PERSPECTIVES DE POLITIQUE ÉCONOMIQUE

N° 36
NOVEMBER 2020

COMPETITIVENESS REPORT 2020

Vulnerabilities and resilience

LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de l'Économie

Observatoire de la compétitivité

COMPETITIVENESS REPORT 2020

Vulnerabilities and resilience

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Ministère de l'Économie
Observatoire de la compétitivité

19-21 Boulevard Royal
L-2449 Luxembourg

observatoire@eco.etat.lu

November 2020
ISBN: 978-2-919770-26-7

This publication can be downloaded from
https://odc.gouvernement.lu

Competitiveness Report 2020

The cut-off date of this report is the 18th November 2020.

The following persons contributed to this publication:

Serge ALLEGREZZA
Ministry of the Economy/STATEC

Aurélie GILLEN
Max JENTGEN
Laurent PUTZ
Giulia SPALLETTI
Ministry of the Economy

Chiara PERONI
STATEC
and the STATEC Research ASBL team

Preface

The progressive spread of Coronavirus across the globe has completely distressed our lives and the economy. Most countries have been forced to drastically restrict their citizens' social contacts and even temporarily reduce the economic activity. The health crisis has thus morphed into an unprecedented economic crisis, the full extent of which will only be known in the long run.

Eventually, the present edition of the Competitiveness Report entitled "Vulnerabilities and resilience" is marked by the impact of both health and economic crisis caused by the COVID-19 pandemic. The Report assesses the competitiveness of Luxembourg prior to the crisis, provides insights of the situation during the pandemic while comparing Luxembourg to its neighbouring countries and puts forward the lessons to be learned from the crisis in order to prepare for the future.

Over the last years, Luxembourg has maintained a solid industrial base, an attractive business environment and priority strategic sectors with high added value, as well as a highly-qualified local and international workforce. This is reflected in the national scoreboard drawn up by the Observatoire de la compétitivité. Indeed, Luxembourg ranks 4th in 2019 among the European Union in its overall competitiveness ranking while maintaining its position of the previous year. Luxembourg ranks once again in the "high performance" group.

Despite its enviable results and as most EU member states, Luxembourg experiences a significant recession as a result of COVID-19. Supporting and even saving our companies and their workers who are confronted with temporary difficulties due to the current situation remains our top priority for the short term.

However, we cannot lose sight of medium and long-term objectives beyond immediate actions. On 6 July 2020, a seminar entitled "What lessons can be learned from the economic crisis COVID-19 in Luxembourg" was organised by the ODC with the aim of drawing the first lessons from this crisis and gathering ideas and opportunities to be seized in order to develop a post-crisis economic scenario that better integrates social and environmental aspects. Hence, joint insights of initial findings emerging from these fruitful exchanges are included in the present edition of the Report.

Luxembourg is now facing a series of challenges and threats amplified by this crisis, which may affect its future development. If addressed in a proactive and dynamic manner, these challenges may offer new development opportunities. Indeed, in the coming years, we must focus on a number of structural elements to make our economy more resilient. Therefore, the digital and sustainable transformation of the economic environment plays a crucial role.

In recent years, we have witnessed a remarkable shift in economic trends, such as the acceleration of digitalisation, increasing risks and threats due to an ageing population, as well as greater pressure on available resources. In addition, climate change and the deterioration of the natural environment are matters that are becoming increasingly problematic on a global level. These megatrends must be an integral part of the analysis of the opportunities and challenges faced by our country. In this perspective, the concept of productivity is a key element. The increase of productivity related to capital, labour and in general to resources, must be considered as the main driver of development in Luxembourg. In order to embark on a strategy towards higher quality development that is less resource-intensive, we must prioritise the maximization of productivity gains.

As of today, both digitalisation and energy transition are key in this discussion. Our companies are directly affected by these two megatrends, meaning that they must adapt and find appropriate solutions while being supported in their efforts by the Ministry of the Economy. Indeed, the Ministry of the Economy contributes proactively to the development and resilience of our economy, and ultimately, to the country's prosperity. Economic development cannot be an objective per se. The aim is to promote sustained, shared and sustainable economic growth to ensure the well-being of all citizens and workers in Luxembourg.

Finally, we must join forces to achieve our ambitious goals. By mobilising our national stakeholders, as well as our partners in the Greater Region, the European Union and the rest of the world, and by considering the future of our country in an international context, we will be able to jointly deal with the opportunities and challenges that lie ahead.

Franz Fayot
Minister of the Economy

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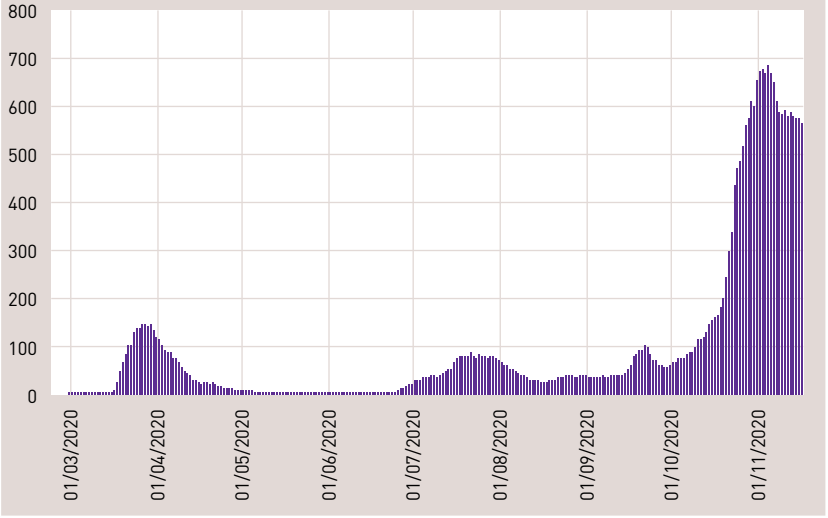
1 Impact of the COVID-19 pandemic in Luxembourg

2020 will forever be remembered as the year in which the coronavirus (COVID-19) pandemic wreaked havoc across the world. This pandemic, unprecedented in modern times, has caused a major health crisis that has in turn led to an economic, financial and social crisis from which Luxembourg has not been spared.

With Luxembourg's first confirmed case of a person infected with COVID-19 recorded on 1 March 2020,[1] the virus spread in a matter of weeks in the neighbouring countries, across Europe and throughout almost every country in the world. At the time of writing, Luxembourg has carried out more than 1,200,000 tests since the start of the pandemic, with almost 26,000 people testing positive for COVID-19.[2]

Chart 1
Development in the number of people testing positive for COVID-19 per day



Source: Ministry of Health (www.covid19.lu)

To minimise the number of deaths and contain the damaging effects of the virus on human health, in March 2020 the Luxembourg government decided, among other measures, to limit travel and professional activities and to cancel all non-essential events. These far-reaching restrictions affected people, businesses and the entire economy simultaneously. Although the pandemic is first and foremost a health risk to citizens and workers, it inevitably also has massive economic consequences.[3]

The budgetary margin for manoeuvre that Luxembourg has enjoyed over the last few years made it possible to implement significant emergency public health measures to limit the pandemic's economic impact and attempt to safeguard as many jobs as possible. Thus, several measures aiming at limiting the damage to the economy were quickly put in place: partial unemployment, repayable advances and non-repayable grants for businesses and the self-employed, and leave for family reasons so that parents could look after their children while schools and childcare facilities were closed.

1 https://gouvernement.lu/fr/actualites/toutes_actualites/communiques/2020/03-mars/01-premier-cas-corona.html

2 https://msan.gouvernement.lu/fr/graphiques-evolution.html

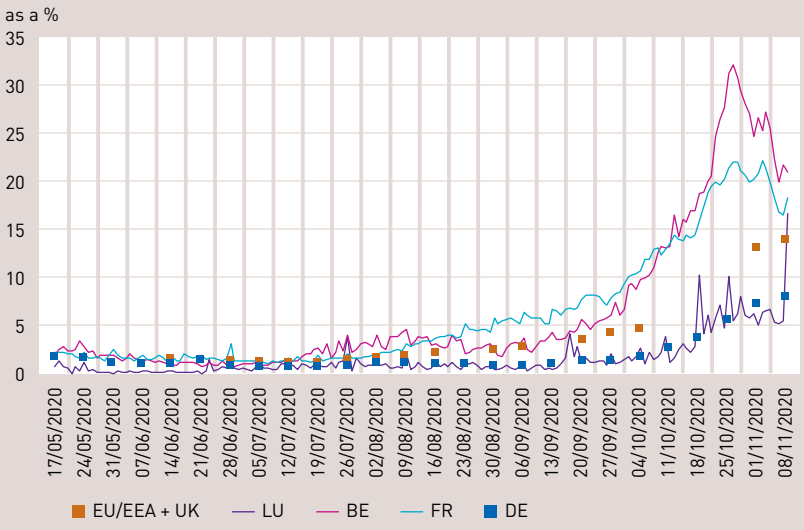
3 National Reform Programme as part of the European semester https://odc.gouvernement.lu/fr/publications/rapport-etude-analyse/programme-national-de-reforme/2020-pnr-luxembourg-2020.html

This chapter aims to summarise a number of key business-cycle, short-term and high-frequency indicators, in order to assess the economic impacts of the pandemic eight months after lockdown began. These indicators are the first opportunity for us to evaluate Luxembourg's economic health and the pandemic's impact thus far.

1.1 Key indicators

1.1.1 International comparison

Chart 2
Positivity rate

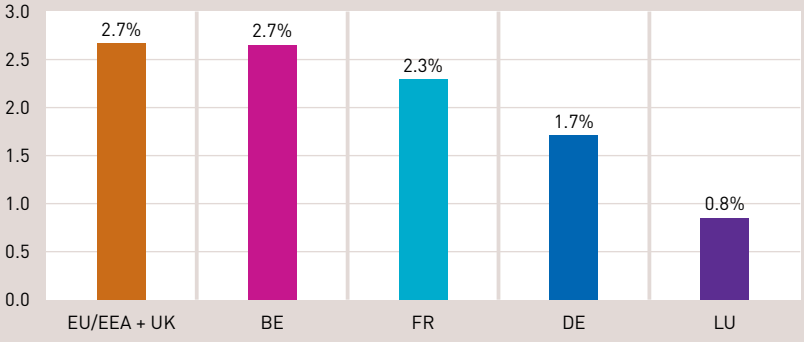


Note: Squares = weekly data
Sources: covid-19.lu, sciensano.be, santepubliquefrance.fr, rki.de, ECDC
Calculations: Observatory for Competitiveness (ODC)

Positivity rate

- The ratio of the number of positive COVID-19 tests to the number of tests performed has increased since mid-September. Starting in mid-October, the number of positive cases has risen rapidly.
- The positivity rate in Luxembourg is lower than in France and Belgium, but higher than in Germany.

Chart 3
Mortality rate

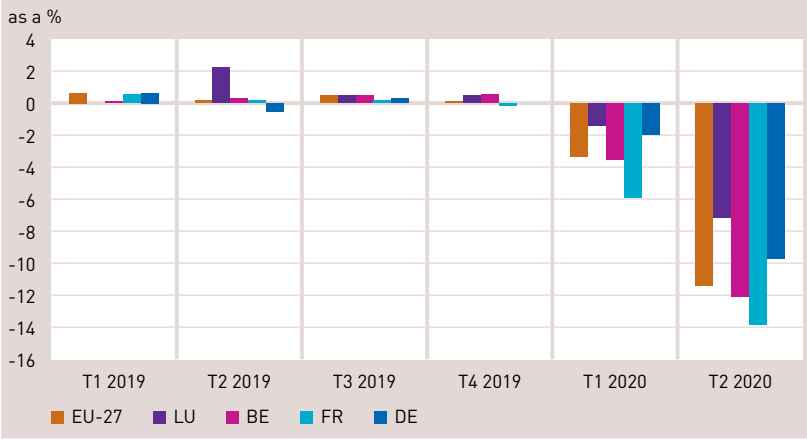


Note: Mortality rate linked to COVID-19 up to 8 November 2020
Sources: covid-19.lu, sciensano.be, santepubliquefrance.fr, rki.de, ECDC
Calculations: ODC

Mortality rate

- The mortality rate linked to COVID-19 in Luxembourg is currently below both the EU/EEA+UK average and the rates in the neighbouring countries.

Chart 4
GDP at market prices

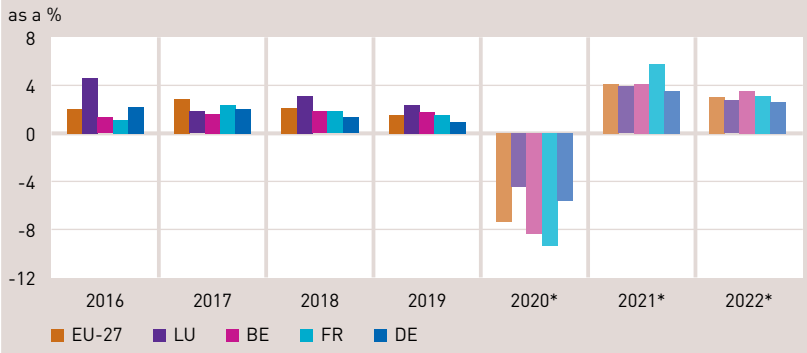


Note: Data adjusted for seasonal and calendar effects; 2020 quarters are offset by one quarter in relation to the same quarter of the previous year
Source: Eurostat

Gross domestic product (GDP)

- The COVID-19 pandemic has had a devastating impact on GDP in 2020 following the ceasing of activity during lockdown.
- In the second quarter of 2020, Luxembourg's GDP shrank by 7.2% compared to the same period in 2019 (the strongest quarterly drop since 1995). However, the contraction experienced in Luxembourg is slightly less severe than in the neighbouring countries.
- An economic slowdown was already visible at the end of the first quarter following the implementation of measures to counter the spread of the virus.

Chart 5
GDP volume growth rate

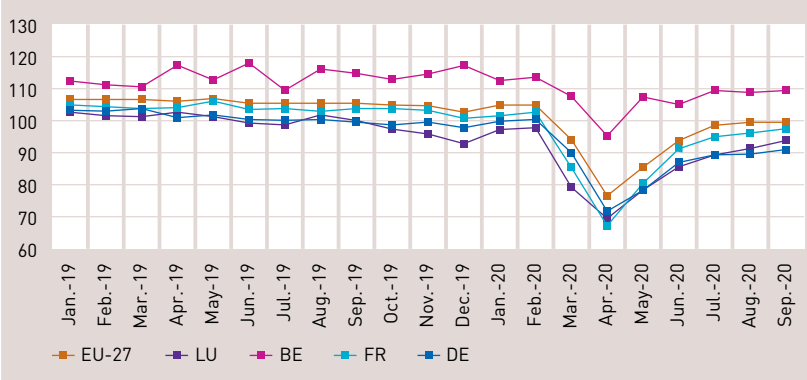


Note: * Projections for 2020-2022 made as part of the Autumn 2020 European Economic Forecast published on 5 November 2020
Sources: European Economic Forecast Autumn 2020 (European Commission), Note de conjoncture 1-2020 (STATEC)

GDP volume growth-rate projections

- According to the Autumn 2020 European Economic Forecast, the European Commission expects negative GDP growth in 2020 in all countries analysed, followed by a rebound in 2021 and 2022.
- However, STATEC believes that Luxembourg will record a GDP volume growth rate of -6% this year and +7% in 2021.

Chart 6
Production volume index

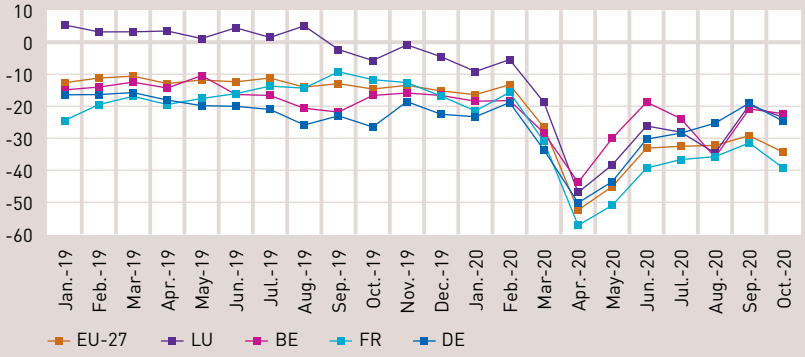


Note: Monthly production; data adjusted for seasonal and calendar effects; 2015 = 100
Source: Eurostat

Industrial production

- In 2019, Luxembourg's industrial production was on a downward trend (index 92.8 at the end of 2019), with troughs recorded during the summer and at the end of the year.
- Industrial production hit a major low in April 2020, reaching its lowest level in all countries analysed, before increasing again, albeit remaining below pre-crisis levels.

Chart 7
Consumer confidence index

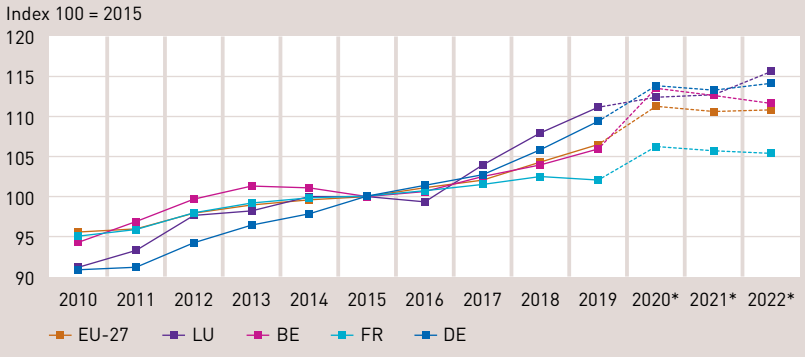


Note: The consumer confidence index only takes into account "general expectations of the economic situation for the next 12 months"
Source: Business and consumer surveys (European Commission)

Confidence index

- Consumer confidence has been severely affected by the health and economic crisis in all countries analysed.
- Luxembourg consumers, who were more confident than their counterparts in the neighbouring countries, have not yet rediscovered their pre-crisis confidence, which remains well below 2019 levels.

Chart 8
Nominal unit labour costs

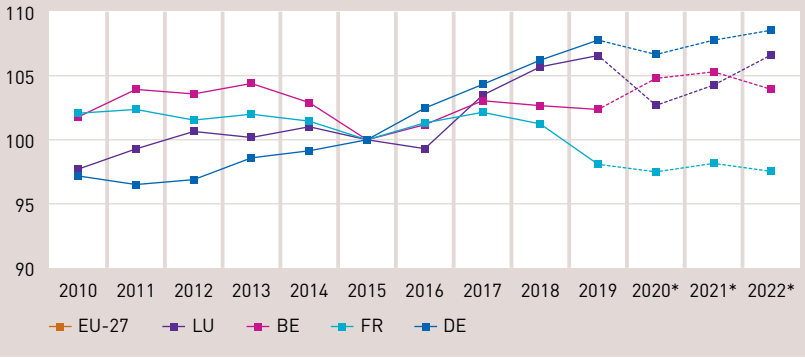


* Projections for 2020-2022 made in November 2020 (taking into account the COVID-19 crisis)
Source: AMECO

Nominal unit labour costs

- Luxembourg pulled away from its neighbours in terms of nominal ULC until 2019. The growth in this ratio of labour costs to productivity is expected to slow over the next two years.

Chart 9
Real effective exchange rate

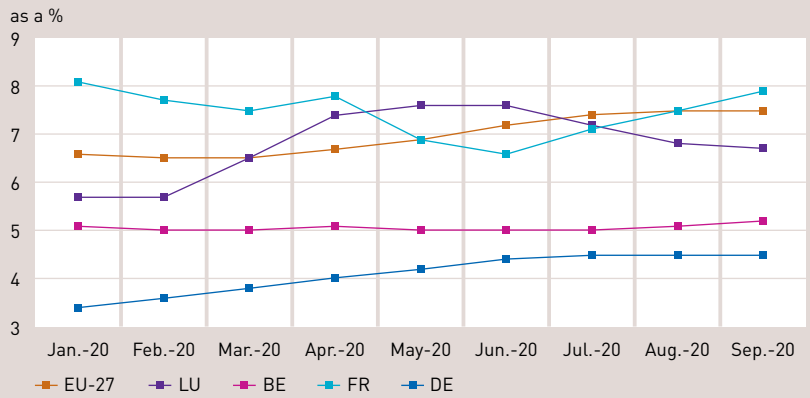


* Projections for 2020-2022 made in November 2020 (taking into account the COVID-19 crisis)
Source: AMECO

Real effective exchange rate

- Current projections point to an improvement in cost competitiveness between 2019 and 2020. However, Luxembourg's real effective exchange rate is expected to worsen thereafter.

Chart 10
Unemployment rate

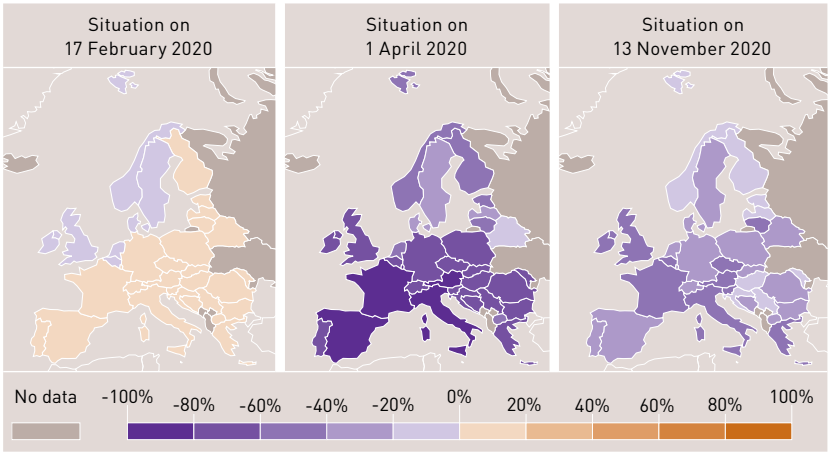


Note: People in partial unemployment due to the COVID-19 crisis are not counted in these figures.
Source: Eurostat

Unemployment rate

- Having increased between February and May, the unemployment rate has been falling again since June 2020.
- In September, Luxembourg's unemployment rate (6.7%) was below the EU-27's (7.5%) and France's. On the other hand, Belgium and Germany had lower unemployment rates.

Chart 11
Mobility trends: retail & recreation



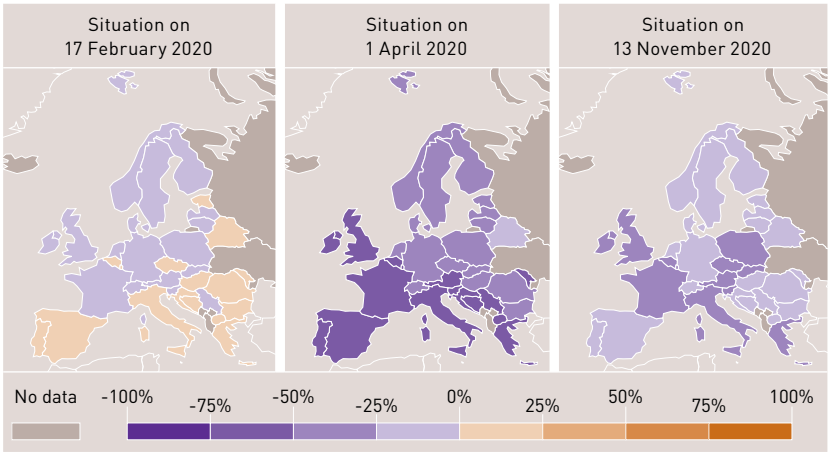
Source: https://ourworldindata.org/covid-mobility-trends

Mobility trends: retail & recreation

- Recreational travel is still far below pre-crisis levels (Luxembourg: -22.6%; Belgium: -54.6%; Germany: -31%; France: -58%).

  Note: 7-day moving average. The baseline is the median value for the corresponding day of the week for 5 weeks between 3 January and 6 February 2020.

Chart 12
Mobility trends: workplaces



Source: https://ourworldindata.org/covid-mobility-trends

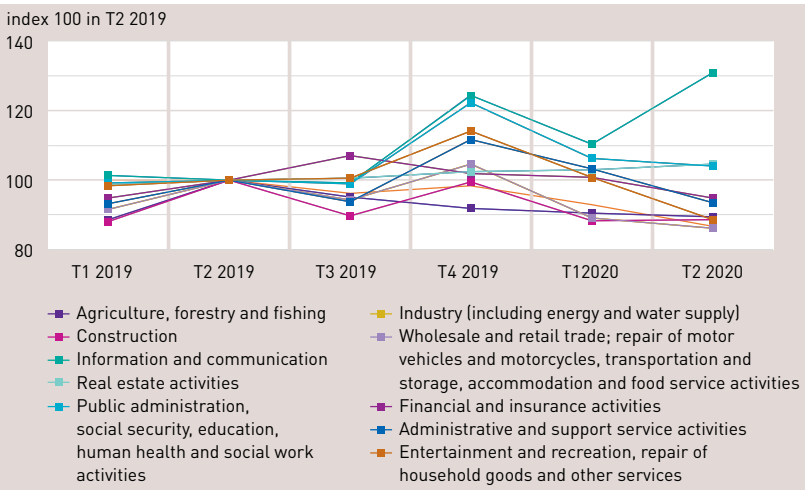
Mobility trends: workplaces

- Travel to workplaces follows the same trend (Luxembourg: -23.7%; Belgium: -45.7%; Germany: -15.9%; France: -39.3%).

  Note: 7-day moving average. The baseline is the median value for the corresponding day of the week for 5 weeks between 3 January and 6 February 2020.

1.1.2 National focus

Chart 13
Gross added value at basic prices, by sector

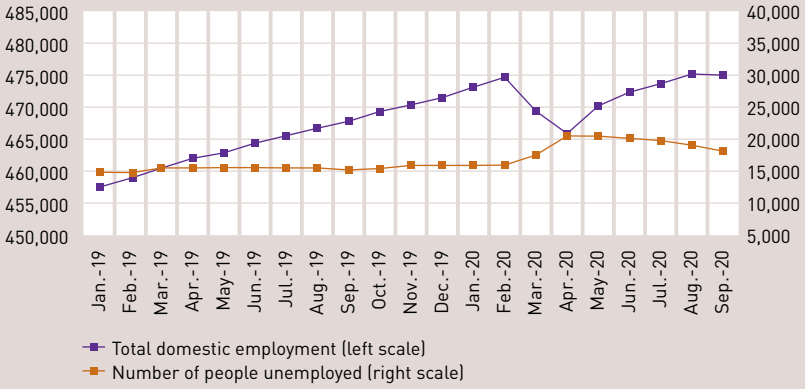


Source: STATEC, calculations by ODC

Added value by economic sector

- The second quarter of 2020 saw a major increase in the added value produced by the information and communication sector (+31% over the same quarter of 2019), and a more modest increase in real-estate activities (+4.5%).
- The other sectors recorded a drop of between 5% (financial and insurance services) and 13.8% (commerce).
- The industrial and commercial sectors lost the most dynamism (-13.2% and -13.8% respectively compared to the same period in 2019).

Chart 14
Employment and unemployment

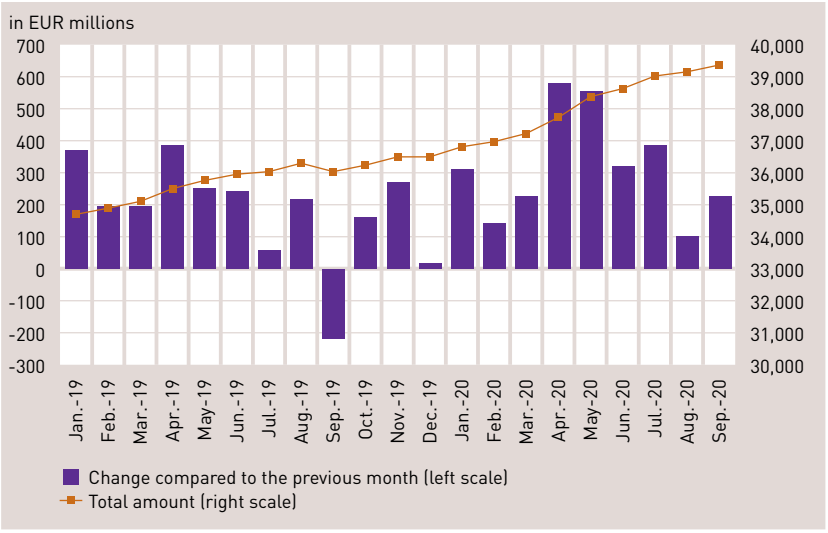


Note: Seasonally adjusted data
Sources: STATEC, IGSS, ADEM

Employment and unemployment

- Total domestic employment (salaried and non-salaried) fell significantly during lockdown.
- The number of people unemployed hit its peak in May 2020 at 20,476, an increase of 32.8% over May 2019, while this number was 18,959 in August 2020.
- The employment rate fell from 7% of the labour force in April to 6.4% in August 2020.
- People in partial unemployment due to force majeure linked to the COVID-19 crisis are not counted in the unemployment figures.

Chart 15
Household demand deposits in Luxembourg banks

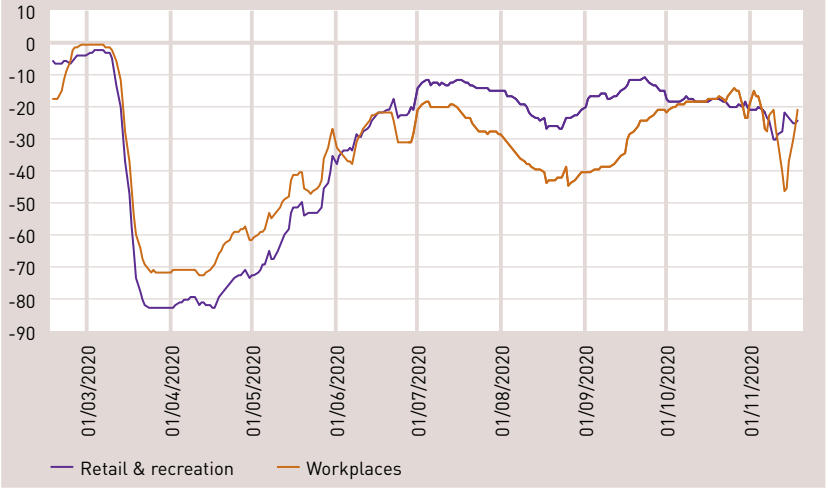


Sources: BCL, STATEC (Conjoncture Flash, June 2020)

Household savings

- To the contrary, the lockdown strongly limited the consumption of households, who as a result accumulated enforced savings on their current accounts to form a reserve against the backdrop of a highly uncertain environment.
- Consequently, Luxembourg residents' demand deposits increased by 1.6% in April in relation to the previous month, and by 1.5% in May (compared to 1.1% and 0.7% respectively at the same time the previous year).

Chart 16
Mobility trends

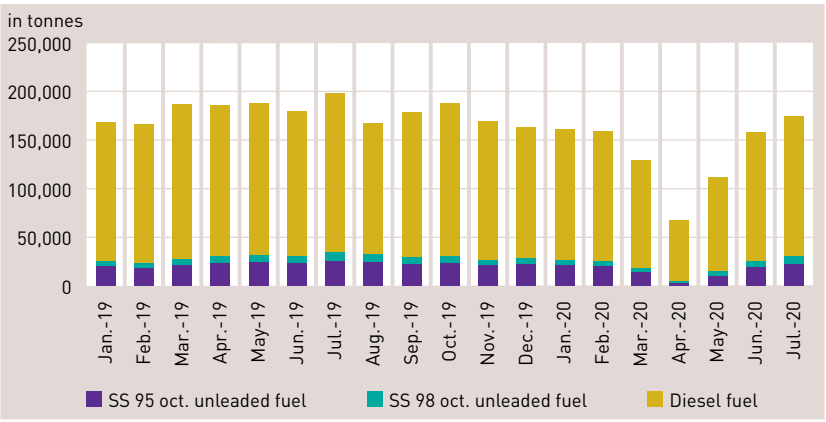


Moving average over 7 days (baseline: median value for the corresponding day of the week between 3 January and 6 February 2020)
Source: COVID-19 Community Mobility Reports – Google, ODC calculations

Mobility trends

- Following lockdown, citizens' mobility was strongly reduced, and is still yet to reach pre-crisis levels.
- The lowest point was recorded on 13 April 2020, when recreational travel and commuting were 93% and 92% lower than pre-crisis levels respectively.
- Following the renewed increase in positive cases since October, mobility has slowed once again.

Chart 17
Fuel sales



Source: STATEC, Conjoncture flash, September 2020

Fuel sales

- The lockdown measures, which restricted travel, caused fuel sales in Luxembourg to plummet.
- Fuel sales dropped by 28% in the first quarter of 2020.
- Following a 56% decrease between February and April 2020, fuel sales quickly bounced back following the gradual easing of lockdown restrictions, albeit not returning to pre-crisis levels.

1.2 What lessons can be learned from the COVID-19 crisis in Luxembourg?

In a matter of weeks, COVID-19 left its mark on our lives, our societies, our economies and our collective imagination. It is a situation unprecedented in its sudden nature and global scale.

"Crisis management" and "emergency management" in an uncertain context have been the main modi operandi for several months, with the virus and its direct impacts on economic life catapulting the Ministry of the Economy centre stage: releasing emergency funds to businesses, devising a recovery plan, a stimulus package and more – all within just weeks – to cushion the effects of the crisis.

As soon as the virus became a part of our lives, coming up with answers that are equal to the challenge became a collective concern for all the players involved, from a health, social and economic perspective. Hence, a wide range of Luxembourg organisations have published analyses and led the debate on how to set up the "post-Covid world". So that the authors can share their points of view with the different stakeholders involved in these discussions at national level, the Ministry of the Economy's Observatory for Competitiveness launched a process to consolidate the ideas and opportunities to seize for devising a post-crisis economic scenario taking into account its social and environmental implications: what have we done well up until now, and what must we change in how we operate? How much growth should we guarantee the country?

This process, which led to a workshop being held, owes a great deal to the exceptional commitment of players[4] from the world of business, leaders of federations, NGOs and associations, and senior civil servants, totalling around 50 people from a wide range of backgrounds who were involved between July and October 2020.

On 6 July 2020, with strict health protocols in place, a workshop was held to bring together these players and hear the different perspectives to stimulate exchange on the topic: "What lessons can be learned from the COVID-19 economic crisis in Luxembourg? How to turn this unprecedented situation into an opportunity and an accelerator for new economic and social policy". The aim of this workshop was to share current analyses, concerns and reflections without pretence, with the mutually beneficial aim of assessing the challenges and assessments from all sides and gaining a shared understanding of the situation. In the presence of Franz Fayot, Minister of the Economy, and Serge Allegrezza, Director of the Observatory, nine contributions were presented and subsequently discussed, giving rise to salient points while lending support to the development of new economic policy:

- Seven areas were identified as priorities: Industry 4.0, sustainable finance, health, food, thermal renovation, mobility, and training for green and circular jobs;
- The recovery could have four major axes: digitisation, innovation, resilience, and the right balance between local economies and globalisation;
- We must maintain trust in the future of the economy by tackling the issues surrounding public and private investment, consumption, business liquidity, tax measures and employment;
- To build a resilient society, environmental and social criteria must be taken into account in the economic recovery;
- We need to give ourselves the means to combat growing inequality and maintain social cohesion;
- Working from home has become a necessity and has transformed the way we work, social connections and the work-life balance;
- Reliable and trustworthy data is essential to bolstering efforts to anticipate and manage crises, and initiatives in this regard must be reinforced.

[4] Particular thanks to the panellists at the workshop: Christel Chatelain (Chamber of Commerce), Sylvain Hoffmann (Luxembourg Chamber of Employees), Romain Poulles (High Council for Sustainable Development), René Winkin (Federation of Luxembourgish Industrials), Muriel Bouchet (Fondation IDEA), Aline Muller (Luxembourg Institute of Socio-Economic Research/ National Productivity Board), Marc Niederkorn (McKinsey/ National Productivity Board), Blanche Weber (Mouvement écologique) and François-Xavier Borsi (Société Luxembourgeoise de l'Évaluation et de la Prospective).

This workshop, which has allowed such exchanges to flourish, has been extended to allow players in Luxembourg's economic and social life to speak in depth about what matters to them. These testimonies have helped us to hear more about experiences and the measures concretely implemented by organisations to seize on the knowledge gained. A second workshop, held on 16 November, extended these valuable exchanges. These workshops are part of a series of meetings where the various players can discuss the direction that the country's development should take to realign the policies and approaches implemented so far. Due to the persistence of the health emergency and the uncertainty regarding its ultimate economic impact, this exercise is very much a work in progress, and it would be premature to attempt to draw definitive lessons right now, or even to put ourselves on a firm path to exit the crisis.

Nevertheless, if there is one thing about the crisis that we can already say with confidence, it is that it has played the perfect role in accelerating awareness.

Awareness of our fragilities and those of the systems that sustain us; of the importance of solidarity between generations; of paying attention to those who work at the end of the chain; and of how interdependent our economic systems are. But also: awareness of the power of working together to find solutions; of mankind's ingenuity and entrepreneurial dynamism when faced with an existential threat; and of the role of government and the common interest.

2 Competitiveness compared – Luxembourg in international benchmarks

2.1 Introduction

In Luxembourg as in any country, the debate on territorial competitiveness is rekindled whenever international benchmarks and territory rankings are published. Composite indices[1] are generally used to make international comparisons as they draw together multiple sets of information under a single numerical value. By consolidating a variety of characteristics, these indices give a concise and instant view of the topic, although they remain broad and approximative. Benchmarks generally tell a more complex story than the apparent simplicity of rankings would suggest. Thus, when analysing benchmarks, it is important not to lose sight of the limits inherent in such an exercise. First of all, rankings in international comparisons are always relative in nature. Therefore, a rise or fall in rankings does not necessarily mean that a country has performed better or worse in absolute terms, but rather that its performance has changed to a greater or lesser extent than other territories. Furthermore, these rankings contain countries, or groups of countries, whose general performance and scores are almost identical; in other words, the numerical values of the composite indices are close to one another. Merely ranking countries does not usually reflect this situation. All other things being equal, a small change in the value of the composite index could lead to a major change in ranking. Consequently, a territory's ranking should not be judged in isolation without taking the value of the composite index into account. It should also be noted that the number of countries analysed in different benchmarks varies a great deal, which obviously impacts on a country's relative position in the rankings concerned. Finally, various benchmarks are often criticised for having methodological weaknesses in three areas: the quality of sources and data, the indicators used, and the calculation method for the composite index (formulae, weightings, etc.). For example, the principle of "one size fits all", which involves the use of the same indicators for all territories analysed, is naturally followed to ensure comparability; but this simultaneously makes it impossible to consider the specific characteristics of each country.

With that in mind, how much importance should we lend to these benchmarks and international rankings? While these analyses are frequently met with scepticism, they serve to put useful performance indicators in the same setting, and deserve to be taken into account. On the one hand, benchmarks summarise complex problems using one sole value, making for formidable communication tools, encouraging political debate and allowing authorities to assess their policies by comparing them with best practices. On the other hand, due to their widespread media coverage, benchmarks also have a significant impact on a territory's brand image, and may therefore influence the views of potential investors.

[1] For more information on composite indicators, see *Competence Centre on Composite Indicators and Scoreboards*: https://ec.europa.eu/knowledge4policy/composite-indicators_en

This chapter provides a descriptive summary of some main benchmarks on competitiveness and its determining factors, with a specific focus on Luxembourg's performance and position in the respective rankings.[2] To avoid the problems involved in comparing benchmarks that cover differing numbers of countries, Luxembourg's position is additionally indicated in relation to a fixed reference group: the Member States of the European Union plus the United Kingdom. Thus, the chapter includes an adjusted EU-27 + UK ranking for the different benchmarks. The benchmarks presented here were selected to cover multiple facets of competitiveness and local attractiveness, but are far from exhaustive. In light of the health and economic crisis linked to the COVID-19 pandemic, countries' vulnerabilities and economic resilience have become key catchphrases in political debate. With that in mind, this chapter first and foremost sheds light on two corresponding benchmarks

2.2 Vulnerability and resilience

The COVID-19 pandemic caught the entire world unawares. The Great Lockdown took a huge toll on economic activity. The duration, severity and impacts of this crisis are yet to be determined, as is the pathway out of it. The extent of the economic slowdown and impact differs from country to country. Two aspects are of key importance here: the measures taken by public authorities to combat the health and economic crisis, and the structural vulnerability of countries in the face of a pandemic of this scale. The economic recovery depends on a number of cyclical and structural factors. A key aspect here is how resilient a country's economy is. Strong resilience makes a country better equipped to deal with shock and to recover more quickly from the after-effects.

To assess Luxembourg's performance in this area, two specific benchmarks are presented here: the Pandemic Vulnerability Index, developed by Creditreform Rating AG, and FM Global's Resilience Index.

[2] The Observatory for Competitiveness's website has information on a multitude of benchmarks: https://odc.gouvernement.lu/fr/statistiques/benchmarks-internationaux.html

a. Pandemic Vulnerability Index (Creditreform Rating AG)

To estimate the potential impact of the COVID-19 pandemic on the 27 Member States of the European Union (EU) and the United Kingdom, Creditreform Rating AG, a leading European rating agency, has developed the Pandemic Vulnerability Index (PVI)[3]. The PVI evaluates countries' structural vulnerability in the face of a pandemic. This index is a relative measure that allows for comparisons between pairs, and does not measure the absolute vulnerability level. By identifying different risk factors and subsequently determining each country's specific exposure, the PVI gives an approximate indication of the potential consequences of a pandemic in terms of the economy, society and health.

The PVI has five pillars and is based on a total of 17 indicators.

Table 1
Pillars and indicators of the PVI

Pillar	Indicator
Economic Structure	Trade openness
	Tourism contribution to GDP
	Global value chain integration
	Industry share of total gross value added
	Share of micro-enterprises
Labour Market	Self-employment
	Precarious employment
Health Care System	Mortality rate influenza
	Acute care beds per head
	Availability of health practitioners
	Healthy life years
Population	Population density
	Population share of elderly
Mobile Work Capacity	Work from home
	Formal childcare
	Broadband web access
	Digital skills

Source: Creditreform Rating AG

From a methodological perspective, the data is standardised with the help of a "Z-score transformation", so that each indicator's data series has a mean of 0 and a standard deviation of 1. When interpreting the results, it must be noted that the higher the index value, the higher the vulnerability.

[3] For additional details: https://www.creditreform-rating.de/en/research/economic-development.html

In the PVI's overall result for the five pillars combined, Luxembourg, with a score of -0.65, ranks first, followed by Germany (-0.57), Denmark (-0.57) and Sweden (-0.31). Thus, Luxembourg is considered the least vulnerable EU Member State. At the other end of the scale, Greece (0.43), Croatia (0.48), Malta (0.50) and Italy (0.65) exhibit the highest structural vulnerability. In general, the least vulnerable countries have a high-quality healthcare system, a strong labour market with few precarious jobs and few self-employed people, and a high capability for remote working.

