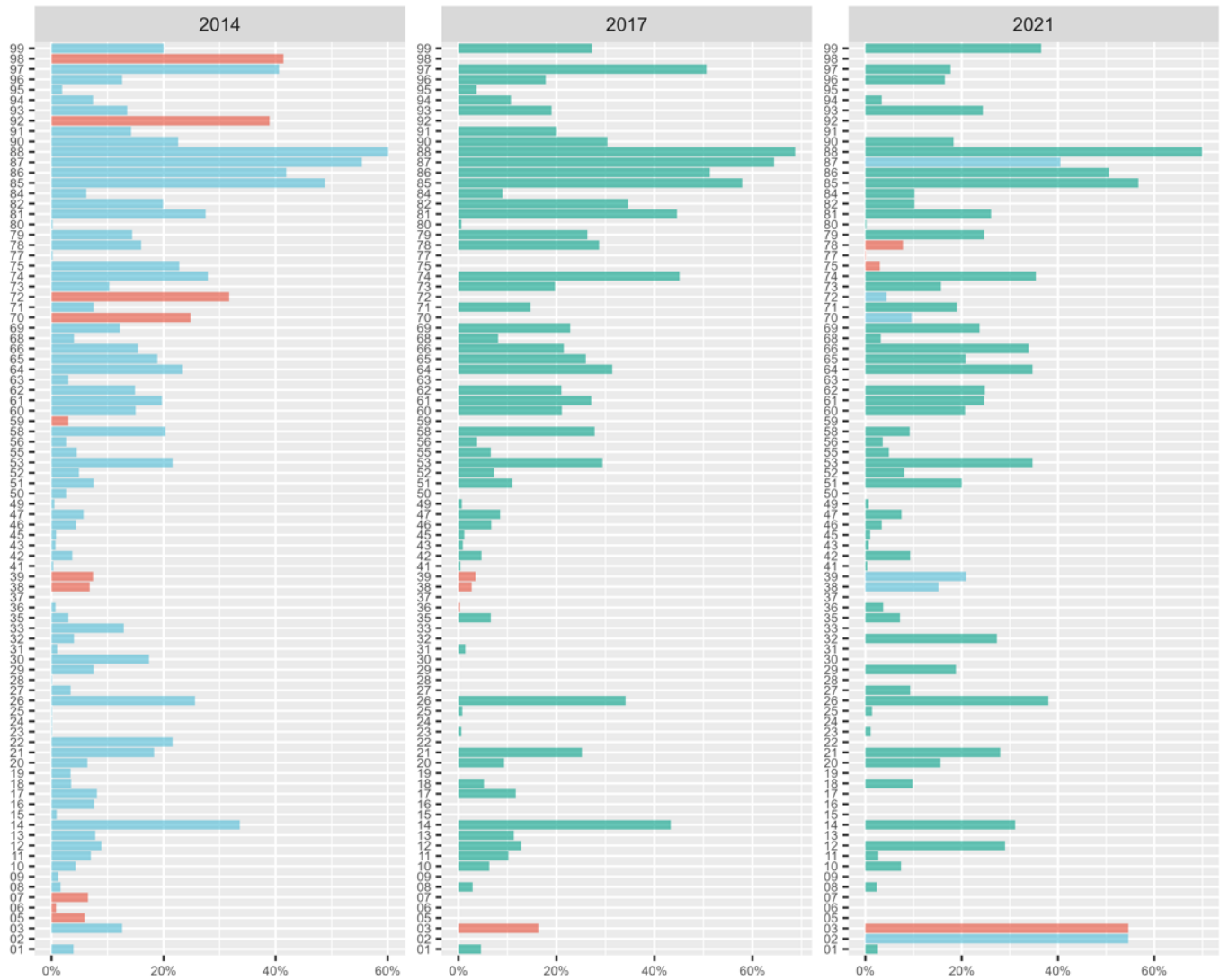


Source: Own estimates.

Note: Data source indicates the methodology used for imputation. See Table 2 for details.

