



**KOF** Swiss Economic Institute

## Heterogeneity in Education and Training

Sixth Release of the KOF Youth Labour Market Index

Filippo Pusterla and Maria Esther Oswald-Egg

KOF Studies, No. 143, November 2019

# Imprint

## Editor

KOF Swiss Economic Institute, ETH Zurich  
© 2019 KOF Swiss Economic Institute, ETH Zurich

## Authors

Filippo Pusterla  
Maria Esther Oswald-Egg

## Photo

© Drobot Dean - stock.adobe.com

# KOF

ETH Zurich  
KOF Swiss Economic Institute  
LEE G 116  
Leonhardstrasse 21  
8092 Zurich, Switzerland

Phone +41 44 632 42 39  
Fax +41 44 632 12 18  
[www.kof.ethz.ch](http://www.kof.ethz.ch)  
[kof@kof.ethz.ch](mailto:kof@kof.ethz.ch)

# Heterogeneity in Education and Training

## Sixth Release of the KOF Youth Labour Market Index<sup>†</sup>

November 28, 2019

Filippo Pusterla & Maria Esther Oswald-Egg<sup>‡</sup>

<sup>†</sup> A project of the Education Systems research division at the KOF Swiss Economic Institute, ETH Zurich

<sup>‡</sup> KOF Swiss Economic Institute, ETH Zurich, Leonhardstrasse 21, 8092 Zurich, Switzerland. E-mails: pusterla@kof.ethz.ch and egg@kof.ethz.ch

### **Acknowledgements:**

The Education Systems research division thanks the International Labour Organisation, OECD Statistics, Eurostat and the Swiss Federal Statistics Office for providing the data and for the technical support. We are grateful to Thomas Bolli and Ursula Renold for valuable comments and suggestions.

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>The Youth Labour Market Situation in 2017</b>	<b>2</b>
<b>3</b>	<b>Adjustments in the Methodology</b>	<b>3</b>
3.1	Revision of Country List . . . . .	3
3.2	Revision of Country Groups . . . . .	5
3.3	Confirmatory Factor Analysis . . . . .	5
3.3.1	Current Weighting Scheme . . . . .	5
3.3.2	Alternative Weighting Scheme . . . . .	6
3.3.3	Robustness of the Weighting Scheme . . . . .	10
<b>4</b>	<b>Participation in Formal Education and Training at a Glance</b>	<b>12</b>
4.1	The Formal Education and Training Rate . . . . .	12
4.2	Patterns and Trends in the Formal Education and Training Rate . . . . .	12
<b>5</b>	<b>Summary and Outlook</b>	<b>15</b>
	<b>Bibliography</b>	<b>16</b>
<b>A</b>	<b>Methodological Notes on the Sixth Release</b>	<b>17</b>
<b>B</b>	<b>Detailed Information on Data Availability</b>	<b>18</b>

## List of Figures

1	Comparison between Optimal and Equal Weights in 2017 . . . . .	11
2	Change in the Share of Youth in Formal Education or Training between 2007 and 2017 . . . . .	13

## List of Tables

1	Evolution of the KOF YLMI between 2016 and 2017 . . . . .	2
2	Change of Countries Included into the KOF YLMI . . . . .	4
3	Summary of the Standard Weights . . . . .	6
4	Correlation Matrix of Indicator Scores . . . . .	7
5	Eigenvalues of KOF YLMI . . . . .	8
6	Rotated Factor Loadings and Computed Weights . . . . .	9
7	Optimal Weights Compared to Equal Weights . . . . .	10
8	Summary of Data Availability . . . . .	17
9	Detailed Information on Data Sources, Extraction Methods, Number of Covered Countries and Time Coverage . . . . .	18

## 1 Introduction

This report describes the sixth release of the KOF Youth Labour Market Index (KOF YLMI). The KOF YLMI is an index consisting of 12 indicators that captures the situation of the youth on the labour market. We update the data on a yearly basis, so that in this release the available data ranges from 1991 to 2017. The updated values are also available in the interactive web tool<sup>1</sup>, which allows comparisons to be made between countries or country groups over time. Users can select their countries of interest and download the created graphs and scoreboards.

In the sixth release we expand the data series to the year 2017, and the data sources continue to be the International Labour Organization (ILO), the Organisation for Economic Co-operation and Development (OECD) and Eurostat. The newest data from 2017 shows a clear improvement of the KOF YLMI around the globe. There were changes in all the four dimensions – namely Activity State, Working Conditions, Education and Transition Smoothness – where most of the changes entail an improvement. The new top performer is Switzerland, which has surpassed Denmark in the country rankings; the third best performer is Latvia, a country that has improved substantially. Overall, the improvements along the country rankings are particularly pronounced in Eastern European countries.

In this release, we implement some methodological adjustments. First, we update the country list that we collect data for. In the first five releases, we based the country selection on the listed entries in the ILO database. From this sixth release onwards, we use the countries recognised by the United Nations. This means that we drop eight zones that are not formally recognised as countries and add 23 entries, resulting in a total of 193 countries. Furthermore, we also revise the country groups. We drop country groupings that are subject to frequent changes, such as low income countries; we decide to keep only the more stable groups such as OECD or groups based on geographical regions. Finally, the issue of weighting has been on our agenda for a long time, and regarding this issue we conduct a confirmatory factor analysis to determine an accurate weighting scheme. A comparison of our standard weighting and the optimal weighting scheme shows some differences, especially an under-weighting of the Working Conditions dimension and an over-weighting of the Transition Smoothness dimension. Nevertheless, the comparison between the two weighting schemes shows no significant differences in the country rankings for 2017. This stability supports the adequacy of our standard weights.

Besides the methodological adjustments, the update of the KOF YLMI also provides the Education Systems research division an opportunity to shed light on a particular aspect of the youth labour market. The focus of this report is on the Education dimension, more specifically the Formal Education and Training Rate indicator, and in particular we consider the development of this indicator between 2007 and 2017. For 2017 we observed large differences across countries; we also found that regarding the development of the indicators in some countries, there were large changes ranging from -10% points up to +20% points.

The outline of this study is as follows. After this introductory section, we present the

---

<sup>1</sup>Access at <https://www.kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-youth-labour-market-index.html>

changes in the KOF YLMI between 2016 and 2017, and we then describe the methodological adjustments adopted in this release. Following this, we conduct an analysis on the heterogeneity in the Formal Education and Training Rate, which is the focal topic of this release. Finally, we summarize our findings and provide an outlook for the next release.

## 2 The Youth Labour Market Situation in 2017

The KOF YLMI consists of 12 labour market indicators, and these fall under four dimensions that capture the situation of the youth on the labour market. Table 1 shows the development of the four dimensions (i.e., Activity State, Working Conditions, Education and Transition Smoothness) between 2016 and 2017 for all countries that have sufficient data available, which consist of at least nine indicators. The last columns display the KOF YLMI in 2016 and 2017, as well as the country ranking from 2017 and an indicator for the change.