Chart 1
PVI Heatmap

	Economic Structure	Labour Market	Health Care System	Population	Mobile Work Capacity	PVI
Italy	-0.07	1.35	0.30	0.88	0.77	0.65
Malta	0.19	-0.19	0.05	2.26	0.18	0.50
Croatia	0.38	0.88	0.25	0.11	0.78	0.48
Greece	0.13	1.44	-0.45	0.47	0.54	0.43
Poland	-0.03	0.90	0.29	-0.50	0.79	0.29
Portugal	0.24	0.20	0.02	0.48	0.08	0.20
Slovakia	0.46	0.09	0.32	-0.90	1.02	0.20
Hungary	0.46	-0.31	0.02	-0.12	0.76	0.16
Czechia	0.58	-0.20	-0.09	-0.01	0.51	0.16
Spain	-0.15	0.81	0.31	-0.13	-0.25	0.12
Latvia	-0.42	-0.48	0.73	-0.04	0.76	0.11
Slovenia	0.64	0.03	0.19	-0.01	-0.32	0.11
Romania	-0.57	-0.22	-0.02	-0.36	1.33	0.03
France	-0.40	0.86	-0.01	0.05	-0.36	0.03
Bulgaria	0.00	-0.81	-0.97	0.27	1.55	0.01
Belgium	0.01	0.69	-0.30	0.24	-0.71	-0.02
Finland	-0.39	0.53	0.36	0.31	-1.01	-0.04
Cyprus	0.13	-0.60	0.46	-0.92	0.51	-0.08
Estonia	0.19	-0.52	0.26	-0.16	-0.21	-0.09
Ireland	1.09	-0.16	-0.01	-1.44	-0.23	-0.15
Netherlands	-0.21	-0.05	0.64	0.54	-1.77	-0.17
Lithuania	-0.08	-0.63	-0.98	-0.13	0.74	-0.22
Austria	-0.08	-0.57	-0.46	-0.24	-0.15	-0.30
United Kingdom	-0.75	-0.33	0.57	-0.05	-0.96	-0.30
Sweden	-0.17	0.01	0.13	-0.14	-1.39	-0.31
Denmark	-0.63	-0.90	0.03	-0.02	-1.31	-0.57
Germany	-0.64	-1.05	-1.48	0.63	-0.30	-0.57
Luxembourg	**0.07**	**-0.77**	**-0.17**	**-1.08**	**-1.34**	**-0.65**

Note for readers: Values are indices. Higher values signal a higher vulnerability to pandemics. The coloured shades indicate the vulnerability depending on the index level, with dark green/blue = lowest relative vulnerability and dark red = highest relative vulnerability.
Source: Creditreform Rating AG

In the PVI's five individual pillars, Luxembourg is usually in the best-performing group, except for the "Economic Structure" pillar, the only one in which Luxembourg's vulnerability is higher than the average for the 28 countries analysed.

- In the "Economic Structure" pillar, the United Kingdom (-0.75), Germany (-0.64) and Denmark (-0.63) perform best, and are thus the countries least exposed to the risks linked to a pandemic. Luxembourg (0.07) ranks only 17th, and its relative vulnerability is above the European average. Luxembourg's fragility in this area is attributable to its openness to international trade and being highly integrated into global value chains.

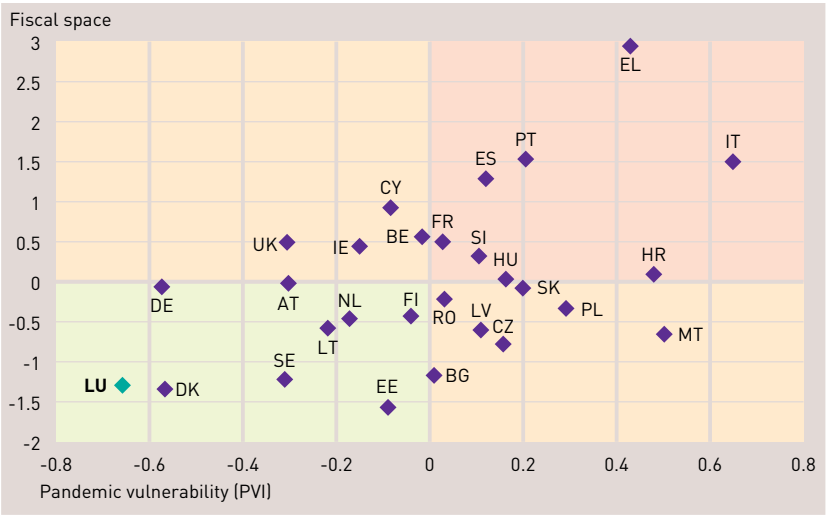
- The "Labour Market" pillar is topped by Germany (-1.05), Denmark (-0.90) and Bulgaria (-0.81). With few self-employed workers and fewer precarious jobs than the European average, Luxembourg (-0.77) performs solidly in this area, ranking 4th.

- The "Health Care System" pillar is topped by Germany (-1.48), Lithuania (-0.98) and Bulgaria (-0.97). Luxembourg (-0.17) performs close to the average for the various indicators, ranking 7th for this risk factor.

- In the "Population" pillar, Ireland (-1.44) is rated as the least vulnerable country, followed by Luxembourg (-1.08) and Cyprus (-0.92). The risks to Luxembourg are limited by its relatively young population and low population density.

- In the "Mobile Work Capacity" pillar, the Netherlands (-1.77) performs best, ahead of Sweden (-1.39) and Luxembourg (-1.34). The Grand Duchy performs well across all the indicators in this pillar.

Chart 2
PVI and fiscal space



Note for readers: For the PVI, higher values signal higher vulnerability to pandemics; for fiscal space, higher values signal less fiscal leeway.
Source: Creditreform Rating AG

To assess different countries' budgetary margin for manoeuvre to be able to soften or even overcome the effects of a crisis, the report's authors combine the PVI with information about the countries' fiscal space. For the purpose of this benchmark, fiscal space is defined as the ratio of governments' tax revenues to their gross debt. Like for the PVI, the data on fiscal space is standardised with the help of a Z-score transformation.

The analysis shows that some of the most vulnerable countries have very little fiscal space, especially Italy, Greece, Portugal and Spain; this limits their ability to react to the crisis. On the other hand, the situation is relatively mild in Luxembourg, Denmark, Sweden and Estonia, which are the top four performers in terms of fiscal space. These countries, along with Germany, Austria, Lithuania, the Netherlands and Finland, are in the green quadrant of Chart 2, and thus have relatively low structural vulnerability and a fairly high fiscal leeway.

b. Resilience Index (FM Global)

The increased resilience of a territory allows businesses located there to protect themselves more effectively against potential disturbances, as well as to bounce back more rapidly in such an event. In this regard, FM Global, one of the world's largest commercial and industrial property insurance companies, publishes its Resilience Index every year.[4] This index analyses economies' resilience to potentially disruptive events, and covers more than 120 countries around the world. The Resilience Index is a helpful decision-making tool for economic players when considering relocating or expanding their activities, evaluating supply chains and selecting suppliers, and identifying potentially vulnerable clients.

For the purpose of the Resilience Index, the countries' resilience is analysed using twelve drivers, separated into three different factors. Each driver has the same weighting when constructing the index. To enable a presentation that is easy to understand, the scores for the different criteria are converted into a scale ranging from 0 (the worst performance) to 100 (the best performance).

[4] For additional details: https://www.fmglobal.com/research-and-resources/tools-and-resources/resilienceindex

Table 2
Factors and drivers of the Resilience Index

Factor	Driver
Economic	Productivity
	Political Risk
	Oil Intensity
	Urbanization Rate
Risk Quality	Exposure to Natural Hazards
	Natural Hazard Risk Quality
	Fire Risk Quality
	Inherent Cyber Risk
Supply Chain	Control of Corruption
	Quality of Infrastructure
	Corporate Governance
	Supply Chain Visibility

Source: FM Global

The "Economic" factor covers political and macroeconomic influences on resilience. It contains the drivers of Productivity, Political Risk, Oil Intensity and Urbanization Rate.

The "Risk Quality" factor assesses the risks to which an industrial or commercial site is exposed. The drivers included under this factor are Exposure to Natural Hazards, Natural Hazard Risk Quality, Fire Risk Quality and Inherent Cyber Risk.

The "Supply Chain" factor covers the drivers that could directly or indirectly influence businesses' supply and distribution chains: Control of Corruption, Quality of Infrastructure, Corporate Governance and Supply Chain Visibility.

In 2020's Resilience Index, Norway leads the overall global rankings, with a score of 100 out of 100. Switzerland (98.8) and Denmark (98.4) complete the top three. Luxembourg (94.7) ranks 7th globally (or 5th among EU Member States plus the United Kingdom), a slight improvement over its 2019 score.

Table 3
Top 10 countries in the 2020 Resilience Index, with scores and rankings per factor

Resilience Index 2020			Performance by factor					
			Economic		Risk Quality		Supply Chain	
Country	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**
Norway	1	100	6	83.1	7	96.5	12	87.7
Switzerland	2	98.8	2	91.1	20	81.9	13	87.5
Denmark	3	98.4	7	77.9	13	89.6	3	91.6
Germany	4	97.5	8	74.3	3	97.8	9	88.3
Sweden	5	95.4	10	73.7	12	90.6	10	88.2
Finland	6	95.2	17	69.7	14	89.3	5	91.3
Luxembourg	**7**	**94.7**	**3**	**90.9**	**18**	**83.4**	**26**	**79.3**
Austria	8	94.6	13	72.6	15	85.8	8	89.9
United States (Central)	9	92.9	23	64.6	1	100	16	85.2
United States (East)	10	91.6	23	64.6	9	95.2	16	85.2

Source: FM Global

When we look at the three factors and twelve drivers that make up the general composite index, Luxembourg's performance is rather mixed.

- In the "Economic" factor, Luxembourg (90.9) ranks 3rd in the world, behind Qatar and Switzerland. In the adjusted classification for EU Member States plus the United Kingdom (EU-27 + UK), Luxembourg is in first place, ahead of Ireland and Denmark.

  Luxembourg performs very well in Productivity (81.8 – 2nd) and Political Risk (95.5 – 4th). Its Urbanization Rate is average (84.6 – 50th). Finally, the country's high Oil Intensity (62.8 – 100th) risks damaging the resilience of its economy.

- For "Risk Quality", Luxembourg (83.4) ranks 18th globally (13th in the EU-27 + UK). The European rankings are led by Czechia, Germany and Spain.

  In more depth, Luxembourg is low-risk in terms of Exposure to Natural Hazards (95.3 – 5th). The country's performance is average for the Natural Hazard Risk Quality (62.6 – 34th) and Fire Risk Quality (72.5 – 33rd) drivers. Luxembourg's economy is deemed to be exposed to a high Inherent Cyber Risk (56.6 – 85th).

- For the "Supply Chain" factor, Luxembourg (79.3) ranks 26th globally (12th in the EU-27 + UK). Denmark, the United Kingdom and Finland are the best-rated European countries in this area.

  Luxembourg excels in Control of Corruption (96.7 – 6th) and performs well in Quality of Infrastructure (84.8 – 19th). On the other hand, Luxembourg does not perform as well for Supply Chain Visibility (69.7 – 33rd) and Corporate Governance (63.3 – 70th).

2.3 Competitiveness and its drivers

This section presents a selection of the main territorial competitiveness benchmarks and their drivers. In addition to benchmarks dealing with competitiveness in general, focus is placed on three crucial competitiveness-related aspects: digitisation, innovation and human capital.

2.3.1. Territorial competitiveness

The benchmarks used by the World Economic Forum (WEF) and the International Institute for Management Development (IMD) are among the most well-known in the debate surrounding territorial competitiveness. The most recent editions of these rankings are presented here, with particular attention paid to Luxembourg's results.

a. Global Competitiveness Index (WEF)

The World Economic Forum (WEF) published the Global Competitiveness Report, its annual study into the competitiveness of 141 countries around the world, in October 2019.[5, 6] This report aims to evaluate the potential of world economies to achieve sustained medium- and long-term growth. The changing nature of economic competitiveness in a world increasingly transformed by new digital technologies is resulting in a series of new challenges for governments and businesses. This is why, since 2018, the WEF's report has used a new methodology to accurately assess the dynamics of the global economy during this Fourth Industrial Revolution in which we are currently living. According to the report's authors, few of the factors that will have the biggest impact on competitiveness in the future have ever been at the forefront of major political decisions in the past. These include the creation of new ideas, entrepreneurial culture, openness and agility.

The Global Competitiveness Index (GCI) assesses all of these factors to determine an economy's level of excellence. The index is based around the following twelve pillars: institutions, infrastructure, ICT adoption, macroeconomic stability, health, skills, product market, labour market, financial system, market size, business dynamism, and innovation capability. The index includes 103 individual indicators in all, based on a combination of statistical data and information derived from an annual opinion survey of economic decision-makers and business leaders. Each indicator runs on a scale of 0 (the worst performance) to 100 (the best performance), showing how far an economy is from the ideal situation.

[5] For additional details: https://www.weforum.org/reports/how-to-end-a-decade-of-lost-productivity-growth

[6] Due to the COVID-19 pandemic crisis, the WEF temporary paused the GCI rankings. Instead, a special edition 2020 of the WEF Global Competitiveness Report is dedicated to elaborating on the priorities for recovery and revival.

https://www.weforum.org/reports/the-global-competitiveness-report-2020

General rankings

The global rankings are topped by Singapore (84.8), the United States (83.7) and Hong Kong (83.1). Luxembourg (77.0) ranks 18th globally, gaining one position over the previous year. The Netherlands is 4th (82.4), Germany 7th (81.8), France 15th (78.8), and Belgium 22nd (76.4).

The adjusted rankings for EU Member States plus the United Kingdom are led by the Netherlands, Germany, Sweden, the United Kingdom and Denmark. Luxembourg ranks 8th in this EU-27 + UK leader board.

Table 4
Top 25 in the WEF Global Competitiveness Index 2019

			Diff. from 2018	
Rank	**Economy**	**Score**	**Rank**	**Score**
1	Singapore	84.8	+1	+1.3
2	United States	83.7	-1	-2.0
3	Hong Kong SAR	83.1	+4	+0.9
4	Netherlands	82.4	+2	–
5	Switzerland	82.3	-1	-0.3
6	Japan	82.3	-1	-0.2
7	Germany	81.8	-4	-1.0
8	Sweden	81.2	+1	-0.4
9	United Kingdom	81.2	-1	-0.8
10	Denmark	81.2	–	+0.6
11	Finland	80.2	–	–
12	Taiwan, China	80.2	+1	+1.0
13	Korea, Rep.	79.6	+2	+0.8
14	Canada	79.6	-2	-0.3
15	France	78.8	+2	+0.8
16	Australia	78.7	-2	-0.1
17	Norway	78.1	-1	-0.1
18	**Luxembourg**	**77.0**	**+1**	**+0.4**
19	New Zealand	76.7	-1	-0.8
20	Israel	76.7	–	+0.1
21	Austria	76.6	+1	+0.3
22	Belgium	76.4	-1	-0.2
23	Spain	75.3	+3	+1.1
24	Ireland	75.1	-1	-0.6
25	United Arab Emirates	75.0	+2	+1.6

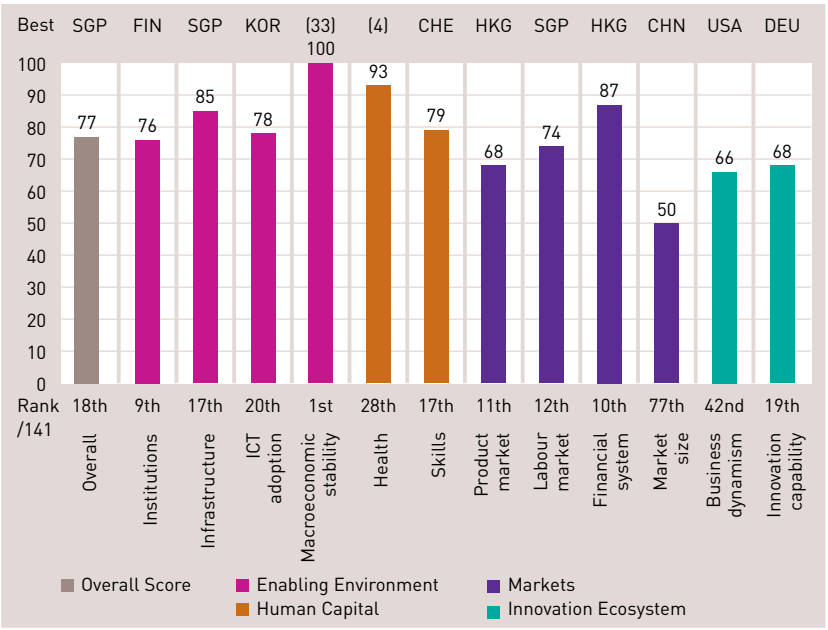
Source: World Economic Forum

Luxembourg's ranking in each pillar

Luxembourg ranks as follows in each of the 12 pillars:

- Institutions: 9th (score of 76/100)
- Infrastructure: 17th (85)
- ICT adoption: 20th (78)
- Macroeconomic stability: 1st (100)
- Health: 28th (93)
- Skills: 17th (79)
- Product market: 11th (68)
- Labour market: 12th (74)
- Financial system: 10th (87)
- Market size: 77th (50)
- Business dynamism: 42nd (66)
- Innovation capability: 19th (68)

Chart 3
Luxembourg's performance in each pillar of the WEF Global Competitiveness Index 2019



Source: World Economic Forum

b. World Competitiveness Ranking (IMD)

In June 2020, Swiss institute IMD published the 32nd edition of its annual competitiveness report: the World Competitiveness Yearbook[7] (WCY). The 2020 edition analyses 63 countries across 235 criteria, which are both quantitative (statistical indicators) and qualitative (opinion surveys of economic decision-makers and business leaders) in nature. The criteria are spread across four pillars: Economic Performance, Government Efficiency, Business Efficiency, and Infrastructure. It should be noted that the 2020 edition is based on statistical data from 2019 and opinion surveys carried out in the first quarter of 2020. Thus, the WCY 2020 is an overview of the situation prior to the COVID-19 pandemic crisis, and does not take into account the impacts of this crisis or the measures taken to support and revive the economy.

Table 5
Top 30 in the IMD World Competitiveness Ranking 2020

2020	Country	2019		Change
1	Singapore	1	0	—
2	Denmark	8	6	↑
3	Switzerland	4	1	↑
4	Netherlands	6	2	↑
5	Hong Kong SAR	2	-3	↓
6	Sweden	9	3	↑
7	Norway	11	4	↑
8	Canada	13	5	↑
9	UAE	5	-4	↓
10	USA	3	-7	↓
11	Taiwan, China	16	5	↑
12	Ireland	7	-5	↓
13	Finland	15	2	↑
14	Qatar	10	-4	↓
15	**Luxembourg**	**12**	**-3**	**↓**
16	Austria	19	3	↑
17	Germany	17	0	—
18	Australia	18	0	—
19	United Kingdom	23	4	↑
20	China	14	-6	↓
21	Iceland	20	-1	↓
22	New Zealand	21	-1	↓
23	Korea Rep.	28	5	↑
24	Saudi Arabia	26	2	↑
25	Belgium	27	2	↑
26	Israel	24	-2	↓
27	Malaysia	22	-5	↓
28	Estonia	35	7	↑
29	Thailand	25	-4	↓
30	Cyprus	41	11	↑

Source: International Institute for Management Development (IMD)

[7] For additional details: https://www.imd.org/wcc/world-competitiveness-center-rankings/world-competitiveness-ranking-2020/

General rankings

The current general rankings of the most competitive countries are topped by Singapore, followed by Denmark, Switzerland, the Netherlands and Hong Kong SAR. Luxembourg has lost three positions compared to the previous year, and is ranked 15th globally.

In the adjusted rankings for EU Member States plus the United Kingdom, Denmark performs best, in front of the Netherlands, Sweden, Ireland and Finland. In this EU-27 + UK ranking, Luxembourg has lost one position from last year and ranks 6th.

Luxembourg's performance in each pillar

When we look more closely at the four pillars of the general rankings, Luxembourg is in the following positions among the 63 countries analysed:

- Luxembourg ranks 8th globally in the "Economic Performance" pillar. Among the sub-pillars in this category, Luxembourg performs well in terms of international trade (6th), employment (9th), international investment (10th) and domestic economy (13th). On the other hand, the country performs poorly as regards prices (45th);

- Luxembourg is in 12th position in the "Government Efficiency" pillar, with strong performances in public finance (7th), institutional framework (9th), business legislation (9th) and societal framework (11th). The tax policy sub-pillar (43rd) is a weak point in the country's competitiveness;

- Luxembourg ranks 17th in the "Business Efficiency" pillar. It performs relatively well in the sub-pillars of finance (13th), productivity and efficiency (15th) and labour market (17th). Performance is average in terms of attitudes and values (21st) and management practices (28th);

- Coming in 24th position, the "Infrastructure" pillar is where Luxembourg's performance is the weakest. More specifically, the country performs fairly well in terms of basic infrastructure (15th) and education (16th), averagely for health and environment (22nd) and scientific infrastructure (28th), and poorly for technological infrastructure (41st).

The main challenges

In its analysis, the IMD identified five main challenges to Luxembourg's current competitiveness:

- Implement recovery plan for COVID-19: support for economic activity, consumption, public investment, incentives for private investment and a massive health plan;
- Transitioning towards a growth model based on productivity gains and the sustainable management of environmental resources;
- Address companies rising labour costs and tax burden (compared to European and international systems);
- Improve SME support: access to funding, over-regulation, develop economic activity zones, and business succession;
- Update legislation on bankruptcy focused on granting companies a second chance.

2.3.2 Digitisation

The ability to adopt and exploit digital technologies is a key factor for competitiveness. Two specific benchmarks are presented here: the European Commission's Digital Economy and Society Index, and the IMD's World Digital Competitiveness Ranking.

a. Digital Economy and Society Index (European Commission)

In June 2020, the European Commission published the latest edition of its annual Digital Economy and Society Index (DESI)[8]. The DESI is a composite index that evaluates EU Member States' progress towards a digital economy and society, and helps them to identify which areas need investment as a priority.

The DESI uses values from 0 (the worst performance) to 100 (the best performance). It is made up of more than 35 indicators separated into five interlinked categories:

- Connectivity (fixed broadband, mobile broadband, connection speed and affordability): 25% weighting;
- Human Capital (basic and advanced digital skills): 25% weighting;
- Use of Internet Services (usage rates, activities and content, online transactions): 15% weighting;
- Integration of Digital Technology (business digitisation, e-commerce): 20% weighting;
- Digital Public Services (e-government, extent of online service, open data): 15% weighting.

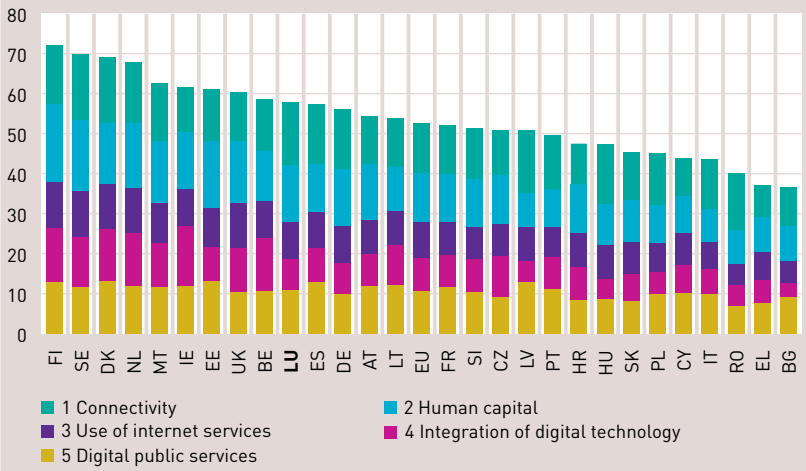
DESI 2020 is based on 2019's data, and thus examines the situation prior to the health and economic crisis linked to the COVID-19 pandemic. Consequently, DESI 2020's conclusions must be considered in tandem with the wide range of measures taken in the digital field by the European Commission and the Member States to manage the pandemic and support the economic recovery. The European Commission emphasises that the COVID-19 pandemic has shown how important digital resources now are for our economies and how networks, connectivity, data, artificial intelligence and high-performance calculations, as well as both basic and advanced digital skills, support our economies and societies by allowing work to continue and enabling us to monitor the spread of the virus and accelerate research into treatments and vaccines.

[8] For additional details: https://ec.europa.eu/digital-single-market/en/desi

General rankings

The 28-country ranking for DESI 2020 is led by Finland (with a score of 72.3/100), followed by Sweden (69.7) and Denmark (69.1). Luxembourg is in 10th position, with a score of 57.9. Looking at our neighbours, the Netherlands is 4th (67.7), Belgium 9th (58.7), Germany 12th (56.1), and France 15th (52.2).

Chart 4
DESI 2020 rankings



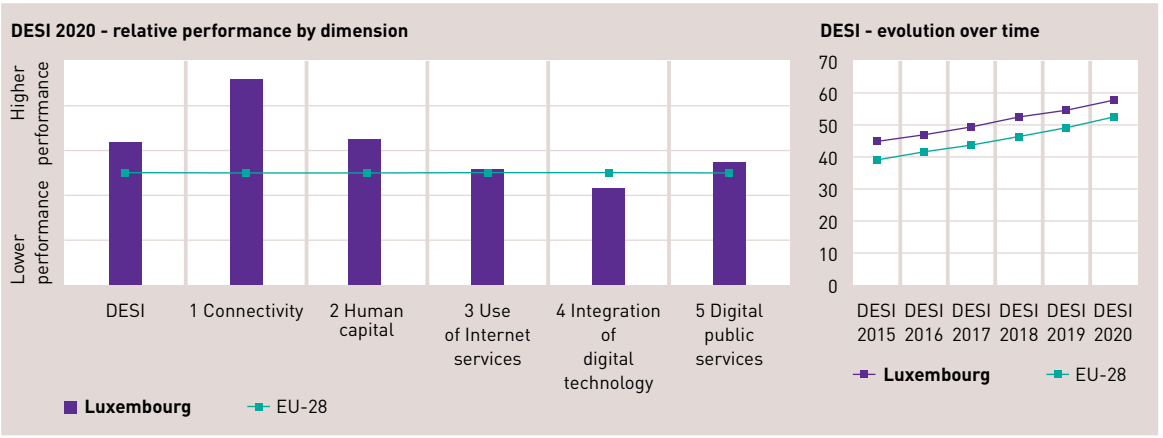
Source: European Commission

Luxembourg's performance

In detail, Luxembourg's performance across the five individual categories is as follows (rank/score):

- Connectivity (3rd/63.3): Luxembourg performs particularly well in terms of adoption and coverage of fixed and mobile broadband;
- Human Capital (8th/58.2): Luxembourg is above the EU average in indicators relating to digital skills;
- Use of Internet Services (12th/58.9): Luxembourg performs well as regards the use of Internet services, sitting above the EU average in this area;
- Integration of Digital Technology (19th/38.2): The integration of digital technology by businesses is the only area in which Luxembourg is below the EU average. Nevertheless, in keeping with its ambition to transition to a data-based economy, Luxembourg has made significant progress in adopting digital innovations;
- Digital Public Services (14th/73,7): Luxembourg has made solid progress in the area of digital public services, being above the EU average in this domain for the first time.

Chart 5
Luxembourg's performance in DESI 2020



Source: European Commission

The European Commission's assessment of Luxembourg

In its assessment, the European Commission states: *"Luxembourg continues to implement a range of strategies and initiatives to boost the digital skills of its population and to attract and retain talent, to address the significant digital skills gap on the labour market."* In particular, the Commission cites *"the inclusion of coding in the education curricula of cycle 4 of the basic education programme, the Digital4Education strategy, and the Artificial Intelligence (AI) strategy that includes measures to boost advanced digital skills."* Furthermore, according to the Commission, *"Luxembourg continues to promote the uptake of strategic digital technologies by businesses. Several strategies are being implemented such as the data-driven innovation strategy to develop a trusted and sustainable economy and the AI strategy. Luxembourg is a founding member of the Euro High-Performance Computing Joint Undertaking, and will acquire the supercomputer Meluxina*[9]*. In parallel, it has signed the Declaration of European Blockchain Partnership and the Declaration on cooperation on Artificial Intelligence. In 2019, Luxembourg launched the first Digital Innovation Hub to boost the digitisation of its industry, particularly among SMEs."*

[9] In the meantime, Luxembourg has acquired the MeluXina supercomputer. https://gouvernement.lu/fr/actualites/toutes_actualites/communiques/2020/09-septembre/29-bettel-fayot-meluxina.html

b. World Digital Competitiveness Ranking (IMD)

In early October 2020, Swiss institute IMD published the fourth edition of its annual World Digital Competitiveness Ranking 2020 (WDCR)[10]. This report measures the capacity and readiness of economies across the globe to adopt and explore digital technologies as a key driver for economic transformation in business, public administrations and society.

In this latest edition, 63 countries are analysed across 52 criteria, which are partly quantitative (32 criteria taken from national and international statistical sources) and partly qualitative (20 criteria taken from opinion survey of a panel of international experts). The criteria are split into three pillars and nine sub-pillars:

- The "Knowledge" pillar follows digital transformation through the discovery, understanding and mastery of new technologies and digital tools. Its sub-pillars are "Talent", "Training & education" and "Scientific concentration";
- The "Technology" pillar analyses the general context enabling digital technologies to be developed. Its sub-pillars are "Regulatory framework", "Capital" and "Technological framework";
- The "Future Readiness" pillar examines how prepared economies are for the digital transition. Its sub-pillars are "Adaptive attitudes", "Business agility" and "IT integration".

General rankings

The general WDCR 2020 rankings are led by the United States (with a score of 100/100), followed by Singapore (98.052), Denmark (96.013), Sweden (95.146) and Hong Kong SAR (94.451).

Luxembourg (73.269) ranks 28th, losing seven positions compared to last year. As for our neighbours, the Netherlands is 7th (92.567), Germany 18th (81.062), France 24th (76.983), and Belgium 25th (76.977).

The adjusted rankings for EU Member States plus the United Kingdom are led by Denmark, Sweden and the Netherlands. Luxembourg ranks 12th in this EU-27 + UK leader board.

[10] For additional details: https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2020/

Table 6
IMD World Digital Competitiveness Ranking 2020

Country / Economy	2020	Change	2019	Country / Economy	2020	Change	2019
USA	1	(0)	1	Spain	33	(-5)	28
Singapore	2	(0)	2	Saudi Arabia	34	(+5)	39
Denmark	3	(+1)	4	Czech Republic	35	(+2)	37
Sweden	4	(-1)	3	Kazakhstan	36	(-1)	35
Hong Kong SAR	5	(+3)	8	Portugal	37	(-3)	34
Switzerland	6	(-1)	5	Latvia	38	(-2)	36
Netherlands	7	(-1)	6	Thailand	39	(+1)	40
Korea Rep.	8	(+2)	10	Cyprus	40	(+14)	54
Norway	9	(0)	9	Chile	41	(+1)	42
Finland	10	(-3)	7	Italy	42	(-1)	41
Taiwan, China	11	(+2)	13	Russia	43	(-5)	38
Canada	12	(-1)	11	Turkey	44	(+8)	52
United Kingdom	13	(+2)	15	Bulgaria	45	(0)	45
UAE	14	(-2)	12	Greece	46	(+7)	53
Australia	15	(-1)	14	Hungary	47	(-4)	43
China	16	(+6)	22	India	48	(-4)	44
Austria	17	(+3)	20	Romania	49	(-3)	46
Germany	18	(-1)	17	Slovak Republic	50	(-3)	47
Israel	19	(-3)	16	Brazil	51	(+6)	57
Ireland	20	(-1)	19	Croatia	52	(-1)	51
Estonia	21	(+8)	29	Jordan	53	(-3)	50
New Zealand	22	(-4)	18	Mexico	54	(-5)	49
Iceland	23	(+4)	27	Peru	55	(+6)	61
France	24	(0)	24	Indonesia	56	(0)	56
Belgium	25	(0)	25	Philippines	57	(-2)	55
Malaysia	26	(0)	26	Ukraine	58	(+2)	60
Japan	27	(-4)	23	Argentina	59	(0)	59
Luxembourg	**28**	**(-7)**	**21**	South Africa	60	(-12)	48
Lithuania	29	(+1)	30	Colombia	61	(-3)	58
Qatar	30	(+1)	31	Mongolia	62	(0)	62
Slovenia	31	(+1)	32	Venezuela	63	(0)	63
Poland	32	(+1)	33				

Source: International Institute for Management Development (IMD)

Luxembourg's ranking in each pillar

Luxembourg is ranked worse than the previous year in all three digital competitiveness pillars. Its results are examined in more detail below.

- Knowledge: Luxembourg ranks 35th globally. Among the sub-pillars, Luxembourg is 39th for talent, 23rd for training and education, and 41st for scientific concentration.

  In this pillar, Luxembourg's strong points are its highly qualified foreign labour force, the importance that businesses give to training employees, and the high number of R&D researchers and staff in general; however, the proportion of women in research activities is low, which is considered a weakness. As for other weak points, Luxembourg's R&D expenditure (as a percentage of GDP) is relatively low, while digital and technological skills are somewhat lacking.

- Technology: Luxembourg ranks 17th globally. Among the sub-pillars, Luxembourg ranks 8th for regulatory framework, 15th for capital, and 35th for technological framework.

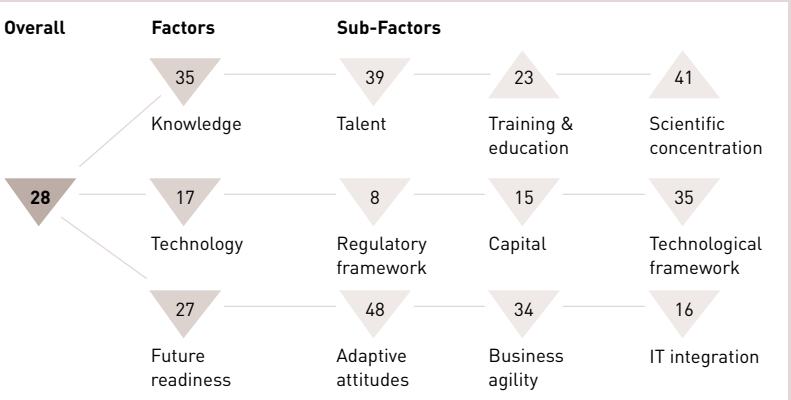
  Luxembourg stands out through a good legal framework for scientific research and intellectual property, as well as the warm welcome extended to foreign talent ("expats"). Other strengths are the country's excellent financial rating, the market capitalisation of businesses active in IT and media, and the availability of broadband connections. Luxembourg's weaknesses are the excessively long time it takes to start a business, the low investment in telecommunications (as a percentage of GDP), and the low proportion of high-tech products in total manufacturing exports.

- Future Readiness: Luxembourg ranks 27th globally. Among the sub-pillars, Luxembourg ranks 48th for adaptive attitudes, 34th for business agility, and 16th for IT integration.

  Luxembourg performs well in cybersecurity, and its businesses are able to react quickly to seize on opportunities and respond to risks. On the other hand, the ability to participate online in the political process is considered insufficient in Luxembourg. Furthermore, Luxembourg has few industrial robots, while the use of big data and the corresponding analytical methods is not widespread.

Chart 6
Luxembourg's ranking in each pillar of the IMD Global Competitiveness Ranking 2020

Luxembourg
Overall performance (63 countries)



The direction of the triangle indicates the performance change from the last year:
▲ improved or stable
▼ declined

Source: International Institute for Management Development (IMD)

2.3.3 Innovation

Innovation is an undeniable asset to ensure competitiveness, and it is unsurprising that indicators relating to research, development and innovation are routinely referred to in territorial competitiveness analyses. Two benchmarks focusing specifically on innovation are presented here: the European Commission's European Innovation Scoreboard, and the Global Innovation Index, published jointly by Cornell University, INSEAD and the World Intellectual Property Organization.

a. European Innovation Scoreboard (European Commission)

In June 2020, the European Commission published the latest edition of its European Innovation Scoreboard (EIS)[11]. The EIS allows to measure and compare countries' relative performance in innovation. Thus, the EIS analyses the strengths and weaknesses of national research and innovation systems, and helps Member States and the EU as a whole to assess in which areas they need to concentrate their efforts.

The EIS's measurement framework distinguishes between four types of activities, ten innovation dimensions and a total of 27 indicators.

- "Framework conditions" relate to the main drivers for innovation external to businesses: human resources; attractive research systems; and an innovation-friendly environment.
- "Investments" take into account public- and private-sector R&D investment: finance and support; and firm investments.
- "Innovation activities" are linked to innovation efforts by businesses: innovators; linkages; and intellectual assets.
- "Impacts" cover how business activities affect innovation: employment impacts; and sales impacts.

[11] For additional details: https://ec.europa.eu/growth/industry/policy/innovation/scoreboards_en

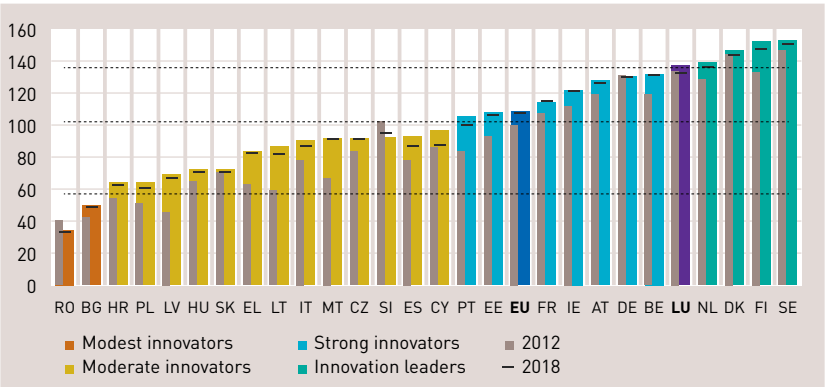
Based on the countries' average innovation results, which are calculated using a composite index known as the Summary Innovation Index (SII), the countries are divided into four performance groups:

- Innovation Leaders, whose innovation results are significantly above the EU average (performance above 125% of the EU average);
- Strong Innovators, whose results exceed or are close to the EU average (performance between 95% and 125% of the EU average);
- Moderate Innovators, whose results are below the EU average (performance between 50% and 95% of the EU average);
- Modest Innovators, whose results fall well below EU average (performance lower than 50% of the EU average).

General rankings

The EIS 2020 rankings are topped by Sweden with a score of 140.7 (current EU average = base 100), followed by Finland (139.8), Denmark (134.5) and the Netherlands (127.8). Luxembourg (126.0) is in 5th place, like last year, with a slight overall improvement. A key achievement is that Luxembourg has joined the group of Innovation Leaders for the 2020 edition of the EIS. In particular, Luxembourg excels in terms of attractive research systems and intellectual assets, leading the EU in both of these innovation domains. As regards Luxembourg's neighbours, Belgium (121.2), Germany (119.9) and France (104.5) are all in the Strong Innovators group.

Chart 7
EIS 2020 rankings



Coloured columns show countries' performance in 2019, using the most recent data for 27 indicators, relative to that of the EU in 2012. The horizontal hyphens show performance in 2018, using the next most recent data, relative to that of the EU in 2012. Grey columns show countries' performance in 2012 relative to that of the EU in 2012. For all years, the same measurement methodology has been used. The dashed lines show the threshold values between the performance groups.
Source: European Commission

Table 7
Luxembourg's EIS 2020 performance

Luxembourg	Relative to EU 2019 in 2019	Performance relative to EU 2012 in 2012	2019
SUMMARY INNOVATION INDEX	**126.0**	**133.9**	**137.1**
Human resources	**154.5**	**141.8**	**177.9**
New doctorate graduates	86.0	32.4	94.7
Population with tertiary education	203.2	219.0	258.7
Lifelong learning	176.3	190.0	190.0
Attractive research systems	**206.8**	**217.2**	**236.2**
International scientific co-publications	263.6	246.4	387.1
Most cited publications	115.2	138.1	115.3
Foreign doctorate students	310.5	358.0	358.0
Innovation-friendly environment	**135.8**	**217.1**	**236.2**
Broadband penetration	147.8	130.0	340.0
Opportunity-driven entrepreneurship	122.2	275.6	166.4
Finance and support	**106.2**	**138.0**	**122.7**
R&D expenditure in the public sector	66.4	57.8	65.2
Venture capital expenditures	151.6	272.6	219.2
Firm investments	**63.1**	**68.2**	**81.9**
R&D expenditure in the business sector	45.6	52.2	52.2
Non-R&D innovation expenditures	23.0	33.8	32.3
Enterprises providing ICT training	122.2	123.1	169.2
Innovators	**141.9**	**149.9**	**126.8**
SMEs product/process innovations	124.6	147.9	124.2
SMEs marketing/organisational innovations	171.3	163.4	140.7
SMEs innovating in-house	132.1	137.7	115.0
Linkages	**87.6**	**90.8**	**90.2**
Innovative SMEs collaborating with others	106.1	164.9	105.4
Public-private co-publications	174.0	125.0	196.7
Private co-funding of public R&D exp.	36.5	33.4	36.8
Intellectual assets	**151.0**	**154.3**	**141.0**
PCT patent applications	70.1	65.8	65.1
Trademark applications	235.3	250.5	250.5
Design applications	189.4	200.0	158.9
Employment impacts	**175.4**	**131.9**	**189.2**
Employment in knowledge-intensive activities	235.0	232.4	254.1
Employment fast-growing enterprises	127.1	50.9	136.9
Sales impacts	**85.2**	**96.0**	**84.8**
Medium and high tech product exports	76.4	94.4	84.7
Knowledge-intensive services exports	147.6	146.4	152.4
Sales of new-to-market/firm innovations	17.9	45.7	14.9

The colours show normalised performance in 2019 relative to that of the EU in 2019: dark green: above 125%; light green: between 95% and 125%; yellow: between 50% and 95%; orange: below 50%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.
Source: European Commission

Luxembourg's performance in detail

When we look at the ten innovation dimensions, Luxembourg achieves the following results in relation to the 2019 EU average (base 100):

- Framework conditions: human resources (154.5); attractive research systems (206.8); innovation-friendly environment (135.8);
- Investments: finance and support (106.2); firm investments (63.1);
- Innovation activities: innovators (141.9); linkages (87.6); intellectual assets (151.0);
- Impacts: employment impacts (175.4); sales impacts (85.2).

The European Commission's assessment of Luxembourg

The European Commission concludes the following in regard to Luxembourg: *"Luxembourg is an Innovation Leader. Over time, performance has increased relative to that of the EU in 2012. [...] Attractive research systems, Employment impacts and Human resources are the strongest innovation dimensions. Luxembourg scores particularly well on Foreign doctorate students, International scientific co-publications, Trademark applications, and Employment in knowledge-intensive activities. Firm investments, Sales impacts and Linkages are the weakest innovation dimensions. Overall, Luxembourg's lowest indicator scores comprise Sales of new-to-market or new-to-firm innovations, Non-R&D innovation expenditures, Private co-funding of public R&D expenditures, and R&D expenditures in the business sector."*

b. Global Innovation Index (Cornell University, INSEAD, World Intellectual Property Organization)

In September 2020, Cornell University, INSEAD and the World Intellectual Property Organization published the 13th edition of the Global Innovation Index (GII).[12] The report presents global innovation trends and aims to encourage debate and corresponding policy. The GII is a comparative tool enabling business leaders, decision-makers and other interested parties to better understand the innovation state of play across the world.

The reports ranks countries by innovation capacities and performance. Given the vital role that innovation plays in economic growth and prosperity, the GII composite index features indicators that go beyond those traditionally used, such as R&D expenditure. The 2020 Global Innovation Index covers 131 economies around the world.

[12] For additional details: https://www.globalinnovationindex.org/home

The GII consists of two sub-indices, seven pillars and a total of 80 individual indicators. This way, the GII attempts to take the multiple facets of innovation into consideration.

- The "Innovation Inputs" sub-index assesses the innovation measures implemented and makes it possible to assess, using five pillars, the elements of national economies that foster innovative activities: 1) Institutions; 2) Human capital and research; 3) Infrastructure; 4) Market sophistication; and 5) Business sophistication.