## Jordan

Data source A.C A.T R.C

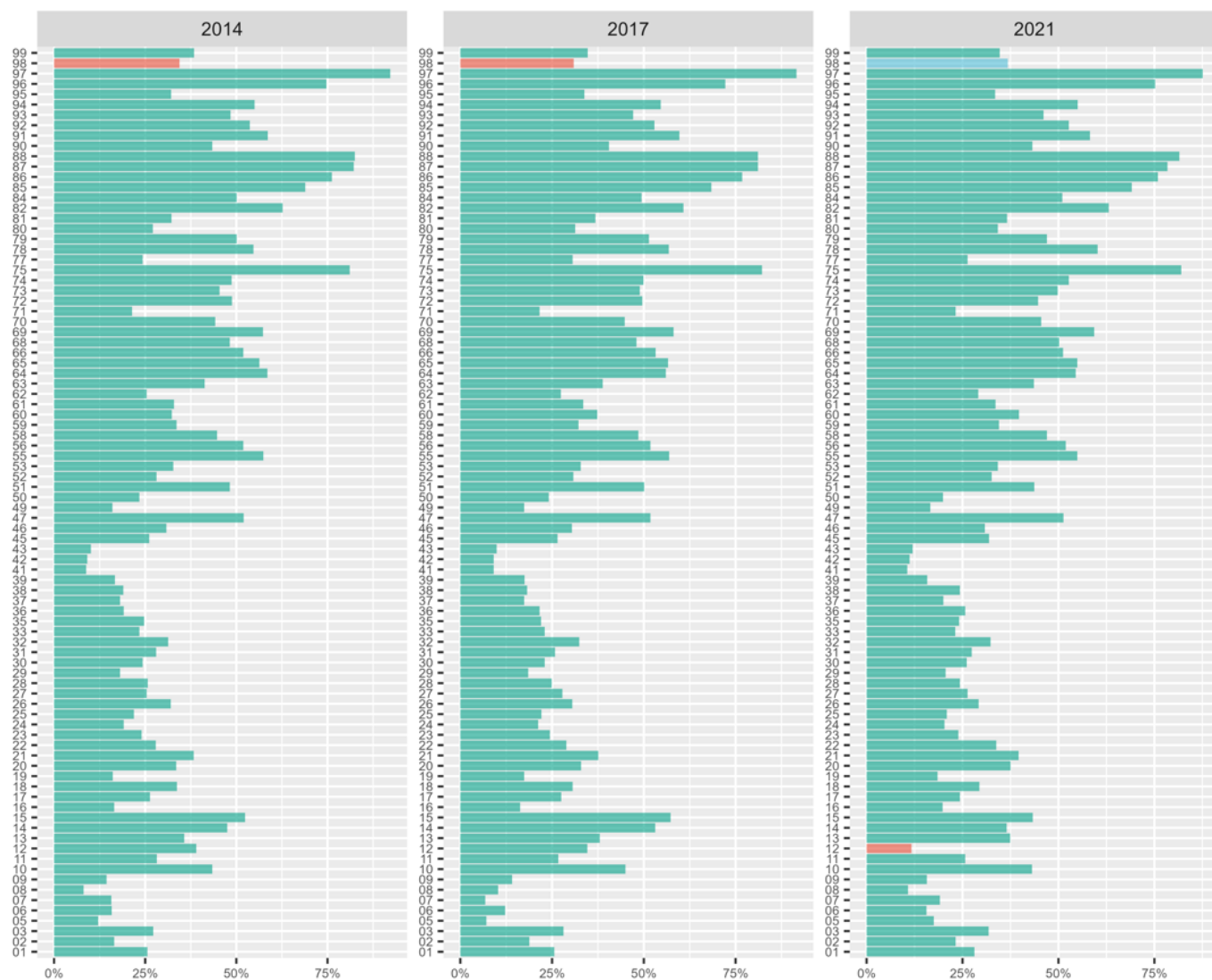


Source: Own estimates.

Note: Data source indicates the methodology used for imputation. See Table 2 for details.