Looking first at the development across the dimensions, we see that the Activity State in all countries has either remained the same or has improved (in 10 countries). For Working Condi-

Table 1: Evolution of the KOF YLMI between 2016 and 2017

Country	Activity State			Working Conditions			Education			Transition Smoothness			KOF YLM Index			
	2016	2017	Direction*	2016	2017	Direction*	2016	2017	Direction*	2016	2017	Direction*	2016	2017	Rank	Change
Switzerland	6.02	6.08	→	5.75	5.69	→	5.36	5.33	→	5.54	5.71	→	5.67	5.70	1	▲ 1
Denmark	5.86	5.92	→	5.07	5.15	→	6.00	5.66	↘	5.94	6.03	→	5.72	5.69	2	▼ 1
Latvia	5.38	5.44	→	5.61	5.73	→	4.95	5.57	↑	5.20	5.73	↑	5.29	5.62	3	▲ 6
Netherlands	6.02	6.18	→	5.12	5.01	→	5.10	5.21	→	5.68	5.79	→	5.48	5.55	4	= 0
Germany	6.23	6.27	→	5.50	5.65	→	4.57	4.49	→	5.52	5.44	→	5.45	5.46	5	= 0
Austria	5.89	6.03	→	5.61	5.69	→	4.43	4.25	→	5.58	5.75	→	5.38	5.43	6	= 0
Slovenia	5.63	5.94	↗	4.19	4.37	→	6.32	6.19	→	4.47	5.13	↑	5.15	5.41	7	▲ 6
Czech Republic	6.06	6.23	→	5.22	5.25	→	4.57	4.74	→	5.06	5.24	→	5.23	5.37	8	▲ 4
Lithuania	5.68	5.75	→	5.75	5.67	→	4.79	4.20	↓	5.73	5.82	→	5.49 <sup>†</sup>	5.36 <sup>†</sup>	9	▼ 6
Estonia	5.68	5.74	→	5.54	5.23	↘	4.80	4.80	→	5.45	5.63	→	5.36	5.35	10	▼ 3
Norway	5.91	6.01	→	5.13	5.10	→	4.92	4.80	→	5.44	5.35	→	5.35	5.32	11	▼ 3
Iceland	6.32	6.33	→	4.70	4.64	→	4.67	4.61	→	5.28	5.48	→	5.24 <sup>†</sup>	5.26 <sup>†</sup>	12	▼ 1
Hungary	5.63	5.74	→	5.62	5.76	→	4.32	4.30	→	4.94	5.21	↗	5.13	5.25	13	▲ 1
Luxembourg	5.29	5.46	→	4.96	4.86	→	5.43	5.09	↘	5.38	5.25	→	5.27	5.16	14	▼ 4
Belgium	5.34	5.34	→	5.28	5.09	→	4.97	5.01	→	4.78	4.96	→	5.09	5.10	15	= 0
UK	5.69	5.76	→	5.23	5.29	→	4.07	4.13	→	5.18	5.20	→	5.04	5.09	16	▲ 1
Poland	5.42	5.63	→	4.54	4.59	→	5.20	5.15	→	4.92	4.99	→	5.02	5.09	17	▲ 1
Finland	5.14	5.20	→	4.45	4.56	→	4.81	4.68	→	5.85	5.90	→	5.07	5.08	18	▼ 2
Cyprus	4.52	4.80	↗	4.37	4.53	→	5.22	5.48	↗	5.45	5.41	→	4.89	5.06	19	▲ 3
Portugal	4.69	5.00	↗	4.29	4.50	→	5.70	5.71	→	4.88	4.93	→	4.89	5.03	20	▲ 3
Ireland	5.47	5.57	→	4.93	5.00	→	4.27	4.41	→	4.95	5.10	→	4.91	5.02	21	= 0
Bulgaria	4.77	5.30	↑	5.40	5.36	→	4.65	4.57	→	4.28	4.78	↑	4.77	5.00	22	▲ 3
Malta	5.89	5.98	→	5.64	5.66	→	3.29	3.19	→	5.11	4.92	→	4.98 <sup>†</sup>	4.94	23	▼ 4
Croatia	4.00	4.38	↗	4.54	4.82	↗	5.17	5.60	↗	4.45	4.90	↑	4.54	4.92	24	▲ 4
France	5.01	5.16	→	4.76	4.83	→	4.65	4.58	→	4.93	4.97	→	4.84	4.88	25	▼ 1
Turkey	4.56	4.53	→	4.69	4.76	→	4.65	4.42	↘	5.74	5.69	→	4.91	4.85	26	▼ 6
Sweden	5.47	5.56	→	4.11	4.28	→	3.58	3.57	→	5.73	5.75	→	4.72	4.79	27	= 0
Slovakia	5.10	5.26	→	4.84	4.98	→	4.82	4.50	↘	4.19	4.29	→	4.74	4.76	28	▼ 2
Romania	4.76	5.08	↗	3.90	4.16	↗	5.31	5.17	→	3.92	3.97	→	4.47	4.59	29	= 0
Greece	3.53	3.81	↗	3.54	3.74	↗	6.27	6.45	→	4.08	4.04	→	4.36	4.51	30	▲ 1
Spain	3.69	4.08	↑	3.73	3.66	→	5.04	4.96	→	5.02	5.13	→	4.37	4.46	31	▼ 1
Serbia	3.72	4.06	↗	3.12	3.25	→	5.98	5.99	→	4.11	4.38	↗	4.23 <sup>†</sup>	4.42 <sup>†</sup>	32	= 0
North Macedonia	3.11	3.05	→	4.75	4.64	→	5.53	5.40	→	3.42	3.30	→	4.20 <sup>†</sup>	4.10 <sup>†</sup>	33	= 0
Montenegro	3.70	4.07	↗	3.04	3.27	↗	5.16	5.44	↗	3.89	3.46	↓	3.95 <sup>‡</sup>	4.06 <sup>‡</sup>	34	▲ 1
Italy	3.30	3.47	↗	3.77	3.65	→	5.37	5.18	→	3.69	3.70	→	4.03	4.00	35	▼ 1
EU 28	5.16	5.35	→	4.84	4.89	→	4.92	4.89	→	5.01	5.14	→	4.98	5.07		

\* The directions describe the changes in the dimensions' score in 2017 relative to 2016. The key of lecture is the following: ↑ score changes > +10%; ↗ score changes by > +5% to +10%; → score remains stable between +5% and -5%; ↘ score changes by > -5% to -10%; ↓ score changes > -10%

<sup>†</sup> Only 11 indicators out of 12 available. <sup>‡</sup> Only 9 indicators out of 12 available.

Notes: The table shows countries ranked according to their KOF YLM index value in 2017. The index value is an unweighted average of the scores in the four dimensions Activity State, Working Conditions, Education and Transition Smoothness. The scores in turn are standardized country values on a scale from one to seven, where a higher score indicates a more desirable outcome. For more information on the construction of the index and the scores please consult (Renold et al., 2014). The second to fifth column display the KOF YLMI value of 2016 as reference and the actual value of 2016 followed by the rank in 2017 and the change from 2016 to 2017. Then, the following columns show respectively the score value in 2016, the score value in 2017 and the direction of the change for the four dimensions activity state, working conditions, education and transition smoothness. The data used for the table are the newest available. Therefore, the data from 2016 in this release might differ from the data of 2016 in the previous release.

tions, there was less movement as most of the scores stayed within the 5% range of the previous year. Only one country, Estonia, experienced a substantial drop in their Working Conditions, whereas four countries experienced a large increase, namely Croatia, Romania, Greece and Montenegro. In the Education dimension, five countries – Denmark, Lithuania, Luxembourg, Turkey and Slovakia – experienced a drop whereas four countries – Latvia, Cyprus, Croatia and Montenegro – show signs of improvement. In the Transition Smoothness dimension, only Montenegro shows a negative development while Latvia, Slovenia, Hungary, Bulgaria, Croatia and Serbia show positive evolution. Thus, from 2016 to 2017 the changes that did occur were predominantly positive.

The trend towards improvement of the youth labour market situation is also seen in the aggregated KOF YLMI. Out of 35 country scores, 25 are higher in 2017 than in 2016. In 2017 none of the countries have a score below 4, while 22 countries have a score of 5 or above compared to 18 countries in 2016. These changes occurred across a range of countries and were not limited to the top- or low-performers. Nevertheless, there is an observable pattern that most of the improvements stem from Eastern European countries.

These movements are also visible in the ranking; none of the top three countries has remained in the same positions. Switzerland and Denmark have switched places so that Switzerland is now ranked first and Denmark second. Latvia follows in third place from ninth in 2016 and belongs to the group of most improved countries together with Slovenia. The countries with the biggest drops are Lithuania and Turkey. Both Slovenia and Czech Republic have replaced Norway and Luxembourg respectively in the top-ten ranking. For the next ten positions in the ranking, a reverse of the order is seen; the better ranked countries in 2016 lost their positions, which are now taken by the ones that were ranked lower previously. Looking at the remaining countries, many shifts can be noted, but there is no actual apparent pattern. Thus, it can be concluded that much has transpired in the youth labour market situation, especially across Europe.