- The "Innovation Outputs" sub-index assesses the results of innovation activities using two pillars: 6) Knowledge and technology outputs; and 7) Creative outputs.

Both sub-indices carry the same weighting in the overall GII, which scores countries from 0 (the worst performance) to 100 (the best performance).

General rankings

The GII 2020 rankings are headed by Switzerland (with a score of 66.08/100), Sweden (62.47) and the United States (60.56). Luxembourg (50.84) is once again in 18th place globally. The Netherlands is 5th (58.76), Germany 9th (56.55), France 12th (53.66), and Belgium 22nd (49.13).

The adjusted rankings for EU Member States plus the United Kingdom are led by Sweden, the United Kingdom, the Netherlands, Denmark and Finland. Luxembourg ranks 9th in this EU-27 + UK leader board.

Luxembourg's rankings in detail

Luxembourg performs as follows in the two sub-indices and seven pillars:

- In the "Innovation Inputs" sub-index, Luxembourg ranks 24th globally, with a score of 57.23. More specifically, Luxembourg is 26th for institutions (with a score of 80.2), 41st for human capital and research (38.6), 23rd for infrastructure (54.9), 32nd for market sophistication (53.4) and 9th for business sophistication (59.0);

- In the "Innovation Outputs" sub-index, Luxembourg ranks 14th globally, with a score of 44.45. For the two pillars in this sub-index, Luxembourg is 31st for knowledge and technology outputs (33.9) and 3rd for creative outputs (55.0).

Table 8
Top 25 in the GII 2020 rankings

Country/Economy	Score (0–100)	Rank
Switzerland	66.08	1
Sweden	62.47	2
United States of America	60.56	3
United Kingdom	59.78	4
Netherlands	58.76	5
Denmark	57.53	6
Finland	57.02	7
Singapore	56.61	8
Germany	56.55	9
Republic of Korea	56.11	10
Hong Kong, China	54.24	11
France	53.66	12
Israel	53.55	13
China	53.28	14
Ireland	53.05	15
Japan	52.70	16
Canada	52.26	17
Luxembourg	**50.84**	**18**
Austria	50.13	19
Norway	49.29	20
Iceland	49.23	21
Belgium	49.13	22
Australia	48.35	23
Czech Republic	48.34	24
Estonia	48.28	25

Source: Global Innovation Index Database, Cornell, INSEAD and WIPO, 2020

Assessment of Luxembourg

In the analysis of the country's economic profile, the report makes the following observations regarding Luxembourg:

- *Relative to GDP, Luxembourg's performance is above expectations for its level of development;*
- *Luxembourg produces more innovation outputs relative to its level of innovation investments;*
- *GII strengths for Luxembourg are found in six of the seven GII pillars. In detail, Luxembourg shows strengths in the indicators Political and operational stability, Tertiary inbound mobility, ICT access, Environmental performance, Venture capital deals, Knowledge-intensive employment, Patent families 2+ offices, Intellectual property payments, Cultural & creative services exports, National feature films and Generic top-level domains;*
- *GII weaknesses for Luxembourg are found in all GII pillars. In detail, Luxembourg exhibits weaknesses in the indicators Cost of redundancy dismissal, Tertiary enrolment, Graduates in science & engineering, QS university ranking, Electricity output, Gross capital formation, Ease of getting credit, High-tech imports, Growth rate of PPP$ GDP/worker and Creative goods exports.*

2.3.4 Human capital

Human capital is essential for ensuring the competitiveness of territories and businesses. In their quest for the best talent, countries are not only aiming to develop human capital in their own territories, but are also in competition with other attractiveness hubs to attract and retain skilled labour. Three benchmarks are presented in this regard: INSEAD's Global Talent Competitiveness Index and the IMD's World Talent Ranking – which both focus on talent and their skills – as well as InterNations' Expat Insider, which assesses the attractiveness of territories for expatriates.

a. Global Talent Competitiveness Index (INSEAD)

In early 2020, INSEAD Business School, in collaboration with The Adecco Group and Google Inc., published the seventh edition of the Global Talent Competitiveness Index (GTCI).[13] 2020's edition covers 132 countries around the world. To compare countries' performances, the report uses a composite index based on an input-output model that makes it possible to assess:

- Inputs: The general business environment, as well as measures, policies and resources implemented to benefit human capital. This pillar has four subcategories with regard to talent: "Enable", "Attract", "Grow" and "Retain";

- Outputs: The level and quality of skills. This pillar has two subcategories: "Vocational and Technical Skills" (or "VT Skills" – the average technical or professional skill level acquired through training and experience) and "Global Knowledge Skills" (or "GK Skills" – high-level skills such as creativity and problem-solving, which benefit innovation and entrepreneurship).

The Global Talent Competitiveness Index (GTCI) is calculated by way of the simple average of the six subcategories, and has a total of 70 variables. It awards scores ranging from 0 (the worst performance) to 100 (the best performance).

[13] For additional details: https://gtcistudy.com/#

General rankings

The GTCI 2020 rankings are headed by Switzerland (with a score of 81.26), the United States (79.09) and Singapore (78.48). Luxembourg (73.94) has improved its score compared to the previous edition, and is now ranked 8th globally.

The adjusted rankings for EU Member States plus the United Kingdom are led by Sweden (75.82), Denmark (75.18) and the Netherlands (74.99). Luxembourg ranks 5th in the EU-27 + UK rankings, outscoring its three neighbouring countries.

Table 9
Top 25 in the GTCI 2020 rankings

Country	Score	Overall rank
Switzerland	81.26	1
United States of America	79.09	2
Singapore	78.48	3
Sweden	75.82	4
Denmark	75.18	5
Netherlands	74.99	6
Finland	74.47	7
Luxembourg	**73.94**	**8**
Norway	72.91	9
Australia	72.53	10
Germany	72.34	11
United Kingdom	72.27	12
Canada	71.26	13
Iceland	70.90	14
Ireland	70.45	15
New Zealand	69.84	16
Austria	68.87	17
Belgium	68.87	18
Japan	66.06	19
Israel	65.66	20
France	64.83	21
United Arab Emirates	62.63	22
Malta	62.02	23
Estonia	61.97	24
Czech Republic	60.91	25

Source: INSEAD

Luxembourg's performance in each pillar

Luxembourg's performance in the six subcategories is as follows:

- In the "Inputs" pillar, Luxembourg ranks 9th for "Enable" (82.74), 2nd for "Attract" (87.10), 19th for "Grow" (60.83) and 4th for "Retain" (86.22);
- In the "Outputs" pillar, Luxembourg ranks 16th for Vocational and Technical Skills (65.68) and 11th for Global Knowledge Skills (61.06).

Table 10
Top 10 GTCI 2020, rankings by subcategory

Country	GTCI Ranking	Enable	Attract	Grow	Retain	VT Skills	GK Skills
Switzerland	1	2	6	2	1	2	4
United States	2	3	11	1	12	1	2
Singapore	3	1	1	8	24	5	1
Sweden	4	4	10	6	9	7	5
Denmark	5	6	14	7	3	10	6
Netherlands	6	5	15	3	7	6	16
Finland	7	10	13	4	8	4	15
Luxembourg	**8**	**9**	**2**	**19**	**4**	**16**	**11**
Norway	9	11	16	12	2	8	13
Australia	10	17	7	9	11	20	9

Source: INSEAD

INSEAD's assessment of Luxembourg

The report concludes the following in regard to Luxembourg: "Luxembourg (8th) stands out in two dimensions regarding talent competitiveness: attracting (2nd) and retaining (4th) talent. As for the former, the country has a high degree of External Openness (2nd) thanks to the country's strong ability to attract foreign business and talent. As for the latter, Luxembourg's world-class pension system and social protection contributes to its solid Sustainability (2nd). The country is a highly innovative and entrepreneurial country (it ranks 3rd in Talent Impact), but its pool of Global Knowledge Skills (11th) would increase with greater High-Level Skills (19th). Luxembourg's lowest rankings are in the Grow (19th) and Vocational and Technical Skills (16th) pillars, where areas for improvement include strengthening Formal Education (60th) and ensuring the Employability (25th) of domestic talent in the private sector."

The Global Cities Talent Competitiveness Index

The country-by-country analysis is once again accompanied by a second composite index specifically dedicated to the cities often constituting centres of attraction for talent: the Global Cities Talent Competitiveness Index (GCTCI), which is based on a limited list of 16 variables split into five subcategories: Enable, Attract, Grow, Retain, and Global Knowledge Skills.

The overall GCTCI 2020 rankings are led by New York (73.7), London (71.7) and Singapore (71.4). Luxembourg City (49.4) ranks 49th out of the 155 cities surveyed worldwide.

b. World Talent Ranking (IMD)

In November 2020, Swiss institute IMD published the seventh edition of its World Talent Ranking (WTR) report (WTR).[14] This report assess how 63 countries around the world develop, attract and retain the talent needed by the economy and businesses to make progress and create lasting, long-term added value. Indeed, cultivating a competent and educated workforce is crucial to improving competitiveness and achieving sustainable long-term growth in a dynamic environment, in which artificial intelligence, robotics and new technologies are continually redefining the challenges faced by public authorities, businesses and society.

The report is based on a total of 31 indicators, of which 14 are quantitative (taken from national and international statistics) and 17 are qualitative (taken from opinion surveys of a panel of international experts). The indicators are divided into three subcategories:

- Investment & Development: The investment in and development of home-grown talent (investment in education, quality of national education, apprenticeships, employee training, etc.);
- Appeal: The extent to which a country taps into the overseas talent pool (quality of life, cost of living, brain drain, etc.);
- Readiness: The availability of skills and competencies in the talent pool (workforce growth, skills, student mobility, PISA test results, etc.).

Based on all of this information, the authors calculate a composite index that reflects the quality of the talent pool in a country, with values ranging from 0 (the worst performance) to 100 (the best performance).

[14] For additional details: https://www.imd.org/wcc/world-competitiveness-center-rankings/world-talent-ranking-2020/

General rankings

The WTR 2020 rankings are led by Switzerland (index of 100/100), followed by Denmark (91.781) and Luxembourg (89.192), which has improved its score and moved up two positions over last year. Looking at our neighbours, the Netherlands is 10th (82.864), Germany 11th (82.229), Belgium 16th (79.354), and France 28th (66,153).

Table 11
Top 30 in the IMD WTR 2020 rankings

1	Switzerland (1)	100.000
2	Denmark (2)	91.781
3	**Luxembourg (5)**	**89.192**
4	Iceland (7)	89.028
5	Sweden (3)	88.234
6	Austria (4)	86.642
7	Norway (6)	86.435
8	Canada (13)	84.377
9	Singapore (10)	83.473
10	Netherlands (9)	82.864
11	Germany (11)	82.229
12	Finland (8)	81.886
13	Australia (16)	81.124
14	Hong Kong SAR (15)	79.996
15	USA (12)	79.760
16	Belgium (14)	79.354
17	Cyprus (21)	76.392
18	Ireland (18)	75.025
19	Estonia (27)	73.932
20	Taiwan, China (20)	72.917
21	New Zealand (17)	72.287
22	Israel (19)	71.894
23	United Kingdom (24)	70.750
24	UAE (30)	69.642
25	Malaysia (22)	69.483
26	Portugal (23)	68.537
27	Lithuania (28)	68.097
28	France (25)	66.153
29	Qatar (26)	65.905
30	Slovenia (31)	65.063

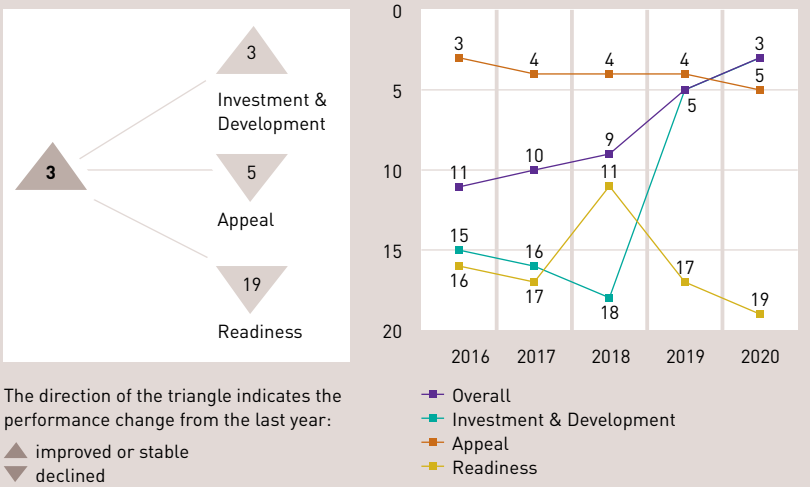
Note: 2019 rankings are in parentheses.
Source: International Institute for Management Development (IMD)

Luxembourg's performance in each subcategory

Luxembourg scores and ranks as follows in the three subcategories:

- Investment in and development of home-grown talent: 95.718 (3rd globally; 2nd in the adjusted EU-27 + UK rankings);
- Attraction of foreign talent: 81.155 (5th globally; 2nd in the adjusted EU-27 + UK rankings);
- Availability of qualified labour and skills: 70.081 (19th globally; 10th in the adjusted EU-27 + UK rankings).

Chart 8
Luxembourg's ranking by subcategory in the IMD WTR 2020



Source: International Institute for Management Development (IMD)

c. Expat Insider (InterNations)

InterNations, a worldwide expatriate network, regularly publishes its Expat Insider reports,[15] which provide expatriates with information on host countries. The reports are generally based on opinion surveys of expatriates. Although these surveys are qualitative and not representative and the opinions expressed are subjective, the results of the analyses nevertheless give an interesting insight into the views and experiences of expatriates in their respective host countries.

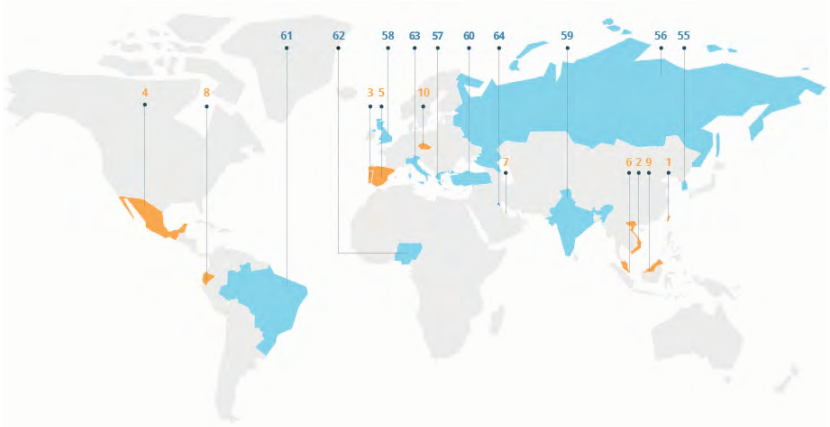
In September 2019, InterNations published the sixth edition of its Expat Insider report, including rankings of the world's best destinations for expatriates. The general rankings are based around five pillars (Quality of life, Ease of settling in, Working abroad, Family life, and Personal finance and cost of living), which are assessed using 48 individual factors.

[15] For additional details: https://www.internations.org/expat-insider/

General rankings

The overall 2019 ranking of the best destinations for expatriates is led by Taiwan, Vietnam, Portugal, Mexico and Spain. Luxembourg ranks 12th globally, outscoring its neighbouring countries. The Netherlands ranks 24th, Belgium 28th, Germany 33rd and France 42th.

Chart 9
Expat Insider 2019 rankings



The Top Expat Destinations 2019

Top 10

1	Taiwan	3	Portugal	5	Spain	7	Bahrain	9	Malaysia
2	Vietman	4	Mexico	6	Singapore	8	Ecuador	10	Czechia
11	Bulgaria	20	Canada	29	Indonesia	38	Switzerland	47	USA
12	**Luxembourg**	21	Costa Rica	30	Hungary	39	Japan	48	Denmark
13	Panama	22	Kazakhstan	31	Malta	40	UAE	49	Egypt
14	Israel	23	Estonia	32	Oman	41	Hong Kong	50	China
15	New Zealand	24	Netherlands	33	Germany	42	France	51	Ukraine
16	Colombia	25	Thailand	34	Poland	43	Ireland	52	South Africa
17	Australia	26	Morocco	35	Norway	44	Sweden	53	Peru
18	Qatar	27	Philippines	36	Kenya	45	Cyprus	54	Argentina
19	Finland	28	Belgium	37	Austria	46	Chile		

Bottom 10

55	South Korea	57	Greece	59	India	61	Brazil	63	Italy
56	Russia	58	UK	60	Turkey	62	Nigeria	64	Kuwait

Source: InterNations

Luxembourg's ranking in each pillar

Luxembourg performs as follows in each of the five pillars and their corresponding sub-indices:

- Quality of life: 12th. In terms of the corresponding sub-indices, Luxembourg ranks 52nd for Leisure options, 25th for Personal happiness, 17th for Travel and Transportation, 12th for Health and Well-being, 4th for Safety and Security, and 15th for Digital life;

- Ease of settling in: 32nd. In terms of the sub-indices in this pillar, Luxembourg ranks 27th for Feeling at home, 34th for Friendliness, 44th for Finding friends, and 12th for Language;

- Working abroad: 3rd. For the sub-indices, Luxembourg ranks 8th for Career prospects and Satisfaction, 31st for Work and Leisure, and 1st for Economy and Job security;

- Family life: 19th. More specifically, Luxembourg ranks 24th for Availability of childcare and education, 18th for Cost of childcare and education, 11th for Quality of education, and 9th for Family well-being;

- Personal finance and cost of living: Luxembourg ranks 24th for Personal financial situation and 59th for Cost of living.

Expat Insider 2020

For the 2020 edition, the Expat Insider's authors decided not to publish an overall ranking of the best destinations for expatriates, but instead focused their analysis on sustainability. Therefore, the Expat Insider 2020 report presents rankings of the best and worst host countries for expatriates concerned about the environment and sustainability.

This ranking, known as the Environment & Sustainability Ranking, is dominated by European countries, especially those in Scandinavia and the Alps. The podium is topped by Finland, ahead of Sweden and Norway, with Austria and Switzerland rounding off the top 5. Luxembourg ranks 10th globally, behind Germany (8th) but in front of the Netherlands (12th), France (17th) and Belgium (27th).

Luxembourg's rating is quite balanced across the three individual pillars that make up the Environment & Sustainability Ranking 2020. The country ranks 10th for Products and Utilities, 11th for Policies and People, and 13th for Quality of Environment.

2.4 Conclusions

Overall, Luxembourg performs relatively well in the various competitiveness benchmarks, and is usually in the top-ranking group among EU Member States plus the United Kingdom. In this reference group (EU-27 + UK), the Nordic countries (Sweden, Denmark, Finland) and the Netherlands regularly top the rankings. Behind this lead group come western European countries (most notably Luxembourg, along with the United Kingdom, Germany, Belgium and France, among others). Southern and eastern European countries are usually towards the middle or bottom of the rankings.

According to Creditreform Rating AG's Pandemic Vulnerability Index, Luxembourg currently exhibits low vulnerability to a pandemic. Furthermore, the country has a high fiscal leeway to soften, or even overcome, the effects of a crisis. In more detail, Luxembourg performs solidly in the "Labour Market", "Population" and "Mobile Work Capacity" pillars, and close to the European average in the "Health Care System" category. Luxembourg's situation is less ideal in terms of "Economic Structure", with the country's trade openness and its deep integration in global value chains compromising its rating and making it more vulnerable.

FM Global's Resilience Index considers Luxembourg fairly well equipped to deal with shocks and able to resist potentially disruptive events. The country performs well in the "Economic" factor thanks to its high productivity and low political risk. However, Luxembourg's high oil intensity risks damaging the resilience of its economy. In terms of "Risk Quality", Luxembourg is not very exposed to the risks of natural hazards by international standards, unlike inherent cyber-risk, which is deemed to be high for the country's economy. In the "Supply Chain" area, Luxembourg excels in control of corruption and has high-quality infrastructure, while it fares less well in supply-chain visibility and corporate governance.

The WEF's Global Competitiveness Index and the IMD's World Competitiveness Ranking validate Luxembourg's relatively strong territorial competitiveness. Among others, the country's political and macroeconomic stability, international openness, efficiency, transparency, forward-looking government and high productivity levels are heralded as strengths. The business environment is generally considered favourable, although the regulatory framework appears to be outdated in some aspects, such as bankruptcy legislation, where various stakeholders have been calling for modernisation. Luxembourg's active workforce is talented and skilled, but not big enough. Thus, attracting international talent remains key. The innovation ecosystem is evolving, but gaps persist. Additional effort is required to turn technology and innovation into key components of the Luxembourg economy's DNA. Among Luxembourg's weak points, labour costs and tax competitiveness are considered the greatest causes for concern. In particular, social security contributions for businesses and employees, the collected corporate taxes on profits, income and capital gains (as a percentage of GDP), and the maximum corporate tax rate on profit are relatively high when compared internationally. Finally, Luxembourg must competently manage its economic growth, and moreover ensure that this growth is accompanied by social inclusion and environmental sustainability in order to maintain its territorial competitiveness.

As far as digitisation goes, the European Commission's Digital Economy and Society Index and the IMD's World Digital Competitiveness Ranking paint a mixed picture of Luxembourg. Connectivity is Luxembourg's main strength. The country has good digital infrastructure in general, which in particular translates into strong fixed and mobile broadband coverage and the presence of several data-storage and data-processing centres at the cutting edge of technology. On the other hand, work remains to be done to integrate digital technology into businesses and public services. Nevertheless, the European Commission recognises Luxembourg's recent efforts in this area, especially its strategies for promoting and adopting digital technologies at national level and participating in various European initiatives, such as the European High Performance Computing Joint Undertaking (EuroHPC) and cooperation on artificial intelligence. The lack of digital skills is also a commonly cited weakness. In this area too, Luxembourg has taken action by implementing a set of strategies and initiatives aiming at strengthening the population's digital skills (such as including coding in the education curricula of cycle 4 of the basic education programme, the Digital-4Education strategy, the artificial intelligence strategy, etc.) and attracting and retaining talent to fill the skills gaps on the labour market.

According to the European Commission's European Innovation Scoreboard and Cornell University, INSEAD and WIPO's Global Innovation Index, Luxembourg performs relatively well in innovation. The country has an attractive research environment with an innovation-friendly regulatory framework, which has notably resulted in a high number of researchers and international scientific co-publications. The population's high educational level and the importance that businesses place in training are also favourable assets for innovation. The venture-capital investment volume is high in relation to the country's GDP, which supports dynamism in the creation and growth of businesses, especially innovative start-ups. Research and innovation are also considered efficient in Luxembourg. According to the Global Innovation Index, Luxembourg produces more innovation outputs than other countries in proportion to its investment level in innovation. However, this is dampened by the fact that R&D expenditure is relatively low in both the public and private sectors. Luxembourg performs well in terms of intellectual assets, especially regarding trademark, design and model registration applications. Conversely, the number of patent applications is low in Luxembourg. Another drawback is that research and innovation efforts in Luxembourg seem to find it difficult to enter onto markets. Consequently, revenues achieved by innovative companies selling new or significantly improved products are low in proportion to the total revenues of all companies. Likewise, the proportion of high-tech and medium-high-tech products in exports is low. However, this is at least partially compensated by the high amount of exports of knowledge-intensive services.

INSEAD's Global Talent Competitiveness Index and the IMD's World Talent Ranking place Luxembourg among the best-performing countries in terms of human capital. The effort and investment in developing home-grown talent are beneficial to the economy, as is the country's ability to attract and retain international talent. Despite this, profiles with the skills required are not always available on the labour market, especially in STEM (science, technology, engineering and mathematics) disciplines. Furthermore, it appears that skilled senior managers are not easily available in Luxembourg, while there is also an issue of the partially insufficient employability of the national workforce due to the skills mismatch. Nevertheless, the country's attractiveness enables it to dampen these deficits by attracting highly qualified foreign labour. In this regard, InterNations' Expat Insider, which is based on a survey on expatriates' views and experiences of their host countries, classes Luxembourg as one of the preferred European destinations for expatriates. Career opportunities, job security, multilingualism, quality of life and family well-being are Luxembourg's main assets in attracting expatriates.

Table 12
Overview of adjusted rankings of EU Member States plus the United Kingdom

	Vulnerability and resilience		Territorial competitiveness		Digitisation		Innovation		Human capital		
	Pandemic Vulnerability Index 2020 (Creditreform Rating AG)	Resilience Index 2020 (FM Global)	Global Competitiveness Index 2019 (WEF)	World Competitiveness Ranking 2020 (IMD)	Digital Economy and Society Index 2020 (European Commission)	World Digital Competitiveness Ranking 2020 (IMD)	European Innovation Scoreboard 2020 (European Commission)	Global Innovation Index 2020 (Cornell University, INSEAD and WIPO)	Global Talent Competitiveness Index 2020 (INSEAD)	World Talent Ranking 2020 (IMD)	Expat Insider 2019 (InterNations)
Belgium	13	11	10	10	9	11	6	11	10	8	9
Bulgaria	14	26	25	23	28	22	26	22	26	25	4
Czechia	20	12	15	15	17	17	16	12	14	22	3
Denmark	3	1	5	1	3	1	3	4	2	1	19
Germany	2	2	2	8	12	7	7	6	6	6	12
Estonia	10	17	14	11	7	9	11	13	13	11	7
Ireland	9	8	12	4	6	8	9	8	8	10	16
Greece	25	28	27	24	27	23	20	27	24	21	20
Spain	19	13	11	17	11	16	14	17	18	17	2
France	15	10	7	14	15	10	10	7	11	15	15
Croatia	26	24	28	27	20	27	25	26	27	24	n/a
Italy	28	18	13	21	25	21	18	15	21	20	22
Cyprus	11	27	23	12	24	20	13	16	16	9	18
Latvia	18	23	21	20	18	19	23	21	19	18	n/a
Lithuania	7	19	20	13	14	13	19	25	20	14	n/a
Luxembourg	**1**	**5**	**8**	**6**	**10**	**12**	**5**	**9**	**5**	**2**	**5**
Hungary	21	20	24	22	21	24	22	20	25	23	10
Malta	27	25	19	n/a	5	n/a	17	14	12	n/a	11
Netherlands	8	7	1	2	4	3	4	3	3	5	8
Austria	6	6	9	7	13	6	8	10	9	4	14
Poland	24	14	18	19	23	15	24	23	23	19	13
Portugal	23	15	16	18	19	18	12	18	15	13	1
Romania	16	21	26	25	26	25	27	28	28	26	n/a
Slovenia	17	22	17	16	16	14	15	19	17	16	n/a
Slovakia	22	16	22	26	22	26	21	24	22	27	n/a
Finland	12	4	6	5	1	4	2	5	4	7	6
Sweden	4	3	3	3	2	2	1	1	1	3	17
United Kingdom	5	9	4	9	8	5	n/a	2	7	12	21

Note: The table shows the order of EU Member States plus the United Kingdom in the general rankings in the various benchmarks presented in this chapter. If a country is not assessed by a specific benchmark, "n/a" is written in the table
Source: Table compiled by the Observatory for Competitiveness

Table 13
Trend in Luxembourg's performance in the adjusted rankings for EU-27 + UK (2016 - 2020)

Luxembourg		2016	2017	2018	2019	2020
Vulnerability and resilience	Pandemic Vulnerability Index (Creditreform Rating AG)	-	-	-	-	1
	Resilience Index (FM Global)	4	3	2	5	5
Territorial competitiveness	Global Competitiveness Index (World Economic Forum)	9	8	8	8	-
	World Competitiveness Ranking (IMD)	5	4	4	5	6
Digitisation	Digital Economy and Society Index (European Commission)	7	5	5	6	10
	World Digital Competitiveness Ranking (IMD)	10	8	8	9	12
Innovation	European Innovation Scoreboard (European Commission)	9	8	6	5	5
	Global Innovation Index (Cornell University, INSEAD and WIPO)	8	8	8	9	9
Human capital	Global Talent Competitiveness Index (INSEAD)	1	3	6	6	5
	World Talent Ranking (IMD)	7	8	6	4	2
	Expat Insider (InterNations)	3	6	4	5	-

Note: The table shows Luxembourg's position in the adjusted EU-27 + UK rankings in the various benchmarks presented in this chapter. If a benchmark is not available for a particular year, "-" is written in the table. The time series signifying the change in positions in the different benchmarks should be consulted with caution and a degree of hindsight. Methodological changes may have been made to the way in which the indices in question are calculated, without the indices and rankings being recalculated for all previous years.
Source: Table compiled by the Observatory for Competitiveness

3 The national indicator system The competitiveness scoreboard

3.1 Introduction

3.1.1 General considerations

The Observatory for Competitiveness (ODC) is committed to sustainability and has embraced the definition of competitiveness used by the Social and Economic Council (CES): "A nation's ability to sustainably improve the quality of life of its residents and to provide them with a high level of employment and social cohesion, while protecting the environment".[1]

Since the competitiveness scoreboard (hereafter TBCO) was revised in 2016 in close collaboration with the Economic and Social Council, it has been based on three sustainable development pillars, namely the economic dimension, the social dimension and the environmental dimension. Although each dimension deals with a specific area, the three dimensions remain interconnected to provide a general overview of the country's sustainable competitiveness.

The scoreboard aims to establish a working reference tool for social dialogue and to enrich public debate. Furthermore, it should help to shed light on the areas where Luxembourg's performance has room for improvement. Thus, the general diagnosis of Luxembourg's competitiveness determined by the indicator system could be followed up by a road map of actions with precise, quantifiable and measurable objectives determined in cooperation with all of the social partners.

However, it should be noted that the scoreboard can be adapted if needed and thus may change over time. The scoreboard is currently made up of 68 individual indicators: 25 for the economic dimension and 18 each for the social and environmental dimensions.

As regards the 2020 edition, it must be borne in mind that the current scoreboard assesses the economic situation in 2019,[2] and does not take into account the health and economic crisis linked to COVID-19. An overview of that topic is provided in Chapter 1 of the 2020 Competitiveness Report ("Impact of the COVID-19 pandemic in Luxembourg").

[1] Opinion of the CES on the national indicator system, https://ces.public.lu/dam-assets/fr/avis/politique-generale/avis-8716-.pdf

[2] Closing date of statistics: 16 october 2020.

3.1.2 Methodology

The data in the national indicator system is analysed using two different approaches. The "scoreboard" approach analyses Luxembourg's position and performance in relation to the other EU Member States in individual indicators, divided into three categories (i.e. economic, social and environmental). The "composite indicator" approach combines the data from individual indicators into one single numerical value in order to rank the countries in terms of competitiveness.

The detailed calculation methodology for the composite indicator is no longer published in the Competitiveness Report, but is available as an annex to the Report on the Observatory for Competitiveness's website, as is the robustness analysis, the table of secondary indicators, and other information supplementing the 2020 edition.[3]

3.1.2.1 The national scoreboard approach

The analytical method remains unchanged from previous editions of the scoreboard.

Firstly, Luxembourg's position is highlighted in relation to the average for European Union Member States.

- If Luxembourg's performance is more than 20% better than the EU average, the indicator is classified as "green" (favourable position).
- If Luxembourg's performance is up to 20% above or below the EU average, the indicator is classified as "orange" (neutral position).
- If Luxembourg's performance is more than 20% worse than the EU average, the indicator is classified as "red" (unfavourable position).

This rating is a purely visual tool to see quickly where Luxembourg is in comparison with the EU average.

Secondly, Luxembourg's absolute performance is analysed over time by comparing the most recent data values with those from the previous years. The arrows indicate in which direction each indicator has most recently changed (improvement or worsening).

- ↑ If Luxembourg's performance has improved since the last edition of the scoreboard, the indicator in question will be marked with an upward arrow.
- → If Luxembourg's performance has remained stable since the last edition of the scoreboard, the indicator in question will be marked with a horizontal arrow.
- ↓ If Luxembourg's performance has worsened since the last edition of the scoreboard, the indicator in question will be marked with a downward arrow.

In addition to the comparison with the EU average, Luxembourg is compared with the best- and worst-performing EU Member States.

[3] For additional details: https://odc.gouvernement.lu/fr/domaines-activite/Outils-evaluation_competitivite/tableau-bord-national-de-la-competitivite.html

3.1.2.2 The composite indicator approach

Calculating a composite indicator makes it possible to summarise countries' performances across all indicators, which entails a number of advantages and disadvantages. A composite indicator with country rankings is often appreciated by the media, as it allows for compact and instant information. However, it is no substitute for a more serious and in-depth analysis of each dimension considering individual indicators. To the contrary, a composite indicator inevitably requires a more detailed look at the baseline data used.

In total, the Observatory for Competitiveness calculates four composite indicators: a general composite indicator, which groups together all the competitiveness scoreboard's indicators and serves as a basis for the overall country rankings, plus one composite indicator specific to each dimension of the national indicator system (i.e. economic, social and environmental).

3.1.2.3 Changes to certain indicators

This year, some changes have been made to the scoreboard compared to previous editions. These changes are detailed in this sub-chapter:

- The indicator for the quality of the educational system (A24), taken from the WEF's Global Competitiveness Report, is replaced by the "Skillset of graduates" indicator, taken from the same publication. This change was necessary because the old indicator is no longer included in the 2018 edition of the WEF's Global Competitiveness Report;

- The indicator for "People living in households with very low work intensity (as a % of the population under the age of 60)" (B25) has been moved to the social dimension to supplement the trio of indicators measuring the fight against poverty and social exclusion as part of the Europe 2020 strategy. The other two indicators in this trio are "At-risk-of-poverty rate after social transfers" (B17) and "Severe material deprivation rate" (B18);

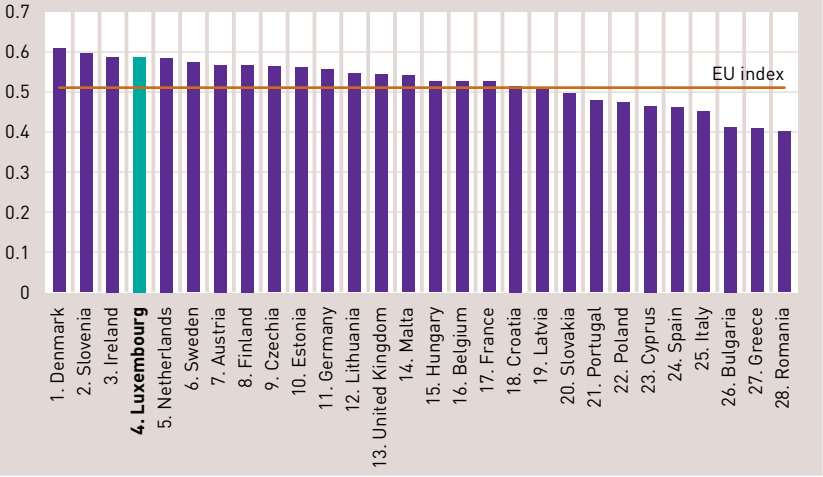
- The "Urban population exposure to air pollution" indicator (C11) is replaced by the indicator "Exposure to air pollution by fine particles (< 2.5 µm)". The old indicator is no longer available.

3.2 Overall result

According to the composite index calculated by the Observatory for Competitiveness based on the 2019 national indicator system, Luxembourg is in 4th position among the EU-28. The rankings are led by Denmark (1st), Slovenia (2nd) and Ireland (3rd). Germany is 11th, Belgium 16th, and France 17th in the overall rankings.

It is important to note that the values for some countries are extremely close to one another. For example, this is the case for Austria and Finland, as well as for Ireland and Luxembourg. Therefore, minimal variations in one sole indicator in one of the three dimensions may result in a slight increase or decrease in the overall composite index, and may thus change the overall rankings.

Chart 1
Overall result



The countries are split into four performance groups based on their competitiveness results compared across the European Union.

The "competitiveness champion" group includes countries whose competitiveness results are significantly higher than the EU composite index for 2019 (performance above 115% of the EU composite index). Denmark, Slovenia and Ireland are in this group.

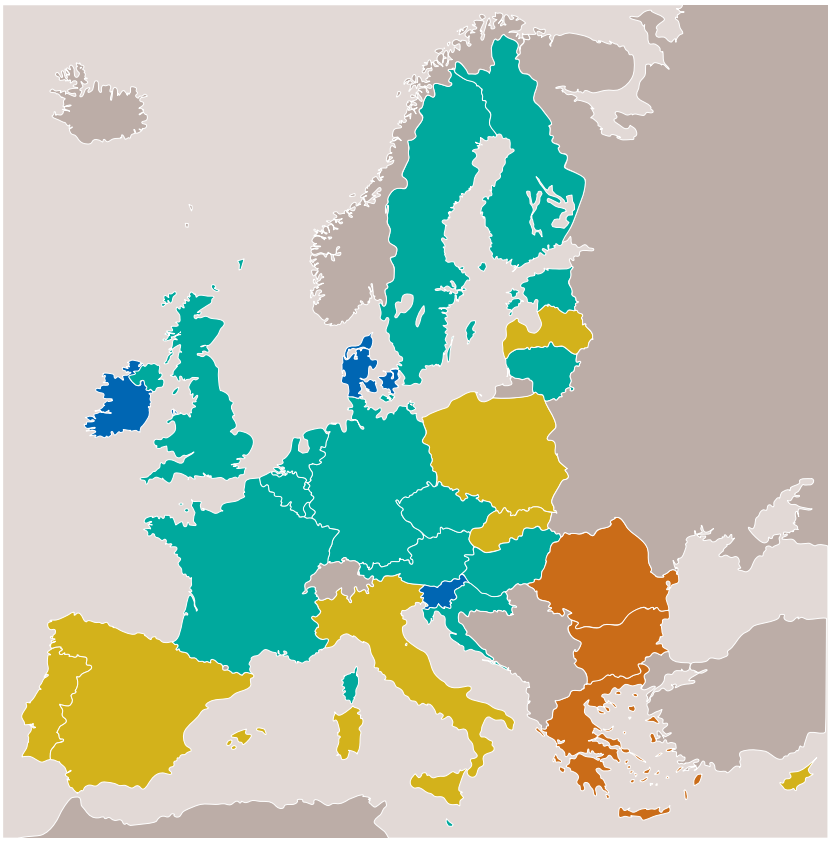
The "high performance" group includes countries whose results are higher than the EU composite index (performance between 100% and 115% of the EU composite index). This group includes Luxembourg, the Netherlands, Sweden, Austria, Finland, Czechia, Estonia, Germany, Lithuania, the United Kingdom, Malta, Hungary, Belgium, France and Croatia.

The "moderate performance" group includes countries whose results are equal to or lower than the EU composite index (performance between 85% and 100% of the EU composite index). This group includes Latvia, Slovakia, Portugal, Poland, Cyprus, Spain and Italy.

[4] Please note that the United Kingdom is still included in the rankings for EU Member States, as the data pertains to 2019.

The "modest performance" group includes countries whose results are significantly lower than the EU composite index (performance below 85% of the EU composite index). In this group are Bulgaria, Greece and Romania.

Chart 2
Overall result – performance groups



Performance in relation to the European Union Index
> 115% 115% - 100% 100% - 85% < 85%

As every year, the Observatory for Competitiveness has recalculated the overall rankings under the new national indicator system for the years 2005 to 2019. During this period, Denmark is the country that has most often topped the rankings.

It is worth noting that the update of the scoreboard also takes regular revisions of statistical data for previous years into account (from 2005 to 2018 for the current edition). Revisions to national accounts by national statistical institutes in the respective Member States have had an impact on some indicators, especially those using GDP in the denominator. In addition, the data for some indicators is published with varying time lapses. This explains why the results for the composite index, published in the previous 2019 Report, may differ from the results for the composite index published in this 2020 edition.

Between 2005 and 2019, Luxembourg experienced both upward and downward shifts. Between 2014 and 2017, the trend was negative, and Luxembourg's ranking fell from 3rd to 8th position. In 2019, Luxembourg held onto its 4th place in the rankings.

The positions of five countries, including Luxembourg, did not change between 2018 and 2019. 14 countries changed position, either up or down. Cyprus, Denmark, Hungary and Lithuania each rose two places, while France, Ireland, Romania, Czechia and Slovakia all fell by two places.

More or less significant changes in the rankings can be seen down the years. When comparing the situation in 2019 with that of 2005, the biggest drops in the rankings are recorded by Finland (-5), France (-5), the United Kingdom (-7) and Italy (-7). Other countries made big gains, including Slovenia (+6), Czechia (+6), Ireland (+8) and Hungary (+8).

Table 1
Overall rankings from 2005 to 2019

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Germany	9	9	9	9	8	7	8	8	7	9	10	10	10	10	11
Austria	5	5	5	5	4	3	6	2	4	5	8	9	9	8	7
Belgium	13	15	12	10	10	10	9	9	10	10	15	15	14	16	16
Bulgaria	28	28	28	28	28	27	27	27	27	26	27	27	27	27	26
Cyprus	20	17	18	19	18	19	23	26	26	27	26	25	25	25	23
Croatia	17	20	20	20	21	20	21	21	21	21	21	20	16	19	18
Denmark	1	1	1	1	1	1	1	1	1	1	2	1	1	3	1
Spain	22	23	23	23	23	22	24	22	22	23	23	23	22	23	24
Estonia	14	13	16	15	15	16	14	13	16	16	14	12	11	11	10
Finland	3	3	3	2	6	6	5	4	5	4	7	7	6	9	8
France	12	12	14	13	13	12	12	12	11	13	13	14	15	15	17
Greece	25	25	26	27	25	28	28	28	28	28	28	28	28	28	27
Hungary	23	22	22	22	19	18	16	19	17	17	16	17	18	17	15
Ireland	11	11	11	16	14	15	15	16	14	11	1	3	4	1	3
Italy	18	19	19	18	16	14	17	20	20	20	20	21	21	24	25
Latvia	19	21	21	26	27	26	22	17	18	19	18	18	20	20	19
Lithuania	16	16	15	17	22	24	18	15	15	12	17	16	17	14	12
Luxembourg	**7**	**6**	**6**	**6**	**5**	**4**	**3**	**6**	**3**	**3**	**4**	**6**	**8**	**4**	**4**
Malta	10	14	13	11	11	11	13	14	13	14	12	13	13	13	14
Netherlands	4	4	4	4	2	5	4	5	6	6	6	4	2	5	5
Poland	26	26	24	21	20	21	20	23	24	25	24	24	24	21	22
Portugal	24	24	25	24	24	23	25	24	23	24	22	22	23	22	21
Romania	27	27	27	25	26	25	26	25	25	22	25	26	26	26	28
United Kingd.	6	8	8	8	9	9	11	10	9	15	11	11	12	12	13
Czechia	15	10	10	12	12	13	10	11	8	8	5	5	7	7	9
Slovakia	21	18	17	14	17	17	19	18	19	18	19	19	19	18	20
Slovenia	8	7	7	7	7	8	7	7	12	7	9	8	5	2	2
Sweden	2	2	2	3	3	2	2	3	2	2	3	2	3	6	6

3.3 Results by dimension

This section will split the general composite indicator into its three dimensions, making it possible to assess the performances of the EU Member States in each dimension.

As already explained in the introduction, this assessment is based on two approaches: the "national scoreboard" (TBCO) approach and the "composite indicator" approach. The national scoreboard approach is based on a summary table that gives an overall view of the values of the individual indicators and of Luxembourg's position in the Member State rankings, taking into account changes in values and positions. For each individual indicator in the table, the EU average is indicated, as well as the highest- and lowest-ranking countries.

