VISUALIZING LABOUR MARKETS: A QUICK GUIDE TO CHARTING LABOUR STATISTICS

Printed in Switzerland

Contents

1. Introduction

Labour statistics are at the core of any labour market information system, and they represent a crucial tool for research and policy formulation. Labour statistics can be derived from a variety of sources, such as household surveys, establishment surveys or administrative records, and they can be produced following different methodologies, though ideally referring to the corresponding international standards. The validity and reliability of labour statistics is greatly determined by the characteristics of the source used, including the design of the data compilation, the geographical coverage, the reference period and the consistency checks put in place, among many others.[1]

However, the true value of labour statistics is not in their existence or production per se, but in their analytical potential. Reliable and timely labour statistics play a key role in labour market research and policy formulation, implementation and evaluation. They inform the work of students, researchers, journalists and policymakers, and support evidence-based decision-making. They are also a valuable means for communicating labour market issues to the general public and keeping them abreast of labour market developments.

In this regard, the way in which labour statistics are presented has a considerable impact on how they are perceived and understood. The presentation of the data influences to a large extent its analysis and interpretation. Effective data presentation conveys a clear message, facilitates the understanding of the data, brings to light interesting facts, avoids miss-interpretations and promotes the sound use of the underlying statistics. In this sense, data visualizations, and particularly, charts, are a simple and easy way of presenting data efficiently and attractively.

According to the Collins English Dictionary[2], a chart is a diagram, picture, or graph which is intended to make information easier to understand. Similarly, the Cambridge English Dictionary[3] defines charts as drawings that show information in a simple way, often using lines and curves to show amounts. Thus, charts are graphic forms of data

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[1] For more information on the sources and uses of labour statistics, refer to ILOSTAT's *Quick Guide on Sources and Uses of Labour Statistics* (available at http://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_590092.pdf)

[2] Available at https://www.collinsdictionary.com/

[3] Available at https://dictionary.cambridge.org

presentation purposely designed to make some piece of information evident and clear to the public. In the field of labour statistics, charts are extremely useful and a valuable tool for communicating complex facts in a much simpler and easier-to-grasp way. Charts often act as the nexus between complicated and cumbersome labour statistics datasets and the end user of labour statistics, may this be a student, a researcher, a journalist, a policy-maker or any individual wishing to know more about the situation of the labour market.

Given how valuable and useful charts are for the analysis and interpretation of labour statistics, this guide describes the main types of charts used as well as some more complex types of charts, providing numerous visual examples in each case.[4] The guide also provides tips on making effective labour statistics charts, considering various aspects to ensure that the charts designed are useful, clear and visually-appealing. This guide is not exhaustive, in that it does not thoroughly cover each possible type of chart and all the characteristics of each chart type, but it provides a quick overview of the main charts used in labour statistics and offers practical advice on charting labour statistics.

2. What are charts and why use them to support labour market analysis?

Charts are visual, graphical representations of data, conveying information in a simple way and making the data easier to understand. Charts use symbols to represent data points (such as bars, lines, slices of a pie, etc.) and can be used to represent the relationship between variables but can also serve to convey frequencies, shares or proportions. Charts can depict functions, numerical data (continuous or discrete), quantitative indicators or even qualitative indicators.

Hence, by definition, charts are visual ways of representing different types of data so as to make it easier to grasp and more accessible to the audience. Charts can play a key role in helping achieve the true analytical potential of labour statistics, by communicating in a clear, simple and ideally also visually appealing way the main facts concerning the labour market. Given that absolute values can be hard to grasp and construe, it is usually easier and more telling to analyse labour statistics by referring to shares, percentages, ratios, comparisons over time or across items or categories, etc. In this regard, charts are

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[4] All the charts included in this guide were made in Excel 2013.

the perfect tool to facilitate this simplified portrayal of labour statistics, providing an easy way to illustrate these compositions, ratios or comparisons with a self-explanatory visually appealing diagram. The large variety of types of charts available and the wide range of existing formatting options allow for charts to be custom-designed to take into account the level of statistical and labour market knowledge of the audience as well as the specific purposes of the analysis, so as to make them as effective as possible.

3. Main types of charts

There are four types of charts generally referred to as the main and most commonly used: bar charts, pie charts, line charts and scatter charts. Each of these main types comprises various sub-types. In addition to the four main types of charts, there are also many other (perhaps more sophisticated) types of charts which could be used depending on the type of labour market analysis being done. The following sections describe the four main types of charts in detail, providing examples using labour statistics in each case, and give a quick overview of some (selected) additional types of charts.

3.1. Bar charts (including histograms)

Bar charts convey data in the form of rectangles (which could be narrower or wider depending on the user's choices) where each rectangle represents a category and the size of the rectangle represents the data value. Bars could be vertical (columns) or horizontal. In the case of a column chart, it is the height of the rectangles which shows the data values, and for bar charts, it is the length of the rectangles which is proportional to the data values.

Bar charts (both horizontal and vertical) depict values independent from each other: each category is not linked to the others, a change in a category does not imply a change in any other category. Bar charts are used to compare these values, that is, to illustrate how the categories differ from each other.

In a vertically-oriented bar chart (column chart), categories are presented in the horizontal axis and the data values in the vertical axis. Figure 1 provides an example of a column chart as used in labour market analysis.

Figure 1. Column chart (vertical bars)

Global and regional unemployment rates, 2017

Source: ILOSTAT - ILO modelled estimates, May 2017.
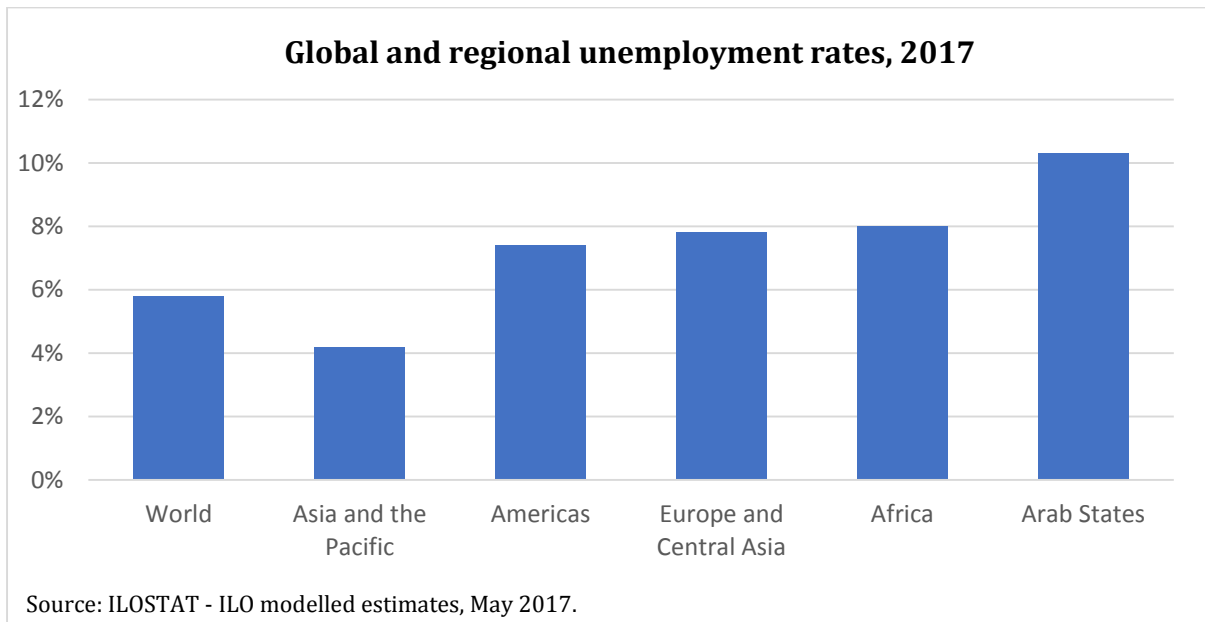
Bar charts (both column charts and horizontal bar charts) present the possibility of displaying more than one data series (but naturally, these would be the same data series for all categories). Figure 2 shows an example of a column chart with two labour statistics data series, one corresponding to unemployment rates among men and the other to unemployment rates among women.

Figure 2. Column chart (vertical bars) with several data series per category

Global and regional unemployment rates by sex, 2017

Source: ILOSTAT - ILO modelled estimates, May 2017.
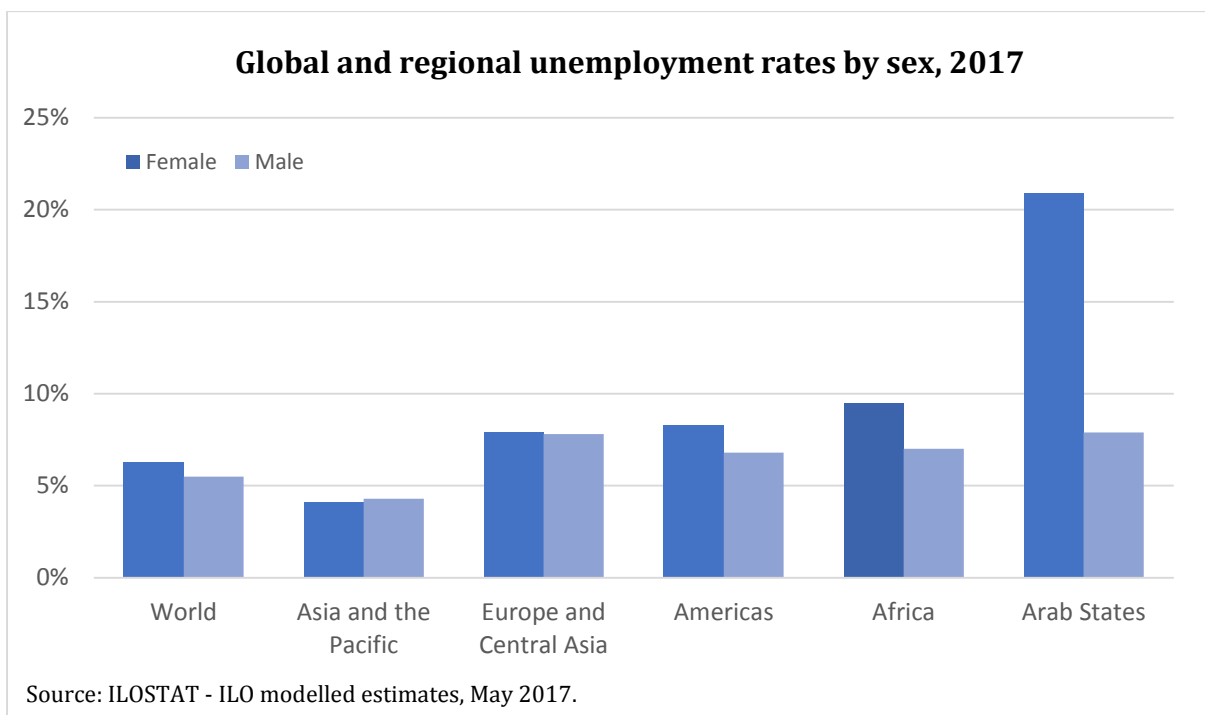
The nature of the data series typically depicted in bar charts is virtually the same for bar charts using horizontal bars and for those using columns. However, some characteristics of the data series and categories plotted may determine that either a vertical or horizontal orientation is preferable for the bar chart. For example, column charts are most suitable for a limited number of items in the category axis, as they can quickly become overcrowded. Similarly, column charts work best with short category labels, as long text in the category axis cannot be displayed as nicely. Thus, horizontal bar charts are the preferred option when representing a large number of items in the category axis and/or when the categories' labels are long (and cannot be adequately shortened). This may be the case for numerous labour statistics indicators which could be charted for labour market analysis, so it is advisable to keep this in mind and choose the best type of bar chart in each case, given the characteristics of the data used. Figure 3 gives an example of a horizontal bar chart, where the number of categories and the categories' labels make the horizontal orientation of bars the most appropriate option.

Figure 3. (Horizontal) bar chart

Global and regional employment-to-population ratios, 2017
(sub-regions)

Source: ILOSTAT - ILO modelled estimates, May 2017.
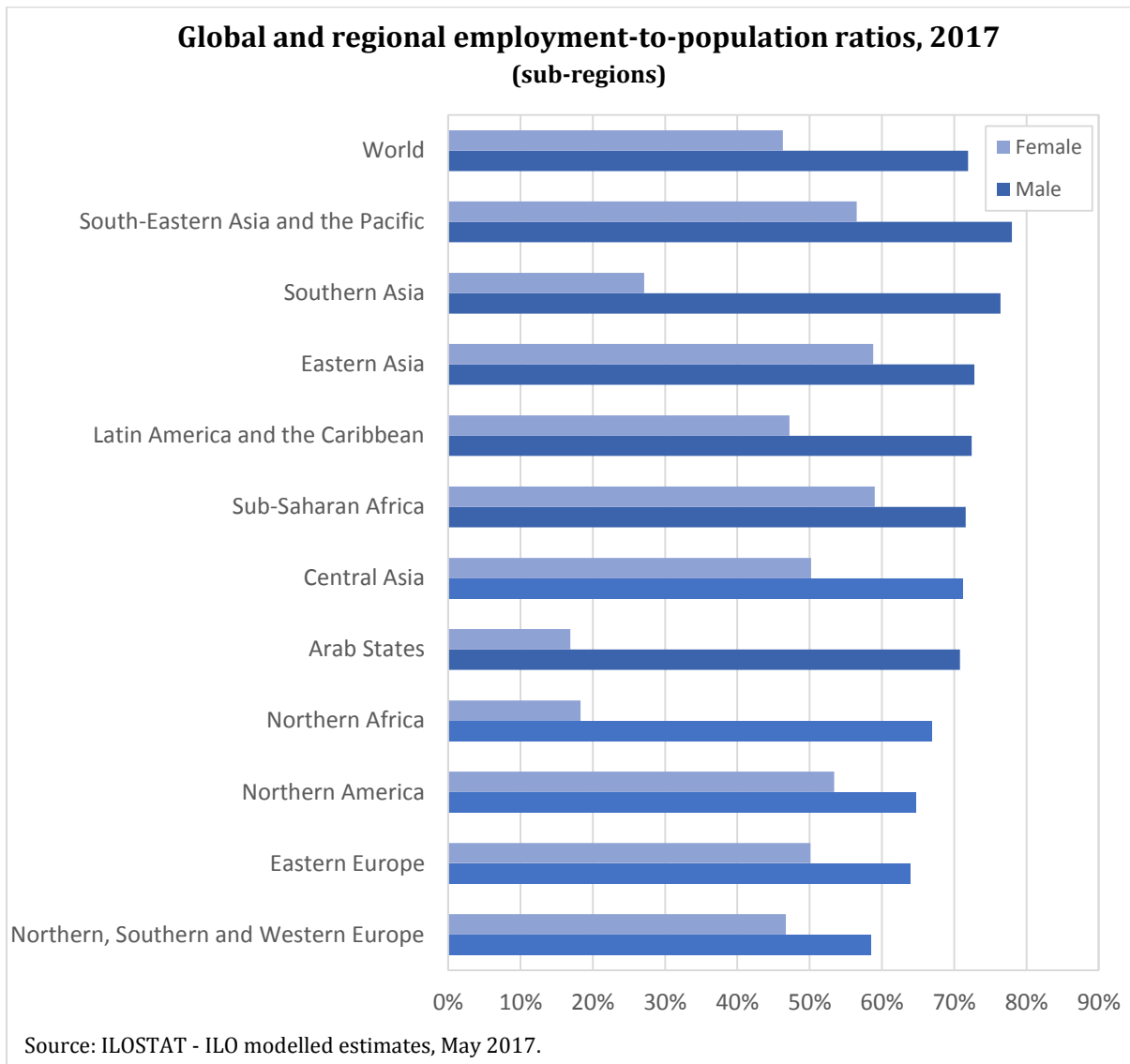
When speaking about bar charts, it is impossible not to mention histograms. These deserve particular attention, as they are a very specific type of bar chart. Histograms are used to chart continuous data, where numerical values are grouped into ranges so as to form the categories (also called bins). Thus, each category in a histogram corresponds to a range of numbers. An important particularity of histograms is that the data values are not represented by the bars rectangles' size (height for column charts) but by their area. Very often, the ranges used in the category axis are of equal size, and in these cases the area of the rectangles would also amount to their height, so the height of the rectangles would indeed be conveying the data values, but this is not always the case. Histograms show ranges of numerical values as categories in the category axis and frequencies in the data values axis. As the data used in a histogram is continuous, there is no space between