### 3 Adjustments in the Methodology

We use the sixth release to conduct some small adjustments in the methodology. First, we revise the list of countries included in the index, which now covers 193 countries. Second, we simplify the groups of countries included in the index by eliminating groups of countries that change their composition very often. We retain only the groups that are relatively stable over time – such as OECD or the EU 28 – as well as groups based on geographical definitions, which do not change over time. Third, we conduct tests using a confirmatory factor analysis to confirm the adequacy of our standard weighting scheme.

#### 3.1 Revision of Country List

When building the KOF YLMI, we considered different statistical data sources, and we adopted the country list from the largest data source, namely the ILO, which provided data on the youth unemployment rate for most of the countries. However, the list provided by the ILO has two



drawbacks. First, this list does not only cover countries but also zones such as Puerto Rico and Macau. Second, some actual countries are missing from the list, such as Andorra, Seychelles and Swaziland. Therefore, we decided to adjust the country list so that it only contains the countries that are accredited at the United Nations (UN). Currently the UN consists of 193 member states<sup>2</sup>. The sixth release of the KOF YLMI includes all these countries, even though for some of them there are no statistics reported yet in the international statistics. In addition, the UN mentions non-member states such as the Holy See, Palestine, the Sovereign Military Order of Malta, Western Sahara, Cook Islands and Kosovo. In maintain consistency, we do not include these states in our dataset. Nevertheless, we will continue monitoring the list and will include any non-member state as a country as soon as it becomes a UN member.

This change in the method of country selection brings us to a total of 193 countries compared to the 178 of the previous releases. Table 2 shows which entries have been deleted from the KOF YLMI as well as the ones that have newly been included; the table also shows which of these newly included countries have data.

Table 2: Change of Countries Included into the KOF YLMI

Country	Dropped from 5th release	Included in 6th release	Data available in YLMI
Andorra		x	no
Antigua and Barbuda		x	no
Dominica		x	no
Djibouti		x	yes
Grenada		x	no
Guadelupe	x		n/a
Hong-Kong (China)	x		n/a
Kiribati		x	no
Liechtenstein		x	no
Macau (China)	x		n/a
Marshall Islands		x	no
Martinique	x		n/a
Micronesia		x	no
Monaco		x	no
Nauru		x	no
Occupied Territory of Palestine	x		n/a
Palau		x	no
Puerto Rico	x		n/a
Réunion	x		n/a
Saint Kitts and Nevis		x	no
Saint Lucia		x	yes
Saint Vincent and the Grenadines		x	yes
Samoa		x	yes
Sao Tome and Principe		x	yes
San Marino		x	no
Seychelles		x	no
South Sudan		x	yes
Taiwan (China)	x		n/a
Tonga		x	yes
Tuvalu		x	no
Vanuatu		x	yes

<sup>2</sup>See the website of the UN for more information: <https://www.un.org/en/sections/member-states/growth-united-nations-membership-1945-present/index.html>

### 3.2 Revision of Country Groups

In the development of the KOF YLMI, we decided that we wanted not only to compare countries with each other but also compare a country to a group of countries. Therefore, we included as many country groups as possible. However, with the revision of the country list, we also reviewed the country groups and realized that most of them are subject to change over time. For example, the members of the developing countries may change in status because some of the countries may become classified as "developed countries" while others may change to "least developed countries". The same applies when grouping countries according to their income level.

For this reason, we dropped all the country groups that are time variant and only keep the almost time-invariant groups. After the revision, the current groups include the continents (Africa, Americas, Asia, Europe and Oceania), OECD, EU15, EU 28 and G8. The groups we dropped are developed countries, developing countries, least developed countries, developing East Asia Pacific countries, developing Eastern Europe countries, developing Latin America and Caribbean countries, developing middle East and North Asia countries, developing South Asia countries, developing Sub-Saharan African countries, high income countries, upper middle income countries, lower middle income countries and low income countries. Another idea entailed adding more economic groups, but there are too many to choose from. In the end, we decided that we are open to include other groups that fall into that description but only upon request.

### 3.3 Confirmatory Factor Analysis

#### 3.3.1 Current Weighting Scheme

Table 3 reports the weights between the indicators as implemented in the calculation of the index. Each of the four dimensions accounts for a quarter of the index composition. The 25% are further equally subdivided between the indicators contained in each dimension. As mentioned in Renold et al. (2014), this normative subdivision was driven by the belief that each dimension describes an equal important aspect of the youth labour market situation. Furthermore, because there is a lack in theoretical background concerning weighting procedures in youth labour market indexes, the indicators within each dimension received equal weight.

However, it must be noted that the web application<sup>3</sup> provides users the possibility to modify the weighting factors and assign custom weights (e.g., a user can adapt the weights according to the development process of the chosen country).

Nevertheless, the possibility of adapting weights still does not address the question of how the appropriate weights are identified. The weighting procedure used in the construction of an index is an important step; this can either be set up according to preferences or by optimizing the variance. Different indicator weights imply different index values that may further reflect in different ranking outcomes. A sensitivity analysis of the robustness of the *a priori* weights allows us to highlight the possible subjective selection bias or the incorrect quantification of an indicator's importance.

---

<sup>3</sup>See <http://viz.kof.ethz.ch/public/yunemp/>

Table 3: Summary of the Standard Weights

Dimensions (in bold) and indicators	Weight of the dimension	Weight of the indicator
<b>Activity State</b>	<b>25%</b>	
Unemployment Rate (UR)		8.3%
Relaxed UR		8.3%
NEET Rate		8.3%
<b>Working Conditions</b>	<b>25%</b>	
Temporary Worker Rate		5.0%
Involuntary Part-time Worker Rate		5.0%
Atypical Working Hours Rate		5.0%
In-Work at-Risk-of-Poverty Rate		5.0%
Vulnerable Employment Rate		5.0%
<b>Education</b>	<b>25%</b>	
Formal Education and Training Rate		12.5%
Skills Mismatch Rate		12.5%
<b>Transition Smoothness</b>	<b>25%</b>	
Relative Unemployment Ratio		12.5%
Incidence of Long-term UR		12.5%

### 3.3.2 Alternative Weighting Scheme

A factor analysis allows us to identify components that capture the largest share of information that is common to single indicators. The goal is to identify the smallest possible set of factors that explain the largest variation in a set of indicators. In our case we want to analyse whether the equal weighting scheme of our dimensions and indicators is deemed adequate. More precisely, the factor analysis allows us to identify the weights that maximize the explained variance in the set of indicators. A confirmatory factor analysis affords us the possibility to test whether the dimensions of the index are validated by the statistical results. According to the foundation of the KOF YLMI<sup>4</sup>, the 12 indicators are subdivided into four dimensions.

To conduct the factor analysis, we restricted our data to include only the observations that contain information on the scores of all 12 indicators; this is only for the cases from 2005 onwards. To obtain a cross-section dataset from our panel dataset, we took the mean score from 2005 to 2017 for each indicator. This leaves us with information on 31 countries, which are mostly European.

For our factor analysis we followed Nardo et al. (2008) who described four steps to derive a weighting scheme. The first step is to check whether the correlation between indicators is sufficiently strong; if so, there is a likely presence of shared common factors. Indeed, if the correlation between the indicators is weak, it would be unlikely that they share common factors. Table 4 reports the correlation matrix of the 12 indicators included in the KOF YLMI. The highest correlation is found between the indicator Unemployment Rate and the Relaxed

<sup>4</sup>See Renold et al. (2014) for detailed explanations.