3.3.1 Economic dimension

3.3.1.1 The national scoreboard approach

Overview of the economic dimension of the competitiveness scoreboard

Six indicators are classified as green – i.e. Luxembourg's performance is at least 20% higher than the EU average in six areas. Nine of the 25 indicators show the country's performance to be within 20% either way of the EU average. Moreover, nine indicators are classified as red, meaning that Luxembourg's performance is at least 20% lower than the EU average.

Luxembourg's performance improved in 11 of the 25 indicators between 2018 and 2019. 12 of the 25 indicators showed a deterioration in performance when comparing the latest available data with 2018's data. Luxembourg's performance remained stable in the indicators for time required to set up a company (days) and unemployment rate (%).

Table 2
Data for the economic dimension

		Year	LU	Trend[5]	Δ_v[6]	Position	Δ_p[7]	EU	First	Last
A1	Public debt (% of GDP)	2019	22.10	↘	+1.10	3/28	-1	79.30	EE: 8.40	EL: 176.60
A2	Government balance (% of GDP)	2019	2.20	↘	-0.90	2/28	-1	-0.80	DK: 3.70	RO: -4.30
A3	Current account balance, % of GDP (average over 3 years)[8]	2019	4.70	↗	-0.20	20/28	+1	2.10	HU: 0.70	NL: 10.50
A4	Market share of world exports (% change over 5 years)	2019	10.19	↘	-4.61	10/28	-2	9.04	IE: 70.89	SE: -5.14
A5	Net international investment position (% of GDP)	2019	56.20	↗	+1.00	4/28	+1	-23.14	NL: 90.00	IE: -174.00
A6	Real effective exchange rate (42 trade partners, % change over 3 years)	2019	2.00	↗	-1.30	17/28	-3	1.37	SE: -8.30	CZ: 8.70
A7	Real GDP growth (%; average over 3 years)	2019	2.40	↘	-0.77	18/28	-4	2.03	IE: 7.73	IT: 0.97
A8	Inflation rate (%)[9]	2019	1.70	↗	-0.20	4/28	+7	1.50	MT: 1.50	RO: 3.90
A9	Time required to set up a company (days)	2019	16.50	→	0.00	20/28	0	11.89	DK: 3.50	PL: 37.00
A10	Long-term government bond yields (%)	2019	-0.12	↗	-0.68	3/27	+1	0.74	DE: -0.25	RO: 4.54
A11	Regulatory capital for risk-weighted assets (%)	2019	21.91	↘	-3.10	8/27	-5	20.11	EE: 25.42	ES: 15.91
A12	Availability of financial resources for entrepreneurs (score from 1 to 5)	2019	2.71	↗	+0.27	14/17	+1	2.89	NL: 3.64	CY: 2.41
A13	Employment rate of population aged 20-64 (%)	2019	72.80	↗	+0.70	21/28	0	73.90	SE: 82.10	EL: 61.20
A14	Unemployment rate (%)	2019	5.60	→	0.00	16/28	-2	6.30	CZ: 2.00	EL: 17.30
A15	Average annual level of variation in total factor productivity in the economy overall (%)	2019	-0.76	↘	-0.81	28/28	-2	0.25	PL: 2.28	LU: -0.76
A16	Real labour productivity per hour worked (%; average growth rate over 3 years)	2019	-1.00	↘	-0.97	27/27	-1	1.00	PL: 5.30	LU: -1.00
A17	Nominal unit labour costs (% change over 3 years)	2019	11.90	↘	+4.00	21/28	-4	4.00	IE: -4.40	RO: 24.50
A18	Corporate tax rates (%)	2019	24.94	↗	-1.07	18/28	+3	21.83	BG: 10.00	MT: 35.00
A19	Profitability of non-financial companies (%)	2018	5.90	↘	-0.50	25/25	+3	10.47	MT: 15.30	LU: 5.90
A20	GDP/hour worked (US=100)	2019	138.00	↘	-4.07	1/28	0	78.95	LU: 138.00	BG: 38.00
A21	Gross domestic R&D expenditure (% of GDP)	2018	1.21	↘	-0.06	17/28	-1	2.11	SE: 3.32	RO: 0.50
A22	Share of jobs in medium-high and high-tech manufacturing sectors (% of total jobs)	2019	0.80	↗	+0.20	27/28	+1	5.80	CZ: 11.50	CY: 0.80
A23	Entrepreneurial intentions (%)	2019	12.92	↘	-1.78	8/16	-2	13.06	LV: 23.24	IT: 5.37
A24	Skillset of graduates (average score; 1 to 7)	2019	5.27	↗	+0.26	3/28	+6	4.57	FI: 5.62	HR: 3.35
A25	Life-long learning as a % of the population aged 25-64	2019	19.10	↗	+1.10	7/28	0	11.30	SE: 34.30	RO: 1.30

[5] Luxembourg's change in indicator performance.

[6] Δ_v: Change in the indicator value.

[7] Δ_p: Position change in the rankings.

[8] Countries are ranked based on the extent to which their current account balance deviates from the average of the two thresholds set by the MIP (the aim is for the balance to be close to +1% of the GDP).

[9] Countries are ranked in terms of the extent to which they vary from the EU average inflation rate.

Description of the most significant indicators in the economic dimension (in terms of values and positions)

Over the last two years, Luxembourg has performed poorly in the indicators that focus on price and cost competitiveness. Luxembourg comes last in the rankings for average annual level of variation in total factor productivity in the economy overall (A15) and real labour productivity per hour worked (A16). The same applies to profitability of non-financial companies (A19): according to the most recent data, Luxembourg carries the EU's wooden spoon with a rate of 5.90%. Conversely, Luxembourg ranks first in the indicator for GDP per hour worked (A20).

Thereafter, in terms of the share of jobs in medium-high and high-tech (A22), Luxembourg comes second last among Member States, with a rate of just 0.8% in 2019. Medium-high and high-tech sectors are defined as sectors with relatively high R&D-intensity requirements. In particular, this includes sectors such as aeronautical and space engineering; the pharmaceutical industry; the manufacturing of office machinery and office and IT equipment; electronics and communications; and scientific instruments for advanced technology.

Main changes in the economic dimension (in terms of values and positions)

To gain a better understanding of these relative rankings, it is important to identify the reasons why these changes occurred. It can be difficult, or even impossible, to analyse a country's results in a general manner when only composite indicators are taken into account. Thus, we need to study the baseline data and the individual indicators used in order to understand Luxembourg's performance in the composite indicators. The indicators studied in more depth are selected based on the changes in position between 2018 and 2019.

From a methodological perspective, it is worth remembering that the rankings are relative by design, meaning that Luxembourg's ranking also depends on the performances of other countries. Regardless of whether Luxembourg performs well or badly, other countries might perform even better or even worse, and so Luxembourg's position will ultimately increase or decrease depending on that. The rankings reveal nothing about a country's absolute performance. To the contrary, an improvement in one country's ranking may result simply from other countries performing worse than the previous year. That is why the Observatory for Competitiveness always recommends providing a more detailed description of the scoreboard's individual base indicators.

The indicators that changed the most between 2018 and 2019 are, among others, A7, A8, A11 and A24, whose differences in position ranged from +7 (A8) to -5 (A11) from one year to the next.

i. Real GDP growth (%; average over 3 years) (A7)

As of 2019, average real GDP growth over 3 years amounts to 2.40%. Luxembourg lost four positions in the country rankings compared to 2018. Ireland performed best in this indicator, with a growth rate of 7.73%, while Italy performed worst, at 0.97%.

ii. Inflation rate (%) (A8)

The difference between Luxembourg's inflation rate (1.70%) and the EU average (1.50%) reduced by 0.2 percentage points. As a result, Luxembourg gained seven positions from 2018 to 2019, ranking 4th.

iii. Regulatory capital for risk-weighted assets (%) (A11)

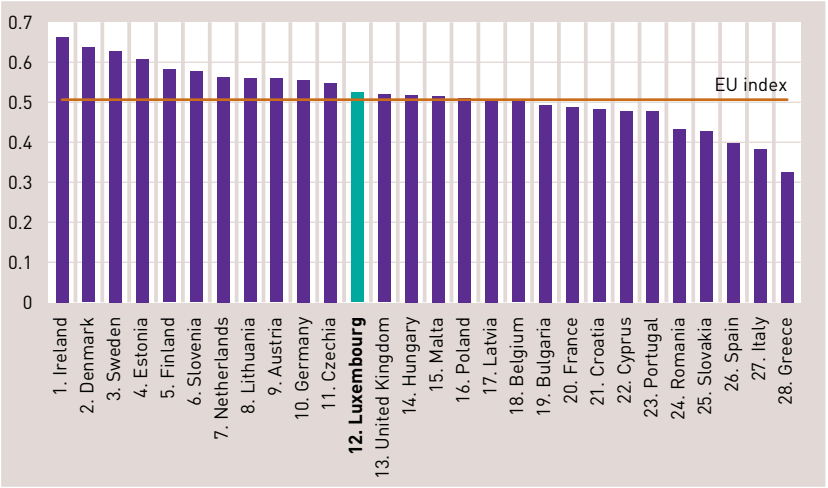
To guarantee a solid and stable banking system, the banking regulatory authorities have introduced bank solvency requirements. The "Regulatory capital for risk-weighted assets (%)" indicator reflects a bank's own-funds requirements relative to its credit risk. Each asset is assigned a weighted risk to ensure that the bank does not take on more risks that it is able to bear. As of 2019, this ratio is equal to 21.91%, putting Luxembourg 8th in the rankings, five places lower than the previous year.

iv. Skillset of graduates (average score; 1 to 7) (A24)

The "Skillset of graduates (average score; 1 to 7)" indicator is taken from the WEF report for the purpose of measuring the quality of the national education system. Luxembourg ranks 3rd among the European Union's 28 Member States, gaining six places over the previous year with a score of 5.27 out of 7 (with 7 being the maximum score). Finland tops the rankings with a score of 5.62.

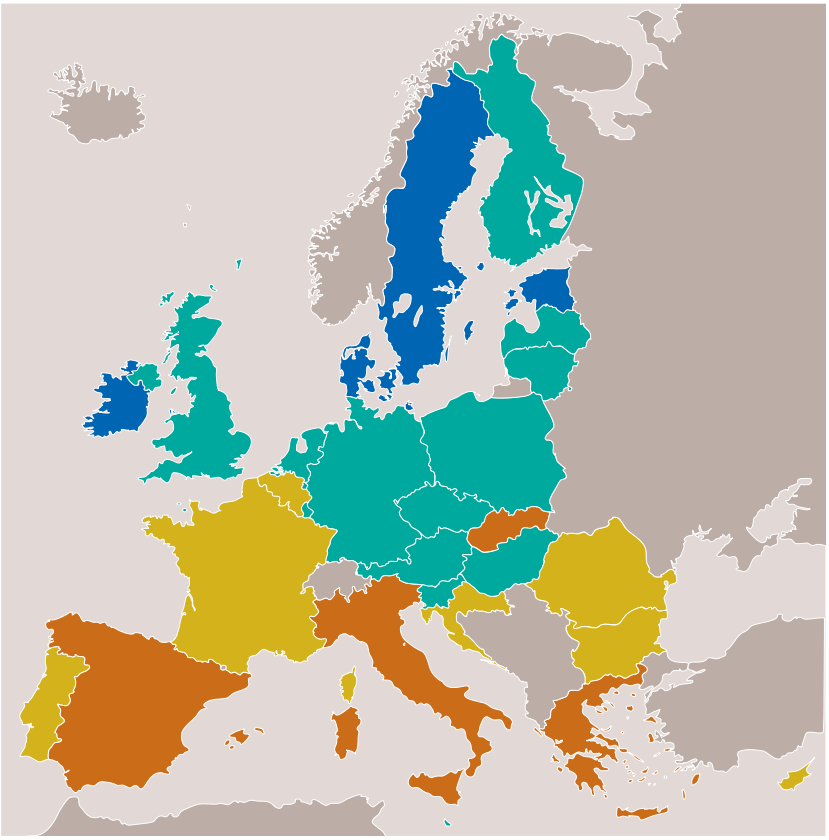
3.3.1.2 The composite indicator approach

Chart 3
Results for the economic dimension



In 2019, Luxembourg dropped one place in the rankings for the economic dimension, moving from 11th to 12th.

Chart 4
Results for the economic dimension – performance groups



Performance in relation to the European Union Index
> 115% 115% - 100% 100% - 85% < 85%

In the same way as for the overall result, the countries are split into four groups: competitiveness champions, high performance, moderate performance and modest performance.

The champions in the economic dimension are Ireland, Denmark, Sweden and Estonia. The high-performance group consists of Finland, Slovenia, the Netherlands, Lithuania, Austria, Germany, Czechia, Luxembourg, the United Kingdom, Hungary, Malta, Poland and Latvia. The moderate-performance group contains Belgium, Bulgaria, France, Croatia, Cyprus, Portugal and Romania. Finally, the modest-performing countries in the economic dimension are Slovakia, Spain, Italy and Greece.

In relation to its neighbouring countries and the Netherlands, Luxembourg (12th) is behind the Netherlands (7th) and Germany (10th), but ahead of Belgium (18th) and France (20th).

In this dimension, as in the previous year, Ireland and Greece are interesting case studies, with significantly higher and lower values respectively than any other country.

Ireland ranks first in three indicators: Market share of world exports (% change over 5 years – A4), Real GDP growth (%; average over 3 years – A7), and Nominal unit labour costs (% change over 3 years – A17). However, Ireland's value for indicator A4 (Market share of world exports (% change over 5 years)) is an outlier. Consequently, it has been revised in the calculation of the composite indicator by assigning Ireland the second-highest value.[10]

Ireland's progress in the rankings since 2010 has been remarkable, climbing from 18th in the economic dimension in 2010 to reach 1st by 2015, where it has remained ever since. However, as a reminder, these results include Ireland's spectacular GDP growth in 2015 following the relocation of several major foreign economic operators' activities to Ireland.

Greece ranks last in three indicators: Public debt (A1), Employment rate of population aged 20-64 (% – A13), and Unemployment rate (% – A14) and has been at the bottom of the economic dimension's ranking since 2005.

[10] Please consult https://odc.gouvernement.lu/fr/domaines-activite/Outils-evaluation_competitivite/tableau-bord-national-de-la-competitivite.html for detailed explanations on the method for processing outliers.

Table 3
Rankings for the economic dimension from 2005 to 2019

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Germany	13	11	9	3	6	4	2	2	2	5	8	8	7	7	10
Austria	6	9	6	6	5	6	6	4	7	14	11	11	12	10	9
Belgium	15	14	13	10	7	5	5	8	10	9	10	15	13	16	18
Bulgaria	22	25	25	24	22	24	23	19	23	24	21	19	19	19	19
Cyprus	18	13	14	12	14	17	22	25	27	27	26	23	23	24	22
Croatia	23	23	20	21	24	25	25	22	22	23	25	22	21	21	21
Denmark	1	1	1	1	1	1	1	1	1	1	4	4	3	5	2
Spain	25	26	26	26	25	26	27	27	26	26	27	27	27	26	26
Estonia	10	10	8	17	16	10	4	3	6	4	7	9	10	4	4
Finland	2	2	2	2	4	3	3	5	8	13	9	5	5	9	5
France	16	17	17	15	15	15	15	16	15	16	16	16	16	20	20
Greece	28	28	28	27	27	28	28	28	28	28	28	28	28	28	28
Hungary	27	27	27	25	23	23	19	24	18	20	18	18	18	18	14
Ireland	5	8	12	19	17	18	16	12	9	3	1	1	1	1	1
Italy	24	22	23	23	21	19	21	23	24	22	23	26	26	27	27
Latvia	14	16	21	28	28	27	12	6	11	15	13	12	15	15	17
Lithuania	12	15	15	18	26	20	18	9	5	7	14	20	22	14	8
Luxembourg	**9**	**5**	**4**	**11**	**9**	**9**	**9**	**10**	**4**	**6**	**5**	**7**	**11**	**11**	**12**
Malta	17	21	19	20	13	14	17	17	17	11	12	13	9	13	15
Netherlands	8	6	7	5	2	7	8	7	12	10	6	6	6	6	7
Poland	20	20	18	16	12	13	13	21	20	21	22	21	20	17	16
Portugal	26	24	24	22	20	21	26	26	25	25	24	25	25	23	23
Romania	19	18	22	13	19	22	20	20	14	12	17	17	17	25	24
United Kingdom	3	7	11	8	10	8	11	14	13	18	15	14	14	12	13
Czechia	7	4	5	9	8	11	10	13	3	8	3	3	4	8	11
Slovakia	21	19	16	14	18	16	24	18	21	19	20	24	24	22	25
Slovenia	11	12	10	7	11	12	14	15	19	17	19	10	8	3	6
Sweden	4	3	3	4	3	2	7	11	16	2	2	2	2	2	3

Luxembourg's performance over this period has been mixed, peaking at 4th between 2007 and 2013, while hitting a low of 12th in 2019.

When comparing performance in the economic dimension between 2005 and 2019, Hungary has improved the most, gaining 13 positions, while the United Kingdom has lost the most performance, falling by 10 positions.

When comparing the results of the current data with the previous year's data, Germany, Czechia, Slovakia and Slovenia have lost the most positions (-3), while Lithuania has gained the most (+6).

Availability of data for the economic dimension

Table 4
Missing data for the economic dimension (%)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Economic dimension	21.3	19.4	18.6	9.1	8.7	7.7	7.0	5.6	6.0	5.4	6.1	5.9	3.1	3.7	11.9

Most of the economic dimension data is readily available and is based on well-established indicators. However, some indicators were only developed recently, such as Skillset of graduates (A24 – since 2017). The indicators for Availability of financial resources for entrepreneurs (A12) and Entrepreneurial intentions (A23) originate from the Global Entrepreneurship Monitor (GEM) study. The GEM database for 2019 holds information on only 16 of the EU's 28 Member States. Luxembourg has been participating since 2013, while other countries, such as the United Kingdom, the Netherlands and Spain, have been doing so every year since 2005.

17 of the 25 indicators are taken from Eurostat, which has drawn up a European Statistics Code of Practice setting the standards for developing, producing and disseminating European statistics. The sources of the remaining eight indicators are the World Bank, the Global Entrepreneurship Monitor (GEM) study, the European Commission's AMECO database, the World Economic Forum (WEF) and the International Monetary Fund (IMF). Seven of the 25 indicators used for the economic dimension (A1, A3, A4, A5, A6, A14 and A17) are used by the European Commission as part of the Macroeconomic Imbalance Procedure (MIP).

3.3.2 Social dimension

3.3.2.1. The national scoreboard approach

Table 5
Data for the social dimension

		Year	LU	Trend[11]	Δ_v[12]	Position[13]	Δ_p[14]	EU Average	First	Last
B1	Long-term unemployment rate (%)	2019	1.30	↗	-0.10	13/28	-6	2.50	CZ: 0.60	EL: 12.20
B2	Risk of in-work poverty (%)	2019	12.00	↘	+0.50	21/23	+4	9.20	FI: 2.90	RO: 15.40
B3	Proportion of employees with fixed-term contracts (%)	2019	7.90	↗	-0.60	13/28	+2	10.80	LT: 1.10	ES: 21.90
B4	Young people not in employment, education or training (NEET) (%)	2019	5.60	↘	+0.30	3/28	-1	10.10	NL: 4.30	IT: 18.10
B5	Involuntary part-time work (%)	2019	13.30	↘	+0.50	10/28	-1	24.30	SI: 5.00	EL: 66.90
B6	Long working hours in main job (%)	2019	4.20	↘	+0.10	7/28	0	9.10	LT: 0.70	EL: 16.60
B7	Change in employment rate compared to the previous year (%)	2019	3.60	↘	-0.10	2/28	+1	1.00	MT: 5.80	PL: -0.20
B8	Individuals having prematurely left education and training (%)	2019	7.20	↘	+0.90	9/28	-1	10.30	HR: 3.00	ES: 17.30
B9	Level of higher education amongst 30 to 34-year-olds	2019	56.20	→	0.00	3/28	+1	41.60	CY: 58.80	RO: 25.80
B10	School year repetition rate (%)	2015	30.90	↗	-3.60	25/28	+1	12.00	HR: 1.60	BE: 34.00
B11	Median income (% change from previous year)	2019	5.46	↗	+10.53	13/23	+15	2.17	BG: 17.66	SE: -4.17
B12	Median income expressed in purchasing power standard (euros)	2019	28,943	↗	+1,414	1/23	0	17,552	LU: 28,943.00	RO: 7,338.00
B13	Gender wage gap (%)	2018	4.60	↗	-0.40	2/25	0	15.70	RO: 3.00	EE: 22.70
B14	Wage changes (%) in the economy (real ULC), over 3 years	2019	1.27	↗	+0.37	7/28	+2	0.15	SK: 2.38	IE: -2.32
B15	Household debt (consolidated) (%)	2019	65.80	↗	-0.30	23/27	0	49.70	RO: 15.40	DK: 108.60
B16	Net worth per household (in EUR k)	2017	897.90	↗	+129.50	1/22	0	233.59	LU: 897.90	LV: 43.00
B17	At-risk-of-poverty rate after social transfers (%)	2019	17.50	↘	+0.80	17/25	-1	16.80	CZ: 10.10	RO: 23.80
B18	Serious material deprivation rate (%)	2019	1.30	→	0.00	1/25	0	5.50	LU: 1.30	BG: 19.90
B19	Gini index of income inequality (0 to 100)	2019	32.30	↘	+1.00	18/23	+1	30.70	SI: 23.90	BG: 40.80
B20	Effectiveness of social transfers (difference between the at-risk-of-poverty rate before and after social transfers) in percentage points	2019	28.60	↘	-2.10	5/23	0	26.30	AT: 31.60	LV: 16.40
B21	Individuals living in over-crowded accommo-dation (% of the total population)	2019	7.10	↗	-1.30	5/23	+6	15.60	CY: 2.20	RO: 45.80
B22	Housing cost burden over 25% of disposable household income (owners and tenants) (%)	2019	23.75	↗	-0.68	10/23	+6	24.67	HU: 9.71	EL: 70.33
B23	Delinquency, violence or vandalism in the surrounding area (%)	2019	11.20	↗	-0.10	14/23	+2	9.80	HR: 2.70	BG: 20.20
B24	Healthy life expectancy (years)	2018	60.70	↗	+1.50	17/28	+1	63.60	SE: 72.80	LV: 52.30
B25	Persons living in households with low work intensity (as a % of the population under the age of 60)	2019	7.50	↗	-0.80	11/25	+3	8.50	CZ: 4.20	EL: 13.80

[11] Luxembourg's change in indicator performance.

[12] Δ_v: Change in the indicator value.

[13] It should be noted that the rankings are not always out of 28 due to missing data for certain countries for the most recent year.

[14] Δ_p: Position change in the rankings.

Overview of the social dimension of the competitiveness scoreboard

As regards Luxembourg's performance in the social dimension, 15 of the 25 indicators are classified as green, meaning that the country's performance in these areas is more than 20% above the EU average. Eight indicators are classified as orange and two as red.

The main aim of the social dimension is to evaluate the state and development of a country's quality of life, well-being and social cohesion. The relevant indicators primarily cover the labour market, education, income, private wealth and debt, social inequality and living conditions.

Description of the most significant indicators in the social dimension (in terms of values and positions)

Luxembourg ranks 21st for Risk of in-work poverty (B2), with a rate of 12% in 2019 (NB: the data for five countries is missing). The risk of in-work poverty measures the proportion of people in work who have an equivalent disposable income below the poverty risk threshold, which is set at 60% of the national median equivalent disposable income (after social transfers).

It should be noted that the data for the school year repetition rate (%) (indicator B10) originates from the PISA study, whose most recent available data is from 2015. Thus, this ranking remains the same as in the previous edition of the Report.

In terms of Household debt (consolidated) (%) (indicator B15), Luxembourg had a rate of 65.80% in 2019, resulting in it remaining in 23rd position like the previous year.

Luxembourg ranks first in the indicators for Median income expressed in purchasing power standard (B12), Net worth per household (B16), and Severe material deprivation rate (B18).

Main changes in the social dimension (in terms of values and positions)

The biggest changes between 2018 and 2019 are seen in indicators B1, B11, B21 and B22, with variations in position ranging between -6 (B1) and +15 (B11). Again, a change in position reveals nothing about whether the indicator values have increased, decreased or remained stable.

i. Long-term unemployment rate (%) (B1)

Luxembourg's long-term unemployment rate reduced by 0.10 percentage points between 2018 and 2019. However, this positive shift could not prevent Luxembourg slipping from 7th to 13th position in the rankings.

ii. Median income (% change from previous year) (B11)

Luxembourg's median income increased by 5.46% over the previous year. Nevertheless, more explanations on the rank (13/23) and the change in position from the previous year (+15) are needed. Firstly, recent data is missing for five EU Member States resulting in a ranking of only 23 positions. Secondly, Luxembourg was ranked bottom (28/28) last year, so its rise from 28th to 13th position explains the 15-place increase in the current rankings.

iii. Individuals living in over-crowded accommodation (% of the total population) (B21)

In 2019, 15.60% of the EU-28's population lived in overcrowded accommodation. The highest rate of overcrowding among the EU Member States was recorded in Romania (45.80%), while the lowest was in Cyprus (2.20%). Luxembourg's rate of overcrowding is 7.10%, thus improving compared to 2018.

iv. Housing cost burden over 25% of disposable household income (owners and tenants) (%) (B22)

In 2019, 23.75% of Luxembourg's population (both owners and tenants) faced a housing cost burden of more than 25% of their disposable household income. The data for this indicator assesses the percentage of owners and tenants in each Member State and the housing cost burden for each household. The Observatory for Competitiveness performed this calculation using data published by Eurostat.

Comparing the most recent data (2019) with data from the previous year (2018), the rate has decreased from 28.1% to 24.7% across the EU-28, and from 24.4% to 23.7% in Luxembourg.

3.3.2.2 The composite indicator approach

Chart 5
Results for the social dimension

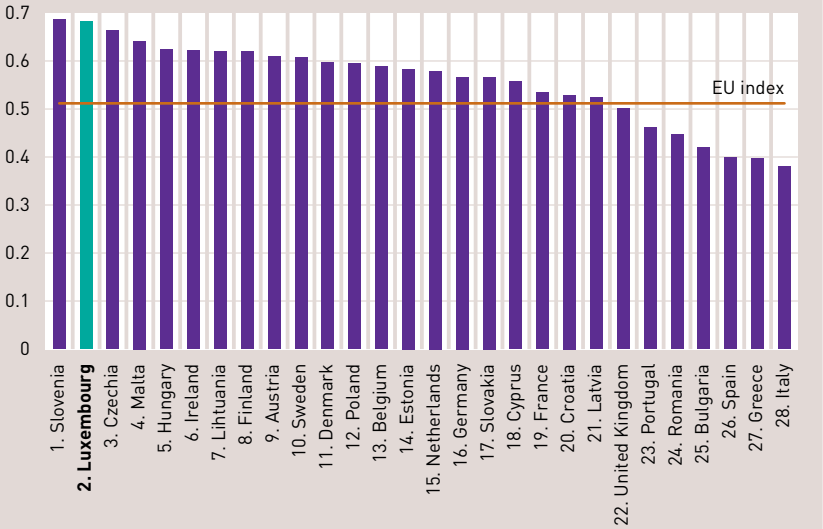
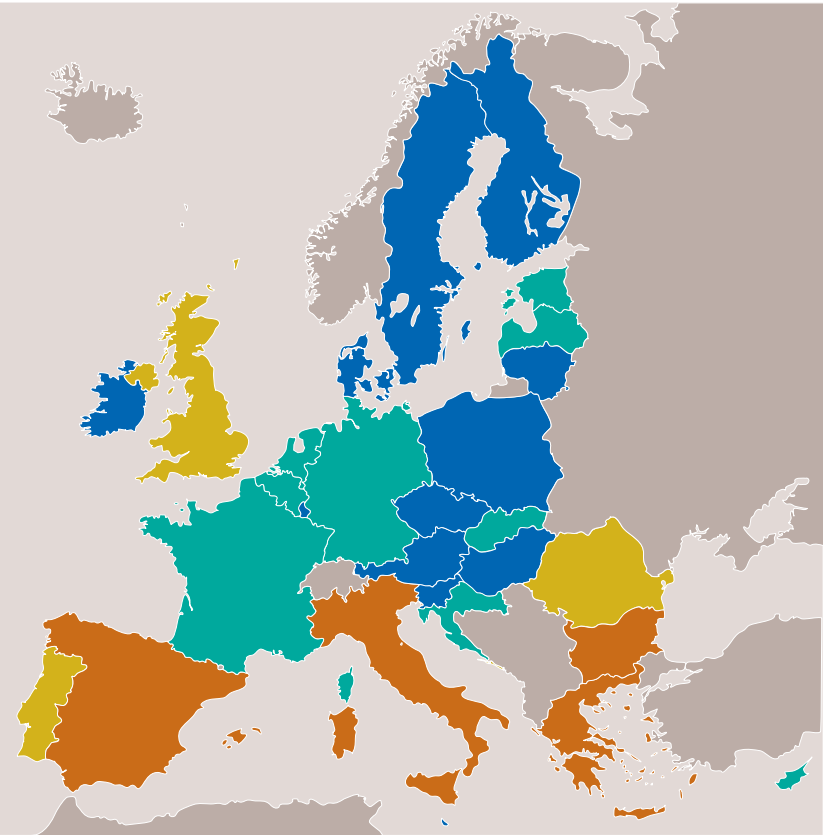


Chart 6
Results for the social dimension – performance groups



Performance in relation to the European Union Index
> 115% 115% - 100% 100% - 85% < 85%

The champions in the social dimension are Slovenia, Luxembourg, Czechia, Malta, Hungary, Ireland, Lithuania, Finland, Austria, Sweden, Denmark and Poland. The high-performance group contains Belgium, Estonia, the Netherlands, Germany, Slovakia, Cyprus, France, Croatia and Latvia.

The moderate-performance group consists of the United Kingdom, Portugal and Romania. Finally, the modest-performing countries are Bulgaria, Spain, Greece and Italy.

It can be noted that Luxembourg is ahead of its neighbouring countries Belgium (13th), Germany (16th) and France (19th), as well as the Netherlands (15th).

Table 6
Rankings for the social dimension from 2005 to 2019

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Germany	15	18	17	19	14	14	13	14	15	15	13	14	15	18	16
Austria	7	9	9	11	8	5	8	7	7	7	7	8	8	11	9
Belgium	10	10	13	9	7	10	9	8	8	9	11	12	12	16	13
Bulgaria	25	27	28	26	23	22	28	26	24	23	26	28	25	28	25
Cyprus	6	6	4	5	6	9	11	16	21	22	22	20	20	17	18
Croatia	22	21	23	22	21	21	22	21	22	20	21	22	21	20	20
Denmark	3	3	5	7	9	7	5	9	5	5	5	5	7	12	11
Spain	23	23	24	23	27	27	25	27	27	27	25	26	27	25	26
Estonia	17	16	18	15	20	20	18	17	16	16	14	13	10	13	14
Finland	4	5	6	4	4	2	3	3	3	3	6	7	6	7	8
France	11	13	14	14	13	12	12	13	13	12	16	18	17	19	19
Greece	19	22	25	24	24	24	27	28	28	28	28	27	28	27	27
Hungary	18	20	19	20	19	19	20	20	20	19	18	15	16	10	5
Ireland	8	8	7	8	12	13	15	15	11	11	8	10	9	4	6
Italy	16	19	20	21	22	18	21	22	23	24	23	23	26	26	28
Latvia	26	25	22	25	28	28	26	23	19	21	20	21	22	22	21
Lithuania	20	14	10	16	16	23	17	11	12	8	10	9	13	8	7
Luxembourg	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**
Malta	9	7	8	6	5	6	6	5	4	4	4	4	2	5	4
Netherlands	12	11	11	10	11	8	10	10	10	14	12	11	11	15	15
Poland	27	24	21	18	15	17	16	18	17	17	17	17	14	9	12
Portugal	24	26	26	28	26	25	24	25	25	26	24	24	24	24	23
Romania	28	28	27	27	25	26	23	24	26	25	27	25	23	23	24
United Kingd.	14	15	15	17	18	15	14	12	14	13	15	16	19	21	22
Czechia	13	12	12	12	10	11	7	6	9	10	9	6	4	2	3
Slovakia	21	17	16	13	17	16	19	19	18	18	19	19	18	14	17
Slovenia	5	4	3	3	2	4	4	4	6	6	3	3	3	3	1
Sweden	2	2	2	2	3	3	2	2	2	2	2	2	5	6	10

Luxembourg ranked first in the social dimension every year between 2005 and 2018, with 2019 the first year that Luxembourg has slipped to 2nd. Italy ranks last in this dimension.

The biggest drops in position between 2005 and 2019 were recorded by Italy and Cyprus (-12). The countries that have gained the most positions are Poland (+15), Hungary (+13) and Lithuania (+13). Hungary (+5) was the best improver between 2018 and 2019. Sweden's position has fallen the most, losing four places.

Availability of data for the social dimension

Table 7
Missing data for the social dimension (%)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Social dimension	24.4	21.1	14.6	14.6	11.0	10.9	12.9	8.6	12.3	9.1	4.3	12.1	9.0	12.4	22.7

Data in this dimension is generally delayed in becoming available, which explains why 22.7% of 2019's data is missing.

3.3.3 Environmental dimension

3.3.3.1 The national scoreboard approach

Table 8
Data for the environmental dimension

		Year	LU	Trend[15]	Δ_v[16]	Position	Δ_p[17]	EU Average	First	Last
C1	Energy intensity (energy consumption per GDP unit) (kilograms of oil equivalents per euro)	2018	88.73	↘	+0.85	4/28	0	117.75	IE: 53.19	BG: 414.36
C2	Share of crude oil and petroleum products in total household energy consumption (%)	2018	29.10	↗	-0.08	26/28	-1	10.83	SK: 0.37	IE: 38.86
C3	Resource productivity (EUR (PPS) per kilogram)	2019	3.76	↗	+0.27	3/28	+1	2.34	NL: 4.21	BG: 0.79
C4	Domestic raw material consumption (RMC) (in tonnes per head)	2019	21.81	↗	-0.95	22/28	0	13.42	IT: 8.13	FI: 32.48
C5	Renewable energy share (% of national 2020 target)	2018	82.35	↗	+25.21	21/28	+6	89.90	HR: 140.12	NL: 52.75
C6	Greenhouse gas emission intensity (index 100 in 2000)	2018	91.40	↗	-0.40	24/28	-2	84.90	MT: 57.60	LT: 102.80
C7	Waste production per head (kilograms per person)	2018	14,828	↗	-2,577.00	25/28	+1	5,068	LV: 920	FI: 23,253
C8	Municipal waste recycling rate (%)	2018	50.10	↘	-0.30	7/25	-1	47.00	DE: 67.30	MT: 6.50
C9	E-waste recycling rate (%)	2018	44.10	↘	-1.40	9/17	+3	38.40	HR: 83.40	FR: 34.50
C10	Exposure to air pollution by fine particles (< 2.5 µm)	2018	11.10	↗	-2.10	8/27	+6	13.80	EE: 6.20	PL: 24.30
C11	Exposure to air pollution by fine particles (< 10 µm)	2018	21.10	↗	-1.40	13/27	+2	21.60	FI: 11.50	BG: 33.80
C12	Biochemical oxygen demand in rivers (mg O_2/l)[18]	2017						2.00	SI: 0.81	CY: 3.31
C13	Total expenditure on environmental protection (% of GDP)	2018	0.90	↗	+0.10	6/28	+1	0.80	NL: 1.40	FI: 0.20
C14	Land protected (%)	2019	27.00	→	0.00	6/28	0	18.00	SI: 38.00	DK: 8.00
C15	Ecoinnovation Index (EU index 100)	2018	138.00	↘	-1.00	1/28	+2	100.00	LU: 138.00	CY: 45.00
C16	Green activities (% of GDP)	2017	4.67	↗	+0.08	14/24	0	5.24	FI: 18.07	IE: 2.17
C17	Number of green jobs (% of total jobs)	2017	2.93	↗	+0.34	6/24	+1	1.93	FI: 5.19	BE: 0.72
C18	Non-energetic material productivity (EUR per kilogram)	2019	4.98	↗	+0.42	4/28	0	3.01	NL: 6.84	RO: 0.99
C19	Circular economy									

[15] Luxembourg's change in indicator performance.

[16] Δ_v: Change in the indicator value.

[17] Δ_p: Position change in the rankings.

[18] For the "Biochemical oxygen demand in rivers (mg O_2/l)" indicator (C12), Luxembourg's data is not available, which is why this indicator is no longer included in the calculation of the composite indicator

Overview of the environmental dimension of the competitiveness scoreboard

As regards Luxembourg's performance in the environmental dimension, three indicators are classified as red, meaning that Luxembourg's performance is more than 20% below the EU average in these indicators. Six indicators are classified as green, and eight as orange.

A country's development, which is fostered at the expense of the environment is not only unsustainable in the long term but also deprives citizens of another form of wealth, namely natural heritage. Sustainable preservation of the natural environment appears to be a crucial matter and the environmental dimension is therefore an integral part of the new system of indicators. A range of indicators cover issues such as raw materials, energy efficiency, renewable energies, harmful emissions, waste processing, nature and the ecosystem, biodiversity and the transition towards a green economy.

Description of the most significant indicators in the environmental dimension (in terms of values and positions)

Indicator C2 shows the share of crude oil and petroleum products in total household energy consumption. Luxembourg's share in 2018 was 29.1%, putting it 26th out of the 28 Member States.

In Luxembourg, the indicator for domestic raw material consumption (C4), which includes solids, gases and liquids except water and air, is 21.81 tonnes per head. The best-performing EU Member State is Italy, with 8.13 tonnes per head.

Indicator C6 (Greenhouse gas emission intensity) is the ratio of energy-related greenhouse gas emissions (carbon dioxide, methane and nitrogen oxide) to gross domestic energy consumption. This index (set at 100 in the year 2000) shows that several Member States have been able to reduce their greenhouse gas emissions since 2000. However, this index does not provide any information about initial consumption levels. Luxembourg is around the EU average, with an index of 91.4 in 2018.

Luxembourg performs relatively well in terms of waste production per head (indicator C7). In 2018, the country produced approximately 14.8 tonnes of waste per head. Countries like Finland, Estonia and Bulgaria produce more waste than Luxembourg. Latvia, at 920 kg per head, produces the lowest amount of waste in the European Union.

On the other hand, Luxembourg ranks first in the Ecoinnovation Index indicator (C15) and 3rd in indicator C3 (Resource productivity (EUR (PPS) per kilogram)).

Main changes in the environmental dimension (in terms of values and positions)

Luxembourg's ranking remains the same for indicators C4, C16 and C18, although its performance in these indicators has improved.

In general, there are fewer year-on-year changes in this dimension than in the other two. Furthermore, data availability varies strongly from one indicator to the next.

i. Renewable energy share (% of national 2020 target) (C5)

As regards the share of renewable energy in gross energy consumption (% of national 2020 target), a number of countries had already met their 2020 target by 2018: Bulgaria, Czechia, Denmark, Estonia, Greece, Croatia, Italy, Cyprus, Latvia, Lithuania, Finland and Sweden. In 2018, Luxembourg was at 82.35% of its 2020 national target, gaining six places. Consequently, it remains on course to meet its target.

ii. Exposure to air pollution by fine particles (< 2.5 µm) (C10)

With a score of 11.10 in 2018, Luxembourg gained six places in the indicator for exposure to air pollution by fine particles (< 2.5 µm). Estonia and Sweden achieved the best result, with 6.20.

3.3.3.2 The composite indicator approach

Chart 7
Results for the environmental dimension

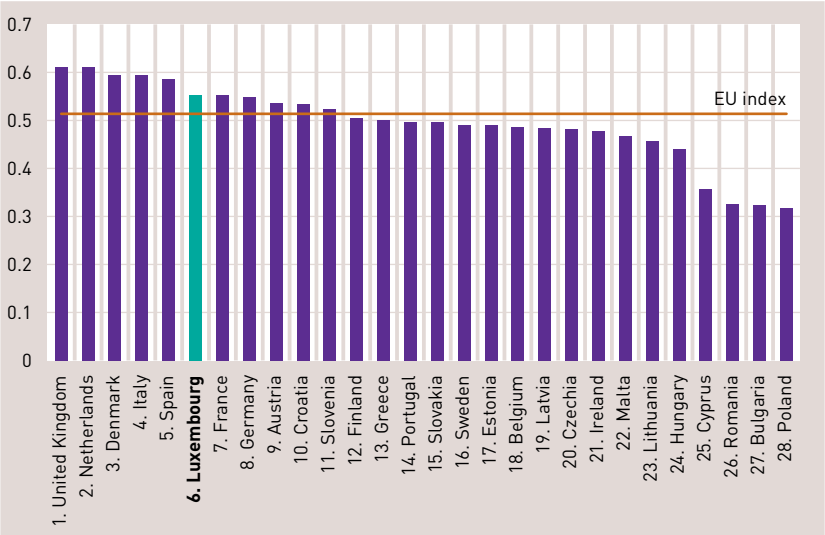
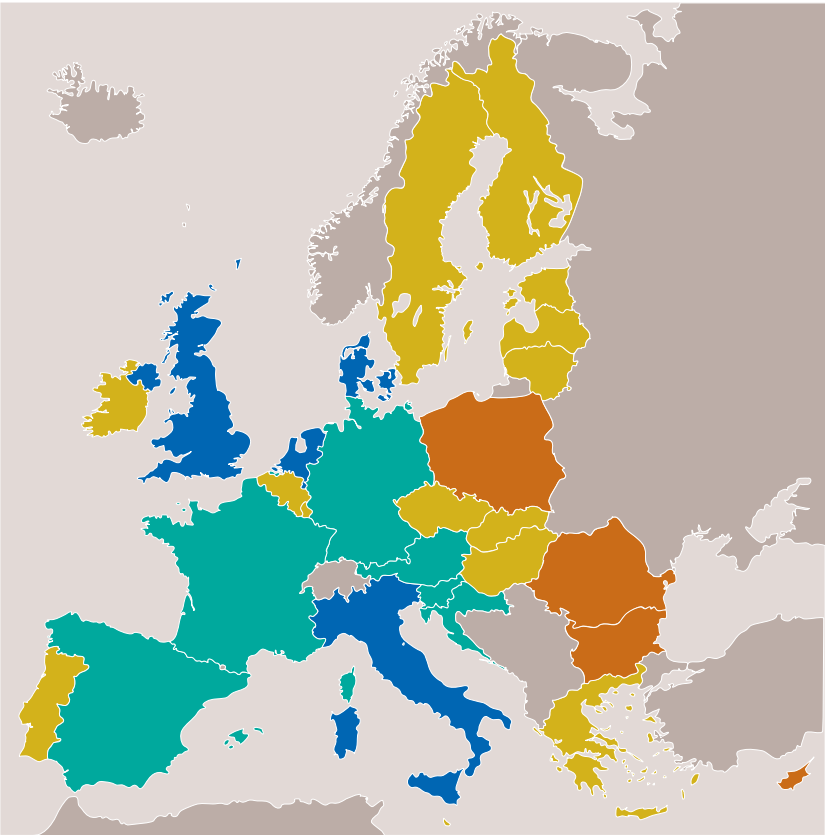


Chart 8
Results for the environmental dimension – performance groups



Performance in relation to the European Union Index
> 115% 115% - 100% 100% - 85% < 85%

The 2019 champions in the environmental dimension are the United Kingdom, the Netherlands, Denmark and Italy.

The high-performance group contains Spain, Luxembourg, France, Germany, Austria, Croatia and Slovenia.

The moderate-performance group consists of Finland, Greece, Portugal, Slovakia, Sweden, Estonia, Belgium, Latvia, Czechia, Ireland, Malta, Lithuania and Hungary.