the bars of this type of chart. Figure 4 below shows an example of a labour statistics histogram.

Figure 4. Histogram

Global labour force by age band (ages 15 to 64), 2017

Source: ILOSTAT - ILO Labour Force Estimates and Projections, November 2017.
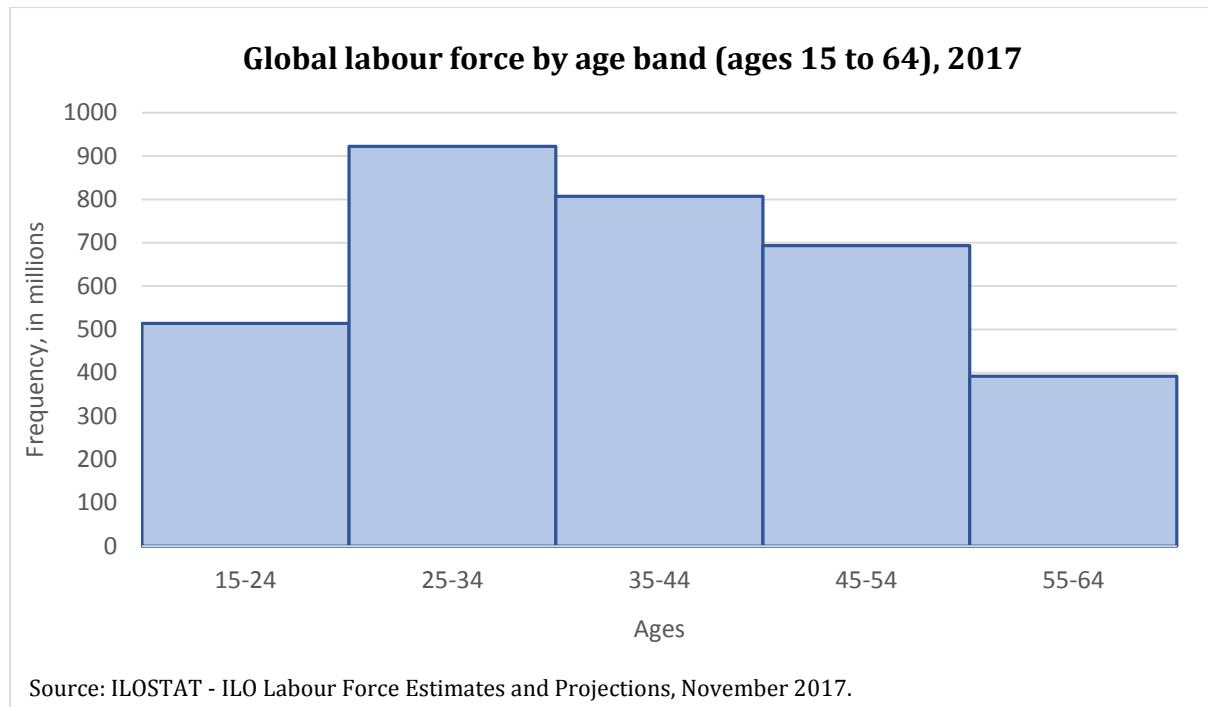
3.2.   Pie charts

Pie charts are simply round shapes divided into segments where each segment constitutes a category. As the whole pie represents the total of all the categories included in it, pie charts convey how a whole is divided into parts. Consequently, categories are interdependent, every category is related to the rest given that they all belong to the same whole and their sum amounts to the total. A change in one category will modify its share of the total, and thus also bring about changes in the shares of the other categories. Pie charts show shares in percentages, and the parts of the pie are proportionally sized according to their percentage share. They are a very useful communication tool in the field of labour statistics as they present a very clear message in a simple manner. Figure 5 shows an example of pie chart depicting data on the composition of employment by sector of economic activity (note how the sum of the shares of each sector is 100%, amounting to total employment).

Figure 5. Pie chart

Share of employment by main sector of economic activity, 2017

Source: ILOSTAT - ILO modelled estimates, May 2017.
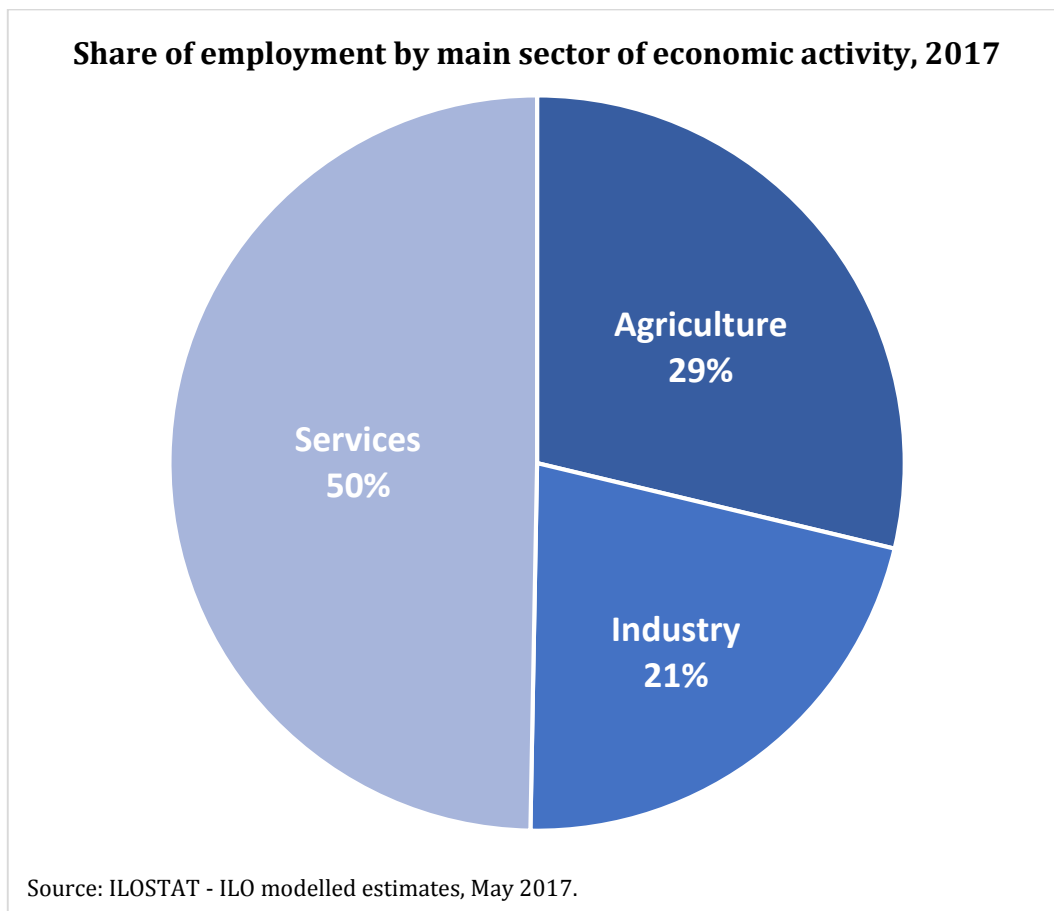
In some cases, the labour market analysis being conducted may call for the depiction of the composition of various items at once. When using pie charts, this would mean building and presenting as many pie charts as items whose composition is being investigated. For instance, figure 5 above refers to the sectorial composition of global employment, but it may also be useful to study the differences in the sectorial composition of employment by region. Rather than building one pie chart per region (which could be hard to grasp as it would require looking at numerous charts at the same time), 100 per cent stacked bars could be used. Stacked bars are a combination of bar charts and pie charts, where each category is represented by a rectangular bar and where these rectangles are divided into segments to show their composition. Elaborating on the example of the sectorial composition of employment by region, figure 6 uses 100 per cent stacked bars to chart the data. This figure conveys a wealth of information in a very simple way. We not only learn the relative importance of each main sector of activity (agriculture, industry and services) in the world and in each region, but we see the differences across regions as well.

Figure 6. 100% stacked bars

Share of employment by main sector of economic activity
For the world and by region, 2017

Source: ILOSTAT - ILO modelled estimates, May 2017.
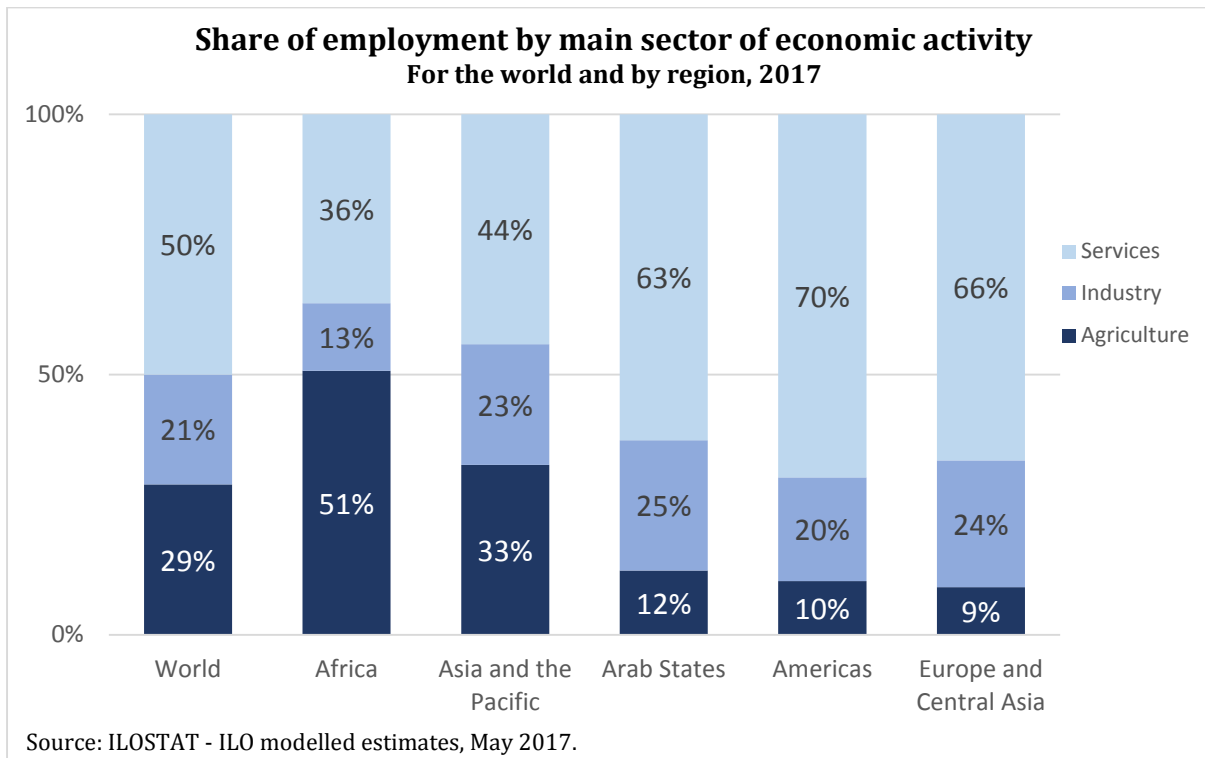
3.3. Line charts

Line charts (or line graphs) are a type of chart showing how data values change over time. In this regard, each category represents a point in time and all categories are related as they all belong to the same time series. Each data point refers to a date and is thus connected to the data points corresponding to the previous and following dates with a line. Line charts are widely used in labour market analysis as they are a powerful yet simple tool to reveal labour market trends, contributing to the evaluation of progress or deterioration in numerous aspects of the labour market. To exemplify this, figure 7 presents the evolution of the global unemployment rate during the past few decades as a line chart. Line charts as this one are very telling in labour market analysis, as they show us the peaks and lows of the series over time, how long the recovery took, and how abrupt changes were.