Table 4: Correlation Matrix of Indicator Scores

	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12
I1	1.00											
I2	0.88	1.00										
I3	0.62	0.61	1.00									
I4	0.40	0.36	-0.04	1.00								
I5	0.47	0.43	0.16	0.19	1.00							
I6	0.17	0.14	0.02	0.23	0.03	1.00						
I7	0.05	0.16	0.08	-0.17	0.37	-0.11	1.00					
I8	0.41	0.34	0.62	0.01	0.17	0.11	0.36	1.00				
I9	0.15	0.07	0.63	-0.35	0.22	0.00	0.02	0.34	1.00			
I10	-0.43	-0.46	-0.42	-0.19	-0.01	0.05	-0.25	-0.64	0.02	1.00		
I11	0.19	0.34	-0.01	0.13	0.49	0.24	0.43	0.16	0.02	0.02	1.00	
I12	0.61	0.53	0.56	0.05	-0.03	0.14	-0.22	0.39	0.11	-0.38	-0.02	1.00

**Notes:** I1 = Unemployment Rate; I2 = Relaxed Unemployment Rate; I3 = NEET Rate; I4 = Temporary Worker Rate; I5 = Involuntary Part-time Worker Rate; I6 = Atypical Working Hours Rate; I7 = In-Work at-Risk-of-Poverty Rate; I8 = Vulnerable Employment Rate; I9 = Formal Education and Training Rate; I10 = Skills Mismatch Rate; I11 = Relative Unemployment Ratio; I12 = Incidence of Long-term Rate

Unemployment rate. Overall, the correlation structure of the data confirms the validity of the selected indicators.

The second step consists of computing the eigenvalues. This allows us to correctly identify the optimal number of the latent factors. Table 5 shows the computed eigenvalues for the available dataset. It is worth highlighting that the first two factors explain about half of the cumulative variance of the 12 indicators. According to Nardo et al. (2008) there are three common practice criteria to identify the optimal number of factors. Standard practices suggest to either (i) retain all eigenvalues larger than one, (ii) consider all eigenvalues that individually contribute by more than 10% in explaining the total variance, or (iii) restrict the set of eigenvalues to the ones that cumulatively explain more than 60%. In our dataset there are four factors with eigenvalues larger than 1. In addition, these four factors satisfy the second condition of individually explaining at least 10% of total variance. According to the third criteria on the number of retained factors, there are three found – these three together already explain about 64% of the variance cumulatively. In the end, we decided to keep the four factors because they satisfy the two first conditions and explain more than the requested 60% from the third condition.

The third step of the procedure is the rotation of the factor loadings. Rotation leaves the sum of eigenvalues unchanged, but it changes the axes; this might affect the eigenvalues of certain factors and consequently the factor loadings. The rotation method adopted is orthogonal *varimax* rotation; this method maximizes the variance of the squared factor loadings, and it does this within the factors.

The last step consists of building the weights by squaring the factor loadings and scaling them up to a unity sum. After this, the squared factor loadings are multiplied by the proportion of the variance of the corresponding factor from the four factors. This generates the weights for each indicator in the four factors. To obtain the overall weights, we sum up the weights for each

Table 5: Eigenvalues of KOF YLMI

Factor	Eigenvalue	Difference	Proportion (%)	Cumulative (%)
Factor 1	4.04	2.14	33.65	33.65
Factor 2	1.90	0.13	15.83	49.48
Factor 3	1.77	0.51	14.77	64.25
Factor 4	1.26	0.28	10.52	74.77
Factor 5	0.99	0.30	8.22	82.99
Factor 6	0.68	0.28	5.69	88.69
Factor 7	0.41	0.03	3.39	92.07
Factor 8	0.38	0.11	3.14	95.21
Factor 9	0.27	0.11	2.25	97.46
Factor 10	0.16	0.05	1.31	98.77
Factor 11	0.11	0.07	0.89	99.66
Factor 12	0.04	.	0.34	100.00

indicator. The approach of considering the weights of all four factors – as in not only one factor loading per indicator – and summing them up horizontally is in line with Koenig & Ohr (2013). These last two steps are reported in Table 6.

The rotated factor loadings reported in Table 6 allow us to understand to what extent each indicator loads the retained factors. The first aspect is that the number of retained factors coincide with the four dimensions used thus far. However, the grouping of the indicators into the dimension is not the same as the grouping of the indicators into the factors. For instance, the first factor – which individually explains more than a third of the total variance – is mainly influenced by the indicators of the Activity State dimension (i.e., Unemployment Rate, Related Unemployment Rate and NEET Rate), but it is also influenced by one of the indicators in the Transition Smoothness dimension, namely the Incidence of Long-term Unemployment Rate indicator. The Working Condition dimension consists of indicators loading into three of the four factors (2, 3 and 4). In addition, the Education dimension loads into two different factors (3 and 4). This finding contrasts the previous dimensions, but the pattern is not completely new, especially for the latter dimension. Indeed, divergence between the two indicators in the Education dimension (i.e., the Formal Education and Training Rate as well as the Skills Mismatch Rate) has already been observed in previous descriptive analyses based on the KOF YLMI<sup>5</sup>. The factor analysis provides statistical evidence of what we previously suspected. Finally, the Transition smoothness dimension also consists of two indicators that load into different factors (1 and 2). To sum up, while the retention of the four factors is consistent with the first considerations, the grouping of these indicators into the four previous dimensions does not coincide with the grouping into the factors.

Despite this inconsistency, the optimal weights generated through this procedure – see the last column of Table 6 – are surprisingly similar to the ones we are using based on equal weights. Table 7 presents a side-by-side comparison of the equal and the optimal weights.

Considering the Activity State dimension, we can observe that the equal weight assigned to this dimension is fairly close to the optimal one identified through the factor analysis. Further-

<sup>5</sup>See for instance the analyses contained in Pusterla (2015) as evidence for European countries.

Table 6: Rotated Factor Loadings and Computed Weights

	Rotated Factor Loadings (orthogonal varimax)				Squared Factor Loadings (scaled to unity sum)				Weights based on factor loadings				Overall weight (13)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 1	Factor 2	Factor 3	Factor 4	Factor 1	Factor 2	Factor 3	Factor 4		
<i>Activity State</i>														
Unemployment Rate (UR)	0.901	0.197	0.044	0.124	0.239	0.019	0.001	0.009	0.090	0.004	0.000	0.002	9.67%	
Relaxed UR	0.840	0.294	-0.018	0.184	0.207	0.043	0.000	0.020	0.079	0.010	0.000	0.004	9.20%	
NEET Rate	0.646	-0.041	0.618	0.297	0.123	0.001	0.210	0.051	0.047	0.000	0.043	0.010	9.91%	
<i>Working Conditions</i>														
Temporary Worker Rate	0.506	0.102	-0.648	-0.119	0.075	0.005	0.231	0.008	0.029	0.001	0.047	0.002	7.81%	
Involuntary Part-time Rate	0.284	0.782	0.117	-0.070	0.024	0.302	0.008	0.003	0.009	0.068	0.002	0.001	7.92%	
Atypical Working Hours Rate	0.374	0.136	-0.091	-0.408	0.041	0.009	0.005	0.096	0.016	0.002	0.001	0.019	3.71%	
In-Work at-Risk-of-Poverty Rate	-0.196	0.686	0.063	0.578	0.011	0.232	0.002	0.194	0.004	0.052	0.000	0.037	9.44%	
Vulnerable Employment Rate	0.412	0.132	0.330	0.643	0.050	0.009	0.060	0.239	0.019	0.002	0.012	0.046	7.90%	
<i>Education</i>														
Formal Education & Training Rate	0.134	0.092	0.914	-0.067	0.005	0.004	0.459	0.003	0.002	0.001	0.093	0.001	9.64%	
Skills Mismatch Rate	-0.439	0.085	0.104	-0.795	0.057	0.004	0.006	0.365	0.021	0.001	0.001	0.070	9.38%	
<i>Transition Smoothness</i>														
Relative Employment Ratio	0.151	0.816	-0.062	-0.060	0.007	0.329	0.002	0.002	0.003	0.074	0.000	0.000	7.76%	
Incidence of Long-term UR	0.739	-0.300	0.178	0.136	0.161	0.044	0.017	0.011	0.061	0.010	0.004	0.002	7.66%	
Explained variance	3.398	2.026	1.820	1.728										
Share of total variance (total=100%)	37.87%	22.59%	20.28%	19.26%										

Notes: columns (1)–(4) report the rotated factor loadings derived in Table 5. Columns (5)–(8) reports the squared values of the factor loadings from (1)–(4). The weights reported in columns (9)–(12) are the derived by multiplying the squared factor loadings of columns (5)–(8) with the share of total variance reported in the bottom lines of columns (1)–(4). The weights reported in column (13) are the results of the horizontal sum of columns (9)–(12).