The modest-performing countries in the environmental dimension are Cyprus, Romania, Bulgaria and Poland.

Luxembourg (6th) ranks behind the Netherlands (2nd) but ahead of France (7th), Germany (8th) and Belgium (18th).

Bulgaria has been last in the rankings for the environmental dimension since 2005, while performing worst in three of the 18 indicators: Energy intensity (C1), Resource productivity (EUR (PPS) per kilogram) (C3), and Exposure to air pollution by fine particles (< 10 µm) (C11).

Table 9
Rankings for the environmental dimension from 2005 to 2019

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Germany	6	4	5	9	6	6	11	12	14	15	10	8	9	7	8
Austria	4	3	2	2	2	2	3	2	6	6	5	6	6	8	9
Belgium	13	17	20	20	22	16	17	17	18	19	24	22	19	20	18
Bulgaria	28	28	28	28	28	28	28	28	28	28	28	27	28	28	27
Cyprus	27	27	27	27	27	27	27	27	26	27	26	25	27	25	25
Croatia	10	10	11	13	13	10	12	13	16	14	15	10	10	9	10
Denmark	7	6	3	3	3	1	2	4	4	4	1	4	3	3	3
Spain	16	20	15	14	8	7	4	3	1	2	4	2	4	5	5
Estonia	12	15	16	11	14	20	23	22	23	23	20	17	20	21	17
Finland	5	8	7	6	9	12	10	9	10	10	11	11	7	12	12
France	8	7	8	8	10	9	9	11	12	9	7	7	11	6	7
Greece	24	24	24	22	17	25	20	18	9	12	14	12	23	16	13
Hungary	21	16	12	15	11	13	14	10	8	5	8	19	22	24	24
Ireland	22	23	23	24	21	18	18	21	22	21	18	20	17	19	21
Italy	14	11	10	7	7	8	7	6	3	1	3	1	2	4	4
Latvia	11	12	13	17	15	19	16	16	17	20	17	16	14	17	19
Lithuania	23	22	21	23	23	23	24	23	24	22	23	23	21	22	23
Luxembourg	**18**	**21**	**19**	**12**	**18**	**14**	**13**	**14**	**19**	**17**	**19**	**21**	**18**	**10**	**6**
Malta	9	9	9	10	16	15	19	24	20	24	22	24	24	23	22
Netherlands	1	1	1	1	1	3	1	1	2	3	9	5	1	1	2
Poland	25	25	25	25	26	26	26	26	27	26	27	28	26	27	28
Portugal	19	13	22	18	19	17	15	15	11	13	12	13	15	15	14
Romania	26	26	26	26	25	24	25	25	25	25	25	26	25	26	26
United Kingd.	3	5	6	5	4	5	6	7	7	8	2	3	5	2	1
Czechia	20	19	17	19	24	22	21	20	21	18	16	18	16	18	20
Slovakia	17	18	18	21	20	21	22	19	15	16	21	15	13	13	15
Slovenia	15	14	14	16	12	11	8	8	13	7	6	9	8	11	11
Sweden	2	2	4	4	5	4	5	5	5	11	13	14	12	14	16

Luxembourg's position in the rankings for this dimension has often changed, varying from 21st in 2006 to 6th in 2019. The trend has been positive since 2016.

Malta and Sweden are the countries that dropped the most in position between 2005 and 2019, falling 13 and 14 places respectively. At the other end of the scale, Luxembourg has gained 12 places, while Spain and Greece have gained 11. Ireland, Latvia, Czechia, Slovakia and Sweden lost the most positions from 2018 to 2019 (-2), while Luxembourg and Estonia gained the most (+4).

Availability of data for the environmental dimension

Table 10
Missing data for the environmental dimension (%)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Environmental dimension	42.9	31.8	36.3	27.1	29.1	17.5	16.9	10.7	14.8	4.7	9.8	4.5	9.8	16.9	73.7

73.7% of the data for the environmental dimension is unavailable for 2019. Other indicators have only existed for a few years, or are in the process of being amended. It is worth noting that the UN adopted 17 Sustainable Development Goals in September 2015, featuring new indicators to measure progress. These indicators may also influence future changes to the indicators here. The circular economy (indicator C19) is a highly complex topic. Although there is a Europe-wide definition, the standards and the indicators measuring them have not yet been set.

3.4 Annexes

For information about the methodology used for the composite indicator, robustness tests and secondary indicators, please refer to the annex to this chapter, available at:
https://odc.gouvernement.lu/fr/domaines-activite/Outils-evaluation_competitivite/tableau-bord-national-de-la-competitivite.html

4 Luxembourg in the European semester

The aim of this chapter is to monitor Luxembourg's indicators and targets as part of the European Union strategy for growth and jobs (Europe 2020) and the Macroeconomic Imbalance Procedure.[1] These two pillars of European economic governance were implemented by Regulation (EU) No 1175/2011 of the European Parliament and of the Council of 16 November 2011 amending Council Regulation (EC) No 1466/97 on the strengthening of the surveillance of budgetary positions and the surveillance and coordination of economic policies.[2]

This chapter primarily focuses on Luxembourg's national performances and targets, and consequently is not intended to serve as an assessment of the indicators and objectives at EU level. Furthermore, it must be emphasised that this chapter does not take into account the effects of the health and economic crisis brought on by COVID-19, as all of the indicators date from previous years.

4.1 Thematic coordination of structural policies

4.1.1 Implementation of thematic coordination under the Europe 2020 strategy

The Europe 2020 strategy, which is a central element of the EU's response to the global economic crisis of 2009 and thereafter, has been designed to update and replace the Lisbon strategy,[3] which was launched in March 2000 and renewed in 2005 as a European strategy for growth and jobs. This new strategy involves closer coordination of economic policies and focuses on the key areas where action must be taken to boost the potential of sustainable and inclusive growth and competitiveness in Europe. It was considered that the end of the crisis should be the entry point into a social market economy, a greener and smarter economy, in which prosperity will be the result of the capacity to innovate and of a better use of resources, and where knowledge will be a key element. In early 2010, the Commission made proposals to implement this new Europe 2020 strategy.[4] In March 2010, on the basis of a communication from the Commission, the European Council discussed and approved the strategy's main elements, including key objectives to guide its implementation, as well as provisions to improve monitoring. The European Council agreed on a series of elements.[5] The June European Council[6] finally completed the development of the new Europe 2020 strategy.

1 However, Luxembourg's budgetary policy coordination (BPC) is not analysed in this section. As concerns the economic policy measures implemented by Luxembourg to meet the objectives set as part of the Europe 2020 strategy, please refer to the National Reform Programme (NRP) submitted in April 2020 by the Luxembourg government to the European Commission within the scope of the European semester.

2 For additional details: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:306:0012:0024:EN:PDF

3 For additional details: http://ec.europa.eu/archives/growthandjobs_2009/

4 EUROPEAN COMMISSION, EUROPE 2020 – A strategy for smart, sustainable and inclusive growth, COM(2010) 2020, Brussels, 3.3.2010

5 EUROPEAN COUNCIL, Conclusions, Brussels, March 2010
For additional details: https://data.consilium.europa.eu/doc/document/ST-7-2010-INIT/en/pdf

6 EUROPEAN COUNCIL, Conclusions, Brussels, June 2010
For additional details: https://ec.europa.eu/eu2020/pdf/council_conclusion_17_june_en.pdf

The European Council confirmed in particular five major EU objectives, which are shared objectives guiding the action of Member States and of the EU in terms of promoting employment, improving the conditions for innovation and R&D, achieving the objectives in the field of climate change and energy, improving education levels and promoting social inclusion, in particular by reducing poverty:

- *Aiming to raise to 75% the employment rate for women and men aged 20-64, including through the greater participation of young people, older workers and low-skilled workers and the better integration of legal migrants;*

- *Improving the conditions for research and development, in particular with the aim of raising combined public and private investment levels in this sector to 3% of GDP; the Commission will elaborate an indicator reflecting R&D and innovation intensity;*

- *Reducing greenhouse gas emissions by 20% compared to 1990 levels; increasing the share of renewables in final energy consumption to 20%; and moving towards a 20% increase in energy efficiency; the EU is committed to take a decision to move to a 30% reduction by 2020 compared to 1990 levels as its conditional offer with a view to a global and comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and that developing countries contribute adequately according to their responsibilities and respective capabilities;*

- *Improving education levels, in particular by aiming to reduce school drop-out rates to less than 10% and by increasing the share of 30-34 years old having completed tertiary or equivalent education to at least 40%;*

- *Promoting social inclusion, in particular through the reduction of poverty, by aiming to lift at least 20 million people out of the risk of poverty and exclusion. The population is defined as the number of persons who are at risk-of-poverty and exclusion according to three indicators (at-risk-of poverty; material deprivation; jobless household), leaving Member States free to set their national targets on the basis of the most appropriate indicators.*

In 2014-2015, the European Commission performed a mid-term review[7] of the Europe 2020 strategy. The review included a public consultation, which concluded that the strategy was still an appropriate framework for the promotion of growth and employment. The European Commission therefore decided to continue pushing the strategy forward while ensuring its monitoring within the European semester.

[7] For additional details: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

Now, in 2020, this ten-year strategy launched in 2010 is shortly coming to an end. The new European Commission, which took office in the autumn of 2019, will have to take stock of the status quo and decide how to follow up on the Europe 2020 strategy. In December 2019, the Commission presented a new growth strategy: the European Green Deal.[8] The European Green Deal is a route map to making the EU's economy more modern, competitive and efficient in the use of resources by translating climate and environmental challenges into opportunities to seize across all action areas and by guaranteeing a fair and inclusive transition for all. This strategy contains several sub-strategies, including "From Farm to Fork" and the EU Biodiversity strategy for 2030. Moreover, this new strategy is based to a greater extent on the sustainable development goals of the 2030 Agenda for Sustainable Development ("Agenda 2030"), which was adopted by world leaders in 2015 at a United Nations summit and entered into force on 1 January 2016. Countries must take action to put an end to all forms of poverty, combat inequality and confront climate change.[9] Eurostat has a number of indicators making it possible to monitor progress made in an EU context.[10] The UN's Sustainable Development Goals (SDGs) have been integrated into the European semester. In the country reports for 2020, the European Commission has assessed the progress made by Member States in implementing the SDGs. Moreover, it has asked the Member States to take stock of their SDG progress in their NRPs as a qualitative supplement to the indicator-based monitoring performed by the European Commission in the country reports.

4.1.2 Priorities, objectives and indicators used

The "thematic coordination of structural policies" component of the Europe 2020 strategy is based on three priorities, five objectives and ten indicators:

- Three priorities that complement each other: smart growth, sustainable growth and inclusive growth;
- Five major European objectives to reach by 2020: to improve the conditions for R&D, to improve education levels, to reach the climate change and energy objectives, to promote employment and to reduce poverty;
- Ten indicators to measure progress in meeting the targets set:[11] gross domestic expenditure on R&D; early school leaving rate; proportion of higher education graduates or with an equivalent level of education; greenhouse gas emissions; share of renewable energy in gross final energy consumption; energy efficiency; employment rate for women and men aged 20-64; risk of poverty; material deprivation; and jobless households.

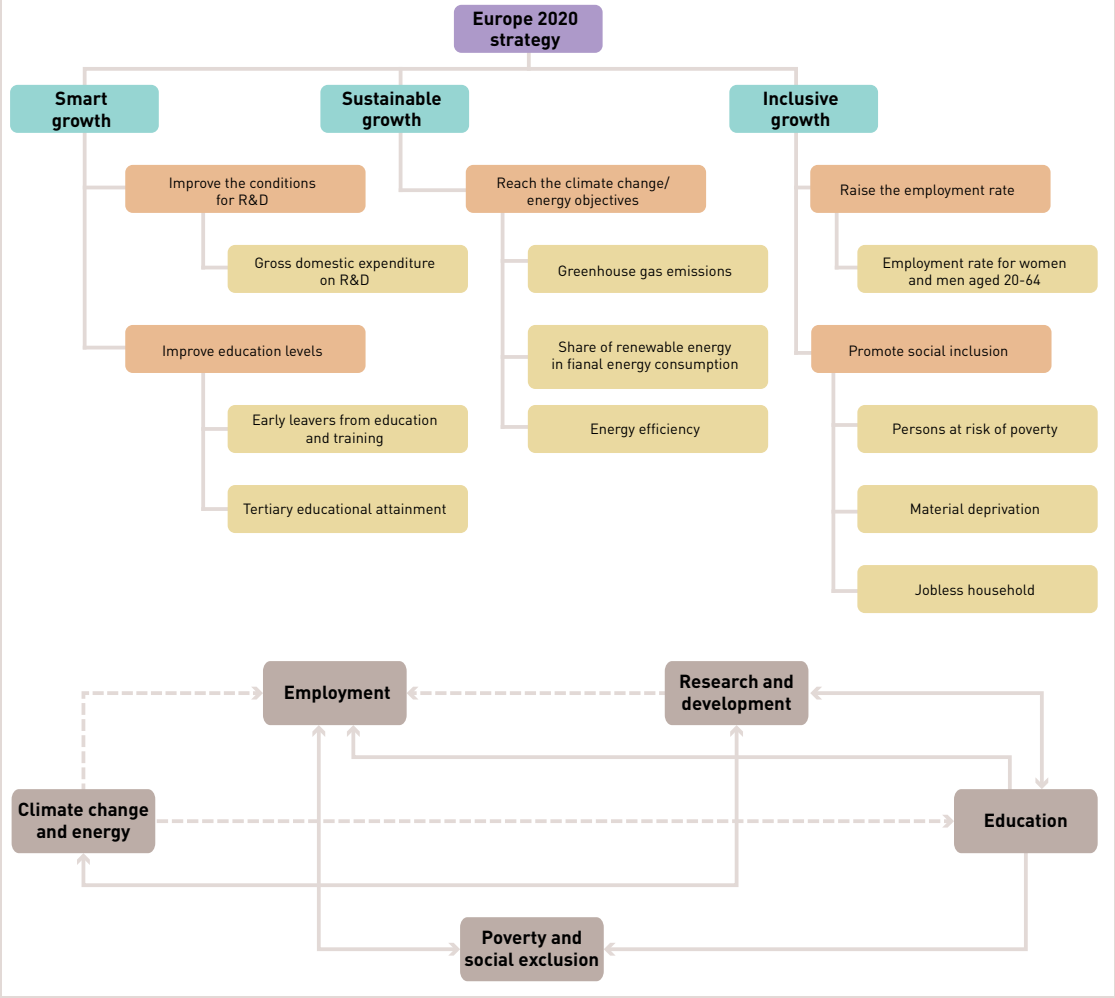
8 For additional details: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

9 For additional details: https://www.un.org/sustainabledevelopment/development-agenda/

10 For additional details: https://ec.europa.eu/eurostat/web/sdi/overview

11 For additional details: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Europe_2020_indicators_-_background&oldid=485929

Chart 1
Priorities, objectives and indicators for "thematic coordination" in Europe 2020



Source: Eurostat

These priorities and objectives are closely linked. For example, higher education levels improve employability and help increase the employment rate, which helps reduce poverty, and a greater R&D and innovation capacity combined with increased resource efficiency improves competitiveness and promotes job creation; investing in cleaner and low-carbon technologies improves the environment, contributes to the fight against climate change and creates new innovative and sustainable business and job opportunities.

Given the diversity of EU Member States and their varying levels of development, applying the same objectives and criteria to all Member States, as had been originally done under the Lisbon strategy, has not proven to be the right approach. The major European objectives therefore no longer apply uniformly to all Member States in the context of Europe 2020. They are European objectives to be broken down into national targets, according to the initial conditions and specifics of each Member State, in dialogue with the European Commission.

Table 1
National targets set by Luxembourg (2020 NRP)

		European objective 2020	Luxembourg target 2020
Priority 1 *"Smart growth"*	*Objective 1*	*"(...) raising combined public and private investment levels to **3%** of GDP"*	**2,3-2,6%**
	Objective 2	*"(...) reduce the early school leaving rate to **less than 10%**"*	Sustainably less than **10%**[a]
		*"(...) increasing the share of people aged 30-34 years who graduated from higher education or reached an equivalent education to **at least 40%**"*	**66%**[b]
Priority 2 *"Sustainable growth"*	*Objective 3*	*"(...) **reducing** greenhouse gas emissions **by 20%** (...)"*	Reducing non-ETS emissions by **-20 %** compared to 2005 (approximately **8.117 Mt CO_2** in 2020)[c]
		*"(...) increasing the share of renewable energy sources in final energy consumption to **20%**"*	**11%**[c]
		*"(...) moving towards a **20%** increase in energy efficiency"*	Final energy consumption of **49,292 GWh**, i.e. **4,239.2 ktoe**
Priority 3 *"Inclusive growth"*	*Objective 4*	*"(...) raise to **75%** the employment rate for women and men aged 20-64"*	**73%**
	Objective 5	*"(...) lift at least **20 million people** out of the risk of poverty and exclusion"*	Reduce the number of people at risk of poverty or social exclusion by **6,000** by 2020[d]

[a] National data will also be used as a measuring instrument, since the indicator calculated by Eurostat, from the Labour Force Survey, is not fully representative for Luxembourg. Attention should be paid to producing statistics that better distinguish people who attended schools in Luxembourg, in order to measure the quality of the national education system and assess the ability of the Luxembourg school system to train young people.

[b] Luxembourg would like this indicator to provide information on the ability of the national education system to make young people able to successfully complete tertiary education, rather than it being a reflection of the skills needed within the higher education labour market. In Luxembourg there is a strong disparity by country of birth (according to Eurostat, the foreign resident rate is close to 60% and the national resident rate is somewhat above 40%), while in neighbouring countries, the differences between these two populations are much less pronounced and the proportion of graduates in these countries is higher among people originally from the country concerned than among foreign residents.

[c] For greenhouse gas emissions and renewable energy, binding national targets already existed before the launch of the Europe 2020 strategy. For the 2013-2020 post-Kyoto period, only non-ETS sectors are subject to targets set at Member State level. The 2020 non-ETS emission reduction objective is compared to the level of 2005.

[d] As regards the methodology, the indicator used in the Europe 2020 strategy does not sufficiently take into account national demographics. Luxembourg has very dynamic demographics, even in times of crisis, and thus the relative nature of the indicator used, i.e. a % of the population, inevitably leads to an increase in the absolute number of people concerned. The government also supports this objective by means of measures aiming to increase the employment rate for women and single parents, in order to reach an employment rate of 73%.

Sources: European Council, Eurostat

This is emphasised in Luxembourg's NRP 2020 as part of the European semester regarding measures implemented by the government under the Europe 2020 strategy.

Eurostat periodically publishes monitoring indicators for monitoring each Member State to be able to take stock of the situation each year and determine whether performance is heading in the right direction. The following pages will analyse the updated indicators for Luxembourg. A descriptive overview[12] will be presented based on the most recent available data[13] and in anticipation of the follow-up to the strategy. Given that for most of the monitoring indicators used there is a significant time lag before the publication of the annual results, it will not be possible to draw up a final assessment of the strategy this year.

[12] On its website Eurostat provides comments regarding the quality of the statistics for the different Member States (series breaks, projections, uncertain data, etc.), which will not be repeated here.

[13] Downloaded on 15 August 2020.

Table 2
Availability of annual data for Luxembourg on 15/08/2020

	Europe 2020 indicator	Last year available
Priority 1	Gross domestic expenditure on R&D (GERD)	2018
	Young people having left education and training prematurely, by gender	2019
	Level of higher education graduates by gender in the 30-34 age group	2019
Priority 2	Greenhouse gas emissions in the sectors included in the Effort Sharing Decision (ESD)	2018
	Share of renewable energy in gross final energy consumption	2018
	Energy consumption	2018
Priority 3	People at risk of poverty or social exclusion	2019
	Employment rate in the 20-64 age group	2019

Source: Eurostat

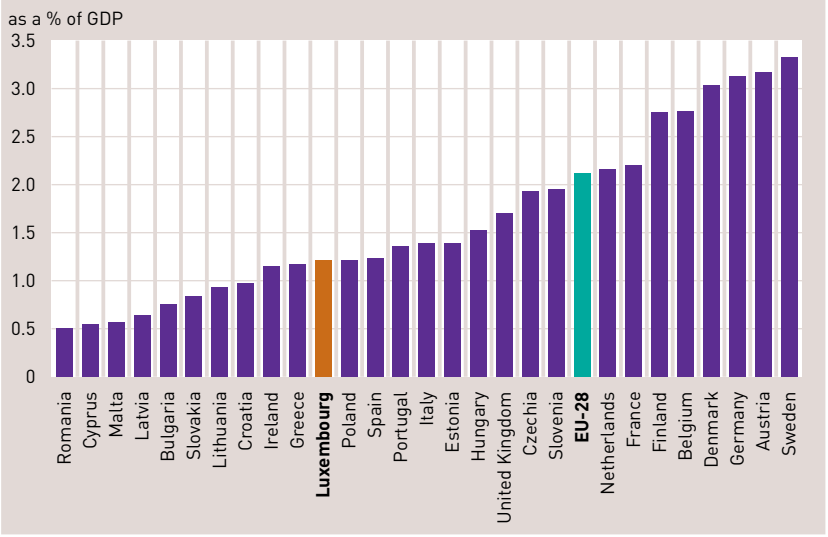
A. Smart growth

A.1 Improving conditions for innovation and R&D

Investment in R&D, along with human capital, is essential for the development of knowledge and new technologies. The Barcelona European Council set the spending target of 3% of GDP on R&D in March 2002. This was one of the two key objectives of the former Lisbon strategy. The logic underlying the setting of this objective was that knowledge-based economies allocated a significant portion of their resources to R&D when the Lisbon strategy was launched (e.g. in 2000 2.7% in the United States and 3% in Japan). For the Europe 2020 strategy, it was proposed that this 3% European objective be maintained as a symbol, to focus political attention on the importance of R&D. The evolution of this indicator will largely depend on structural factors and public policies promoting R&D.

The average R&D expenditure for the EU-28 was 2.12% in 2018. With a rate of 1.21% in 2018, Luxembourg is significantly below the EU average in terms of R&D expenditure.

Chart 2
Gross domestic expenditure on R&D, as a % of GDP, 2018



Source: Eurostat

Luxembourg is one of the Member States whose private R&D expenditure by businesses is far below the EU-28 average. However, as the European Commission noted in its 2018 country report for Luxembourg as part of the European semester, the relatively low level of R&D expenditure on the part of companies could be partially due to the weight of the financial sector (25% of GDP) and the low level of investment required for this sector's activities:[14] *"The structure of the Luxembourg economy partly explains the low business R&D intensity. Sectors that account for the bulk of the Luxembourg GDP (services, in particular financial sector) invest traditionally less in R&D, and even less in Luxembourg than in the rest of the EU. In Luxembourg, the ratio R&D investments on added-value is 0.1% in financial and insurance services (EU average: 0.4%) and 0.7% in Nonfinancial businesses (EU average: 1.5%). By contrast, for the Industry (including energy), this ratio is higher in Luxembourg (7.2%) than the EU average (5.6%)."*

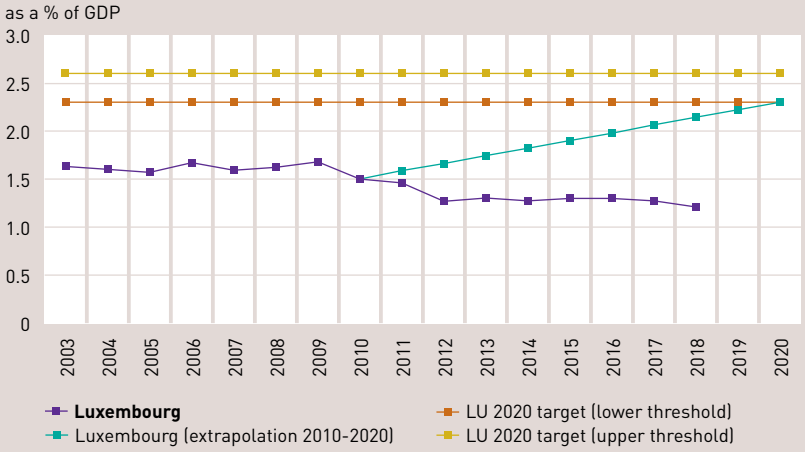
Despite that, in 2018, Luxembourg was among the countries whose public R&D expenditure was close to the EU-28 average. Public spending on R&D and innovation in Luxembourg has risen year on year since 2000, whereas private R&D expenditure,[15] in EUR millions, fell between 2007 and 2012, only to begin slowly climbing again from 2013 onwards. The share of overall R&D expenditure spent on public research in Luxembourg has therefore increased from 7.5% in 2000 to about 44% at present (of which public research represents 24% and higher education 20%). R&D activities carried out by companies in the private sector therefore currently still account for just over 55% of total expenditure.

[14] For additional details: https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-luxembourg-en.pdf

[15] The R&D expenditure of companies with a commercial economic activity employing at least 10 people.

As part of its NRP, Luxembourg set a national target of spending 2.3-2.6% of GDP by 2020, with 1.5-1.9% being contributed by the private sector and 0.7-0.8% by the public sector. Therefore, as of 2018, Luxembourg is a long way off its 2020 national target, as well as being significantly below the upward trend needed to reach it.

Chart 3
Gross domestic expenditure on R&D, as a % of GDP[16]



Note: The green line connecting the years 2010-2020 is an example to illustrate the linear trend Luxembourg's performance should display after 2010 in order to achieve the national target set for 2020. In this specific case of gross expenditure on R&D, the lower threshold limit is the national target set for 2020, i.e. 2.3%.
Sources: Eurostat, NRP 2020

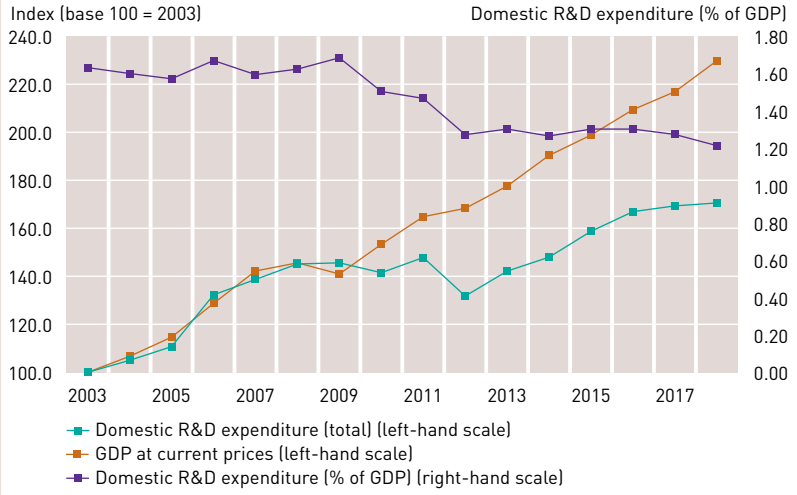
[16] Definition: R&D comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications" (Frascati Manual, 2002 edition, § 63). R&D is an activity where there are significant transfers of resources between units, organizations and sectors and it is important to trace the flow of R&D funds.

Box 1
Developments in domestic R&D expenditure and GDP in Luxembourg

In order to analyse the evolution of domestic R&D expenditure (as a % of GDP) in Luxembourg, it may be useful to study the two variables' curves individually. Indeed, Luxembourg's economy is very dynamic, and the country has experienced high GDP growth in the last few decades. However, if GDP grows faster than domestic R&D expenditure, the R&D expenditure indicator as a % of GDP (ratio) automatically drops.

By means of this analysis, we can see that the two curves evolved in quite similar fashions between 2003 and 2009. Consequently, the ratio for R&D expenditure as a % of GDP has remained relatively constant throughout the period under consideration (approximately 1.6%). On the other hand, the GDP grew much more after that (going from EUR 40.1 billion in 2010 to EUR 60 billion in 2018). Domestic R&D expenditure (total) also rose (EUR 603.7 million in 2010 to EUR 727.4 million in 2018): the public sector spent much more in this area, compensating largely for expenditure in the business sector virtually flatlining. The gap between these two variables grew mainly between 2009 and 2012, when the two curves evolved very differently. In conclusion, the increase in R&D expenditure has not been significant enough to put the indicator in the right direction.

Chart
Developments in GDP and domestic R&D expenditure



Note: calculations by the Observatory for Competitiveness
Source: STATEC

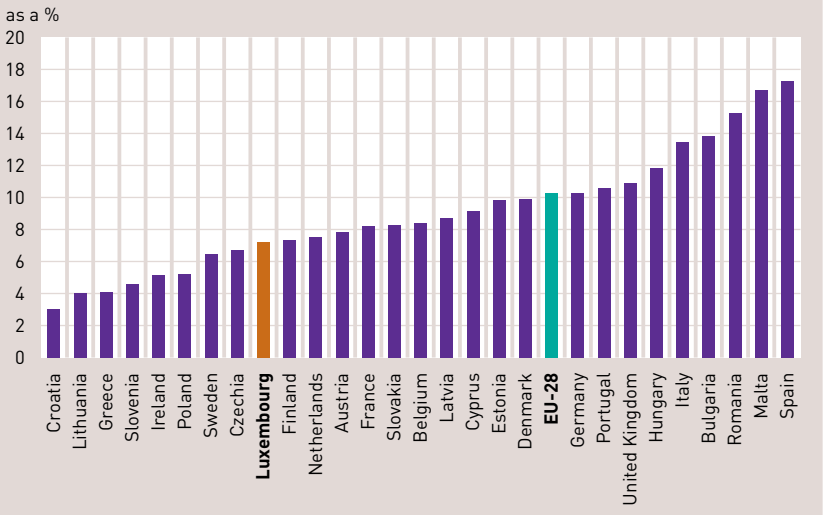
A.2 Improving education levels

Investments in human resources alongside those in R&D are essential to ensure the development of knowledge and new technologies. The objective of the Europe 2020 strategy is smart and inclusive growth, with two objectives fixed for education and training. The trajectory of these two indicators is determined by demographic and social changes as well as political and institutional reforms, and should not therefore be influenced by cyclical fluctuations.

A.2.1 Early school leavers

The average early school leaving rate for the EU-28[17] is 10.3% as of 2019. Luxembourg's national average is 7.2%.

Chart 4
Young people having left education and training prematurely, % of 18-24-year-olds not in education or training and whose educational level is not higher than lower secondary (2019)



Source: Eurostat

The breakdown by gender shows that this rate is 8.9% for men and 5.5% for women in Luxembourg. The gender gap has increased by 2.5 percentage points compared to the previous year. As regards the distribution according to the employment status of the early school leavers, the rate is 3.8% for those who are in employment and 3.4% for those who are unemployed but want to work:[18] in Luxembourg, there are therefore more early school leavers with a job than those who are unemployed and want to work.

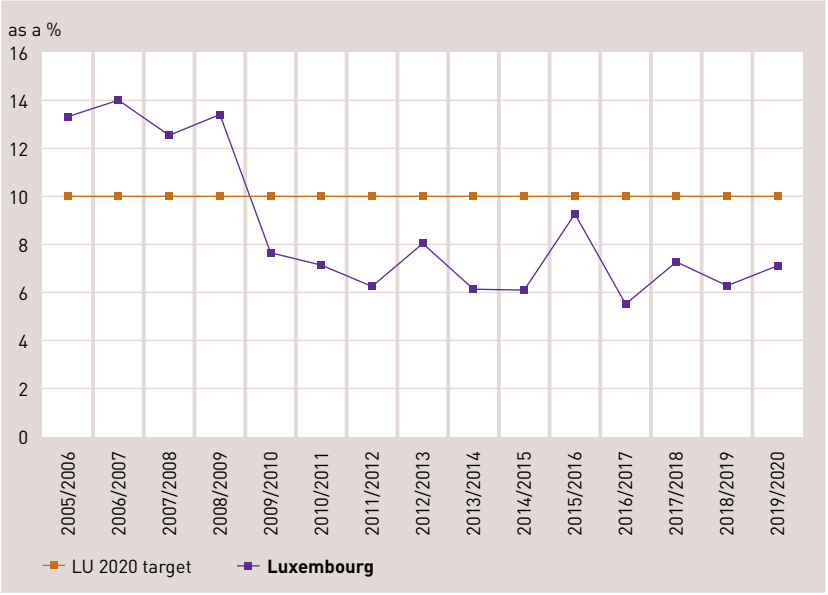
[17] Definition: From 20 November 2009, this indicator is based on annual averages of quarterly data instead of one unique reference quarter in spring. Early school leavers refers to persons aged 18 to 24 fulfilling the following two conditions: first, the highest level of education or training attained is ISCED 0, 1, 2 or 3c short, second, respondents declared not having received any education or training in the four weeks preceding the survey (numerator). The denominator consists of the total population of the same age group, excluding no answers to the questions "highest level of education or training attained" and "participation to education and training". Both the numerators and the denominators come from the EU Labour Force Survey.

[18] For additional details: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Early_leavers_from_education_and_training

The EU has set an objective for an early school leaving rate of under 10% by 2020. Luxembourg has rallied behind this European objective and has set a national target to keep the early school leaving rate under the 10% mark in the long term.

The underlying statistics of this indicator are calculated by Eurostat and taken from the Labour Force Survey (LFS),[19] and are prone to considerable yearly variations for Luxembourg, due to the limited size of the survey sample for a small country such as Luxembourg. The Ministry of Education, Children and Youth (MENEJ) in Luxembourg has therefore set up its own national survey on early school leaving, and levels of early school leaving calculated are different from LFS ones. The approach of this analysis acts as a complement to that of the LFS, because it focuses on students having prematurely left the Luxembourgish school system during a specific reference period. The LFS, however, bases its assessment on the entire population residing in Luxembourg, which includes a high percentage of residents who did not attend school in the Luxembourgish school system. A new methodology has recently been applied to calculate the national early school leaving rate. It allows for a more direct calculation of the early leaving rate, making it possible to quickly measure the impact of policy implemented to combat the problem of leaving school prematurely. According to this new method, the early school leaving rates for 2017/2018 and 2018/2019 are 5.8% and 6.0% respectively. In conclusion, Luxembourg is below the national maximum rate according to both methods.

Chart 5
Trend in early leaving from education and training in Luxembourg



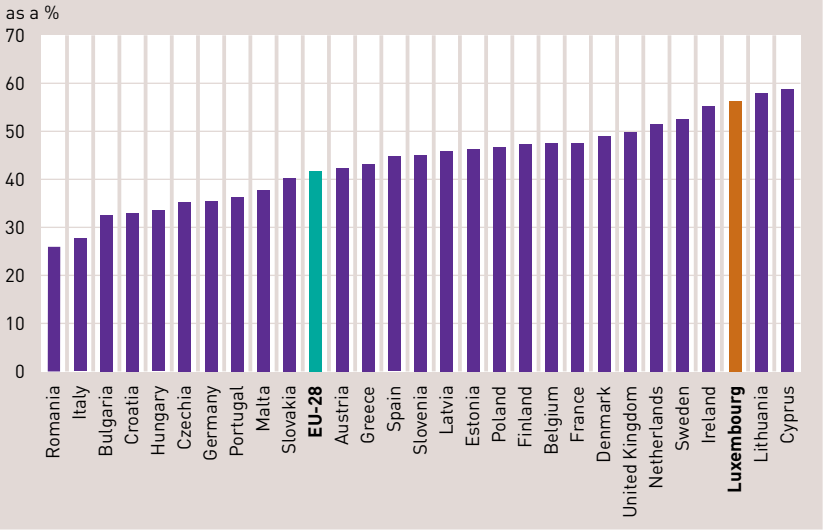
Source: Eurostat

[19] For additional details: http://ec.europa.eu/eurostat/statistics-explained/index.php/Early_leavers_from_education_and_training

A.2.2 Share of higher education graduates

In 2019, the percentage of the population aged 30-34 with a higher education qualification was 41.6% for the EU-28. With a rate of 56.2% in 2019, Luxembourg is one of the best-performing Member States in this regard.[20]

Chart 6
Level of higher education graduates in the 30-34 age group (%), 2019



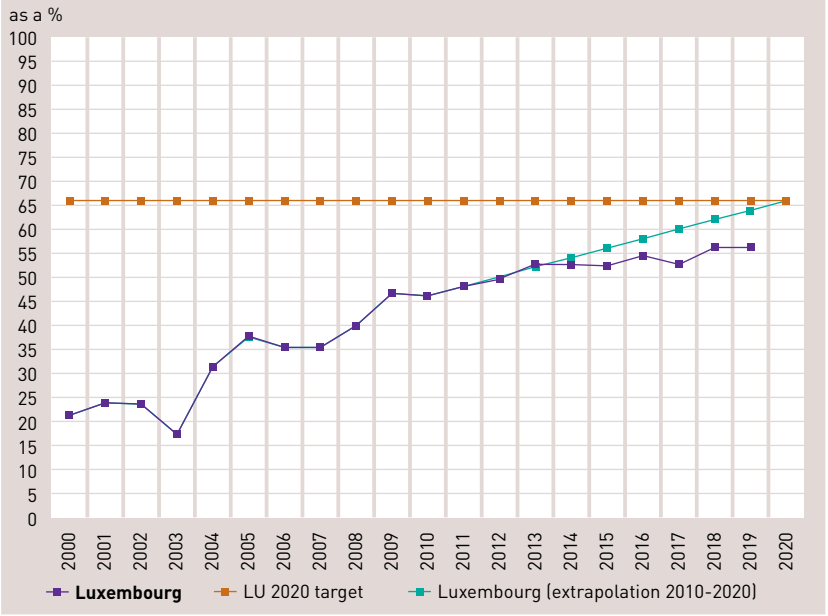
Source: Eurostat

The overall EU objective is to achieve a rate of 40% of people aged 30-34 graduated in higher education by 2020. Luxembourg has set a much higher objective in its NRP (66%). Luxembourg has experienced a significant increase in this indicator, which rose from 21.2% in 2000 to 56.2% in 2019. In more detail, the rate of individuals having obtained a higher education diploma is currently 54.5% for men and 57.9% for women. The gender gap has reduced compared to the previous year. Thus, Luxembourg already exceeds the European objective at this stage, but is still below its national target although it shows a positive mid- and long-term trend.

This indicator, like the one for early school leaving, comes from the Labour Force Survey (LFS), and is not entirely representative for Luxembourg. On the one hand, it includes foreign graduates living and working in Luxembourg (around 45% of residents in Luxembourg do not have Luxembourg nationality). On the other hand, this indicator can capture neither nationals from Luxembourg who graduated and work abroad, nor the numerous cross-border workers coming to Luxembourg (around 45% of the total workforce in Luxembourg).

[20] For additional details: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Europe_2020_headline_indicators#Tertiary_educational_attainment_and_early_leavers_from_education_and_training

Chart 7
Level of higher education graduates in the 30-34 age group (%)[21]



Note: The green line connecting the years 2010-2020 is an example to illustrate the linear trend Luxembourg's performance should display after 2010 in order to achieve the national target set for 2020.
Sources: Eurostat, NRP 2020

B. Sustainable growth

B.1 Reaching the climate change and energy objectives

In order to reach the climate change and energy objectives, the objectives set at the European Council in March 2007 were kept within the framework of the Europe 2020 strategy. The greenhouse gas emission reduction targets and the share of renewable energy in the total energy consumption are legally binding.[22, 23]

B.1.1 Greenhouse gas emissions

In the 2013-2020 post-Kyoto period, only the non-EU Emissions Trading System (EU ETS) sectors have objectives that are set at Member State level. In Luxembourg, the 2020 target for non-EU ETS emissions is a 20% reduction from the 2005 reference level – a target to be met following a linear path with the 2013 starting point consisting of the average rate of emissions between 2008 and 2010. The effects of the economic crisis have certainly not been favourable to Luxembourg as there has been a reduction in the emissions budget post-2013. The annual budget is based on annual emissions quotas. In 2020, non-EU ETS emissions should be limited to 8.12 Mt CO_2.

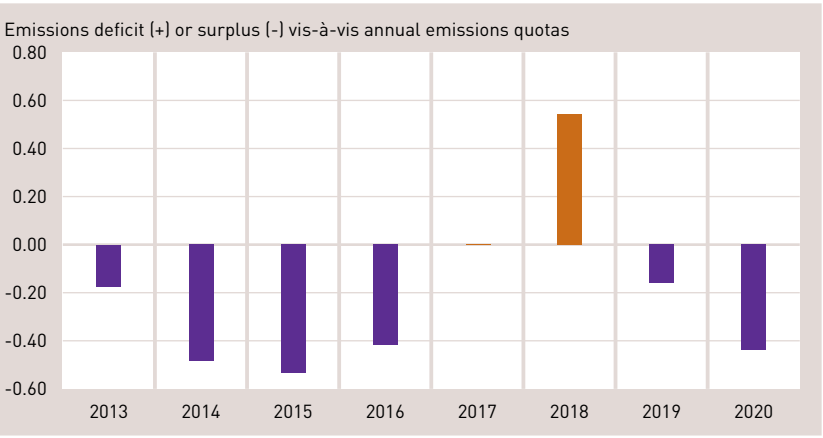
[21] Definition: The share of the population aged 30-34 years who have successfully completed university or university-like (tertiary-level) education with an education level ISCED 1997 (International Standard Classification of Education) of 5-6.

[22] See Directive 2006/32/EC. The reduction in energy consumption is a policy objective endorsed by the Member States in their Energy efficiency action plan.

[23] For additional details: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Europe_2020_headline_indicators#Energy_efficiency.2C_greenhouse_gas_emissions_and_share_of_renewable_energy_in_gross_final_energy_consumption

According to the forecast sent by Luxembourg to the European Commission, featured in the 2020 NRP, the government predicts that, for the 2013-2020 period, it could generate an emission surplus of around 0.44 Mt CO_2 equivalent (CO_2e) in the central "with existing measures" scenario. Under this scenario, the use of external credits should no longer be necessary. However, surplus and deficit calculations are subject to considerable uncertainty because they are heavily dependent on the expected developments in one particular sector, namely road transport, which alone represents almost two thirds of total non-EU ETS emissions.

Chart 8
Projected GHG emissions, excluding LULUCF and ETS (2013-2020)

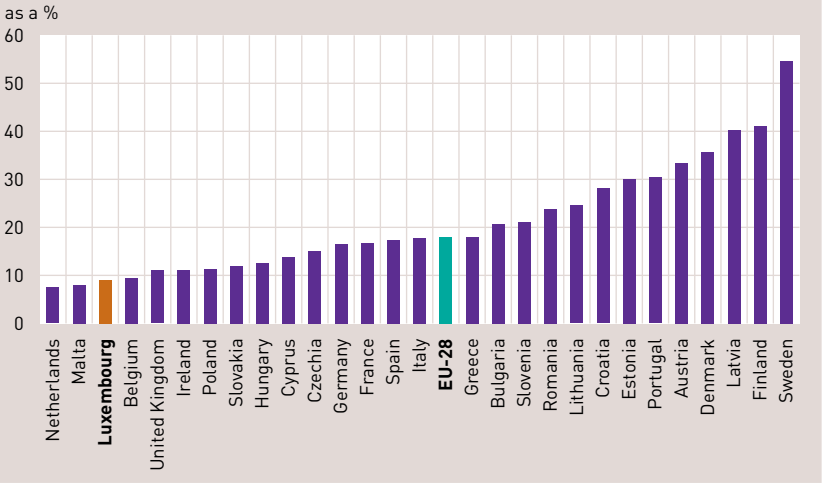


Source: NRP 2020

B.1.2 Share of renewable energy in energy consumption

In 2017, the share of renewable energy in gross final energy consumption accounted for an average of 18% among the EU-28. Luxembourg's rate was 9.1%, putting it bottom of the rankings.