Figure 7. Line chart with one series

Global unemployment rate, 2000 to 2017

Source: ILOSTAT - ILO modelled estimates, May 2017.
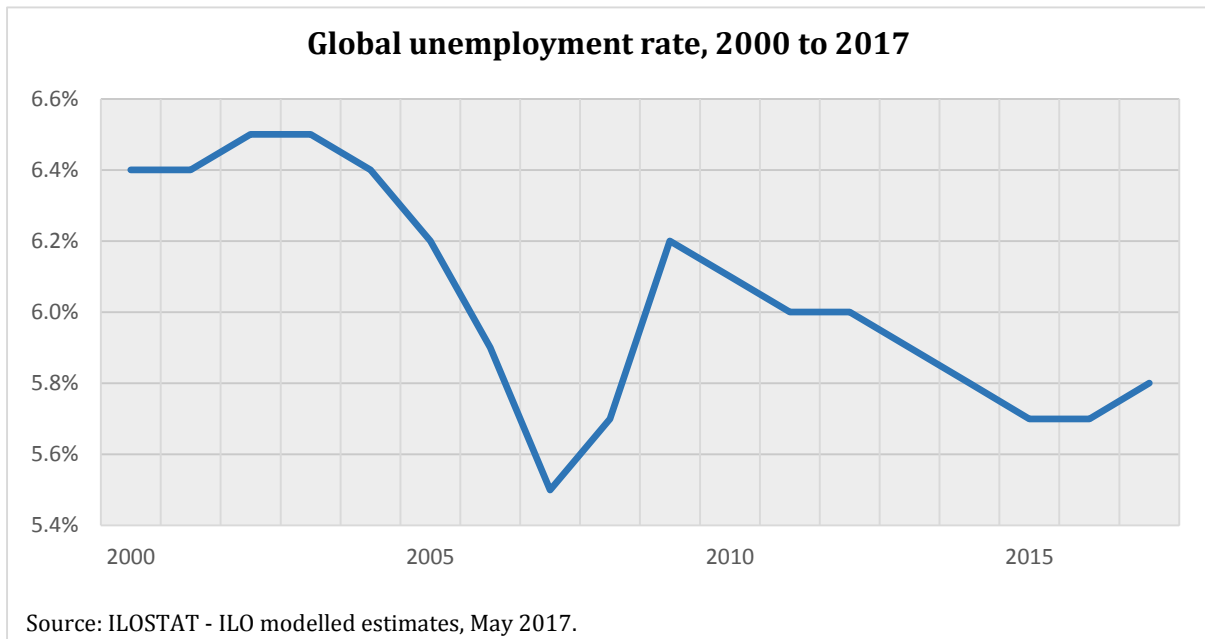
Naturally, line charts also offer the possibility to draw more than one series at once. This is very useful to compare the evolution of various series during the same period of time. However, ideally, the number of series included in a line chart should be limited to a manageable number, as too many series would overcrowd the chart and render it illegible. The following figure builds on the previous one (figure 7) to add two extra series, thus providing more useful information on the labour market, specifically on the situation of youth (persons aged 15 to 24) as compared to that of adults (persons aged 25 and above). This line chart reveals that the young persons in the labour force are much more likely to be unemployed than their adult counterparts, as the youth unemployment rate is close to three times that of adults, and this holds true for the whole time period under review (2000-2017).

Figure 8. Line chart with many series

Global, youth and adult unemployment rate, 2000 to 2017

Source: ILOSTAT - ILO modelled estimates, May 2017.
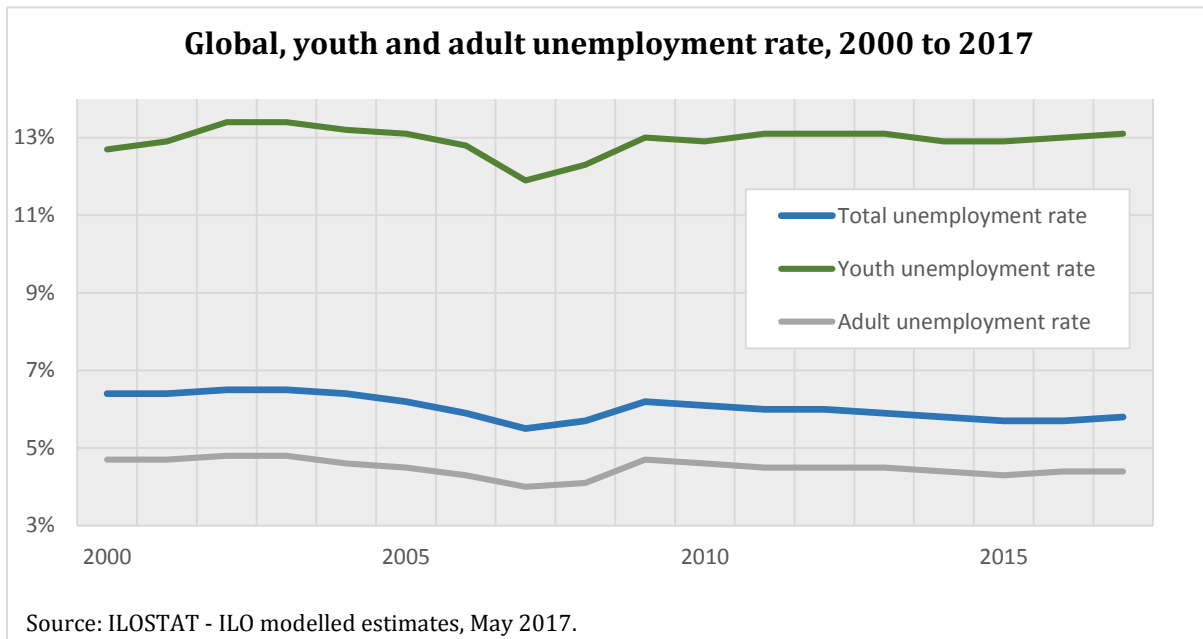
3.4.   Scatter charts

The main purpose of scatter charts (also called scatter plots, XY charts, XY plots or Cartesian charts) is to visually convey the relationship between two series. Each category or data point included in the chart has two coordinates associated to it, which determine the category's place on the X and Y axes. The categories are generally independent from each other, but the series plotted in the X and Y axes are linked to each other to a certain extent or in a certain way (or at least there are reasons to believe they could be correlated to each other, even if the scatter plot shows otherwise).

The scatter plot provides a simple tool of investigation of the relationship between two series, by facilitating the visual comparison of the two: scatter plots reveal patterns and correlations, for example whether the series in X is always higher than the series in Y (markers in the chart would be below the bisector or 45 degree line), whether the series in Y is always higher than the series in X (markers in the chart would be above the bisector), whether both series tend to have similar values for all categories (markers in the chart would be concentrated around the bisector), another type of correlation altogether or finally a lack of correlation between the variables of interest. It is often advisable to draw the bisector in a scatter plot, to help the user derive quick conclusions

only by skimming through the chart.[5] The position of the markers in the chart relative to the bisector is what actually determines how the two series compare to each other.

Scatter plots are an excellent visual aid for labour market analysis, as in this type of analysis there is often the need to investigate whether there is a link between two series, and if so, the nature of the relationship. More sophisticated statistical methods can then be used to further and better describe the relationship between the series, but the scatter plot provides a great first approach to reveal the underlying pattern. Scatter plots are also easy to interpret and can generally be understood by all audiences. In the field of labour statistics, scatter plots can be used for many purposes, always with a view to showing how two things are connected: to illustrate the relationship between two different labour market indicators (example in figure 9), to show the evolution of a labour market indicator between two points in time (example in figure 10), or to compare two subsets (variables, or categories) of the same labour market indicator (example in figure 11). From figure 9 we deduce that youth (defined as persons aged 15 to 24) are significantly more represented in the global number of persons unemployed than in the global labour force (their share in unemployment is considerably higher than their share in the labour force in all regions). Figure 10 shows that there has not been a significant change in the global employment-to-population ratio (defined as the share of the working-age population who is employed) from 2006 to 2016, although at the regional level it did moderately increase in the Arab States and moderately decrease in Asia and the Pacific. From figure 11 we understand that the employment-to-population ratio is higher for men than for women in the world and in every region, and we also notice that the difference is the most striking in the Arab States.

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[5] More information on how to do this is provided in section 4.1.

Figure 9. Scatter plot comparing two indicators

Youth share of the labour force and unemployment in the world and by region, 2017

Source: ILOSTAT - ILO modelled estimates, May 2017 for unemployment and July 2017 for labour force.
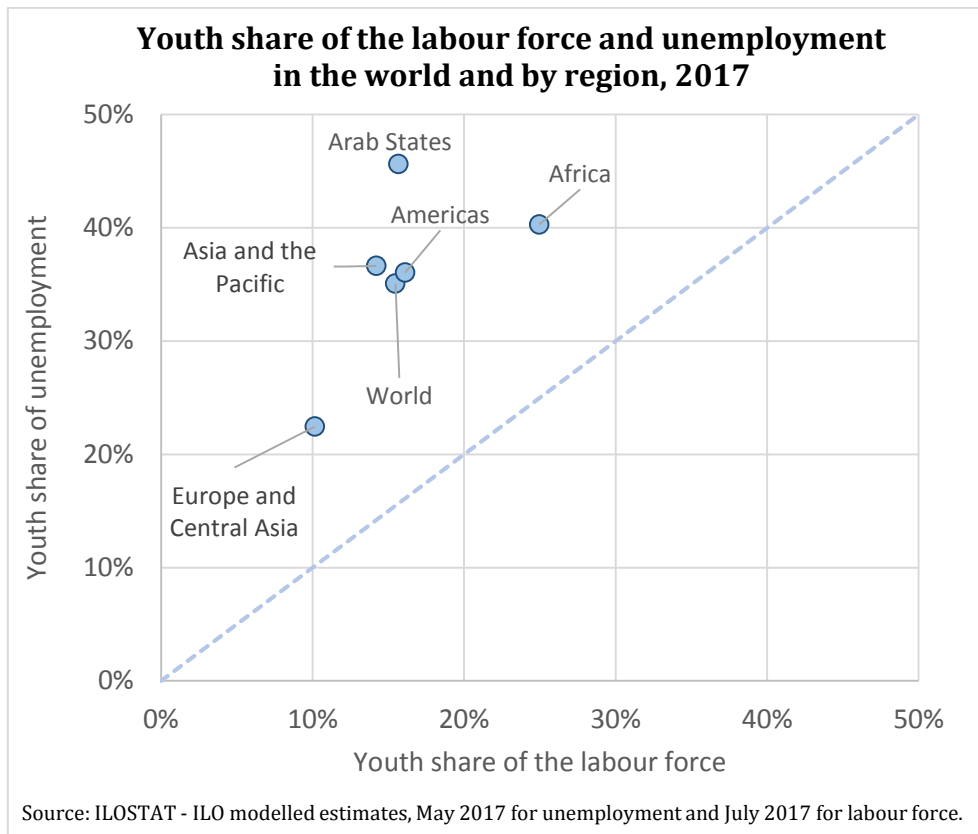
Figure 10. Scatter plot comparing two points in time

Employment-to-population ratios in the world and by region, 2006 and 2016

Source: ILOSTAT - ILO modelled estimates, May 2017.
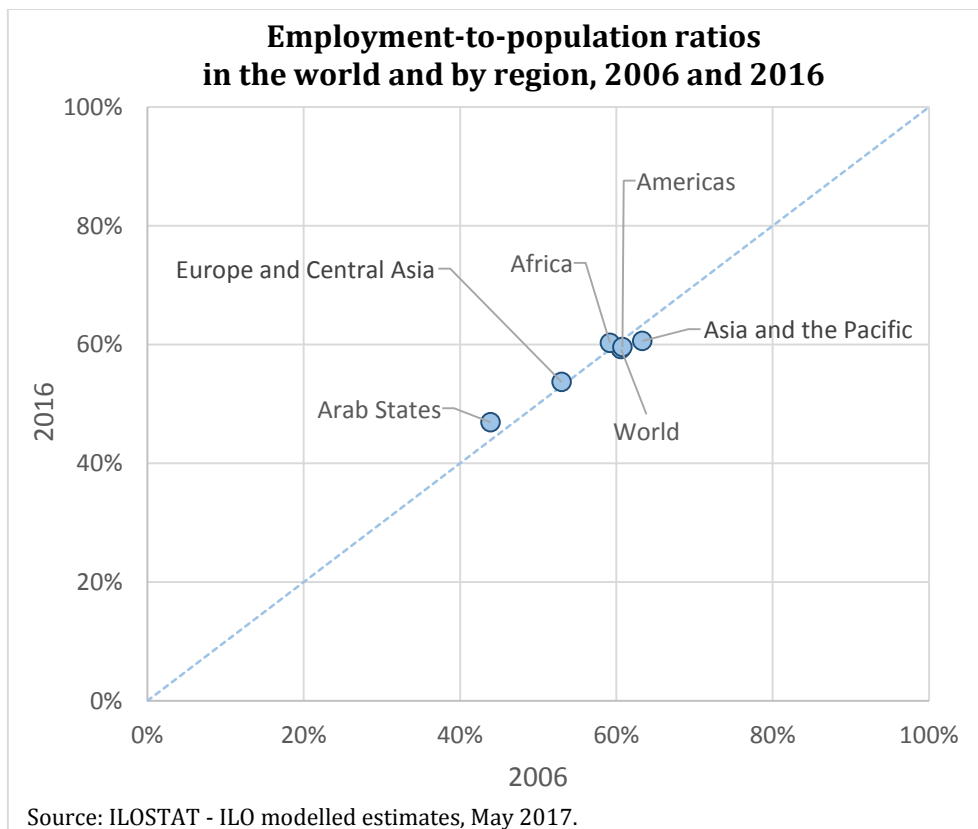
<u>Figure 11. Scatter plot comparing two subsets of the same indicator</u>