Table 7: Optimal Weights Compared to Equal Weights

Dimensions (in bolt) and indicators	Equal Weight (conceptual construct)	Optimal Weight (factor analysis)
<b>Activity State</b>	<b>25.00%</b>	<b>28.78%</b>
Unemployment Rate (UR)	8.33%	9.67%
Relaxed UR	8.33%	9.20%
NEET Rate	8.33%	9.91%
<b>Working Conditions</b>	<b>25.00%</b>	<b>36.78%</b>
Temporary Worker Rate	5.00%	7.81%
Involuntary Part Time Rate	5.00%	7.92%
Atypical Working Hours Rate	5.00%	3.71%
In-Work at-Risk-of-Poverty Rate	5.00%	9.44%
Vulnerable Employment Rate	5.00%	7.90%
<b>Education</b>	<b>25.00%</b>	<b>19.03%</b>
Formal Education and Training Rate	12.50%	9.64%
Skills Mismatch Rate	12.50%	9.38%
<b>Transition Smoothness</b>	<b>25.00%</b>	<b>15.42%</b>
Relative Employment Ratio	12.50%	7.76%
Incidence of Long-term UR	12.50%	7.66%

more, the subdivision of the dimension's weight between the three indicators is almost equal. For this dimension there are no substantial differences. The Working Conditions dimension appears to be underestimated in the equal framework according to the calculations of the optimal weights. The equal weighting within the dimension works for three out of five indicators. For the two indicators that are not in line with equal weighting, the Atypical Working Hours Rate indicator has too much weight, whereas for the indicator In-Work at-Risk-of-Poverty Rate, the weight is too small. Regarding the Education dimension, the equal weight is higher than the optimal one. However, the equal weighting within the dimension seems to be adequate. Finally, the Transition Smoothness dimension is the one that seems to be the most overestimated dimension in the equal framework. The two corresponding indicators of the Relative Unemployment Ratio and the Incidence of Long-term Unemployment Rate jointly explain about 15% of the total variance instead of 25%.

In summary, the optimal weights differ only in a moderate way from the equal weights. The largest difference are in the Working Condition dimension, which should have higher weights, while the Transition Smoothness dimension should optimally have less weight than the one assigned in the equal considerations. The next section investigates the impact of the new weighting scheme on the KOF YLMI.

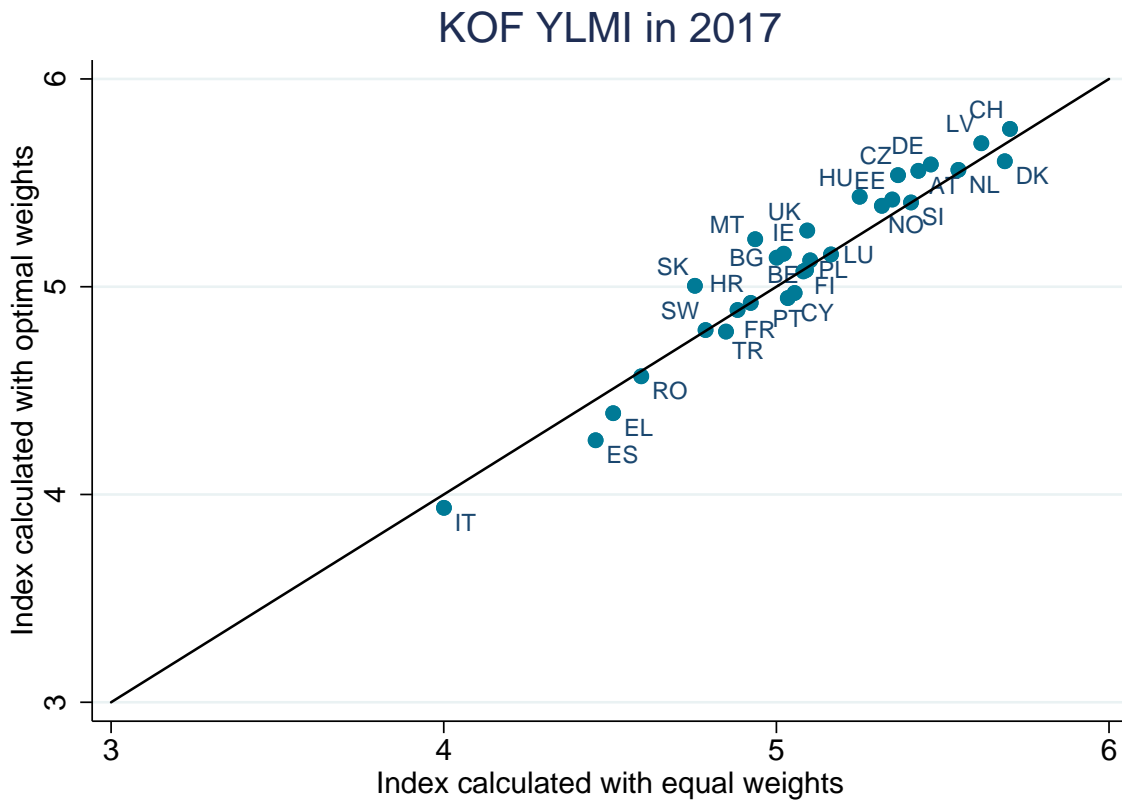
### 3.3.3 Robustness of the Weighting Scheme

This section applies the inquired optimal weights to the KOF YLMI. Specifically, we compare the index values calculated with the optimal weights with the ones based on equal weights. Figure 1 presents the values of the KOF YLMI in 2017 calculated with both equal and optimal weights. More specifically, the horizontal axis indicates the index values according to the equal weights, while the vertical axis indicates the ones calculated with the new values reported in

Table 6. It should be noted that the optimal weights are based on the dataset of 31 countries having full data availability over the 2005-2017 time period. The black line shows the 45° line.

In looking at Figure 1, we can observe that the vast majority of the countries is very closed to the 45° line. This means that the switch from the standard to the optimal weighting scheme affects the final index values only marginally. Some countries – as observed for instance in the lower part of the distribution – show values below the 45° line. However, if we look at the ranking (i.e., the position that countries have by looking at the distribution horizontally or vertically), no particular variations are observable. In some cases, two countries simply shifted one position in the ranking. In other words, there are no large or substantial changes across the distribution. This is also supported by the correlation coefficient of 96.9%, which indicates that the two weighting approaches are very similar. It should be noted that the measure of correlation assumes a normal distribution of the data and this might not be given in such a small sample; because of this, we also considered the Spearman correlation, which indicates a 94.4% accordance. These findings provide evidence for the robustness of the equal weighting scheme.

Figure 1: Comparison between Optimal and Equal Weights in 2017



Notes: The graph compares KOF YLMI scores achieved by the countries in 2017 calculated according to the equal weight (x-axis) and the optimal weight (y-axis). Scores ranges on a scale from 1 to 7, where higher scores suggest more desirable outcomes.



## 4 Participation in Formal Education and Training at a Glance

With this release, we place a special focus on the Formal Education and Training Rate indicator; the large changes observed in the values of this indicator during the past decade have prompted us to have a closer inspection. In the following section, we firstly recall the indicator’s definition, and then we present the evolution of this indicator between 2007 and 2017.