## The United States

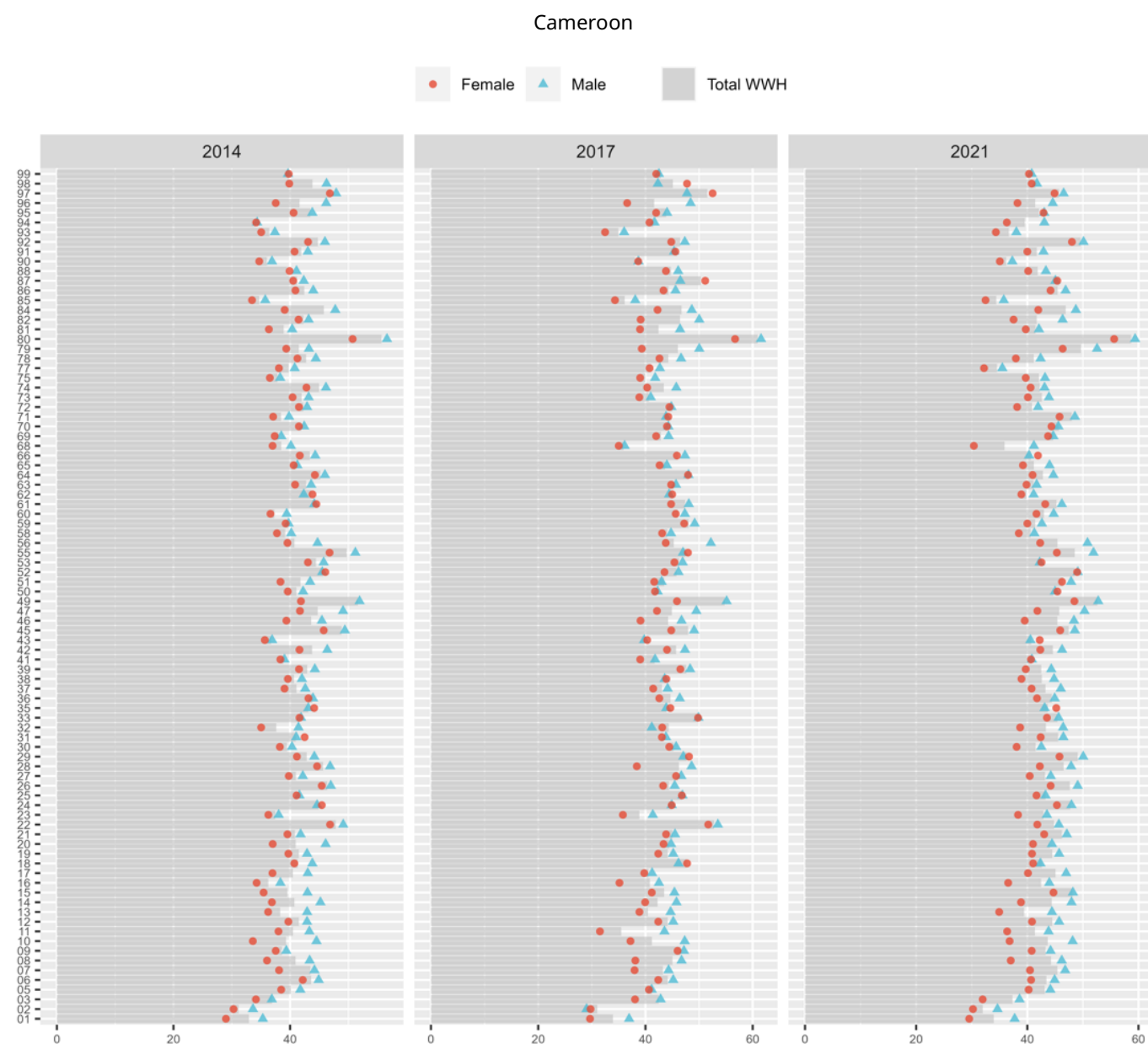
Data source A.C A.T R.C



Source: Own estimates.