**Male and female employment-to-population ratios
in the world and by region, 2017**

Source: ILOSTAT - ILO modelled estimates, May 2017.
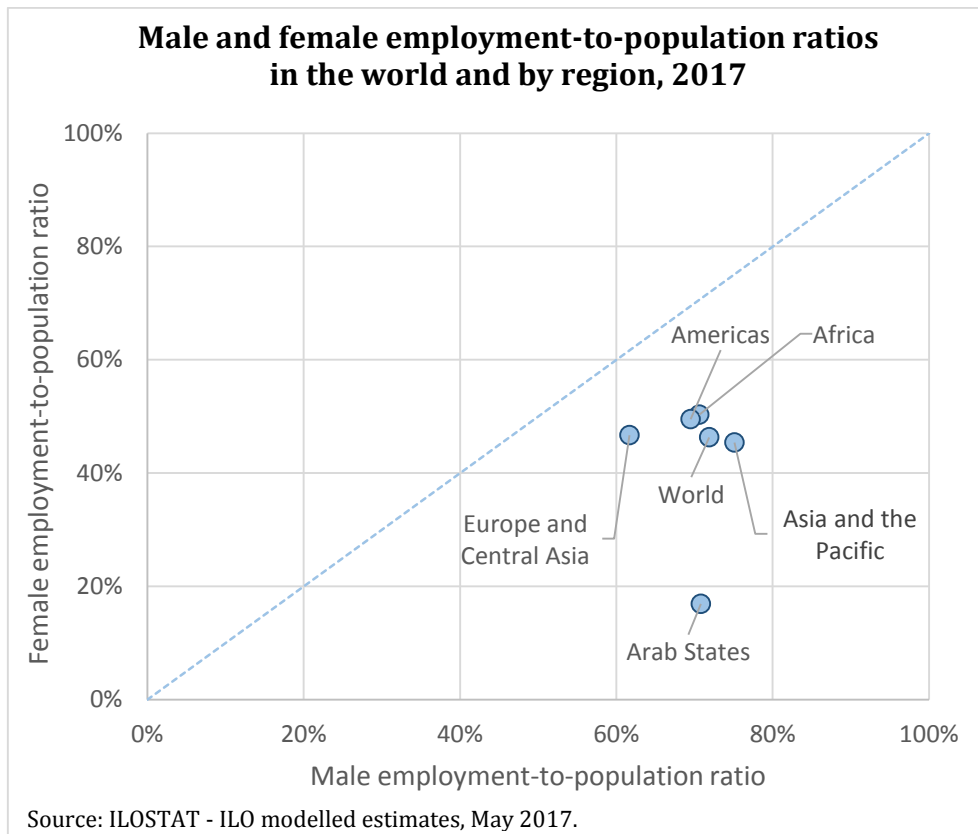
3.5.   Other chart types

Nowadays, many charting software and programs provide numerous possibilities of chart design, with a long list of chart types available. The four main abovementioned chart types (bar charts, pie charts, line graphs and scatter plots) do have great analytical value for labour market studies, and are often sufficient to fulfil all of the desired communication objectives set for the data visualizations. However, in some cases it may be necessary or advisable to explore more sophisticated options, in order to find a type of chart which will convey the message in the most efficient and effective manner.

For instance, area charts are a good tool to represent the evolution in the composition of a certain item. Area charts are similar to line graphs but where the whole area under the line is what matters and not just the line per se. Stacked area charts have a similar aim to that of stacked bars, but they show the differences in composition of one continuous set of data categories as opposed to a range of discrete categories.

Boxplots and stock charts show the distribution of one or more series, visually conveying how disperse the series are by illustrating the proportional space between the minimum, the maximum and in the case of boxplots, the quartiles of each series.

Bubble charts represent a useful twist on scatter plots, as they are XY charts where the size of the marker corresponds to a third variable. That is, the size of the markers (bubbles) is proportional to the value of the corresponding third variable.

Figure 12. Scatter plot and bubble chart based on the same series for the X and Y axes, where the bubble chart introduces an additional variable (the bubbles' size)

Prevalence of child employment and child labour in the total child population by region, 2016

Source: Global Estimates of Child Labour, Results and Trends 2012-2016, ILO.
Note: The size of the bubbles in the bubble chart is proportional to the size of each region's child population. For information on the definitions of child employment and child labour refer to the ILO report *Global Estimates of Child Labour, Results and Trends 2012-2016.*
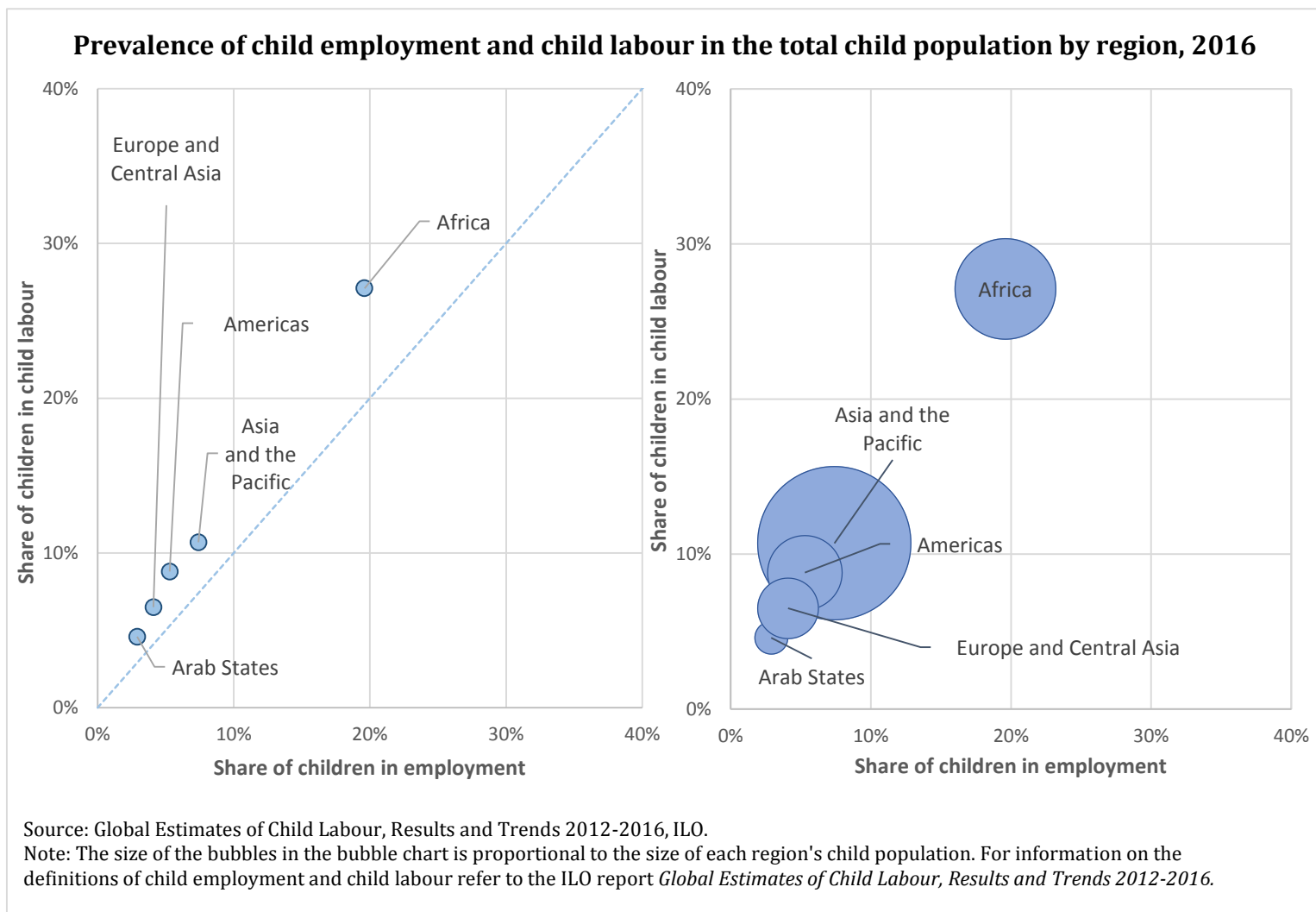
Figure 12 shows the additional analytical value of a bubble chart as compared to a scatter plot. In this specific example, by showing the relative size of each region's child population in addition to the regional child labour and child employment rates, the

bubble chart allows us to understand the magnitude of the problem and the reference population in each region.

These are only some examples of other types of charts available, but naturally, there are many more existing charting possibilities. The choice of the chart type and formatting should stem directly from the specific needs of the analysis or study being conducted, and follow clear deductive purposes. The chart type and formatting are part and parcel of the chart's overall communication power, in that they shape the chart's core message, and thus, should be chosen in accordance with the chart's analytical goals.

4. Practical tips for effective charts

Every chart should be created for a given purpose, and with a clear goal in mind. In this sense, an effective chart is one that accomplishes its primary goal, by illustrating the pattern or trend it was built to illustrate, in a simple and unequivocal manner. Readers should be able to understand a chart by only briefly studying it, without the need to refer to any other source of information. An effective chart stands on its own and makes evident to the reader the main analytical conclusions drawn from the data underlying the chart. The following sections provide some practical and helpful tips to ensure that charts designed for labour market analysis fulfil their purpose, communicate information effectively and facilitate the task of the reader rather than discouraging them.

4.1. Make them useful

The first thing to keep in mind when designing a chart is that it should be useful. That is, the chart is being created to accompany a certain analysis, or to illustrate a certain study. Thus, it is important to make the chart useful by ensuring it does indeed fulfil its analytical purposes and is not superfluous. Ensuring that a chart is really useful involves verifying that it conveys a clear message, by selecting the right chart type and formatting (this may mean using a combination of chart types or a secondary axis), by deciding what information to keep and what information to drop, and by carefully choosing formatting options which ease understanding and avoid miss-interpretations.
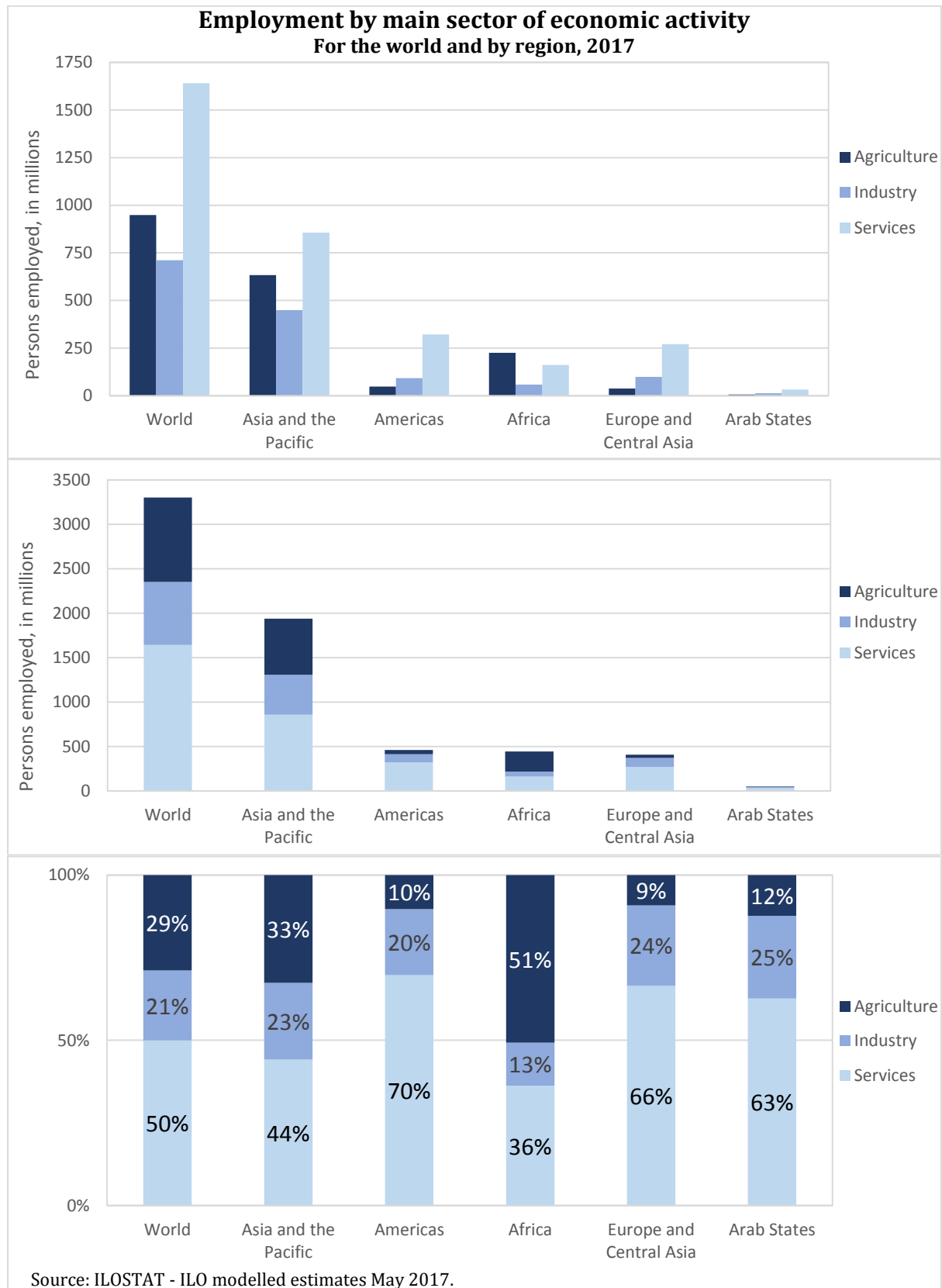
Choose the right type of chart

From the descriptions of each chart type in the previous sections it is clear that every chart type is the most useful to represent data series of certain characteristics. For instance, pie charts are associated with data series representing the components of a whole, whereas bar charts typically illustrate data categories independent from each other.

A great deal of thought should go into the choice of the chart type, taking into account what the aim of the chart is, what it should convey, and the nature of the data used to build it. The chart type plays a key role in how accessible the information contained in it will be, and how easy it will be for the reader to understand it, and thus, it has an effect on the chart's overall communication impact.

As a concrete example of the impact of the chart type on how accessible the information contained in it actually is to the reader, we can refer to the study of the employment composition by sector of economic activity. When using only the three main broad sectors of economic activity for this analysis (agriculture, industry and services) a pie chart is a very suitable option (as seen in figure 5). However, when using more detailed and numerous sectors of economic activity, the pie chart becomes harder to read, especially if many categories are represented by very thin slices in the pie, so it may be desirable to explore other options, such as 100 per cent stacked bars.

When analysing and charting the differences across regions in employment by main sector of economic activity, one may think of presenting it as a bar chart (first chart of figure 13) or as a stacked bar chart (second chart of figure 13). Nevertheless, the magnitude of employment varies so much across regions that the scale makes the composition by sector of the regions with smaller employment sizes almost undecipherable. Thus, if the main aim of the analysis is to focus on sectoral composition, it may be best to refer to the shares rather than the actual numbers, and use a 100 per cent stacked bar chart (third chart of figure 13, corresponding also to figure 6). A later section discusses how to include employment figures in the chart in a way that they would still be easy to read.