### 4.1 The Formal Education and Training Rate

The Formal Education and Training Rate indicator together with the Skills Mismatch Rate compose the Education dimension of the KOF YLMI. This dimension describes the levels of qualification acquired by youth and the correlation they have with the requirements of labour demand. For young people it is important to obtain further education after finishing compulsory education, as this can increase their skills and subsequently their chances to obtain a good job. Additionally, the ILO (2011) stated that the advances in machinery and technology require higher knowledge to increase economic growth and improve welfare.

There are commonly three types of education: formal, non-formal and informal. For the KOF YLMI, we focus on formal education, which is defined by Eurostat (2013) as the education provided by formal institutions such as schools, colleges and universities. This includes also vocational education and training (VET), meaning that apprentices attending a dual VET program (i.e., with both school- and work-based training) are also taken into consideration. In the KOF YLMI we neglected non-formal education due to its heterogeneity; we also did not include informal education due to its lack of international standards. We focused primarily on the Formal Education and Training Rate, which is a rough indicator of how much education and skills are acquired by the youth. The indicator is calculated as follows:

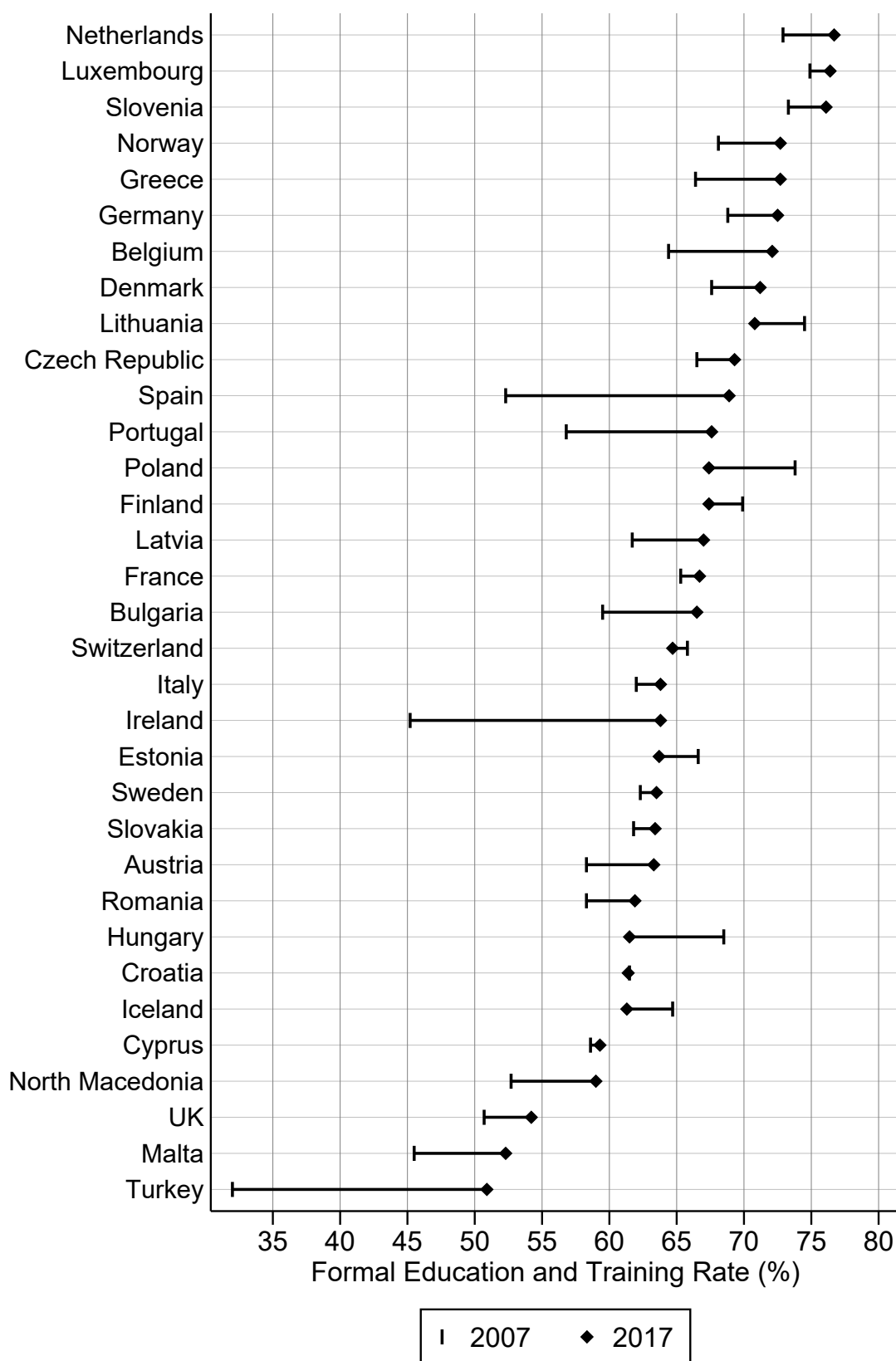
$$\text{Formal Education and Training Rate} = \frac{\text{Youth in formal education or training}}{\text{Young Population}} * 100$$

### 4.2 Patterns and Trends in the Formal Education and Training Rate

After recalling the definition of the Formal Education and Training Rate, we now examine the evolution of this indicator over time. Figure 2 shows the evolution of this indicator between 2007 and 2017 for the countries with available data.

At a first glance, we observe large differences across the countries. On the one hand, countries such as the Netherlands, Luxembourg and Slovenia of the young population participating in formal education and training in 2017 – meaning three out of four young people aged 15 to 24 are in education or training. On the other hand, countries such as Turkey, Malta and the UK show a rate that is only slightly above 50% in 2017 – meaning that only every second young person is taking part in formal education or training. In between the two groups, the majority of the countries show on average a participation rate between 60% and 70%.

Figure 2: Change in the Share of Youth in Formal Education or Training between 2007 and 2017



By focusing on the evolution between 2007 and 2017, additional patterns can also be observed. First, in some countries we observe a reduction in the share of youth taking part in formal education or training. For instance, in Lithuania, the Formal Education and Training Rate decreased from about 75% to 70%; in both Poland and Hungary especially, the decrease was about 10%-points. Smaller reductions in the Formal Education and Training Rate are further observed in Finland, Estonia and Iceland.

Contrary to the countries just mentioned, the majority of the other countries experienced an increase in the Formal Education and Training Rate on average between 2007 and 2017. In this regard, it is worth noting that a 20%-point increase is seen in Turkey (from approximately 32% to 52%), in Ireland (from 45% to about 65%) and in Spain (from 52% to 70%). These large increases in the share of youth enrolled in education or training can be partly related to these countries responding to the Great Recession, which heavily affected the youth labour market situation in these countries (Pusterla, 2015).

Furthermore, increases in the Formal Education and Training Rate larger than 10% were also observed in Greece, Belgium, Portugal, Bulgaria, North Macedonia and Malta. These large changes are widely diffused across European countries and are apparently not linked to the transition stage of the economy. Country-specific research should attempt to further investigate the effect that these changes in the participation in education and training had on the youth labour market.

## 5 Summary and Outlook

In this sixth release of the KOF YLMI, we extended the time series to 2017. The updated values are available in the interactive web tool<sup>6</sup>, which allows for comparisons between countries and over time. Users can select their country of interest and then obtain access to graphs and scoreboards.

Our assessment of the evolution of the index between 2016 and 2017 confirms the leading positions of Switzerland and Denmark. Latvia is ranked in third place and is followed by the Netherlands, Germany and Austria. The trend towards improving the youth labour market situation is also visible in most of the countries. Among the countries that have sufficient data, 25 out of 35 present a score that is higher in 2017 than in the previous year. Furthermore, in 2017 no country has an index value below 4, while 22 countries have a value of 5 or above.

In this sixth release, we updated the list of countries included in the KOF YLMI by exclusively considering the countries that are recognised by the UN. Concretely, this means that we dropped eight entries that are not formally recognised as countries and added 23 entries, bringing the total now to 193 countries. We also revised the country groups; we decided to drop country groupings that are subject to frequent changes and keep only the more stable groups as well as groups based on geographical regions.