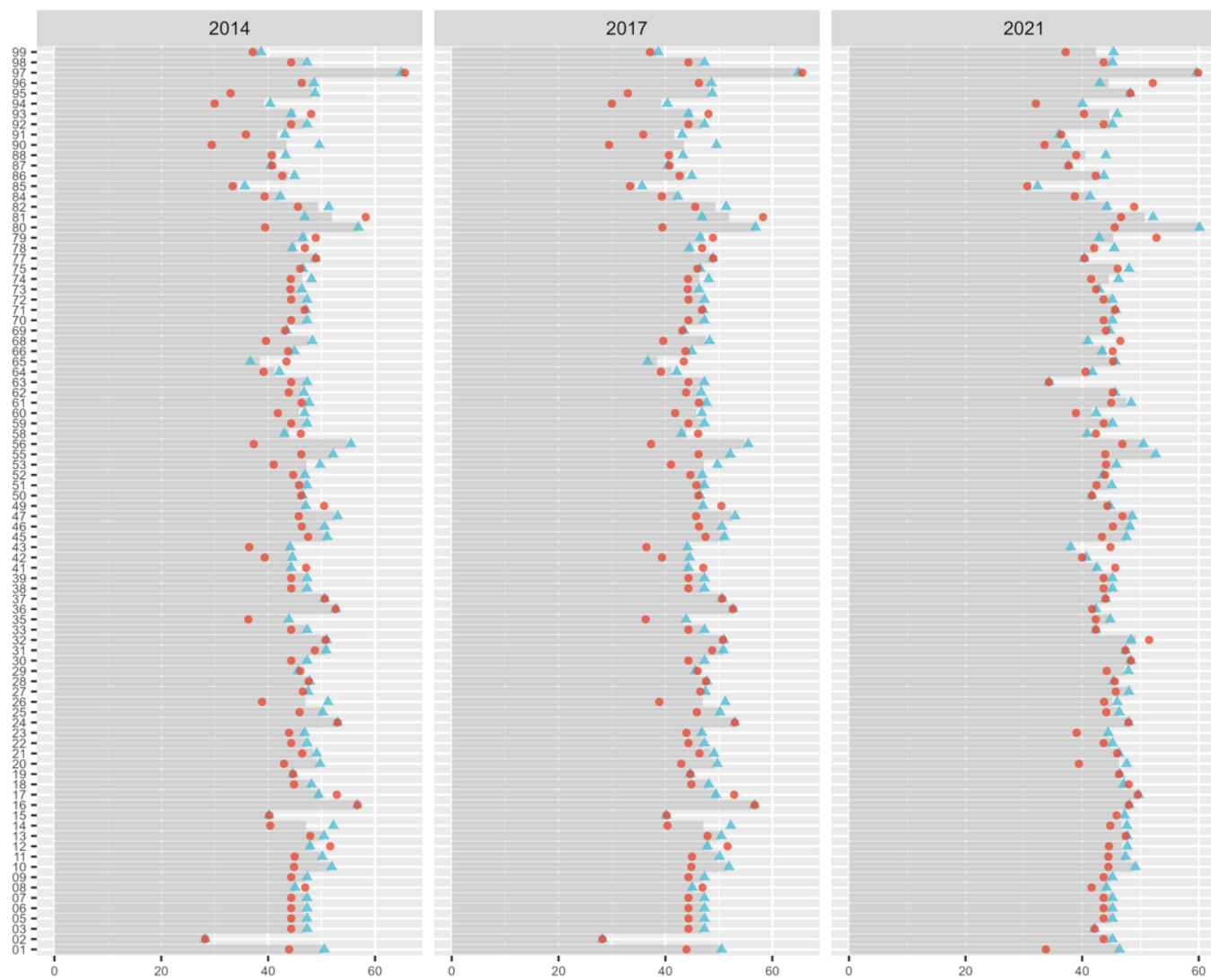
Note: Data source indicates the methodology used for imputation. See Table 2 for details.