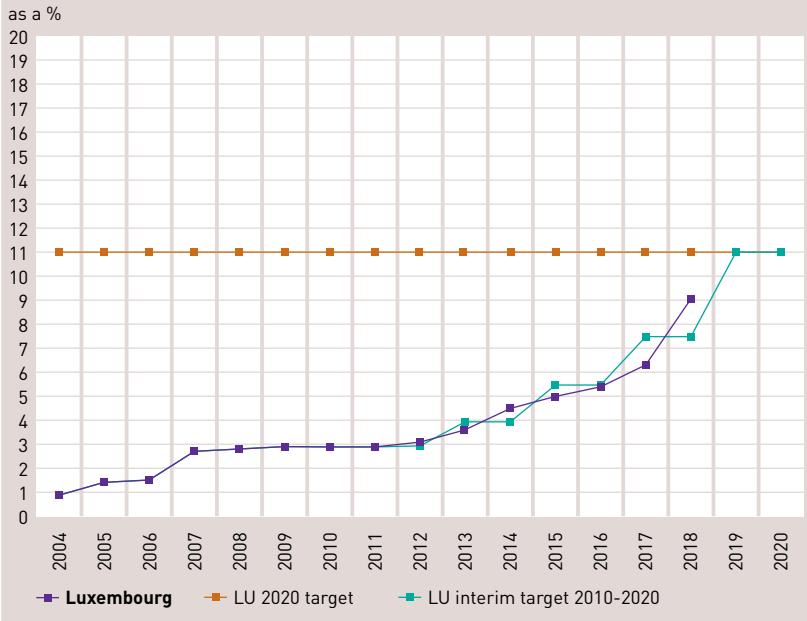
Chart 9
Renewable energy in gross final energy consumption, 2018



Source: Eurostat

As an objective, the EU has set the target of a 20% share of renewable energy by 2020. In this context, Luxembourg has set an overall target of an 11% share of renewable energy in final energy consumption, with a series of interim targets. The country is currently above the projected interim trajectory required to fulfil this commitment. Nevertheless, the results of the efforts made in 2019 and 2020 to meet its 2020 national target remain to be seen.

Chart 10
Share of renewable energy in gross final energy consumption[24]



Note: The green line is the interim development set by the government after 2010 in order to achieve the national target set for 2020.
Sources: Eurostat, NRP 2020

[24] Definition: This indicator is calculated on the basis of energy statistics covered by the Energy Statistics Regulation. It may be considered an estimate of the indicator described in Directive 2009/28/EC, as the statistical system for some renewable energy technologies is not yet fully developed to meet the requirements of this Directive. However, the contribution of these technologies is rather marginal for the time being. More information about the renewable energy shares calculation methodology and Eurostat's annual energy statistics can be found in the Renewable Energy Directive 2009/28/EC, the Energy Statistics Regulation 1099/2008 and in DG ENERGY transparency platform.

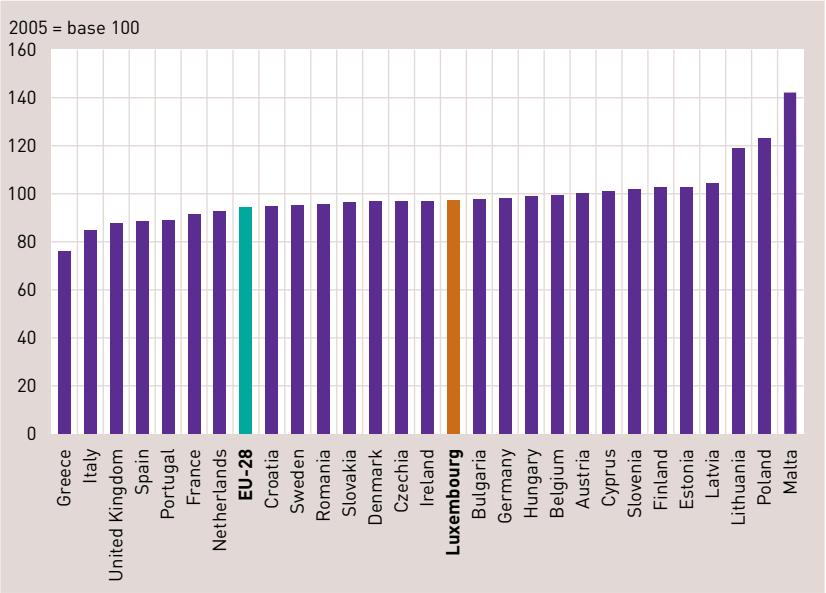
B.1.3 Energy efficiency

The Energy Efficiency Directive has set an energy efficiency objective for the whole of Europe by 2020. The EU has set an objective of a 20% increase in energy efficiency by that date. Although it applies to the EU as a whole, the Europe 2020 indicator does not provide information about national energy efficiency rates in the Member States. In fact, the Europe 2020 indicator only takes into account the energy savings of the EU in comparison to a scenario whereby policies remain unchanged, and based on economic forecasts dating from 2007. Member States were obliged to set indicative national targets for primary and/or final energy consumption levels. In order to draw comparisons on the basis of this information regarding energy consumption, Eurostat subsequently calculates the primary and final energy consumption in million tonnes of oil equivalent[25] in order to assess the progress made in energy efficiency at national level. It is worth noting that the economic and financial crisis that began in 2008, and the resulting downturn in economic activity, had a significant impact on energy consumption during the period of time taken into consideration. Therefore, the reduction in the volume of energy recorded in recent years, both in the EU as a whole and in the Member States, may not necessarily only signal an increase in energy efficiency, but may also be the result of declining economic activity.

Taking all factors into account, final energy consumption fell between 2005 and 2018 in Luxembourg (index 97.05, 2005 = base 100) to a lesser extent than in the EU as a whole (94.13). As a result, final energy consumption was about 3% lower in 2018 in Luxembourg than in 2005.

Luxembourg set a national target for 2020 with the aim of an annual consumption of less than 49,292 GWh (4,239.2 ktoe). In addition to the energy efficiency target, Luxembourg has set itself the goal of saving 5,993 GWh by the end of 2020.

Chart 11
Final energy consumption in Luxembourg (2005 = base 100), 2018



Source: Eurostat

[25] Definition: "Primary energy consumption" refers to gross domestic consumption with the exception of the non-energy-related use of energy products (e.g. natural gas used not only for fuel, but also for manufacturing chemical products). This quantity is relevant for measuring actual energy consumption. The "percentage of savings" is calculated using 2005 values and their projections for 2020. The Europe 2020 target will be met once this value reaches a level of 20%.

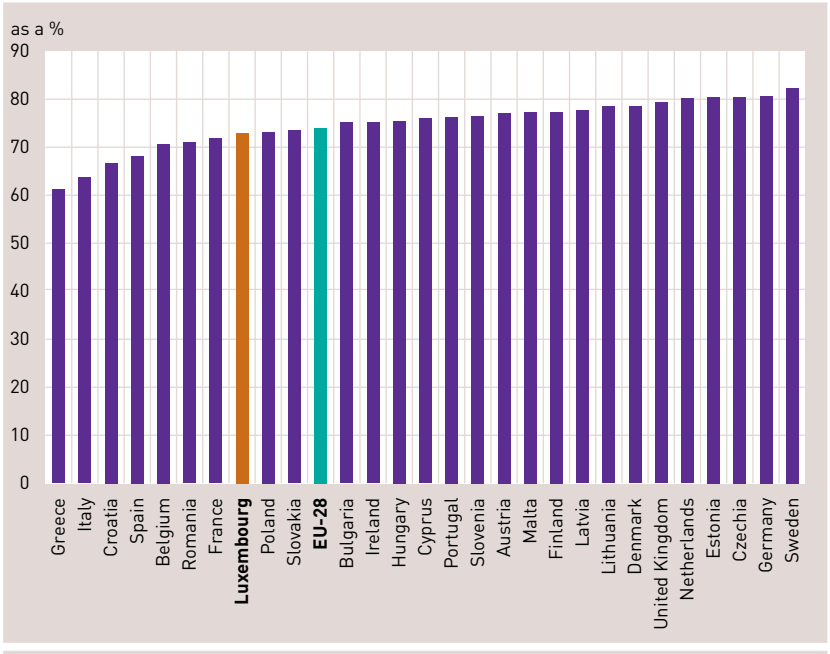
C. Inclusive growth

C.1 Promoting employment

The Lisbon strategy (2000-2010) included a target related to employment policies, namely the employment rate. The new Europe 2020 target shows two major changes compared to the former Lisbon objective: firstly, the age range considered (20-64 for 2020 instead of 15-64 for 2010), in order to reduce potential conflicts between employment policies and education policies; and secondly the reference value to be achieved (75% by 2020 instead of 70% by 2010). Developments in the employment rate depend on many uncertainties, which must be considered when setting quantified targets for the Europe 2020 strategy. The employment-rate indicator is a highly cyclical indicator. For example, the actual exit date of the 2008/2009 crisis plays a key role in the development of this indicator.

In 2019, the employment rate in the EU-28 was 73.9%. With a rate of 72.8%, Luxembourg performed below the EU average.[26]

Chart 12
Employment rate of people aged 20-64, 2019



Source: Eurostat

[26] For additional details: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Europe_2020_headline_indicators#Employment_rate

However, the employment rate, which constitutes an average for the resident population of working age, conceals the fact that there are significant differences in the employment rate according to socio-economic categories. Proceeding to a narrower segmentation of the employment rate, for example according to the gender or age of the worker, reveals major fluctuations in the employment rate.[27] For example, in 2019:

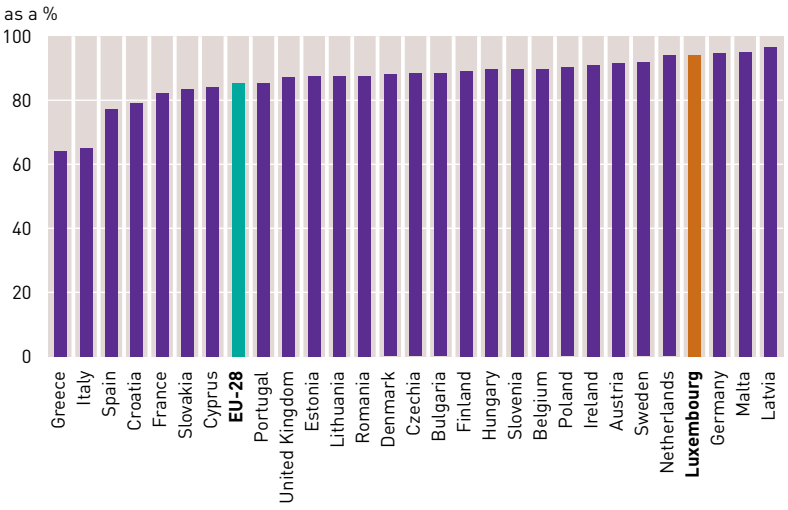
- Luxembourg's employment rate for men was 77.2%, while it was only 68.1% for women;
- The employment rate for the 55-59 age group was close to 61.9%, while for people aged 60-64 it was 20%;
- The employment rate of national residents was 70.4% whilst the employment rate of foreign residents was 74.5% (77.2% for EU citizens and 64.3% for third-country nationals).[28]

Box 2
Employment rate for recent tertiary graduates[29]

In 2019, for graduates aged 20-34 in the EU who had attained a tertiary level education within the previous three years, the employment rate stood at 85.3%.

Luxembourg (94.2%) is among the countries with the highest employment rate.

Chart
Employment rates of recent tertiary graduates



Source: Eurostat

[27] For additional details: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Employment_rates_and_Europe_2020_national_targets

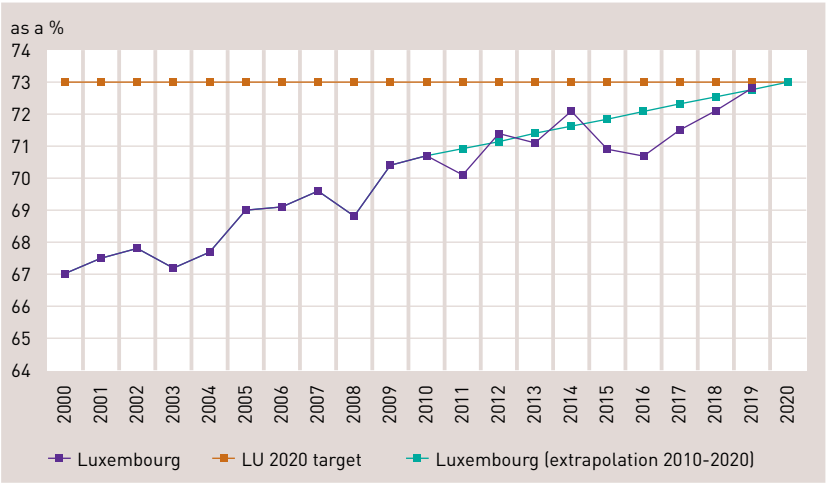
[28] For additional details: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfsa_ergacob&lang=en

[29] For additional details: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=edat_lfse_24&lang=en

Luxembourg set as a national target a 73% employment rate by 2020. Luxembourg's employment rate has risen from 67% in 2000 to 72.8% in 2019, in particular thanks to an increase in the employment rate among women and older people. This employment rate is calculated on the basis of data from the Labour Force Survey (LFS), and therefore reveals an upward trend for the past few years in Luxembourg.

However, this trend must be interpreted with care, as STATEC has carried out technical studies on the matter.[30] The employment rate can be calculated based on two different sources: the LFS or administrative data. The employment rate based on administrative data takes stock of national employment in national accounts related to the population, an official figure from population censuses. The national employment in national accounts is mainly based on data from the General Social Security Inspectorate (IGSS) and is calculated according to harmonised European-level rules. In the last few years, developments in the employment rate have diverged strongly between the two sources: the former shows an increase in the employment rate, while the latter shows a decrease. The analysis aims to demonstrate that the increase in the employment rate (LFS) is mainly the result of methodological changes aiming to improve the survey (improved response rate, better coverage of people in employment, etc.). The drop in the employment rate (administrative sources) can be explained by an increase in years spent in education, the introduction of parental leave and the ageing population.

Chart 13
Employment rate (according to LFS) of people aged 20-64[31]



Note: The green line is an example to illustrate the linear trend Luxembourg's performance should display after 2010 in order to achieve the national target set by Luxembourg.
Source: Eurostat

Finally, although a higher employment rate generally allows for increasing the supply of domestic labour, boosting growth and relieving social and public spending, these statements must be put in perspective in the case of Luxembourg.

[30] For additional details:
https://statistiques.public.lu/catalogue-publications/cahiers-economiques/2018/PDF-Analyses-01-2018.pdf

https://statistiques.public.lu/catalogue-publications/note-conjoncture/2018/PDF-NDC-02-18.pdf

[31] Definition: The employment rate is calculated by dividing the number of persons aged 20 to 64 in employment by the total population of the same age group. The indicator is based on the EU Labour Force Survey. The survey covers the entire population living in private households and excludes those in collective households such as boarding houses, halls of residence and hospitals. Employed population consists of those persons who during the reference week did any work for pay or profit for at least one hour, or were not working but had jobs from which they were temporarily absent.

The Luxembourg labour supply has three components: the local supply, the cross-border supply and the immigrant supply. However, cross-border workers are not considered in the definition of the employment rate. This is a purely national concept, related to the worker's place of residence. Yet cross-border workers in Luxembourg make up more than 45% of domestic employment. As noted by the Social and Economic Council (CES),[32] this indicator *"is not representative of macroeconomic reality in Luxembourg and is even less suitable for a macroeconomic employment target, on which employment policy should be defined."* In contrast, the employment rate for young people, women and older people is useful for understanding how human resources are utilised in the economy.

C.2 Reducing poverty

The European objective that was initially proposed by the European Commission for social inclusion focused on reducing poverty by 20 million people at risk of poverty. However, in order to meet the Europe 2020 strategy objective of promoting inclusive growth, the European Council in March 2010 had asked the Commission to work further on social inclusion indicators, including also non-monetary ones. In June 2010 the European Council decided to ensure that at least 20 million people would no longer be faced with the risk of poverty and exclusion, and defined this population as the number of people at risk of poverty and exclusion according to three indicators, with Member States being free to set their national targets on the basis of indicators they consider most appropriate among these:

- At-risk-of-poverty rate: people living on less than 60% of the national median income. The at-risk-of-poverty rate is the key indicator to measure and monitor poverty in the EU. This is a relative measure of poverty, linked to income distribution, which takes into account all sources of monetary income, including market revenues and social transfers. It reflects the role that employment and social protection play in preventing and reducing poverty;

- Material deprivation rate: people whose lives are severely limited by a lack of resources.[33] The material deprivation rate is a non-monetary measure of poverty, which also reflects the different levels of prosperity and quality of life in the EU;

- People living in households with very low work intensity: this population is defined relative to zero or very low work intensity over an entire year, in order to properly reflect situations of prolonged exclusion from the labour market. These are people living in families in a situation of long-term exclusion from the labour market. Long-term exclusion from the labour market is one of the main factors of poverty and increases the risk of disadvantage being transmitted from one generation to the next.

[32] CES, Second opinion on the Broad Economic Policy Guidelines (BEPG) of the Member States of the Community, Luxembourg, 2003. For additional details: http://www.ces.public.lu/fr/avis/index.html

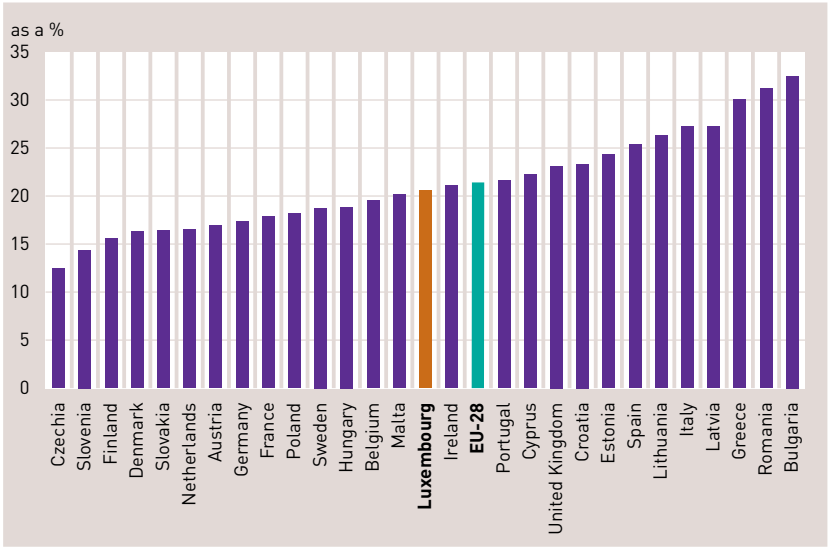
[33] Definition: Currently the agreed EU material deprivation indicator is defined as the share of people are concerned with at least 3 out of the 9 following situations: people cannot afford i) to pay their rent or utility bills, ii) keep their home adequately warm, iii) face unexpected expenses, iv) eat meat, fish, or a protein equivalent every second day, v) a week of holiday away from home once a year, vi) a car, vii) a washing machine, viii) a colour tv, or ix) a telephone.

The risks that have an impact on the evolution of poverty indicators are related to macroeconomic developments, but also to the ability of employment policies to promote an inclusive labour market and employment opportunities for all, and to the welfare system's capacity to improve efficiency and effectiveness because of the constraints on public finances. It should be noted that the monetary indicators for poverty, such as the poverty-risk rate, are highly limited: they do not take into account the multitude of non-monetary public services and benefits in kind that are available to citizens. In Luxembourg, among other benefits in kind in this regard, childcare service vouchers are not taken into consideration.

For a more comprehensive view of people experiencing poverty or exclusion, Eurostat has developed an indicator to better quantify the percentage of the total population facing the risk of poverty or exclusion, by combining the three individual indicators mentioned above.

In 2019, an average of 21.4% of the total population of the EU-28 was considered at risk of poverty or social exclusion. This figure was 20.6% in Luxembourg.

Chart 14
Share of people at risk of poverty or social exclusion (2019)



Note: Italy, Ireland, United Kingdom (2018)
Source: Eurostat

In Luxembourg in 2019, there were fewer people at risk of poverty or social exclusion among national residents (15.6%) than among foreign residents (23.9%). Among the latter, people from the EU-28 (21.3%) were less affected than those from third countries (38.7%).[34].

In 2019, the majority of people at risk of poverty or social exclusion in Luxembourg were those at risk of poverty after social transfers (17.5%). A significantly smaller number were people living in a household with very low work intensity (7.5%) and people living in severe material deprivation (1.3%).

Box 3
Analysing the risk of poverty after social transfers[35]

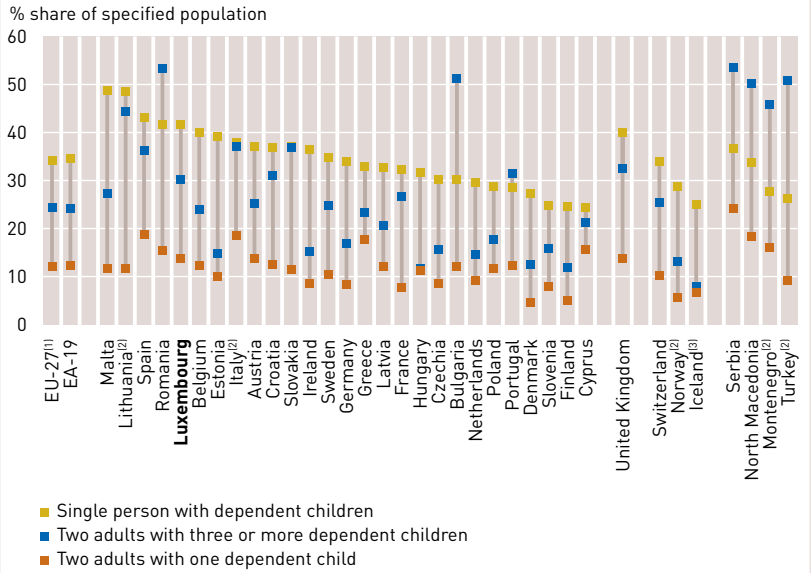
The at-risk-of-poverty threshold after social transfers is set at 60% of the national median disposable income. To enable international comparison, this indicator is often expressed in terms of purchasing power parity (PPP). In the EU in 2018, this threshold ranged from 3,767 PPP in Romania to 19,295 PPP in Luxembourg.

Some groups in society are more exposed than others to this risk of poverty after social transfers.

For example, among people in Luxembourg aged 18 or over, those in employment (13.5%) are far less affected than unemployed people (49.7%) but more affected than retirees (9.2%).

Finally, the risk of poverty is much higher in Luxembourg for single-parent households with dependent children than for households with two adults and one dependent child.

Chart
At-risk-of-poverty rate by household type for households with dependent children, 2018



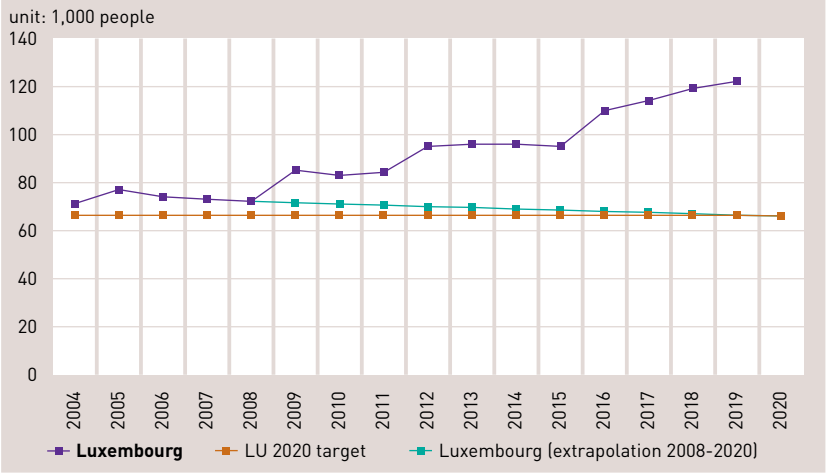
Note: ranked on single person with dependent children
(1) Estimates
(2) 2017
(3) 2016
Source: Eurostat (online data code: ilc_li03)

[34] For additional details: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Migrant_integration_statistics_-_at_risk_of_poverty_and_social_exclusion

[35] For additional details: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Income_poverty_statistics#At-risk-of-poverty_rate_and_threshold

In its NRP, Luxembourg has adopted a national target for 2020, which is to *"reduce by 6,000 the number of people at risk of poverty or social exclusion"*. As is the case for the vast majority of EU Member States, Luxembourg is far from reaching its national 2020 target. In fact, since the 2008/2009 economic and financial crisis, the number of people at risk of poverty or social exclusion has been steadily rising in Luxembourg. With about 126,000 people in 2018, Luxembourg is way above the downward trend necessary to reach its national target by 2020, according to the methodology used by the European Commission in its assessment (taking 2008 as the reference year). The national target would require 6,000 fewer people affected in 2020 than in 2008, when the figure was 72,000. This would mean that only 66,000 people should be at risk of poverty or social exclusion in Luxembourg in 2020.

Chart 15
Trend in rate of people at risk of poverty or social exclusion, 2004-2019



Note: The green line connecting the years 2008-2020 is an example to illustrate the linear trend Luxembourg's performance should display after 2008 in order to achieve the national target set for 2020. Therefore, the 2020 target corresponds to the 2008 figure minus the 6,000 people that Luxembourg intends to lift out of poverty or social exclusion.
Sources: Eurostat, NRP 2020

Box 4
Reflections on the rate of people at risk of poverty or social exclusion

As regards the methodology, the Europe 2020 national targets[36] – which are expressed as a reduction in the absolute number of people in 2020 compared to 2008 (e.g. -6,000 for Luxembourg) and linked to the indicator pertaining to the rate of people at risk of poverty or social exclusion – do not sufficiently take Member States' demographic factors into account. Unlike other EU Member States, Luxembourg's demographics are highly dynamic (20% population increase between 2008 and 2018), even in times of crisis, which in particular translates into weaker economic activity.

For example, assuming that the risk rate remains stable, the indicator's relative nature when used in this context (% of population) inevitably leads to an increase in the absolute number of people exposed to this risk in Luxembourg. This is not the case for Member States whose populations have been stagnating or decreasing in the last few years. For Luxembourg to meet its target of reducing the number of people at risk of poverty or social exclusion by 6,000 compared to 2008, its national rate of people at risk of poverty or social exclusion would have had to be a hypothetical figure of 11.5% in 2018 – in other words, the lowest rate of all EU Member States (Luxembourg's actual risk rate in 2018 was 20.7%).

The At-risk-of-poverty rate, which is one of the three sub-indicators of the rate of people at risk of poverty or social exclusion, represents the proportion of people living on an income lower than 60% of the national median income.

The first observation to make is that this relative measure of poverty, which is linked to income distribution, exclusively takes into account all monetary income sources (flows), including market revenues and social transfers. Therefore, it is a monetary measure of poverty. On the other hand, this indicator does not take into account the multitude of non-monetary public services and benefits in kind that are available to citizens (e.g. childcare service vouchers).

The second factor to note is what this indicator actually measures. All other things being equal, the indicator considers that people are at risk of poverty if their income is lower than 60% of the national median income, although this does not necessarily expose a person to a high risk of poverty. In this regard, Eurostat states in its glossary: *"This indicator does not measure wealth or poverty, but low income in comparison to other residents in that country, which does not necessarily imply a low standard of living."*[37] An analysis from the Bruegel think tank notes: *"Income inequality and the share of people with an income below 60 percent of the national median are in principle associated. When income inequality is low, the at-risk-of-poverty rate is also low because if everybody earns roughly the same, incomes do not vary greatly from the median. This is irrespective of whether everyone is super rich or everyone is super poor."*[38]

In its 2019 Work and Social Cohesion Report,[39] Statec observes: *"Measuring poverty solely based on disposable income does not suffice, as there are two other factors that have an often significant influence on quality of life: consumption and assets."*

The rate of people at risk of poverty or social exclusion, as defined at European level, includes two other sub-indicators for poverty risk: severe material deprivation and households with very low work intensity. Nevertheless, Statec's review of the interrelationships in the aforementioned report reveals that more than 80% of the people at risk of poverty or social exclusion in Luxembourg were excluded according to only one of these three dimensions. The remainder were in a multiple exclusion situation, being included in at least two of the three dimensions concerned. Furthermore, the analysis demonstrates that most people at risk of poverty or social exclusion in Luxembourg are excluded under the "at risk of poverty" dimension. Thus, it follows that particular attention should be paid to this sub-indicator and its methodology, as relatively few people in Luxembourg are affected by the other two dimensions regarding the risk of poverty or social exclusion (material deprivation and lack of work).

[36] For additional details: https://ec.europa.eu/eurostat/web/europe-2020-indicators/europe-2020-strategy/headline-indicators-scoreboard

[37] For additional details: https://ec.europa.eu/eurostat/databrowser/product/view/tespm010?lang=en

[38] For additional details: https://www.bruegel.org/2020/02/the-eus-poverty-reduction-efforts-should-not-aim-at-the-wrong-target/

[39] For additional details: https://statistiques.public.lu/catalogue-publications/analyses/2019/PDF-Analyses-02-2019.pdf

Box 4
Continued

Table
The Europe 2020 indicator for Luxembourg is on an upward trajectory

	Number of individuals concerned	%
Population at risk of poverty who are neither in a situation of severe material deprivation nor living in a household with very low work intensity	82,610	14.3
Population not at risk of poverty who are in a situation of severe material deprivation but not living in a household with very low work intensity	1,282	0.2
Population not at risk of poverty who are not in a situation of severe material deprivation but are living in a household with very low work intensity	19,457	3.4
Total population excluded according to one sole dimension	**103,349**	**17.9**
Population at risk of poverty who are in a situation of severe material deprivation but not living in a household with very low work intensity	4,615	0.8
Population not at risk of poverty who are in a situation of severe material deprivation and living in a household with very low work intensity		
Population at risk of poverty who are not in a situation of severe material deprivation but are living in a household with very low work intensity	16,903	2.9
Total population excluded according to two dimensions	**21,518**	**3.7**
Population at risk of poverty who are in a situation of severe material deprivation and living in a household with very low work intensity	1,488	0.3
Total population excluded according to all three dimensions	**1,488**	**0.3**
Total risk of poverty and social exclusion, EU-2020	**126,355**	**21.9**

Source: STATEC (in partnership with LISER), EU-SILC

Seeing as reducing poverty is essential for social cohesion, individual well-being and the development of a sustainable economy, and due to the fact that this indicator does not seem entirely appropriate to accurately measure all facets of poverty in Luxembourg, the methodology used should be reviewed so as to include the maximum number of relevant factors (e.g. non-monetary public services and benefits in kind, assets, consumption, etc.) and to make it possible to conduct a more detailed examination of changes in the poverty risk at national level.

4.1.3 Conclusions – Taking stock of the situation in Luxembourg

The review of the indicators for Luxembourg in the previous section paint a descriptive overview of the situation in Luxembourg regarding its national targets within the framework of the Europe 2020 strategy. For some targets, the indicators are progressing in the right direction, whereas others are not so positive, and, in light of the current trends, the 2020 targets seem unattainable.

Table 3
Summary table of the Europe 2020 strategy objectives

Priorities	Smart growth			Sustainable growth			Inclusive growth	
Objectives	**Improving conditions for innovation and R&D**	**Improving education levels**		**Reaching the climate change/energy objectives**			**Promoting employ-ment**	**Reducing poverty**
Indicators	R&D	Early school leaving rate	Higher education	GHG emissions	Renewable energy	Energy efficiency	Employ-ment rate	Poverty
Unit	% of GDP	%	% of 30-34-year-olds	Mtoe	%	Mtoe	% of 20-64-year-olds	People
LU*	**1.21%**	**7.2%****	**56.2%**	**9.09**	**9.1%**	**4.35**	**72.8%**	**122,000**
National target 2020	2.3 – 2.6%	< 10%	66%	8.12***	11%	4.2****	73%	66,000

Notes: Colours for level (background): orange = national target not yet achieved; green = national target achieved.
Colours for trend (figures): orange = stagnating or trending away from target; green = trending towards target.
* Overview according to the most recently available data (level) and assessment of the trend in relation to the respective benchmarks
** Most recent national data (MENEJ): 6.0% (2018/2019)
*** -20% in relation to 2005
**** Final energy consumption
Source: Eurostat, STATEC, NRP 2020

In its country report[40] as part of the European semester (February 2020), the European Commission made the following observation: *Luxembourg's progress towards its national targets under the Europe 2020 strategy paints a mixed picture. The employment rate target of 73% is still out of reach despite substantial job creation. Luxembourg (...) is broadly on track to reach the targets for energy efficiency. On the other hand, it is at risk of failing to achieve the targets for reducing the risk of poverty or social exclusion, the school drop-out rate ('early school leaving'), post-secondary educational attainment, research and development intensity and reducing greenhouse gas emissions."*[41]

In conclusion, this overview as part of the 2020 Competitiveness Report must once again be considered a provisional exercise, in the knowledge that there is a significant delay before the annual results for most indicators are published, and thus it will only be possible to issue a definitive report next year. In fact, the data for 2020 will not be available for another two or three years.

[40] For additional details: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020SC0515

[41] Note: In its conclusions, for early school leaving, the European Commission refers to national data from the Luxembourg government and not to LFS (Eurostat) data. Regardless, according to the new national methodology, the early school leaving rate for 2017/2018 and 2018/2019 was 5.8% and 6.0% respectively. Therefore, according to both data sources, Luxembourg is ahead of the national target of 10%.

4.2 Macroeconomic surveillance

4.2.1 Implementation of the monitoring of macroeconomic imbalances

The years before the 2008/2009 financial and economic crisis were characterised in the EU and the eurozone by divergent macroeconomic developments that created imbalances among Member States. However, before the onset of the global economic and financial crisis, little attention was paid to these imbalances within the EU, in particular within the eurozone. For example, public and private debt rose sharply in Greece, real-estate bubbles were created in Spain and Ireland, and Italy, Spain, Portugal and Greece experienced significant losses in cost competitiveness.[42] Public attention only started to focus on this unhealthy situation after the crisis began. As a result, new challenges have arisen in monetary policy and coordination of economic and fiscal policies because of the interdependence of European economies and because the existing mechanisms were insufficient. It was therefore important to reinforce and further coordinate economic policy.

Therefore, the Commission proposed to further strengthen the coordination of economic policy. In its May 2010 communication "Reinforcing Economic Policy Coordination", the Commission highlighted a persistent accumulation of macroeconomic imbalances, which could destabilise the eurozone and the functioning of the European Monetary Union. Based on this communication, in June 2010 the European Council decided to establish a European Stability Mechanism. The Commission subsequently developed its ideas in its "Enhancing economic policy coordination for stability, growth and jobs – Tools for stronger EU economic governance" communication on the governance of economic policy, and proposed to develop a new structured mechanism to detect and correct macroeconomic imbalances. In order to better detect these imbalances, the Commission, along with the Member States, established an initial scoreboard with economic and financial indicators. On 29 September 2010, the Commission finally proposed a legislative package (the "Six-Pack"), which includes the monitoring of internal and external macroeconomic imbalances in the Member States, such as housing and increasing differences in cost competitiveness between Member States.[43]. This legislative package on economic governance was approved by the European Parliament at a vote on 28 September 2011 and entered into force at the end of 2011.

[42] MONETARY POLICY & THE ECONOMY, Prevention and Correction of Macroeconomic Imbalances: the Excessive Imbalances Procedure, Q4/2011

[43] Based on Regulations (EU) 1176/2011 and 1174/2011. For additional details: http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32011R1176

http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32011R1174

4.2.2 Macroeconomic Imbalance Procedure

The monitoring procedure consists of a preventive and a corrective arm.

A. The preventive arm

In the preventive component of the procedure, a scoreboard was established and is published annually by the Commission. The first edition of this scoreboard was published in the Alert Mechanism Report (AMR)[44] in February 2012. For each Member State, this mechanism analyses several indicators compared with "alert thresholds" and is accompanied by an economic reading of the indicators, so as to not limit the interpretation to a "mechanical" reading. This procedure allows the Commission to identify a potential risk. If this initial scoreboard reveals the existence of a potential macroeconomic imbalance within a Member State, in a second step the Commission calls for an in-depth analysis, which examines the origin, nature and severity of a potential imbalance.

In the analytical work carried out within the context of the implementation of this scoreboard, it proved to be very difficult to agree on "one size fits all" indicators for all Member States, which could take into account both the specifics of each Member State and the potential methodological problems. It was thus agreed that the results should not be limited to a "mechanical" interpretation but to accompany the reading by an economic analysis. The selection of indicators is mainly based on four guidelines: indicators should detect the major macroeconomic imbalances and signs of loss of competitiveness; indicators should enable the analysis of both the level and flows; indicators should serve as an important communication tool; and the statistical quality of data should be high and suitable to make international comparisons.

The initially adopted main scoreboard included eleven indicators divided into two categories: external and internal imbalances. The analysis of external imbalances includes indicators such as the current account balance (foreign exchange of a country and factors having a direct impact on this aggregate, such as cost competitiveness. In terms of internal imbalances, the experience gained through past crises has made it possible to identify various key indicators, such as unusual developments in the financial sector and extreme changes in credit with a high increase in house prices. The statistics used in the scoreboard are updated periodically by Eurostat.[45] For each of these indicators, the Commission – in collaboration with Member States – had also defined the thresholds at which performances can be regarded as potentially "at risk" based on the historical statistical distribution of each indicator.[46]

[44] EUROPEAN COMMISSION, Alert Mechanism Report, Report prepared in accordance with Articles 3 and 4 of the Regulation on the prevention and correction of macro-economic imbalances, Brussels, 14.2.2012 COM(2012)68 final

[45] For additional details: http://ec.europa.eu/eurostat/web/macroeconomic-imbalances-procedure/indicators

[46] For more details about the implementation methodology of the AMR scoreboard: EUROPEAN COMMISSION, Scoreboard for the surveillance of macroeconomic imbalances, European Economy. Occasional Papers 92, Brussels, February 2012.

Source: http://ec.europa.eu/economy_finance/publications/occasional_paper/2012/op92_en.htm

This means that if a Member State exceeds a threshold, it could display a macroeconomic imbalance. It is important to stress that the defined thresholds are usually the same for all Member States, making a difference only in some cases between Member States based on whether they are inside or outside the eurozone.

Since late 2015, the European Commission has added three new employment indicators to the initial scoreboard: the activity rate in the total population (aged 15-64), long-term unemployment rate (active population aged 15-74), and youth unemployment rate (active population aged 15-24). The scoreboard now contains fourteen main indicators[47] for identifying and monitoring internal and external macroeconomic imbalances, as well as for employment trends and for the social situation, with the aim of better understanding the social implications of macroeconomic imbalances. The indicators and thresholds of the scoreboard must not be seen as objectives or public policy instruments. Their interpretation must be complemented by a critical economic analysis specific to each country. The composition of the series of indicators is reviewed regularly and may be modified over time.

B. The corrective arm

If in-depth examination, which is performed after the scoreboard-based analysis, finds that an excessive macroeconomic imbalance exists in a Member State, the corrective arm of the procedure is triggered. The Member State concerned is then placed in an excessive imbalance situation. In this case, the Member State must submit a corrective action plan to the Council specifying concrete measures and a detailed implementation schedule. The Commission and the Council assess the corrective action plan, which is found to be either satisfactory, which leads to the issuing of regular progress reports to the Council, or insufficient, in which case the Member State is requested to amend its action plan. If, after the amendments, the action plan remains insufficient, the Council adopts sanctions on the basis of recommendations by the Commission, unless the Council supports the arguments of exceptional economic circumstances by a reverse qualified majority.

[47] In addition to the main scoreboard, there is an auxiliary scoreboard that enables more detailed analyses to be performed. This will not be reviewed in this chapter. For additional details: https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/macroeconomic-imbalances-procedure/scoreboard_en

Table 4
AMR scoreboard indicator results (December 2019 edition)

	External imbalances and competitiveness					Internal imbalances						Employment indicators[1]		
Year 2018	Current account balance - % of GDP (3 year average))	Net international investment position (% of GDP)	Real effective exchange rate - 42 trading partners, HICP deflator (3 year % change)	Export market share - % of world exports (5 year % change)	Nominal unit labour cost index (2010=100) (3 year % change)	House price index (2015=100), deflated (1 year % change)	Private sector credit flow, consolidated (% of GDP)	Private sector debt, consolidated (% of GDP)	General government gross debt (% of GDP)	Unemployment rate (3 year average)	Total financial sector liabilities, non-consolidated (1 year %)	Activity rate - % of total population aged 15-64 (3 year change in pp)	Long-term unemployment rate - % of active population aged 15-74 (3 year change in pp)	Youth unemployment rate - % of active population aged 15-24 (3 year change in pp)
Thresh-olds	-4/6%	-35%	±5% (EA) ±11% (Non EA)	-6 %	9% (EA) 12% (Non EA)	6%	14%	133%	60%	10%	16.5%	-0.2 pp	0.5 pp	2 pp
BE	0.3	41.3	6.9	-1.5	3.7	1.0	0.8	178.5	100.0	7.0b	-2.9	1.0	-1.5	-6.3
BG	4.0	-35.2	3.9	13.4	18.3p	4.5	3.9	95.0	22.3	6.3	6.8	2.2	-2.6	-8.9
CZ	1.2	-23.5	11.0	11.9	13.5	6.1p	5.3	70.7	32.6	3.0	7.4	2.6	-1.7	-5.9
DK	7.5	48.5	2.6	-1.5	4.0	3.5	2.4	199.4	34.2	5.6	-4.7	0.9	-0.6	-1.6
DE	8.0	62.0	5.3	3.1	5.6	5.1	6.6	102.4	61.9	3.8	2.0	1.0	-0.6	-1.0
EE	2.1	-27.7	7.7	0.8	14.3	2.1	3.7	101.5	8.4	6.0	6.9	2.4	-1.1	-1.2
IE	2.3	-165.0	2.3	77.4	-2.8	8.3	-7.8	223.2	63.6	7.0	5.1	0.8	-3.2	-6.4
EL	-2.2	-143.3	3.6	6.9	1.4p	1.3e	-1.1p	115.3p	181.2	21.5	-5.0	0.4	-4.6	-9.9
ES	2.6	-80.4	4.1	4.6	0.7p	5.3	0.4p	133.5p	97.6	17.4	-2.2	-0.6	-5.0	-14.0
FR	-0.6	-16.4	4.5	-0.2	2.4p	1.5	7.9p	148.9p	98.4	9.5	1.6	0.6	-0.8	-4.0
HR	2.4	-57.9	4.2	22.9	-2.4d	4.6	2.3p	94.0p	74.8	10.9	4.6	-0.6	-6.8	-18.9
IT	2.6	-4.7	3.3	0.3	2.7	-1.6	1.6	107.0	134.8	11.2	-0.1	1.6	-0.7	-8.1
CY	-4.6	-120.8	1.8	16.6	-0.4p	0.2	8.4p	282.6p	100.6	10.8	0.3	1.1	-4.1	-12.6
LV	0.6	-49.0	4.9	8.6	14.7	6.6	-0.2	70.3	36.4	8.6	-3.0	2.0	-1.4	-4.1
LT	-0.1	-31.0	6.4	3.5	16.5	4.6	4.3	56.4	34.1	7.1	8.2	3.2	-1.9	-5.2
LU	**4.9**	**59.8**	**3.3**	**10.7**	**7.9**	**4.9**	**-0.5**	**306.5**	**21.0**	**5.8**	**-2.0**	**0.2b**	**-0.5**	**-2.5**
HU	2.1	-52.0	2.0	8.4	12.4	10.9	4.3	69.3	70.2	4.3	-9.2	3.3	-1.7	-7.1
MT	8.9	62.7	4.9	24.0	3.2	5.1p	7.5	129.8	45.8	4.1	2.3	5.9	-1.3	-2.5
NL	9.9	70.7	3.2	1.7	3.0p	7.4	4.5p	241.6p	52.4	4.9	-3.3p	0.7	-1.6	-4.1
AT	2.2	3.7	4.8	3.9	4.7	2.5	3.9	121.0	74.0	5.5	1.7	1.3	-0.3	-1.2
PL	-0.5	-55.8	0.1	25.8	8.1p	4.9	3.4	76.1	48.9	5.0	3.0	2.0	-2.0	-9.1
PT	0.9	-105.6	3.1	9.4	5.3p	8.9	-0.1p	154.3p	122.2	9.1	0.7	1.7	-4.1	-11.7
RO	-3.3	-44.1	-0.7	23.7	33.6p	1.8	1.9p	47.8p	35.0	5.0	3.3	1.7	-1.2	-5.5
SI	5.5	-18.9	2.0	20.4	6.1	7.4	1.3	72.8	70.4	6.6	4.1	3.2	-2.5	-7.5
SK	-2.4	-68.1	2.5	3.2	10.9	5.0	2.0	90.9	49.4	8.1	8.9e	1.5	-3.6	-11.6
FI	-1.4	-2.0	3.0	-3.0	-2.6	-0.2	1.6	142.1	59.0	8.3	19.9	2.1	-0.7	-5.4
SE	2.8	10.3	-4.0	-6.3	7.4	-3.0	9.0	200.0	38.8	6.6	-2.9	1.2	-0.3	-3.6
UK	-4.3	-10.5	-13.0	-3.8	7.8	0.7	5.3	169.1	85.9	4.4	-0.6	1.0	-0.5	-3.3

Figures highlighted are the ones at or beyond the threshold.
Flags: b:Break in series. d:Definition differs. e:Estimated. p:Provisional.
1) For the employment indicators, see page 2 of the AMR 2016. 2) House price index e=estimate by NCB for EL. 3) Nominal unit labour cost HR, d: employment data use national concept instead of domestic concept. 4) Unemployment rate for BE: revision in the survey methodology.
5) In Total financial sector liabilities for SK, derivatives are estimated.
Sources: European Commission, Eurostat and Directorate General for Economic and Financial Affairs (for Real Effective Exchange Rate), and International Monetary Fund data, WEO (for world volume exports of goods and services).