From the methodological point of view, the sixth release of the index contributes to the existing work by testing the equal weighting scheme with an optimal weighting scheme, which we derived using a factor analysis. The results suggest that the optimal weights differ only in a moderate way from the equal weights. The largest difference are in the Working Condition dimension, which should have higher weights, while the Transition Smoothness dimension should optimally have less weight than the one assigned in the equal scheme. However, these differences do not heavily influence the index values.

As in the previous releases, the update of the KOF YLMI allows the Education Systems research division to shed light on a particular aspect of the youth labour market. With this report, we focused particularly on the Formal Education and Training Rate. After reviewing the definition, we present the evolution of this indicator over the 2007–2017 period. Our descriptive analysis highlights two important facts. First, we observed large differences across countries. Countries such as the Netherlands, Luxembourg and Slovenia have about 75% of their young population participating in formal education and training, while countries such as Turkey, Malta and the UK show a rate that is only slightly above 50% in 2017. Second, some countries experienced a reduction in the share of youth taking part in formal education or training, while the majority of the other countries experienced an increase over the last decade, which in some cases is even larger than 20 percentage points.

In the future, we will pursue yearly updates of the index values and a continuous check of the methodological aspects. We also plan to conduct further analyses on the evolution of single indicators as well as comparisons across countries based on the entire set of indicators.

---

<sup>6</sup>Access at <http://viz.kof.ethz.ch/public/yunemp/>

## Bibliography

- Eurostat (2013). Lifelong learning (metadata). [http://epp.eurostat.ec.europa.eu/cache/ITY\\_SDDS/en/trng\\_esms.htm](http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/en/trng_esms.htm) [accessed 10.12.2013].
- ILO (2011). *Key Indicators of the Labour Market, Seventh Edition*. International Labour Office Geneva. [http://www.ilo.org/empelm/pubs/WCMS\\_114060/lang--en/index.htm](http://www.ilo.org/empelm/pubs/WCMS_114060/lang--en/index.htm) [accessed 11.09.2013].
- Koenig, J. & Ohr, R. (2013). Different Efforts in European Economic Integration: Implications of the EU Index. *Journal of Common Market Studies*, 51(6), 1074–1090.
- Nardo, M., Saisana, M., Saltelli, A., Tarantola, S., Hoffman, A., & Giovannini, E. (2008). *Handbook on Constructing Composite Indicators: Methodology and User Guide*. OECD publishing.
- Pusterla, F. (2015). How did the Youth Labour Market Situation Evolve between 2012 and 2013? Second Release of the KOF Youth Labour Market Index. *KOF Studies*, (67).
- Renold, U., Bolli, T., Egg, M. E., & Pusterla, F. (2014). On the Multiple Dimensions of Youth Labour Markets. *KOF Study*, (51).

## A Methodological Notes on the Sixth Release

This section recalls the data sources of the indicators that compose the KOF YLMI. Compared to the previous releases, the sixth release contains no methodological changes with respect to the definition of indicators or calculation procedures. Readers who are interested in methodological aspects such as indicator definitions, the standardization scale, or index aggregation should refer to the technical manuals of the previous releases.

The principal repositories of the KOF YLMI remain the same as the ones in the previous release. As highlighted by Table 8, the main data sources for this sixth release are the ILO, the OECD and Eurostat<sup>7</sup>. As in the previous releases, we matched data sets from these three institutions to increase geographical coverage; we then validated comparability by checking definitions and consistency of values across data sets.

As mention in Section 3, in this sixth release we conducted an update of the list of countries included in the KOF YLMI by exclusively considering the countries recognised by the United Nation. The KOF YLMI now covers all 193 countries recognised by the United Nation, even though 15 countries were disposed of as there are no data for any of the indicators. Altogether, the number of country observations in the KOF YLMI sixth release increases by about 4% relative to the previous release.

Appendix B reports extensive information on data sources, time, and geographical coverage for every indicator.

Table 8: Summary of Data Availability

Indicator	Source	Time coverage	No. of countries
<i>Activity State</i>			
Unemployment Rate	ILO KILM & ILOSTAT	1991 - 2017	up to 178
Relaxed Unemployment Rate	Eurostat	2005 - 2017	up to 35
NEET Rate	Eurostat, ILO KILM & ILOSTAT	1998 - 2017	up to 141
<i>Working Conditions</i>			
Temporary Worker Rate	Eurostat	1992 - 2017	up to 35
Involuntary Part-Time Workers Rate	OECD & SFSO	1991 - 2017	up to 42
Atypical Working Hours Rate	Eurostat	1992 - 2017	up to 35
In-Work at-Risk-of-Poverty Rate	Eurostat	2003 - 2017	up tp 34
Vulnerable Employment Rate	ILO KILM & ILOSTAT	1991 - 2017	up to 177
<i>Education</i>			
Formal Education and Training Rate	Eurostat & SFSO	1996 - 2017	up to 35
Skills Mismatch Rate	Eurostat, ILO KILM & ILOSTAT	1992 - 2017	up to 60
<i>Transition Smoothness</i>			
Relative Unemployment Ratio	ILO KILM & ILOSTAT	1991 - 2017	up to 178
Incidence of Long-Term Unemployment Rate	Eurostat, ILO KILM, ILOSTAT & OECD	1991 - 2017	up to 130

<sup>7</sup>In a few cases, the data sources are completed by data from national institutions such as the Swiss Federal Statistical Office (SFSO).

## B Detailed Information on Data Availability

Table 9: Detailed Information on Data Sources, Extraction Methods, Number of Covered Countries and Time Coverage

Indicator	Sources	Countries covered in at least one year	Countries covered in 2016 (5th release)	Countries covered in 2017 (6th release)	Years
Unemployment Rate		178	175	178	1991 - 2017
	<b>ILO - ILOSTAT, Key Indicators of the Labour Market (KILM): Unemployment rate - ILO modeled estimates, May 2018 [Source: ILO estimate; Age: 15-24; Time: 2000-2017]</b> Last update 18.03.2019	178	175	178	2000 - 2017
	<b>ILO - KILM 9th Edition Table 10a: Youth unemployment (ILO estimates) [Youth unemployment rate; Countries: Select all, exclude Samoa; Income group: Select all; Year: 1991-2014; Sex: MF; Type of statistic: Select all]</b> Extracted on 08.03.2016	170	-	-	1991 - 2014
Relaxed Unemployment Rate	<b>Eurostat - Unemployment [lfsa_ugan; Age: 15-24; Citizens: Total; Geo: Select all; Sex: Total; Time: 1995-2017; Unit: Thousand] Last update 13.12.2018; Supplementary indicators to unemployment [lfsi_sup_a; Age: 15-24; Geo: Select all; INDIC_EM: NSEE_AV; Sex: Total; Time: 2005-2017; Unit: Thousand] Last update 24.04.2019; Population [lfsa_pganws; Age: 15-24; Citizens: Total; Geo: Select all; Sex: T; Time: 1995-2017; Unit: Thousand; WStatus: ACT]</b> Last update 09.01.2019	35	30	34	2005 - 2017

NEET Rate		142	83	83	1998 - 2017
	<b>ILO - ILOSTAT, Key Indicators of the Labour Market (KILM): Youth NEET rate [Share of youth not in employment, education or training (NEET) (%); Source: all; Time: 2000-2017] Last update 04.02.2019</b>	141	83	83	2000 - 2017
	<b>ILO - KILM 9th Edition Table 10c: NEET Rates [Share of youth not in education, employment, or training; Countries: Select all, exclude Samoa; Income group: Select all; Year: 1998-2014; Age: 15-24; Repository: Select all; Type of source: Select all; Coverage: Select all; Geographical coverage: Select all] Extracted on 24.11.2015</b>	106	-	-	1998 - 2014
	<b>Eurostat - Young people neither in employment nor in education and training by sex and age (NEET rates) [NEET rate; Sex: Total; Age: 15-24; Year: 2000-2014; Unit: Percentage; WStatus: NEMP] Last update 08.10.2015</b>	33	-	-	2000 - 2014
Temporary Worker Rate	<b>Eurostat - Temporary employees by sex, age and duration of the work contract [lfsa_etgadc; Age: 15-24; Duration: Less than 1 month, From 1 to 3 months, From 4 to 6 months, From 7 to 12 months, From 13 to 18 months; Geo: Select all; Sex: T; Time: 1992-2017] Aggregated values (1 to 18 months) obtained from Eurostat on 18.02.2019 after direct request; Employment by sex, age and citizenship [lfsa_egan; Age: 15-24; Citizen: Total; Geo: Select all; Sex: T; Time: 1995-2017]</b>	35	34	35	1992 - 2017