► **Figure A7.3 Mean hours actually worked by ISIC sectors, for selected years**



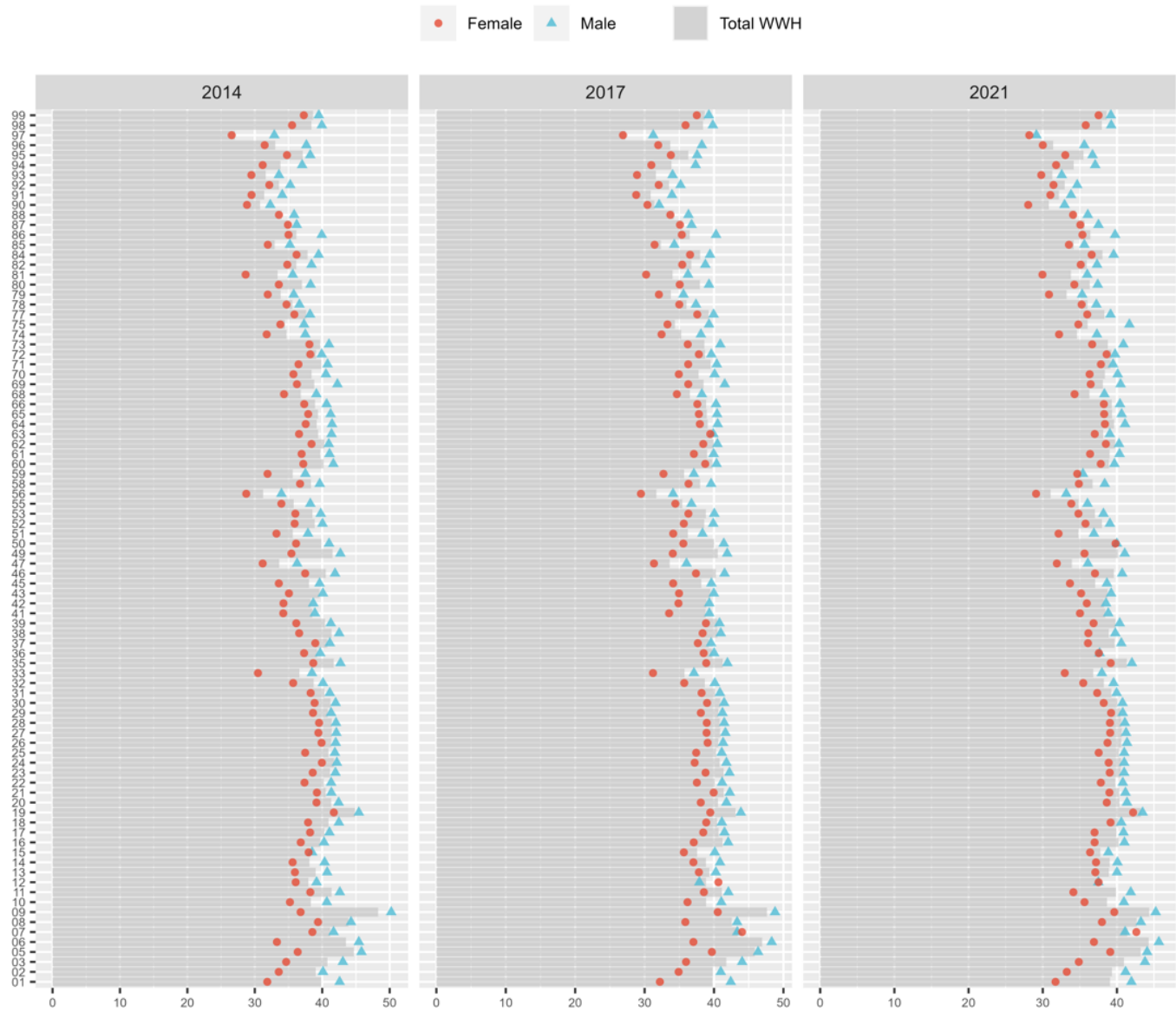
## Jordan

● Female ▲ Male ■ Total WWH





The United States



Source: Own estimates.

|                        |                                                                                                       |                                                                                      |
|------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
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