Figure 13. Bar chart, stacked bar chart and 100 per cent stacked bar chart based on the same data series

Employment by main sector of economic activity
For the world and by region, 2017

Source: ILOSTAT - ILO modelled estimates May 2017.

The preceding example illustrates the importance of choosing the most appropriate chart type for the data series being drawn, and the strong impact this choice has on the ease with which the information gets across to the reader. Hence, thorough consideration should go into the selection of the chart type before building each chart.

Think of combining chart types

In some cases, selecting the most accurate chart type to best convey the intended message implies combining different chart types. That is, incorporating several chart types into one chart by choosing different chart types for the various data series included in the chart. For instance, this is the technique used in figures 9, 10 and 11 to draw the bisector line in the scatter plots. All of the data series in the scatter plots are charted precisely as scatter plots (with markers for each data point and no line joining the markers to each other), whereas the bisector in each scatter plot refers to an additional data series charted as a line joining two data points with no markers for the data points. It is important to note here that this cannot be done for bubble charts in Excel, as these do not allow for the combination of chart types.

In Excel, combining various chart types within one chart is rather simple: once the chart is created (using one chart type for all data series), clicking on one specific series to select it and then going to "Change chart type" in the "Chart Tools – Design" menu will display all available choices of combination under the "Combo" section.

Think of the possibility of adding a secondary axis

In other cases, the most appropriate and telling way of representing various series within one chart would be to use a secondary axis, so as to be able to express different series in different units or using different scales. This can often make the chart clearer and more intuitive.

Elaborating on the example described in figure 13, if the aim of the analysis was not only to focus on the regional differences in employment composition, but to point to the differences in employment size across regions as well, the regional employment can be charted using an additional axis to avoid distorting the chart (figure 14). This chart allows to grasp in one glance the sectorial composition of employment in each region and at the same time understand the relative importance of each region's employment in global

employment. Note that dropping the marker representing the world's employment (global employment size) would allow to have a scale for the secondary axis better suited to convey the differences in employment size across regions, but this would leave the reader wondering what the size of global employment is (or it would prompt him/her to sum up all of the regional employment figures). Thus, this is a formatting and analytical decision to be taken in accordance with the purposes of the chart.

Figure 14. Chart with two chart types and secondary axis

Source: ILOSTAT - ILO modelled estimates May, 2017.
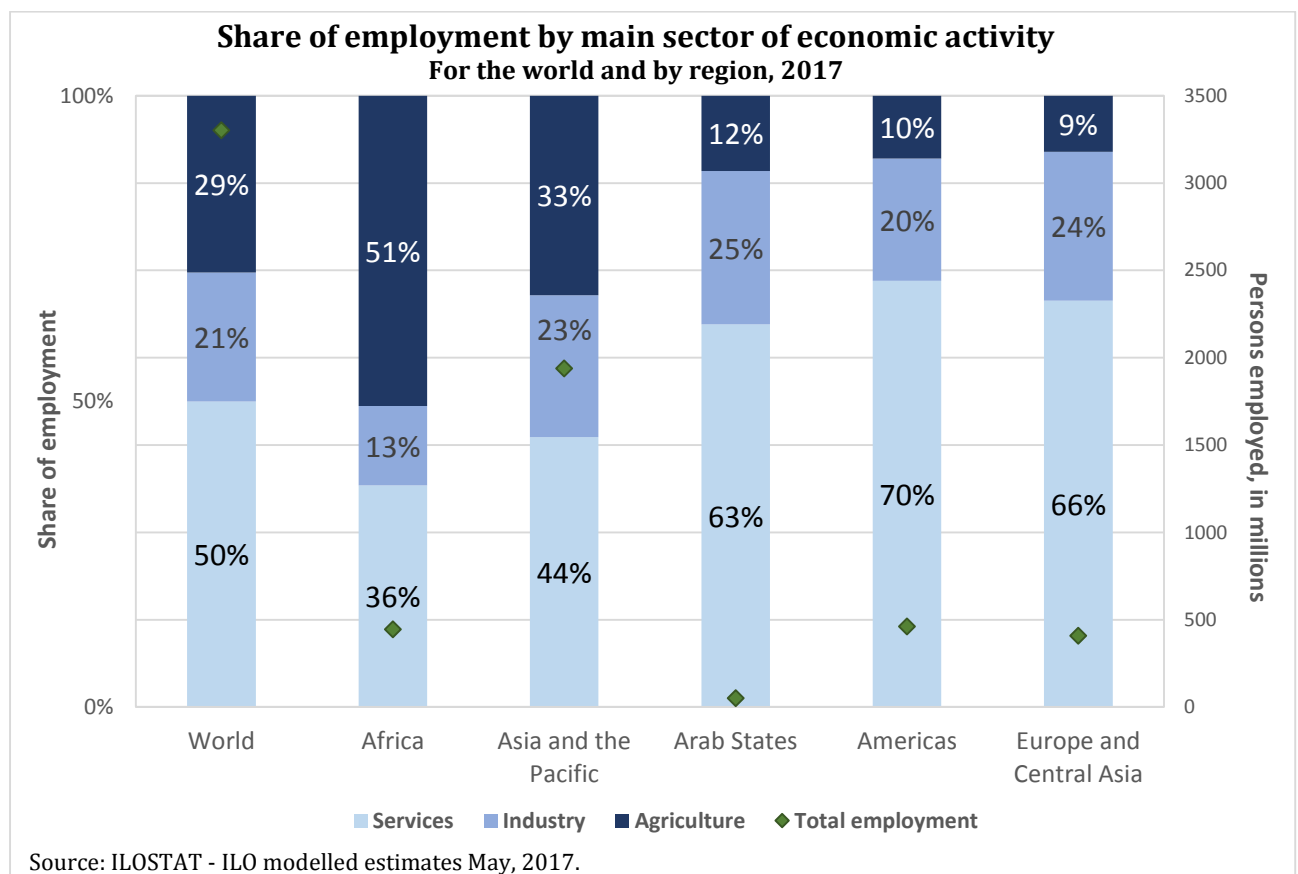
Decide what to include based on your analytical purposes

Everything in your chart should be carefully decided based on your communication and analytical goals, and what you want the chart to convey. This means that the chart type, the formatting and scaling of the axes, the data labels, the legend, everything should be deliberately chosen so as to contribute to the understanding of the chart.

Even more importantly, a lot of thought should go into deciding what variables or data series to include in the chart in order to avoid visual miss-interpretations. The choice of variables or series should stem directly from your analytical goal. For instance, if you are

studying gender differences in the labour market and want to focus on unemployment rates, charting male and female unemployment rates should be enough, without the need to overcrowd the chart by also including total unemployment rates. However, if you suspect that readers may wish to know the total unemployment rate as well, then you should add it, but it would be advisable to assign this series a different type of chart so it will not remove focus from the gender differences, which are the core of the subject. Figure 15 below builds on figure 2 to illustrate this.

Figure 15. Bar chart and markers combined

Source: ILOSTAT - ILO modelled estimates, May 2017.
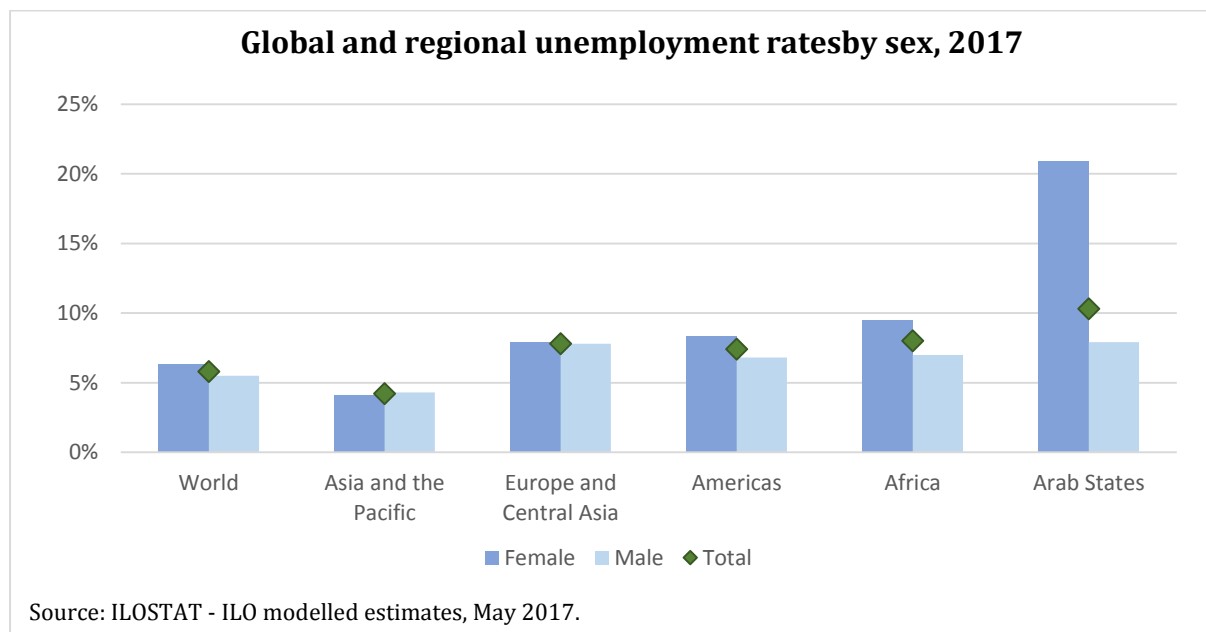
Question default settings and make conscious formatting choices

Do not rely solely on the default formatting settings of the program or software used to build your charts. These should only be the starting point from which to improve your chart adapting each formatting choice to the characteristics of your data and the needs of your analysis. Everything in your chart should be your conscious decision so as to maximize its impact.

Pay special attention to the axis scale and formatting

Make sure that the axes are correctly formatted, that the axes scales are the most adequate ones and that the necessary information on the axes is clear to the reader (whether it is communicated in the chart title, the axes titles, the axes per se, the data labels or the legend).

In particular, make a point of choosing the right unit in each axis. Is the data in percentage, units or thousands? The axis should reflect it. This not only contributes to making your chart more accurate, it also makes it easier to understand. In this regard, note how in all the charts included in this guide where the data charted was in percentages, the corresponding axes were in percentage, rather than in numbers with an indication in the chart title or axis title that figures referred to percentages. In Excel the unit of the axis can be selected in the axis formatting options, by clicking on the corresponding axis and then going to the "Number" section of the "Axis Options" menu. Note that in order to express the axis in percentages you would have to divide by 100 the corresponding data used to build the chart.

Choosing the right unit also prevents overcrowding the chart, as in many cases it will be associated with shorter axis labels. For instance, if all your data values refer to several million, then rather than expressing the axis in units (which would require having axis labels with at least seven digits), you could express it in millions and significantly shorten the labels. Figure 13 (where employment was expressed in millions) provides some examples of this.

Deciding on the right unit also involves deciding how many decimals should be shown in the axis labels (if any at all). The default settings tend to show two decimals even when they are superfluous, and this adversely affects the chart by making it more crammed and less attractive. In most charts included in this guide, no decimals were needed for the axis and thus, no decimals are shown. However, the nature of the data charted in figure 7 required precision at the one decimal level, so in that case the axis labels reflect this.

Particular attention should be paid to the axis options of the X and Y axes in a scatter plot, including their minimum and maximum bounds and the scale. Using the same scale for both the X and Y axes (provided the two are expressed in the same unit) usually renders the scatter plot more intuitive and makes the main conclusions stand out, thanks to the visual aid provided by the bisector and the symmetry of the chart. Having different X and Y scales implies that the public would have to devote some time to carefully reading the axis information before being able to focus on the data points per se and their patterns. Figure 16 illustrates this by comparing two scatter plots using the same data but different axis options: a scatter plot where the X and Y axes follow the same scale (first chart, based

on figure 11) and a scatter plot where different options were applied to each axis based on the data charted (second chart).

Figure 16. Impact of X and Y axes options in a scatter plot

Source: ILOSTAT - ILO modelled estimates, May 2017.

It is not necessarily always the case that using the same axis options for the X and Y axes would be the most appropriate. This depends on the nature of the two variables being charted. Given that the purpose of a scatter plot is by definition to show how the two variables compare, the axes should be formatted so as to favour this comparison and make the results stand out. In the example of figure 16, the first chart allows us to understand with just one glance that the employment-to-population ratio is higher for men than for women in every region in the world, whereas it takes a little longer to reach the same conclusion based on the second chart.

Also consider that displaying the axes is not always absolutely necessary, and it may be better to omit them in some cases. Note how in figure 6 it was decided to keep the Y-axis to explicitly convey that the sum of the shares in employment of each sector amounts to 100 per cent of employment for each region and to let the reader know where the mark of half of employment is in each region (50 per cent). Nonetheless, the Y-axis could have

been dropped altogether as data labels already indicate each specific data value included in the chart.

Sort categories in the order that makes most sense

Everything in your chart should contribute to its ease of understanding, and the sort order of the data series charted plays a significant role in this. Make a conscious decision about the order in which to sort the data underlying your chart, as it is the order in which it will appear on the chart and thus, be read by your audience. The sorting order chosen should reflect (once again) your analytical goals, and go along the fundamental purposes of your chart. Often times, categories of a chart appear simply in the order in which they were in their primary source (often alphabetical) which makes little sense when trying to grasp with the naked eye the data values associated with each category and how they differ.

In order to show visually the impact of the sorting order of the categories included in a chart, figure 17 in the following page refers again to the data charted in figure 1 and presents it as sorted in figure 1, that is, in ascending order (first chart) and then sorted in alphabetical order (second chart). Nevertheless, note how when the regions were sorted in ascending order of their regional unemployment rate, the world was left out and shown first of all. This was a conscious formatting decision made with a view to separating the global figure from the regional figures.