4.2.3 Macroeconomic Imbalance Procedure 2020

The ninth edition of the scoreboard was published in the Alert Mechanism Report issued in December 2019 as part of the European semester. In this edition, the European Commission concludes as follows in its assessment of Luxembourg: *"In the previous round of the MIP, no macroeconomic imbalances were identified in Luxembourg. In the updated scoreboard private sector debt is beyond the indicative threshold. (...) Overall, the economic reading points mainly to issues related to increasing housing prices and household debt although risks appear contained at this stage. Therefore, the Commission will at this stage not carry out further in-depth analysis in the context of the MIP."*[48]

4.2.4 Updating alert mechanism scoreboard data

The data used in this chapter to illustrate Luxembourg's position under the alert mechanism comes from the Eurostat database. This is an update of the data published in the last AMR scoreboard (December 2019). Therefore, differences may occur between the results of the Competitiveness Report and those of the last alert mechanism scoreboard. The data presented here was downloaded on 15 August 2020 and is thus an update halfway between the last Alert Mechanism Report and the one that the Commission will publish in November 2020 in the context of its annual Growth Survey, which will launch the 2021 European semester.

A. External and competitiveness imbalances

A.1. Current account balance[49]

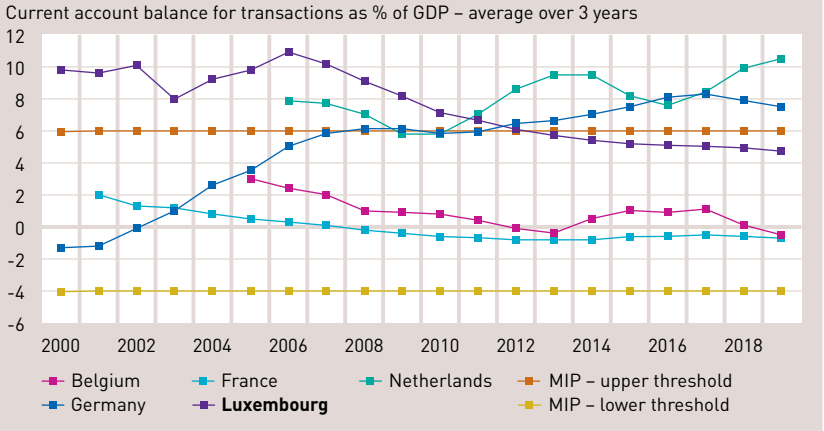
Regarding the current account balance, unlike a country's financing need (negative balance), a financing capacity (positive balance) does not seem to be evidence of imbalance since it doesn't threaten the sustainability of its external debt. For this indicator, it has therefore been agreed that a country is potentially at risk if it has a current account balance with either a deficit exceeding -4% of GDP or a surplus of over +6% of GDP.

Luxembourg exceeded the upper threshold limit between 2000 and 2012 but, over the past few years, its current account surplus has fallen and, since 2013, has been below the upper threshold limit and is thus included in the interval defined as not posing a macroeconomic imbalance risk.

[48] For additional details: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019DC0651

[49] The balance of payments is a statistical statement that systematically summarises, for a specific period, the economic transactions of an economy with the rest of the world. It is divided into three main sub-balances: the current account, the capital account and the financial account. The current account is the main determinant of the financing capacity or need of an economy; it provides important information on the economic relations of a country with the rest of the world. It reports all transactions (other than those recorded under financial headings) in economic values that occur between resident and non-resident units.

Chart 16
The current account balance, as a % of GDP, 3-year average



Note: A Member State is considered to be at risk of imbalance if its balance surplus exceeds the +6% of GDP threshold or if the deficit of its balance is below -4% of GDP. If the trade balance is between those two thresholds (in the "tunnel"), a Member State is not considered to be potentially at risk.
Source: Eurostat; yellow and orange lines = thresholds of -4%/+6% set by the MIP

A.2. Net international investment position[50]

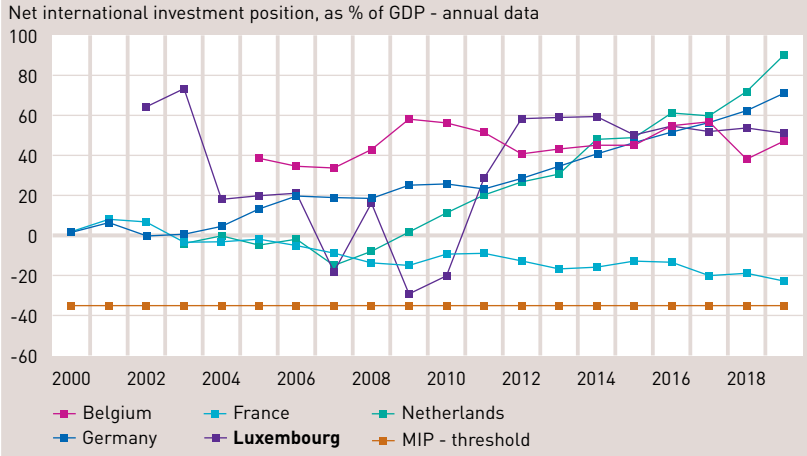
The indicator of the net external position provides information on the relationship between foreign assets and the external debt of a country.[51] It has been agreed that a country is potentially at risk if it has a negative balance over -35% of GDP.

Luxembourg's performance varies wildly. However, over the entire period for which data for Luxembourg is available, Luxembourg is above the threshold limit. In line with a current account surplus, Luxembourg adheres to the criteria with regard to its net international position. Luxembourg's foreign assets far outweigh its foreign liabilities.

[50] The statistics for the international investment position (IIP) record the status of the financial assets and liabilities of a country relative to the rest of the world. They are an important measure of the net position of the domestic economic sectors relative to the rest of the world. The net international investment position (NIIP) is calculated by the difference between assets and liabilities in the IIP. It allows a stock flow analysis of external positions.

[51] For additional details: http://ec.europa.eu/eurostat/statistics-explained/index.php/International_investment_position_statistics

Chart 17
Net international investment position, as % of GDP



Note: A Member State is considered to be at risk of imbalance if its net international position is below -35% of GDP. If the indicator is above this threshold, a Member State is not considered to be at risk.
Source: Eurostat; orange line = threshold of -35% set by the MIP

A.3. Real effective exchange rate (REER)[52]

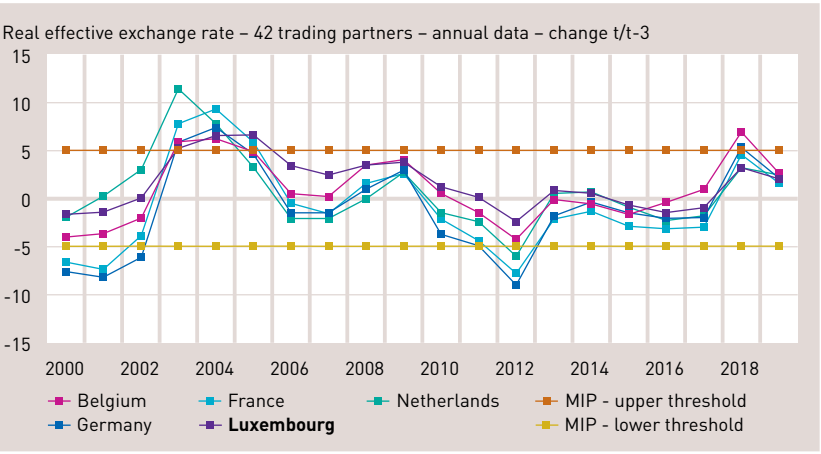
The REER indicator tracks the evolution of a country's price competitiveness or cost competitiveness by analysing the relationship between domestic prices or costs and foreign prices or costs, expressed in euros. Thus, an increase in the REER is usually equivalent to a decline in competitiveness, due to the fact that domestic prices/costs increase faster than those in foreign countries. The REER is constructed from currencies of major trading partners.

For this indicator, it has been agreed for the eurozone Member States that a country is potentially at risk if the REER indicator is above + 5% or under -5%.

Just like its neighbouring countries, Luxembourg often ranks in the interval considered not to pose a risk of imbalance. According to the latest data available for 2019, Luxembourg's value is 2%
.

[52] The REER aims to assess the price competitiveness or the cost competitiveness of a country compared to its main competitors in international markets. Changes in cost competitiveness and price competitiveness depend not only on changes in the exchange rate, but also on the cost and price evolution. The specific REER for the Macro-economic Imbalance Procedure is deflated with the price indices compared to a group of 42 countries (double weighting of exports is used to calculate the REER in order to take into account not only the competition on the domestic markets of the various competitors, but also on other export markets). A positive value means real appreciation. Data is expressed as a three-year percentage change and a one-year percentage change. The scoreboard indicator corresponds to the three-year percentage change of the real effective exchange rate based on the consumer price index of the 42 trading partners.

Chart 18
Real effective exchange rate, % change over 3 years



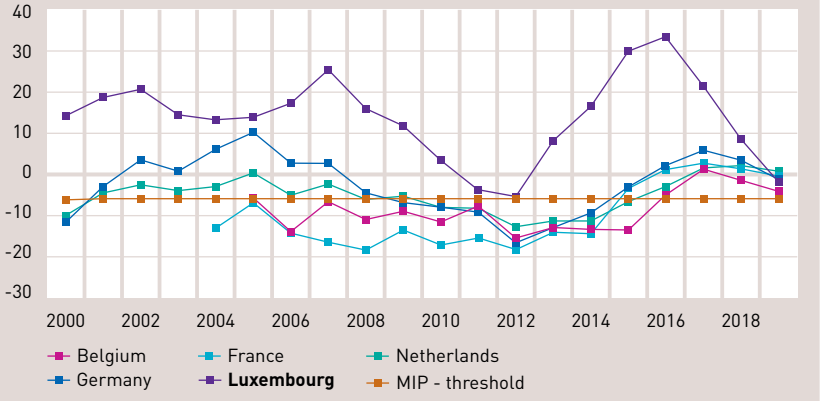
Note: A eurozone Member State is considered to be at risk of imbalance if its REER is above +5% or below -5%. If REER changes are within these two thresholds (in the "tunnel"), a Member State is not considered to be at risk.
Source: Eurostat; yellow and orange lines = thresholds of +/- 5% for eurozone Member States

A.4. Export market shares[53]

The scoreboard includes an indicator on changes in a country's market share in global exports of goods and services, in order to measure in volume the slow and persistent losses in competitiveness. It is an outcome indicator, which also captures the components of non-cost competitiveness, or the ability of a country to exploit new business opportunities due to increased demand. It has been agreed that a country is at risk if this indicator is lower than -6%.

According to the available data, Luxembourg has observed the established threshold limit every year.

Chart 19
Export market shares, % change over 5 years



Note: A Member State is considered to be at risk of imbalance if the change in its export market shares is below -6%. If the indicator is above this threshold, a Member State is not considered to be at risk.
Source: Eurostat; orange line = threshold of -6% set by the MIP

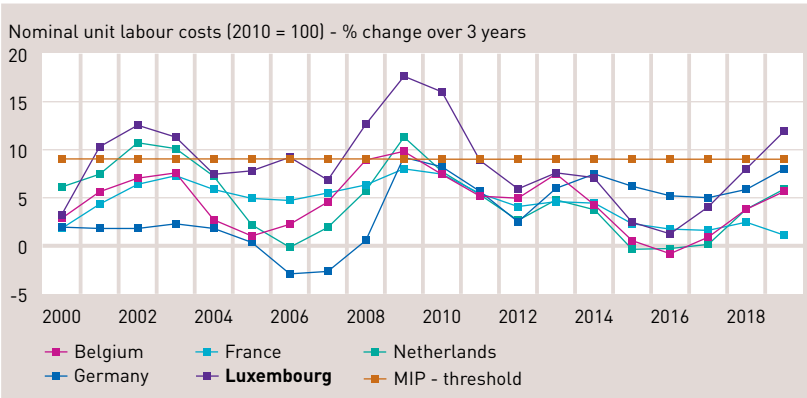
[53] This indicator shows the evolution of the export shares of goods and services of the EU Member States in total world exports. Data on the values of exports of goods and services is developed in the context of the each country's balance of payments. To take into account the structural losses in competitiveness that can accumulate over long periods, the indicator is calculated by comparing year Y to year Y-5. The indicator is based on the data on balance of payments provided to Eurostat by the 28 EU Member States.

A.5. Nominal unit labour costs[54]

Nominal unit labour costs (nominal ULC) are the indicator traditionally used to measure the cost competitiveness of an economy. The change in a country's domestic nominal unit labour costs, i.e. the cost of labour per unit of value added produced, is compared to those of its main trading partners. This indicator includes two factors: firstly, the average labour cost in an economy; and secondly, the level of productivity. It has been agreed that a country is at risk if this indicator is higher than +9%.

Luxembourg's performance for this indicator has varied somewhat. The increase between 2008 and 2010 is largely due to a drop in productivity, which can be observed in almost all sectors. An explanation for Luxembourg's sub-par performance is the stronger weighting of the financial sector in Luxembourg's economy, a sector whose significant loss in productivity over the last few years has heavily contributed to the increase in Luxembourg's ULC. The same explanation can be given for industry, which implemented major job-saving plans in the final years of the crisis. Luxembourg scored under the threshold limit in the period 2011-2018 and therefore did not face a macroeconomic imbalance risk under this indicator, but in 2019 Luxembourg exceeds the threshold once again (11.9%).

Chart 20
Nominal ULC, % change over 3 years



Note: A eurozone Member State is considered to be at risk of imbalance if the change in its nominal ULC is above +9%. If the indicator is below this threshold, a Member State is not considered to be at risk.
Source: Eurostat; orange line = threshold of +9% for eurozone Member States

[54] The nominal unit labour costs (NULC) are defined as the ratio of total employee compensation (D1), in millions of national currency, relative to the total number of employees, divided by the ratio of GDP at market prices in millions, expressed in chain-linked volume for the reference year 2010 with the 2005 exchange rate into national currency relative to the total number of people employed. The change in nominal unit labour costs is the change in the total compensation of employees by number of employees not covered by the change in labour productivity, as well as the change in the proportion of employees in total employment. The input data is obtained through official data transmissions from countries' national accounts in the ESA 2010 transmission programme. Data is expressed as a percentage change in indices between the year Y and the year Y-3.

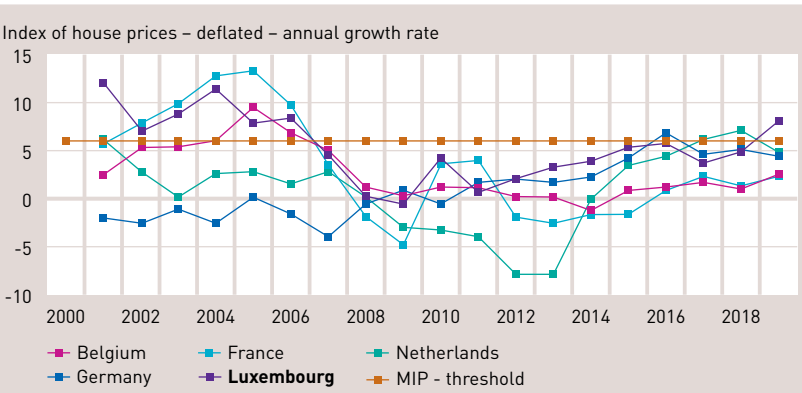
B. Internal imbalances

B.1. House prices[55]

This indicator measures changes in the acquisition prices of real estate within the EU Member States to detect internal imbalances linked to a potential "housing bubble". It has been agreed that a country is at risk if this indicator is higher than +6%.

Real-estate (housing) prices in Luxembourg have risen, in real terms, almost continuously since 2001, with the exception of 2009. Between 2001 and 2006, Luxembourg was above the threshold limit, with prices rising too quickly. Since 2007, annual price rises have been below the threshold limit, although Luxembourg's score was very close to the threshold limit in 2015, 2016 and 2018. In 2019, the score was above the threshold limit once again (8%).

Chart 21
Deflated index of house prices, % change over 1 year



Note: A Member State is considered to be at risk of imbalance if the change in housing prices, in real terms, is above +6%. If the indicator is below this threshold, a Member State is not considered to be at risk.
Source: Eurostat; orange line = threshold of +6% set by the MIP

B.2. Private-sector credit flow[56]

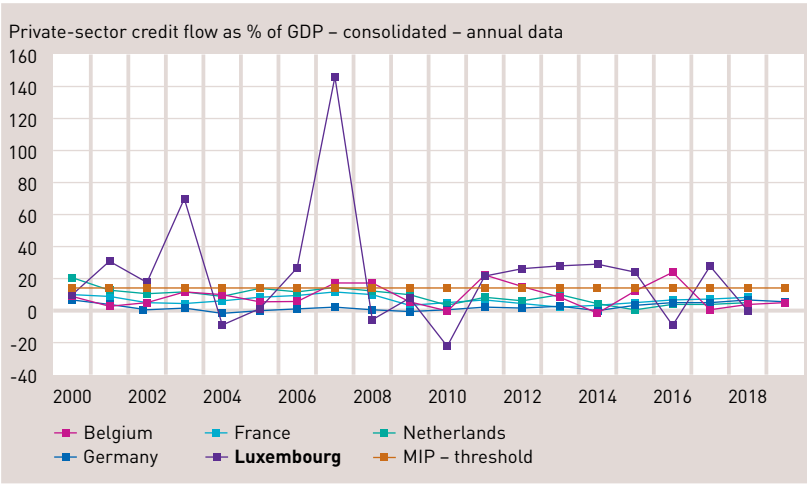
This indicator measures the credit flow of the private sector that corresponds to the net changes in liabilities of the non-financial corporate sectors, households, and non-profit institutions serving households. A country is at risk if the indicator is above +14%.

Luxembourg's performance for this indicator varies to a far greater extent than its neighbouring countries. The structure of the Luxembourg economy, which is very small but open and home to several large non-financial companies whose financial decisions can have a major impact on the national economy, could explain this situation. In 2018, the private-sector credit flow was -0.5% of GDP, and was thus below the threshold limit (14%).

[55] The deflated index of house prices is the ratio between the housing price index and the deflator of private final consumption expenditure (households and non-profit institutions (NPIs)). Therefore, this indicator measures inflation in the housing market compared to that in the final consumption of households and NPIs. Eurostat's index of housing prices reflects the price changes of all types of housing purchased by households (apartments, detached and non-detached houses, etc.), both new and existing, regardless of their final use and previous owner. Only market prices are considered, so housing built on own account is excluded. The land is included. The data shows percentage changes from year Y compared to year Y-1.

[56] The private-sector credit flow corresponds to the net changes in liabilities of non-financial corporate sectors (S.11), households, and non-profit institutions serving households (S.14_S.15) incurred during the year. The instruments included in the calculation of private-sector credit flow are "Securities other than shares" (F.3) and "Credits" (F.4), with all other instruments excluded. The concepts used in the definition of sectors and instruments are consistent with ESA 2010. Data is expressed as a percentage and calculated on a non-consolidated basis, i.e. by including transactions among units of the same sector.

Chart 22
Private-sector credit flow, as % of GDP



Note: A Member State is considered to be at risk of imbalance if the change in the private-sector credit flow is above +14%. If the indicator is below this threshold, a Member State is not considered to be at risk.
Source: Eurostat; orange line = threshold of +14% set by the MIP

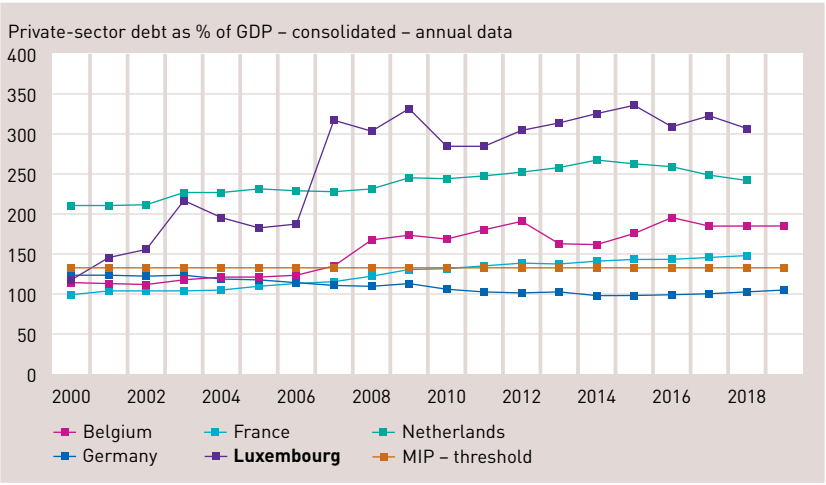
B.3. Private-sector debt[57]

The private-sector debt indicator is important because if it is excessively high, private-sector debt involves significant risks to the growth and financial stability of a country. The indicator measures, as a percentage of GDP, the level of private debt in the economy: non-financial corporations, private households, and non-profit institutions serving households. The indicator is based on non-consolidated data, meaning it includes, for example, intra-sector debt at national level. It has been agreed that a country is potentially is at risk if this indicator is above +133% of GDP.

Since 2001 in Luxembourg, this indicator has significantly exceeded the threshold set by the MIP. However, for Luxembourg this indicator should be interpreted with caution because non-financial companies incur most of this private-sector debt. Given the liquidity of financial markets and the experience in international transactions, a company may choose to incur debt through funding in Luxembourg, not for its own needs but for another related entity that may be located abroad (e.g. intra-group loans). This debt then contributes to the numerator of the "private-sector debt relative to GDP" indicator used here, without taking into account the added value produced by this funding if it is outside Luxembourg, because GDP (denominator) is a national concept. For a small and very open economy such as Luxembourg, this indicator therefore tends to be overestimated because the numerator (debt) is overvalued and the denominator (GDP) is undervalued because the added value created abroad from these sources of financing (debt) raised inside the country is not taken into account. With particular regard to household debt, this debt results mainly from loans taken out for housing acquisition.

[57] Private-sector debt corresponds to the outstanding amount of liabilities of non-financial corporate sectors (S.11), households, and non-profit institutions serving households (S.14_S.15). The instruments included in the calculation of private-sector debt are "Securities other than shares", excluding financial derivatives (F.33), and "Credits" (F.4), with all other instruments excluded. The concepts used in the definition of sectors and instruments are consistent with ESA 2010. Data is calculated on a non-consolidated basis, i.e. excluding transactions among units of the same sector. The indicator is calculated as a percentage of GDP.

Chart 23
Consolidated private-sector debt, as a % of GDP



Note: A Member State is considered to be at risk of imbalance if private-sector debt exceeds 133% of GDP. If the indicator is below this threshold, a Member State is not considered to be at risk.
Source: Eurostat; orange line = threshold of 133% set by the MIP

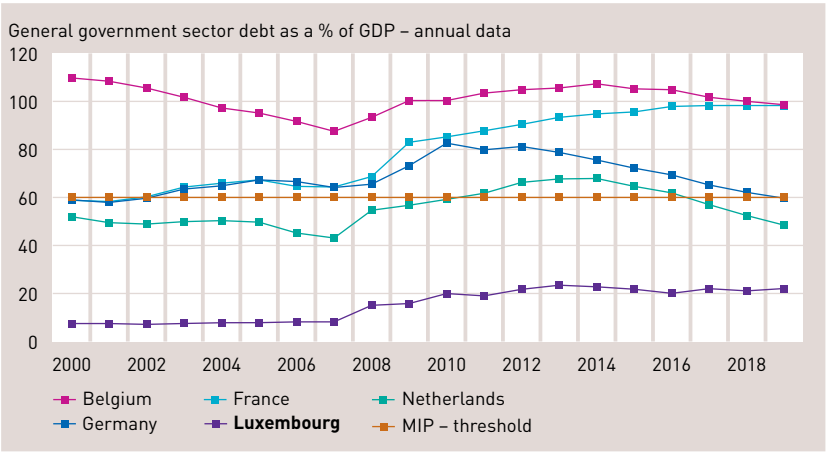
B.4. General government sector debt[58]

This indicator takes into account the potential contribution of general government sector debt to macroeconomic imbalances. The definition used is that set by the Stability and Growth Pact (SGP). This indicator is not included to monitor the risk of unsustainable public finances, but should be considered complementary to the indicator for private debt. A high level of government debt is more alarming when accompanied by a high level of private debt. For this indicator, it has been agreed under the MIP that a country is potentially at risk if the indicator is above +60% of GDP.

The rate of gross government sector debt in Luxembourg is well below the Maastricht threshold (60% of GDP). However, government sector debt started to rise considerably in Luxembourg with the onset of the economic and financial crisis in 2008, before stabilising in the last few years.

[58] General government sector debt is defined in the Maastricht Treaty as the consolidated gross debt of the whole general government sector in nominal value at the end of the year. The government sector includes the following sub-sectors: central government, State government, local government and social security funds. Definitions are available in Council Regulation (EC) No 479/2009, as amended by Council Regulation (EU) No 679/2010. National data for the general government sector is consolidated among the sub-sectors. The series are available as a percentage of GDP. The GDP denominator comes from the ESA 2010 transmission programme, and not from the EDP notifications. As the revised GDP is transmitted with a delay, this may result in potential differences in debt as a % of GDP, depending on the source (EDP or the AMR scoreboard).

Chart 24
Gross general government sector debt as a % of GDP



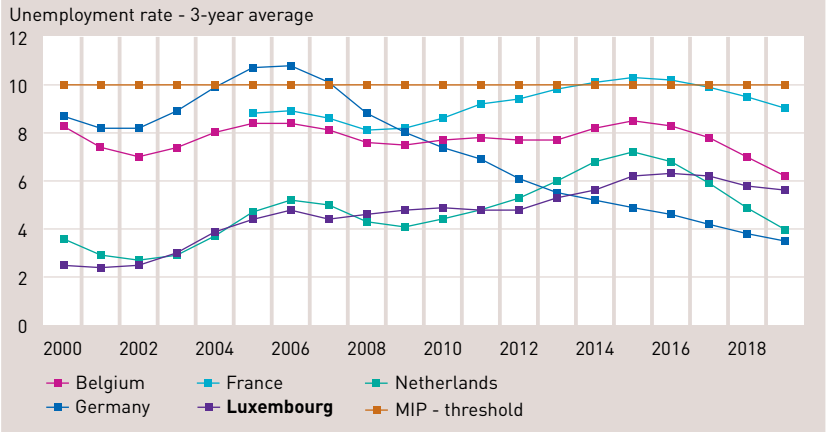
Note: A Member State is considered to be at risk of imbalance if its general government sector debt exceeds 60% of GDP. If the indicator is below this threshold, a Member State is not considered to be at risk.
Source: Eurostat; orange line = threshold of 60% set by the Maastricht Treaty

B.5. Unemployment rate[59]

This indicator is intended to monitor high and persistent unemployment rates and highlights any potential misallocation of resources (incompatibility) and a general lack of responsiveness in the economy. It should therefore be read in conjunction with other more future-oriented indicators and should be used to better understand the potential severity of macroeconomic imbalances. It has been agreed that a country is at risk if this indicator is above 10%.

Luxembourg has an unemployment rate well below the threshold. However, since 2000 the unemployment rate has risen sharply in Luxembourg.

Chart 25
Unemployment rate, 3-year average



Note: A Member State is considered to be at risk of imbalance if its unemployment rate exceeds 10%. If the indicator is below this threshold, a Member State is not considered to be at risk.
Source: Eurostat; dotted line = threshold of 10% set by the MIP

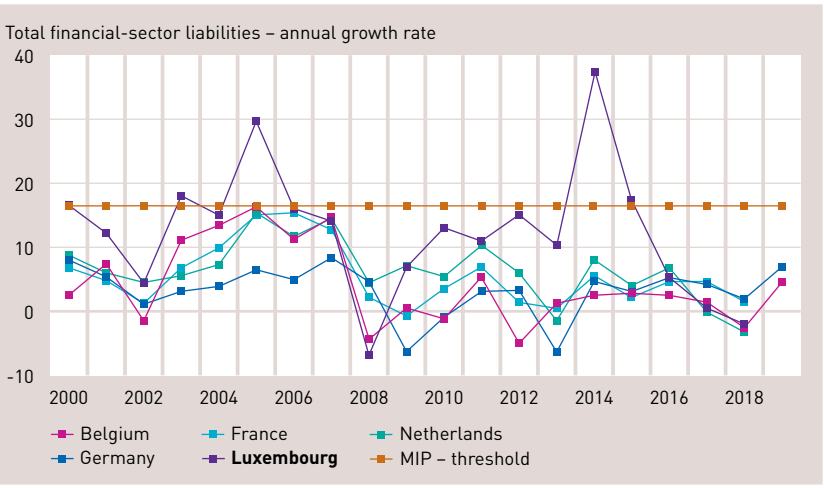
[59] The unemployment rate represents the number of unemployed people as a percentage of the labour force as defined by the International Labour Organization (ILO). The labour force consists of employed and unemployed people. Unemployed people are those aged 15 to 74 who: - were jobless during the reference week; - were available for work during the next two weeks; and - were either looking actively for a job during the previous four weeks or had already found a job that began in the following three months. The data is expressed as 3-year moving averages, i.e. year Y's data is the arithmetic mean of years Y, Y -1, and Y -2. In this context, it is not the national definition of unemployment used in Luxembourg, which is the one used by the National Employment Agency (ADEM): "The unemployment rate is the ratio of the number of available resident jobseekers to the labour force. The latter consists of all persons living in the country who are working (employed or self-employed) or looking for a job (jobseeker)." For additional details: https://adem.public.lu/en/publications/communiques/2015/note-technique.html

B.6. Total financial-sector liabilities[60]

This indicator measures the evolution of the sum of the liabilities of the entire financial sector of a country. The indicator is expressed as an annual growth rate. For this indicator, it has been agreed that a country is potentially at risk if the indicator is higher than +16.5%.

In most of the years under analysis, Luxembourg has been below the threshold limit, although it exceeded the threshold in 2000, 2003, 2005 and 2015. Based on the latest available data, Luxembourg is currently below the threshold limit.

Chart 26
Growth rate of total financial-sector liabilities



Note: A Member State is considered to be at risk of imbalance if the growth rate of the total financial-sector liabilities exceeds +16.5%. If the indicator is below this threshold, a Member State is not considered to be at risk.
Source: Eurostat; orange line = threshold of 16.5% set by the MIP

C. Employment indicators

C.1. Activity rate[61]

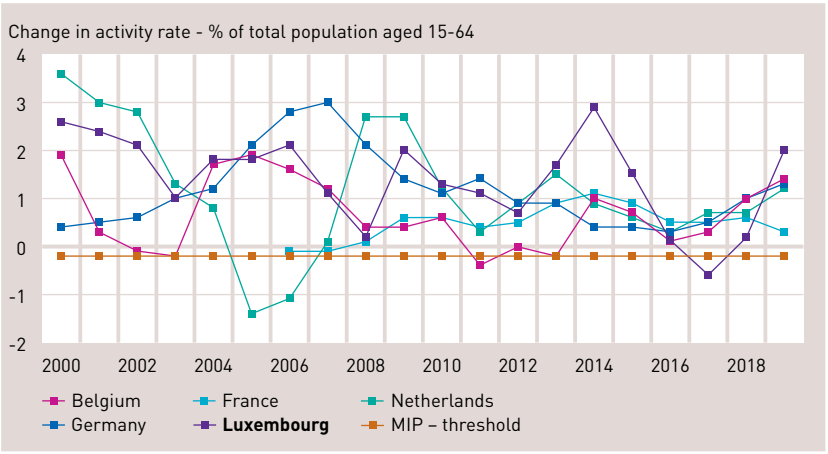
This indicator measures variations in the activity rate amongst Member States' residents. The indicator is expressed in percentage points (p.p.) over a three-year period. For this indicator, a country is deemed to be potentially at risk if the activity rate falls by more than 0.2 p.p. over the period in question.

Between 2000 and 2016, the activity rate rose in Luxembourg, so the threshold was adhered to. Conversely, in 2017, the activity rate in Luxembourg dropped (-0.6 p.p.) and the threshold was not adhered to. However, based on the latest available data for 2019, Luxembourg once again conforms to the threshold (2 p.p.).

[60] Total financial sector liabilities measure the evolution of the sum of all liabilities (including currency and deposits, securities other than shares, loans, shares and other equity, insurance technical reserves and other accounts payable) of the entire financial sector. The indicator is expressed as an annual growth rate.

[61] The activity rate is the ratio between the number of economically active individuals aged 15-64 years and the total population in the same age bracket. In line with the International Labour Organization (ILO) definitions and for the purpose of compiling labour-market statistics, individuals are categorised as follows: employed, unemployed, and economically inactive. The economically active population (also referred to as "the labour force") corresponds to the sum of employed and unemployed individuals. Inactive individuals are individuals who, during the reference period, were neither employed nor unemployed. The scoreboard indicator reveals the change over three years expressed in percentage points. The indicative threshold is -0.2 p.p. This indicator is based on the results of the EU's quarterly Labour Force Survey (LFS), which covers the resident population living in private households.

Chart 27
Activity rate – % of total population aged 15-64 – change in percentage points (t, t-3)



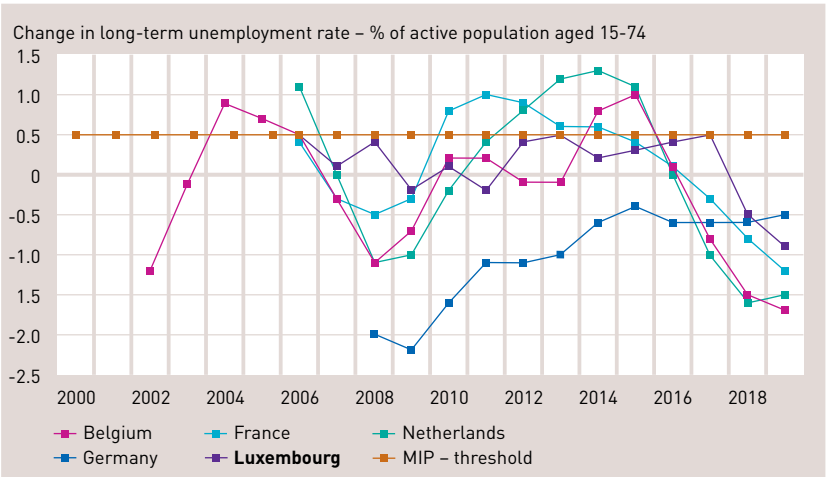
Note: A Member State is considered to be at risk of imbalance if the growth rate is below -0.2 p.p. If the indicator exceeds this threshold, a Member State is not considered to be at risk.
Source: Eurostat; orange line = threshold of -0.2 set by the MIP

C.2. Long-term unemployment rate[62]

This indicator measures the variation in long-term unemployment rates in the Member States. The indicator is expressed in percentage points and measured over a three-year period. For this indicator, a country is deemed potentially at risk if the rate increases by more than 0.5 p.p. over the period in question.

Over the entire period under analysis, the variation in Luxembourg's long-term unemployment rate has been below or equal to the threshold limit.

Chart 28
Long-term unemployment rate – % of active population aged 15-74 – change in percentage points (t, t-3)



Note: A Member State is considered to be at risk of imbalance if the growth rate exceeds +0.5 p.p. If the indicator is below this threshold, a Member State is not considered to be at risk.
Source: Eurostat; orange line = threshold of +0.5 set by the MIP

[62] The long-term unemployment rate is the number of individuals who have been unemployed for at least 12 months, expressed as a percentage of the active population (the economically active population). The unemployment rate is the percentage of unemployed individuals in the active population (the total number of persons employed and unemployed), as per the International Labour Organization (ILO) definition. The term "unemployed" covers individuals aged 15-74 who meet the following criteria: - unemployed during the reference week; - available to begin work within the following two weeks; - actively looking for a job during the previous four weeks or have found a job that they will start within the following three months.

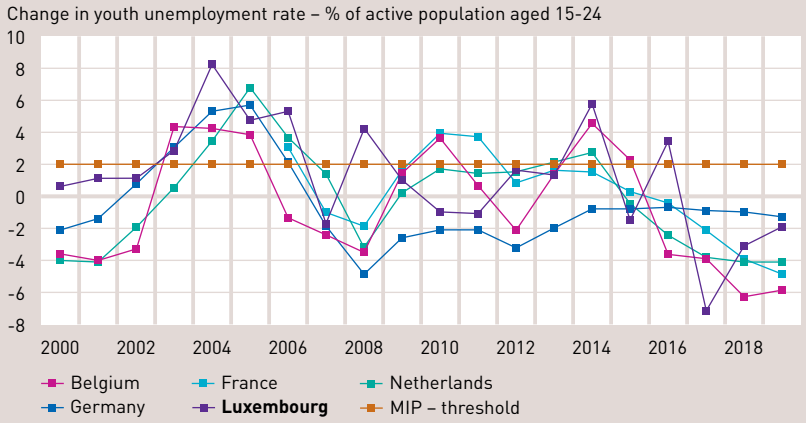
The scoreboard indicator reveals the change over three years expressed in percentage points. The indicative threshold is 0.5 p.p. This indicator is based on the results of the EU's quarterly Labour Force Survey (LFS), which covers the resident population living in private households.

C.3. Youth unemployment rate[63]

This indicator measures the variation in the youth unemployment rate in the Member States. The indicator is expressed in percentage points and measured over a three-year period. For this indicator, a country is deemed potentially at risk if the rate increases by more than 2 p.p. over the period in question.

The youth unemployment rate in Luxembourg has been oscillating around the threshold. In some years, the indicator has risen above the threshold, whereas in other years it has remained below. Luxembourg was below the threshold in 2019 (-1.9 p.p.)

Chart 29
Youth unemployment rate – % of active population aged 15-24 – change in percentage points (t, t-3)



Note: A Member State is considered to be at risk of imbalance if the growth rate exceeds +2 p.p. If the indicator is below this threshold, a Member State is not considered to be at risk.
Source: Eurostat; orange line = threshold of +2 set by the MIP

D. Interim conclusions

Based on the updated data used in this chapter and pending the 2021 Alert Mechanism Report, whose publication by the European Commission is expected in November 2020, we note that Luxembourg has exceeded three thresholds:

- (Consolidated) private-sector debt;
- Variation in nominal unit labour costs (% change over 3 years);
- Variation in the index of house prices (deflated) (% change over 1 year).

[63] The youth unemployment rate is the percentage of unemployed individuals aged 15-24 and the active population in the same age bracket. The unemployment rate is the percentage of unemployed individuals in the active population (the total number of persons employed and unemployed), as per the International Labour Organization (ILO) definition. The term "unemployed" covers individuals aged 15-74 who meet the following criteria: - unemployed during the reference week; - available to begin work within the following two weeks; - actively looking for a job during the previous four weeks or have found a job that they will start within the following three months.

The scoreboard indicator reveals the change over three years expressed in percentage points. The indicative threshold is 2 p.p. This indicator is based on the results of the EU's quarterly Labour Force Survey (LFS), which covers the resident population living in private households.

Table 5
Summary table of the alert mechanism update (August 2020)

	External imbalances					Internal imbalances						Employment indicators		
	Current account balance	Net international investment position	Real effective exchange rate	Export market share	Nominal ULC	Deflated house prices	Private-sector credit flow	Private-sector debt	General government sector debt	Unemployment rate	Total financial-sector liabilities	Activity rate	Long-term unemployment rate	Youth unemployment rate
LUX*	4.7%	50.9%	2%	-1.87%	11.9%	8%	-0.5%	306.5%	22.1%	5.6%	-2%	2 pp	-0.9 pp	-1.9 pp
Thresholds**	> -4% < +6%	> -35%	> -5% < +5%	> -6%	< +9%	< +6%	< +14%	< 133%	< 60%	< 10%	< +16.5%	> -0.2 pp	< +0.5 pp	< +2 pp

Notes: * 2019 data, except private-sector credit flow, private-sector debt and total financial-sector liabilities (2018).
** Conditions for not being considered imbalanced (for some indicators these thresholds differ between eurozone Member States and other Member States).
Sources: European Commission, Eurostat

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5 Thematic studies

5.1 Studies STATEC Research[1]

The COVID-19 pandemic, the worst health crisis in 100 years, is deeply affecting economies and societies worldwide. In the short run, the pandemic has entailed large social and economic costs: value chains have been disrupted, entire groups of economic activities have been nearly shut down, and unemployment has increased dramatically. The organisation of labour has also undergone profound transformations. These events have also increased anxiety and mental distress, and negatively affected people's well-being. Only time will tell if some of these changes will be transitory or long lasting, and will be such to induce structural changes in our economies and lives.

These disruptions have affected Luxembourg, too. On March 18th of 2020 the country went into lockdown to contain the spread of the novel coronavirus, with the restrictions being relaxed gradually in three phases from late April until June. These extraordinary measures have contained the spread of the virus, saved lives, and helped the health system to cope with demand. They have also affected the country's economic activity. STATEC estimates a decline in GDP of 7.8% in the second quarter of 2020 compared to the same quarter in 2019 (STATEC, 2020). On an annual basis, GDP is expected to decline by 6.2% according to the European Commission.[2]

The pandemic is also having an impact on scientific research. On the one hand, the outbreak has highlighted the relevance of research and data analysis in providing essential information, insight and feedback to decision makers. On the other hand, it has also confronted scientists with new research questions and challenges that involve the sharing and availability of data, and the timeliness of information.