## B. DETAILED INFORMATION ON DATA AVAILABILITY

Involuntary Part-Time Workers Rate		42	42	42	1991 - 2017
	<b>OECD</b> - <i>Incidence of involuntary part time workers [Country: Select all; Time: 1991-2017; Sex: All persons; Age: 15-24; Employment status: Total Employment; Series: Share of involuntary part-timers in total employment]</i> Extracted on 04.02.2019	41	41	41	1991 - 2017
	<b>Swiss Federal Statistical Office</b> - <i>Involuntary part-time workers [Involuntary part-time workers are part-timers (working less than 30-usual hours per week) because they could not find a full-time job]; Data obtained from the SFSO on 05.02.2019 after direct request. Note that the values for the years 2007-2010 and 2013-2014 have relatively low reliability. Please interpret those values with caution.</i>	1	1	1	2004 - 2017
Atypical Working Hours Rate	<b>Eurostat</b> - <i>Employees working shifts as a percentage of the total of employees [lfsa_ewpshi; Age: 15-24; Geo: Select all; Sex: T; Time: 1992-2017] Last update 23.05.2019, Employed persons working at nights as a percentage of the total employment [lfsa_ewpnig; Age: 15-24; Frequenc: Usually; Geo: Select all; Sex: T; Time: 1992-2017; WStatus: EMP] Last update 23.05.2019, Employed persons working on Sundays as a percentage of the total employment [lfsa_ewpsun; Age: 15-24; Frequenc: Usually; Geo: Select all; Sex: T; Time: 1992-2017; WStatus: EMP], Last update 23.05.2019</i>	35	32	34	1992 - 2017

In-Work at-Risk-of-Poverty Rate	<b>Eurostat</b> - <i>In-work at-risk-of-poverty rate by age and sex</i> [ <i>ilc_iw01</i> ; Age: 15-24; Geo: Select all; Sex: T; Time: 2003-2017; WStatus: EMP] Last update 22.05.2019	34	33	33	2003 - 2017
Vulnerable Employment Rate	<b>ILO</b> - <i>ILOSTAT, Key Indicators of the Labour Market (KILM): Status in employment - ILO modeled estimates, Nov. 2018 [Own-account workers, Contributing family workers, Total employment; Sex: Tot; Time: 1991-2017]</i> Extracted on 18.03.2019	177	175	177	1991 - 2017
	<b>ILO</b> - <i>KILM 9th Edition Table 3: Status in Employment [Share of vulnerable employment in total employment; Countries: Select all, exclude American Samoa, Anguilla, Antigua and Barbuda, Aruba, British Virgin Islands, Cayman Islands, Cook Islands, Djibouti, Dominica, French Guiana, French Polynesia, Germany (Federal Republic of), Grenada, Guam, Isle of Man, Kosovo, Marshall Islands, Montserrat, Netherlands Antilles, New Caledonia, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Sao Tome and Principe, Tonga, Turks and Caicos Islands, Tuvalu, Vanuatu; Income group: Select all; Year: 1998-2014; Age: Select all; Repository: Select all; Type of source: Select all; Coverage: Select all; Geographical coverage: Select all]</i> Extracted on 01.12.2015	157	-	-	1991 - 2014

Formal Education and Training Rate		35	34	35	1996 - 2017
	<b>Eurostat</b> - <i>Participation in education and training</i> [trng_lfs_09; Age: 15-24; Geo: Select all; Sex: T; Time: 2004-2017; TYPTRAI: Formal education and training; Unit: PC] Last update 15.01.2019. Values for year 2003 obtained from Eurostat on 10.09.2015 after direct request.	35	34	35	2003 - 2017
	<b>Swiss Federal Statistics Office</b> - <i>Participation rate in formal education and training (last 4 weeks) [by sex and age (15-24), frequencies in percent]</i> Data available from the SFSO upon request	1	-	-	1996 - 2002
Skills Mismatch Rate		60	34	35	1992 - 2017
	<b>Eurostat</b> - <i>Active population by sex, age and educational attainment level (1 000) [lfsa_aged; Sex: Total; Age: From 15 to 24 years &amp; from 25 to 29 years; Unit: Thousand; Time: 1992-2017] Last update: 11.03.2019 - Employment by sex, age and educational attainment level (1 000) [lfsa_aged; Sex: Total; Age: From 15 to 24 years &amp; from 25 to 29 years; Unit: Thousand; Time: 1992-2017] Last update: 11.03.2019</i>	35	34	35	1992 - 1999 2013 - 2017
	<b>ILO</b> - <i>KILM 8th Edition Table 15a: Skills mismatch between labour supply and demand by educational attainment [Skills mismatch; Sex: MF; Year: 2000-2013; exclude: Samoa]</i> Extracted on 02.02.2015	59	-	-	2000 - 2013

Relative Unemployment Ratio		178	175	178	1991 - 2017
	<b>ILO - ILOSTAT, Key Indicators of the Labour Market (KILM):</b> Unemployment rate - ILO modeled estimates, Nov. 2018 [Source: ILO estimate; Age: 15-24 & 25+ ; Time: 2000-2017] Last update 18.03.2019	175	175	178	2000 - 2017
	<b>ILO - KILM 9th Edition Table 10a:</b> Youth unemployment (ILO estimates) [Ratio of youth unemployment rate to adult unemployment rate; Countries: Select all, exclude Samoa; Income group: Select all; Year: 1991-2014; Sex: MF; Type of statistic: Select all] Extracted on 01.22.2015	170	-	-	1991 - 2014
Incidence of Long-Term Unemployment Rate		130	75	85	1991 - 2017
	<b>ILO - ILOSTAT:</b> Unemployment by sex, age and duration [Sex: Total, Age: 15-24 Duration: Total (aggregate duration) & 12 months or more; Source: all; Time: 2000-2017] Extracted on 28.05.2019	128	75	85	2000 - 2017
	<b>ILO - KILM 9th Edition Table 11a:</b> Long-term unemployment [Incidence of long-term unemployment; Countries: Select all, exclude French Polynesia; Income group: Select all; Year: 1991-2014; Sex: MF; Age group: Youth; Repository: Select all; Type of source: Select all; Coverage: Select all; Geographical coverage: Select all] Extracted on 10.03.2016	87	-	-	1991 - 2014

	<b>OECD - OECD.Stat [Unemployment by duration; Year: 1991-2013; Sex: All Person; Age: 15 to 24; Frequency: Annual; Unit: Persons, thousands]</b> Extracted on 06.07.2015 - <i>OECD.Stat [Incidence of unemployment by duration; Year: 1991-2013; Sex: All Person; Age: 15 to 24; Unit: Percentage]</i> Extracted on 06.07.2015	12	-	-	1997-2013
	<b>Eurostat - Long-term unemployment (12 months or more) as a percentage of the total unemployment, by sex, age and nationality (%) [lfsa_upgan; Age: From 15 to 24 years; Citizen: Total; Geo: Select all; Sex: Total: Time: 1995-2014; Unit: Percentage]</b> Last update 24.02.2016	1	-	-	1998-2014

*Notes:* Data sources might change over releases due to data availability. Values for certain countries/years, which are no longer contained in the last version of the repository, are included from previous release of the KOF YLMI.