Figure 17. Impact of the sorting order of categories in a bar chart

Global and regional unemployment rates, 2017

Source: ILOSTAT - ILO modelled estimates, May 2017.
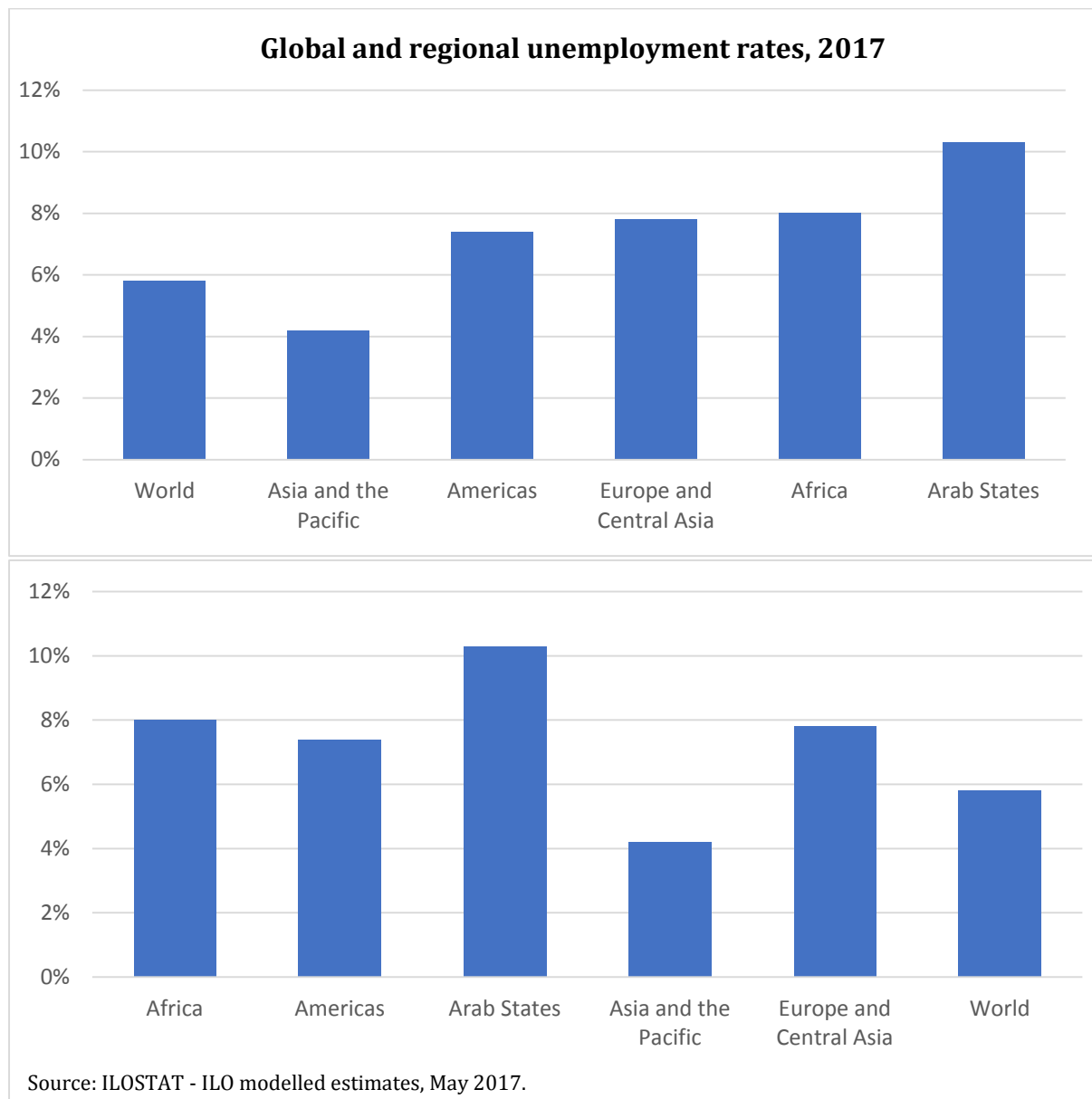
You may notice how the sort order of the categories was carefully chosen in all relevant charts included in this guide. For figure 13, which included three charts, the regions were sorted based on their employment size in all three charts for consistency across charts. However, had the third chart been presented independently, a sort order based on employment size would not have made any sense, as the chart does not depict employment figures, and sorting the regions according to the employment share of one of the sectors would have been preferable.

Naturally, the sort order of the series charted is irrelevant for some types of charts, as it bears no significance for scatter plots, and in line graphs data would always be sorted in

chronological order. Nevertheless, for some other chart types, the sort order of the series is highly important (notably bar charts and pie charts).

Considerations on making charts for labour market analysis

When conducting labour market analyses based on labour statistics, it is important to always keep in mind the characteristics of the statistical source (including its geographical and population coverage, its reference period, the concepts and definitions used, among others) and to take into account the relevant context (the legal framework, the national socio-economic and cultural particularities, etc.). This is just as crucial for charts used for labour market analysis: any caveat on the source coverage or the methodology used that would have an impact on the interpretation of the data should be clearly stated in the corresponding chart.

In labour market analysis, absolute values can be key sometimes, but it is usually more revealing to study shares, percentages and ratios, and these are also easier to grasp. Similarly, comparisons (either across countries, regions, categories or over time) are often more enlightening than analysing a single number on its own. All of this should be reflected in the charts created for analytical purposes: choosing the right type of data to display and depicting striking facts and comparisons will have a great impact on the chart's overall effect.

4.2.   Make them clear

In order to be truly effective, a chart should be clear. That is, it should be self-explanatory, explicit and straightforward. This is all the more important when designing a chart for labour market analysis: charts based on labour statistics should include all the necessary information on the indicators, variables and categories used, the underlying data sources, the reference periods, etc., but without being crammed with superfluous information.

Add all the necessary information

To fulfil its communication and analytical purposes, a chart must be clear. This implies that the reader should be able to understand what the chart conveys only by glancing at the chart: there should be no need to refer to any other material (all the required

information should be presented within the chart so it would stand alone) and it should be possible to grasp its meaning at first sight without having to spend too much time deciphering it.
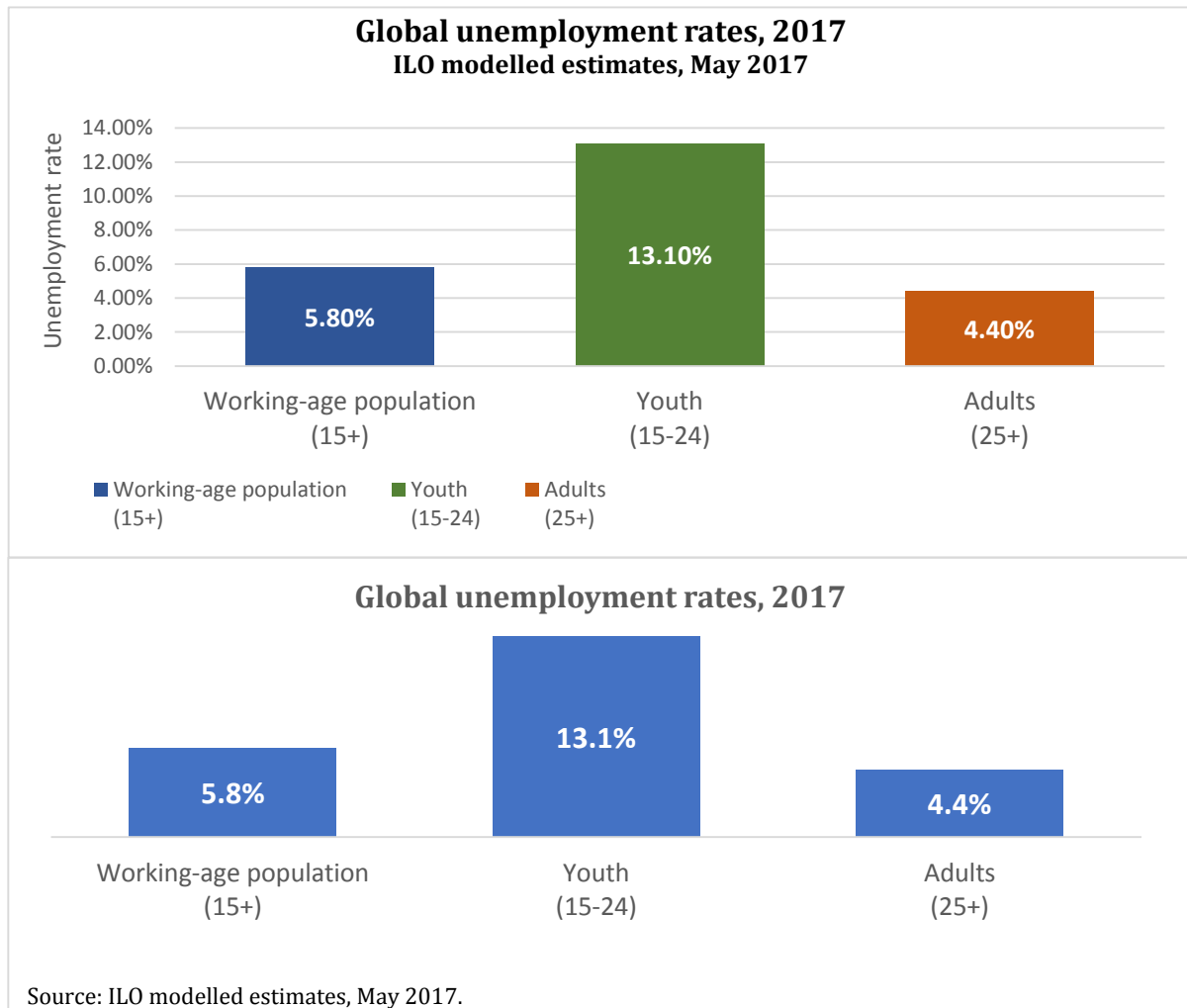
The pieces of information that must be introduced depend on the characteristics of each chart and the nature of the data series plotted, but generally these include the name of the data series and categories charted, the data reference period, the unit, the axis scale and the data source.

Avoid redundancies

Nevertheless, even though all the relevant information has to be there, an excess of information may be detrimental. That is, the information included in the chart should never be repetitive, as this overcrowds the chart and hinders its effectiveness.

Ensure that your chart is really powerful by conveying a simple message (this may mean finding a way to simplify your message if it is complicated). Refrain from including redundant and nonessential information, as this brings clarity to your chart. Figure 18 provides an example of the impact of avoiding repetitions on the overall legibility of the chart: the first chart presents no additional information whatsoever compared to the second chart, it is only more packed with unnecessary redundancies.

Figure 18. Impact of avoiding redundant information

Global unemployment rates, 2017
ILO modelled estimates, May 2017

Global unemployment rates, 2017

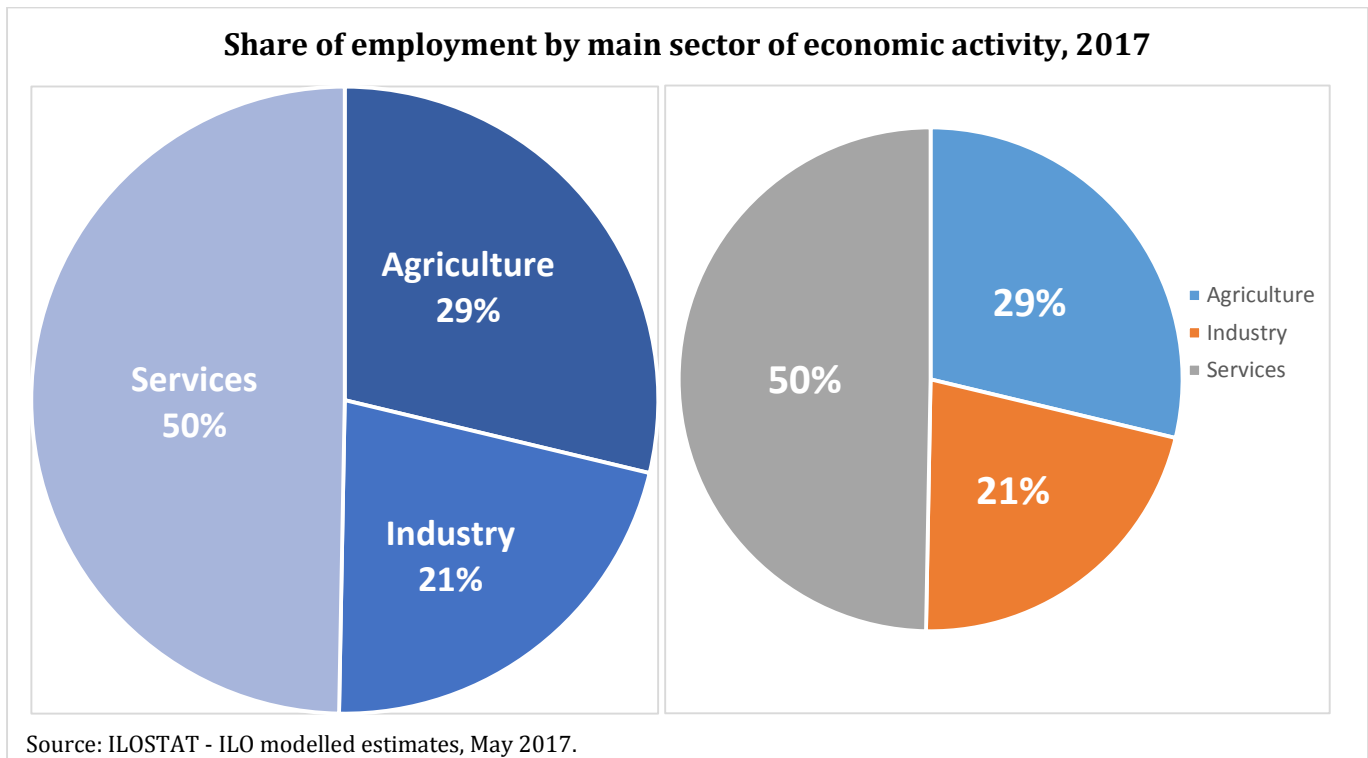Source: ILO modelled estimates, May 2017.

Choose the best place for each piece of information

Including all the necessary information in each chart without being repetitive also implies choosing the best and most intuitive place to present each piece of information, so the reader does not have to put too much effort into finding it. Here too, question the default settings and decide how they could be improved.