At the time of writing, we are witnessing a second wave of the pandemic. Countries are debating how to design policies that effectively balance health and economic needs. Thus, understanding the implications of the pandemic on economies and societies, and the policies that could mitigate the crisis, is crucial.

In this challenging context, STATEC Research has reshaped its agenda to study the impact of COVID-19 in Luxembourg. This chapter provides an account of selected studies carried out by the team of researchers during recent months. The studies focus on the impact of the pandemic on aspects of well-being and on the economy, discusses policies that could mitigate the adverse effects of the health crisis and lockdowns, and the role of social trust in these events, including compliance with health measures.

[1] Kelsey J. O'Connor, Chiara Peroni, Cesare Riillo, Pietro Santoleri, Francesco Sarracino contributed to this chapter. They are affiliated to STATEC Research. Robson Morgan contributed to Section 5.3. Opinions and views expressed in this chapter are those of the authors and not those of STATEC or the Observatoire de la compétitivité.

The author(s) gratefully acknowledge the support of the Observatoire de la compétitivité, Ministère de l'Économie, DG Compétitivité, Luxembourg, and STATEC, the National Statistical Office of Luxembourg.

STATEC RESEARCH performs research in the field of applied economics. This research focuses on drivers of countries' economic growth, such as entrepreneurship and productivity, and on those conditions that make growth inclusive, sustainable, and compatible with people's well-being. The research contributes to the understanding of Luxembourg's social and economic development in a comparative perspective, to the international scientific debate, and to new perspectives for policy making.

[2] https://ec.europa.eu/info/business-economy-euro/economic-performance-and-forecasts/economic-performance-country/luxembourg/economic-forecast-luxembourg_en

The first study of the chapter presents the main takeaways from the analysis of residents' living conditions during the lockdown in Luxembourg, using rapid survey data collected by STATEC. The findings highlight an increase in residents' mental distress, by looking at self-reported mental health and feelings of job security, but also suggest that certain measures have been successful in mitigating the difficulties faced by the population. The section also reports on novel research showing the effectiveness of physical distancing measures in disrupting the spread of the virus.

The next section discusses relevant lessons from past crises, namely the effect of labour market policies on individuals' well-being during the Great Recession of 2008 in Europe. The chapter moves on to present two ongoing projects that explore novel data and methods to study well-being, trust and compliance with health policies during the coronavirus crisis. The projects are supported by Luxembourg's National Research Fund (FNR), and are part of the Research Luxembourg's COVID task-force efforts to tackle the pandemic's challenges. The first results are expected at the end of the current year.

Finally, the last contribution presents the first results from the new wave of Luxembourg's Entrepreneurship Monitor, which is part of the Global Entrepreneurship Monitor (GEM) research programme. The survey asked targeted questions to examine the response of entrepreneurs to the COVID-19 pandemic. The findings provide a mixed picture, consistent with the idea that crises, while profoundly unsettling, also bring about opportunities for entrepreneurs. On the one hand, fewer residents want to engage in entrepreneurial activities; they perceive worsened conditions. On the other hand, some entrepreneurs envision opportunities to seize, and are satisfied with the government response to the pandemic.

5.2 The social consequences of COVID-19

During the spring of 2020, STATEC conducted a national survey on the social and economic impact of COVID-19 in Luxembourg. It aimed at portraying life in lockdown, as well as changes in perceptions and the employment and financial situation of Luxembourg's residents.

We analysed these data focusing on aspects relevant to the general well-being of the population, namely mental health and feelings of job security. Mental health is one of the most important components of well-being and feelings of job security is known to affect well-being.

During the first COVID-19 outbreak and lockdown, Luxembourg residents experienced a decline in mental health and in their job security. However, certain policy measures seem to have done a good job in counteracting the effects of the pandemic on well-being. Indeed, the data show that working from home in Luxembourg was largely beneficial to mental health, while not detrimental to feelings of job security. Moreover, the partial unemployment scheme *(chômage partiel)* did not contribute to the decline in mental health. These findings suggest that policies that preserve job security and employment mitigated the adverse well-being effects of the pandemic.

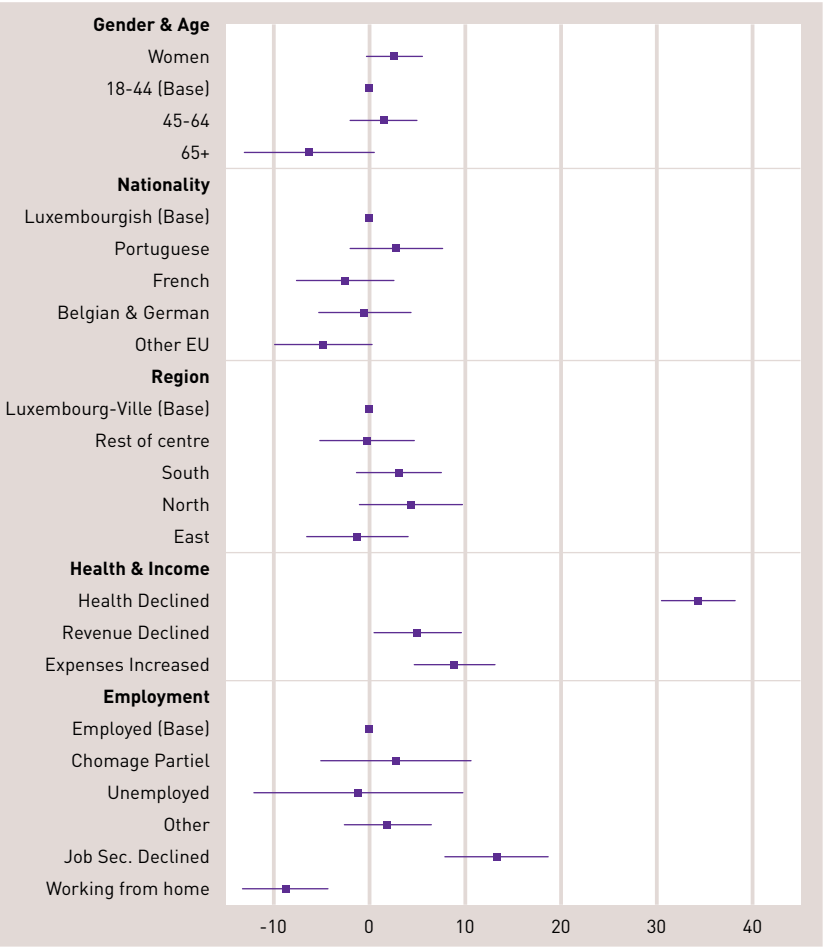
During lockdown, one in three Luxembourg residents reported a decline in their mental health (santé morale), more than double the corresponding decline in physical health. What are the plausible causes of this mental distress?[3]

Based on the available data, the most important factors associated with the decline in mental health were declines in physical health, income, and job security. Someone that experienced a decline in their physical health was about 35 percent more likely to experience a decline in their mental health. Similarly, if an individual's revenue decreased or expenses increased, they were more likely to report a decline, at about 5 and 9 percent respectively. Those who felt their job security had deteriorated were about 13 percent more likely to experience a decline in mental health. In contrast, those working from home were about 9 percent less likely to report a decline in mental health. Moreover, being unemployed was not statistically related to declining mental health. Figure 1 below depicts the relations between declining mental health and the factors discussed, namely changes to health and income, feeling of job security, teleworking. It also reports on demographic characteristics, region of residence, and employment status. These relations have been estimated using regression analysis.[4]

[3] These results are reported in Peroni, C. and O'Connor, K. (2020), One in three Luxembourg residents felt a mental health decline during the COVID-19 crisis. Regards, 08/2020, STATEC. https://statistiques.public.lu/catalogue-publications/regards/2020/PDF-08-2020.pdf

[4] The estimates are based on a regression of mental health change for 2020 people on the reported characteristics, as well as education, and characteristics of the household and dwellings. The latter are: number of people living there; whether or not a child or elderly person lives there; whether the respondent lives in an apartment, house, or other; if it has external amenities (e.g. garden or terrace); number of people living there. Figure 1 reports point estimates and confidence intervals.

Figure 1
Mental Health Decline. Change in probability (%) of decline associated with different characteristics



Source: Author's calculations using the STATEC-ILRES survey, April 2020.

One interesting feature of this analysis is the statistical link between the decline in job security and the decline in mental health. Indeed, the health crisis and lockdown brought about involuntary reductions in working hours and rising unemployment, as well as increased anxiety and insecurity in the working population. This finding is consistent with the scientific literature, which finds unemployment has long-lasting negative consequence on the mental health and well-being of both the unemployed and employed.

Job insecurity is linked to the fear of losing one's job, and to the perception of worsening employment or re-employment perspectives. How widespread is job insecurity in Luxembourg? What are the factors associated to it?

During lockdown, a quarter of the resident population in Luxembourg perceived an increase in job insecurity.[5]

[5] Results are reported in Sarracino, F. (2020), Job insecurity worsened for 25% of the residents as a consequence of the COVID-19 crisis. Regards, 06/2020, STATEC. https://statistiques.public.lu/catalogue-publications/regards/2020/PDF-06-2020.pdf

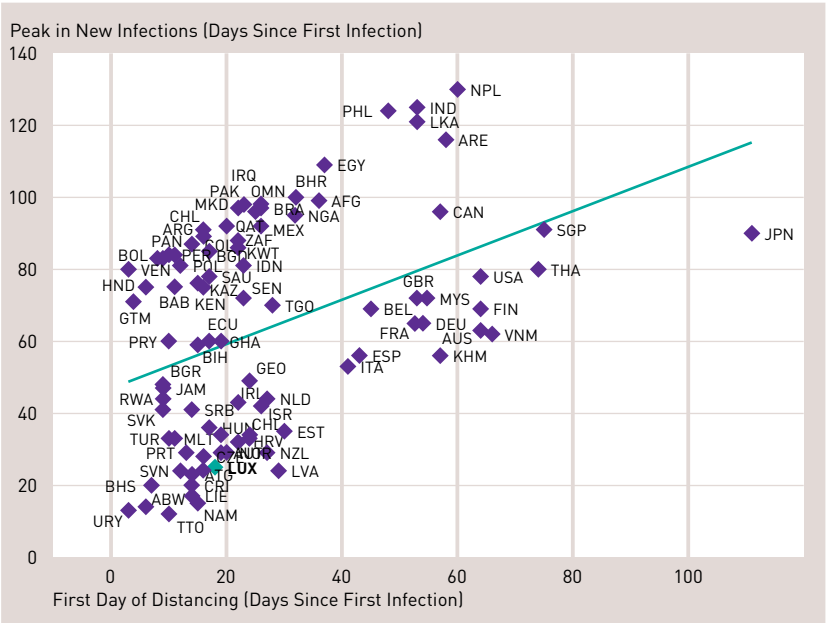
Based on the survey data, the most important factors associated to the perceived decline in job security were income, and physical and mental health. Those who experienced a decline in income and in saving abilities were more likely to report an increase in job insecurity by 14 and 13 percent respectively. Those who reported a decline in physical and mental health were 10 percent more likely to report an increase in job insecurity. In contrast, working from home and feelings of job insecurity were not related.

Was lockdown worthwhile? While there is widespread consensus that lockdowns and physical distancing are (possibly the only) effective tools in countering the spread of the COVID-19 disease, these measures have been questioned, partly due to their economic and social costs.

An analysis conducted by STATEC Research on mobility and health data at the country level suggests that these measures worked (O'Connor, 2020).[6] This research estimates the relation between distancing behaviour and the duration and severity of the pandemic. The analysis is conducted on a sample of 95 countries. Mobility data from Google provide a direct measure of distancing behaviour.

Results show that the sooner people distanced, the sooner countries reached a peak in new cases, and the peak was also lower. In other words, the sooner people distanced, the sooner cases started to decline, and the lower was the number of cases recorded during peaks.[7] Figure 2 plots the day of the peak in new infections against the day when reduced mobility (greater distancing) began. The line of best fit (or regression line) illustrates the general tendency that countries which distanced later also peaked in new infections later.[8] The research also offers a comparative perspective of Luxembourg's stance in terms of the outbreak's severity and distancing behaviour.

Figure 2
The peak in new infections occurred later in countries where distancing began later



Source: Author's elaboration, based on data from https://covid.ourworldindata.org/ and Google Mobility data

[6] The working paper is available at https://statistiques.public.lu/catalogue-publications/economie-statistiques/2020/116-2020.pdf

[7] The data are as of early June 2020. Any subsequent resurgence in cases is not evaluated.

[8] ISO codes indicate countries.

5.3 How to mitigate the psychological effects of the COVID-19 crisis: learning from the Great Recession of 2008

What can governments do to protect the well-being of their citizens during the COVID-19 pandemic? How should policy makers choose the right course of action, collectively weighing the health, economic, and psychological costs? There is no easy answer; however insights from previous crises help to shed light on these difficult questions.

The findings summarized in this section, based on Morgan and O'Connor (2020), indicate that during the Great Recession of 2008, European countries with more generous unemployment support policies better supported the well-being of their residents. In contrast countries with stronger restrictions on the dismissal of employees (employment protection legislation) fared worse.

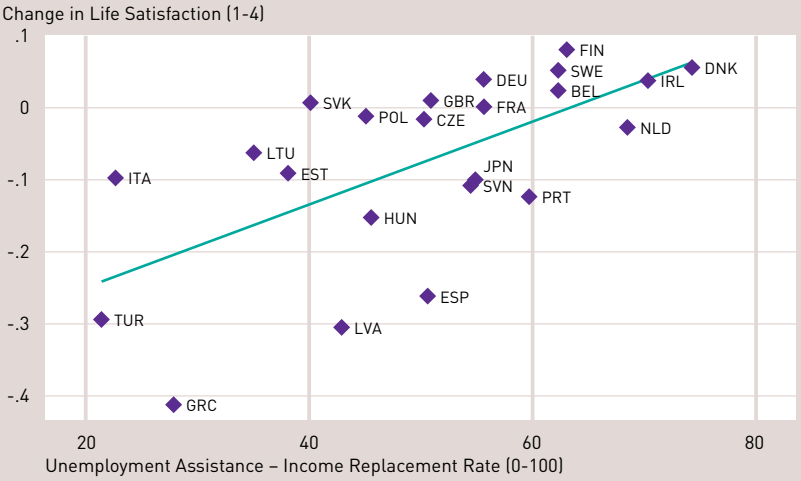
As many recall, quality of life generally declined during the Great Recession. Then, as during the COVID-19 crisis, not all countries fared the same. In 2008, some countries did not experience a decline in reported well-being, such as Denmark, while others, such as the Mediterranean countries (Greece, Italy, Spain, and Portugal), suffered greater than average declines. These differences may appear to be due to geography, but our research indicates labour market policies matter more (Morgan and O'Connor, 2020)[9]. Greece and Italy offered relatively low income support for the unemployed and had strict employment protection legislation. Portugal and Spain also had fairly strict employment protection. Denmark on the other hand, offered generous unemployment support and had lax employment protection.

Figure 3 illustrates how the declines in life satisfaction (a broad survey-based measure of well-being[10]) varied across countries (on the vertical axis) with different levels of income replacement for the unemployed (on the horizontal axis). Countries towards the bottom experienced greater losses in life satisfaction – Greece (GRC) and Turkey (TUR) experienced declines by approximately 0.4 and 0.3 life satisfaction points (on a scale from 1 to 4). They are also located towards the left of the figure, with income replacement rates of less than 30 percent. In contrast, the replacement rates in Ireland (IRL) and Denmark (DNK) were greater than 70 percent, and they did not experience a decline in life satisfaction. This general tendency, that countries with greater unemployment support reported smaller declines in life satisfaction, is illustrated by the line of best fit (regression line) in green.

[9] Morgan and O'Connor (2020) is based on individual self-reported well-being (life satisfaction) data from Eurobarometer surveys, conducted by the European Commission, and variation in labour market policies across 23 European countries. Beyond Figure 3, the authors use regression analysis intended to estimate unbiased relations that are free from concerns like reverse causality or omitted variables.

[10] Life satisfaction is measured as the response to the question, "On the whole, are you very satisfied, fairly satisfied, not very satisfied or not at all satisfied with the life you lead?" Responses to such questions predict future behaviour, relate to objective characteristics including biometrics, relate to other subjective measures (including expert evaluations), and are consistent over time. For a further discussion of the types of subjective well-being questions and their reliability and validity see Helliwell and Wang, 2012; Kapteyn et al., 2015; OECD, 2013.

Figure 3
The relationship between changes in Life Satisfaction during the Great Recession of 2008 and rates of income replacement for the unemployment (23 European Countries indicated by ISO codes)



Sources: Author's calculations. Eurobarometer and OECD.
See Morgan and O'Connor (2020) for details.

A similar relation is visible when observing the strictness of employment protection legislation, but in reverse. Countries with stricter employment protection legislation in 2008 experienced greater declines in life satisfaction during the Recession. This may be surprising because employment protection is intended to improve job security; but during a recession, stricter legislation may in fact cause greater unemployment. That is because employers generally limit hiring during recessions to reduce risk, which is especially true when there are greater costs to adjust their workforce due to stricter employment protection locking employees into jobs. Indeed, in the full text we provide evidence that suggests unemployment increased by a larger amount in countries with greater restrictions on the use of temporary employment contracts (another form of employment protection legislation) (Morgan and O'Connor, 2020).

Does this result, concerning the unanticipated negative impacts of employment protection legislation, apply during the COVID-19 crisis? The answer is not obvious. Employment protection policies are long term in nature and differ from the temporary measures that furloughed employees (e.g. chômage partiel in Luxembourg). Such short-run policies may have been successful had we recovered from COVID-19 relatively quickly. However, in the medium to long run, our findings on employment protection legislation indicate that employers need to be able to adjust their workforce in order to respond to changing conditions.

As the crisis continues, it has become clear that a quick recovery is not coming. The economy is already undergoing a significant restructuring. Consumption and production patterns are changing in important and lasting ways – for instance individuals are eating fewer meals out, attend less in-person events and business may keep more workers at home, requiring less office supplies and space. Production supply chains are also changing. All of these changes shift company profits and losses in ways that are difficult to predict. The optimal response is unclear and differs across contexts. However, our research indicates unemployment insurance represents a strong option, unlike permanent employment protection legislation, because the former provides relief to unemployed people and allows the economy to re-organize itself.

Why is reported well-being important when people are dying? Mental distress is a concern in its own right, but additionally important today because it could exacerbate the crisis, initiating a vicious cycle – fear, despair, depression, and isolation lead to poor health, economic, and social outcomes, which in turn exacerbate the negative psychological costs. We know from multiple disciplines that less happy people do not live as long, and negative feelings predict political behaviour such as Arab Spring and the U.K.'s vote to exit the EU (Arampatzi et al., 2018; Liberini et al., 2019). Whereas positive feelings contribute to positive outcomes. Happy people (broadly defined) are more likely to get married, they are also more productive, more creative, less likely to become unemployed, and live longer (De Neve et al., 2013; O'Connor, 2020; O'Connor and Graham, 2019; Piekałkiewicz, 2017).

We can learn from past crises to design and implement better strategies for combatting COVID-19 and its consequences. Our research indicates income support for the unemployed and flexible labour markets reduce the negative consequences on individuals' reported well-being. More broadly, insights from our research and the economics of happiness literature more generally, indicates the need to think beyond traditional metrics (e.g. GDP). Psychology matters. In recognition of the mental health costs of containment measures, the World Health Organization (WHO) changed its recommendation from social distancing to physical distancing at the end of March. Physical distancing is necessary to combat the spread of COVID-19 but social isolation is not, and mental distress (e.g. loneliness) exacerbates the consequences of COVID-19.

5.4 STATEC Research and the COVID task force: compliance with health policies and preferences through Twitter

STATEC Research participated in Luxembourg's COVID task force, an initiative to gather evidence on the COVID-19 pandemic coordinated by Research Luxembourg, and supported by the FNR. The task force of economists provided a first assessment of the economic impact of COVID-19, and a research agenda to tackle challenges posed by the novel coronavirus outbreak (Beine et al., 2020).[11] In this context, the team participated in the FNR special COVID call with two projects to study the determinants of the compliance with health policies, and the changes in people's preferences and attitudes during the health crisis. Both projects were retained for funding and are ongoing, with first results expected by the end of the year.

The first project, Support for app-based contact tracing of COVID-19 in Luxembourg (APP-reciate, Riillo, C., 2020),[12] studies the determinants of the acceptance of digital technologies for COVID-19 contact tracing. In doing so, the research addresses the issue of compliance, crucial to the success of health measures to contain/suppress the virus. The case of mobile phone apps to aid manual contact tracing exemplifies this issue, as their effectiveness depends on the number of app users.

The second project, Preference through Twitter (PRET, Sarracino, F., 2020),[13] studies changes in people's well-being, preferences and attitudes during the pandemic, as those affect people's economic decisions (e.g. how much to consume, how long to work), and the broader welfare and social cohesion. As an example, if people's expectations about the future worsen, they might choose to save more money, thus reducing consumption and contributing to lowering aggregate demand. Changes in people's trust in others and confidence in institutions can reduce social cohesion and the ability of the society to cooperate to achieve common goals, including containment of the pandemic.

Both projects adopt innovative methods capable of providing timely information to analyse changes in socio-economic conditions. In doing so, the projects also aim to improve and strengthen the resilience of STATEC to collect data and conduct research and analysis in the event of external shocks. APP-reciate builds a framework to administer online surveys on nationally representative and repeated samples of the resident population. In principle, this could allow STATEC to collect data on urgent matters by administering short and relatively inexpensive surveys. PRET enters the world of big data by deriving key indicators from the sentiment analysis of Twitter posts. In doing so, it explores new sources of data to draw timely information of interest to decision makers.

What follows provides a concise overview of the projects.

[11] https://www.liser.lu/documents/RECOVID/RECOVid_working-note_full-1.pdf

[12] Grant number COVID-19/2020-2/14844092

[13] Grant number COVID-19/2020-2/14878312

Support for contact tracing apps in Luxembourg

The project "Support for app-based contact tracing of COVID-19 in Luxembourg" (APP-reciate) studies the determinants of the likelihood to adopt a COVID-19 tracing app in Luxembourg's residents. The project aims to provide insights into the main determinants of installation intentions, including socio-economic characteristics, trust, and app design; into concerns that could prevent the adoption of an app; and into how residents' propensity to install and its determinants change over time. Thus, results from the analysis could provide valuable information to the public debate and to decision makers.

At the time of the project's submission, many countries were developing, or considering whether to develop, tracing apps as part of their strategies to counter the novel coronavirus spread and exit lockdowns. Several smartphone tracing apps have been proposed to detect coronavirus exposure (O'Neill et al., 2020). The apps enable quick identification and notification of COVID-19 exposure to those users who have come into contact with someone infected by the virus. A lively debate surrounded this technology. On the one hand, tracing apps installed on mobile phones are credited as having helped to contain the pandemic in South Eastern Asian countries (South Korea, Taiwan, and Japan), and studies have shown their effectiveness. On the other hand, the apps raise ethical concerns related to privacy and data sharing. To date, many European countries have adopted tracing apps, but the take up has remained low. At the same time, an increasing number of cases risks overwhelming manual contact tracing.

The case of mobile phone apps exemplifies the issue that public support and compliance with health policies is a crucial element for their effectiveness. Indeed, studies show that tracing apps require a substantial level of acceptance in the population to be effective. Recent simulation studies suggest that the virus spread could be stopped if approximately 60% of the adult population adopted a tracing app (Ferretti et al., 2020; Hinch et al., 2020).

To answer APP's research questions, the team is analysing data sourced from two online surveys, administered to a representative and longitudinal sample of the resident population of Luxembourg. Thus, the project represents a major methodological advancement in survey research in Luxembourg. Indeed, the project constructs a new probability-based access panel, which permits to follow a representative sample of respondents over time by administering online questionnaires. APP-preciate provides additional evidence to the international study "Support for app-based contact tracing of COVID-19: Cross-country evidence" that is conducted comparatively in the United Kingdom, Germany, France, Italy and the United States (Altmann et al., 2020, available here https://osf.io/v45y2/) by replicating the survey in Luxembourg.[14] This allows researchers to analyse results for Luxembourg in a comparative perspective.

[14] https://osf.io/hmfct/

Preferences through Twitter

The project titled "Preferences through Twitter" (PRET) aims to study the changes in people's preferences, attitudes, and well-being that occurred during the COVID-19 crisis in Luxembourg. During a crisis, more than ever, decision makers need timely information to design effective policies to promote economic recovery, and support social cohesion. Previous studies have shown traumatic events can change people's preferences, attitudes and well-being in unpredictable and persistent ways (Cameron and Shah, 2015; Cassar et al., 2017; Beine et al., 2020). In turn, those changes represent an important channel through which traumatic events impact economic and social outcomes in the medium to long run (Arampatzi et al., 2018). This is especially important for policy-making in the COVID-19 context, as people's behavioural responses can influence the effectiveness of health policies, successful "exit" strategies to ease lockdowns, and recovery plans.

The PRET project will use sentiment analysis to study the changes that occurred to life satisfaction, mental stress, trust in others and in institutions (both national and international), loneliness, anger, uncertainty about the future in Luxembourg from January to December 2020. Previous studies documented that these variables can have relevant economic and social consequences, and this is why the research team will prioritize them.

Usually, data on people's preferences, attitudes and feelings are collected via large scale surveys administered on samples of the population. A downside of this approach is that information is available to analysts with some delay. The use of sentiment analysis, instead, allows researchers to trace the social change triggered by the pandemics in real time. In this way, the project aims to provide timely information, and to avoid delays typical of conventional large-scale surveys.

Sentiment analysis is an automated process to determine the feelings and attitudes of the author of a written text (Hailong et al., 2014). Authors from many social sciences have applied sentiment analysis to address various issues (Eichstaedt et al., 2015, Riotta et al., 2014, Gayo-Avello 2013, Bollen et al., 2011, Asur and Huberman 2010, O'Connor et al., 2010). For instance, Twitter messages have been used to track the influenza rate in the United Kingdom and the United States (Lampos and Cristianini, 2010; Culotta 2010). Paul and Dredze (2011) found a positive association between public health data and the data issued from sentiment analysis of tweets.

The PRET project follows the approach currently adopted by the Gross National Happiness (GNH) project (http://gnh.today) for South Africa, New Zealand, and Australia for a limited number of variables. The GNH analyses a live feed of tweets, firstly to determine the sentiment expressed and second to determine the underpinning emotion. The sentiment of a tweet is measured as either being positive, neutral or negative. These data are then aggregated to create happiness indices for the various countries. The happiness indices are measured on scales from 0 (very unhappy) to 10 (very happy), with 5 being neutral (neither happy nor unhappy). GNH also differentiates between eight emotions underpinning the tweets: trust, anger, anticipation, disgust, fear, joy, sadness and surprise. By using the results, the dominant emotions of a nation can be determined.

The GNH Index has proven to be a reliable monitor of people's reactions to various events, including the COVID-19 pandemic. For instance, people's feelings initially did not react to the pandemic (Greyling et al., 2020), but after the public realized the threat of the disease, the happiness levels dropped below previous daily averages. Later, when protective regulations were implemented and people had adjusted to the new circumstances, happiness recovered slightly but remained lower than normal.

The PRET project will provide time-series data for each variable of interest by aggregating the sentiment content of the messages exchanged on social media on a daily basis in Luxembourg, Italy, France, Germany, Spain and United Kingdom. These countries were chosen because of their vicinity to Luxembourg, the severity of the epidemics, and the different rates of decrease of new contagions. The international dimension of the project will allow the researchers to place Luxembourg in an international perspective, and to compare the effect of different policy contexts on people's preferences, attitudes and well-being. The time-series will cover the period before the crisis until December 2020, and it will permit us to study how preferences, attitudes and well-being changed over time, and whether such changes are permanent or transitory. The analysis of people's posts will also indicate how the use of online social media changed during the crisis.

In sum, the PRET project will provide urgent information about the changes over time in some key economic and behavioural variables, it will extend the existing GNH project by increasing the number of countries and of variables considered, and it will also build an infrastructure that can easily be up-scaled to collect timely data on indicators in the future.

5.5 Entrepreneurship during the pandemic: first evidence from the GEM Luxembourg

The COVID-19 outbreak and the containment measures inevitably have had a negative impact on entrepreneurship, with existing businesses forced to close down and at risk of insolvency, and fewer new businesses entering the market due to challenging demand, supply and credit conditions. The disruption in global value chains, along with a sustained increase in uncertainty, represent obstacles preventing firms from resuming business as usual. Yet, at the same time, the COVID-19 crisis has also brought about significant opportunities for those entrepreneurs who are able to leverage the new economic conditions to introduce innovative ideas in the market (Li-Ying and Nell, 2020).

Given the crucial role played by entrepreneurship in fostering technological change, job creation and, ultimately, economic growth[15], monitoring how entrepreneurs are responding to the COVID-19 crisis is important to encourage the recovery, and represents a central policy concern.

Against this backdrop, the 7th edition of the Global Entrepreneurship Monitor (GEM) for Luxembourg devotes special attention to this aspect. Since STATEC joined the GEM project in 2013, the GEM report has been providing unique information on entrepreneurial activities in Luxembourg. Over time, the GEM has tracked entrepreneurship rates across the phases of the entrepreneurship process; it has reported on the motivations and individual traits of entrepreneurs and on the attitudes of society towards entrepreneurial activities. In 2020, GEM has collected data on how entrepreneurs are faring during the pandemic.

This contribution explores the new GEM 2020 data to give a preliminary account on the state of entrepreneurship in Luxembourg during the COVID-19 crisis.

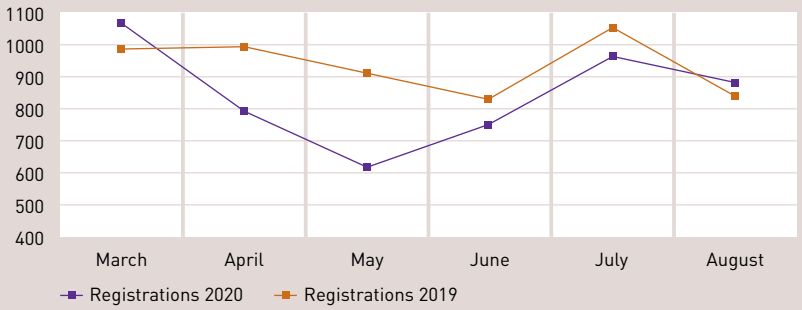
The findings of the survey reveal a mixed picture. According to respondents, current entrepreneurial activity in Luxembourg has dropped in 2020 due to the pandemic. Setting up a business is considered more difficult than in the past, with the pandemic delaying getting businesses operational. While many entrepreneurs have lower growth expectations when compared with the past, at the same time, some of them perceive that the pandemic has brought about new opportunities. A sensible reduction is observed when it comes to potential entrepreneurs, with fewer people planning to set up a business in the coming years mostly due to the COVID-19 crisis. Finally, while most respondents declared that the response of the government in dealing with the economic consequences of the pandemic has been effective, it is important to keep monitoring entrepreneurs' response and adaptation to the new economic conditions, given the importance of entrepreneurship for the recovery and the overall economic activity.

[15] Newly-established firms account for about 20% of employment but create almost half of new jobs on average across OECD countries (OECD 2016), and their innovation efforts contribute significantly to aggregate productivity growth (Klenow and Li 2020).

Fewer individuals engage in entrepreneurial activity and experience worse conditions to set up a business

COVID-19 has triggered an unprecedented crisis with potentially severe consequences for entrepreneurs, start-ups and established firms. One of the expected implications of the COVID-19 crisis has been a reduction in the number of people currently engaging in entrepreneurial activities. A drop in business registrations is generally observed during economic crises (Klapper and Love, 2011). The initial spreading of the coronavirus followed by the lockdown have inevitably hampered the start of new entrepreneurial activities during the first semester of 2020. Data from the Luxembourg Business Register (LBR) confirm a 10% drop in new business registrations during the months of March and August if compared with 2019 (Figure 4).

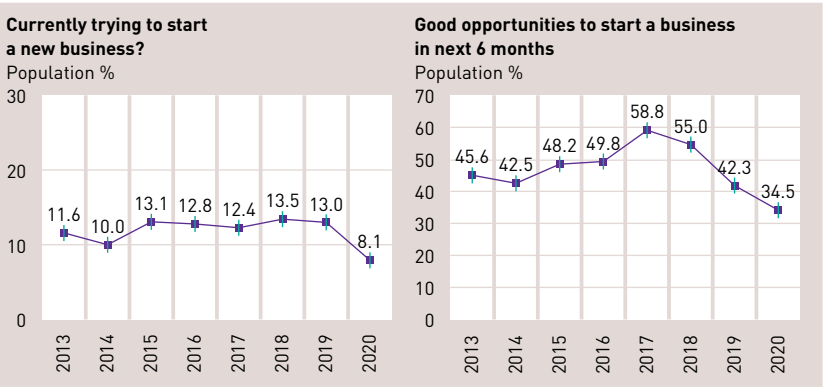
Figure 4
Business registrations. 2020 vs 2019



Notes: elaboration based on LBR data for Luxembourg over the 2019-2020 period

One additional way to monitor entrepreneurial activity is to look at the share of individuals over the overall population who are currently trying to set up a business in Luxembourg according to the GEM survey. Figure 5 displays how this share has evolved over the 2013-2020 period.

Figure 5
Entrepreneurial activity and opportunities to start a business



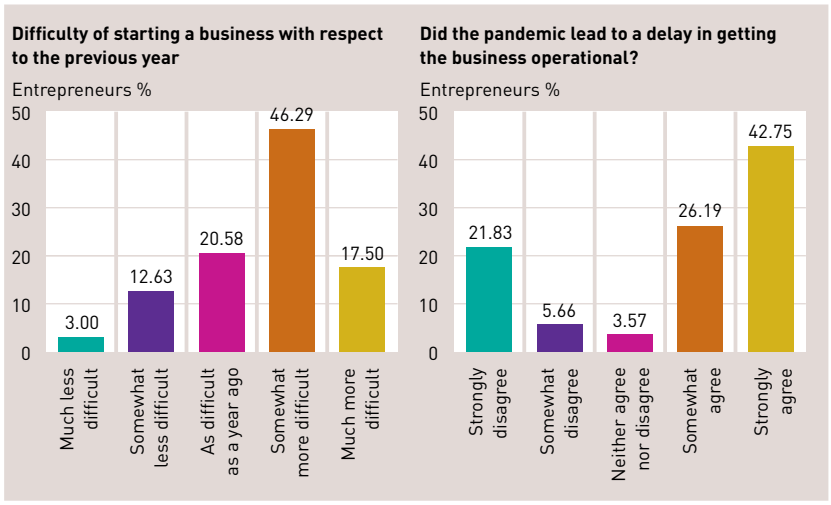
Notes: elaboration based on GEM data for Luxembourg over the 2013-2020 period. Population-weighted estimates. 95% confidence intervals reported.

While it has been roughly constant over time, it experienced a substantial decline during the last year, with the rate of individuals trying to start a business going from 13% in 2019 to 8% in 2020. This drop, which represents an all-time low since the GEM has started collecting data, arguably reflects individuals opting to delay or abandon their entrepreneurial intentions altogether.

Among the reasons for the decline in people engaging in entrepreneurial activity, the perception that the current economic scenario does not provide favourable conditions to set up a business seems to have played a role. Indeed, while last year 42.3% perceived that there were good opportunities to start up a business in Luxembourg, this figure has declined to 34.5% in 2020. It is worth noticing that this indicator features a downward trend that has started in 2018.

The pandemic has indeed increased the difficulties involved in the start-up process. According to the entrepreneurs surveyed by GEM, roughly 64% reported that setting up a business is harder in 2020 if compared with last year, although only 18% of them considered it much more difficult than before.

Figure 6
Difficulty of starting a business and delay in getting businesses operational



Notes: elaboration based on 2020 GEM data for Luxembourg. Population-weighted estimates.

Those individuals who recently engaged in entrepreneurial activities further corroborate this view. Around 69% of them declared that the COVID-19 crisis has indeed caused a delay in getting their business operational.

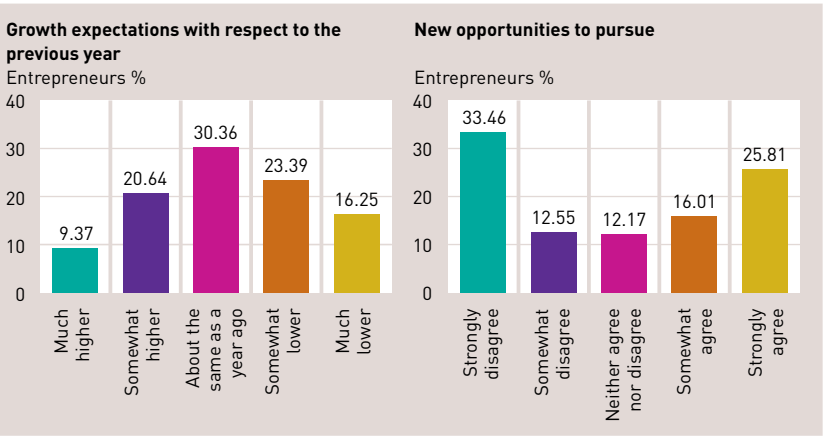
Entrepreneurs' growth expectations are generally worse but some envision opportunities

The pandemic represents a threat to current entrepreneurial activity, and not only in terms of ease of establishing and running a business. The crisis could also affect the growth prospects of newly established entrepreneurial activities. Indeed, prior research has found that economic downturns generally hamper the growth of young and small entrepreneurial firms (Fort et al., 2013).[16]

The GEM survey asked entrepreneurs about their future business growth expectations and how these have changed compared to 2019. The data provide a mixed portrayal of entrepreneurs' prospects (Figure 7). Most of them, approximately 40%, expect their businesses to grow less than they would have expected in 2019. However, around 30% reported no substantial change, while 30% even reported to have higher growth expectations.

Despite worsened economic conditions, crises can also be regarded as times of "creative destruction", with the emergence of many successful entrepreneurs and innovative start-ups. Disney, Microsoft, Oracle, Hewlett-Packard, and, more recently, Airbnb, Dropbox, Pinterest, Uber, and WhatsApp, were all founded during recessionary periods. An additional example is Alibaba's Taobao founded during the SARS pandemic in China. The COVID-19 crisis represents a challenge but also provides new opportunities for entrepreneurs (Li-Ying and Nell, 2020).

Figure 7
Change in growth expectations and new opportunities to pursue



Notes: elaboration based on 2020 GEM data for Luxembourg. Population-weighted estimates.

[16] Given that young and small firms disproportionately contribute to job creation, their hampered performance could also have negative consequences for aggregate employment growth (Sedláček and Sterk, 2020).

In the short term, the COVID-19 crisis has given entrepreneurs the opportunities to introduce radical innovations in tele-medicine, remote personal care, home delivery, food processing, teleworking, online education, and contact tracing. In the long term, the COVID-19 outbreak may provide valuable opportunities for those entrepreneurs that are able to anticipate permanent changes involving, for example, demand for remote working, e-commerce, education and health services.

Around 42% of all surveyed entrepreneurs agrees that the COVID-19 pandemic has provided them with new opportunities to pursue (Figure 7), which supports the view that the current crisis represents a challenge but also an opportunity, at least potentially.

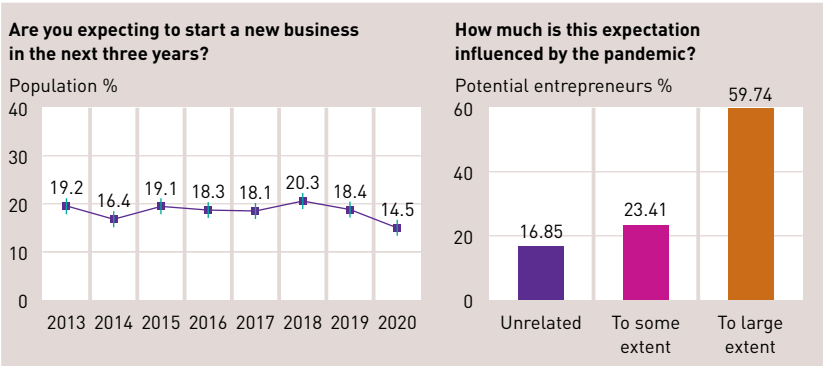
Fewer people with future entrepreneurial intentions due to the COVID-19 crisis

The COVID-19 outbreak did not only affect those entrepreneurs and businesses that have already started their activity. One additional concern are those entrepreneurial endeavours that would have started, if the pandemic had not happened. This 'missing generation of firms', the firms that would have been established without COVID-19, is potentially detrimental to future aggregate economic performance (Sedláček and Sterk, 2020).

The GEM survey sheds some light in this direction by examining how the COVID-19 crisis is affecting the future entrepreneurial intentions. In particular, the data allow us to track the share of individuals that report the intention to start a business during the next three years.

Figure 8 plots the evolution over the entire population of individuals with entrepreneurial intentions in the future. Future start-up intentions declined from 18.8% in 2019 to 14.5% in 2020. This declined is arguably due to the coronavirus pandemic. Approximately 60% of all respondents declared that their decision is largely influenced by the pandemic while 24% reported that their decision was influenced to same extent.

Figure 8
Potential entrepreneurship and the impact of the pandemic



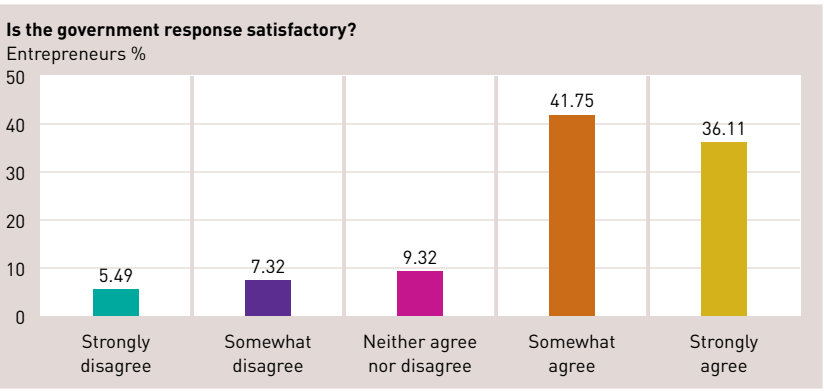
Notes: author's elaboration based on 2013-2020 GEM data for Luxembourg. Population-weighted estimates. 95% confidence intervals reported.

Whether these recent dynamics are here to stay or will see a positive rebound in the forthcoming months should be object of analysis and monitoring.

Entrepreneurs are satisfied overall with the government response to the pandemic

The response of the government to curb the negative impact on the private sector included a series of measures to help firms secure the necessary financial means to address the shortage of cash and to prevent insolvency. Policy measures addressed the difficulties of younger and smaller firms as well with interventions aimed at supporting innovative start-ups with extraordinary provisions, as well as measures tailored to help innovative businesses develop solutions to fight the COVID-19 pandemic through RandD grants.[17]

Figure 9
Government response to the pandemic



Notes: author's elaboration based on 2013-2020 GEM data for Luxembourg. Population-weighted estimates.

While we do not have data concerning the appreciation of such measures by entrepreneurs, the GEM has asked whether the government has so far effectively responded to the economic consequences of the coronavirus outbreak. Data indicate an overall positive appreciation of government efforts in tackling the pandemic with around 79% agreeing that the response was indeed effective (Figure 9).

[17] A complete list of measures adopted in Luxembourg to help businesses navigate the COVID-19 pandemic is available here: https://www.cc.lu/en/covid19/business-support/complete-list/

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