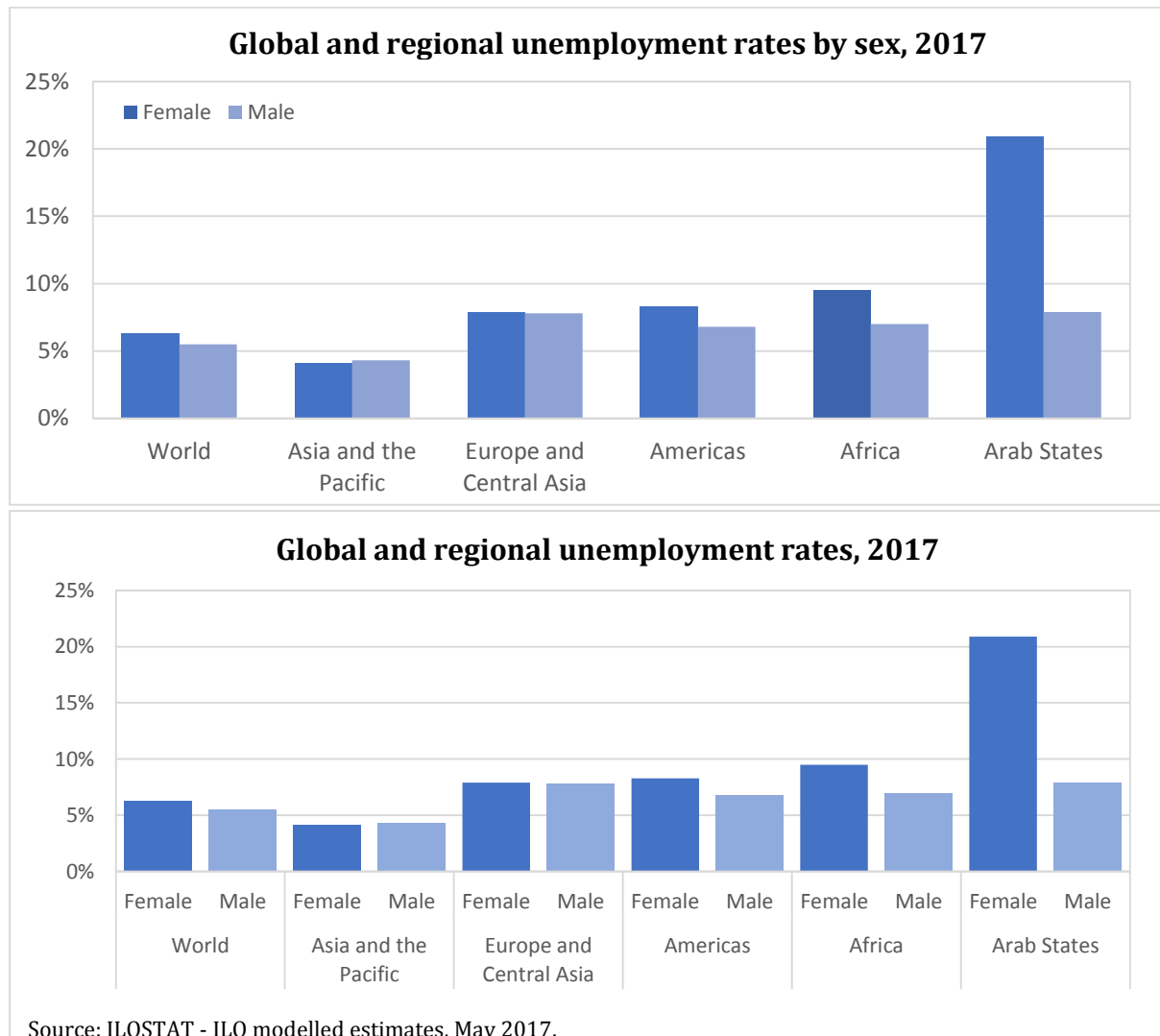In many cases, the best place to present each piece of information depends on the personal taste of the chart producer, but it is important to always make a conscious choice on this. For instance, the categories in the pie chart in figure 5 were indicated in the data labels, but they could have been specified in the legend instead (see figure 19). The second chart is much less intuitive and harder to read.

Figure 19. Categories in a pie chart specified in data labels or in the legend

Share of employment by main sector of economic activity, 2017

Source: ILOSTAT - ILO modelled estimates, May 2017.

Similarly, figure 2 introduced an example of a column chart with two data series per category, where the two data series were specified in the legend. Figure 20 shows how this could have been done differently. Probably the first chart in figure 20 is more nicely presented than the second one, but in general, when designing this type of chart, the preferred chart formatting options among the two presented will depend on personal taste, the characteristics of the data used and the purposes of the chart. In order to achieve the formatting shown in the second chart of figure 20 with Excel, the categories and sub-categories should be entered in columns in the data table used to build the chart, and the cells of each broad category should be merged to comprise all the corresponding cells of the sub-categories.

Figure 20. Two ways of formatting several data series per category in a column chart

Global and regional unemployment rates by sex, 2017

Global and regional unemployment rates, 2017

Source: ILOSTAT - ILO modelled estimates, May 2017.

Especially for data labels, make a point of choosing whether or not to include them, and if so, what to display in them and how (the categories' names, the data values –in what unit?-, the categories' shares, etc.).

4.3.   Make them nice

The aesthetic aspect of charts should not be neglected, as it greatly contributes to the charts' overall impact. How effective charts are is associated with how well they manage to convey the message they were designed to convey, and this not only depends on their being useful and clear, but visually appealing as well. The impact and importance of the chart's aesthetics should not be disregarded or downplayed. Visuals have to be at

the service of your analytical goal: make your chart attractive to increase the ease of understanding.

Use colours, but for a purpose

Colours are a valuable resource in charts, but having too many colours in one chart may be distracting and remove focus from the message you are trying to convey.

Notice how in all scatter plots included in this guide (up to this point), the markers of all the data points are the same colour, and how in figures 1 and 4 all the bars are also the same colour. This is because in those cases there was no need to use different colours to further distinguish the categories, and this would only have added confusion to the charts.

In numerous other cases though, the use of colours would be justified as they would serve a specific purpose. For instance, in the scatter plot presented in figure 11 all markers had the same colour, but it could be useful to differentiate in some way the marker pertaining to the world (as opposed to all the markers corresponding to the world's regions). Thus, a different colour or formatting could be used for the world's data point (figure 21).

Figure 21. Using colours in a scatter plot to single out a data point

Source: ILOSTAT - ILO modelled estimates, May 2017.
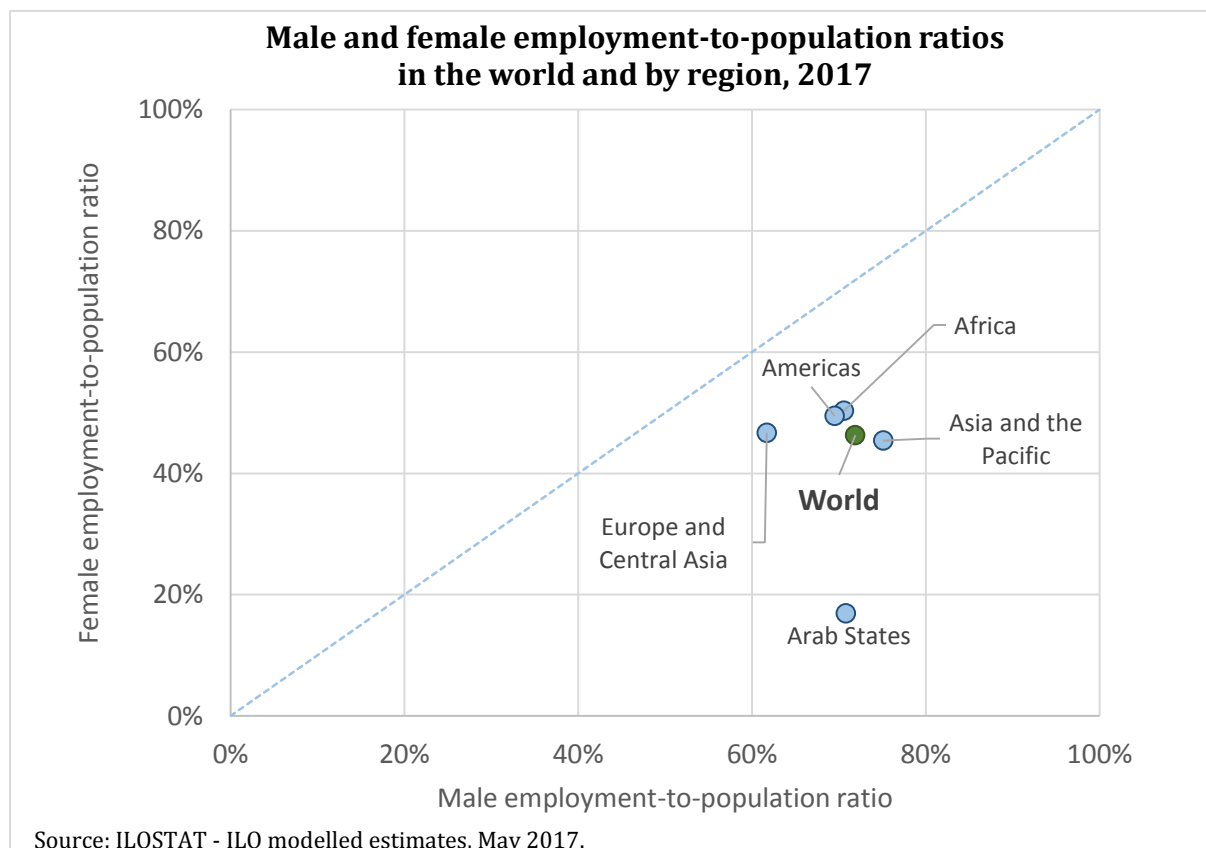
Also, many types of charts give the option to use colours to plot different variables at once. For instance, the use of colours in a scatter plot provides an additional tool to depict one more variable. Grouping the data points by colour, the scatter plot would represent an additional item (in addition to the data point category, X-axis value and Y-axis value). Figure 22 illustrates this with an example: the chart presents each country's male and female unemployment ratios, but there are too many countries in the chart to specify the name of all of them using data labels, so the use of colours per region provides a good way of giving additional information on the countries without overcrowding the chart. Naturally, for some purposes it would be absolutely necessary to specify the name of each country included.

Figure 22. Using colours in a scatter plot to represent an additional variable

Source: ILOSTAT - ILO modelled estimates, May 2017.
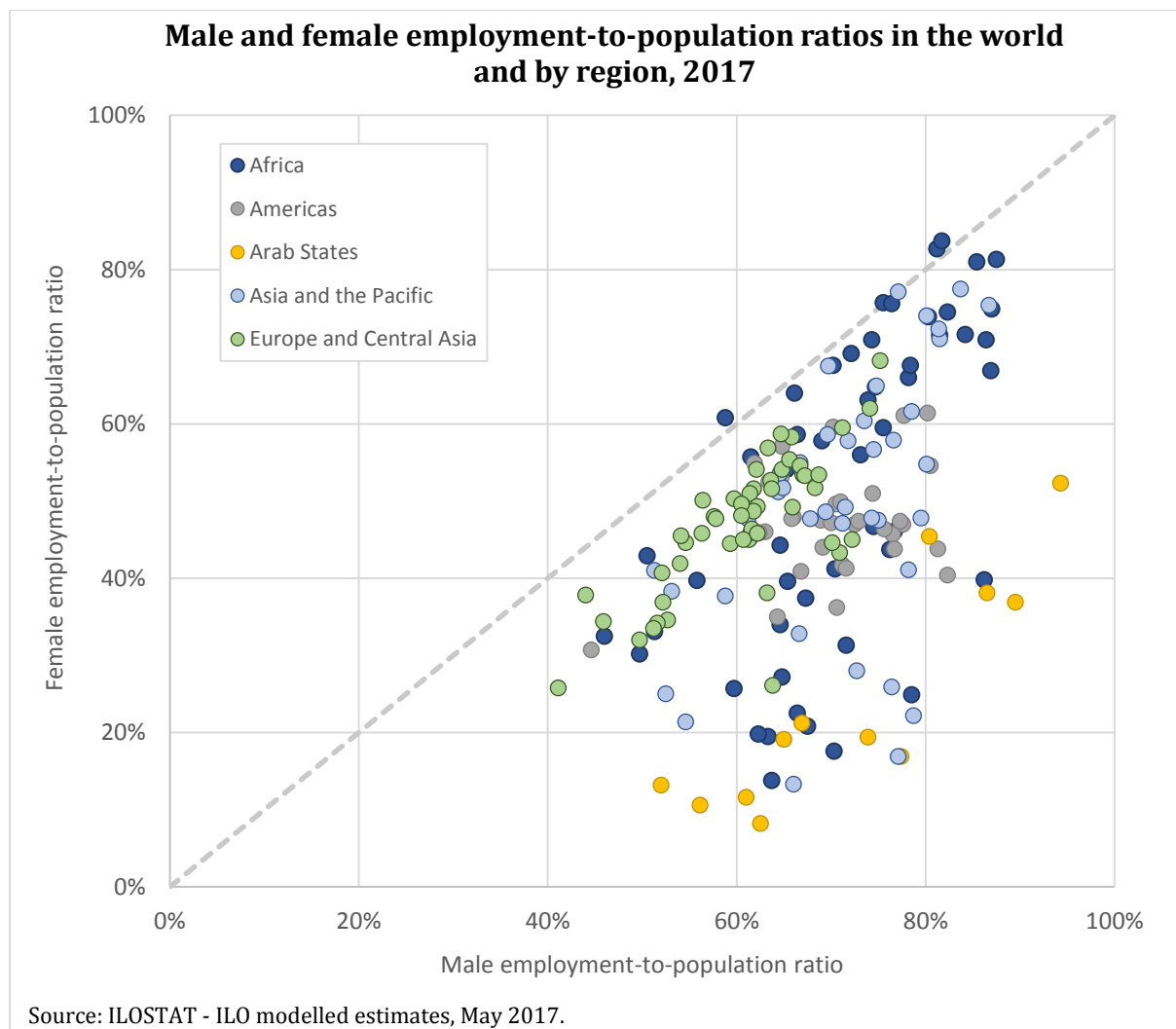
Make sure the legend is necessary, clear and nicely presented

Only add the legend when it is needed, and not if the information is already included in the chart title, axes titles or data labels. Make sure that the legend is unambiguous and that the labels of the legend items are as short and clear as possible.
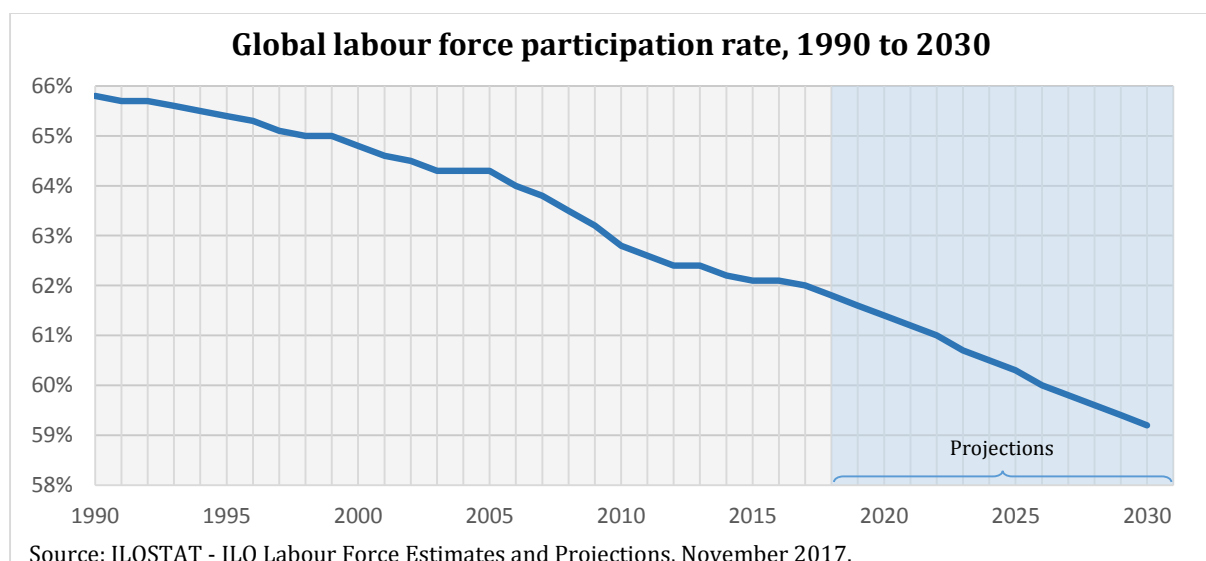
When the legend is indeed necessary, include it by paying special attention to its placement. For ease of understanding and increased visual appeal, the categories should appear in the legend in the same order and manner as they appear in the chart. That is, the legend should be placed below or above the graph for bar charts and at the left or right of the graph for line graphs, so the items would be shown in the legend horizontally or vertically, as they appear in the chart. You can refer to figure 2 for an example of legend items displayed horizontally to accompany a column chart, and to figures 3, 6 and 8 for examples of cases where it is best to present the items in the legend vertically.

Draw within your graph to ease understanding and make conclusions stand out

Do not hesitate to use all the means at your disposal to get the point of your chart across, including inserting shapes and text in your chart to clarify or make patterns more visible.

As an example of this, figure 23 below presents a line chart where the colouring of the plot area alerts the reader to which data points are projections (and which are estimates). In addition to this, a brace shape and a text box were inserted into the chart to further explain that projections are included.

Figure 23. Shapes inserted into a line chart to ease understanding

Global labour force participation rate, 1990 to 2030

Source: ILOSTAT - ILO Labour Force Estimates and Projections, November 2017.

Similarly, you can add trend lines to your chart to show either the trend of the data points included, the moving averages, or the expected future values. Excel allows to do this rather easily in all types of charts, by going to the "Chart tools - Format" menu and selecting the "Add Chart Element" option, and then "trend line". Excel's trend line formatting options even give the possibility to display the trend line's R-squared, which for scatter plots may be very enlightening. Figure 24 provides an example of a scatter plot with the corresponding trend line. This figure is based on the same data as figure 22, only this time all countries are comprised in the same data series rather than being grouped by region (this is to enable drawing the trend line referring to all countries at once as opposed to having one trend line per region).

Figure 24. Scatter plot with linear trend line

Source: ILOSTAT - ILO modelled estimates, May 2017.
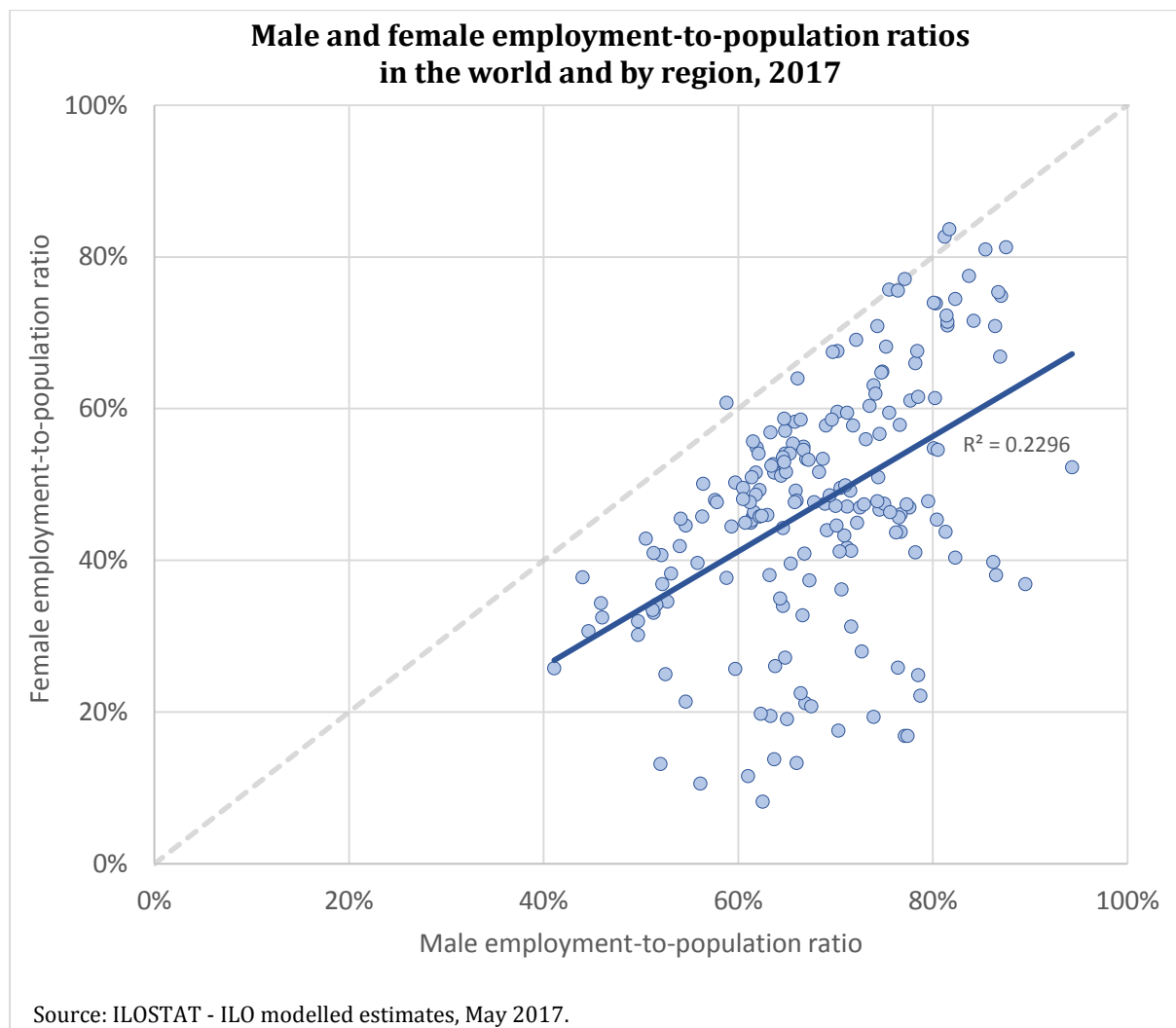
These are only some examples of things that could be drawn within a chart to ease its understanding, but there are countless more options, so do not hesitate to get creative

and add the explanations you deem necessary through shapes and text. Do so, however, tastefully and within reason, when it is justified by your analytical objectives and the chart is not sufficiently explicit on its own or you fear the audience may miss the point if you do not specify it. As stated in a preceding section, avoid cramming your chart with superfluous information as this draws attention away from the main focus of the chart.

Stay clear from 3D charts

Whether 3D charts are attractive or not is a matter of personal taste, and so it will not be discussed here. Nevertheless, beyond the aesthetic debate of whether 2D or 3D charts are nicer to look at, there is a crucial drawback to 3D charts and it is that they tend to portray a distorted picture of the data patterns. The 3D formatting makes it harder for the reader to understand with a quick glance how the categories in a chart compare to each other.

Referring again to the pie chart presented in figure 5, figure 25 below compares it to a similar pie chart, built using the same data, but formatted in 3D. The conclusions on the composition of global employment by main sector are much easier to draw based on the 2D chart. The 3D may even lead to some miss-interpretations as the relative size of the pie slices is not totally proportional to the value of each category (in this particular example, the slice corresponding to industry occupies a larger area than that of agriculture, and the services slice seems to take up more than half of the pie).

Figure 25. 2D versus 3D pie chart

Source: ILOSTAT - ILO modelled estimates, May 2017.
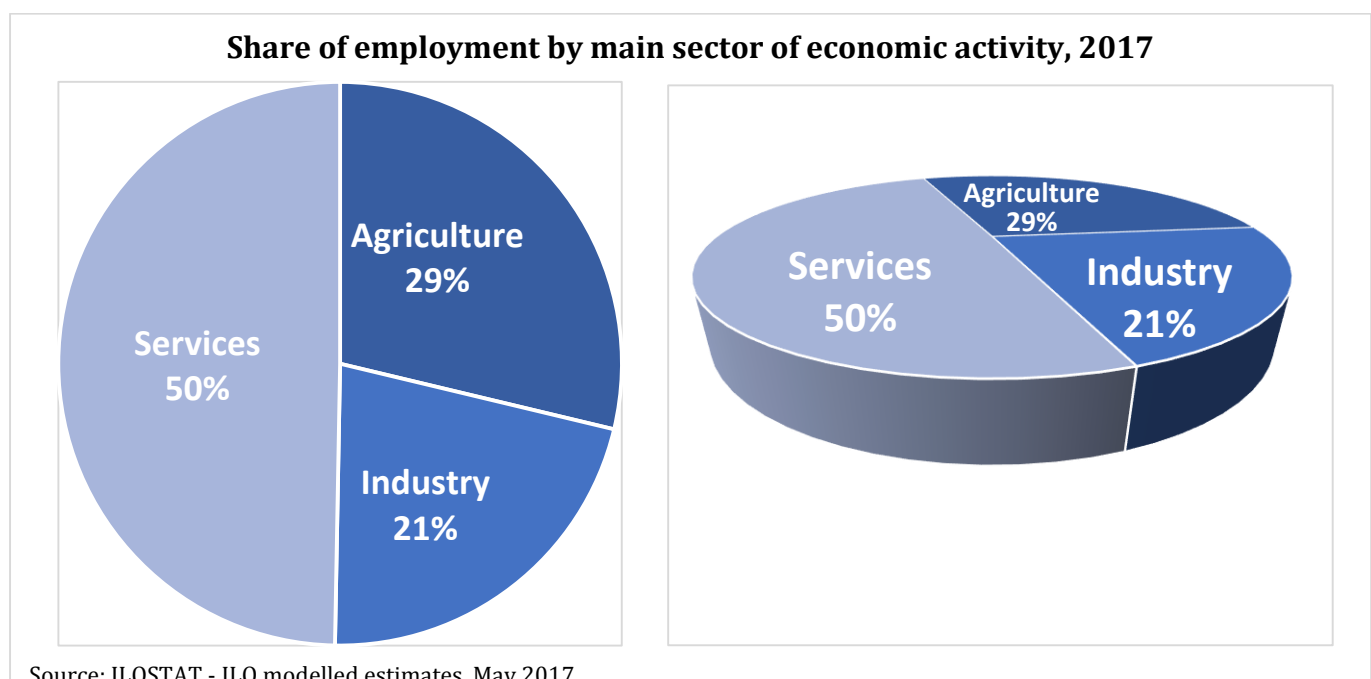
5. Concluding remarks

Labour statistics are a valuable resource to inform labour market analyses and research. In order to fulfil their full analytical potential, labour statistics need to be interpreted attentively and purposely, and their interpretation should be adequately communicated to the appropriate audience.

The graphic representation of labour statistics plays a crucial role in this, as it allows for the simple and clear presentation of the data and constitutes an essential means of communication of the key labour market patterns and trends. In this sense, charts are an excellent tool for labour market analysis. They are very easy to produce, can convey a wealth of information and make labour market data accessible to all types of audiences.

The way data is presented has an impact on the way data is interpreted (and the ease with which it is interpreted). Charts included in labour market studies or presentations on labour market topics should be conceived with a clear objective in mind: precisely that of illustrating the study or presentation they accompany. The design and formatting of the charts determine how well they depict the main items, conclusions and/or results of the corresponding labour market studies.

In order to maximize the communication impact of charts designed for labour market analyses, every formatting option should be the object of a careful deliberation and every formatting decision should be taken in accordance with the main aim of the chart.

Effective charts are useful and clear. This means that charts should be produced following a specific analytical need as opposed to being superfluous or unnecessary. They should also be self-explanatory, explicit and not overcrowded. All of the information required to understand the chart should be included but in a concise way, avoiding repetitions and not overcrowding the chart.

The nature and characteristics of the data being charted determine to a large extent what the most appropriate type of chart would be to convey the message underlying the data. Conscious decisions are to be made on how and where to show the relevant data (data labels or axes, for instance) and the relevant information (chart title, axes titles, axes, legend, etc.) depending on the type of data, the information we want to highlight and the conclusions we want the reader to draw.

Making charts visually appealing and drawing within them (using shapes and text as needed) are effective ways of easing the task of the reader and facilitating the understanding of the chart.

Effective charts depicting valid and reliable labour statistics in a clear, simple and appealing way enrich labour market studies and presentations, giving the analysis a statistical foundation, contributing to the audience's accurate understanding, making complex labour indicators accessible, and avoiding misleading conclusions by making labour market patterns and trends stand out.